

**Study on Human Resources and
Infrastructure Development for Co-
creation of Resilient Society under the
With/Post COVID-19 Context in Central
America and the Caribbean Region**

Final Report

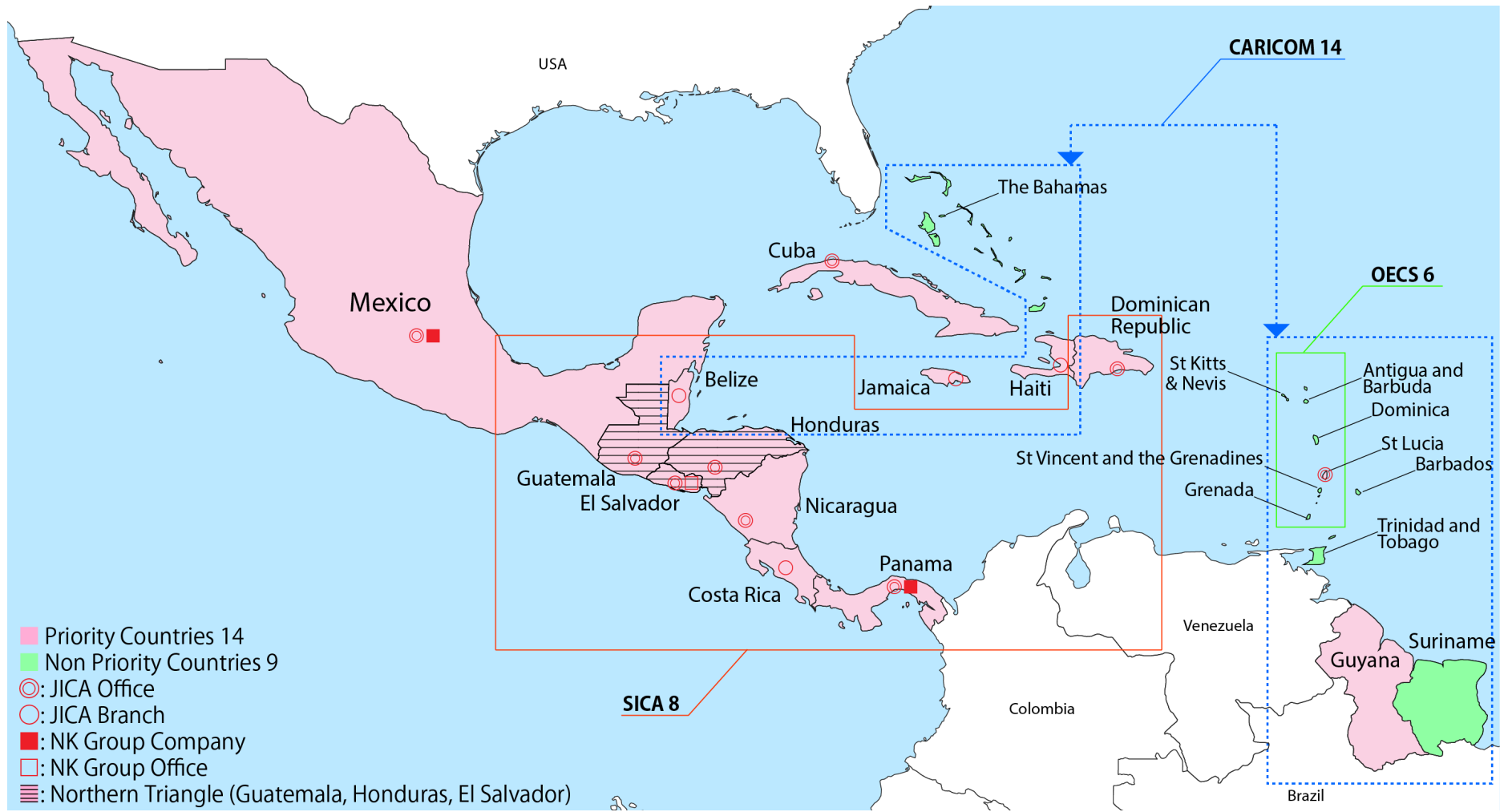
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Study area

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Abbreviation

Abbreviation	English / Spanish
AND	Alcaldía del Distrito Nacional (República Dominicana)
ADT	Accessible Digital Textbook
AECID	Spanish Agency for International Development Cooperation
AFD	Agence Française de Développement
AHP	Analytic Hierarchy Process
ALIDES	Alianza para el Desarrollo Sostenible de Centroamérica
APORDOM	Dominican Port Authority / Autoridad Portuaria Dominicana
BBB	Build-Back-Better
BCIE	Banco Centroamericano de Integración Económica
BCP	Business Continuity Plan
BDS	Business Development Service
BTB	Belize Tourism Board
CABEI	Central American Bank for Economic Integration
CANICARNE	Cámara Nicaragüense de Plantas Exportadoras de Carne Bovina
CAPE	Caribbean Advanced Proficiency Exam
CARDI	Caribbean Agricultural Development Institute
Carib-Export	Caribbean Export and Investment Agency
CARICOM	Caribbean Community
CARPHA	Caribbean Public Health Agency
CCAD	Central American Commission for Environment and Development / Comisión Centroamericana de Ambiente y Desarrollo
CCC	CARICOM Competition Commission
CCS	Cooperativas de Crédito y Servicios
CCSA	Committee for the Coordination of Statistical Activities
CCSLC	Caribbean Certificate of Secondary Level Competence
CCTV	Closed-circuit Television
CDB	Caribbean Development Bank
CDEEE	Corporación Dominicana de Empresas Eléctricas Estatales
CDEMA	Caribbean Disaster Emergency Management Agency
CDF	CARICOM Development Fund
Cenpromype	Centro Regional de Promoción de la MIPYME
CEPAL	Economic Commission for Latin America and the Caribbean
CIA	Central Intelligence Agency
CIMH	Caribbean Institute for Meteorology & Hydrology
CIV	Ministerio de Comunicaciones, Infraestructura y Vivienda (Guatemala)
COCATRAM	Central American for Maritime Transport
COMISCA	Council of Ministers of Health of Central America and the Dominican Republic
COMITRAN	Consejo Sectorial de Ministros de Transporte de Centroamérica
CONAMYPE	Comisión Nacional de la Micro y Pequeña Empresa
CONATRADEC	Comisión Nacional para la Transformación y Desarrollo de la Caficultura
COVAX	COVID-19 Vaccine Global Access
COVID-19	Coronavirus Disease 2019
CPA	Cooperativas de Producción Agropecuaria
CPD	Continuous Professional Development
CPEA	Caribbean Primary Exit Assessment
CPM	Critical Path Method
CPSO	CARICOM Private Sector Organisation
CRFM	Caribbean Regional Fisheries Mechanism
CSEC	Caribbean Secondary Education Certificate
CSUCA	Consejo Superior Universitario Centroamericano
CT	Computed Tomography
CTA	Coordinadora Técnica Administrativa
CTO	Caribbean Tourism Organization
CVQ	Caribbean Vocational Qualification
CXC	Caribbean Examinations Council
DECCC	Plan Económico Compatible con el Cambio Climático (República Dominicana)
DG	Dirección General
DIDEDUC	Dirección Departamental de Educación
DIGEACE	Dirección General de Acreditación y Certificación
DIGECADE	Dirección General de Gestión de Calidad Educativa
DIGECUR	Dirección General de Currículo
DIGEDUCA	Dirección General de Evaluación e Investigación Educativa
DIGEEEX	Dirección General de Educación Extraescolar

DTP	Diphtheria-Pertussis-Tetanus
DX	Digital transformation
ECFA	Engineering and Consulting Firms Association, Japan
ECLAC	Economic Commission for Latin America and the Caribbean
EDMU	Education Development and Management Unit
EMIS	Educational Management Information System
EOJ	Embassy of Japan
ERCE	Fourth Regional Comparative and Explanatory Study
EU	European Union
EXCAN	Asociación de Exportadores de Café de Nicaragua
FAO	Food and Agriculture Organization of the United Nations
FUNDESAL	Fundación Salvadoreña de Desarrollo y Vivienda Mínima
GAF	Grupo Empresarial Agroforestal
GAG	Grupo Empresarial Agrícola
GBV	Gender Based Violence
GDP	Gross Domestic Product
GEA	Guyana Energy Agency
GFDD / FUNGLODE	Global Foundation for Democracy and Development / Fundación Global Democracia y Desarrollo
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNR	Global Nutrition Report
GPE	Global Partnership for Education
GPL	Guyana Power and Light Inc.
GPS	Global Positioning System
GTT	Guyana Telephone and Telegraph Company
HACCP	Hazard Analysis and Critical Control Point
HECI	Hinterland Electrification Company (Guyana)
HoReCa	Hotel, Restaurant and Cafeteria
ICCO	International Cocoa Organization
ICDF	International Cooperation and Development Fund
ICO	International Coffee Organization
ICT	Information and Communication Technology
ICTZ	Intertropical Convergence Zone
IDB	Inter-American Development Bank
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IHR	International Health Regulations
IICA	Inter-American Institute for Cooperation on Agriculture
IIFT	Instituto de Investigaciones de Fruticultura Tropical
IMF	International Monetary Fund
IMST	Incident Management Support Team
IMT	Incident Management Team
INATEC	Instituto Nacional Tecnológico
INBAR	International Bamboo and Rattan Organization
INTA	Instituto Nicaragüense de Tecnología Agropecuaria
INTRANT	Instituto Nacional de Tránsito y Transporte Terrestre
IOM	International Organization for Migration
IPP	Independent Power Producers
IPSA	Instituto Nicaragüense de Protección Agropecuaria
ITU	International Telecommunication Union
JAD	Dominican Agribusiness Board / Junta Agro-Empresarial Dominicana
JAMPRO	Jamaica Promotions Corporation
JCAP	JICA Country Analysis Paper
JCC	Japan Communication Consultants, LLC
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
JPS	Jamaica Public Service Company
JTC	Jamaica Teaching Council
KPI	Key Performance Indicator
LAC	Latin America and the Caribbean
LCDS	Low Carbon Development Strategy (Guyana)
LINUX	Linux is a family of open-source Unix-like operating systems
MAG	Ministerio de Agricultura y Ganadería (El Salvador)
MAG	Ministry of Agriculture of Nicaragua / Ministerio Agropecuario de Nicaragua

MARN	Ministerio de Ambiente y Recursos Naturales (MARN)
MEAL	Monitoring, Evaluation, Accountability and Learning
MEFCCA	Ministerio de Economía Familiar, Comunitaria, Cooperativa y Asociativa
MEM	Ministerio de Energía y Minas (Guatemala)
MIDH	Ministry of Infrastructure Development & Housing (Belize)
MIFIC	Ministerio de Fomento, Industria y Comercio
MINAE	Ministerio de Ambiente y Energía (Costa Rica)
MINAG	Ministerio de la Agricultura
MINAL	Ministerio de la Industria Alimentaria
MINCEX	Ministerio del Comercio Exterior y la Inversión Extranjera
MINCIN	Ministerio del Comercio Interior
MINEDUC	Ministerio de Educación
MIVI	Ministerio de Vivienda (El Salvador)
MOFA	Ministry of Foreign Affairs of Japan
MOPC	Ministry of Public Works and Communications (Dominican Republic)
MoPW	Ministry of Public Works (Guyana)
MPP	Migrant Protection Protocols
MRI	Magnetic Resonance Imaging
MRT	Mass Rapid Transit
MSET	Ministry of Science, Energy and Technology (Jamaica)
MSME	Micro, small and medium enterprise
MYSQL	open-source relational database management system
NCDs	Non-communicable diseases
NEET	Not in Education, Employment or Training
NEMO	National Emergency Management Organization (Saint Lucia)
NGO	Non governmental organization
NICADAPTA	Proyecto de Adaptación a Cambios en los Mercados y a los Efectos del Cambio Climático en Nicaragua
NICIL	National Industrial and Commercial Investment Ltd. (Guyana)
NICTO	Information Communications and Technology Office (Saint Lucia)
NNA	Niñas, niños y adolescente
NTMI	Iniciativa de gestión de información de movilidad
NTRC	National Telecommunications Regulatory Commission (Saint Lucia)
OAS	Organization of American States
OCOP	One Community, One Product
OECD	Organisation for Economic Co-operation and Development
OECS	Organization of Eastern Caribbean States
OMUS	Observatorio de Movilidad Urbana Sostenible (República Dominicana)
OS	Operating System
OSDE	Organización Superior de Dirección Empresarial
OUR	Office of Utility Regulation
OVOP	One Village, One Product
PAHO	Pan American Health Organization
PCR	Polymerase Chain Reaction
PdD	Plan Nacional de Descarbonización (Costa Rica)
PDM	Product Design Matrix
PHC	Primary Health Care
PHP	general-purpose scripting language especially suited to web development
PNDES	Plan Nacional de Desarrollo Económico y Social 2030
PNLOG	National Logistics Plan 2020-2032 (Dominican Republic)
PP	Pilot Project
PPE	Personal Protection Equipment
PPP	Public-Private Partnerships
PRODECAFE	Projet de développement des coopératives agroforestières
PTA	Parents Teacher Association
PUC	Public Utility Commission
RECOPE	Refinadora Costarricense de Petróleo
SE-CAC	Secretaría Ejecutiva del Consejo Agropecuario Centroamericano
SEGIB	Secretaría General Iberoamericana
SEGIB	Secretaría General Iberoamericana
SFESD / FUSADES	Salvadoran Foundation for Economic and Social Development / Fundación Salvadoreña para el Desarrollo Económico y Social
SICA	Central American Integration System
SICCS	Sistema Integrado Centroamericano de Calidad y Sostenibilidad Turística
SIDS	Small Island Developing States
SIECA	Secretaría de Integración Económica Centroamericana

SINAE	Sistema Nacional de Acompañamiento Escolar
SIT	Superintendencia de Telecomunicaciones (Guatemala)
SITCA	Secretaría de Integración Turística Centroamericana
SLUHIS	Saint Lucia Health Information System
SME	Small and Medium-sized Enterprises
SOE	State Owned Enterprise
SPS	Sanitary and Phytosanitary
STEAM	Science, Technology, Engineering, Art and Math
STEM	Science, Technology, Engineering, and Math
SUN	Scaling Up Nutrition
TECHNOLINKS+	Moving Towards Inclusive Prosperity in Nicaragua's Agri-Food and Export Sectors
TERCE	Third Regional Comparative and Explanatory Study
TOD	Transit Oriented Development
TPDCo	Tourism Product Development Company (Jamaica)
TVET	Technical and Vocational Education and Training
UBPC	Unidad Básica de Producción Cooperativa
UCE	Unidad de Coordinación Energética (SICA)
UCSF	Unidad Comunitaria de Salud Familiar
UHC	Universal Health Coverage
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNWTO	United Nations World Tourism Organization
USAID	United States Agency for International Development
USF	Universal Service Fund (Jamaica)
VC	Value Chain
WFP	World Food Program
WHO	World Health Organization
WTTC	World Travel & Tourism Council

Currency conversion rate (Date of application: January 2022, JICA conversion rate)

Japan	Yen	JPY	Rate (1USD=¥)
USA	US Dollar	USD	133.21
Belize	Belize Dollar	BZD	67.7429
Costa Rica	Costa Rican Colon	CRC	0.23434
El Salvador	US Dollar	USD	133.21
Guatemala	Quetzal	GTQ	17.39
Honduras	Lempira	HNL	5.50046
Nicaragua	Cordoba Oro	NIO	3.70191
Panama	US Dollar	USD	133.21
Mexico	Mexican Peso	MXN	6.8478
Bahamas	Bahamian Dollar	BSD	-
Barbados	Barbados Dollar	BBD	-
Cuba	Cuban Peso	CUP	5.32842
Dominican Republic	Dominican Peso	DOP	2.40926
Haiti	Gourde	HTG	0.91657
Jamaica	Jamaican Dollar	JMD	0.88378
Trinidad Tobago	TT Dollar	TTD	-
Guyana	Guyana Dollar	GYD	-
Suriname	Surinam Dollar	SRD	-
Antigua and Barbuda	E. Carib. Dollar	XCD	49.3372
Dominica	E. Carib. Dollar	XCD	49.3372
Grenada	E. Carib. Dollar	XCD	49.3372
St. Kitts and Nevis	E. Carib. Dollar	XCD	49.3372
St. Lucia	E. Carib. Dollar	XCD	49.3372
St. Vincent Grenadines	E. Carib. Dollar	XCD	49.3372

Part 1

Introduction and Summary of the Study

Chapter 1	Outline of the Study
Chapter 2	Study Method
Chapter 3	Study Summary

1. Outline of the Study

1.1 Introduction

The study was contracted on May 25, 2022 and started promptly thereafter.

The work plan was submitted and approved on June 7, 2022 and the inception report on June 24, 2022.

The 1st field survey was conducted from July 30, 2022 to September 9, 2022. The project leader focused his visit on regional institutions (SICA, CARICOM, and OECS). Sector members conducted field surveys, focusing on priority countries in each sector. The pilot project member visited the implementing countries of the candidate pilot projects and discussed the project formation with the counterpart organizations and Japan International Cooperation Agency (JICA) overseas offices.

Based on the results of the 1st field survey, the JICA Study Team updated the focus countries and survey contents for each sector in consultation with JICA and updated the overall study plan and destinations for the 2nd field survey.

The 2nd field survey was conducted from November 1, 2022 to December 5, 2022. The project leader visited mainly regional institutions (SICA, CARICOM, and OECS) to report and discuss the progress of the study. Members visited the priority countries of each sector to present and discuss the draft development and cooperation scenarios. The pilot project members visited Honduras, the pilot project country, to assist in the project management.

The 3rd field survey was conducted on January 30, 2023 to February 11, 2023. The members visited the priority countries of each sector to explain and discuss the draft development and cooperation scenarios. The pilot project members visited Honduras, the pilot project country, to support the project completion report by the project consignee.

1.2 Name of the Study

Table 1-1 lists the names of the study in each language.

Table 1-1 Name of the Study1

No.	Language	Name
1	Japanese	北米・中南米（広域）With/Post-COVID-19 禍下における強靱な社会共創のための人材及びインフラ開発に係る情報収集・確認調査
2	English	Study on Human Resources and Infrastructure Development for Co-creation of Resilient Society under the With/Post-COVID-19 Context in Central America and the Caribbean Region
3	Spanish	Estudio Sobre Desarrollo de Recursos Humanos e Infraestructura para Cocreación de Sociedad Resiliente en el Contexto Con/Post-COVID-19 en la Región de América Central y el Caribe

Source: JICA Study Team

1.3 Background

In 2021, JICA conducted the "Data Collection Survey on Development Cooperation With/Post-COVID-19 Society in Central America and the Caribbean Region" to collect and analyze information on the impact of the coronavirus disease 2019 (hereinafter COVID-19) on social systems and cooperation needs in the region. A pilot project was also conducted and recommendations of the JICA Study Team regarding the future direction of development were formulated. As a result, it was recommended that priority needs to be given to social and economic infrastructure development, private sector value chain development for industrial development, and the promotion of green economy and climate change countermeasures. It was also recommended that efforts to address the root problem of

illegal immigration, which is also on the agenda between the U.S. and Japan. In addition, because of COVID-19, efforts have been initiated between the Central American and Caribbean region and Japan for the development of both regions and deepening these efforts could contribute to the formation of more resilient communities.

Considering this situation, the JICA Study Team decided to conduct this basic information collection study to gather information on the efforts in Central America and the Caribbean region to contribute to a better recovery plan (Build Back Better, hereinafter "BBB") to build a more resilient society under the COVID-19.

1.4 Study Purpose

This study will collect the latest information on efforts to contribute to the realization of a better recovery "BBB" for building resilient societies under COVID-19 in Central America and the Caribbean Region and will verify this information through pilot projects. In addition to the migration issues that the JICA Study Team analyzed as a priority issue in the "Data Collection Survey on Development Cooperation With/Post-COVID-19 Society in Central America and the Caribbean Region" (hereinafter "preliminary study"), the private sector and value chain development, including new industrial players, "Transition to a Green Economy," and "Local Development and Regional Enrichment" are included in the analysis. The JICA Study Team will analyze and make recommendations on human resources and infrastructure development for the co-creation of a resilient society under COVID-19, which will contribute to the establishment of basic social services, a priority sector in each country.

1.5 Study Countries

(1) Countries Covered in the Study

The target of this survey are the 23 countries in the Central American and Caribbean region as listed in Table 1-2. Figure 1-1 shows the location map of the study countries.

Table 1-2 Study Countries

No.	Region	Study Countries
1	Central America (8 countries)	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama
2	Caribbean (15 countries)	Bahamas, Barbados, Cuba, Dominican Republic, Haiti, Jamaica, Trinidad and Tobago, Guyana, Suriname
	OECS (6 countries)	Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, Trinidad and Tobago, St. Vincent and the Grenadines

OECS : Organisation of Eastern Caribbean States

Source: Prepared from special specifications.

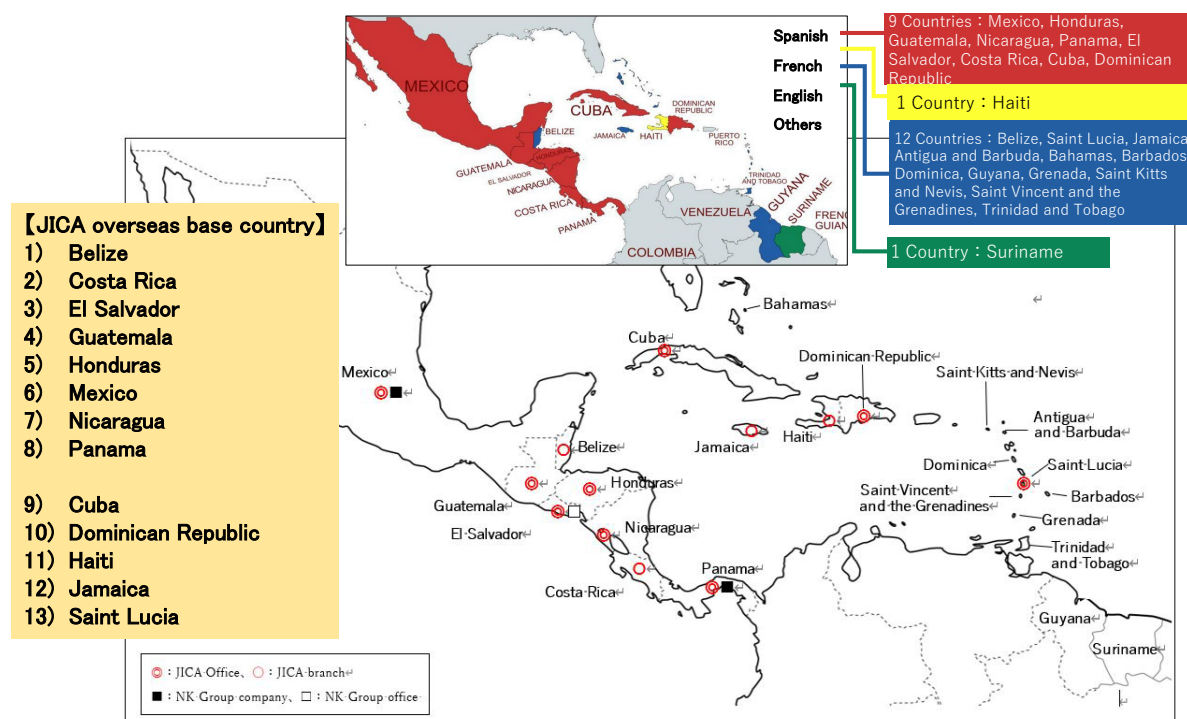
(2) Priority Countries for the Study

As shown in Table 1-3, the 13 countries where the JICA overseas offices are located, and Guyana are the priority countries.

Table 1-3 Priority Countries for the Study2

No.	Level	Country
1	Priority	Mexico, Honduras, Guatemala, Nicaragua, Panama, El Salvador, Belize, Costa Rica, Cuba, Dominican Republic, Haiti, St. Lucia, Jamaica, Guyana
2	Non-priority	Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Suriname, St. Kitts and Nevis, St. Vincent and the Grenadines, Trinidad, and Tobago

Source: Prepared for special specifications.



Source: JICA Study Team

Figure 1-1 Study Countries1

1.6 Study Contents

To achieve the above objectives, a study will be conducted with the details shown in Table 1-4.

Table 1-4 Study Contents

No	Study Contents
1	Collection and analysis of information on economic and social infrastructure development in priority sectors in each country and compose recommendations for the development of JICA cooperation.
2	Information collection and analysis contributing to the transition to a green economy, including value chain development in agriculture, fisheries, and recommendations for the development of JICA cooperation.
3	Collection and analysis of the latest information on the root causes of migration, particularly in the Northern Triangle region of Central America, compilation and analysis of trends in policy and measures in the United States and other countries concerned, and recommendations for the development of future JICA cooperation, including from the perspectives of South-South, Triangle and Regional cooperation.
4	Implementation of pilot projects and verification of effectiveness to examine effective development cooperation to contribute to the realization of a better reconstruction "BBB" for building a resilient society under the With/Post-COVID-19 disaster, based on (1) - (3).
5	Propose development scenarios for better reconstruction "BBB" for building a resilient society under the With/Post-COVID-19 disaster based on (1) - (4)

Source: Prepared for special specifications.

1.7 Status and Issues in Study Implementation

1.7.1 Priority Issues Recommended in the Preliminary Study

The global spread of COVID-19 has infected 664 million people worldwide and killed 6.72 million. In the countries studied, the cumulative number of cases and deaths have reached 14.0 million and approximately 410,000, respectively, seriously affecting not only the medical and health systems of target countries, but also economic activities. Since last September 2022, the number of new cases in the region has decreased and leveled off, and the COVID-19 disaster is coming to an end, but the risk of another outbreak remains. JICA conducted a preliminary study in 2021 to collect and analyze information on the impact of the COVID-19 disaster on social systems and cooperation needs in the

region and conducted a pilot project to make recommendations on future development directions (Table 1-5).

Table 1-5 Priority Issues Recommended in the Preliminary Study³

No	Priority Issues
1	Development cooperation direction of "Resilient, Inclusive, and Sustainable Growth"
2	Development cooperation using "Green Technology"
3	Development cooperation to address "Climate Change"
4	Development cooperation using "Digital Technology"
5	Smart city technology as a solution to urban problems
6	Development cooperation with enhanced wide-area collaboration
7	Value chain analysis and resilience enhancement in industrial activities
8	Efficient training of human resources for development cooperation
9	Utilization of pilot project method (formation and implementation)

Source: Excerpt from "Data Collection Survey on Development Cooperation With/Post-COVID-19 Society in Central America and the Caribbean Region (2021)"

1.7.2 Status and Issues in the Study Implementation

Table 1-6 summarizes the status and issues to be addressed in conducting this study.

Table 1-6 Challenges in Study Implementation

No.	Issues	Description
1	The preliminary study proposed the direction of future development and priority issues to be addressed, but "specific development scenarios" have not been created.	Based on the preliminary study, a draft of a "specific development scenario" will be prepared and through a process of discussion with counterpart agencies, international organizations, and regional organizations a consensus will be reached on the final draft.
2	In relation to Issue No. 1, target countries and sectors have not been selected for the preparation of "specific development scenarios".	In preparing "specific development scenarios" based on the future development directions and priority issues proposed in the preliminary study, it is necessary to select target sectors, discuss, and build consensus on specific scenarios.
3	Pilot project period to study effective development cooperation is short.	The study period is 10 months where 4 pilot projects must be initiated and terminated during this period. Pilot projects will be selected for which the process of selection, implementation, and verification can be smoothly executed within this period.
4	Insufficient information has been collected and analyzed for local development and BBB initiatives.	As for a better reconstruction "BBB", it has already been realized in the COVID-19 society with contactless services and remote operations. In the preliminary study, it was organized as "new social issues" but in this study, it is incorporated into "specific development scenarios".
5	Cooperation scenarios on the most promising development scenarios are needed.	"Specific development scenarios" will be created by summarizing Issues Nos. 1 to 4. The scope of JICA cooperation with a view to realize the most promising development scenario will be considered and a cooperation scenario will be created.
6	Measurement is required to cover the whole study area and for the language barrier.	The study plan will be made considering local business style and travel time, to make effective use of the JICA Study Team's local resources and networks.
7	Response to the risk of the COVID-19 is needed.	Confirm the status of the COVID-19 in the countries to be studied in advance for the field survey and take necessary actions to prevent infection and to deal with the disease in case of infection.

Source: JICA Study Team

1.8 Study Outcomes

The deliverables of this study are shown in Table 1-7.

Table 1-7 Submissions for this Study

Reports	Date of Submission	Copies
Study Implementation Plan	June 7, 2022	1 copy in Japanese and data
Inception Report	June 24, 2022	1 copy in Japanese, 1 copy in English and data
Progress Report	October 14, 2022	1 copy in Japanese, 1 copy in English and data
Draft Final Report	Late December 2022 Early January 2022	1 copy in Japanese and data 1 copy in English and data

Reports	Date of Submission	Copies
Final Report	Before March 8, 2023	20 copies in Japanese (hard cover) CD-R 1 copy each in Japanese, English, and Spanish

Source: JICA Study Team

1.9 Consulting Contract

A summary of the consulting contract is shown in Table 1-8.

Table 1-8 Consulting Contract

No	Item	Contents
1	Project Name	Study on Human Resources and Infrastructure Development for Co-creation of Resilient Society under the With/Post-COVID-19 Context in Central America and the Caribbean Region
2	Client	Japan International Cooperation Agency (JICA)
3	Consultant	Nippon Koei Co., Ltd. and Koei Research & Consulting, Inc. Joint Venture
4	Work Period	May 25, 2022 - March 8, 2023

Source: JICA Study Team

1.10 Composition of the Survey Team

The composition of the survey team is shown in Table 1-9.

Table 1-9 Composition of the Survey Team

No.	Field	Name (Japanese)	Name	Belonging
1	Chief Operations Officer/Build Back Better	石本 一鶴	Ishimoto Ichizuru	NK
2	Deputy Operations Manager/Disaster Prevention and Climate Change	寺本 雅子	Teramoto Masako	NK
3	Infrastructure Development for Building a Resilient Society (1)	三原 拓	Mihara Taku	NK
4	Infrastructure Development for Building a Resilient Society (2)	平野 邦臣	Hirano Kuniomi	NK
5	Economic Infrastructure Development (1)	小川 良輔 ¹⁾ 福永 淳一 ²⁾ 遠藤 和志 ³⁾	Ogawa Ryosuke Fukunaga Junichi Endo Kazushi	NK
6	Economic Infrastructure Development (2)	和田崎 泰明	Wadasaki Yasuaki	NK
7	Social Infrastructure Development (1)	井川 真理子	Ikawa Mariko	KRC
8	Social Infrastructure Development (2)	後藤 修也	Goto Nobuya	KRC
9	Green Economy	松岡 宏	Matsuoka Hiroshi	NK
10	Agricultural Value Chain Development (1)	小浦 拓馬	Koura Takuma	NK
11	Agricultural Value Chain Development (2)	吉野 倫典	Yoshino Michinori	NK
12	Fisheries Value Chain Development	樋野 芳樹	Hino Yoshiki	NK ⁴⁾
13	Regional Economic and Social Development	増田 耕平	Masuda Kohei	NK
14	Root Cause Measures for Central American Migration / South-South, Triangular, and Regional Cooperation	バジエリ やよい	Baggieri Yayoi	NK
15	Supervision of Innovation/Pilot Project Implementation (1)	片山 英城	Katayama Hideki	NK
16	Supervision of Innovation/Pilot Project Implementation (2)	ガンゾリグ ロカ	Ganzorig Luvsanjamts	NK

NK: Nippon Koei Co., KRC : Koei Research & Consulting

1) In charge of Information & Telecommunications and Electric Power (2022.5.25~2022.10.31)

2) In charge of Electricity (2022.11.1~2023.3.8)

3) In charge of Information and Communication (2022.11.1~2023.3.8)

4) Item Consulting

Source: JICA Study Team

2. Study Method

2.1 Introduction

This study was started by the method explained in the Inception Report, but at the stage of compiling the results of the first field survey as a progress report, and at the stage of preparing the survey plan for the second field survey, depending on the sector, contents method was changed.

2.2 Study Tasks

The contractual study tasks are shown in Table 2-1.

Table 2-1 Contractual Study Tasks

No.	Task	Remarks
1	Inception Report	Submitted on June 24th, 2022
2	Literature Review	Completion of implementation
3	Field Surveys	1st (July 30th to September 9th, 2022) 2nd (November 1st to December 5th, 2022) 3rd (January 30th to February 11th, 2023)
4	Selection of Pilot Projects	-
5	Preparation of Pilot Project Plans	-
6	Implementation of Pilot Projects	1 Pilot project in Honduras
7	Progress Report	Submitted on October 14th, 2022
8	Study and Recommendations for Future Cooperation Scenarios	-
9	Prepare Draft Final Report	Submitted on December 26th, 2022
10	Prepare Final Report	March 8 th 2023

Source: JICA Study Team

2.3 Study Schedule Table

Table 2-2 shows the schedule of this study.

Table 2-2 Study Schedule

Work	Period	2022										2023		
		5	6	7	8	9	10	11	12	1	2	3		
(1)	Inception report preparation		□	△-△										
(2)	Literature review		□	□	□	□	□	□	□	□	□	□	□	□
(3)	Field survey				■	■	■	■	■	■	■	■	■	■
(4)	Selection of pilot projects		□	□	□	□	□	□	□	□	□	□	□	□
(5)	Preparation of pilot project plans				■	■	■	■	■	■	■	■	■	■
(6)	Implementation of pilot projects				□	□	□	□	□	□	□	□	□	□
(7)	Progress report preparation					□	△-△							
(8)	Discussion and recommendations on cooperation scenario		□	□	□	□	□	□	□	□	□	□	□	□
(9)	Draft final report preparation									□	△	△	△	△
(10)	Final report preparation											□	△	△

Legend: □ Preparation ■ Field work □ Local work △-△ Report discussion □ Other work □ Translation

Source: JICA Study Team

2.4 Study Scope and Target

(1) Overall Study

Study scope and target of each sector is shown in Table 2-3.

Table 2-3 Study Scope and Target of each Sector

No.	Sector	Subsector	Study Target	Study Scope
1	Infrastructure for Resilient Society		Indicate the direction of development cooperation for building a resilient society through economic and social infrastructure development.	Collection and analysis of information on economic and social infrastructure development in priority sectors in each country and propose recommendations for the development of JICA cooperation
2	Economic Infrastructure Development (1)	Information and Telecommunications	To present measures that will contribute in narrowing the gap between urban and rural areas in terms of communication infrastructure, which is the basic infrastructure for remote activities that emerged during the COVID-19 disaster.	Guatemala in Central America and Saint Lucia in the Caribbean region will be the main countries targeted for the field research. In addition, relevant information will be collected on the electricity sector from the countries and issues and possibilities for cooperation in the public (policy) and private (telecommunications operators) sectors will be indicated in terms of the disparity between urban and rural areas.
3		Electricity	To present measures that contribute to the direction of carbon neutrality in the energy sector, which has been and will continue to be a major issue, and the possibilities for cooperation (countries and contents of cooperation).	Conducting studies on renewable energy and related electric power infrastructure in Jamaica and Guyana with a view of structuring projects in these countries.
4	Economic Infrastructure Development (2)	Transportation Traffic (Bridges and Road Traffic Control)	Investigate economic infrastructure development needs and formulate development and cooperation scenarios for infrastructure development.	Conduct survey of existing plans, identify maintenance needs for bridges on economic corridors, and determine the applicability of Japanese technology. Update the Preliminary Study, scrutinize areas to be improved with signals, etc., and discuss with relevant agencies (including introduction of Japan's official development assistance (ODA) projects).
5		Port and Building Materials and Construction Methods		Investigate the housing situation, bamboo housing initiatives, the applicability of bamboo housing, and the development of a bamboo industry in El Salvador.
6	Social Infrastructure Development (1) Education		Developing cooperation scenarios in the education sector necessary to narrow the inequalities uncovered or widened by the COVID-19 pandemic and to ensure that learning continues in the event of an outbreak of diseases or natural disasters in the future.	To assist the counterpart government in strengthening the education sector under the with/post-COVID-19 environment, information will be collected and analyzed regarding the challenges in education uncovered and the gaps widened by the COVID-19 pandemic, and ongoing efforts for ensuring the continuity of learning (remote-hybrid classroom, etc.) in the event of an outbreak of diseases or natural disasters.
7	Social Infrastructure Development (2) Health Care		Based on the vulnerabilities and challenges related to health care identified through the preliminary study, priority issues related to health care under the with/post COVID-19 situation in the studied countries will be identified and development and cooperation scenarios for achieving universal health coverage (UHC) will be developed.	Based on the desk review and discussions with the Japan International Cooperation Agency (JICA), the JICA Study Team is to select the countries to be studied in the field, establish priority themes for the study, and update the scope of work. Desk studies will be conducted in El Salvador, St. Lucia, and Guyana. Field surveys will be conducted in El Salvador and St. Lucia. A study will be conducted in El Salvador with the aim of strengthening core hospitals (provision of equipment) at the secondary level through grant assistance. In addition, detailed information on primary health care (PHC) and non-communicable diseases (NCDs) will be collected. As cooperation and surveys related to health care have not yet been conducted in St. Lucia and Guyana, general information related to health care will be collected as broadly as possible, while focusing to some extent on priority issues such as NCDs and PHC. Consider grant assistance (facility and equipment maintenance) and broad-based technical cooperation targeting regional institutions such as the Caribbean Public Health Agency (CARPHA) and Organisation of Eastern Caribbean States

No.	Sector	Subsector	Study Target	Study Scope
				(OECS).
8	Green Economy	Decarbonized Society, Energy Efficiency, and Renewable Energy	To create measures and development scenarios that contribute to a decarbonized society, energy conservation, and renewable energy. Further support needs will be investigated and shall consider support measures in the Central American region based on the information from the previous phase of the survey. In the Caribbean region, support measures and development scenarios will be considered based on further information gathering and issue identification.	In Central America, further support needs assessment will be conducted in Costa Rica based on the previous study and the hydrogen potential study of related projects, while in Guatemala and Dominica, surveys of relevant local institutions, the IDB, World Bank, BCIE, etc., will be conducted as part of the feasibility study. In the Caribbean region, a survey on energy mix improvement needs will be conducted in Jamaica based on the previous study and a survey in Guyana will be conducted in accordance with the power sector.
		Resilient Economic Development (including Tourism)	Data for resilient economic development, information on SME promotion, startups, and ecosystem promotion that contribute to a green economy will be collected to identify issues and create scenarios for development and cooperation. For tourism, specific project proposals and support schemes will be considered by taking the previous research one step further.	In the Central American region, the scope includes research contributing to the green economy as part of the industrial promotion (promotion of SMEs, startups, and ecosystems). In the Caribbean region, a desk study of all target countries will be conducted to select priority countries. In the tourism area, further assessment needs to be conducted in the Dominican Republic, following the previous phase of the study.
9	Agriculture and Rural Development	Agricultural Value Chain Development	Clarify the issues of VC for export crops and livestock products, and create development and cooperation scenarios for improving agricultural VC.	Consulting with JICA, it was decided to formulate a development and cooperation scenario for improving VC for export crops (Nicaragua and Cuba) and livestock products (Nicaragua), where in Nicaragua and Cuba as priority countries.
10		Agriculture DX	Select priority countries to study the potential for digital technology (DX) applications related to agricultural activities and create development and cooperation scenarios.	Select Guatemala's agricultural sector as a priority country for DX application study and examine the possibility of applying DX to VC.
11	Fisheries Value Chain Development	Fisheries	For the six countries in the Eastern Caribbean region, to identify challenges in the value chain of fishery products, which are for export, and the hotel, restaurant, and cafe (HoReCa) sector. Formulate a development scenario and JICA's future cooperation scenario based on the identified challenges. For Jamaica, to clarify issues surrounding the Jamaican fisheries industry and collect basic information that will contribute to the consideration of future JICA cooperation.	(Six countries in the Eastern Caribbean region) Formulate a comprehensive development scenario and JICA's future cooperation scenario for the fisheries value chain improvement of six countries (Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines). (Jamaica) Identify issues surrounding the Jamaican fisheries industry and propose cooperation ideas.
		Sargassum	To identify the impacts of Sargassum influx and issues in the current response. To formulate development scenarios and cooperative scenarios.	Focus on collecting information and summarizing knowledge through document investigation. Select 2-3 countries and conduct interviews and information exchange with related government agencies, regional organizations, and private companies (as necessary).
12	Regional Economic and Social Development		Grasp the challenges of regional economic and social development in rural areas of Central America, SICA countries, and Caribbean countries and propose support programs and projects through regional branding and collaboration with local governments in Japan.	For regional branding, consider measures to utilize Japan's related efforts such as OVOP, roadside stations, and regional revitalization. For cooperation with local governments, to investigate the possibility of cooperation between Japan and the local governments, targeting those with budding cooperative relationships such as sister cities and host towns, and considering support schemes, not limited to regional branding. In addition,

No.	Sector	Subsector	Study Target	Study Scope
				examine the direction of building co-creation relationships in regional revitalization in Central America and the Caribbean region with Japanese municipalities.
13	Disaster Risk Reduction and Climate Change Countermeasures	Disaster Risk Reduction	With the aim of realizing a carbon-neutral, circular society, and building a society that is resilient to increasingly serious climate change and disaster risks with/post COVID-19 society, collect and analyze information related to the fields of disaster risk reduction and climate change countermeasures, and propose development policies and cooperation scenarios.	For disaster risk reduction infrastructure (including the use of ICT technology), consider support measures based on the organization of issues to realize regional cooperation for disaster risk reduction for Central American Integration System (SICA) member countries. For strengthening the disaster risk reduction capacity based on the Sendai Framework for Disaster Risk Reduction, strengthen the resilience through structural and non-structural countermeasures and consider cooperation policy based on the organization of issues related to the mainstreaming of disaster risk reduction in CARICOM region.
14		Climate Change Countermeasures/ Waste Management	With the aim of realizing a carbon-neutral, circular economy, and building a society that is resilient to increasingly serious climate change and disaster risks with/post COVID-19 society, collect and analyze information related to the fields of disaster risk reduction and climate countermeasures, and propose development and cooperation scenarios.	For climate change countermeasures, study the current situation and organize issues related to Greenhouse Gas (GHG) emission control and atmospheric environment conservation and consider future development/cooperation scenarios. For waste management, consider cooperation policy based on the organization of issues related to appropriate waste management for the realization of a recycling-oriented society.
15	Root Cause Measures for Central American Migration		In the era of with/post COVID-19, to improve the root cause of the forced migration in the Central American Northern Triangle region, which is expected to continue to increase in the future, the JICA Study Team will consider JICA's competitive advantages and will make recommendations for international cooperation strategy	For Central America Northern Triangle, Guatemala, El Salvador, and Honduras will be the priority target countries. For Central American migration transit and destination countries, a general study will also be conducted in Mexico, Costa Rica, and Panama to capture the large flows of migration.
16	South-South, Triangular and Regional Cooperation		Consider how the South-South, triangular, and regional cooperation can be activated in the Latin American region in the with/post COVID-19 era, which can make use of Japan's strengths, and summarize the direction and proposals for cooperation.	Triangular cooperation: SICA cooperation, CARICOM collaboration cooperation, Western-speaking cooperation, Cooperation among SIDS. *Triangular cooperation is included in the concept of South-South cooperation, but it is also understood broadly as cooperation in collaboration with other donors. For regional cooperation, investigate SICA and CARICOM. *The definition of regional cooperation includes the concept of possible regional collaboration.
17	Pilot Project		Forming a pilot project and supervising the smooth implementation to study the effective development cooperation that contributes to the realization of a better reconstruction "BBB" for building a strong society under the With/Post COVID-19 pandemic.	Based on discussions with JICA, select the countries to be studied, confirm the study priorities, and update and agree on the work scope.

Source: JICA study team

3. Study Summary

3.1 Summary of Central America and the Caribbean Region

(1) Economic Indexes of the Target Countries

Table 3-1 shows economic indexes of the study countries of Central America and the Caribbean Region.

Table 3-1 Economic Indexes of Target Countries

Region	No	Country	Population ('000)		Rate (cap/pop, %)		Urbanization Rate (%)		GDP (Million USD)		GDP per Capita (USD)		Poverty Ratio ²		Human Development Index ³		Gini Index ⁴		Global Peace Index ⁵	
			2021	2021	2021	2021	2021	2021	(%)	Year	2021	Rank	Year	2022	Rank					
Central America (8)	1	Belize	405	23	6	46	1,907	4,815	-	-	0.683	123	0.533	1999	-	-				
	2	Costa Rica	5,139	1,379	27	80	61,774	12,238	30.0	2020	0.809	58	0.493	2020	1.732	38				
	3	El Salvador	6,518	1,106	17	73	27,023	4,187	26.2	2020	0.675	125	0.388	2019	2.231	114				
	4	Guatemala	18,250	2,891	16	51	76,710	4,363	59.3	2014	0.627	135	0.483	2014	2.139	106				
	5	Honduras	10,063	1,403	14	58	25,095	2,575	48.0	2019	0.621	137	0.482	2019	2.269	117				
	6	Nicaragua	6,702	1,056	16	59	12,521	1,913	24.9	2016	0.667	126	0.462	2014	2.334	124				
	7	Panama	4,382	1,822	42	68	66,788	15,728	21.5	2019	0.805	61	0.498	2019	1.876	61				
O (1)	8	Mexico	130,262	21,672	17	80	1,256,441	9,849	43.9	2020	0.758	86	0.454	2020	2.612	137				
Caribbean (15)	9	Bahamas	397	280	70	83	13,579	34,864	-	-	0.812	55	-	-	-	-				
	10	Barbados	288	89	31	31	5,209	18,149	-	-	0.790	70	-	-	-	-				
	11	Cuba	11,318	2,138	19	77	105,355	9,296	-	-	0.764	83	-	-	2.083	98				
	12	Dominican Republic	10,954	3,245	30	82	88,941	8,282	21.0	2019	0.767	80	0.396	2020	1.990	81				
	13	Haiti	11,542	2,704	23	56	8,051	715	58.5	2012	0.535	163	0.411	2012	2.254	115				
	14	Jamaica	2,974	590	20	56	15,831	5,370	19.9	2012	0.709	110	0.455	2004	1.990	81				
	O (3)	15	Trinidad Tobago	1,403	544	39	53	23,209	16,637	-	-	0.810	57	0.403	1992	2.005	88			
		16	Guyana	790	110	14	27	5,174	6,610	-	-	0.714	99	0.579	1999	2.140	107			
		17	Suriname	592	240	40	66	3,697	6,360	-	-	0.730	99	0.579	1999	-	-			
	OECS (6)	18	Antigua and Barbuda	99	21	21	25	1,662	17,113	-	-	0.788	71	-	-	-	-			
		19	Dominica	72	15	21	71	582	8,111	-	-	0.720	102	-	-	-	-			
		20	Grenada	113	39	35	36	1,212	10,818	-	-	0.795	68	-	-	-	-			
		21	St. Kitts and Nevis	54	14	27	31	1,051	19,897	-	-	0.777	75	-	-	-	-			
		22	St. Lucia	184	22	12	19	2,122	11,611	25.0	2016	0.715	106	0.512	2016	-	-			
		23	St. Vincent Grenadines	285	27	9	53	825	7,464	-	-	0.751	89	-	-	-	-			
Regional average													34.4	-	0.731	-	-	0.5	2.127	-

1: Population, Capital population, Population concentration, Urbanization rate, GDP data is from UN, <http://data.un.org/en/index.html>

2: Data from WB, <https://data.worldbank.org/indicator/SI.POV.NAHC>, (percentage of the poor in the total population)

3: Data from UNDP, <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>, (0 lowest, 1 highest)

4: Data from WB, <https://data.worldbank.org/indicator/SI.POV.GINI?view=map>, (0% for perfect equality, 100% for extreme inequality)

5: Vision of Humanity report, <https://www.visionofhumanity.org/wp-content/uploads/2022/06/GPI-2022-web.pdf>, (lower is peaceful)

6: O means Oil exporting country

Source: JICA study team

(2) Grouping of Target Countries

The countries surveyed can be grouped as shown in Table 3-2 based on their geographical location, political relations, population / economic size, and the presence of oil production. In each sector survey, we have conducted detailed surveys by grouping target countries for their vulnerabilities and/or issues. In consideration of the ideal way of development cooperation, regional connections between countries, similarities in industrial practices and information, efficiency of sharing, the grouping shown in Table 3-2 should be used as the baseline for the survey and analysis of the target countries for development cooperation.

Table 3-2 Grouping of Target Countries

No.	Region	Countries
1	Central America (8 Countries)	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama
2	Oil Producing (1 Country)	Mexico
3	Caribbean (15 Countries)	Bahamas, Barbados, Cuba, Dominican Republic, Haiti, Jamaica
4	Oil Producing (3 Countries)	Trinidad Tobago, Guyana, Surinam
5	OECS (6 Countries)	Antigua and Barbuda, Dominica, Grenada, St. Christopher Nevis, St Lucia, St Vincent Grenadines

OECS: Organisation of Eastern Caribbean States

Source: JICA study team

(3) Regional Organizations

Target countries belong the regional organizations as shown in Table 3-3 except Mexico and Cuba. Belize belongs to both SICA and CARICOM.

Table 3-3 Regional Organizations

No.	Regional Organization	Locations	Countries
1	Central American Integration System (SICA) (8 Countries)	Central American Parliament (Guatemala) Central American Court of Justice (Nicaragua) General Secretariat of Central American Integration System (El Salvador) Central American Bank for Economic Integration (Honduras)	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Dominican Republic
2	Caribbean Community (CARICOM) (14 Countries)	Guyana	(CA) Belize (Carib) Antigua and Barbuda, Bahamas, Barbados, Dominic, Grenada, Haiti, Jamaica, St. Christopher Nevis, St Lucia, St Vincent Grenadines, Trinidad Tobago, Guyana, Surinam
3	Organisation of Eastern Caribbean States (OECS) (7 Countries)	St Lucia	Antigua and Barbuda, Dominica, Grenada, St. Christopher Nevis, St Lucia, St Vincent Grenadines

Source: JICA study team

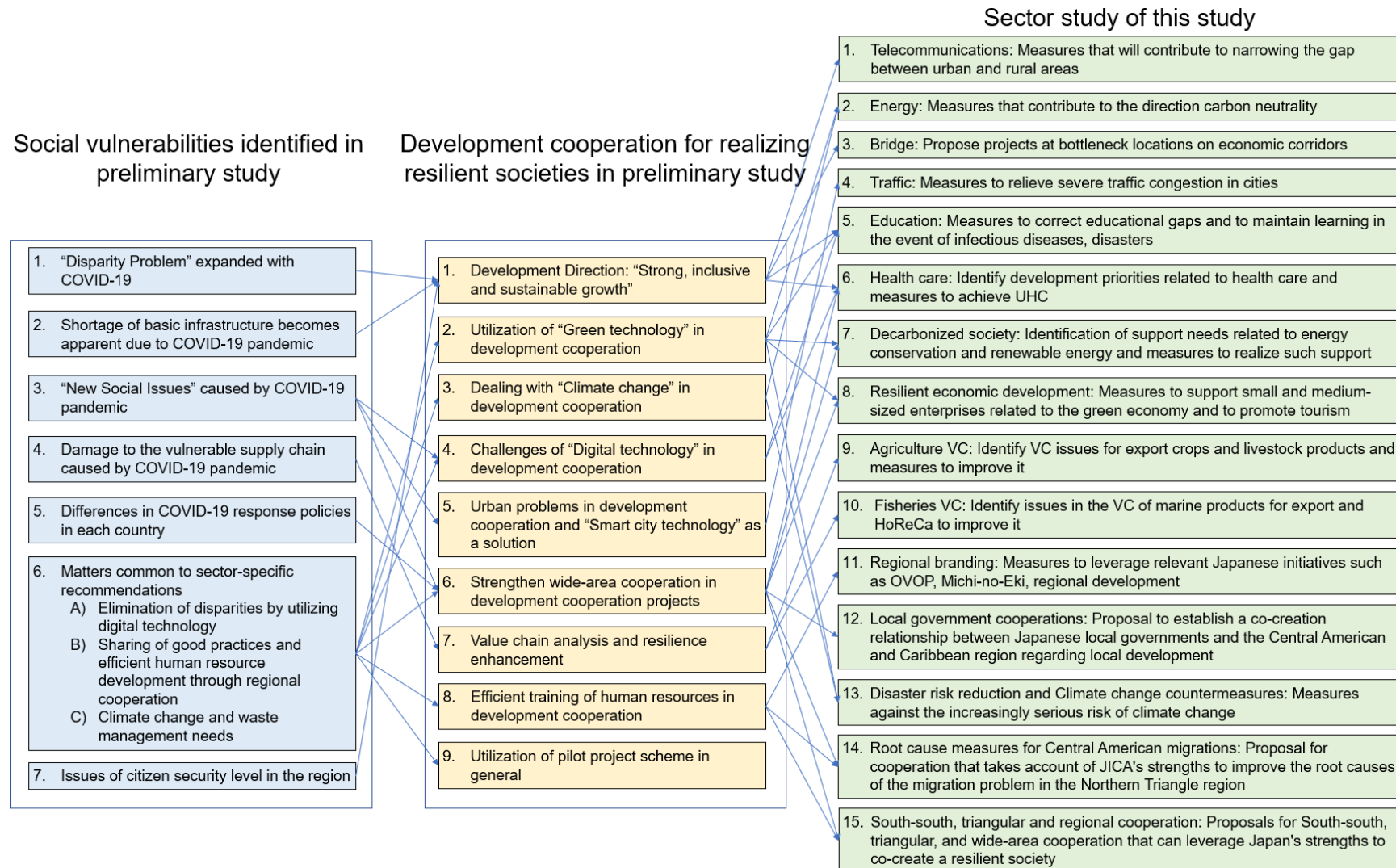
3.2 Content of Study Sectors

3.2.1 Relation Between the Preliminary Study and This Study

The relation between the recommendations of the preliminary study and the sector studies in this study is summarized in Figure 3-1.

3.2.2 Sector Priority Countries and Study Countries

Table 3-4 shows the priority countries for each sector and the countries studied (online survey and field survey), which were established based on the results of discussions with JICA.



Source: JICA study team

Figure 3-1 Relation Between the Preliminary Study and This Study

Table 3-4 Sector Priority Countries and Study Countries

No.	Sector	Subsector	Priority Countries	Study Countries (Online Survey)	Study Countries (Field Survey)		
					1st	2nd	3rd
Infrastructure for Resilient Society							
1	Economic Infrastructure Development	Information and Telecommunications	Guyana, St. Lucia, Guatemala, Jamaica	-	Guyana, St. Lucia, Guatemala, Jamaica	-	-
2		Electricity	Guyana, Jamaica	-	Guyana, Jamaica	-	-
3		Transportation Traffic (Bridges and Road Traffic Control)	Belize, El Salvador, Honduras, Dominican Republic, St. Lucia, Guyana, Costa Rica	-	Belize, El Salvador, Honduras, Dominican Republic, Guyana	Belize, Dominican Republic, Guyana	Belize, Dominican Republic
4		Port and building materials and construction methods	Dominican Republic, El Salvador	-	Dominican Republic, El Salvador	El Salvador	-
5	Social Infrastructure Development (1) Education		Guatemala, Jamaica, St. Lucia, Mexico, Guyana	Mexico, Guyana	Guatemala, Jamaica, St. Lucia	Guatemala, Jamaica, St. Lucia	-
6	Social Infrastructure Development (2) Health Care		El Salvador, Saint Lucia (OECS), Guyana	Guyana	St. Lucia, El Salvador	St. Lucia	-
Green Economy							
7	Decarbonized society, Energy conservation, Renewable energy		Guatemala, Costa Rica, Dominican Republic, Guyana, Jamaica	Dominican Republic	Guatemala, Nicaragua, Costa Rica, Guyana, Jamaica	-	-
8	Resilient economic development		Dominican Republic, Jamaica	Dominican Republic	Jamaica	-	Jamaica
9	Agriculture and Rural Development	Argiculture VC	Nicaragua, Cuba	-	Nicaragua, Cuba	Nicaragua, Cuba	-
		Argiculture DX	Guatemala	-	-	Guatemala	-
10	Fisheries Value Chain Development	Fisheries	St. Lucia, Dominica, Grenada, St. Vincent and the Grenadines, St. Kitts and Nevis, Antigua and Barbuda, Jamaica	Dominica, St. Vincent and the Grenadines, Antigua and Barbuda	St. Lucia	St. Lucia, Jamaica	-
		Sargassum	Belize, Barbados, St. Lucia	-	Belize, Barbados, St. Lucia	-	-
11	Regional Economic and Social Development		Central America, St. Lucia (OECS),	-	El Salvador, St. Lucia, Jamaica	St. Lucia, Jamaica	Jamaica

No.	Sector	Subsector	Priority Countries	Study Countries (Online Survey)	Study Countries (Field Survey)		
					1st	2nd	3rd
			Jamaica		Lucia, Jamaica		
12	Disaster Risk Reduction and Climate Change Countermeasures	Disaster Risk Reduction	Belize, Jamaica, St. Lucia, SICA, CARICOM member countries	Jamaica, St. Lucia, Guyana, CEPREDENAC (Guatemala), CDEMA (Barbados)	Belize, El Salvador, Honduras	-	-
13		Climate Change Countermeasures (in general, waste management)	Nicaragua, Cuba, Mexico, Guatemala, Panama	-	Nicaragua, Cuba, Mexico	Mexico, Guatemala, Panama	-
Cross-sector Study							
14	Root Cause Measures for Central American Migration		El Salvador, Honduras, Guatemala (especially Honduras)	Northern Triangle of Central America + Mexico, Panama, Costa Rica (desk survey)	Mexico, El Salvador, Honduras		
15	South-South, Triangular and Regional Cooperation	Regional cooperation	SICA	SIDS, CARICOM, Western language area			
		South-south, triangular	Cuba (triangular cooperation), Mexico	El Salvador, Panama, and Costa Rica.			
17	Pilot Project		Honduras, Barbados, Guatemala, Mexico	Mexico	Honduras, Barbados, Guatemala	Honduras	Honduras

Source: JICA Study Team

3.2.3 Priority Sectors by Country

The priority sectors by country are summarized in Table 3-5.

Table 3-5 Priority Sectors by Country

No.	Priority Countries	Priority Sectors	Remarks
1	Mexico	Education Waste Management South-South, Triangular and Regional Cooperation Pilot Project (Agriculture DX)	Pilot project canceled and held a seminar in lieu.
2	Honduras	Transportation (Bridges and Road Traffic Control) Central American Migration Root Cause Measures Pilot Project (Security DX)	
3	Guatemala	Information and telecommunications, Agriculture DX Education Green Economy Waste Management Central American Migration Root Cause Measures Pilot Project (Satellite image, Agriculture DX)	Agriculture DX and Waste Management added (2 nd field survey). Satellite image pilot project canceled. Held a seminar in lieu of Agriculture DX pilot project.
4	Nicaragua	Agricultural Value Chain Development Waste Management	
5	Panama	Waste Management	Waste Management added (2 nd field survey).
6	El Salvador	Transportation (Bridges and Road Traffic Control) Construction Materials and Methods Health and Medical Care Regional Economic and Social Development Central American Migration Root Cause Measures	
7	Belize	Transportation (Bridges and Road Traffic Control) Sargassum and Disaster Risk Reduction	
8	Costa Rica	Green Economy Transportation (Bridges and Road Traffic Control)	
9	Cuba	Agricultural Value Chain Development Waste Management South-South, Triangular and Regional Cooperation	
10	Dominican Republic	Transportation (Bridges and Road Traffic Control), Ports Green Economy	
11	St. Lucia	Information and Telecommunications, Electricity Transportation (Bridges and Road Traffic Control) Education, Health and Medical Care Sargassum Regional Economic and Social Development	
12	Jamaica	Information and Telecommunications Education Green Economy Regional Economic and Social Development Disaster Risk Reduction	
13	Guyana	Information and Telecommunications, Electricity Transportation (Bridges and Road Traffic Control) Education, Health and Medical Care Green Economy	
14	SICA	Disaster Risk Reduction, South-South, Triangular, and Regional Cooperation	
15	CARICOM	Disaster Risk Reduction	
16	OECS	Health and Medical Care, Fisheries, Local Economy and Social Development	

Source: JICA Study Team

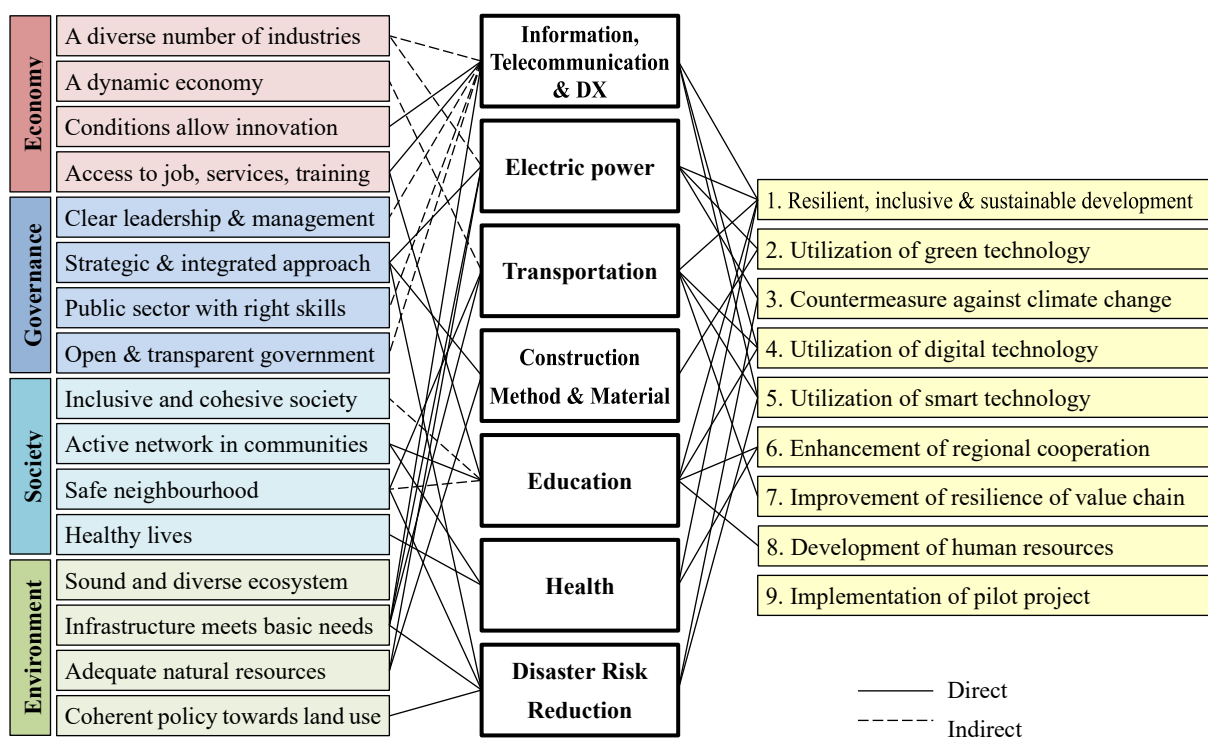
3.3 Study Summary

3.3.1 Infrastructure for Resilient Society

This section summarizes the results of this study from the perspective of infrastructure development for building a resilient society.

(1) Role of Infrastructure in this Study for Building Resilient Society

This study proposes development and cooperation scenarios of economic and social infrastructure to improve the indicators defined by the OECD based on the issues, vulnerabilities and policies for building resilient society in Central America and the Caribbean region which were identified by the previous study. The reasons for referring to the OECD definition are 1) existing plans and studies on resilience in Central America require actions in wide areas, not only natural disaster but also such as food security and tourism, 2) while disaster reduction is prioritized, it is necessary to address vulnerabilities realized through COVID-19 in the Caribbean region and 3) the OECD shows a broader area in resilience.



Source: JICA Study Team

Figure 3-2 Role of Infrastructure in this Study for Building Resilient Society

(2) Contribution to Enhancement of Resiliency by Proposed Scenario in this Study

This section discusses and summarizes how the cooperation scenarios proposed in this study will contribute to improving the resilience of the Central American and Caribbean region.

Table 3-6 Contribution to Enhancement of Resiliency (Central America)

		Telecommunication	Electric Power	Transportation	Construction Material &	Education	Health	Disaster Risk Reduction
Economy	Diversified industries	✓						
	Dynamic economy			✓				
	Conditions allow innovation	✓						
	Access to employment & education	✓				✓		
Governance	Clear leadership and management	✓						
	Strategic and integrated approaches				✓			✓
	Public sector has the right skills	✓						
	Government is open and transparent	✓						
Society	Inclusive and cohesive society					✓		
	Active citizens' networks in communities					✓	✓	
	Safe neighbourhood			✓		✓		✓
	Healthy lives						✓	
Environment	Sound and diverse ecosystem							
	Basic infrastructure			✓				✓
	Adequate and available natural resources				✓			
	Coherent policy towards land use							✓

Source: JICA Study Team

Table 3-7 Contribution to Enhancement of Resiliency (Caribbean Region)

		Telecommunication	Electric Power	Transportation	Construction Material &	Education	Health	Disaster Risk Reduction
Economy	Diversified industries	✓	✓					
	Dynamic economy			✓				
	Conditions allow innovation	✓	✓					
	Access to employment & education	✓				✓		
Governance	Clear leadership and management	✓						
	Strategic and integrated approaches		✓					✓
	Public sector has the right skills	✓						
	Government is open and transparent	✓						
Society	Inclusive and cohesive society					✓		
	Active citizens' networks in communities					✓	✓	
	Safe neighbourhood			✓		✓		✓
	Healthy lives						✓	
Environment	Sound and diverse ecosystem							
	Basic infrastructure		✓	✓				✓
	Adequate and available natural resources		✓					
	Coherent policy towards land use							✓

Source: JICA Study Team

3.3.2 Transition to Green Economy

This section summarizes the findings of the study from the perspective of the transition to a green economy.

(1) Evaluation Indicators Adopted in this Study

Many organizations are researching and setting up indicators for the transition to a green economy, and the content of the indicators differs depending on the perspective from which they are set (environmental perspective, economic perspective, etc.). The OECD also states, "Indices that measure the green economy need to be interpreted with caution. Evaluations based solely on green industries may underestimate their economic importance", "The list of indicators is proposed based on the OECD's current activities and experience, and the list is a work in progress and will be revised as new data becomes available and as underlying ideas evolve", and advocated a Green Growth Indicator as "an indicator is needed to help raise awareness, measure progress, and identify opportunities and risks". In this study, the team attempted to analyze the four indicators listed in the table below by surveying which items from the evaluation indicators were publicly available and by making sure that the weight and distribution of each evaluation item was as clear as possible.

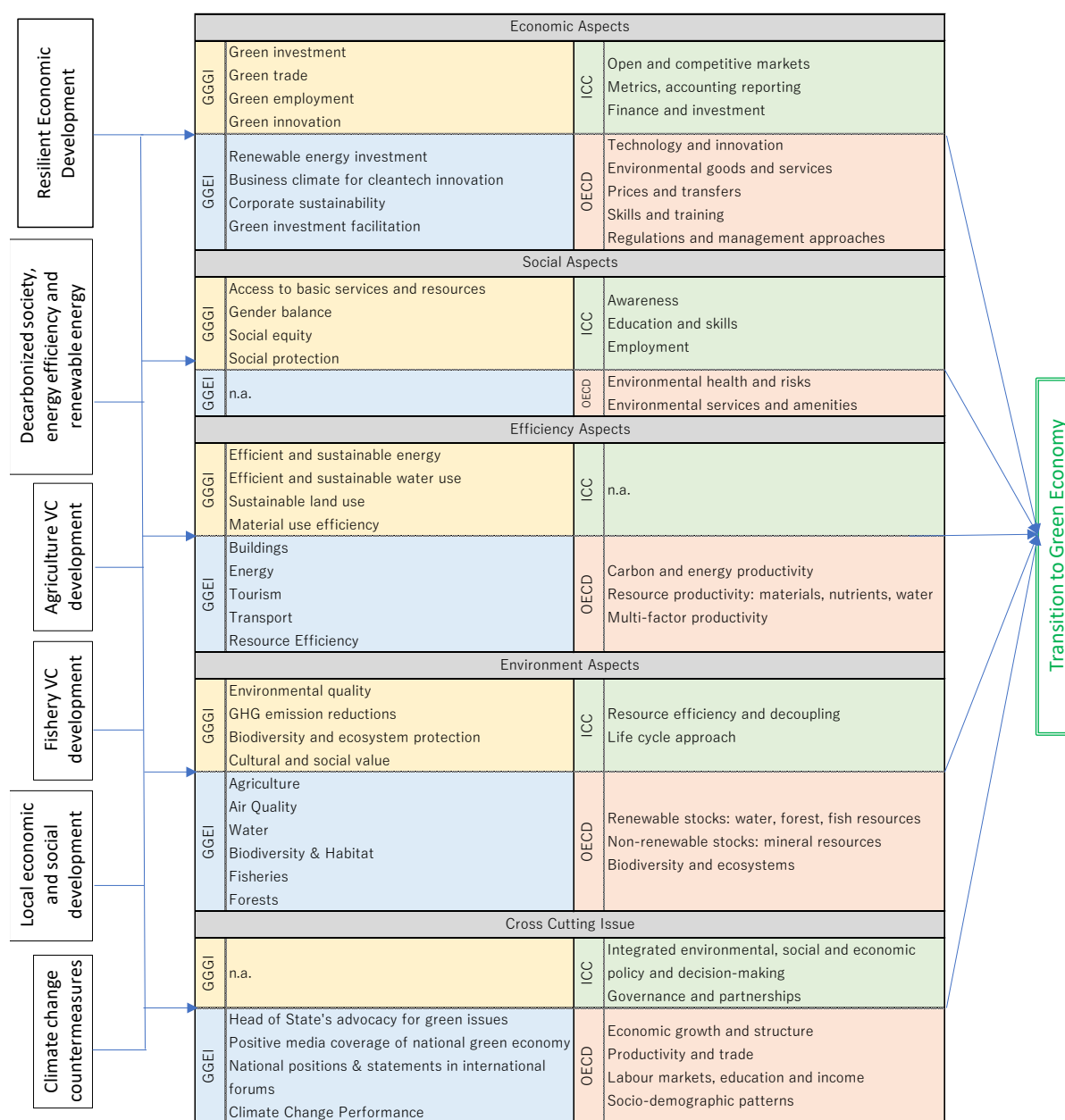
Table 3-8 Evaluation Indicators Adopted in this Study

Organization name	Indicator Name	Remarks
International Chamber of Commerce (ICC)	Green Economy Indicator	Green Economy Roadmap https://iccwbo.org/publication/icc-green-economy-roadmap-a-guide-for-business-policymakers-and-society-2012/
Global Green Growth Institute (GGGI)	Green Growth Index 2020	https://ggi.org/
Dual Citizen LLC.	Global Green Economy Index (GGEI)	GGEI 2022 is most updated version https://dualcitizeninc.com/global-green-economy-index/
OECD	Green Growth Indicators 2017	https://www.oecd.org/greengrowth/towards-green-growth-9789264111318-en.htm

Source: JICA Study team

(2) Contribution to Transition to Green Economy by Proposed Scenario in this Study

Figure 3-3 shows the relationship between each sector of this study and the evaluation items of the four evaluation organizations, organized into five aspects (economic, social, efficiency, environmental, and cross-cutting aspects). It shows that steadily implementing each of the proposed cooperation scenarios will contribute to the transition to a green economy.



Source: JICA Study Team

Figure 3-3 Impact of Improvement of Sector Issues in this Study on the Four Aspects of Evaluation

3.3.3 Sector Study and Cooperation Scenario

(1) Creating Sectoral Cooperation Scenarios

Based on the results of the literature review and field survey, development goals and strategies, development scenarios, and cooperation scenarios for the priority sectors in each country in this study were formulated. A list of projects was then prepared as a cooperation scenario based on the partner government's intentions and the feasibility of cooperation. Cooperation scenarios and priorities by priority sector for each country are shown in Table 3-9.

Table 3-9 List of Countries which Cooperation Scenarios and Recommendations Created

Sector		Country														
		SICA	CARICOM/ OECS	Mexico	Honduras	Guatemala	Nicaragua	Panama	El Salvador	Belize	Costa Rica	Cuba	Dominican Republic	St. Lucia	Jamaica	Guyana
Economic Infrastructure	Information and Telecommunications					B								B		B
	Electricity														B	C
	Transportation Traffic, Ports									A	A		A			B
	Building materials and construction method								B							
Social Infrastructure	Education			B		A								B	A	C
	Health Care								B					A		C
Green Economy	Decarbonized society, Energy conservation, Renewable energy	A				B					B		A		B	C
	Resilient economic development	A											B			
Agriculture and Rural Development			A			B	A					A				
Fisheries Value Chain			A												A	
Regional Economic and Social Development		B	A											A	A	
Disaster Risk Reduction and Climate Change Countermeasure	Climate Change			B												
	Waste Management			B		A	A	A				A				
	Disaster Risk Reduction	B														
Central American Migration				B	B	B		B	B		B					
South-South Cooperation		B														
Local Government Cooperation		B														
Pilot Project					B											

Note: A: Priority Project; B: Potential Project; C: Possible Project

Source: JICA Study Team

(2) Summary of Short-term Priority Projects

Table 3-10 shows the summary of the short-term Priority Projects.

Table 3-10 List of Short-term Priority Projects

T/C	Sector	Project Name	Modality	C/P	Summary
SICA	Resilient economic development	Tourism Sector MSME Support Project	Issue-specific training/dispatch of regional advisor	SITCA, CEMPROMYPE, COMMCA	<p>Provide support for sustainable tourism development through community tourism promotion for SICA member countries.</p> <p>Project goal: Intra-regional collaboration for sustainable tourism development will be promoted, and MSME capacity building and networking will be strengthened.</p> <p>Outcome 1: The actual situation and needs of MSME in the tourism sector will be identified.</p> <p>Outcome 2: The current status of CBT and local resources in each country will be analyzed.</p> <p>Outcome 3: Capacity building and networking of MSME in the tourism sector will be strengthened.</p> <p>Outcome 4: A common SICA framework for certification, PR, etc. will be established.</p> <p>Outcome 5: The experience and know-how on CBT accumulated in the Dominican Republic will be shared with SICA member countries.</p> <p>Outcome 6: Central America will be promoted as a single tourism destination.</p>
	Decarbonized society, Energy conservation, Renewable energy	Training on Renewable Energy, Energy Saving and Hydrogen Energy for SICA Member Countries	Issue and country specific training	SICA, UCE, MEIC, MINAE	<p>Conduct training for SICA member countries to share Costa Rica's knowledge of renewable energy and Japan's knowledge of energy conservation and hydrogen energy.</p> <p>Project goal: Capacity building and networking in the renewable energy and energy saving sectors, as well as in hydrogen energy, will be strengthened.</p> <p>Outcome 1: Japanese technologies related to renewable energy, energy saving, and hydrogen energy will be introduced.</p> <p>Outcome 2: Human resources for hydrogen energy will be developed.</p> <p>Outcome 3: Costa Rica's renewable energy initiatives and experiences will be shared within the SICA region.</p> <p>Outcome 4: SICA UCE network in the field of renewable energy will be established.</p>
Guatemala	Education	Project for Improving Mathematics Learning through Effective Use of Textbook and Teaching/Learning Materials	Expert dispatch (collaboration with JOCV)	MINEDUC	<p>Interventions will be implemented so that teachers can appropriately utilize high-quality teaching materials such as government textbooks, which are the result of JICA's cooperation, and digital teaching materials to be created, and support students' learning by utilizing communication lines and systems such as ICT network centered on the Ministry of Education, DIDEDUC activities, and SINAE/Learning Community.</p> <p>Project goal: A cycle of educational improvement will be established through the promotion of the effective use of textbooks and supplementary materials in secondary schools.</p> <p>Outcome 1: Textbooks and digital supplementary materials are distributed to each school.</p> <p>Outcome 2: DIDEDUC-CTA/SINAE's ability to support teachers will be strengthened (through math teaching support as a model case).</p> <p>Outcome 3: Interactive communication between MINEDUC-DIDEDUC/CTA/SINAE will be strengthened (feedback from the situation at school)</p>
Nicaragua	Agriculture VC	Project for Strengthening the Value Chain of Export Products	T/A	MEFCCA	<p>Based on the export strategy formulated, in addition to the strengthening of production techniques by producers based on the needs of new markets, support will be provided to agricultural cooperatives to strengthen their business skills, including matching and promotion of products to develop buyers in new markets.</p> <p>Project goal: The export volume of target products (coffee and cacao) by agricultural cooperatives is increased.</p> <p>Outcome 1: Problems related to the export of agricultural products by agricultural cooperatives will be identified.</p> <p>Outcome 2: The capacity of government officers to support agricultural cooperatives is improved.</p> <p>Outcome 3: Business plans for export promotion by agricultural cooperatives (including plans for accessing new markets) are developed.</p> <p>Outcome 4: Production and business skills of producers in the cooperatives are improved.</p> <p>Outcome 5: An action plan for strengthening export is formulated.</p>

T/C	Sector	Project Name	Modality	C/P	Summary
Costa Rica	Decarbonized society, Energy conservation, Renewable energy	Project on Support for Formulation of Hydrogen Energy System and Human Resources Development	Country-specific training / Training in Japan	MINAE	<p>Safety standards for hydrogen and relevant regulations for its production and handling will be developed. Project goal: Safety standards for hydrogen and related regulations for handling and production will be developed. Impediments to the approval of hydrogen strategies and policies will be identified. Related human resource development will be developed. Outcome 1: Impediments to approval of hydrogen strategies and policies will be identified. Outcome 2: Hydrogen strategies and policies are approved based on the identified impediments. Outcome 3: Technical standards for hydrogen will be organized and analyzed. Outcome 4: Human resource development related to hydrogen development and handling.</p>
	Transportation traffic	Knowledge Co-creation Program in Urban Transportation and Railway	Issue specific training	INCOFER	<p>Introduce Japan's expertise in urban transportation and railway to increase the government's understanding of Japan's know-how, as well as to raise awareness of the challenges in the Costa Rica. The program will also strengthen connections between Japan and government officials. Project goal: Understand Japan's technology and experience in urban transportation and railway, as well as to identify issues that need to be overcome in Costa Rica. Outcome 1: Through lectures and on-site training, learn about technologies, systems, and actual examples in the field of urban transportation and railway in Japan. Outcome 2: Country reports will be prepared as participants recognize the challenges in their country. Outcome 3: Based on Japan's initiatives and the challenges in Costa Rica, an action plan will be developed to further improve country's transportation and urban rail sector in the future.</p>
Panama, Guatemala, Nicaragua, Cuba	Waste management	Capacity building on waste management for building a circular economy	T/A	Waste management related organizations	<p>Implementation of T/A, dispatch of experts, issue-specific training, and dispatch of volunteers to improve the waste management capacity of each country. Nicaragua: Improvement of disposal sites and collection and transportation by T/A and dispatching experts, capacity building for 3R promotion, and promotion of environmental education Cuba: Improvement of disposal sites and collection and transportation by T/A and dispatching experts, and transition to a circular economy. Panama: Improvement of disposal sites and collection and transportation by T/A and dispatching experts, improvement of 3R promotion capacity, promotion of environmental education, and promotion of private sector involvement. Guatemala: Improvement of disposal sites and collection and transportation by T/A and dispatching experts, approach to local governments using returning trainees, and promotion of environmental education.</p>
Dominican Republic	Transportation traffic	Projects for upgrading of road traffic control in Santo Domingo	T/A	INTRANT	<p>Improve the traffic control management capacity of INTRANT, which is in charge of road traffic control operations in the Santo Domingo metropolitan area, thereby reducing traffic congestion and contributing to road safety. Project goal: Improve INTRANT's traffic control and management capabilities. Outcome 1: Improve planning capacity in ITS through the creation of an ITS Master Plan. Outcome 2: Improve intersections and improvement plan making capacity. Outcome 3: Improve the ability to monitor traffic.</p>
		Bridge development projects in Santo Domingo	Information collection Study / Loan	MOPC	<p>The construction of a new bridge over the Ozama and Isabela Rivers flowing into Santo Domingo will disperse traffic concentration on the existing bridge, alleviate traffic congestion, and expand the city's road network. The bridge envisioned is a cable-stayed bridge with a length of 830m. Otherwise, conduct information collection study on transportation infrastructure in general, such as bridge maintenance, and conduct in-depth studies on maintenance needs and Japan's potential for cooperation.</p>

T/C	Sector	Project Name	Modality	C/P	Summary
		Capacity development project for bridge asset management	Issue specific training / Long-term expert dispatch / T/A	MOPC	For bridges under the authority of MOPC, based on the census, MOPC will be supported for the development of efficient bridge rehabilitation and renewal plans, support the streamlining of bridge inspection operations, and promote capacity development for bridge renewal projects.
Belize	Transportation traffic	Bridge replacement project in Belize City	Grant Aid	MIDH	Of the four bridges in Belize City, the Swing Bridge (37m long, 2 lanes) and the Belcan Bridge (80m long, 2 lanes), or one of them, will be replaced to ensure safe and smooth traffic in the city and to enhance disaster resilience.
CARICOM	Fisheries VC	Project for Value-adding of Fishery Products/ Distribution Improvement of Fishery Products	T/A	Fishery authority of each country	In the past and in existing projects, support has been provided to strengthen the upstream of the marine products supply chain. Utilizing these achievements and lessons learned, VC development will be implemented, including downstream areas, to strengthen the foundation of the fisheries industry. Project goal: 1. Fishery products produced by each country are added high-value and distributed for the export market and HoReCa sector. 2. Domestic and intra-regional distribution of fishery products in each country is promoted. Outcome 1: Detailed distribution networks of fishery products (domestic and intra-regional) are identified Outcome 2: High-value-added fishery products are developed (high freshness fishery products and highly processed fishery products) Outcome 3: Distribution networks to the domestic, intra-regional HoReCa sectors and export are developed and strengthened.
	Agriculture VC	CARICOM Confirmation Study on Strengthening Food Security	Dispatch of expert	CARICOM	The COVID-19 revealed that CARICOM countries are inadequate in securing their own food supply. CARICOM countries are planning to produce the minimum necessary amount of food domestically. JICA will conduct a survey to confirm the demand of CARICOM countries and the amount that can be produced and supplied domestically, and will also examine the coordination system in the region and make recommendations to CARICOM. Project goal: A master plan will be formulated to strengthen food security in CARICOM countries. Outcome 1: Necessary production amount of major agricultural products is identified to meet the demand of CARICOM countries. Outcome 2: Major challenges are identified to strengthen the production of major agricultural products. Outcome 3: Actions to address the challenge are proposed. Outcome 4: The long-term strategy and action plan to strengthen food security are formulated.
OECS	Local branding	Regional Advisor for (OCOP) Movement	Dispatch of expert	OECS (Economy department)	Similar to St. Lucia, the OECS countries face issues such as dependence on tourism, and because they are all small island nations, there is a limit to the scale of diversification and differentiation that can be achieved within a single country. This project will support the development of the OCOP movement from St. Lucia to the OECS to help each country rediscover its uniqueness and promote differentiated branding to break away from the uniform image of Caribbean beach resorts as represented by "Sun, Sand & Sea". Project goal: OCOP Movement developed in OECS Outcome 1: OECS OCOP Network will be established. Outcome 2: Experiences of Saint Lucia on OCOP are shared with OECS countries. Outcome 3: OECS-common certification and promotion scheme is established. Outcome 4: Uniqueness of each country of OECS is recognized within and out of the region.

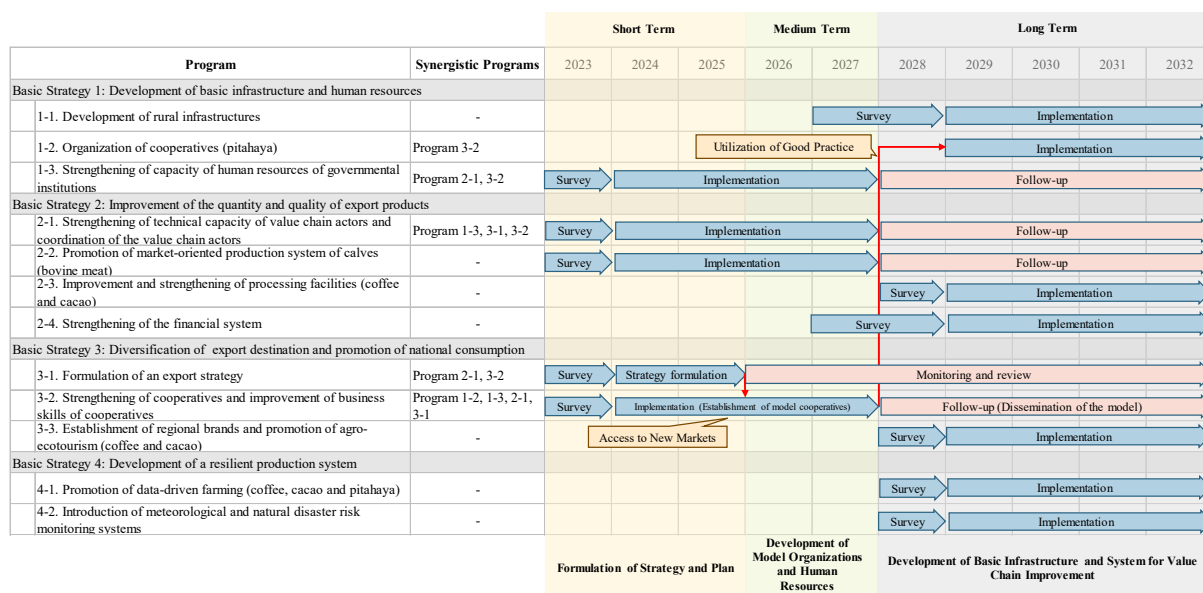
T/C	Sector	Project Name	Modality	C/P	Summary
Cuba	Agriculture VC	Regional Agricultural VC Strengthening Project	T/A	MINAG, GAG, GAF	<p>Support the identification and role clarification of regional VC actors and the development of strategies to strengthen regional exports and VC, with the aim of facilitating access to freight markets. Furthermore, based on the developed strategy, the project will support VC stakeholders in strengthening their business skills and production systems, including SOE-led development of diverse processed products based on market needs.</p> <p>Project goal: Access to the foreign market of value chain actors is improved.</p> <p>Outcome 1: Strategies are developed to strengthen regional exports and the value chain.</p> <p>Outcome 2: The business skill of value chain actors is strengthened.</p> <p>Outcome 3: An action plan to strengthen the regional value chain is formulated.</p>
Jamaica	Local branding	T/A on Enhancement of Local Branding	Dispatch of expert	MOAF and RADA (ALEX)	<p>From the viewpoint of local branding, the project will solve tourism leakage issues and increase the ripple effect of tourism on local industries by enhancing the linkage between tourism and local industries such as agriculture, as well as providing support for outer and inner branding, and for local communities to organize and develop business.</p> <p>Project goal: To strengthen the ripple effect of the tourism sector on local industry.</p> <p>Outcome 1: To establish national policy for local branding.</p> <p>Outcome 2: To enhance organizational system to promote local branding under the policy.</p> <p>Outcome 3: To support local business support system to local communities.</p> <p>Outcome 4: To share experiences of Jamaica on local branding.</p>
		JOCV to Moneague College for Dairy Processing	Volunteer (or Grassroot T/A)	Moneague College	<p>Moneague College is highly interested in producing cheese, yogurt, and other dairy products utilizing the milk of the goats it breeds. Although goat meat is widely consumed in Jamaica, there is little dairy product processing, and it is hoped that Moneague College will accumulate and disseminate processing technology to grow this as a specialty product.</p> <p>Project goal: Capacity development for processing of dairy products and education</p> <p>Outcome 1: Capacity development for processing of dairy products and education</p>
	Education	Project for Strengthening Mathematics Education	T/A / expert dispatch and JOCV	MOEY	<p>In order to introduce math drills and improve subject instruction, which have been worked on with the Curriculum Bureau of the Ministry of Education with the cooperation of Naruto University of Education, to have a more efficient and effective impact at the school level, the collaboration of math and mathematics coordinators stationed at each regional office of the Ministry of Education will be strengthened, and mini T/A will be implemented using JOCV.</p> <p>Project goal: Math coordinators' capacity for coaching schools and teachers will be strengthened, and children's learning will be improved.</p> <p>Outcome 1: A support mechanism between the core curriculum office, math coordinators (national and regional) and schools will be established.</p> <p>Outcome 2: A mechanism will be established that allows schools to feedback on challenges they face to MOEY.</p>
	Fisheries VC	Promotion of the sustainable marine capture fisheries development	Dispatch of expert	National Fisheries Authority	<p>Fishery development will contribute to improving the livelihoods of fishermen and the vulnerability of fishing communities.</p> <p>Project goal: Fishery development that contributes to improving the livelihoods of fishers and the vulnerability of fishing communities is promoted.</p> <p>Outcome 1: Stock of marine fisheries resources is assessed.</p> <p>Outcome 2: Untapped and underutilized fishery resources are developed (fishing techniques, processing, and market development).</p> <p>Outcome 3: Extension plans for livelihood improvement of fishing communities are developed.</p>

T/C	Sector	Project Name	Modality	C/P	Summary
		Capacity building for marine fisheries, cultivation, and IUU measures	Country and issue specific training	National Fisheries Authority	<p>It is envisaged that the project will be implemented by dispatching expert to existing issue-specific training programs and by designing new country-specific training programs. Expected outcomes are: Capacity of NFA staff for marine fisheries, cultivation, and IUU measures will be strengthened.</p> <p>Training theme</p> <ul style="list-style-type: none"> • Policies and countermeasures against illegal, unreported, and unregulated (IUU) fishing • Enhancing capacity for sustainable fisheries development • Small-scale inland cultivation • Sustainable small-scale fisheries for blue economy • Value-chain development for sustainable use of fisheries resources • Sustainable use of fisheries resources through diversification of fisheries-based livelihoods in small-island states
St. Lucia	Health care	Training of remote island medical experience	Training/ T/A	+OECS and its' MOHs	<p>In St. Lucia and the Eastern Caribbean, where medical resources are limited, it is important to make effective use of these limited medical resources. The environment of St. Lucia and other small island countries in the Eastern Caribbean is very similar to that of Japan, which has many remote islands. Through training, the experience of remote island medical care in Japan will be shared.</p>
	Regional branding	Advisor for OCOP Movement	Dispatch of expert	Ministry of Agriculture	<p>Support will be provided by dispatching experts based on the request letter that has already been issued. Suggestions from this study include: (1) Reexamination of pilot products, (2) Shift from product-out to market-in, (3) Steady improvement of management capacity, and (4) Collaboration with the tourism industry.</p> <p>Project goal: To strengthen cross-sectorial institutional system to promote OCOP movement.</p> <p>Outcome 1: OCOP Secretariat is established with participation of related ministries.</p> <p>Outcome 2: OCOP Council (tentative name) is established in each community or product.</p> <p>Outcome 3: Capacity development capacity of OCOP Secretariat and OCOP Councils for marketing, accountancy, product development, standards and certifications are strengthened.</p> <p>Outcome 4: OCOP brand acknowledged and distribution and sales route are established.</p> <p>Outcome 5: OCOP movement is acknowledged in OECS.</p>

Note: T/C: Target Country or Organization; C/P: Counter partner; T/A: Technical Assistance; JOCV: JICA Overseas Cooperation Volunteers; OCOP: One Community One Product; MOAF: Ministry of Agriculture and Fisheries; MOH: Ministry of Health;

Source: JICA Study Team

In proposing cooperation scenarios, including the above short-term priority projects, a development scenario consisting of a roadmap of multiple projects in each sector was developed. As an example, Figure 3-4 is a roadmap for Nicaragua's agricultural VC sector. Roadmaps for other countries and sectors and the contents of each proposed project are presented in the following chapters.



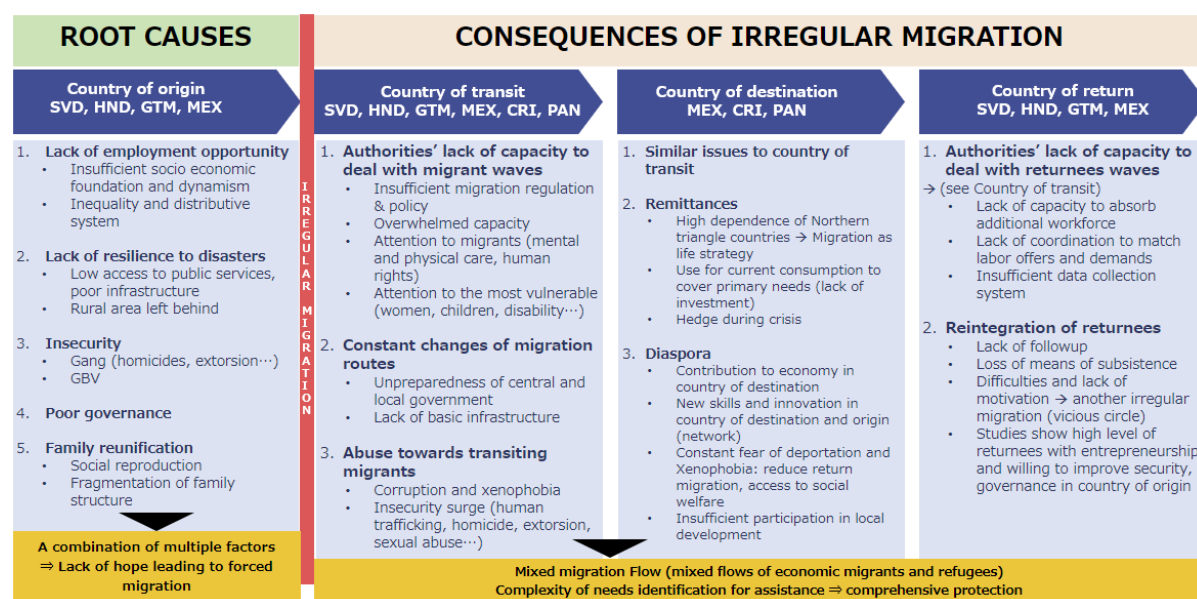
Source: JICA Study Team

Figure 3-4 Roadmap for Agricultural Value Chain Development in Nicaragua

3.3.4 Cross-sector Study

(1) Root Cause Measures for Central American Migration

In this study, the study team summarized proposed JICA initiatives that could contribute to curbing the root causes of migration, and prepared analyses and recommendations that would contribute to future cooperation. Figure 3-5 summarizes issues by country of origin, country of transit, country of destination, and country of return for illegal migrants. The development goal to address these issues was set as "Sustainable Social and Economic Development in the Northern Triangle of Central America for Building Communities of Hope," and four strategies shown in Table 3-11 were established to achieve this goal.



Source: JICA Study Team

Figure 3-5 Migration Root Causes and Consequences

Table 3-11 Strategies for Addressing Root Causes of Migrants in the Central American Northern Triangle

Strategy	Strategy Overview
Industrial development and job creation	Under this strategy, job creation will be revitalized by strengthening the industrial base, promoting the development of local industries, and developing the human resources necessary for this. The sectors that are expected to have the greatest impact on employment are agriculture/livestock/forestry/fishery, retail/commerce, manufacturing, and construction, in that order. In agriculture, it is necessary to make efforts to increase added value due to low income and will also focus on initiatives targeting the remaining migrant families and women.
Social development and poverty reduction	Disparities between regions are factors that cause political and social instability, and as a result, they are factors that impede economic growth. Under this strategy, in areas where many poor people and indigenous people live, economic development is aimed at social development (health, sanitation, education, etc.) targeting basic needs, food security, and maintaining and improving livelihoods. Through this, it contributes to rectifying disparities with urban areas and promote sustainable and inclusive growth.
Security improvement	Crime by violent juvenile crime groups (Maras) has become a serious problem in the region, and securing the safety of citizens' lives is one of the most important issues for the government in the country, and it is a hindrance to development. Under this strategy, it will ensure the safety of citizens and contribute to human security by strengthening crime prevention.
Strengthening resilience through disaster prevention	Vulnerability to natural disasters still exists in the region, stifling self-reliant and sustainable economic growth. Under this strategy, vulnerability to natural disasters will be addressed by strengthening disaster risk reduction capacity.

Source: JICA Study Team

(2) South-South, Triangular and Regional Cooperation

In this study, the study team summarized the general situation of South-South, Triangular, and Regional cooperation in Central America and the Caribbean region, organized trends in each country, and prepared directions and recommendations for cooperation by Japan.

Table 3-12 Recommendations Contributing to Cooperation Policy (South-South, Triangular)

Item	Recommendations
Strategic Positioning of South-South and Triangular Cooperation	<ul style="list-style-type: none"> The assets and strengths of Japan's South-South and triangular cooperation are its extensive experience in the region and its ability to build trust with partner countries by disseminating management know-how and improving ownership by standing by developing countries. Continue to implement cooperation that is more effective and improves ownership, without simply increasing the number of projects but without losing sight of the strengths that differentiate JICA.
Improving Japan's Presence	<ul style="list-style-type: none"> As South-South and triangular cooperation is becoming mainstream as a trend in international cooperation, South-South and triangular cooperation is explicitly included in the issue-specific project strategies of JICA's Global Agenda, and will play a role within the framework of the Global Agenda. South-South and triangular cooperation is not limited to third-country training and the dispatch of third-country experts, but is entrusted to the partner country for implementation as a joint project. Therefore, in the implementation of joint projects, Japan's presence will be actively demonstrated by highlighting its strengths. In concretizing South-South and triangular cooperation, Japan will utilize its past achievements, lessons learned, and good practices, taking into consideration the matching of areas in which Japan is strong, areas in which partner countries wish to provide assistance, and the assistance needs of beneficiary countries.
Improved Flexibility Process	<ul style="list-style-type: none"> Consideration will be given to simplifying the process in order to implement triangular cooperation more flexibly. In addition, the establishment of a fund and a mechanism for more effective and efficient utilization of the overseas project enhancement funds of existing JICA projects will also be considered. Establish a scheme to avoid challenges due to complicated procedures and to improve ownership, in a manner that extends the capacity of the countries concerned to implement projects through the framework of the Partnership Program.

Source: JICA Study Team

Table 3-13 Recommendations Contributing to Cooperation Policy (Regional)

Item	Recommendations
Cooperation through SICA	<ul style="list-style-type: none"> Regional cooperation in conjunction with SICA has already been realized, and experience sharing among member countries on a sector-by-sector basis using SICA specialized agencies as a platform has been actively implemented, and numerous seminars and other events have been held. Share examples of JICA good practices with SICA member countries by more actively utilizing the JICA-SICA platform.
Cooperation with SIDS	<ul style="list-style-type: none"> CARICOM's presence in SIDS is significant and influential. By leveraging JICA's longstanding experience in CARICOM and strengthening SIDS collaboration, opportunities for information sharing and mutual learning between the two regions of the Caribbean and Pacific will be created. Disaster preparedness in small island states is particularly important.
Diffusion of SICA as a Best Practice for Cooperation with Regional Organizations	<ul style="list-style-type: none"> JICA has sent several experts to SICA to achieve a close relationship between the two organizations through the formulation of regional cooperation projects aimed at contributing to regional integration. The formulation of the Five-Year Program for Regional Cooperation (2021-25) in August 2022 is an important milestone and can be considered a best practice for JICA's interregional cooperation.

Source: JICA Study Team

(3) Local Government Cooperation and Local Revitalization

Based on a survey of 13 cases of collaboration, this study led to insights and recommendations for the development of local government cooperation. The analysis was prepared from four perspectives: (1) The stage of cooperation and the size of the municipality, (2) The process that led to the relationship, (3) The establishment of the framework, and (4) The areas of effort. The table below summarizes the contents.

Table 3-14 Summary of Insights into the Development of Local Government Cooperation

No.	Viewpoint	Details
1	Stage of cooperation and the size of the municipality	The cooperation is classified into (1) Interaction stage, (2) Training and goods provision stage, (3) Staff dispatch stage, and (4) Project stage. The degree of difficulty increases in this order, and a correlation can be seen with the size of the municipality. It is essential to aim for a realization and sustainable cooperation stage based on the resources of the municipalities and to learn from cities that have made progress in the cooperation stage, even though they are relatively small.
2	Process that led to the relationship	Triggers for cooperation are categorized as (1) Purpose-driven type, (2) Embassy-approach type, (3) Local network type, and (4) Externally recommended type. The most common case in this study was (3).
3	Establishment of the framework	Important points include (1) Secure human resource in the local government office, (2) Existence of points of contact between municipalities and partner countries, and (3) Utilization of local human resources including NPOs and private companies.
4	Areas of effort	A relatively easy area to address is education. There are also many initiatives in the agricultural sector. Although no examples were identified in this study, cooperation in disaster risk reduction and waste management in general is expected.

Source: JICA Study Team

The recommendations follow the stages of collaboration indicated in viewpoint-(1), with recommendations for starting the cooperation and getting to each stage.

1. It is desirable to promote cooperation at the feasibility stage to increase opportunities for cooperation and to grow the cooperation to the next stage.
2. There are four cases, as mentioned above, that lead to the initiation of cooperation. The embassy approach type and local network type are considered effective in supporting and promoting planned municipal cooperation.
3. In deepening the cooperation stage, it is effective to utilize JICA-related resources such as former Japan Overseas Cooperation Volunteers.
4. In the training and goods provision stage, it is important to utilize local human resources such as NPOs, agricultural advisors, universities, and other personnel and organizations related to local industries.
5. In the staff dispatch phase, CLAIR's Cooperative Exchange Program for Local Government Officials and JICA's Overseas Cooperation Volunteers programs can be utilized.
6. In order for the cooperation to continue and develop to the project stage, it is important to identify and disseminate the unique resources that each municipality possesses, as well as to identify issues through the previous cooperation stages.
7. In order to develop more co-creative relationships with local governments, JICA is mainly expected to (1) Contribute to co-creative and sustainable development that contributes to new "town development" based on overseas experiences, and (2) Utilize overseas human resources and organizational networks and create a platform for such cooperation.

3.3.5 Pilot Project

Five pilot project proposals were considered in this study, but only one, the Honduran Security DX pilot project, ended up being implemented. Based on the project proposals that were not implemented,

as part of the study, agricultural DX seminars were held in Guatemala and Mexico, and a technology introduction seminar on human flow data utilization was held in the Dominican Republic for the respective governments and stakeholders. Based on the results of the pilot project and the exchange of opinions at the seminar, recommendations for future development were organized.

The Honduras Security DX Pilot Project, which was implemented, aimed to improve the effectiveness and efficiency of security activities by proposing a crime prediction system and optimal patrol routes based on it. The C/P, Honduran National Police, is focusing on introducing digital technology and developing its own systems based on the long-term strategy for 2030. Through the implementation of the pilot project, the study team was able to identify C/P's specific needs, such as technology that could optimize resources and improve the efficiency of police activities.

Supporting the DX promotion efforts of the Honduran National Police will enhance their ability to collect and analyze crime information and contribute to the fight against drug trafficking-related criminal organizations. In addition, if it can be linked to community policing projects, it would be the first attempt to utilize smart technology in this field. Sharing and providing knowledge and data obtained through a series of activities to other countries in the region that are facing similar social issues could lead to a wide-scale improvement in public security in the Central American region. Table 3-15 summarizes the projects recommended for implementation in the security sector in Honduras.

Table 3-15 Programs and Projects Suggested in the Public Security Sector in Honduras

Strategy	Programs and Projects	Term	C/P
1. System development	1-1. Standardize, streamline, and accelerate information collection	Short	UMEP, SEPOL, DIPOL
	1-2. Optimize the overall workflow of report, information collection, and analysis	Medium	UMEP, SEPOL, DIPOL, 911, COI, TELEMATICA
	1-3. Introduce prank call detection system to reduce needless work (case of Japan)	Short	911
	1-4. Provision of equipment for data backup	Short	DIPOL
2. Strengthen cross-sectoral cooperation (Department strengthening)	2-1. Coordination among departments through real-time sharing and expanded access to collected data	Short and Medium	COI, UMEP, SEPOL, DIPOL
	2-2. Share GPS data held by COI to visualize police activities	Short	COI, UMEP, SEPOL, DIPOL
3. Human resource development	3-1. Enhance capacity for evidence-based crime prediction (criminal psychology, statistics)	Short and Medium	DIPOL
	3-2. Capacity building for optimal patrol planning based on crime prediction	Short and Medium	UMEP, DIPOL
	3-3. Strengthen human resource development systems at training and in-service educational institutions	Medium	Police academy

Source: JICA Study Team

Four of the five project proposals considered in this study were concepts for digital transformation (DX) that utilize digital technologies such as data, satellite imagery, and algorithms. Although only one project was implemented due to the difficulty in establishing an implementation framework, in all of the projects, there was a high level of interest in the new technology on the part of the counterparts, and it was confirmed that there was room for cooperation. The study team recommend to identify counterpart's priority areas for DX promotion and development cooperation be promoted in collaboration with Japanese companies that possess advanced and smart technologies and know-how.

3.4 Lessons Learned from the Study

The main goal of this study was to formulate cooperation scenarios for development cooperation, and it confirmed that several projects were realized during this study, including those proposed in the preliminary study. The study team is confident that the projects proposed in the cooperation scenarios in this study will continue to be considered on an ongoing basis. On the other hand, mismatches between the partner government's development master plan or sector development plan and JICA's support intentions have also occurred, and some sector studies have failed to deliver results as a cooperation scenario.

Based on the content of the study, the results achieved, and the lessons learned from the study, the study team propose the following recommendations for future development cooperation.

1. Conduct Flexible Survey

This study was characterized by the flexible implementation of the survey by members from diverse sectors. In response to the latest local needs identified in the course of the survey, both JICA and the study team were able to propose a scope that partially evolved from the original study plan, thereby making the study more in line with local needs. In conducting such a study, it is important to agree on the scope of the study, managing changes, coordinate the resource allocation required accordingly, and share the scope of the study with all parties involved.

2. Support for Star-up Companies

With the revolutionary progress of digital technology and the development of DX in socioeconomic activities, startup companies in many countries are taking on the challenge of forming new industrial fields. In future development cooperation, there is great potential to contribute to the resilience of socioeconomic activities using DX by providing a funding scheme to support the incubation function of start-up companies that market in developing countries.

3. Contribution to Food Security in Caribbean Island States

Although not confirmed in the preliminary study, "Food security in the Caribbean island states" was identified in this study as a regional vulnerability that was revealed in the COVID-19 pandemic (CARICOM, OECS). Similar studies to the agricultural and fisheries value chain development in this study should be conducted to help solve pressing social issues in the Caribbean region.

4. Support for Strengthening Urban Resilience

In the preliminary study and in this study, transportation projects are proposed in Santo Domingo City, Dominican Republic; Belize City, Belize; and San Jose, Costa Rica. The global trend of population concentration in urban areas, which has been a constant theme since before COVID-19, is not expected to change in the post-COVID-19 society. In Central America and the Caribbean region, urban problems caused by population concentration are also a social issue, and the COVID-19 pandemic has revealed the vulnerability of each city. In future development cooperation, it is desirable to confirm the situation and intentions of each city, and the pros and cons as a development cooperation menu, in order to determine how to address urban problems, which are common social issues worldwide.

5. Organizational System Building and Human Resource Development for Co-Creation

Collaboration with international and regional organizations as well as Japanese local governments and

companies is expected not only in the cross-sectoral studies of this study, such as Root Cause Measures for Central American Migration, South-South, Triangular and Regional Cooperation, Local Government Cooperation and Local Revitalization, but also in Green Economy, Disaster Risk Reduction, and infrastructure development in Guyana. Since it is anticipated that the organization and systems based on conventional bilateral cooperation will become more complicated to deal with, it is necessary to timely establish organizations and systems and to develop human resources in parallel with it in preparation for the generalization of co-creation projects such as South-South, Triangular, and Regional cooperation and Local government cooperation, as described above.

6. Utilization of Pilot Project Method

Although the three pilot projects in this study that were in the process of formation could not be implemented, an analysis of the causes of the three projects that could not be implemented was conducted in the report, and lessons learned for future implementation of pilot projects are provided. The pilot project method has many advantages, such as clarifying the direction of development cooperation and specific issues to be addressed, and promoting mutual understanding among the parties concerned by sharing the results of the project in a tangible manner, even though the project is small in scale.

Part 2

Infrastructure for Building Resilient Society

Chapter 4	Information and Telecommunications
Chapter 5	Transportation
Chapter 6	Construction Method and Material
Chapter 7	Education
Chapter 8	Health Care

4. Economic Infrastructure Development (Information and Telecommunications)

4.1 Outline of the Study

Issues related to the information and telecommunications subsector were identified, and development scenarios and JICA's cooperation scenarios were formulated through a field survey, desk research and interviews with relevant organizations.

Table 4-1 shows the scope of work of the information and telecommunications subsector within the economic infrastructure development sector.

Table 4-1 Scope of Work (Information and Telecommunications)

No.	Task	Scope of Work
1	Sector Targets	To present measures that will contribute to narrowing the gap between urban and rural areas in terms of communication infrastructure, which is the basic infrastructure for remote activities that emerged as a result of the COVID-19 disaster.
2	Scope Update	Guatemala in Central America and Saint Lucia in the Caribbean region will be the main countries targeted for field research. In addition, relevant information will be collected on target country, Guyana, in the electricity sector, and issues and possibilities for cooperation in the public (policy) and private (telecommunications operators) sectors will be proposed in terms of the disparity between urban and rural areas.
3	[Task 2] Desktop Study	<ul style="list-style-type: none"> -To collect indicator data (penetration rate, tariffs, coverage area by 2G/3G/LTE, etc., effective speed (if possible), current status of broadcasting services) -To collect information on projects which is ongoing or planned -To identify issues that are emerged in COVID-19 and existing before COVID-19 -To make final report according to the information until 1st field survey
4	[Task 3] Field Survey	To conduct interviews with government agencies in information and telecommunications subsector, telecommunications carriers, and conduct field checks on the telecommunications situation in rural areas, if possible.
8	[Task 8] Recommendation	To finalize the draft development and cooperation scenarios based on comments from JICA and relevant organizations.

Source: JICA Study Team

4.2 Overview of Economic Infrastructure Development (Information and Telecommunications) in the Region

4.2.1 Outline

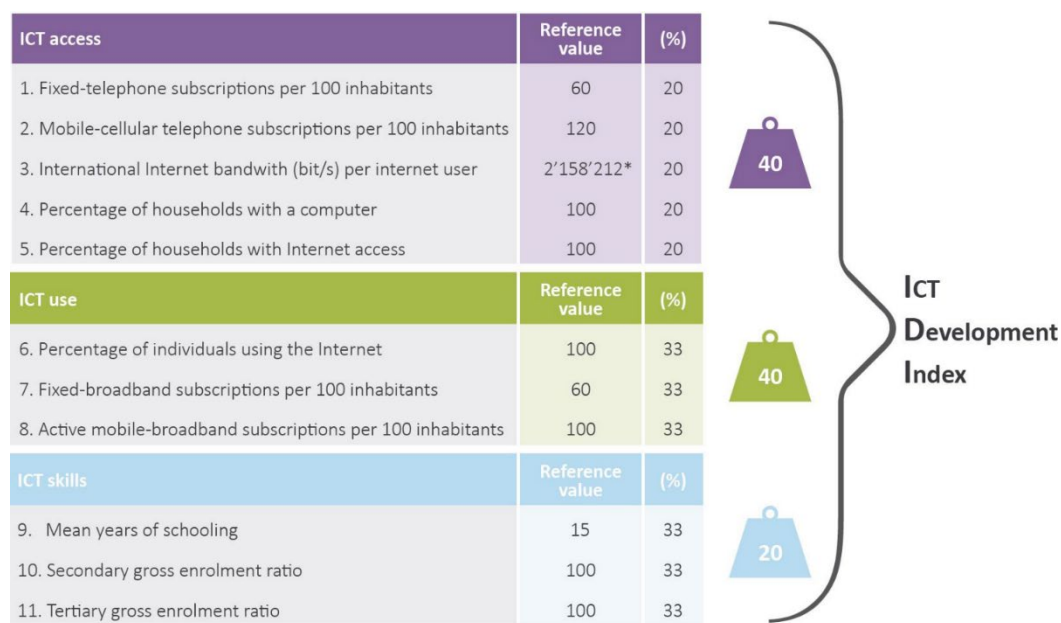
(1) ICT Development Index of International Telecommunication Union (ITU)

The Information and Communication Technology (ICT) Development Index was published by the International Telecommunication Union (ITU), which uses 11 indicators to measure the diffusion and development of ICTs in each country. Table 4-2 shows the ICT Development Index in 2017, which is the latest index. The next revision which was scheduled for 2018 has been postponed due to technical issues.

Countries in Central America except for Costa Rica and Mexico are below the world average, and lagged behind in diffusion and development. The average of countries in Caribbean Region is above the

world average. Barbados and St. Kitts and Nevis are in the higher ranks, but Guyana and Haiti are in the lower rank.

In comparison between the Central America and the Caribbean region, all sub-indices of the Central America are lower than that of the Caribbean region. The gaps in ICT access sub-index may be caused by level of developed infrastructure, household income, population density, physical distance among the nations and disparity between urban and rural areas.



Source: ITU

Figure 4-1 ICT Development Index: Indicators, Reference Values, and Weights

Table 4-2 ICT Development Index in Central America and the Caribbean Region (2017)

Economy	Region	Rank	Value	Sub index ICT access	Sub index ICT use	Sub index ICT skills
Japan		10	8.43	3.52	3.26	1.64
United States		16	8.18	3.30	3.06	1.81
Barbados	CR	34	7.31	3.21	2.52	1.57
St. Kitts and Nevis	CR	37	7.24	3.02	2.70	1.50
Bahamas	CR	57	6.51	2.78	2.23	1.48
Costa Rica	CA	60	6.44	2.56	2.47	1.41
Trinidad & Tobago	CR	68	6.04	2.87	2.02	1.13
Grenada	CR	73	5.80	2.52	1.61	1.65
Antigua & Barbuda	CR	76	5.71	2.69	1.78	1.23
Dominica	CR	77	5.69	2.53	1.91	1.24
St. Vincent & the Grenadines	CR	82	5.54	#N/A	#N/A	#N/A
Mexico	CA	87	5.16	2.11	1.86	1.18
Suriname	CR	88	5.15	2.33	1.82	0.99
Panama	CA	94	4.91	2.38	1.32	1.20
Jamaica	CR	98	4.84	2.11	1.57	1.15
St. Lucia	CR	104	4.63	2.06	1.47	1.09

Dominican Rep.	CA	106	4.51	1.72	1.61	1.17
El Salvador	CA	119	3.82	1.90	0.90	1.02
Belize	CA	120	3.71	1.62	0.91	1.16
Guyana	CR	124	3.44	1.74	0.64	1.05
Guatemala	CA	125	3.35	1.80	0.71	0.82
Honduras	CA	129	3.28	1.63	0.75	0.88
Nicaragua	CA	130	3.27	1.67	0.69	0.90
Haiti	CR	168	1.72	0.94	0.30	0.47
Average: World			5.11	2.24	1.70	1.17
Average: CR(Caribbean Region)		83.7	5.34	2.41	1.72	1.22
Average: CA(Central America)		107.8	4.27	1.94	1.25	1.09

Note: Bold line: median value among the world

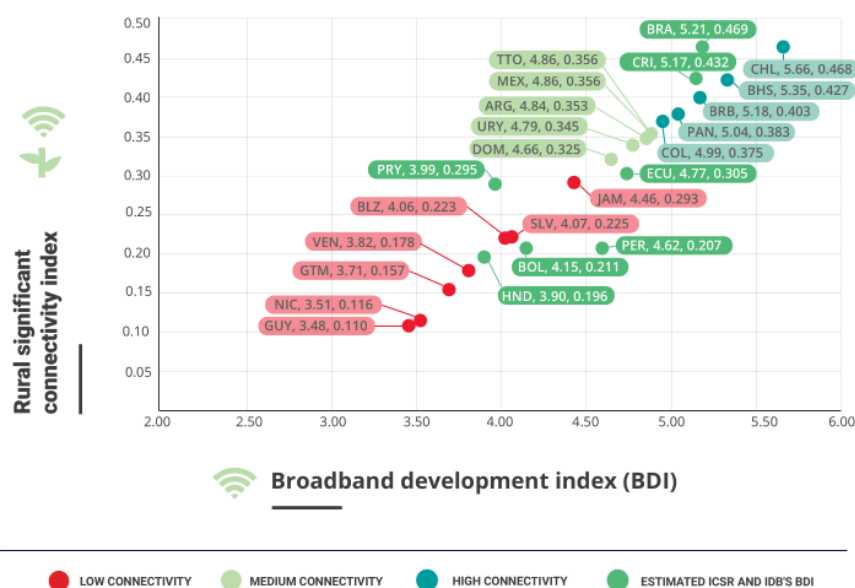
Source: JICA Study Team based on The ICT Development Index, ITU (2017)

(2) Index of Telecommunication in Rural Area

In 2020, IICA/IDB/Microsoft conducted a study on telecommunication indicators in rural areas entitled "Rural Connectivity in Latin America and the Caribbean - A Bridge for Sustainable Development in a Time of Pandemic". In the study, the "rural significant connectivity index" of each country was compared using a combination of various indicators. The results are shown in Figure 4- below.

The same as the ITU's index, Nicaragua, Guatemala, Honduras, and El Salvador of the Central American countries were ranked as countries with lower "rural significant connectivity index".

GRAPH 3. CORRELATION BETWEEN THE RURAL SIGNIFICANT CONNECTIVITY INDEX (RSCI) AND THE IDB'S BROADBAND DEVELOPMENT INDEX (BDI), 2018 VERSION



Source: "Rural Connectivity in Latin America and the Caribbean - A Bridge for Sustainable Development in a Time of Pandemic", IICA, IDB, Microsoft, 2020

Figure 4-2 Rural Significant Connectivity Index

(3) International Infrastructure for Telecommunication (submarine cable)

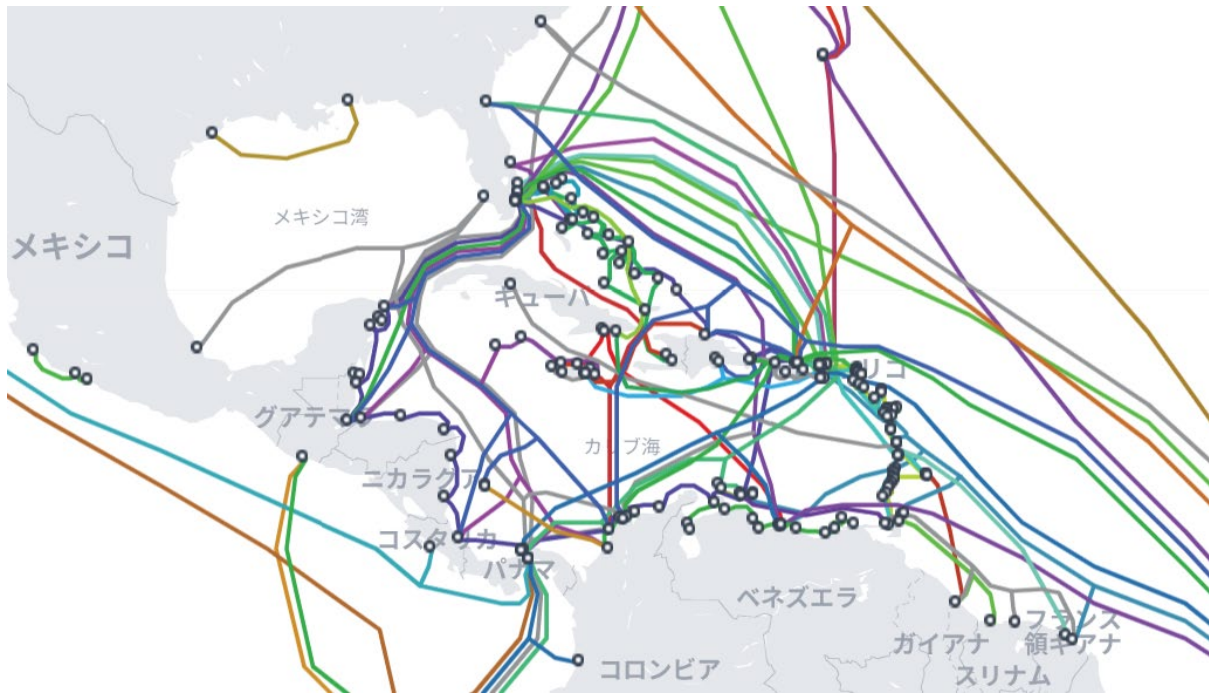
Submarine cables as an international telecommunications infrastructure connect all countries in Central America and the Caribbean region. Though most countries in the Central American are directly connected to the United States, countries in the Caribbean region are also connected with neighboring countries (Table 4-3 and Figure 4-3)

Table 4-3 Submarine Cable Connection of the Central America and Caribbean Region

Nation	Name of cable	Domestic points connected	Major international point connected
Belize	ARCOS	Bomba	Americas
	SEUL	Belize City, San Pedro	None (domestic only)
Costa Rica	AMX-1	Puerto Limon	North and Central America/ Brazil
	ARCOS	Puerto Limon	Americas
	Maya-1	Puerto Limon	North and Central America
	PAC	Ungui	United States/ Mexico
El Salvador	なし	-	-
Guatemala	AMX-1	Puerto Barrios	North and Central America/ Brazil
	ARCOS	Puerto Barrios	Americas
	SAM-1	Puerto Barrios, Puerto San Jose	Dominican Republic/ Latin America
	SPSC/Mistral	Puerto San Jose	
Honduras	ARCOS	Puerto Cortes, Trujillo, Puerto Lempira	Americas
	Maya-1	Puerto Cortes	North and Central America
Mexico	AMX-1	Cancun	North and Central America/ Brazil
	ARCOS	Cancun, Tulum	Americas
	Culf of California Cable	Topolobampo, La Paz	None (domestic only)
	Ixchel	Isla de Conzumel, Playa del Carmen	None (domestic only)
	LCMSSCS	Ciudad Lázaro Cárdenas, Ixtapa, Mabzanillo	None (domestic only)
	Maya-1	Cancun	North and Central America
	PAC	Mazatlán, Tijuana	United States/ Mexico
Nicaragua	ARCOS	Puerto Cabezas, Blue Fields	Americas
Panama	ARCOS	Maria Chiquita	Americas
	Curie	Balboa	United States/ Chile
	Maya-1	Maria Chiquita	North and Central America
	PCCS	Balboa, Maria Chiquita	Caribbean region/ United States
	PAC	Fort Amador	United States/ Mexico
	SAC	Colon, Fort Amador	United States/ Mexico
Barbados	ECFS	Bridge Town	Eastern Caribbean
	Southern Caribbean Fiber	Needham's Point	Eastern Caribbean
	X-Link Submarine Cable	Pegwell	Guyana
Cuba	ALBA-1	Siboney, Santiago de Cuba	Jamaica/ Venezuela
	GTMO-1	Guantanamo	United States
	GTMO-PR	Guantanamo	Puerto Rico
Dominican Republic	AMX-1	Puerto Plata	North and Central America/ Brazil
	Antillas-1	Santo Domingo, Punta Cana	Puerto Rico
	ARCOS	Puerto Plata, Punta Cana	Americas
	East-West	Haina	Jamaica, British Virgin Islands
	Fibralink	Puerto Plata	Jamaica, Haiti
	SAM-1	Punta Cana	Guatemala, Latin America
Jamaica	ALBA-1	Ocho Rios	Cuba, Venezuela
	CJFS	Bull Bay, Montego Bay, Ocho Rios, Port Antotio	Cayman Islands
	CFX-1	Copa Club, Morant Point	United States, Columbia
	East-West	Harbour View	Dominican Republic, British Virgin Islands
	Fibralink	Bull Bay, Montego Bay, Ocho Rios	Dominican Republic, Haiti
	JSCFS	Black River, Bull Bay, Montego Bay, Negril	None (domestic only)
Guyana	SG-SCS	George Town	Trinidad and Tobago, Suriname
	X-Link Submarine Cable	George Town	Barbados
St. Lucia	ECFS	Castries	Eastern Caribbean

Nation	Name of cable	Domestic points connected	Major international point connected
	Southern Caribbean Fiber	Rodney Bay	Eastern Caribbean

Source: <https://www.submarinecablemap.com>



Source: <https://www.submarinecablemap.com>

Figure 4-3 Submarine Cable Connection of the Central America and Caribbean Region

4.2.2 Selection of Priority Countries in Information and Telecommunications Subsector

Small island countries with relatively high-income levels may be more likely to develop infrastructure and have more access to and use of ICTs. On the other hand, in the With/Post COVID-19 society, ICT infrastructure will become more of a basic infrastructure for healthcare, education, and other aspects of society as a whole. Therefore, it is necessary to pay more attention to whether opportunities for access are provided to people in the rural areas and low-income groups from the perspective of "no one is left behind."

A selection of priority and focus countries was examined from the perspective of "disparity between urban and rural areas." In addition, the selection was also considered in the travel plans of the members of the delegation with other sectors, from the perspective of the use of ICT technology in other sectors, its challenges, and future possibilities.

As a result, Guatemala was selected from Central America, while Guyana and Saint Lucia from the Caribbean region were selected as the target countries of the field survey.

4.3 Overview of Information and Telecommunications Sector in Focus Countries

4.3.1 Guatemala

(1) Overview of Information and Telecommunications Sector

In Guatemala, the Ministry of Communications, Infrastructure, and Housing (*Ministerio de Comunicaciones, Infraestructura y Vivienda*: CIV) is in charge of the telecommunications sector. The CIV manages and allocates radio frequencies, and cell phone operators receive their allocations from the CIV to conduct cell phone communications business.

The mobile operators are TIGO and Claro, with market shares of 57% and 43%, respectively. In the first field survey, interviews were conducted with SIT and Claro. The following items were confirmed, including the results of the interviews.

Table 4-4 Current Situation of Information and Telecommunications Sector in Guatemala

<p>Population Coverage</p> <ul style="list-style-type: none"> • The population coverage rate for cell phone service is 100%¹. • Population coverage for 3G and above is 95%¹. • Population coverage for 4G and above is 40%¹. • Population coverage for 5G of Claro is 22%². • Fixed broadband penetration rate is 3.5%¹. However fixed broadband is basically only available in urban areas². • Population coverage of satellite TV is 100%, but it is unusable in some areas due to inadequate electricity supply². • In reality, it is not uncommon for connections to be unstable or slow in rural areas. In addition, due to cost considerations, some people do not have access even within the covered area. Others need to move to a location where they can get a signal and try to access it². • The government is trying to develop Wi-Fi in public squares to provide free access to the Internet³. <p>Communication Quality</p> <ul style="list-style-type: none"> • The communication speed was extremely slow around candidate sites of pilot project for the agricultural DX located in Solola, and although there is a possibility of getting notifications via the application, the communication conditions were such that it could be considered difficult to use the application's functions in any area. <p>Affordability</p> <ul style="list-style-type: none"> • Both TIGO and Claro charge approximately 10 Guatemalan quetzals per GB (10 GB, valid for one month) for mobile data⁴. • More than 90% of Claro users are prepaid users². • Affordability of mobile network (GNI ratio) in ITU's ICT Price Basket (2021) is 3.4%, ranking 130th out of 189 countries. • Guatemala's Gini Coefficient is 44.5%, indicating a large income disparity⁵. <p>Response to COVID-19</p> <ul style="list-style-type: none"> • In response to the COVID-19 disaster, Claro, a private mobile operator, distributed free data bundles and exempted access to certain educational and other content from billing (making it exempt from data bundle consumption), and also made video content conducive to job training. In addition, the company also made video content that contributes to job training available to the public free of charge. (Viewing itself is free of charge and Claro users are not subject to consumption of data bundles for access.)² <p>Other / Collaboration with the Government</p> <ul style="list-style-type: none"> • All projects conducted by the government require open bid procedures, and procedures for them such as obtaining subsidies by private company is complicated. Close collaboration with the private sector may be accompanied by difficulties. In reality, it is difficult for the private sector to cooperate with the public sector in order to take advantage of their mobility. • In some government offices in other sectors, the government does not provide internet access through its own budget, and the staff members have to pay for the connection. In addition, the speed of the connection was also reported to be inadequate.
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Source: JICA Study Team

¹ ITU (2020)

² Interview with Claro (August 2022)

³ Interview with SIT (August 2022)

⁴ Website of TIGO and Claro (January 2023)

⁵ Website of Knoema (2018)

Table 4-5 Measured Data Communication Speed by Smart Phone at the Pilot Project Site for Agricultural DX

Site	Date/Time	Download (Mbps)	Upload (Mbps)	Connection Status
One of Candidate Farm	8/28 10:29 am	12.0	16.1	LTE
	8/28 10:30 am	6.20	13.4	LTE
	8/28 10:31 am	11.0	16.7	LTE
Office (Inside and Outside)	8/28 11:05 am	0.68	0.32	LTE
	8/28 11:10 am	0.31	0.20	LTE
	8/28 11:11 am	0.27	0.54	LTE
	8/28 11:23 am	0.23	0.43	LTE
	8/28 11:24 am	0.18	0.90	LTE
	8/28 11:25 am	0.30	0.47	LTE
	8/28 11:28 am	0.13	0.33	LTE

Measure method: Mobile application for measuring internet speed of a smartphone with a TIGO Sim card inserted

Analysis: In the "One of Candidate Farm" site, the speeds were sufficient for general smartphone use, such as using applications, browsing websites, checking e-mail, and making video calls.

In the "Office", the speeds were considered sufficient to receive notifications from smartphone applications, but it did not interfere with general smartphone use. The "Office" speed was measured both inside and outside the building, but there was no significant difference in speed, confirming that the speed was not slow because the user was inside the building.

Source: JICA Study Team

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

In the With/Post COVID-19 society, the importance of ICT infrastructure has increased as basic infrastructure for medical care, education, and other aspects of society as a whole. There is room for improvement in terms of connectivity (physical connection), and affordability (economical connection), which is particularly burdensome for low-income people in rural areas. From these two aspects, it is necessary for both public sector (regulator) and private sector (telecommunication carrier) to provide a wide range of opportunities for connection, and to ensure a certain level of communication quality as the basic infrastructure of society.

The following issues can be extracted as common issues in each of the focus countries. The penetration rate of fixed broadband lines in rural areas is generally lower than in urban areas, the quality is not high, therefore data communication networks are critically important.

- Although a certain level of coverage of mobile network has been achieved in rural areas, there are areas where stable quality (stable use of various services) is not available, especially in rural areas.
- The cost of data communication is especially burdensome for low-income people in rural areas.
- There is a challenge in accessing the information and telecommunications network, which is the "basic infrastructure of society," for low-income people in rural areas where there is no signal coverage or where access to data communication is difficult in terms of affordability. This is a problem that cannot be easily solved solely by public or private sectors.

Table 4-6 Development Issues and Strategies of Information and Telecommunications Sector in Guatemala

Sector	Issue	Strategy
Guatemala Information and Telecommunications	Stabilization of telecommunications	Availability and comfortability of fixed high-speed Internet access in rural areas to be improved
		Quality of mobile data service to be improved
		Affordability, especially for low-income groups in rural areas to be improved
		Information and communication network as a "basic infrastructure " for the radio insensitive and low-income groups to be enhanced/developed

Source: JICA Study Team

b) Programs and Projects

The programs and projects proposed in Guatemala are summarized in Table 4-7.

Table 4-7 Proposed Programs and Projects in Guatemala

Target	Issues	Programs and Projects	Period
Guatemala	Development of national policy for telecommunications	Clarification of target level of telecommunications quality for effective speed and actual ease of connection	Short
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	Short
		Development and implementation of plans to expand coverage based on the above standard	Mid
	Basic infrastructure development for promoting DX in other sectors	Providing opportunities for information and telecommunications infrastructure at public facilities such as school or hospital	Mid

Source: JICA Study Team

The following development scenario is proposed.

- Clarifying the level of communication quality (speed and stability) of the information and telecommunications network in national policy.
- Clarifying planning methods to achieve appropriate communication quality necessary for future expansion of coverage areas (including countermeasures against radio silence zones such as mountainous areas).
- Improvements in cases where communication quality is inadequate.
- The government (regulators) should appropriately regulate that communication quality is ensured to a certain standard.
- The private sector (telecommunications carriers) should ensure that communication quality is ensured based on certain standards, thereby enhancing confidence in the information and telecommunications network as the basic infrastructure of the With/Post COVID-19 society.
- In cases where the private sector cannot provide coverage from the perspective of economic activities (thinly populated areas) or affordability (difficulty in providing services to low-income people), the public sector should play a certain role from the perspective of providing opportunities for access to basic infrastructure, i.e., from the perspective of social welfare. In addition, alternative access opportunities should be provided through collaboration between the public and private sectors (e.g., provision of affordable connection in major points in rural areas).

2) Cooperation Scenario

Among the proposed development scenarios, the areas where Japan's experience and technology can be utilized are extracted, as possible cooperation scenarios of Japan in the information and telecommunications sector in Guatemala as shown in Table 4-8. “Clarification of standards for effective speed and actual ease of connection” and “Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area” will be implemented by public sector, “Providing opportunities for information and telecommunications infrastructure access to difficult areas for private sector” will be led by the government while incorporating private sector know-how, while “Development and implementation of plans to expand coverage based on the above standard” will be a field that private business operators will mainly work on.

Table 4-8 Proposed Cooperation Scenario of Information and telecommunications Sector in Guatemala

Target	Issues	Programs and Projects	Modality
Guatemala	Development of national policy for telecommunications	Clarification of standards for effective speed and actual ease of connection	Technical assistance
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	
		Development and implementation of plans to expand coverage based on the above standard	
	Basic infrastructure development for promoting DX in other sectors	Providing opportunities for information and telecommunications infrastructure at public facilities such as school or hospital	Grant or technical assistance

Source: JICA Study Team

4.3.2 Guyana

(1) Overview of Information and Telecommunications Sector

In Guyana, the Office of the Prime Minister is responsible for the information and telecommunications sector. Regulatory agencies include the Telecommunication Agency and the Guyana National Broadcast Authority.

Liberalization of telecommunications sector was done in October 2022⁶. The mobile operators are Guyana Telephone and Telegraph Company (GTT) and Digicel, with Digicel having a 70% share while GTT the remainder.

During the first field survey, interviews were conducted with consultants of Digicel. The following is a summary of what was confirmed, including the results of the interviews.

Table 4-9 Current Situation of Information and Telecommunications Sector in Guyana

Population Coverage
<ul style="list-style-type: none"> • The population coverage rate for cell phone service is 97%¹. • Population coverage for 3G and above is 93%¹. • Population coverage for 4G and above is 50%¹. • The latest population coverage rate for LTE is 95%⁷.

⁶ Website of International Trade Administration, United States (January 2023)

⁷ Interview with local consultant, as an advisor of Digicel (August 2022)

- Internet penetration rate is 43%⁸.
- Communication Quality and Local Conditions⁷**
- In border areas, where there are military camps, Digicel has set up base stations because of the high demand for telecommunications. On the other hand, some people are using Brazilian SIMs to pick up signals from Brazil instead of Guyana SIMs. In areas where the signal is weak, some people spend several hours to climb up to the top of a hill where the signal is strong enough to make a call.
 - Base stations are powered by diesel and solar power.
 - Base stations are set up independently by each telecommunications carrier, and there is no collaboration.
 - Television is not available in many hinterland areas.
- User Usage⁷**
- Prepaid phones are more expensive than postpaid phones, but there are more prepaid users than postpaid phones. The advantage is that family members do not know where the call was made to.
 - Many users purchase short-term, small-volume data bundles (1-day, 3-day, 7-day, etc.), and when the balance runs out, they buy more.
- Others / Collaboration with the Government⁷**
- Digicel has been providing the government with a 911 (emergency call to police) system since 2015, and also cooperates with the government in the areas of remote education, remote health, security cameras, and satellite communications (agriculture, security, etc.).

Source: JICA Study Team

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

As in Guatemala, it is necessary to provide a wide range of opportunities for connectivity in terms of both connectivity (physical connectivity) and affordability (economical connectivity).

Especially in the inland areas of Guyana, the population density is sparse, so that the delay in infrastructure development has been pointed out. The following can be extracted as issues for Guyana's information and telecommunications sector. These are common issues outside of Guyana, albeit to a greater or lesser degree.

- The fixed broadband penetration rate in rural areas is generally lower than in urban areas, and the quality is not high, so the importance of mobile phone data communication networks is high.
- Although a population coverage rate is high, area coverage rate is not comparatively high because most of the population is in coastal area.
- People in rural cities except for George Town are unable to choose mobile company because only one company provides mobile data network
- There are challenges in accessing information and telecommunications networks, which are the “basic infrastructure,” in areas where radio waves do not reach in rural areas, and for low-income earners who have difficulty accessing data communications due to affordability. This is a problem that cannot be easily solved by the government alone or the private sector alone.

Table 4-10 Development Issues and Strategies of Information and Telecommunications Sector in Guyana

Sector	Issue	Strategy
Information and Telecommunications	1. Stabilization of telecommunications	Quality of mobile data service to be improved
		Affordability, especially for low-income groups in rural areas to be

⁸ Website of DataReportal (January 2022)

Sector	Issue	Strategy
		improved
		Information and communication network as a "basic infrastructure " for the radio insensitive and low-income groups to be enhanced/developed

Source: JICA Study Team

b) Programs and Projects

The following table shows the projects and programs proposed to be implemented in Guyana.

Table 4-11 Proposed Programs and Projects in Guyana

Target	Issues	Programs and Projects	Period
Guyana	Stabilization of telecommunications	Clarification of standards for effective speed and actual ease of connection	Short
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	Short
		Development and implementation of plans to expand coverage based on the above standard	Mid
	Basic infrastructure development for promoting DX in other sectors	Providing opportunities for information and telecommunications infrastructure at public facilities such as school or hospital	Mid

Source: JICA Study Team

The following development scenarios are proposed.

- Clarify the level of communication quality (speed and stability) of information and telecommunications networks in national policy.
- Clarify the planning method for achieving the appropriate communication quality necessary in the process of expanding the coverage area and improving the above (including countermeasures for radio dead zones such as mountainous areas).
- The private sector (telecommunications carriers) will ensure communication quality based on certain standards, thereby increasing the trust of information and telecommunication networks as basic infrastructure for With/Post COVID-19 society.
- From the perspective of providing access to basic infrastructure, meaningly from the perspective of social welfare, when coverage is not economically possible (sparsely populated areas) and affordability cannot be provided (difficult to provide services to low-income people) by private sector, the public sector should play a certain role, to provide alternative opportunities for access through public-private partnerships. (Provision of affordable connection machines in urban areas, etc.)

2) Cooperation Scenario

Among the proposed development scenarios, the areas where Japan's experience and technology can be utilized are extracted, as possible cooperation scenarios of Japan in the information and telecommunications sector in Guyana as shown in Table 4-12.

Table 4-12 Proposed Cooperation Scenario of Information and telecommunications Sector in Guyana

Target	Issues	Programs and Projects	Modality
Guyana	Stabilization of telecommunications	Clarification of standards for effective speed and actual ease of connection	Technical assistance
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	
		Development and implementation of plans to expand coverage based on the above standard	
	Basic infrastructure development for promoting DX in other sectors	Providing opportunities for information and telecommunications infrastructure access to difficult areas for private sector	Grant or technical assistance

Source: JICA Study Team

In light of the above, proposed cooperation scenarios are “capacity development for planning and quality ensuring of information and telecommunication networks” and “providing basic infrastructure access in the With/Post COVID-19 society”.

4.3.3 Saint Lucia

(1) Overview of Information and Telecommunications Sector

In Saint Lucia, the Ministry of Public Service, Home Affairs, Labor, and Gender Affairs is responsible for the information and telecommunications sector (National Information Communications and Technology Office (NICTO)). The National Telecommunications Regulatory Commission (NTRC) is the regulatory agency.

There are two cell phone operators, Digicel and Flow, with Digicel having a 70% share.

In the first field survey, interviews were conducted with NTRC and Digicel. The following items were confirmed, including the results of the interviews.

Table 4-13 Current Situation of Information and Telecommunications Sector in Saint Lucia

<p>Population Coverage</p> <ul style="list-style-type: none"> The population coverage rate for cell phone service is 98%¹. Population coverage for 3G and above is 37%¹. Population coverage for 4G and above is 20%¹. Population coverage rate of Digicel for cellular service is 100% and for LTE is 97%⁹. Although the coverage of telecommunications is considered to be quite good, affordability in terms of availability to all is a major challenge. In rural areas in particular, there are issues with both coverage and affordability. We believe that support for affordability for lower income groups is necessary¹⁰. Internet penetration rate is 57%¹¹. As an effort to ensure quality, Digicel checks the frequency of drop calls in each region, and if there are too many, engineers are dispatched to the region to conduct on-site investigations and identify the cause⁹. <p>User Usage</p> <ul style="list-style-type: none"> The average data usage of Digicel users is about 3 GB/month, and the median data usage is about 1 GB/month. This is due to some heavy users pushing up the average⁹. Rural users are more likely than urban users to purchase inexpensive, smaller capacity bundles with shorter validity

⁹ Interview with Digicel (August 2022)

¹⁰ Interview with NTRC (August 2022)

¹¹ Website of DataReportal (January 2021)

periods. Some behavior is seen in buying 1-day bundles because they need them when they are out in urban areas⁹.

- Curfews and increased time at home have increased data usage. The situation was challenging for those with lower incomes¹⁰.
- In terms of disparities between urban and rural areas, there is a large difference in the burden of equipment and fees⁹.
- In general, people seem to feel that when they are at home, they are connected via a fixed line (FTTH, copper wire) and that mobile data services are for use when they are out of the home. In rural areas, mobile Internet access is used more than fixed lines. A survey was once conducted to find out why mobile lines are used more often than fixed lines, and the results showed that it is more comfortable for each member of a family to use a mobile line than to share a fixed line among several members of the family. It can be said that there are issues with the quality (speed and stability) of fixed lines¹⁰.

Affordability

- Digicel provides both mobile and FTTH services, with FTTH service currently available only in populated areas. Competitors offer fixed-line copper broadband service, which is available in areas not covered by FTTH⁹.
- The cable TV companies provide service to a large portion of the country, with a household penetration rate of at least 80%. However, the quality of the Internet connection has been a problem, especially in rural areas⁹.
- Affordability of mobile network (GNI ratio) in ITU's ICT Price Basket (2021) is 4.1%, ranking 141st out of 189 countries.
- Saint Lucia's Gini Coefficient is 51.2%, indicating a large income disparity¹².

Response to COVID-19

- The government (NTRC) provided subsidies to telecom operators, which Digicel used to distribute 4,000 LTE modems and 1,000 MiFi (mobile Wi-Fi) units. The cost of the devices is free of charge due to the subsidy, while the data usage for a few months is borne by Digicel, and the user bears the cost of continued use beyond that amount⁹.
- In consideration of low-income users, entry-level smartphones are offered at a lower price by Digicel in terms of Corporate Social Responsibility. The company is also working to reach out to low-income people on a community basis and offer inexpensive bundles. However, the company believes that further support is needed for those who still do not have access to the Internet, but this will be a social welfare initiative by the government⁹.
- The COVID-19 disaster has increased demand in the education sector. However, in rural areas, communication is not stable, and in some cases, people are searching for places where they can easily pick up the signal (climbing hills, etc.)¹⁰.

Others / Cooperation with the Government

- The government owns backbone lines¹⁰.
- The government owns the backbone lines, and the need for telemedicine will increase in the future. There is a shortage of medical personnel, and it is also difficult to travel to medical institutions from rural areas. It would be good if initial diagnosis could be done remotely¹⁰.
- NTRC is collaborating with the National Emergency Management Organization (NEMO) in the field of disaster management. Improving the resilience of communication networks is an issue, and roaming to other providers in the event of a failure of one provider is being considered. They are also looking at strengthening backbone circuits between agencies within the government. This also aims to improve the resilience of the communication networks of all related agencies, such as police, fire, the National Emergency Management Organization (NEMO), power, and telecommunication companies¹⁰.
- NTRC is working on a smart bus stop project. NTRC is paying for the project⁹.
- Digicel also provided the NEMO with a system to deliver alerts via SMS. Other projects include the Safe City Project (installation of CCTV cameras at key locations in urban areas and on major highways), a location system for fishing boats in combination with GPS, and the 911 project (a system for notifying the police)⁹.
- Digicel has a Disaster Management Plan that includes emergency generators, a monitoring system to identify faulty areas, technicians on standby, and the distribution of free bundle plans. The plan includes the distribution of free bundles to users in specific areas where disasters or other events have occurred⁹.
- NTRC thinks that support for the best plan to improve coverage is needed and that interest in the experience of Japan is important due to its similar topography. Other interests include technology, such as maintaining communication quality¹⁰.
- Funding needs are constant, and they are looking for funding sources on a project-by-project basis¹⁰.
- The International Cooperation and Development Fund in Taiwan provided free wi-fi service in schools, hospitals, and public spaces in communities as one of the activities of the Gi-Net project as a grant project. After completion of the project, a running cost on local government is a problem, and the use of wi-fi is currently suspended.¹³

Source: JICA Study Team

¹² Website of World Bank (2016)

¹³ Interview with International Cooperation and Development Fund (August 2022)

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

The following can be extracted as issues for Saint Lucia's information and telecommunications sector. These are common issues outside of Saint Lucia, albeit to a greater or lesser degree.

- The fixed broadband penetration rate in rural areas is generally lower than in urban areas, and the quality is not high, so the importance of mobile data networks is high.
- Although a certain level of coverage is achieved even in rural areas of mobile phone data communication networks, there are cases where it is difficult to say that stable quality (various services can be used stably) is particularly apparent in rural areas. Quality assurance is an issue in that although it is said to be "covered", it does not correspond to the actual situation.
- The cost of data communication is a heavy burden, especially for low-income people in rural areas.
- There are challenges in accessing information and telecommunications networks, which are the "basic infrastructure of society," in areas where radio waves do not reach in rural areas, and for low-income earners who have difficulty accessing data communications due to affordability. This is a problem that cannot be easily solved by the government alone or the private sector alone.

Table 4-14 Development Issues and Strategies of Information and Telecommunications Sector in Saint Lucia

Target	Issue	Strategy
Saint Lucia	1. Stabilization of telecommunications	Availability and comfortability of fixed high-speed Internet access in rural areas to be improved
		Quality of mobile data service to be improved
		Affordability, especially for low-income groups in rural areas to be improved
	2. Basic infrastructure development for promoting DX in other sectors	Information and communication network as a "basic infrastructure " for the radio insensitive and low-income groups to be enhanced/developed

Source: JICA Study Team

b) Programs and Projects

The following table shows the projects and programs proposed to be implemented in Saint Lucia.

Table 4-15 Proposed Programs and Projects in Saint Lucia

Target	Issues	Programs and Projects	Period
Saint Lucia	Stabilization of telecommunications	Clarification of standards for effective speed and actual ease of connection	Short
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	Short
		Development and implementation of plans to expand coverage based on the above standard	Mid
	Basic infrastructure development for promoting DX in other sectors	Providing opportunities for information and telecommunications infrastructure at public facilities such as school or hospital	Mid

Source: JICA Study Team

The following development scenarios are proposed.

- Clarify the level of communication quality (speed and stability) of information and telecommunications networks in national policy.
- Clarify the planning method for achieving the appropriate communication quality necessary in the process of expanding the coverage area and improving the above (including countermeasures for radio dead zones such as mountainous areas).
- The government (regulatory authority) will appropriately regulate that communication quality is ensured according to certain standards.
- The private sector (telecommunications carriers) will ensure communication quality based on certain standards, thereby increasing the trust of information and telecommunication networks.
- From the perspective of providing access to basic infrastructure, meaning from the perspective of social welfare, when coverage is not economically possible (sparsely populated areas) and affordability cannot be provided (difficult to provide services to low-income people) by private sector, the public sector should play a certain role, to provide alternative opportunities for access through public-private partnerships. (Provision of affordable connection machines in urban areas, etc.)

2) Cooperation Scenario

Among the proposed development scenarios, the areas where Japan's experience and technology can be utilized are extracted, as possible cooperation scenarios of Japan in the information and telecommunications sector in Guyana as shown in Table 4-16.

Table 4-16 Proposed Cooperation Scenario of Information and telecommunications Sector in Saint Lucia

Target	Issues	Programs and Projects	Modality
Guyana	Stabilization of telecommunications	Clarification of standards for effective speed and actual ease of connection	Technical assistance
		Clarification of optimal and appropriate coverage expansion standards for eliminating radio dead zones such as mountainous area	
		Development and implementation of plans to expand coverage based on the above standard	

Source: JICA Study Team

5. Economic Infrastructure Development (Transportation)

5.1 Outline of the Study

5.1.1 Updated Survey Scope

In terms of transportation infrastructure, the study focused on the Bridge, Road Traffic Control, Port and Urban Railway Sector. This is after consulting with Japan International Cooperation Agency (JICA) and taking into consideration the local development needs and the possibility of JICA's cooperation.

Based on the results of the first field survey, the survey scope of transportation infrastructure has been updated as shown in the table below. Desk research, interview surveys, and field surveys were conducted to formulate the development scenarios (draft) and JICA's cooperation scenarios (draft) for improving transportation infrastructure.

Table 5-1 Updated Survey Scope (Transportation)

No.	Item	Survey Scope	
1	Sector Targets	Investigate economic infrastructure development needs and formulate development and cooperation scenarios for infrastructure development.	
2	Scope Update	Transportation (Bridge Sector)	Conduct survey of existing plans and identify maintenance needs for bridges on economic corridors.
		Transportation (Road Traffic Control Sector)	Update the Preliminary Study, scrutinize areas to be improved with signals, etc., and discuss with relevant agencies (including introduction of Japan's official development assistance (ODA) projects).
		Port	Conduct survey of ports situation and existing plans in the Dominican Republic, identify issues to be addressed in Port of Manzanillo, determine the applicability of Japanese technology, and discuss with relevant agencies (including introduction of Japan's ODA projects)
		Urban Railway	Collect data on urban railway in San Jose, Costa Rica
3	[Task 2]	Conduct the literature reviews on the general conditions and existing plans of each target economic infrastructure in the survey target countries, as well as the preliminary results of Japan's assistance. Based on the results, organize the issues to be confirmed during the field survey.	
4	[Task 3]	Conduct interviews with related ministries, other donors (IDB, etc.), and JICA overseas offices, conduct field surveys, identify issues, and grasp local needs.	
5	[Task 8]	Finalization of development and cooperation scenarios	Finalize the development scenario (draft) and cooperation scenario (draft) based on comments from JICA.

Source: JICA Study Team

5.2 Overview of Economic Infrastructure Development (Transportation) in the Region

5.2.1 Current Situation of Road Transport in Central America and the Caribbean Region

(1) Overview

Due to the relatively small land area and mountainous topography, the Central America and the Caribbean region relies almost entirely on road traffic for both freight and passenger movements. Although there are no large rivers in this region, except for Guyana and Suriname, there are many cases where river crossings are bottlenecks for road traffic. This issue is found not only in inter-city highways,

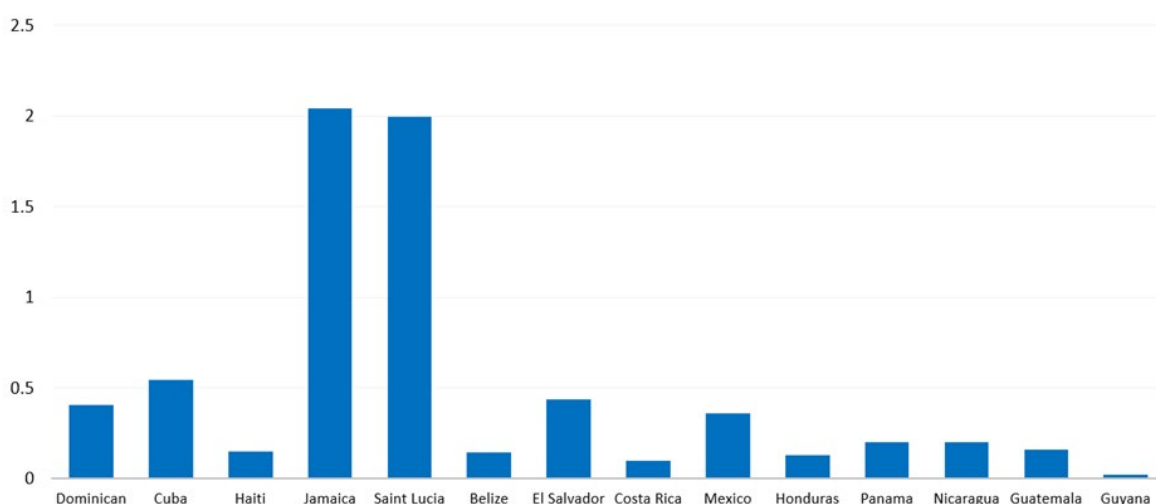
but also in cities such as Santo Domingo and Belize City. In addition, aging of existing bridges is becoming a critical issue. Moreover, since many countries are at high risk of disasters such as hurricanes, earthquakes, and floods, there is a need to mainstream disaster risk reduction into the infrastructure sector.

Regional organizations related to transportation include *Secretaría de Integración Económica Centroamericana* (SIECA) and *Consejo Sectorial de Ministros de Transporte de Centroamérica* (COMITRAN) under SICA. In addition, the Central American Bank for Economic Integration (CABEI) under SICA and the Caribbean Development Bank (CDB) under CARICOM support infrastructure development including bridges in member countries.

(2) Current Situation of Development of Road

The following figure describes the situation of road infrastructure development as well as passenger and freight volume by road traffic, focusing on the 14 priority target countries in this study.

First, regarding road infrastructure development, the figure below shows the road density for each country, calculated based on data of land area and total length of road network provided by the Central Intelligence Agency (CIA)¹. Jamaica and Saint Lucia have the highest road densities, at 2.04 km/km² and 2.0 km/km², respectively. Guyana has the lowest road density at 0.02 km/km².



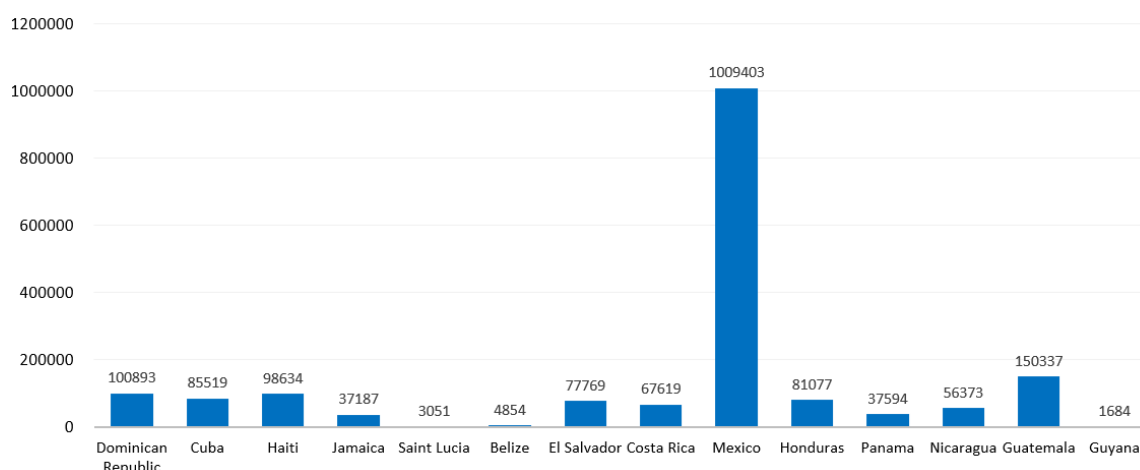
Source: JICA Study Team based on CIA

Figure 5-1 Road Density in Priority Target Countries (Unit: km/km²)

(3) Passenger and Cargo Traffic Volume

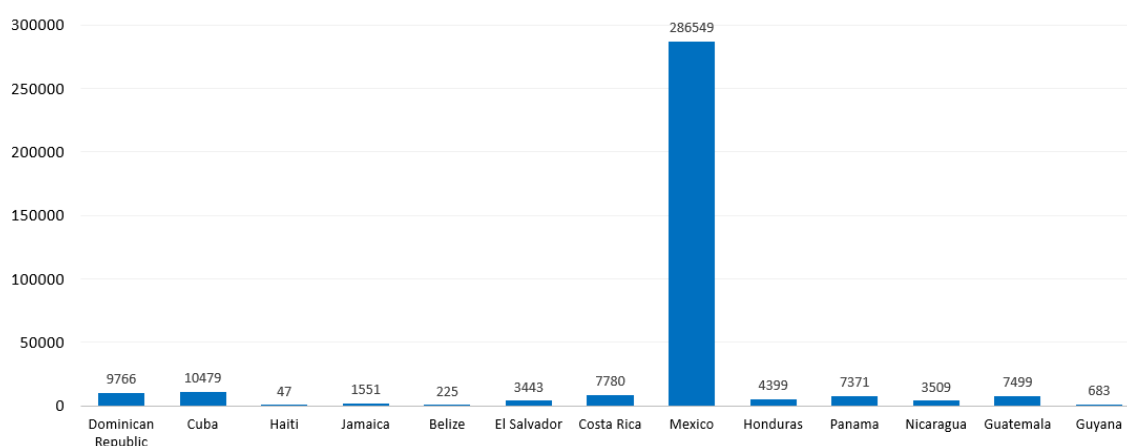
Road passenger and freight traffic volumes in 2018 are shown in the figures below. Regarding passenger traffic, Mexico has the highest traffic volume. The next are Guatemala and the Dominican Republic. With respect to freight traffic, Mexico, in the same way as for passenger traffic, is the country with the highest volume of freight traffic. Cuba and the Dominican Republic are the next, with approximately the same volume.

¹ <https://www.cia.gov/the-world-factbook/>



Source: JICA Study Team based on CIA

Figure 5-2 Passenger Traffic Volume in 2018 (Unit: x10⁶ Passenger-Km)



Source: JICA Study Team based on CIA

Figure 5-3 Freight Traffic Volume in 2018 (Unit: x10⁶ Ton-Km)

5.2.2 Overview of Economic Infrastructure Development (Port Sector) in Central America

Port activities in the Central American region are brisk due to its advantageous location in maritime trade between the Atlantic and Pacific oceans and its proximity to the Panama Canal.

However, along with the increase in handled cargo volume, major ports in each country are facing problems such as shortages of container terminals, docks, gantry cranes, etc., and insufficient water depth for large vessels, as well as software problems such as abandonment of containers due to delayed customs procedures and cargo inspections². The eight member countries of SICA have 14 major ports, of which only four can receive post-Panamax ships (two in Panama, one in El Salvador, and one in the Dominican Republic), and five have no gantry cranes³.

Another issue regarding the transportation infrastructure between ports and major cities is the

² JETRO, 2014 : Current Status and Future Perspective of Port Development in the Central and South American Countries

³ IDB, 2014 : Infrastructure and Port Development in Central America: Role of the IDB

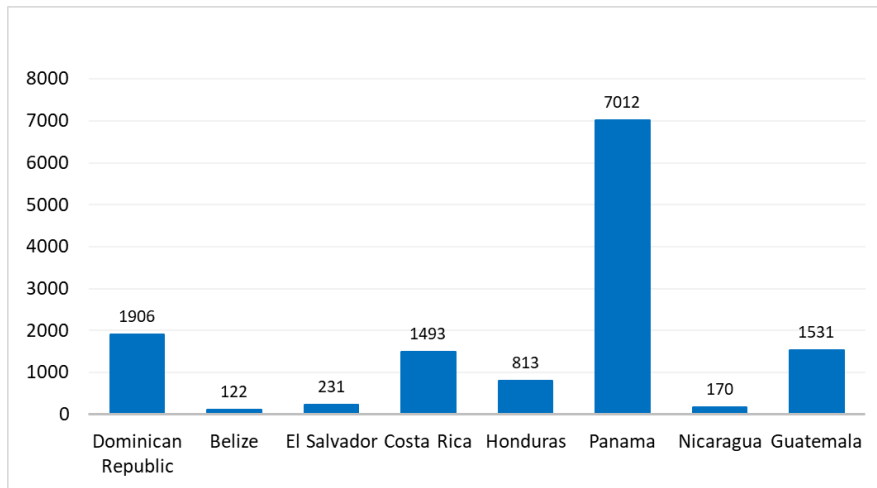
increase in transportation costs due to inadequate development of transportation routes⁴.



Source: IDB

Figure 5-4 Major Ports of SICA Member Countries

The following figure shows the container volume of SICA member countries extracted from ECLAC's 2018 Port Activity Report for 31 countries in the Latin American and the Caribbean region. Panama has the highest container volume, mainly concentrated in the ports of Colon, Panama Pacific, and Almirante. The second highest is the Dominican Republic, where container volumes are concentrated in the major ports of Caucedo, Rio Haina, Santo Domingo, Puerto Plata, and Manzanillo ports. Belize handles the smallest volume, which is most probably due to its small population.



Source: JICA Study Team based on ECLAC

Figure 5-5 Container Volume in SICA Member Countries in 2018

In addition, the above-mentioned ECLAC report shows the ten countries with the highest transshipment volume, as shown in the following table. Panama and the Dominican Republic are ranked second and sixth, respectively, indicating that these two countries are important cargo transshipment hubs in the Latin American and the Caribbean region.

⁴ Ministry of Foreign Affairs of Netherlands, 2017: The Seaports of Central America

Table 5-2 Percentage of Cargo Transshipment in 2018

Ranking	Country	Transshipment in 2018 (%)
1	Bahamas	87.9
2	Panama	86.9
3	Jamaica	81.0
4	Colombia	56.8
5	Aruba	53.1
6	Dominican Republic	39.3
7	Brazil	33.0
8	Uruguay	32.4
9	Guadalupe	30.3
10	Trinidad and Tobago	30.1

Source: ECLAC

Regarding regional organizations for the port sector, there are COMITRAN (Central American Commission of Transport) and COCATRAM (Central American for Maritime Transport). COMITRAN is responsible for developing policies and guidelines for logistics in the SICA region. Meanwhile, COCATRAM deals with port and maritime issues and advises member governments in the formulation of policies on port and maritime sector.

Based on the above discussion, this study selected the Dominican Republic as a target survey country for the following reasons:

- The Dominican Republic is an important country for maritime trade in the Central American region and is considered to have high port development potential.
- It is not a target country in the Logistics Master Plan under implementation.
- The Rehabilitation and Expansion of the Port of Manzanillo Project (described below) is being implemented, and the interest in port improvement is expected to be high by the local government and support agencies.

5.2.3 Selection of Priority Countries in Transportation Sector

Based on the above study and the results of the Preliminary Study, target countries for survey in the transportation sector and the reasons for their selection are shown below. A data collection was carried out about the urban railway in Costa Rica since the interest of the Government of Costa Rica has been confirmed. Besides the countries listed below, an additional study was conducted for Honduras regarding bridge maintenance on National Road No. 6.

Currently, JICA carries out the “Project to Strengthen Capacities in the Elaboration of Regional Master Plan for Mobility and Logistics for Sustainable Regional Development in the Framework of Central American Economic Integration” in the Central American countries. This master plan study covers SIECA member countries: Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. Hence, SICA member countries can be covered as this study focuses on the Dominican Republic and Belize. With regard to railway, this study focuses on urban railway in San Jose while cargo railway was considered in the master plan study.

Table 5-3 Target Countries for Economic Infrastructure Development (Transportation) and Selection Reasons

Subsector	Region	Target Country	Selection Reasons
Bridge	Central	Dominican	• Since road infrastructure is relatively well-developed, it is considered that

Subsector	Region	Target Country	Selection Reasons
	America	Republic	<ul style="list-style-type: none"> there is the need for infrastructure development and maintenance requiring more advanced technology through Japan's cooperation (e.g., loan projects) in the future. It is not a target country in the Logistic Master Plan under implementation (other Central American countries are target countries, excluding Belize)
		Belize	<ul style="list-style-type: none"> To explore the future support direction in the field of infrastructure such as bridges from the viewpoint of disaster risk reduction.
	Caribbean	Guyana	<ul style="list-style-type: none"> While the infrastructure stock is not sufficient, the need of infrastructure development is expected to increase rapidly due to economic growth associated with oil development. There are many large rivers that require significant bridge development.
Road Traffic Control	Central America	Dominican Republic	<ul style="list-style-type: none"> Continue the survey conducted last year.
Port	Central America	Dominican Republic	<ul style="list-style-type: none"> The Dominican Republic is an important country for maritime trade in the Central American region and is considered to have high port development potential. It is not a target country in the Logistics Master Plan under implementation. The Rehabilitation and Expansion of the Port of Manzanillo Project (described below) is being implemented, and the interest in port improvement is expected to be high by the local government and support agencies.
Urban Railway	Central America	Costa Rica	<ul style="list-style-type: none"> The Government of Costa Rica has a large interest in the development of urban railway.

Source: JICA Study Team

5.3 Overview of Transportation Sector in Focus Countries

5.3.1 Belize (Bridge)

(1) Overview of Bridge Sector

1) Regulations, Organization, and Standards

In Belize, the Ministry of Infrastructure Development & Housing (MIDH) is responsible for the road and bridge sector. MIDH's Facebook has published that they repair road pavement and carry out maintenance/cleaning of roadside drainage.

Laws and regulations related to the road and bridge sector include the Public Roads Act (PRA), the Motor Vehicles and Road Traffic Act (MVRTA), the Motor Vehicle Insurance (Third Party Risks) Act (MVIA), etc. Since Belize does not have its own technical standards for the road and bridge sector, the standards of the American Association of State Highway and Transportation Officials (AASHTO) are used in projects supported by the Inter-American Development Bank (IDB) and others. The introduction of new standards and manuals is proposed in the National Transport Master Plan, which will be described later.

The budgetary plan of the public investment including infrastructure is compiled by the Ministry of Finance, Economic Development, and Investment (MFEDI), which is also responsible for national plans and the Public Sector Investment Plan. The national budget for the next fiscal year (April-March) is submitted from each ministry to MFEDI every November. The budget is approved by Parliament in March after coordination with MFEDI.

2) Road and Bridge Situation

a) Road Network of Belize

Belize has a road network of approximately 5,050 km, of which 601 km are primary roads and highways, 765 km are secondary roads, and the rest are local roads⁵. The main road network (see figure below) is basically centered on Belize City, the largest city and former capital, and extends radially to the north-south and west directions. The main roads are shown in the table below.

The country is connected to neighboring Mexico via the Philip Goldson Highway and to Guatemala via the George Price Highway.

San Pedro, one of the country's most important cities and a center for resort tourism, is not connected to the Belize or Mexico mainland by road. There are no railways, and although there are coastal shipping and air routes, road traffic plays a major role in both passenger and freight movement.

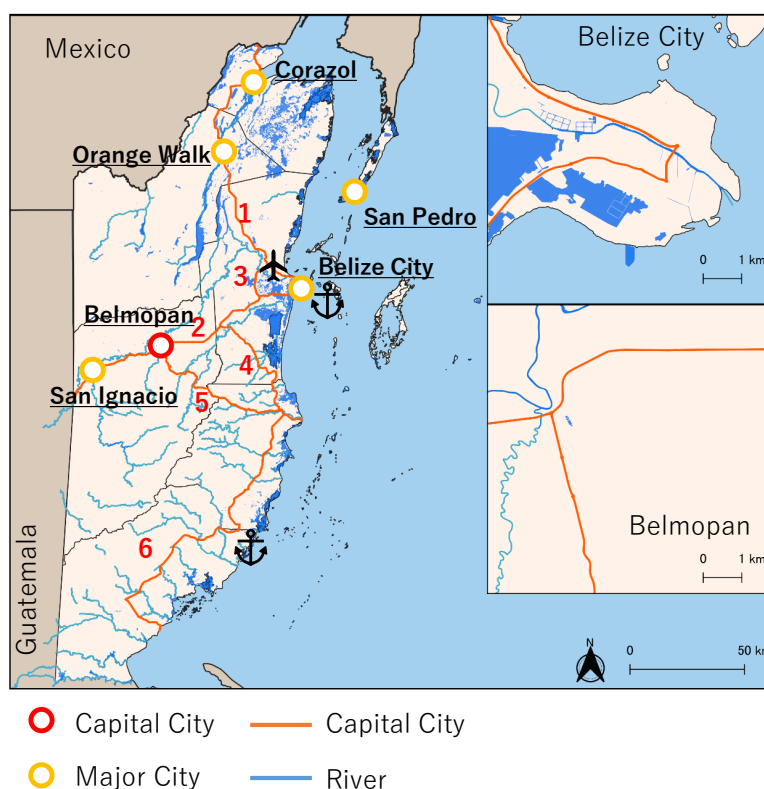
As shown in Figure 5-8, major highways play a significant role in import and export.

The road condition is not good, and the paved ratio is low at about 20%. In addition, road maintenance is not sufficient, with 27% of the main highways in poor condition, 69% in standard, and 4% in good condition. The transportation cost per kilometer of a 40-foot container is USD 2.6 /km, which is higher than neighboring countries like Mexico (USD 1.42) and El Salvador (USD 1.34)⁶. One of the reasons for this is overloaded vehicles; in 2014, 26-40% of medium and heavy trucks were reported to be overloaded⁷.

⁵ IDB, 2017: Comprehensive National Transport Masterplan (CNTMP)

⁶ Ditto

⁷ CDB, 2020: Appraisal Report on Philip Goldson Highway and Remate Bypass Upgrading Project – Belize



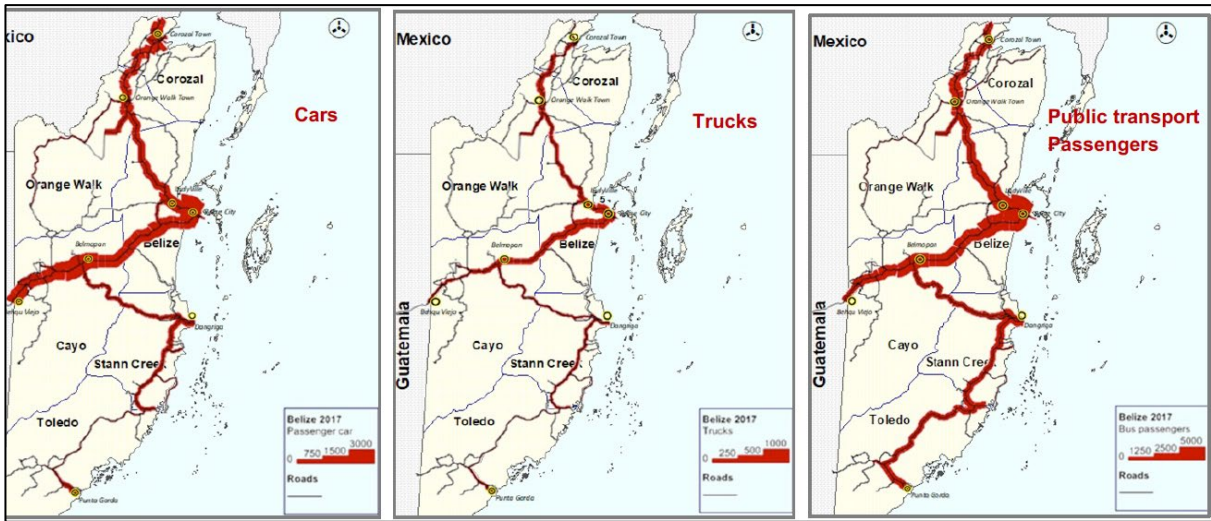
Source: JICA Study Team

Figure 5-6 Main Road Network of Belize

Table 5-4 Main Roads of Belize

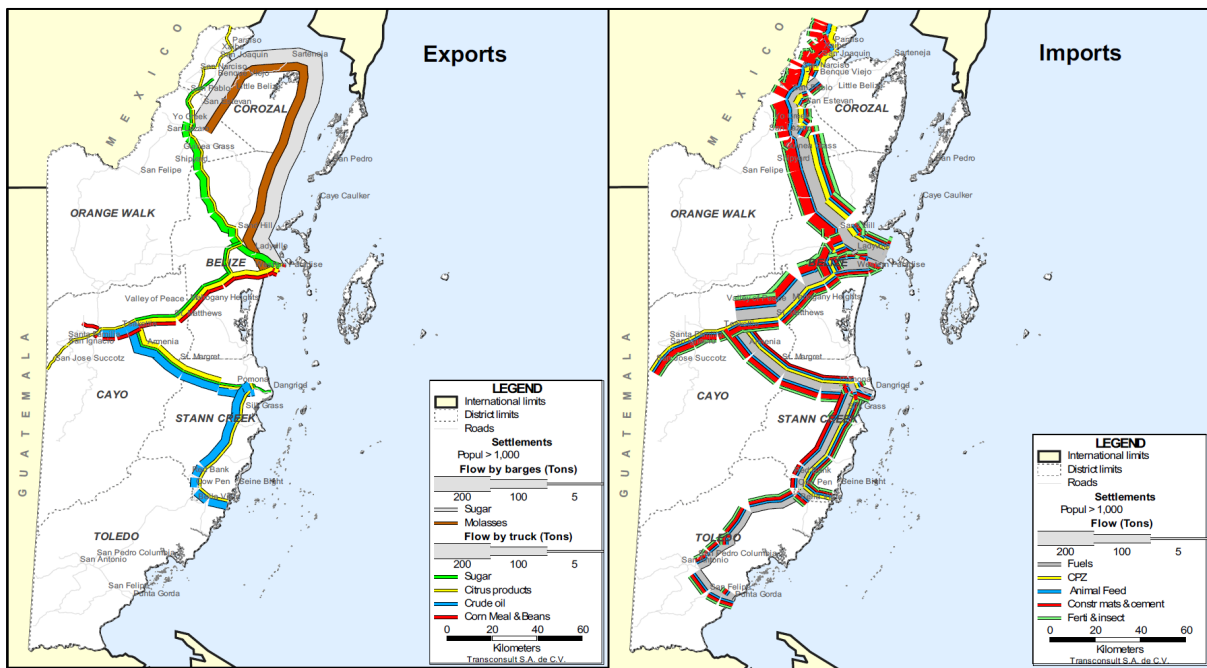
No.	Main Road	Section
1	Northern Highway (Philip Goldson Highway)	Belize City – Orange Walk – Mexico border (Chetumal - connected to the capital of Quintana Roo) Two-lane road with a total length of 147 km. The Old Northern Highway runs parallel.
2	Western Highway (George Price Highway)	Belize City – Belmopan – San Ignacio – Benque Viejo (Guatemalan border, connect to Flores (tourist city with Tical ruins) via CA13)) A two-lane road that comprises RICAM with a total length of 125 km.
3	Burrell Boom Cut	Los Lagos Community - Burrell Boom – Hattieville Total length of 20 km. Connect Northern Highway and Western Highway to bypass Belize City
4	Coastal Highway	La Democracia – Hope Creek Unpaved, total length of 58 km.
5	Hummingbird Highway	Belmopan – Hope Creek – Dangriga Two-lane road with a total length of 88 km.
6	Southern Highway	Dangriga – Punta Gorda Two-lane road with a total length of 157 km.

Source: JICA Study Team



Source: IDB, 2017: Comprehensive National Transport Masterplan (CNTMP)

Figure 5-7 Daily Traffic Volume of Major Highways of Belize



Source: IDB, 2017: Comprehensive National Transport Masterplan (CNTMP)

Figure 5-8 Major Import/Export Routes

b) Bridge

There are 313 bridges on Belize's primary and secondary road network⁸. The major bridges are described below.

In Belize City, the largest city of Belize, there are four bridges over the Haulover River crossing the city. According to the MIDH, three of them, except for the Chetumal Bridge, are aging and the Swing

⁸ CDB 2020: Appraisal Report on Philip Goldson Highway and Remate Bypass Upgrading Project – Belize



Bridge and the Belcan Bridge are especially considered to need to be replaced⁹ (Described in detail in(2)3)). The Haulover River plays an important role in transport because boats transporting goods to islands (cayes) and one for leisure. In the field survey, corrosion was observed on the steel parts of both bridges. The Swing Bridge and Belcan Bridge are swing bridges, in which the girders rotate around the piers to open the bridge. When a hurricane strikes, the bridges are rotated to evacuate vessels in the Belize City Harbor upstream, but in recent years, it has become difficult to open and close the bridges due to their ages.

In addition, the Roaring Creek Bridge (485 m long) over the Roaring River in Belmopan, the capital city, has been flooded twice in the past ten years¹⁰, but currently a new adjacent bridge has been constructed, significantly reducing the risk of flooding. Other bridges over Garbutt Creek and Red Creek on the George Price Highway have also suffered flood damage in the past¹¹.

On the Philip Goldson Highway connecting Belize City to the airport, construction of a new bridge next to the Haulover Bridge across the Belize River is underway with CDB’s fund. The Hawkesworth Bridge in San Ignacio in the western part of the country is one-way eastward (toward Belmopan) due to lack of width. For westward traffic (toward the Guatemalan border), it is necessary to pass through a wooden bridge nearby, but this bridge becomes impassable during floods because of its low height. In Punta Gorda, the southern part of the country, there is a bridge named Joe Taylor Bridge on the Southern Highway, which is 100 years old since its completion. According to MFEDI, the bridge is too deteriorated and needs to be replaced.

When bridges are closed due to disasters or deterioration associated with aging, it is difficult to secure a bypass, and the impact on passenger and freight transportation is significant. Therefore, it is desirable to take measures such as replacing aged bridges or bridges with high risk of disasters.



Table 5-5 Four Major Bridges in Belize City

Bridge name	Article	Photo
Swing Bridge	Structure: Steel bridge Bridge length: 37 m Completion year: 1922 Remark: The bridge was constructed by U.K. in colonial era. The central span rotates and opens to allow ships to pass through.	
Belchina Bridge	Structure: Concrete bridge Bridge length: about 90 m Completion year: 1993 Remark: Built with support from Taiwan. The central span is drawbridge.	

⁹ Amanadara, “Belize City bridges need replacement”, 20 July 2022

¹⁰ IDB, 2018: Loan Proposal for Additional Financing for George Price Highway Rehabilitation Project

¹¹ Ministry of Works, 2018: Design Review Report for Consulting Service for the Supervision of Works for the George Price Highway Rehabilitation Project (IMC Worldwide Ltd.)

Bridge name	Article	Photo
Belcan Bridge	Structure: Steel bridge Bridge length: about 79.6 m Completion year: Unknown Remark: Built with assistance from Canada. The central span rotates and opens to allow ships to pass through.	
Chetumal Bridge	Structure: Steel bridge Bridge length: about 90 m Completion year: Unknown Remark: A water level gauge is installed in the center of the span.	

Source: JICA Study Team



Source: JICA Study Team

Figure 5-9 Steel Corrosion of Swing Bridge



Source: JICA Study Team

Figure 5-10 Belcan Bridge Pier (Corrosion of Pedestal)



Source: JICA Study Team

Figure 5-11 Hawkesworth Bridge



Source: JICA Study Team

Figure 5-12 Wooden Bridge nearby Hawkesworth Bridge

c) Disaster Risk Reduction

Belize is constantly affected by storms and floods caused by hurricanes and other tropical cyclones as the country is composed of plains facing the Caribbean Sea. Furthermore, recent climate change-related sea level rise and storm surges are threatening economic infrastructure, including bridges.

For example, the damage caused by Hurricane Earl that hit Belize in 2016 was estimated at USD 37 million¹². Furthermore, in November 2022, Hurricane Lisa landed in Belize where houses, electricity, among others were damaged, resulting to significant damages such as 39% of the country's population are affected and estimated damage of USD 40 million¹³.

As the vulnerability to climate change and natural disasters has become an issue, Belize is ranked as the 8th most vulnerable country to climate change, according to the World Bank and the Green Climate Fund (GCF)¹⁴.



Source: Facebook Page of National Emergency Management Office (NEMO)

Figure 5-13 Damage by the Hurricane Lisa

3) Existing Plans and Supports by Development Partners

a) National Plan

In 2011, the National Development Plan for the period 2010-2030, called Horizon 2030, has been enacted in Belize. In this plan, along with the promotion of export-oriented agriculture and tourism, a "resilient economy" is one of the high-level goals, and it is proposed that investments in roads, bridges, and other economic infrastructure be made in a timely manner.

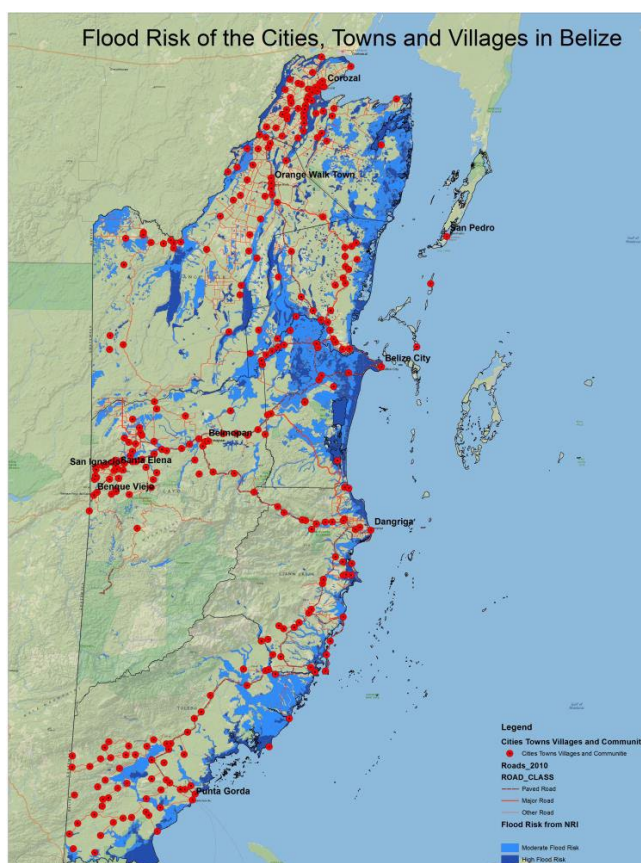
As a mid-term plan, #PLANBELIZE -Medium Term Development Strategy 2022-2026 is formulated. This strategy designates "Economic Transformation" as one pillar out of the six pillars, where nine infrastructure projects are incorporated including the rehabilitation of the George Price Highway.

In addition, the National Climate Resilience Investment Plan (NCRIP) was established in 2013 as a measure related to disaster risk reduction and climate change. The plan points out that infrastructure including bridges, may not be able to adapt to the impacts of climate change, hence investments are needed to increase resilience. The following figure shows an analysis of roads as economic infrastructure together with flood risk. From this figure, it can be confirmed that main roads pass through areas with high flood risk in the vicinity of Belize City, Corozal City, and the Southern Highway in the south.

¹² IDB, 2016: Project Completion Report of Flood Mitigation Infrastructure Program for Belize City

¹³ JICA, 18 November 2022, Emergency assistance against Hurricane Lisa in Belize -Handover of aid goods-

¹⁴ Green Climate Fund, 2022, Country Programme, Belize



Note: Red points indicate cities, towns and villages, orange lines indicate roads, and blue hatching indicate flood risk (the darker the higher).

Source: National Climate Resilience Investment Plan (2013)

Figure 5-14 Positional Relationship between Municipalities/Main Roads and Flood Risk

In addition, the Comprehensive National Transportation Master Plan was developed in 2018 with support from IDB. While this master plan makes various recommendations for the road sector, including improvement projects such as shoulder widening, the following recommendations are made for the bridge sector.

[Short-term plan (until around 2020)]

- Construction of three bridges: Baking Pot (George Price Highway) - Spanish Lookout, Cotton Tree - More Tomorrow - Meditation (Santander), Branch Mouth Park Bridge
- Rebuilding of bridges on main roads: 13 bridges on major primary roads and 6 bridges on secondary roads to be rebuild from 1-lane to 2-lane bridges.

[Long-term (until 2035)]

- Rebuilding of bridges on main roads: Rebuild three ridges on primary roads and one bridge on a secondary road. In addition, widening of four bridges on main arterial roads and three bridges on secondary arterial roads, and the improvement of the river's flow capacity.

Other roads connecting to Guatemala in the south of the country are under construction¹⁵. Project implementation for (1) Hummingbird Highway, (2) Coastal Highway, and (3) Caracol Road are under

¹⁵ IDB, 2017: Comprehensive National Transport Masterplan (CNTMP)

consideration in the portfolio of the Ministry of Works, MIDH's former organization.

For rural roads, the USD 20 million Resilient Rural Belize Program is underway with support from the International Fund for Agricultural Development (IFAD)¹⁶. This program consists of two components to strengthen resilience to climate change: value chain and infrastructure asset resilience, respectively. On the infrastructure side, the program plans to improve roads to improve access to markets.

b) Japan (JICA)

Although JICA has provided grant assistance to Belize in the past for the provision of medical equipment and the introduction of solar power generation systems and is carrying out technical assistance in biodiversity protection, there is no recent support for the transportation sector, including bridges.

On the other hand, support through the Japan Special Fund to IDB is also being provided to Belize, details of which are described in the following section. The Ministry of Foreign Affairs has jurisdiction over the recipients of Japan Special Fund contributions.

c) IDB

The IDB has provided numerous supports to Belize in the road and bridge sector. The main projects are listed in the table below.

Table 5-6 Examples of IDB Support to the Road and Bridge Sector in Belize

No.	Project Name	Implementation Year	Abstract
1	George Price Highway (Western Highway) Rehabilitation Project	2014-2020	Project to rehabilitate 31 km from Belmopan to Santa Elena (town adjacent to the eastern part of San Ignacio), including replacement and alignment improvement of Roaring Creek Bridge in Belmopan. Total project cost is USD 41 million.
2	Capacity Building to Support the Preparation of a National Transportation Master Plan	2014-2016	Support in the preparation of a National Transportation Master Plan, which covers multiple modes such as roads, ports, and air. It handles both passenger and freight. The target year is 2030, and short-term and medium-long term action plans will be formulated. Amount of funding is about USD 1.1 million, 80% of which was contributed by IDB funds from the Japan Special Fund.
3	Project Preparation Studies for the Rehabilitation of the Caracol Road	2015-2017	Rehabilitation of a 94-km road on the George Price Highway (Western Highway) that branches off from San Ignacio and Georgeville and connects to the Caracol Ruins. In addition to alignment improvement and drainage improvement, this project includes the replacement of a bridge over the Macal River with a length of about 100 m. The survey cost is USD 600,000.

Source: JICA Study Team based on IDB

¹⁶ Ministry of Economic Development, <https://med.gov.bz/rrb/>



Source: JICA Study Team



Source: JICA Study Team

Figure 5-15 George Price Highway

Figure 5-16 Roaring Creek Bridge after Replacement

d) Caribbean Development Bank (CDB)

CDB has provided several supports to Belize's road and bridge sector with the goal of building economic, environmental, and social resilience. In addition to this, CDB is also supporting the construction of a new bypass and bridge in the San Ignacio and Santa Elena districts.

Table 5-7 Examples of CDB Supports to the Road and Bridge Sector in Belize

No.	Project Name	Implementation Year	Abstract
1	Phillip Goldson Highway Upgrading Project	2021-2024-	Improve safety, accessibility, and efficiency for 125 km of Phillip Goldson Highway from milepost 24.5 (northwest of Sand Hill) to milepost 92 (end at Mexico border) and Remate Bypass (bypass bypassing Corozal City). In the past, improvement projects have been underway from milepost 1 to milepost 24.5. Total project cost is about USD 60 million.
2	Second Road Safety Project	2019-2023	A road safety improvement project on the road between Belize City and the Mexico border. Implement measures such as improving safety awareness. Total cost is USD 7 million (the Belizean government also invested in it).
3	6th Road (Coastal Highway Upgrading) Project	2018-	Promote resilience to climate change and improve access to economic activities on Coastal Highway Corridor. Total project cost is USD 78 million.

Source: JICA Study Team based on CDB and the Ministry of Economic Development

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

To address the issues of transportation (bridge) sector in Belize which are pointed out above, the following strategies are proposed as shown in the table below.

Table 5-8 Strategies of Transport Sector in Belize

Target	Strategy	Description
Transport Belize	1. Increase in road and bridge infrastructure stock	Due to the small population, size of the economy, and budget constraints, the road network itself, the number of bridges, and the number of lanes on the roads are not sufficient, and the pavement rate is low. Therefore, it is required to develop infrastructure continuously to expand the network and ensure redundancy.
	2. Promotion of	The deterioration of road continues, and some damages are found in the major

Target	Strategy	Description
	asset management	bridges in Belize City. The Comprehensive National Transport Masterplan points out that the causes are i) Government’s implementation entity and budget limitation, ii) Shortage of maintenance equipment, and iii) Increase in load due to increase in traffic volume. It is important to carry out the maintenance efficiently in order to utilize existing road and bridge infrastructure under limited human resource and budget.
	3. Enhancement of resilience to disasters	The coverage of road network is limited in spite of high risk of disasters such as hurricane and flood. As the impact of disaster seems large due to absence of redundancy etc., it is required to enhance the resilience of infrastructure against natural disasters.

Source: JICA Study Team

b) Programs and Projects

The table below lists programs and projects which the Government is recommended to carry out to tackle the issues abovementioned.

Table 5-9 Program and Projects Proposed to be Carried out in Belize

Target	Strategy	Program / Project	Term
Transport Belize	1. Increase in road and bridge infrastructure stock	1-1: Projects for improvement of primary and secondary road	Long
		1-2: Projects for improvement of the access in rural area	Long
		1-3: Project for improvement of access of the south part to Guatemala	Long
	2. Promotion of asset management	2-1: Bridge replacement project in Belize City	Middle
		2-2 Capacity development project for bridge asset management	Short
	3. Enhancement of resilience to disasters	3-1: Project for mainstreaming of disaster risk reduction in infrastructure sector	Middle

Note: Short term: 2023-2025, Middle term: 2023-2027, Long term: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

Criteria shown the table below is set to select program/projects which is suitable for JICA’s support. Judging from the table below, the preferable modalities for cooperation in Belize are i) grant aid and ii) technical cooperation. Regarding grant aid, it is required to confirm the validity of the project in light of MOFA’s “Effective utilization of grant aid for countries with relatively high income” since Belize is categorized as “lower middle income country” in the Development Assistance Committee (DAC) List of Organization for Economic Co-operation and Development (OECD)¹⁷. When technical cooperation project is carried out, it is recommended to conduct it for CARICOM member countries, given that many opinions were raised in interviews with counterpart authorities that technical cooperation for CARCIOM member countries is better for them in view of same language (English). However, project for SICA member is preferable if geological adjacency matters more.

Table 5-10 Criteria of Selection of Program/Project (Belize)

Criteria	Description
(1) Compatibility with Japan’s Country-wise Development Cooperation Policy	The Development Cooperation Policy to Belize states that i) disaster risk reduction and environment and ii) disparity reduction are important sectors. Also, the policy mentions that there is a large need of countermeasures against natural disasters through infrastructure development.
(2) Compatibility with JICA’s Global Agenda	JICA sets “Toward the world where everyone and everything can move safely and freely” as the global agenda in transport sector and describes road asset management as cooperation policy. In disaster risk reduction and reconstruction sector, global agenda proposes to enhance

¹⁷ OECD, DAC List of ODA Recipients | Effective for reporting on 2022 and 2023 flow, DAC-List-of-ODA-Recipients-for-reporting-2022-23-flows.pdf (oecd.org)

Criteria	Description
	the governance for disaster risk reduction.
(3) Modality applicable in Belize	As Belize is a middle-income country, the room for implementation of grant aid project is limited. Furthermore, considering the population and size of economy, technical cooperation project is recommended to be carried as regional projects which covers plural countries. That is why, cooperation projects in Belize are mainly JOCV and training so far.

Source: JICA Study Team (based on MOFA and JICA)

Based on the criteria above, prioritized programs and projects are selected as shown below.

Table 5-11 Prioritized Programs/Projects in Belize

Target	Strategy	Program/Project	Modality	Term	Implementation Agency
Transport Belize	2. Promotion of asset management	2-1: Bridge replacement project in Belize City	Grant Aid	Middle	MIDH
		2-2 Capacity development project for bridge asset management	Technical Cooperation Training in Japan or third country	Short	MIDH
	3. Enhancement of resilience to disasters	3-1: Project for mainstreaming of disaster risk reduction in infrastructure sector	Technical Cooperation Training in Japan or third country	Middle	MIDH NEMO

Note: Short term: 2023-2025, Middle term: 2023-2027, Long term: 2023-2032

Source: JICA Study Team

a) 2-1: Bridge replacement project in Belize City

Out of the four bridges in the city, the Swing Bridge and Belcan Bridge are the targets, both of which are severely deteriorated. Through the replacement of these bridges, it is expected to mitigate the risk of closure of the bridges due to damages from deterioration and disasters. Additionally, this is to secure safe and smooth traffic in the city and traffic for citizen’s evacuation and reconstruction work in case of disaster. For example, after Hurricane Lisa’s attack, disaster waste with a weight of 39,000 t were generated in Belize City¹⁸. The Swing Bridge can be a bottleneck of the transportation of the waste because heavy vehicles (over 5,000 lb. (2.2 t)) cannot pass the bridge due to the obsolescence of the bridge. In addition, the citizens of Belize City evacuate to the houses of relatives and others in inland cities such as Belmopan or to schools in Belize City when a hurricane hits the city. Given that many schools are located near both bridges, it is highly important to ensure the passability of the bridges, which are only four in the city from the perspective of ensuring safe evacuation routes. Furthermore, security of the freeboard between water surface and the girder will allow boats to evacuate to the river smoothly when a hurricane attacks. That is why the replacement of the old bridges might contribute to overcoming the vulnerability to disasters.

The detail of this project is described in the following section.

b) 2-2: Capacity development project for bridge asset management

It is proposed that target countries will be some CARICOM member countries. Technology transfer of asset management of bridges will be carried out and equipment for maintenance will be provided.

c) 3-1: Project for mainstreaming of disaster risk reduction in infrastructure

¹⁸ CDEMA, 2022, Final Situation Report on Hurricane Nicole Hurricane Lisa

sector

It is proposed that the target countries will be from the CARICOM member countries. In this project, Japan’s knowledge will be shared with CARICOM members which includes an approach to upstream policies such as evaluation of infrastructure project and land usage, and soft measures. On the other hand, JICA carried out the Disaster Management Project in the Caribbean Region Phase 2, a technical cooperation project from 2009 to 2012, and is also implementing a pilot project in Belize. However, in the ex-post evaluation conducted in 2017 after the project, issues were pointed out, such as the fact that all staff participating in the project were replaced in Belize and that responses to the questionnaire to the National Emergency Management Office (NEMO), the implementing agency, were not obtained¹⁹. When implementing the project, it is necessary for both JICA and counterparts to be aware of the issues pointed out in past technical cooperation projects and to confirm the measures to be taken for improvement.

3) Detailed Study on the Bridge Replacement Project in Belize City



a) Results of Ongoing Study

In February 2022, the Project Execution Unit under the MIDH conducted a survey of three bridges in Belize City (Swing, Belchina, and Belcan bridges), excluding the relatively new Chetumal Bridge. A summary of the survey results is shown in Table 5-12. The Swing and Belcan bridges were determined to be significantly deteriorated and in need of replacement or repair.




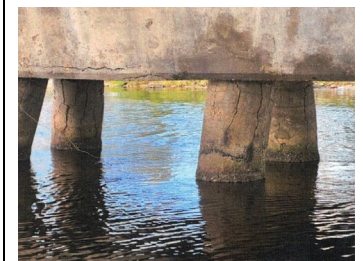
In addition, a feasibility study is now underway about upgrading the George Price Highway connecting Belize City with Belmopan with the Kuwait Fund for Arab Economic Development (KFAED) as of November 2022. The Swing and Belcan bridges were also included in the study. The report states that the two bridges are severely damaged. (See Table 5-12 for details)

The Haulover Creek which these bridges cross, used to be an evacuation area for vessels in the Port of Belize City during disasters, such as hurricanes. However, since the Swing Bridge can no longer turn, vessels that cannot pass under the bridge can no longer evacuate to the river.

Table 5-12 Result of the Study on Bridges in Belize City

Bridge	Description	Photo	
Swing Bridge	About 100 years have passed since the construction was completed. It is assumed that the bridge can no longer withstand the design load and needs to be replaced as soon as possible. Corrosion is particularly noticeable on the steel superstructure and there is the risk of collapse. The current clearance from the water surface is approximately 4 ft (1.2 m).		

¹⁹ JICA, 2017, Result sheet of the ex-post study by project (internal review), Technical cooperation project “Disaster Management Project in the Caribbean Region Phase 2”

Bridge	Description	Photo	
Belchina Bridge	Although minor repairs, such as repainting and replacement of bearings, are considered necessary, the bridge can continue to be used with regular maintenance.		
Belcan Bridge	Although cracks are found in the floor slabs, the superstructure and abutments are in relatively good condition. The piers of the substructure need to be replaced due to concrete spalling, exposed bars, and its corrosion.		

Source: JICA Study Team based on “Bridges in Belize City (MIDH)”, and “Consultancy Services for Environmental and Social Impact Assessment, Feasibility Study and Detailed Designs for George Price Highway Upgrading Project (Belize City to Belmopan), Feasibility Study Report, September 2022 (MIDH)”

With regards to the Swing and Belcan Bridges, the JICA Study Team conducted a simple traffic volume survey during the field survey in November 2022 (Swing Bridge) and February 2023 (Belcan Bridge). The survey was conducted on Friday, November 23 (weekday) from 10:45 to 10:55 (passenger cars) and 10:57 to 11:07 (motorcycles, bicycles, and pedestrians) for Swing Bridge, and on Wednesday, February 8 (weekday) from 12:53 to 13:03 (vehicles) and from 13:07 to 13:17 (Bicycles and pedestrians) and Thursday, February 9 (weekday) from 7:06 to 7:16 (Bicycles and pedestrians) and from 7:17 to 7:27 (Vehicles). The weather was clear on 23 November and 8 February and clear with shower on 9 February. The 1-hour equivalent traffic volumes are shown in Table 5-13 and Table 5-14, respectively.

Near the Swing Bridge, there is a ferry terminal from which ferries go to San Pedro and Caye Caulker, but the time of the survey was not just before or after the boat arrival and departure times. The Swing Bridge is in the center of Belize City where schools and supermarkets are in the neighborhood, so there is a lot of pedestrian and bicycle traffic as well as passenger car traffic.

The Belcan Bridge has a heavy traffic of buses and automobiles, and if demand increases in the future, the current two lanes may not be able to accommodate the traffic (the adjoining road has four lanes). There is also a certain amount of truck traffic, indicating that the road is also important for logistics. In addition to automobiles, there is a certain amount of pedestrian and bicycle traffic. Since there are many schools in the neighborhood, the number of pedestrians heading in the direction of the north bank is particularly high during the morning commuting hours.

Since this is a simple 10-minute traffic survey, it is desirable to conduct another traffic survey before implementing the project to determine the current traffic volume and to forecast the future demand based on population and GDP growth rates to determine the number of lanes, sidewalk widths, etc. Especially in the morning hours, it is highly necessary to check hourly traffic volume, as demand is expected to fluctuate in 10-minute increments due to the influence of office and school starting times.

Table 5-13 Daytime Hourly Traffic Volume of the Swing Bridge

Direction	Passenger Vehicle	Motorcycle	Bicycle	Pedestrian
Northbound	360	54	54	474
Southbound	378	36	96	258

Note: There is no traffic of truck and buses due to restriction. The hourly traffic volume is calculated by multiplying six with 10-minute traffic volume

Source: JICA Study Team

Table 5-14 Hourly Traffic Volume of the Belcan Bridge

Survey Date & Time	Direction	Truck	Bus	Passenger Vehicle	Motorcycle	Bicycle	Pedestrian
Morning (9 Feb. 2023)	Northbound	6	30	786	138	234	570
	Southbound	0	24	516	78	84	78
Daytime (8 Feb. 2023)	Northbound	36	24	648	144	144	54
	Southbound	24	42	420	60	90	114

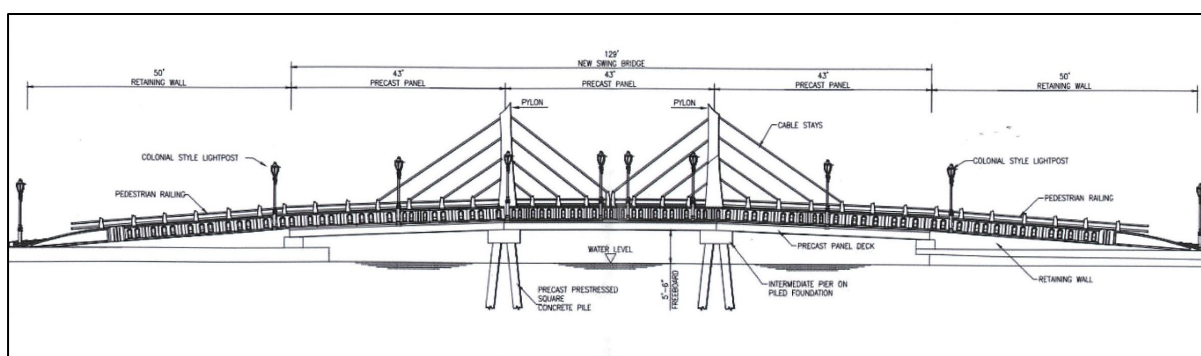
Note: The hourly traffic volume is calculated by multiplying six with 10-minute traffic volume. The southbound traffic volume of truck in the morning was zero because the count was zero.

Source: JICA Study Team

b) Replacement Plan under Study

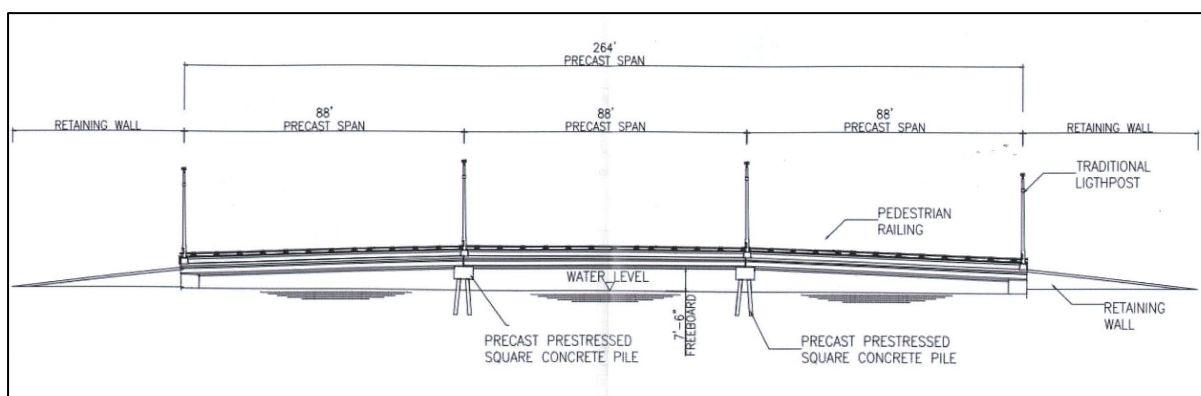
Currently, under the Kuwait Fund (KFAED), the Consultancy Services for Environmental and Social Impact Assessment, Feasibility Study, and Detailed Designs for the George Price Highway Upgrading Project (Belize City to Belmopan) is ongoing. The Swing and Belcan Bridges are being considered for replacement in the study. The drawings of the new bridges after replacement are shown in Figure 5-17 and Figure 5-18, respectively. According to the MIDH representative, traffic survey was not carried out during this study. On the other hand, according to a consulting firm which conducted the study, geotechnical survey was carried out at two sites for two bridges respectively, and the pile length was determined based on the survey result.

The study and design was completed in December 2022, but according to MIDH, no funds for construction have been found as of February 2023, including in Kuwait. Therefore, the Government of Belize (MFEDI and MIDH) expressed strong expectations for Japan's support for the project.



Source: MIDH, 2022, “Consultancy Services for Environmental and Social Impact Assessment, Feasibility Study and Detailed Designs for George Price Highway Upgrading Project (Belize City to Belmopan), Feasibility Study Report, September 2022

Figure 5-17 Drawing of the Swing Bridge after Replacement



Source: MIDH, 2022, "Consultancy Services for Environmental and Social Impact Assessment, Feasibility Study and Detailed Designs for George Price Highway Upgrading Project (Belize City to Belmopan), Feasibility Study Report, September 2022

Figure 5-18 Drawing of the Belcan Bridge after Replacement

c) Considerations for Implementation under Grant Aid

As mentioned above, both the Swing and Belcan bridges have aged and been damaged significantly and require immediate replacement. As proposed in the cooperation scenario, considering the economic scale of Belize and the size of the bridges, it is considered more appropriate to utilize grant aid for bridge replacement rather than ODA loan. On the other hand, since Belize is classified as a middle-income country, more attention should be given to the appropriateness of applying a grant aid.

In 2014, the Ministry of Foreign Affairs of Japan (MOFA) published a document titled "Effective Utilization of Grant Aid to Countries with Relatively High Income," which states that when implementing grant aid to countries with relatively high-income levels, the appropriateness of the project should be evaluated from multiple perspectives, including urgency, rapidness, and humanitarian needs. The document states that when implementing grant aid to countries with relatively high-income levels, the appropriateness of the project shall be evaluated from multiple perspectives, including urgency, speed, and humanitarian needs. Table 5-15 shows the appropriateness of the bridge replacement project in Belize City from the perspective indicated in MOFA's document.

In the case of grant aid, it is desirable to confirm the interest of Japanese companies in the project since the grant aid will be Japan-tied.

Table 5-15 Verification of Appropriateness of the Bridge Replacement Project in Belize City

Perspective	MOFA's Evaluation Point	Evaluation of Bridge Replacement Project in Belize City
(1) Nature of the Project		
Urgency / Speed	In the event of a conflict or disaster, is an urgent response necessary to avoid the expansion or recurrence of damage?	The survey has already indicated that the aging of the system has progressed to the point that it no longer meets the design standards, and a rapid renewal is required. In addition, there are concerns that hurricanes and other disasters may further accelerate damage. Indeed, the Swing Bridges has been deteriorated due to high wave and storm surge as it is located at the mouth of an estuary.
Humanitarian needs	From the perspective of human security, is it necessary to address threats to individual dignity, life, and livelihood such as poverty, natural disasters, infectious diseases, and	The bridges are important for evacuation and rehabilitation work in the event of a hurricane or other attack. There is an urgent need for replacement from the perspective of protecting the lives and livelihoods

Perspective	MOFA's Evaluation Point	Evaluation of Bridge Replacement Project in Belize City
	terrorism/conflict?	of residents. The bridges are also required to be raised to evacuate vessels into the river.
Regional impact	Is it considered difficult to impose the burden only on the country concerned, given the fact that the support provided based in the target country will also influence the surrounding areas?	The George Price Highway, connected by the Swing and Belcan bridges, leads to Northern Guatemala and is the end of the international corridor.
Tackling with global issue	Is Japan also expected to contribute its share in addressing global issues that developed and developing countries should work together on, such as the environment, climate change countermeasures, and disaster risk reduction?	Belize is vulnerable to climate change and there is a significant room for Japan to contribute through the development of high-quality infrastructure. In addition, this project will contribute to achieving Goal 11 of the SDGs, "Make cities and human settlements inclusive, safe, resilient and sustainable"
(2) Compatibility with Japan's diplomatic policy		
Diplomatic perspective	Will it contribute to strengthening bilateral relations and enhancing Japan's presence in the international community?	The Government of Belize (MFEDI, MOPW) has also expressed its expectations for Japanese support for the replacement of the Swing and Belcan Bridges. The replacement of the Swing Bridge, the oldest bridge in Belize and located in the center of Belize City, will contribute to strengthening bilateral relations and can be a symbol of friendship between Japan and Belize.
Relationship with important policies	Is the project in line with important government strategies such as "National Security Strategy," "Revitalization Strategy of Japan," and "Infrastructure System Export Strategy?"	Belize is a member of both SICA and CARICOM, and the support to Belize is highly significant from the perspective of strengthening the relationship between Japan and both regional organizations.
International perspective	Are international trends of other donors fully considered?	The IDB, CDB, among others, are aiding on major highways in Belize, which is consistent with the direction of other donors.
(3) Situation of the Recipient Developing Country		
Debt situation	Is ODA loan difficult from the viewpoint of repayment capacity? Or is it not appropriate to impose a new debt burden on the country?	According to MFEDI, Belize's external debt is approximately 70% of the GDP; although the country has reduced its external debt using Blue Bond, it remains high.
Economic vulnerability	The country's income level is statistically high, but the country is vulnerable to international economic fluctuations due to factors such as small economic scale and dependence on a single industry.	Belize has a relatively small population of 400,000 people. It is also economically vulnerable due to its heavy reliance on tourism and agriculture (sugar, bananas, and citrus fruits).
Environmental vulnerability	Is the country vulnerable to changes in the natural environment due to factors such as its small land area, maritime or mountainous location, small islands, or landlocked countries?	In addition to being a Small Island Developing State (SIDS), Belize is vulnerable in terms of its natural environment, with many low-lying areas and significant flooding damage from hurricanes and other disasters.

Source: JICA Study Team based on MOFA

In addition, the following points need to be clarified before or during the feasibility study of the ODA Grant Aid Project in terms of technical aspects:

Table 5-16 Major Items to be Clarified for the Bridge Replacement Project in Belize City

Item	Points to be Clarified
Traffic volume and demand	Conduct traffic volume surveys to determine traffic volumes on weekdays and weekends, and during peak and off-peak hours. Based on the results, demand forecasts need to be made. In addition, study the number and types of vessels passing the Haulover Creek.
Socio-environmental considerations	Baseline surveys need to be conducted on noise, vibration, river water quality, and other socio-environmental considerations, to assess impacts during construction and after completion. In addition, land acquisition and involuntary resettlement are required to be re-checked.
Geotechnical conditions	A geotechnical survey needs to be conducted for the assumed location of the abutments and piers. Then, determine the structure of the substructure.
Bridge type and span	The bridge type needs to be reconfirmed, taking into account construction cost and method. In particular, since the current replacement plan for the Swing Bridge has three spans, there is

Item	Points to be Clarified
	room to reconsider whether it is possible to reduce the number of spans. In addition, it is also necessary to consider how much freeboard can be secured during the study.
Location of bridge	The current replacement plan assumes that the bridge will be placed at the same location as the existing bridge. In this case, the piles of the existing bridge may not be able to remain in place, and there is concern that construction costs will become large. Also, type of temporary bridge such as number of lanes and necessity of carriageway needs to be studied.
Construction method	The location and area of the construction yard should be confirmed. Also, the availability of cranes and other machinery should be confirmed.
Project cost	Review the construction cost estimated in the Kuwait's survey, taking into consideration items stated in this table and estimate additional cost as necessary. Since the project will be Japan-aided when implemented through grant aid, travel expenses for Japanese company personnel, etc. need to be considered.
Procurement planning	Conduct market research to avoid unsuccessful bids through interview with Japanese company such as contractors and bridge manufacturers and other means. Study preferable conditions such as tax exemption and works to be done by the recipient country, to enhance the interest in the bid.
Soft component	To ensure that the bridges are properly maintained after completion, the contents of the soft components, such as technology transfer related to maintenance and management, will also be reviewed.

Source: JICA Study Team

5.3.2 Dominican Republic (Bridge, Road Traffic Control and Port)

(1) Overview of Bridge Sector

1) Regulations, Organization, and Standards

In the Dominican Republic, the Ministry of Public Works and Communications (*Ministerio de Obras Públicas y Comunicaciones*, MOPC) is responsible for building, expanding, repairing, and maintaining transportation infrastructure works, as well as organizing, supervising, coordinating, and planning land transportation systems. Under MOPC, there are several organizations such as RD VIAL which is in charge of the construction and maintenance of highways and the operation of toll booths. Parquéate RD is in charge of planning and construction of public parking lots, and the National Institute of Terrestrial Transit and Transport (*Instituto Nacional de Tránsito y Transporte Terrestre*, INTRANT) is in charge of traffic management. According to interviews with MOPC, there are issues with bridge design technology, and there was an opinion that support from other countries is necessary.

For the technical standards in road and bridge sector, AASHTO which is internationally used, is applied along with the country own standards listed below.

- R-001 Regulation for the Seismic Analysis and Design of Structures
- M-011 Basic Criteria for Geotechnical Studies of Roads
- M-012 Basic Criteria for the Geometric Design of Roads
- M-014 General Specifications for Road Construction

In addition to arterial roads, some local roads are managed by local municipalities. As described below, there is more room for improvement in the level of maintenance of local roads compared to that of arterial roads, so coordination between MOPC and agencies that have jurisdiction over local roads is also required.

2) Road and Bridge Situation

a) Road Network in the Dominican Republic

The road network in the Dominican Republic has a total length of 19,730 km, of which 5,514 km are

highways, 8,697 km are rural access roads, and 5,519 km are temporary roads and trails²⁰. The main road network (figure below) starts from the capital, Santo Domingo and extends radially to the northern region, southern region, and western region. Regarding the road pavement, around 7,766 km (39.3% of total roads) are paved, while 11,964 km (60.7%) are unpaved.

Main highways play a central role in inter-regional travel and transportation, while rural roads support access to agricultural production areas. Although road maintenance and improvement have been prioritized by the government in recent years, many areas, especially in rural areas, roads are not in good condition due to inadequate maintenance. Only 22% of rural access roads are in good condition, 44% are in fair condition, while 34% are in poor or very poor condition, which increases travel times, transportation operating costs, and traffic disruptions due to heavy rainfall. As a result, unpaved local roads become impassable during the hurricane season, making access to agricultural areas and waste disposal sites difficult.

In terms of highways, the DR-1 crosses 270 km from north to south through the country carrying 70% of the country's freight traffic, but it has the highest accident rate, with more than 1,500 injuries and 284 fatalities in 2019. Traffic safety measures should also be considered when developing roads.

Current road condition is one of the factors that increase the cost of transporting goods and cargo. In the Dominican Republic, the average freight shipping cost for a 40-foot container is three times the average of Mesoamerica and the cost per ton-kilometer is the fourth highest in Latin America and the Caribbean²¹.

Table 5-17 Main Road in the Dominican Republic

No.	Main Road	Length	Section
1	DR-1 (Autopista Duarte)	270 km	Connect the capital Santo Domingo with the Cibao Region, through the second city of Santiago de los Caballeros
2	DR-2 (Carretera Sánchez)	238 km	Connect Santo Domingo with the southwestern region of the country and connect to Haiti through the southern border.
3	DR-3 (Autovia del Este)	187 km	Connect Santo Domingo with the eastern region and end of Punta Cana.
4	DR-4 (Carretera Mella)	182 km	Start from Santo Domingo through San Pedro de Macoris, Hato Mayor del Rey and end in Boca de Yuma.
5	DR-5 (Carretera Navarrete-Puerto Plata)	294 km	Start from a junction with DR-1 located in the north of Santiago de los Caballeros, then run through to the northeast city Puerto Plata, Sosua, where its ending point is at the Samana Province.

Source: JICA Study Team

²⁰ IDB, 2022: Loan Proposal for the Road Infrastructure Maintenance and Rehabilitation Program in the Dominican Republic

²¹ IDB, 2019 : Loan Proposal for Program to Support Mobility, Overland Transportation, and Road Safety in the Dominican Republic



Source: JICA Study Team

Figure 5-19 Main Road Network in the Dominican Republic

b) Bridge

MOPC is currently conducting a nationwide bridge census to prioritize its repairs. As of December 2022, approximately 3,000 bridges have been surveyed nationwide. Of which, 350 are on main roads such as the above-mentioned DR-1 to 5 and the highway extending from Santo Domingo to the Samana Peninsula. The condition (soundness) of these bridges is shown in the table below.

The flyover shown in the following picture was determined to be Category 1 in terms of soundness. In this bridge, corrosion and exposure of reinforcing bars were confirmed at the gabled pier and beam section. Since a comprehensive survey is currently being conducted on the soundness of bridges, it is considered necessary to take measures for efficient repair and reinforcement work based on the results of inspections and diagnosis in the future.

Table 5-18 Soundness of Bridges in the Dominican Republic

Soundness	Whole Country	Main Road
Category 1 (Need urgent repair)	116	20
Category 2 (Need minor but significant repairs)	332	49
Category 3 (Aesthetic repair)	919	281
Total	1,367	350

Note: Soundness of the bridges were evaluated based on diagnosis by inspectors of MOPC

Source: JICA Study Team



Source: MOPC, CENSO NACIONAL DE PUENTES

Figure 5-20 National Bridge Census



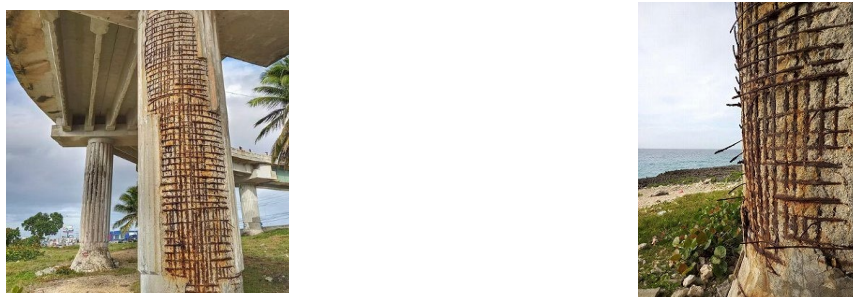
Source: JICA Study Team

Figure 5-21 Bridge over DR-3 (left) and Deterioration Parts (center and right)

The number of staff in charge of this census by the MOPC was about 5 to 7, and two vehicles were used to conduct onsite inspections of bridges throughout the country. The number of staff in charge of major bridges in the entire country is considered to be insufficient, so it is necessary to increase the number of staff in the future and to devise ways to make maintenance and management more efficient.

In terms of bridge maintenance, MOPC considers the maintenance of bridges in coastal areas, i.e., salt damage control, to be the most important issue. On the elevated road called Elevado Hipodromo near Santo Domingo, the steel bars of the bridge piers are extensively corroded and exposed (Figure 5-22). MOPC explained that a combination of design, construction, and maintenance factors was causing this, but it is likely that the root cause has not been identified. It is necessary to identify the mechanism of deterioration and to confirm the availability and proficiency of specialized skills to study countermeasures to address the problem.

Regarding bridges in urban areas, bridges such as the Juan Pablo Duarte Bridge and others are located in Santo Domingo on the Ozama and Isabela rivers, which flow through the center of the city, play an important role in the city's transportation system. Indeed, the daily traffic volume of those bridges is approximately 100,000 vehicles. On the other hand, according to interviews with ADN, the road capacity of these bridges is not sufficient, causing traffic congestion during the morning and evening commuter rush hours.



Source: El Municipio, 10 January 2022, “Deterioro de elevado de la autopista Las Américas”

Figure 5-22 Deterioration of Coastal Bridge

c) Disaster Risk Reduction

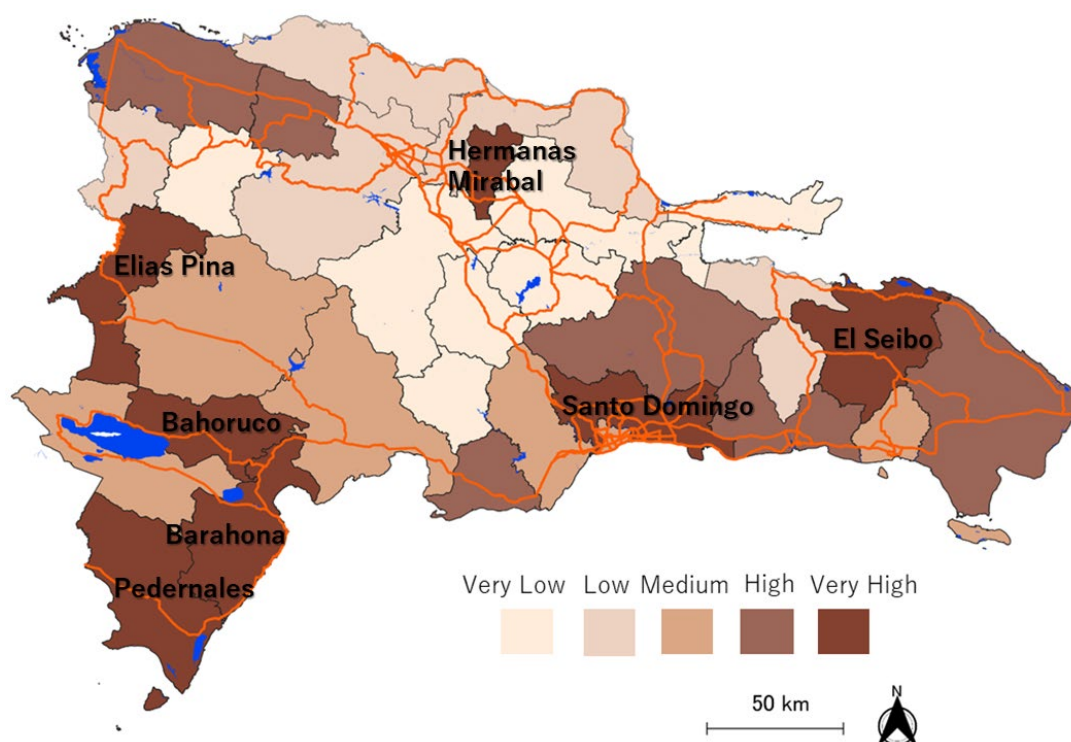
The Dominican Republic lies in the “hurricane belt” and was hit by over 100 hurricanes from 1871 to 2018²². According to the Global Climate Risk Index 2018, the Dominican Republic is one of the most vulnerable countries to climate change, ranking tenth, after Vietnam and Thailand²³. In the last 30 years, the total economic losses due to tropical storms and hurricanes exceed USD 5000 million, where the most affected sectors are social, productive, agriculture, and infrastructure. Regarding road infrastructure, from 2016 to 2017 alone, there are 644 roads and bridges from 15 provinces that have to be rebuilt due to natural disaster damage worth USD 394 million.

Regarding the vulnerability to the climate change in the Dominican Republic, there are 13 provinces that have high or very high level of vulnerability. The most vulnerable provinces are Pedernales, Bahoruco, Barahona, Elias Pina, El Seibo, Hermanas Mirabal, and Santo Domingo²⁴.

²² IDB, 2022: Loan Proposal for the Road Infrastructure Maintenance and Rehabilitation Program in the Dominican Republic

²³ Global Climate Risk Index 2018 (<https://www.germanwatch.org/en/cri>)

²⁴ National Adaption Plan for Climate Change in the Dominican Republic 2015-2030



Source: National Adaption Plan for Climate Change in the Dominican Republic, 2015-2030

Figure 5-23 Vulnerability Level to Climate Change by Provinces

3) Existing Plans and Supports by Development Partners

a) National Plans

In the Dominican Republic, the National Development Strategy 2010-2030 approved by law in 2012 (Law 1/2012) lays out priorities for public investment. It shows that the goal in infrastructure development is “expanding the coverage and improving the quality of transportation and logistics infrastructure and services, with a focus on regional integration, support for productive development, and competitive integration in international markets.”

Public investment in infrastructure between 2014 and 2019 has been concentrated in the transport sector (88%), followed by water and sanitation (12%), communication (0.07%), and energy (0.02%)²⁵. During the period of 2012-2016, 12,057 km was intervened in projects for the construction, reconstruction, and maintenance of highways, local roads, and streets at the national level. About 228 bridges and overpasses have also been built or rebuilt, which complement the Dominican Republic Road Network²⁶.

The National Infrastructure Plan 2020-2030 and National Logistic Plan 2020-2032 (PNLOG) describe the strategies for road infrastructure development on the hard side.

In PNLOG, the maintenance of highway and rural road network that support logistics activities is mentioned as a priority task in the road infrastructure sector. According to the short- and medium-term

²⁵ National Infrastructure Plan in the Dominican Republic 2020-2030

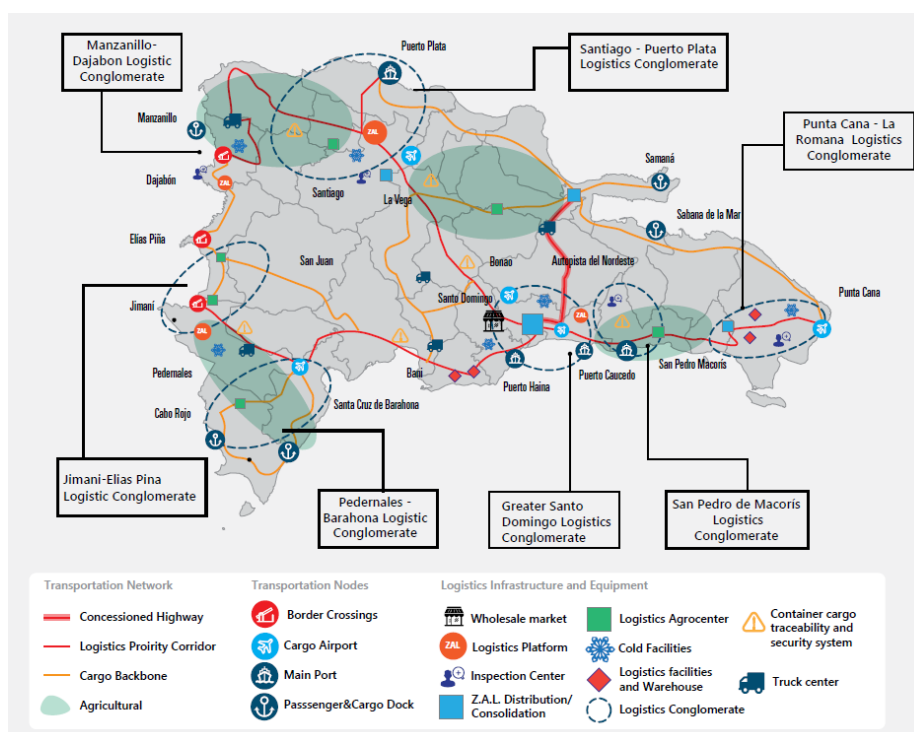
²⁶ MOPC: Strategic Plan for Institutional Development 2017-2020

priority plans related to road infrastructure in each logistic conglomerate are proposed in the table below.

Table 5-19 Priority Actions Related to Road Infrastructure in Logistic Conglomerates

No.	Logistic Conglomerate	Prioritized Plan
1	Manzanillo-Dajabon Jimani-Elias Pina	Accesses to the port of Manzanillo. Feasibility Study of the Road Corridor for Border Integration (Dajabon, Elias Pina and Jimani) Improvements to tertiary networks in areas of influence of conglomerates that support tourism and agricultural activity
2	Santiago-Puerto Plata Punta Cana-La Romana	Maintenance of the road network and improvement of standards for loading and consolidation of trunk corridors
3	San Pedro de Macoris Greater Santo Domingo Pedernales-Barahona	Section 4 of the North Ring Road of Santo Domingo Ring Road connects Santo Domingo - Barahona. Road investments in the Haina - Haina Free Trade Zone Road section.

Source: PNLOG



Source: PNLOG

Figure 5-24 Conceptual Image of National Logistics System in the Dominican Republic

The National Infrastructure Plan 2020-2030 sets the priority projects related to the bridge sector as stated in the table below. Among those projects, the bridge construction over the Seibo River and in Ramon Santana are highly prioritized in terms of adaption with climate change. According to MOPC, these two bridges are in study stage.

Table 5-20 Priority Projects Related to Bridge Sector

No.	Project	Estimated Amount (USD)
1	Bridge Construction over the Seibo River	1,337,699
2	Bridge Construction in Ramon Santana	1,341,927
3	Expansion of the JFK Bridge over Ave. Luperon	5,971,936
4	Construction of the Yuna River Crossing Bridge in Las Carreras	2,057,998
5	Canete Bridge	1,131,899

No.	Project	Estimated Amount (USD)
6	Bridge Over the Cana River	1,858,053
7	Bridges Los Brache - Los Cadillos - Vuelta Larga - Jababa – Hinch	3,086,997
8	Higuamo Bridge	783,949
9	Tabara Arriba Bridge	1,182,483

Source: National Infrastructure Plan 2020-2030

b) Planned Projects in Santo Domingo

In addition, according to the interview with MOPC, there is a plan for constructing new bridges over the Ozama River and the Isabela River.

Table 5-21 New Bridge Construction Plan in Santo Domingo City


No.	River Name	Location/Remarks	Map
1	Ozama River	From Francisco Alberto Caamaño Deño Street to Malecon Street. Suppose a floating bridge.	
2	Ozama River	Near Calle 9, between the Juan Bosch Bridge and Francisco del Rosario Sanchez Bridge.	
3	Isabela River	Near Mirador Norte Park in the vicinity of Hermanas Mirabal Metro Station	
4	Isabela River	Near Jacobo Majluta Street	

Source: JICA Study Team (Map by Google Map 2022)

Among the four bridges above, the first and second bridges over the Ozama River were studied in 2018 as explained in the table below. According to the MOPC, the study was only a basic study, although the study estimated the project cost. For example, it has not yet been decided whether Bridge No. 1 should be cable-stayed or not. Therefore, there are many aspects of the project details that should be scrutinized (detailed in (4)2)b) of the cooperation scenario).

Table 5-22 Summary of the Study on Construction and Replacement of the Bridges on the Ozama River

No.	Summary	Image
1	Cable-stayed bridge over the Ozama River with a length of 830 m and a width of 68 m (six lanes). The traffic volume is estimated to be 50,000 vehicles per day. The bridge is expected to alleviate the traffic congestion from the neighboring Juan Bosch Duarte Bridge and the Francisco del Rosario Sánchez Bridge. The estimated project cost for the bridge itself and access road to the west side is approximately USD 180 million, and approximately USD 31 million for the land acquisition. The plan has been revised from 6 lanes to 4 lanes.	

2	Replacement project of the Florante Bridge crossing the Ozama River. The new bridge will be developed as a floating bridge because the existing Florante Bridge has been used over its lifespan. The new bridge will be a drawbridge to secure river transport. The project cost is estimated to be approximately USD 40 million.	
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Source: JICA Study Team based on the questionnaire to MOPC

c) Japan

JICA has provided support in several sectors such as tourism development and waste management development in the Dominican Republic. The projects in the road and bridge sector, however, are limited to a project of installation of LED light in streetlights, which is co-financed with IDB.

d) IDB

IDB is the main donor agency of the Dominican Republic, supporting this country in various sectors. Regarding the road sector, IDB is providing funds to projects in both hard and soft aspects. The project currently being executed are given on the table below. On the other hand, there is little support for bridge-related projects. In the Road Infrastructure Rehabilitation and Maintenance Program, the support for bridge sector is proposed as minor repair activities and crack sealing.

According to the MOPC, technical cooperation on road maintenance and seismic resistance is currently being conducted by the IDB, and a report is to be submitted in September 2023.

Table 5-23 Existing Projects Funded by IDB in the Dominican Republic

No.	Project Name	Approval Date	Abstract
1	Road Infrastructure Rehabilitation and Maintenance Program in the Dominican Republic	April 2022	The objective of this program is to help improve regional connectivity in the country through four component projects. Of which, the first component project focuses on rehabilitation and improvement of the 407-km highway and rural access roads in the provinces of Azua (31.2 km), San José de Ocoa (23.3 km), Barahona (51.5 km), Monte Plata (100.8 km), Monte Cristi (28.7 km), and other seven provinces (172 km). Total cost of the project is USD 140 million, will be fully funded by IDB.
2	ECO-DELIVERY: Electro Mobility, Environment, and Intelligence	November 2021	This program implements a pilot project to reduce environmental pollution, noise pollution, and accident rate in the city of Santo Domingo by transitioning to electric vehicles for delivery, generating real time data to monitor and improve the working condition of grocery stores. Total cost of project is USD 1.5 million, half of which is funded by IDB and other by the Dominican Republic government.
3	Resilient Transport Infrastructure: Support for the Development of Transport Infrastructure Adaptable to Climate Change	July 2018	Support the Dominican Republic government in the development of a comprehensive risk management system that considers climate and natural disaster risk scenarios, implementing flood risk model HydroBID-Flood to prioritize the interventions in road assets. This is a technical cooperation project with a total cost of USD 650,000, fully funded by IDB.

Source: JICA Study Team based on the website of IDB

e) CABEI

Since the Dominican Republic became a member of CABEI in 2007, this organization has funded

eight projects with total amount of USD 1.16 billion. Regarding road infrastructure sector, CABEL is financing for 148 km of highways through two projects as below:

- Coral Highway Project: Construction of a 70 km long, 4-lane highway with a fund of USD 70.0 million
- Improvement and Expansion of the Eastern Highway Corridor: Focus on 78 km length of road in San Pedro de Macoris-La Romana Section, La Romana Beltway Section and Eastern Tourist Boulevard Section

(2) Overview of Transportation (Road Traffic Control Sector) in the Dominican Republic

1) Overview of the Preliminary Study

As a part of an additional study to the Preliminary Study, an information collection survey was conducted targeting urban traffic in Santo Domingo, the capital city of the Dominican Republic.

In the Preliminary Study, literature review, site visit, and interviews with stakeholders were carried out regarding road transport and public transport (bus and railway). As a result, the issues to be addressed and recommendations to be tackled for the improvement of the urban transport were identified as shown in the table below.

Table 5-24 Summary of the Preliminary Study on Urban Transport in Santo Domingo

No.	Issues to be Addressed	Recommendations to Tackle with the Issues
(A) Road Transport (Traffic Control)		
A-1	<u>Expansion of the traffic capacity at the intersections:</u> Signal control corresponding to the demand is not applied. It is required to expand the traffic capacity by improving the traffic signal control and developing the traffic signals.	<ul style="list-style-type: none"> • Traffic signal control corresponding to traffic demand by the introduction of centralized control system
A-2	<u>Segregation of pedestrians from vehicles:</u> Although the traffic signals are installed, they do not necessarily function properly. As a result, jaywalking is found in many places.	
A-3	<u>Operation and maintenance of signaling system:</u> There are some problems on operation and maintenance such as expiration of maintenance contract for the signaling system.	<ul style="list-style-type: none"> • Upgrading of traffic control center • Utilization of traffic data
A-4	<u>Appropriate policing:</u> There are many violations of traffic laws and rules such as illegal parking and violation of traffic signals. Nonetheless, proper enforcement is not sufficient.	<ul style="list-style-type: none"> • Traffic safety measures such as 3E (Enforcement, Engineering, and Education) • Crackdown of illegal parking through development of parking lots
(B) Public Transport		
B-1	<u>Improvement of accessibility and network of railway:</u> The coverage of railway is not enough although two metros and one cable car are operated in Santo Domingo. Moreover, integration of urban development with public transport is needed.	<ul style="list-style-type: none"> • Development of Metro Line-3 • Formulation of land use plan • Promotion of transit-oriented development (TOD)
B-2	<u>Improvement of service level of buses:</u> The exact operation of sharing buses is not grasped which are operated frequently. It is required to increase the number of public buses.	<ul style="list-style-type: none"> • Procurement of new buses • Efficient control of buses with GPS

Source: JICA Study Team based on the Preliminary Study

2) Results of this Survey

In this study, as a follow-up to the Preliminary Study, discussions with relevant organizations were conducted focusing on Road Traffic Control Sector. The Alcaldia of National District (Alcaldia de Distrito Nacional (ADN)) expressed the importance of the traffic safety (strengthen enforcement and

enhance citizens' awareness of law-abiding) and the willingness to participate in the implementation of the project.

INTRANT, which is in charge of road traffic control, commented that the main problem is the lack of funds to purchase equipment and hire staff, and there is almost no remote control of traffic signals. At present, there is only one remote control signal at the intersection of May 30th Street and San Juan Bautista Avenue. Currently, monitoring of road traffic conditions is limited to CCTV installed at traffic signals and other locations. The image gained from the CCTV is made public in real time through twitter as of 2022. Regarding “Utilization of traffic data” of A-3 in the table above, the current situation and willingness of the usage of such mobile big data are discussed with INTRANT. According to them, such data has not become common yet except for some universities which study on mobile big data.

In the province of Santo Domingo, as shown in the table below, traffic signals made by manufacturers from various countries are used. For example, Spanish and Chinese signals are used in the same protocol.

With regard to “Formulation of land use plan” and “Promotion of transit-oriented development (TOD)” of B-1 in the table above, District Nacional out of the province of Santo Domingo has a land use plan named “*Plan de Ordenamiento Territorial*” which is shown in Figure 5-28. To a certain extent, the linkage between urban planning and public transportation development is also taken into account, as the land use plan shows the areas where TOD is promoted. On the other hand, when the JICA Study Team had a meeting with the Territorial Planning and Regional Development Department (Viceministerio de Ordenamiento Regional, hereinafter called "VIOTDR") of the Ministry of Economy, Planning and Development (Ministerio de Economía, Planificación y Desarrollo, hereinafter called "MEPyD"), which is in charge of national land planning and urban planning administration. From this meeting, it seemed that the concept of TOD is not well understood even among VIOTDR personnel. In fact, the area around the metro transfer station (Juan Bosch Station), which is designated as a TOD area, does not have a clear transportation node, and is not highly utilized by commercial facilities and high-rise residential buildings. Hence, the implementation of TOD is considered a future challenge.



Source: JICA Study Team

Figure 5-25 Remote Control Signal and Control Equipment



Source: JICA Study Team

Figure 5-26 Monitoring via CCTV at Traffic Control Center



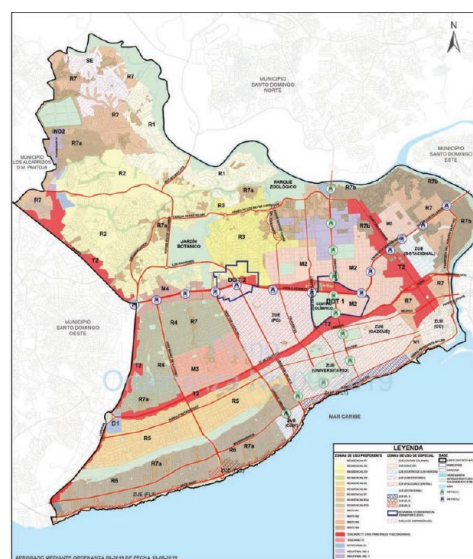
Source: JICA Study Team

Figure 5-27 Information Dissemination on Congestion through SNS

Table 5-25 List of Signals Installed in Santo Domingo Metropolitan Area

Model	Country	Boca Chica	Districto Nacional	Los Alcarrizos	Pedro Brand	Santo Domingo Este	Santo Domingo Norte	Santo Domingo Oeste	Total
ESC GROUP	Dominican Republic	0	0	0	0	2	0	0	2
ETX	Spain	0	51	0	0	0	0	0	51
GTEC	China	0	0	4	1	0	0	4	9
HOSTOS	Dominican Republic	0	4	0	0	10	3	0	17
ICG 4	Dominican Republic	0	21	0	0	10	0	2	33
INTERMIT	Dominican Republic	0	0	0	0	0	0	1	1
JLR-S4	Dominican Republic	3	10	1	5	20	1	9	49
MEXICANO	Mexico	0	2	0	0	1	0	0	3
RMY	Spain	0	114	0	0	0	3	3	120
SIEMENS	Germany	0	0	0	0	0	1	0	1
Total		3	202	5	6	43	8	19	286

Source: INTRANT



Source: ADN

Figure 5-28 Land Use Plan of District Nacional

3) Technical Seminar
a) Outline

It is considered important to utilize traffic data for efficient and effective implementation of a project when a project is implemented for the improvement of road traffic. Recently, the utilization of probe data obtained from smart phones has become more and more common along with conventional data of traffic counters. Thus, in a project for improvement of road traffic, utilization of technology of digital transformation (DX) is expected by employing such mobile big data. As abovementioned, mobile big data is not necessarily used sufficiently in the Dominican Republic and the understanding on the technology is not accumulated well in INTRANT.

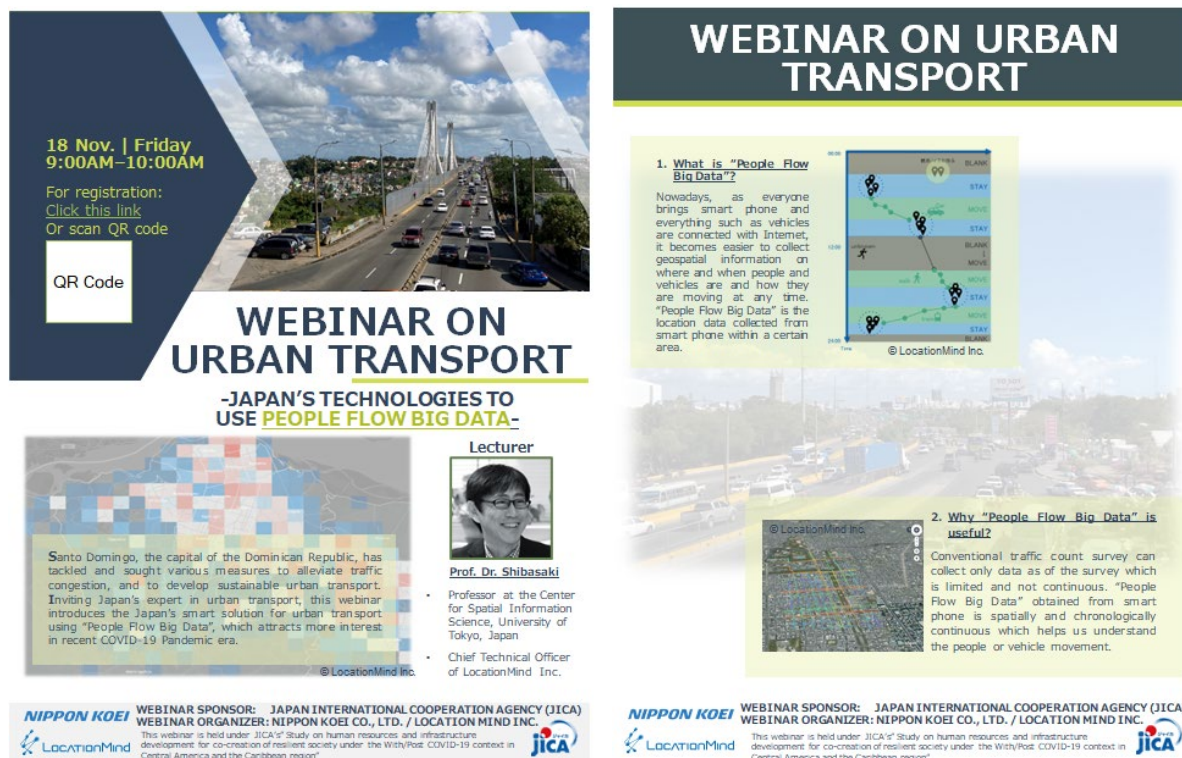
Hence, a seminar about the practice of the usage of the DX technology in the transport sector was held for authorities in charge of urban transport sector including INTRANT to enhance their interest and understanding on the DX technology related to traffic control. The lecturer of the seminar was Dr. Shibasaki, Professor of the University of Tokyo, Japan, who is specialized in 3D mapping of urban space and measuring and monitoring of movement or behavior of people and goods. In the seminar, the outline of mobile big data, case studies in and outside of Japan, and secure of privacy were explained. The outline and flyer of the seminar are shown in Table 5-26 and Figure 5-29 respectively.

Table 5-26 Outline of the Seminar on DX of Transport

Item	Description	Remarks
Date and time	9:00 – 10:00, 18 November 2022 (Fri.)	Local time of the Dominican Republic (21:00 – 22:00 18 November at Japan time)
Venue	Meeting Room of the Traffic Control Center of INTRANT	Hybrid (In person and online via MS Teams)
Lecturer	Dr. Ryosuke Shibasaki, Professor at the Center for Spatial Information Science, University of Tokyo, Japan	Attended online from Japan
Authorities invited	INTRANT, <i>Viceministerio de Ordenamiento Territorial y Desarrollo Regional</i> (VIOTDR), <i>Ministerio de Presidencia</i> (MINPRE)	VIOTDR oversees the national plan. From MINPRE, DX Office (<i>Gabinete de Transformación Digital</i>) was invited.
Language	Consecutive interpretation between Japanese and	Interpreter joined online from Japan

Item	Description	Remarks
	Spanish	
Agenda	9:00 – 9:05 Opening remarks by the Chief Representative of JICA’s Dominican Republic Office 9:05 – 9:40 Seminar by Dr. Shibasaki 9:40 – 9:55 Q&A session with the attendees 9:55 – 10:00 Closing remarks by the Chief Representative of JICA’s Dominican Republic Office	
Contents	1. Introduction 2. Significant Places with Location Labeling) 3. Trip Reconstruction 4. Route Matching 5. Major Types of Mobile Data 6. How to Preserve Privacy; Mozambique Example	

Source: JICA Study Team



Source: JICA Study Team (Some figures are from LocationMind Inc.)

Figure 5-29 Flyer of the Seminar (left: face, right: background)

b) Result of the Seminar

The seminar took place as described in Table 5-26. From the Dominican Republic, twelve people attended both in person and online. In addition, some observers joined the seminar from JICA and the JICA Study Team.

In the last half of the seminar, a Q&A session was held, and the attendees had a lively discussion.

Table 5-27 Number of Attendees of the Seminar

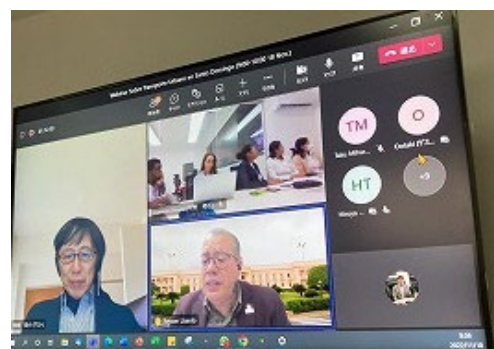
Organization	Number of Attendees	Remarks/Position of Attendees
INTRANT	7	People in charge of traffic control center
VIOTDR	1	Territorial Analyst
MINPRE	3	Director of Monitoring and Coordination of the Digital Agenda 等
DIGSETT	1	Director of Planning and Development
Total	12	

Source: JICA Study Team

Table 5-28 Major Questions at the Seminar

Questions from Attendees	Answer from Lecturer
From what provider can the mobile big data be obtained? Is the data available in the Dominican Republic?	There are several providers dealing with mobile big data from where you can purchase the data. We have several providers in Japan. There are providers in the Dominican Republic as well.
Is it possible to apply for the traffic safety sector? For example, is it possible to identify accident-prone spots?	It is difficult to detect an accident which is rare and sudden event because the sampling rate of the mobile big data is not frequent. However, it is possible to identify the congested points and congestion due to traffic accidents from mobile big data.
Is it possible to integrate mobile big data with traffic signal control? How can we utilize the data to mitigate the traffic congestion?	This technology is different from traffic signal control. However, mobile big data can help make a policy because phenomena like congestion can be detected.

Source: JICA Study Team



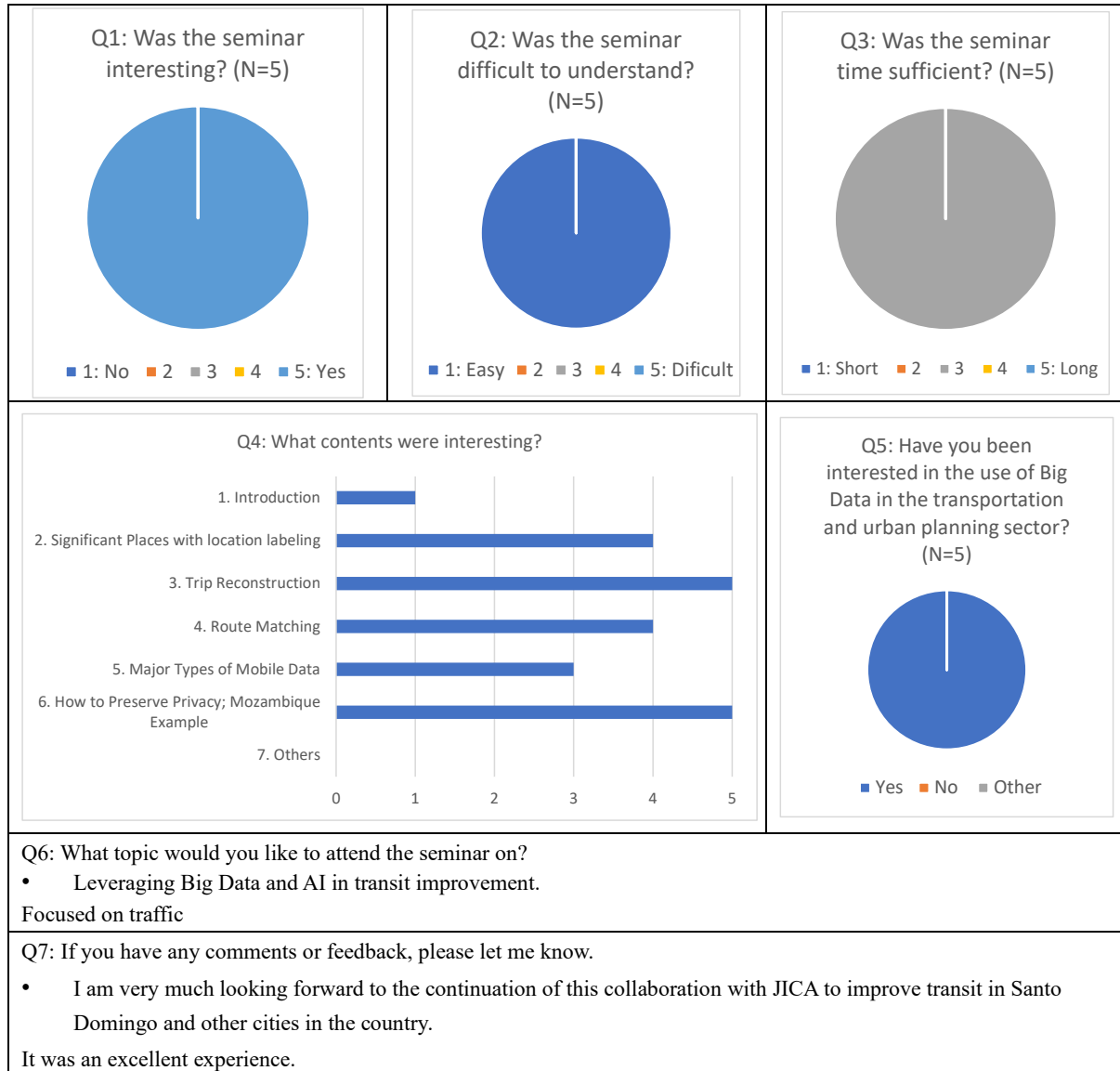
Source: JICA Study Team

Figure 5-30 Photos of Seminar

c) Questionnaire about the Seminar and Evaluation of the Seminar

A questionnaire survey was carried out of the attendees after the seminar. An online questionnaire survey was sent to the attendees who joined online while a questionnaire paper was distributed to the attendees who joined in person. The result of the questionnaire is described in Figure 5-31. Although an attention should be given for the interpretation of the result of this questionnaire because the number of answers is only five out of twelve attendees, the results imply that the attendees are satisfied with the contents, level of difficulty, and length of time of the seminar. Also, it is observed that they are highly interested in the reconstruction of the trip (Visualization of origin and destination and trip method) and protection of privacy.

Under the situation that the application of DX technology including mobile big data is not so common in the Dominican Republic, the introduction of new technology through this seminar can be regarded as effective because the seminar helps attendees enhance their knowledge and understanding and contribute to make the future project more fulfilling. For the next step, it is recommended to carry out a pilot project of the analysis of mobile big data to enhance the stakeholders' understanding and to confirm the challenges for implementation.



Source: JICA Study Team

Figure 5-31 Result of Questionnaire about the Seminar

4) Support by Other Donors

a) France • European Union (EU)

In the field of urban traffic, including the road traffic control sector, France and the EU are actively supporting the Dominican Republic. In 2019, the Urban Transport Master Plan (*Plan de Movilidad Urbana Sostenible: PMUS*) for the Santo Domingo metropolitan area was developed with the support of France and EU. Currently, with the support of the French Development Agency (AFD) and EU, an agency responsible for the implementation of the master plan (*Observatorio de Movilidad Urbana Sostenible: OMUS*) was established in June 2022. The following shows the ongoing projects.

- Study on Integrated Public Transport System (toll system integration, etc.)
- Formulation of Manual and Rule for Bicycle Transportation Infrastructure

b) Korea and CABEI

According to CABEI, CABEI and the Korean government agreed to provide USD 600,000 for technical cooperation related to the promotion of ITS²⁷. The Korea-CABEI Partnership Single Donor Trust Fund (KTF) scheme is expected to be utilized. When the JICA Study Team asked INTRANT about this project in November 2022, they answered that there is no progress, and they are continuing the discussion with CABEI.

(3) Overview of Transportation (Port Sector) in the Dominican Republic

1) Regulations, Organization, and Standards

Ports in the Dominican Republic play a major role in the economy since a large part of the industrial sector is dependent to some extent on the export of various commodities out of the country. In the Dominican Republic, the Dominican Port Authority (*Autoridad Puerto Dominicana: APORDOM*) is the regulatory body of the National Port System²⁸. The authority's role is to direct and manage seaports and increase the country's international trade. It is defined as an agency, with autonomous character, own patrimony, independent, and unlimited duration, subject to the requirements of Law No. 70, and to the regulations issued by the Executive Power. Under APORDOM, there are subordinate bodies such as the Planning and Development Department, Logistics Management Department, and Financial Management Department.

Recently, in compliance with Law No.489-06, APORDOM has created Institutional Strategic Plan 2021-2024 (PEI 2021-2024), which focuses on institutional strengthening and transformation of the technical infrastructure of this authority.

2) Overview

The National Port System in the Dominican Republic has 13 major ports. These ports are located mostly in the southern of country, exactly in Santo Domingo Province (four ports), San Pedro de Macoris Province (one port), Pedernales Province (one port), Barahona Province (one port), Azua Province (one port), and La Romana Province (one port).

Among the 13 ports, seven ports are under the direct administration and operation of the State, through the Dominican Port Authority, three ports are private ports, and three ports are operated under concession modality.

The most important ports in maritime logistics are the Port of Santo Domingo and Port of Caucedo, both located in Santo Domingo. The Port of Rio Haina has the largest cargo volume, due to its 2.88 m of dock to handle containers and general cargo, bulk liquid and solid. The Port of Caucedo is the main container terminal in the country mainly for the transshipment of goods.

Table 5-29 Major Ports in the Dominican Republic

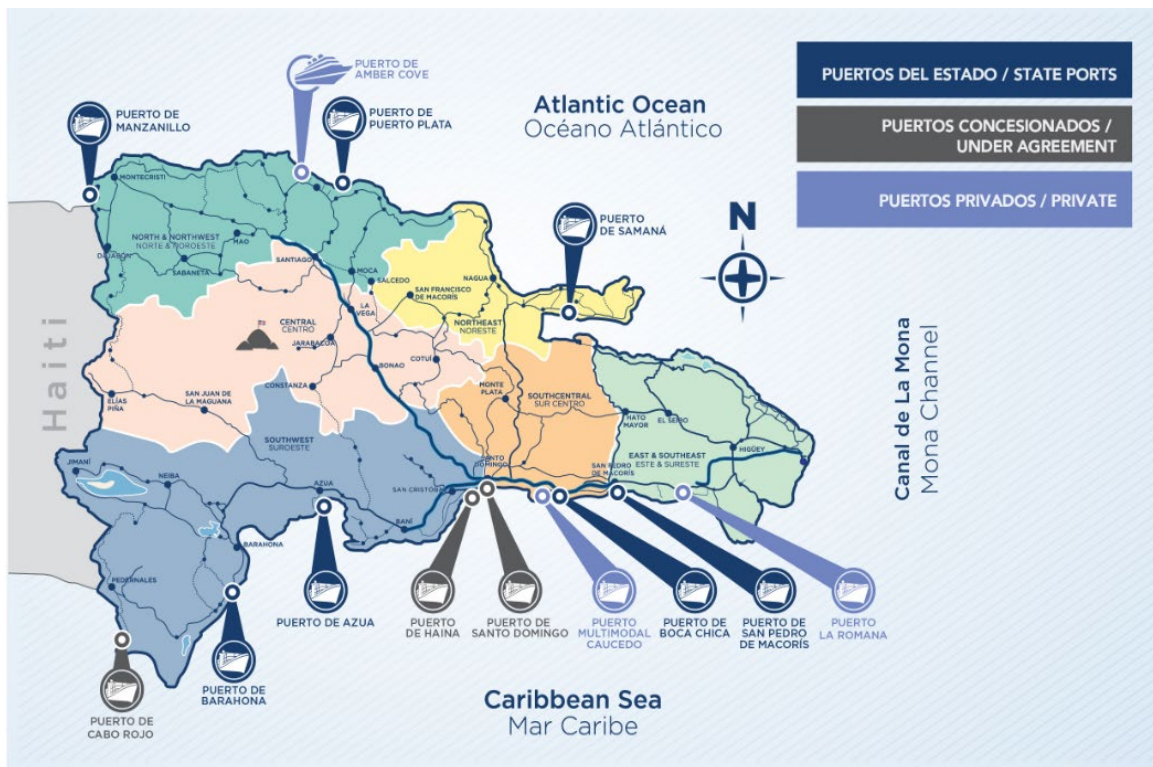
No.	Port Name	Operation Type	Location
1	Port of Santo Domingo	State Port-Concession	Santo Domingo Province
2	Port of Rio Haina	State Port-Concession	Santo Domingo Province
3	Port of Cabo Rojo	State Port-Concession	Pedernales Province

²⁷ CABEI, 18 Aug 2022, "CABEI and Korea approved USD 600,000 cooperation agreement to promote the development of Intelligent Traffic Systems in the Dominican Republic"

²⁸ Dominican Port Authority HP: <https://portuaria.gob.do/>

No.	Port Name	Operation Type	Location
4	Port of Puerto Plata	State Port	Puerto Plata Province
5	Port of Barahona	State Port	Barahona Province
6	Port of Samana	State Port	Samana Province
7	Port of Manzanillo	State Port	Monte Cristi Province
8	Port of San Pedro de Macoris	State Port	San Pedro de Macoris Province
9	Port of Boca Chica	State Port	Santo Domingo Province
10	Port of Viejo de Azua	State Port	Azua Province
11	Port of Caucedo	Private Port	Santo Domingo Province
12	Port of La Romana	Private Port	La Romana Province
13	Port of Amber Cove	Private Port	Puerto Plata Province

Source: APORDOM



Source: Dominican Port Authority (APORDOM)

Figure 5-32 Location of Major Ports in the Dominican Republic

3) Major Ports

a) Port of Santo Domingo

The Port of Santo Domingo is the oldest in the National Port System. It is located on the south-central coast, at the mouth of the Ozama River, Santo Domingo Province. The dock length is 2,310 m. The Port of Santo Domingo has three terminals with different services. Among them, Don Diego and Sans Souci are tourist terminals. They receive cruise ships as well as general loose cargo. On the other hand, Molinos Dominicanos-Molinos Modernos terminal mainly serviced the importation of loose containerized liquid and solid general cargo.

b) Port of Rio Haina

The Port of Rio Haina is located at the mouth of the Haina River, west of the town of Haina, Santo

Domingo Province. The dock length is 2,880 m. There are 15 berths, of which nine are on the eastern shore and six are on the western shore. It has two terminals, located on both sides of the river. These are called the Haina Oriental and Haina Occidental. The Port of Rio Haina mainly imports and exports of loose general cargo, containerized general cargo, solid general cargo, and liquid general cargo.

c) Port of Cabo Rojo

The Port of Cabo Rojo has a structure that includes two facilities for bulk exports, with Dolphin-type dock. This port is operated by a Colombian company called Cementos Andino (Andino Concrete), a company with Colombian capital. The berth depth is 10.9 m. This port mainly handles operations to export clinker, limestone, bauxite, and concrete.

d) Port of Puerto Plata

The Port of Puerto Plata is the third most important port in the country. The Port of Puerto Plata is the main commercial and cruise port on the north coast of the Dominican Republic. The entrance channel is 12 m in depth. There are two terminals. One of them is currently being repaired by the government for tourism cruise operations, known as Muelle Viejo. The other called Muelle Nuevo is currently operating. This port operates container cargo, general cargo, fuel, and tourist cruise management.

e) Port of Barahona

The Port of Barahona is located on the south coast of the Barahona Province. The dock is 550 m in length and 10.4 m in depth. The entrance channel is 110 m in width and 11 m in depth. There are four terminals in this port. These are Consorcio Azucarero Central, Muelle del Central Azucarero, Muelle de Barahona, and EGE Haina. This port is mainly used for loading bulk cargos. The main exports are sugar and gypsum. The main import is coal.

f) Port of Samana

The Port of Samana is located on the Samana Peninsula, on the northeast coast of the Dominican Republic. Its operations are based on receiving loose general cargo and tourist ships. The dock is 2,29.5 m in length and 9.4 m in depth. The entrance channel is 300 m in width and 11 m in depth.

g) Port of Manzanillo

The Port of Manzanillo is located in Manzanillo, Monte Cristi Province. The dock is 227.7 m in length. The port depth is 14.6 m. The entrance channel has width of 600 m. Its operations are mainly based on the export of refrigerated containers, especially bananas. This port is detailed later (See 5))

h) Port of San Pedro de Macoris

The Port of San Pedro de Macoris is located on the Higuamo River, San Pedro de Macoris. The dock length is 600 m. The entrance channel depth is 6 m. This port mainly imports dry bulk cargo such as clinker, coal, and fertilizers. The main exports are sugar and molasses, cement in bags.

i) Port of Boca Chica

The Port of Boca Chica is located in Boca Chica, Santo Domingo Province. The port was originally

built to serve the Boca Chica Sugar Mill and to export sugar. However, it is now used for import and export of containers, wood, bagged cement, newsprint, fuel, liquids, homogeneous cargo, tourist vessels and cargo in general. The dock length is 615 m. The entrance channel is 120 m in width and 8.5 m in depth.

j) Port of Viejo de Azua

The Port of Viejo de Azua is located in the southeast of the city of Azua. The dock length is 210 m. The entrance channel is 140 m in width and 30 m in depth. This port has two terminals. One of those is utilized by Petroleum Gas Company which has installed containers of gas. The other terminal is used for exportation of fruits (bananas), minerals, and many more.

k) Port of Caucedo

The Port of Caucedo is located in Punta Caucedo, the eastern part of the city of Santo Domingo. The dock length is 600 m, and the mooring depth is 13 m. This port is only used for cargo operations incoming from several countries in the Caribbean zone and is the youngest port in the island. It is managed by Dubai Port World (DP World) that operates the port as a global free zone and maritime terminal.

l) Port of La Romana

The Port of La Romana is located at the mouth of the Chavón River. It was built in the 1950s by the Central Roma Corporation, which is a private company that has the largest sugar mill in the country. There are two terminals in this port, a commercial terminal, and a tourist terminal. The dock length is 520 m. The entrance channel is 60 m in width and 12.2 m in depth.

m) Port of Amber Cove

The Port of Amber is in the Bay of Maimón, on the north coast of the country. This port was developed by Carnival Corporation. The maximum length of the vessels recorded to having entered this port is 334 m. The berth depth is 8.6 m.

4) Port Activity

The total international cargo volume of all ports is shown in the table below. The cargo volume increased stably from 2010 to 2015. Since 2016, the cargo volume has decreased but increased again in 2018. In 2021, the total cargo volume reached 28.4 thousand tons, which the largest ever recorded.

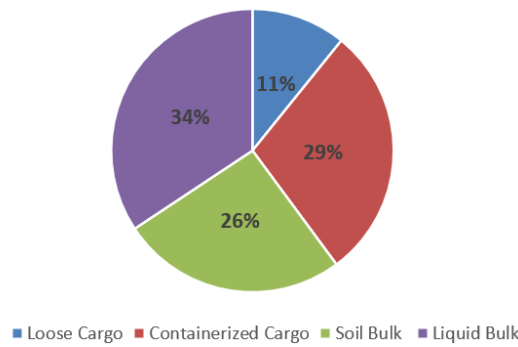
Table 5-30 International Cargo Volume of Ports in the Dominican Republic

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Load	2,420	3,570	4,242	4,637	5,297	5,089	3,449	2,108	3,397	3,344	3,218	4,706
Unload	13,129	15,722	13,766	14,722	15,899	16,890	17,537	14,196	18,310	20,236	20,318	23,712
Total	15,549	19,292	18,008	19,359	21,196	21,979	20,986	16,304	21,707	23,580	23,536	28,418

Unit: 1,000 M.T

Source: National Statistical Office (ONE), Data and Statistics²⁹

²⁹ National Statistical Office (ONE), Data and Statistics: <https://web.one.gob.do/>

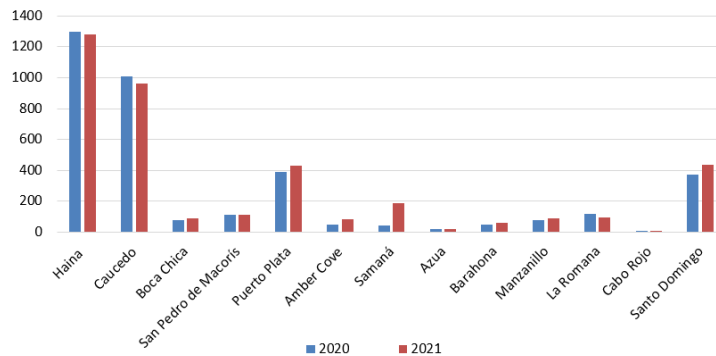


Source: National Statistical Office (ONE), Data and Statistics

Figure 5-33 Share of Cargo Volume by Type in 2021

The figure above shows the share of cargo by type, handled at the port. It shows that liquid bulk accounts for the largest proportion (34%). Loose cargo has the least amount, accounting for 11% of the total.

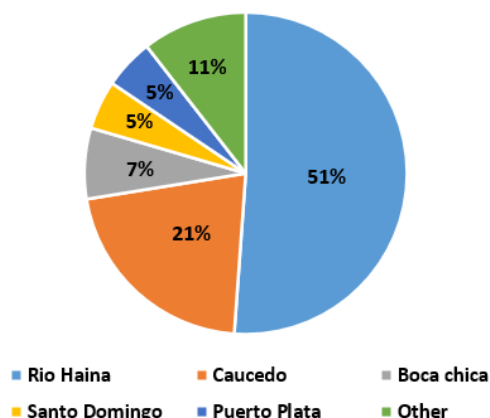
Regarding the number of ships in international trade, the following figure shows that the Port of Rio Haina has the largest number, next is the Port of Caucedo. These two ports account for a much larger number of ships than the others.



Source: National Statistical Office (ONE), Data and Statistics

Figure 5-34 Number of Ships in International Trade by Port

The following figure shows that more than half of the international cargo volume is handled at the Port of Rio Haina. Next, the Port of Caucedo accounts for 21% of the total. From this, it can be considered that Rio Haina Port and Caucedo Port have important positions in the port international trade in the Dominican Republic.



Source: National Statistical Office (ONE), Data and Statistics

Figure 5-35 Share of International Cargo Volume by Port in 2021

5) Port of Manzanillo

a) Port Situation

The Port of Manzanillo is located in Manzanillo (Pepillo Salcedo), Monte Cristi Province. It is very close to the border with Haiti. The port was built in the 1940s by the United Dominican Fruit Company, a North American company dedicated to export bananas and other minor fruits of the country. This port is currently under a leasing trade for its reconstruction and is still being supervised by the Dominican Port Authority.

The dock is 227.7 m in length. The port depth is 14.6 m, the deepest natural draft in the country³⁰. The entrance channel has a width of 600 m. Its operations are based on the export of refrigerated containers, especially bananas mainly to the European market, with a total of 220,000 tons in 2019, accounting for 95% of the country's banana exports to foreign countries. The main imports are general cargo and loose cargo (clinker and mineral coal) with a total of 120,000 tons in 2019³¹.

Regarding the port connectivity, in general, the road density is low, and it must make a detour to access the port from the banana production area. At present, the highway DR-1 and the surrounding rural roads support access to the Port of Manzanillo, but the roads are not in good condition. Regarding rural roads, about 70% of roads in Cibao Region where the Port of Manzanillo is located, are in fair or poor condition³². This could become a factor limiting the movement of freight from another area of the country to the Port of Manzanillo, as well as import and export activities at the port in general.

³⁰Cara Santana (2019): Study of the Commercial Development and Plant Design of the Port of Manzanillo (Dominican Republic)

³¹IDB,2021: Rehabilitation and Expansion of the Port of Manzanillo • Environmental and Social Impact Study

³²IDB,2021: Loan Proposal of Manzanillo Port Rehabilitation and Expansion

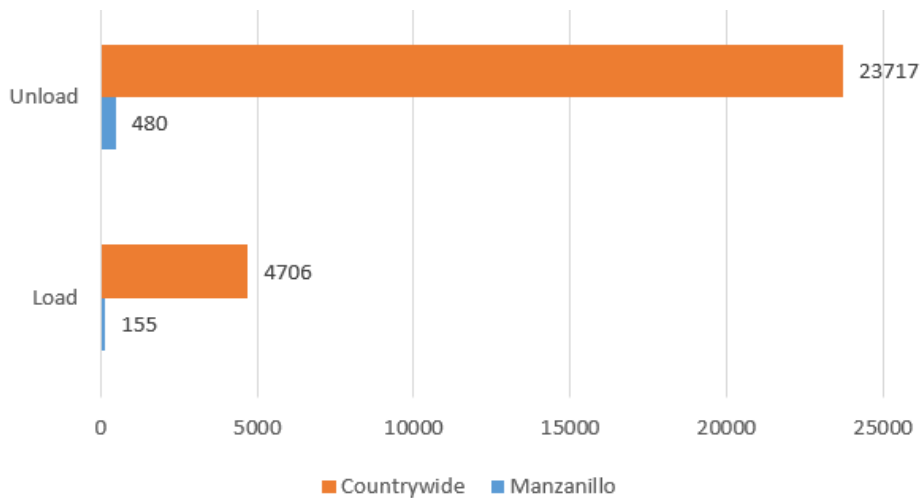


Source: JICA Study Team (Satellite photo is based on Google Earth)

Figure 5-36 Port of Manzanillo

b) Port Activity

In 2021, the total cargo volume handled in Port of Manzanillo was about 635,000 tons, which accounts for a small share (about 2%) of the country's cargo volume.

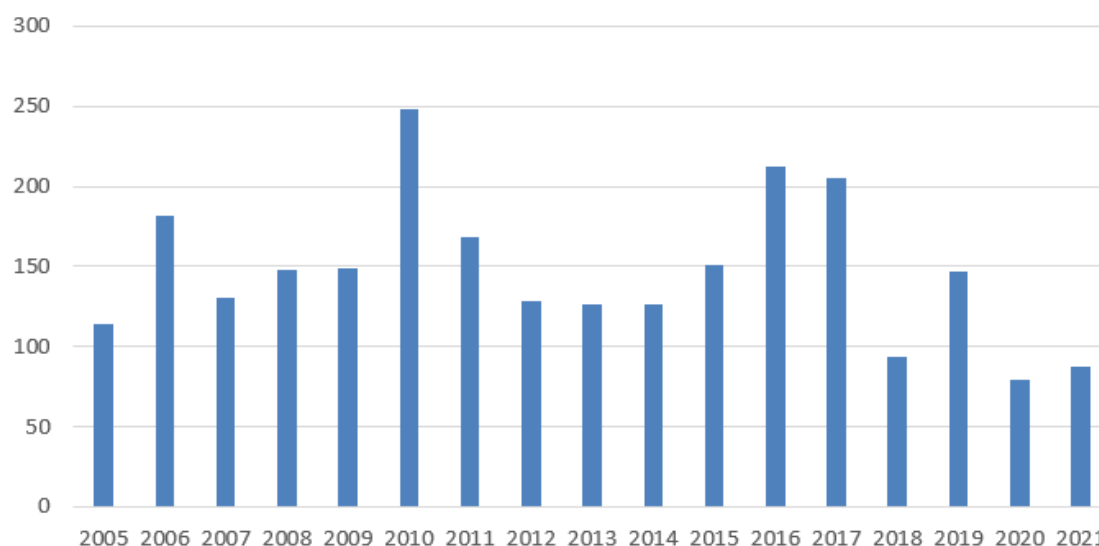


Unit: 1000 M.T

Source: National Statistical Office (ONE), Data and Statistics

Figure 5-37 International Cargo Volume of Manzanillo Port (2021)

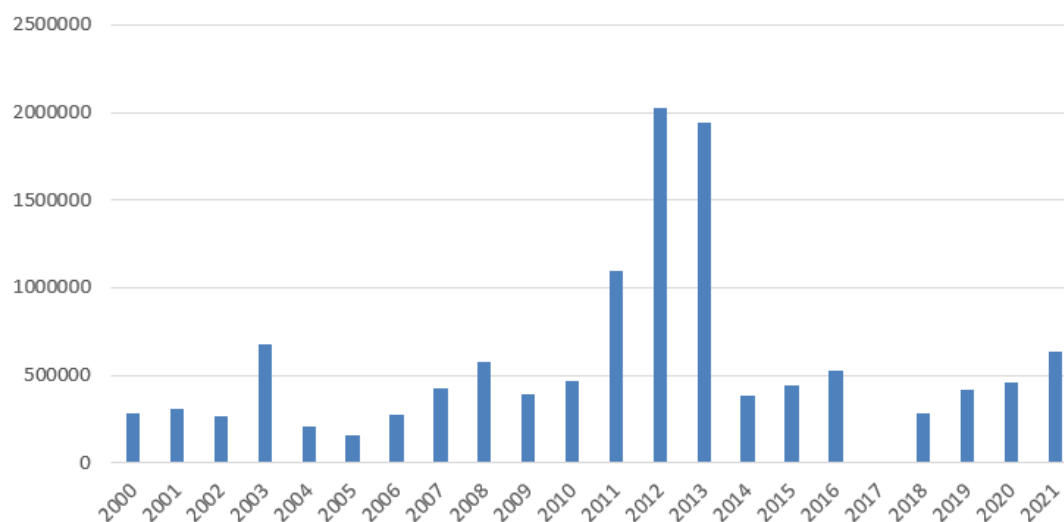
Regarding the number of international trade ships, in general, the number of ships has decreased significantly. The ship number was the highest in 2010 with 248 ships and the lowest in 2020 with 79 ships. In 2021, the number of ships increased compared with 2020 but the increase is not significant.



Source: National Statistical Office (ONE), Data and Statistics

Figure 5-38 Number of International Ships in Port of Manzanillo by Year

The figure below shows the international cargo volume at the Port of Manzanillo from 2000 to 2021. Cargo volume peaked in 2012 at 2,000,000 tons, then dropped sharply in 2014 to 385,000 tons. In general, in recent years, the cargo volume tends to increase but is still much lower than in 2012.



(Unit: M.T)

Source: National Statistical Office (ONE), Data and Statistics

Figure 5-39 International Volume Cargo in Port of Manzanillo by Year

c) Ongoing Project

i. National Plan

Due to the strategic location and the deepest natural draft, the Port of Manzanillo is defined as an important port for exporting freight in the northern region. Priority actions related to the Port of Manzanillo were proposed in the National Cargo Logistics Plan 2020-2032 and are also shown below:

- Improvement of access road to the port
- Improvement of loading dock and cold storage facilities
- Design of the port's management model

ii. IDB

IDB decided to invest USD 100 million through a loan for the Rehabilitation and Expansion of the Port of Manzanillo³³. The amortization period is 25 years with a disbursement period of 5 years and grace period of 5.5 years³⁴. The Government of the Dominican Republic has opened the prequalification process of the candidates for the international public tender of this project in April 2022.

This project's purpose is to improve the competitiveness and socioeconomic growth in the northern part of the country by providing effective port and logistics infrastructure. The specific objectives are:

- Reduce the transportation costs and times for freight with origin/destination in the northern part of the country; and
- Increase the total movement of freight and containers through Manzanillo.

This project is designed into four component projects as shown below:

Table 5-31 Project Component

Component Project	Fund (USD in millions)	Purpose
First project	46	Rehabilitation of the basic structure of the logistics area, internal roads, perimeter security, and protection work for protected areas
Second project	44	Improvement of the roads that connect with the productive areas of the port (90.6 km of DR-1, 9 km of DR-20)
Third project	6	Strengthening of port management
Fourth project	4	Strengthening of socio-environmental management

Source: IDB

(4) Development and Cooperation Scenario in the Dominican Republic

1) Development Scenario

a) Development Issues and Strategies

To address the issues of transportation (bridge and road traffic control) sector in the Dominican Republic which are pointed out above, the following strategies are proposed as shown in the table below.

Table 5-32 Strategies of Transport Sector in the Dominican Republic

Target	Strategy	Description
Transport Dominican	1. Improvement of urban	Traffic congestion is a severe problem in Santo Domingo. To mitigate the congestion, it is necessary not only to develop road transport such as development

³³<https://presidencia.gob.do/noticias/gobierno-abre-licitacion-para-rehabilitacion-y-ampliacion-del-puerto-de-manzanillo-por>

³⁴IDB,2021: Loan Proposal of Manzanillo Port Rehabilitation and Expansion

Target	Strategy	Description
Republic	transport in Santo Domingo	of road network and enhancement of road traffic control, but also to develop public transport and improve its level of service. In addition, it is required to promote the policy which encourages land usage which makes use of public transport easier.
	2. Promotion of asset management	The level of development of road and bridge infrastructure is relatively high, mainly in interurban highway. Also, MOPC carries out bridge census and makes an effort for maintenance of infrastructure. As the limitation of budget etc., some bridges are being deteriorated. Thus, it is required to promote efficient and effective maintenance.
	3. Improvement of access to rural areas	The roads connecting to rural areas are not necessarily developed well, while interurban highways have been developed. It is important to expedite the construction of bridges which is proposed in the national plans.

Source: JICA Study Team

b) Programs and Projects

The table below lists programs and projects which the Government is recommended to carry out to tackle the issues abovementioned.

Table 5-33 Program and Projects Proposed to be Carried out in the Dominican Republic

Target	Strategy	Program / Project	Term
Transport Dominican Republic	1. Improvement of urban transport in Santo Domingo	1-1: Projects for upgrading of road traffic control in Santo Domingo	Middle
		1-2: Bridge development projects in Santo Domingo	Long
		1-3: Project for promotion of TOD (Transit Oriented Development) in Santo Domingo	Long
		1-4: Projects for development of public transport in Santo Domingo (Metro Line-3 etc.)	Long
	2. Promotion of asset management	2-1: Capacity development project for bridge asset management	Short
	3. Improvement of access to rural areas	3-1: Project for development of bridges in rural area	Long

Note: Short term: 2023-2025, Middle term: 2023-2027, Long term: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

Criteria shown the table below is set to select program/projects which is suitable for JICA's support. Judging from the table below, the preferable modalities for cooperation in the Dominican Republic are i) ODA loan and ii) technical cooperation. By using these modalities mainly, future cooperation is studied for the development and maintenance of infrastructure as well as disaster risk reduction which contribute to sustainable economic infrastructure.

Table 5-34 Criteria of Selection of Program/Project (Dominican Republic)

Criteria	Description
(1) Compatibility with Japan's Country-wise Development Cooperation Policy	The Development Cooperation Policy to the Dominican Republic states that i) sustainable economic development and ii) disparity reduction are important sectors.
(2) Compatibility with JICA's Global Agenda	JICA sets "Toward the world where everyone and everything can move safely and freely" as the global agenda in transport sector and describes road asset management and promotion of urban public transport as cooperation policies. In urban and regional development sector, global agenda proposes to enhance the governance of urban management.
(3) Modality applicable in Belize	As the Dominican Republic is a middle-income country, ODA loan is prioritized rather than grand aid. Also, technical cooperation is regarded as an effective modality because there are several examples such as solid waste management.

Source: JICA Study Team (based on MOFA and JICA)

Based on the criteria above, prioritized programs and projects are selected as shown below.

Table 5-35 Prioritized Programs/Projects in the Dominican Republic

Target	Strategy	Program/Project	Modality	Term	Implementation Agency
Transport Dominican Republic	1. Improvement of urban transport in Santo Domingo	1-1: Projects for upgrading of road traffic control in Santo Domingo	Technical cooperation ODA loan	Middle	INTRANT
		1-2: Bridge development projects in Santo Domingo	ODA loan	Long	MOPC
		1-3: Project for promotion of Transit Oriented Development (TOD) in Santo Domingo	Technical cooperation Training in Japan	Long	VIOTDR, Municipalities such as ADN
		1-4: Projects for development of public transport in Santo Domingo (Metro Line-3 etc.)	Technical cooperation ODA loan	Long	MINPRE
	2. Promotion of asset management	2-1: Capacity development project for bridge asset management	Technical Cooperation Dispatch of long-term expert Training in Japan or third country	Short	MOPC

Source: JICA Study Team

a) 1-1: Projects for upgrading of road traffic control in Santo Domingo

In Project 1-1, it aims for mitigation of traffic congestion through promotion of Intelligent Transport System (ITS) such as enhancement of the capacity of traffic control by upgrading the control of traffic signal and utilization of traffic data. It is suggested that the project include civil works such as improvement of intersection as traffic control is related to geometric structure of the intersection. In the project, it is recommended to utilize DX technologies such as people flow big data to conduct the project efficiently and visualize the activities and results. For example, it is recommended to utilize human flow data to understand congestion, probe data to identify congestion and near-miss areas, and traffic volume surveys using image analysis with artificial intelligence (AI). In the future, it is recommended to develop intersection and traffic control and management (e.g., upgrade of traffic signals) through ODA loans. In addition, as mentioned above, France/EU and Korea are planning and implementing related projects, and it would be effective to consider collaboration with other donors in the implementation of such projects.

b) 1-2: Bridge development projects in Santo Domingo

In the project 1-2: Bridge development projects in Santo Domingo, by constructing new bridges over the Ozama and Isabela Rivers, which are planned by MOPC, the project will reduce congestion on existing bridges and surrounding roads, ensure redundancy in the event of accidents and disasters, and promote equitable urban growth. In particular, with regard to the cable-stayed bridge over the Ozama River mentioned in(1)3b), there is a large potential for utilizing the knowledge and experience of Japan, which has a track record of building long-span bridges in Japan and abroad. An example of Japanese technology is weather-resistant steel, which is resistant to corrosion and is expected to extend the service life of bridges and reduce maintenance and management work.

As the existing study is only basic, there are many items to be considered in the future. As a result of the interview with MOPC, for example, the following points need to be closely examined for cable-stayed bridges over the Ozama River:

- Traffic demand forecast: Traffic survey and demand forecast need to be conducted to examine the width

(number of lanes) of the bridge, etc.

- Geotechnical survey: A geotechnical survey should be conducted at the candidate site of the substructure, to study the type of substructure, pile length, etc.
- Access road: As the connecting road is a local road with about two lanes, widening of the connecting road and traffic safety measures need to be studied.
- Bridge location and bridge type: The proposed bridge location is on the Juan Bosch Bridge side rather than the middle of the existing Juan Bosch Bridge (Juan Pablo Duarte Bridge) and Francisco del Rosario Sánchez Bridge. However, it is considered necessary to reconfirm the bridge location from multiple perspectives, including the existence of an access road and the scale of land acquisition and involuntary resettlement, and if necessary, consider selecting the most appropriate one among multiple alternatives. In conjunction with this, bridge type and span allocation will also be considered.

In the discussions with local governments, although interest in new bridge construction is very high, there are many aspects that need to be scrutinized as abovementioned, and it would be desirable to conduct a data collection survey specifically for the transportation and bridge sector to gather further information and identify other projects with high development and cooperation needs. Alternatively, it would be a good idea to strengthen communication between MOPC and the Japanese side through the technical cooperation project on bridge maintenance as described in 2-1 below, while increasing the validity of the project.

c) 1-3: Project for promotion of the Transit Oriented Development (TOD) in Santo Domingo

In the project 1-3, it aims for reduction of reliance in private automobiles, mitigation of traffic congestion, reduction of travel time, and reduction of CO2 emission. The project supports the transition of the city to where the usability of public transport is higher in terms of urban development, housing development, and land usage.

Specifically, for the Distrito Nacional, where a land use plan has been formulated, the project will review the land use plan, confirm the existence and content of zoning, building regulations, and other systems for implementation, and support the formulation of such systems, as necessary. In addition, several case study stations will be selected to assist in the formulation of TOD master plans. For other municipalities that do not have a land use plan for transportation node development (e.g., Santo Domingo Este City), support may be provided for the development of the land use plan itself.

d) 1-4: Projects for development of public transport in Santo Domingo

In the project 1-4, the development of public transport such as Metro Line-3, cable car and bus is supported.

e) 2-1: Capacity development project for bridge asset management

Since the bridge census conducted by MOPC was surveyed by a limited staff of 5 to 7 persons, it is assumed that although the soundness of each bridge was evaluated, the respective deterioration mechanisms and measures to be taken have not been examined. Therefore, technology transfer for diagnosis of bridges and a workshop on bridge engineering will be held. Furthermore, based on the result of the bridge census, the project will support the formulation of the repair and replacement plan of bridges, efficient inspection of bridges, capacity development of replacement of bridges, and

establishment of the Bridge Management System (BMS).

Although technical cooperation is assumed as the modality, it would be effective to carry out training such as Knowledges Co-Creation Program and/or to dispatch long-term experts to the MOPC to provide advisory services and information collection for the MOPC if further information collection and relationship building with the MOPC are required.

The MOPC has shown a high level of interest in the technical cooperation and dispatch of experts for this project, and it is considered that the needs of the government of the Dominican Republic are high.

5.3.3 Guyana (Bridge)

(1) Overview of Bridge Sector

1) Regulations, Organization, and Standards

In Guyana, the Ministry of Public Works (MOPW) is taking the main role in the transportation sector. The MOPW is basically responsible for transport policy, the provision and maintenance of almost all major transport infrastructures. The Work Service Group (WSG) is an agency under MOPW, involved in all works being undertaken by the MOPW and is responsible for the planning and management of road investments and maintenance as well as coastal security. However, the Demerara Harbour Bridge is managed by the Demerara Harbour Bridge Company, a subsidiary of MOPW. In the case of small-scale construction projects, the ministry's in-house engineers will design, but in the case of large-scale projects such as national projects, the design will be done by an international consultant. Some bridges, such as the Wismar Bridge, described later, are maintained and managed by the National Industrial and Commercial Investment Ltd. (NICIL).

2) Outline of Road and Bridge Sector

a) Road Network in Guyana

The road network in Guyana has a total length of 2,064 km, including 428 km of primary roads, 583 km of secondary roads, and 1,593 km of interior roads. Most of these roads are unpaved, accounting for 65% of the total roads in the network³⁵.

Major highways are paved and run largely along the coastal areas. The main road network is comprised of two-lane roads with two 3.3 m wide driving lanes and shoulders varying between 0.0 and 1.5 m wide³⁶. These roads have limited road safety features and there are no provisions for pedestrian and bicycle traffic. Just 10 km of two short segments (along the East Coast Demerara and East Bank Demerara roads) are four lanes. Traffic congestion on some sections of the main road network has become a major issue due to the increase in the country's vehicle fleet and the creation of new housing developments in the outskirts of Georgetown. In addition to the above, the West Bank Demerara Road and East Bank Berbice Road are also positioned as main roads.

In terms of rail, Guyana has 98 km of railroads entirely dedicated to ore transport. Guyana has one international airport, one regional (short-range international) airport, and some airstrips with short runways. The country has a single general cargo seaport in Georgetown.

³⁵ Analytical Evidence to Support Guyana 's Green State Development Strategy: Vision 2040

³⁶ IDB, 2012: Project Profile of Road Network Upgrade and Expansion Program

Table 5-36 Main Roads of Guyana

No.	Main Road	Location
1	Essequibo Coast Road	Charity - Aurora
2	Parika-Vreed en Hoop Road	Parika – Vreed en Hoop
3	East Coast Demerara and West Coast Berbice Roads	Georgetown - Rosignol
4	Corentyne Highway	New Amsterdam - Moleson Creek
5	East Bank Demerara Road	Primary road of South Georgetown. Runs from Georgetown to Timehri, where the Cheddi Jagan International Airport is located.

Source: JICA Study Team



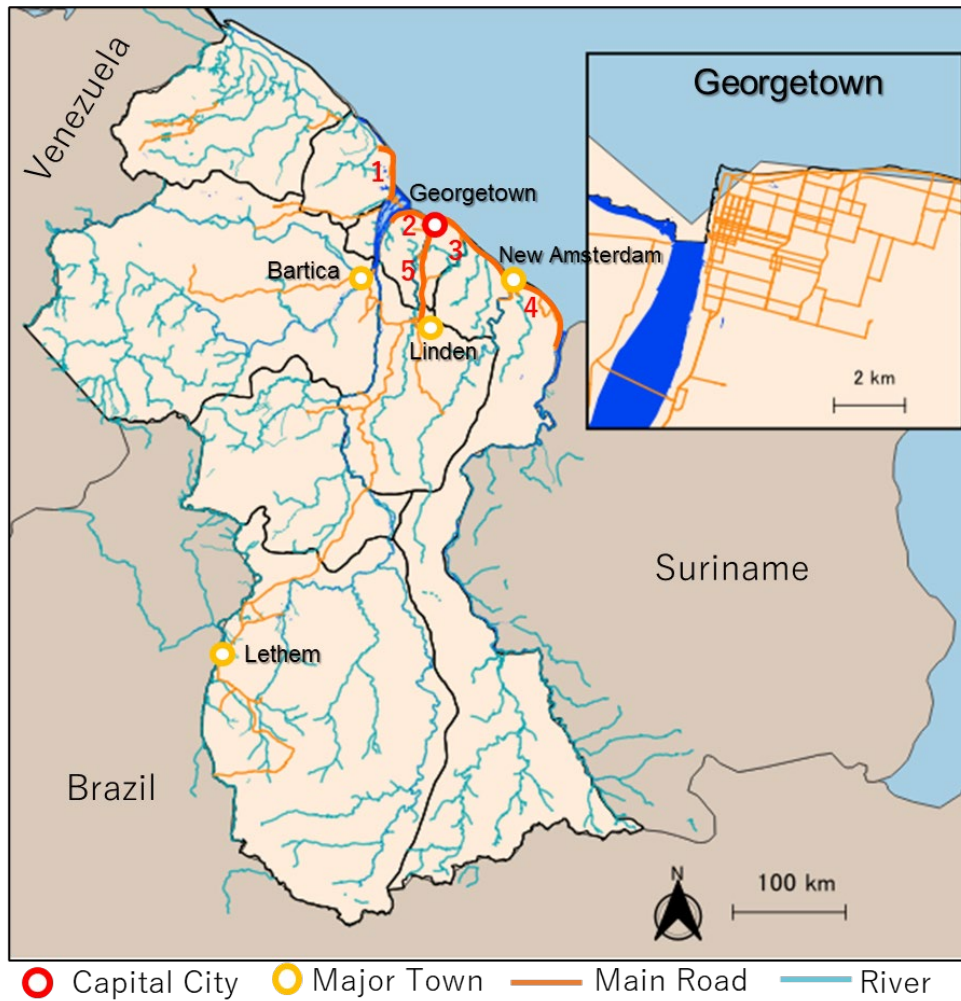
Source: JICA Study Team

Figure 5-40 Road in Georgetown City



Source: JICA Study Team

Figure 5-41 National Highway Georgetown (Linden)



Source: JICA Study Team

Figure 5-42 Main Road Network in Guyana




b) Bridge

Guyana's national land is divided by large rivers. With this, bridges play a significant role in the country's transportation system. The existing major bridges are often congested due to their insufficient capacity to handle the increasing traffic volume. The main bridges in Guyana are shown in the table below. In addition, there are also relatively large bridges between Georgetown and Adelphi in Mahaica and Mahaicony with a length of approximately 100 m.

At some points, river crossing is mainly through ferry because of the lack of bridges. At present, the road network has a missing link in the following areas:

- Border with Suriname
- River crossing at the Essequibo River in Linden-Lethem Road
- River crossing at the Essequibo River that connect Supernaam and Parika

Table 5-37 List of Main Bridges in Guyana³⁷

No.	Bridge	Feature
a	Demerara Harbour Bridge	<p>The Demerara Harbour Bridge is the critical link between Georgetown and the west bank area of the Demerara River. It is a 2-lane floating bridge, built in 1978. This bridge is 2 km long, and 2 spans of which retract to permit the passage of vessels. Its lifespan was estimated to be 20 years, but it has now exceeded this time by 20 years. Major congestion on the east and west bank mainly at the junctions of the bridge approaches and the main roads. Traffic congestion and traffic delays are also caused by the bridge retraction schedule to accommodate river traffic. The maximum speed and axle load are limited to 32 km/h and 22.4 ton respectively, due to the structure of floating bridge and deterioration. The traffic volume as of 2022 is 22,000 vehicle/day.</p> 
b	Berbice River Bridge	<p>The Berbice River Bridge, which was opened in 2008, is crossing the Berbice River in New Amsterdam. This bridge is a 2-lane floating bridge. Like the Demerara Harbour Bridge, there are traffic delays for bridge crossing at the Berbice River Bridge due to scheduled/unscheduled bridge openings for vessels.</p> 
c	Wismar Bridge	<p>The Wismar Bridge is a steel bridge crossing the Demerara River in Linden, the second largest city in Guyana. The bridge was opened in 1968 and has a length of 250 m (the bridge crosses river at a slant. The width of the river is approximately 200 m). The existence of this bridge is an important factor in making Linden the hub of hinterland road transport because it is located on the highway from Georgetown to the border with Brazil. In addition, the Wismar Bridge play an important role in urban transport in Linden as it is only bridge crossing the Demerara River in Linden, As the bridge has only one lane, vehicles need to wait for passing. Furthermore, limitation up to 20 t is imposed.</p> 
d	Takutu River Bridge	<p>The Takutu River Bridge, which was opened in 2009, is crossing the Takutu River, linking Lethem in Guyana to Bonfim in Brazil. This is a 2-lane bridge, and drivers must change their position from driving on the left (Guyana) to driving on the right (in Brazil), or vice versa.</p>

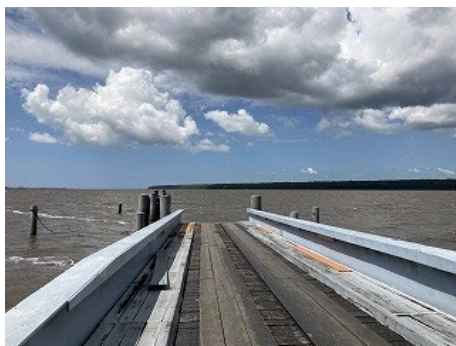
Source: JICA Study Team (Traffic volume of the Demerara Harbour Bridge is based on Stabroek News, 26 May 2022)

³⁷ National Development Strategy 2001-2010, Annex 8 Transport



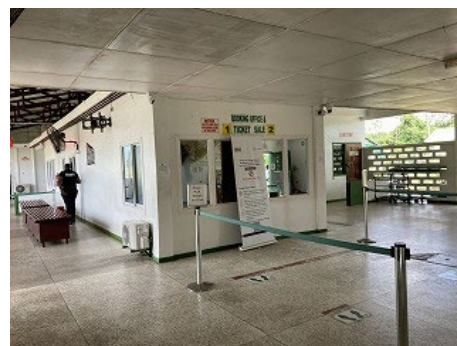
Source: JICA Study Team

Figure 5-43 Main Bridge and Missing Link Areas



Note: The opposite shore in the photo is Vassen Island in towhead

Source: JICA Study Team



Source: JICA Study Team

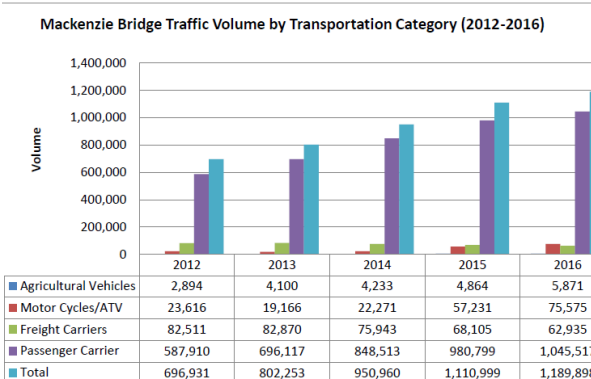
Figure 5-45 Boat Landing at the Border with Suriname

Figure 5-44 Courantyne River at the Border with Suriname



Source: MOPW, 2017, National Land Transport Strategy and Action Plan

Figure 5-46 River Crossing of the Esequibo River in Kurupukari



Note: Mackenzie Bridge is the other name of the Wismar Bridge
Source: MOPW, 2017, National Land Transport Strategy and Action Plan

Figure 5-47 Traffic Volume of the Wismar Bridge

c) Disaster Risk Reduction

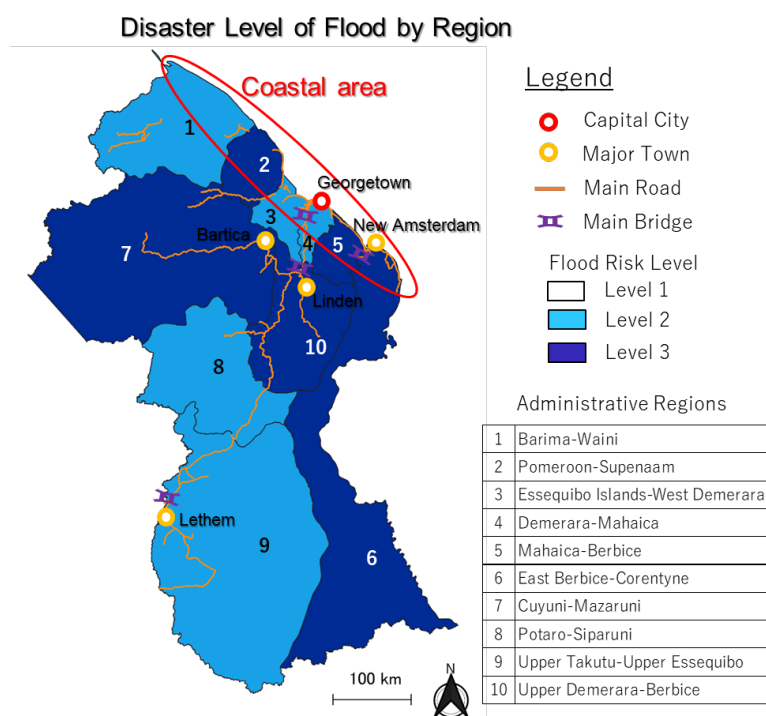
Guyana is considered one of the most vulnerable CARICOM member countries to sea level rise. The coastal area represents 7% of Guyana’s total area but supports 90% of the population lies 2.5 m below mean high tide sea level. Moreover, due to the impact of Intertropical Convergence Zone (ICTZ), Guyana is subject to long-lasting rain. As a result, most regions of Guyana including coastal area are at high flood risk due to rainfall, especially in the coastal areas (region 2, 5) and hinterland area (region 6, 7, 10)³⁸. Because the main roads and bridges are located in the areas with the high level of flood, it implies that the main transport infrastructure is increasingly at risk of flood. Flooding in 2005 caused damages estimated at USD 465 million (60% of GDP)³⁹. In addition, a large-scale flood occurred between May and June 2021, affecting 6,900 households⁴⁰, as well as agricultural and livestock products, causing prices of vegetables and other items to skyrocket.

The drainage and irrigation infrastructure are more than 150 years old; most are not operating of full capacity due to insufficient maintenance.

³⁸ CDEMA, 2021: Flooding in Guyana, Situation report No.3

³⁹ Analytical Evidence to Support Guyana ‘s Green State Development Strategy: Vision 2040

⁴⁰ NASA, “Guyana Floods 2021”, 19 May 2021



Source: CDEMA, 2021: Flooding in Guyana, Situation Report No.3

Figure 5-48 Disaster Level of Flood by Region in Guyana

3) Existing Plans and Supports by Development Partners

a) National Plan

iii. Green State Development Strategy

Guyana’s main development plan is the Green State Development Strategy (GSDS) -Vision 2040, which presents visions for development up to 2040. Accordingly, the plan describes the goals in infrastructure development as follows: Providing and maintaining high quality connections in transport and communication from the coastal region to the west, east, and south of Guyana, lowering transit times, transport and business costs, and environmental impacts, while improving the reliability of national connectivity services. There are three new bridge projects that highly prioritized in the Green State Development Strategy as shown below:

- Replacement of the existing Demerara Harbour Bridge;
- Construction of a new bridge in Soesdyke close to the Cheddi Jagan International Airport; and
- Replacement of the existing Wismar Bridge.

iv. National Land Transport Strategy and Action Plan

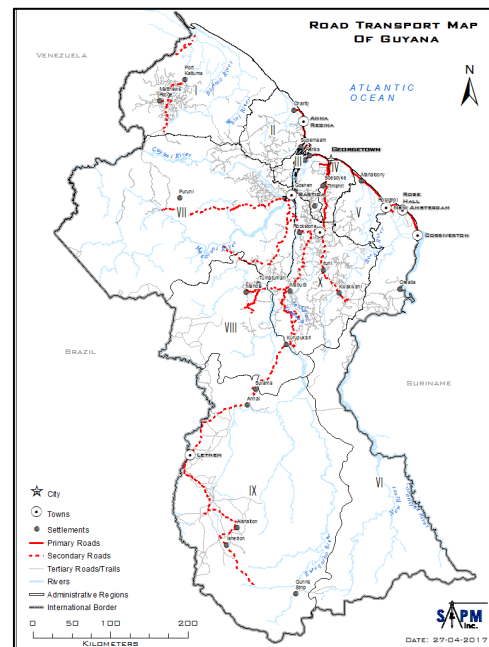
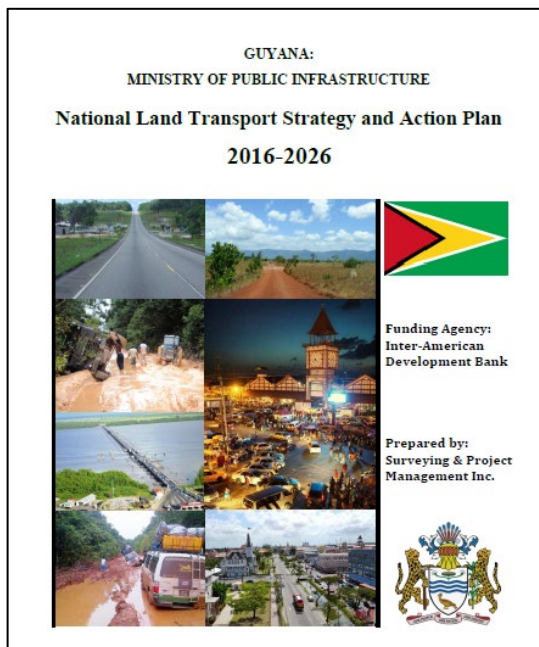
In 2017, the National Land Transport Strategy and Action Plan was formulated with IDB’s fund. The plan focuses on road traffic and analysis of the current situation, and then propose the following goals as well as projects to be implemented in the short term (2016-2018), medium term (2019-2021), and long term (2022-2026):

- Goal 1: By 2020, a strengthened legal and institutional structure with the technical capability of developing a sustainable land transport network within the context of a Green State Development Framework is in existence.

- Goal 2: By 2025, development measures are commenced to ensure coastal and hinterland land transport networks satisfy modern environmental and safety standards and are well-designed for efficient and effective movement.
- Goal 3: By 2026, the inter-connectivity among communities increased by 70% through an integrated land transport network, which supports the National Green Development Agenda.

The bridge projects proposed in the plan are described below. The timing and estimated project cost in the report are shown inside the parenthesis. The proposed projects include a new bridge in Soesdyke and replacement of the Wismar Bridge, which are coherent with the aforementioned Vision 2040.

- Construction of a bridge on the Demerara River in Georgetown (Short term, USD 150 million)
- Construction of a bridge on the Demerara River in Wismar (Linden) (Medium term, USD 100 million)
- Construction of a bridge on the Esequibo River in Monkey Jump (Medium term, USD 15 million)
- Construction of a bridge on the Demerara River in Soesdyke (Long term, USD 100 million)
- Construction of a bridge on the Esquibo River between Bendoff and Buck Hall (Long term, USD 450 million)



Note: Ministry of Public Infrastructure is a former name of MOPW

Source: MOPW, 2017, National Land Transport Strategy and Action Plan

Figure 5-49 National Land Transport Strategy and Action Plan

v. National Infrastructure Plan

The National Infrastructure Plan was formulated by an organization called the Central Transport Planning Unit under MOPW in August 2022. The JICA Study Team has not obtained the plan yet because the plan has just been approved. Instead, the Infrastructure Investment Opportunities in Guyana which was prepared by MOPW and the Ministry of Finance, seems to cover the important infrastructure projects in Guyana

In this document, necessary infrastructure investments are classified into two groups: (1) Infrastructure for Sub-Hemispheric Integration and (2) Infrastructure for Internal Economic Integration. The former one stresses on the following: i) Guyana Shield integration, ii) Market opportunities in

Northern Brazil, and iii) Access to Guyana’s Atlantic seaport. While the latter suggests the following: i) Integration of major communities and towns, ii) Development of new residential and commercial centers, and iii) Farm to Market Access. The projects described in this document are listed in Table 5-38. From the projects introduced, the bridge projects are No. 2 and No. 3, both of which are described in detail in subsections vi and vii, respectively.

Although it is required to confirm the full report of the National Infrastructure Plan to understand the entire idea of the Government of Guyana, the priority of bridge projects might be changed as a new bridge in Soesdyke is not included in the list. Thus, it is needed to grasp the prioritized projects based on the latest national plans.



Source: MOPW and Ministry of Finance

Figure 5-50 Infrastructure Investment Opportunities in Guyana

Table 5-38 Projects Proposed in Infrastructure Investment Opportunities in Guyana

No.	Project	Outline	Estimated Project Cost (USD)
1	Guyana-Brazil Road Link – Phase 2	Paving road of 329 km from Mabura Hills to Lethem. Construction of a new bridge on the Esequibo River in Kurupukari.	550 million
2	Construction of a New Bridge across the Demerara River at Linden	Pre-cast concrete box girder 2-lane bridge. Approx. 0.5 km of road approaches and roundabouts.	50 million
3	Guyana-Suriname Bridge Link	Two 2-lane bridges (1.2 km & 2.5 km). Approx. 4km of new roads to be built. Project to be procured as a Public Private Partnership (PPP) with a Design Build Finance Operate & Maintain (DBFOM) model contract.	300 million
4	Ogle International Airport - Cheddi Jagan International Airport Road Link – Phases 2 & 3	4-lane by-pass road Phase 2: Eccles to Little Diamond – 9.35km of rigid pavement Phase 3: Little Diamond to Silica City (24.06km) with 7.8km of connectors at Little Diamond, Friendship & Land of Canaan	524 million
5	Schoonard – Parika Road Link	30km 4-lane highway from Schoonard to Parika. 23.4 km of connector roads.	334 km
6	Parika to Bartica Road Link	57km 2-lane road from Parika to Bartica. Provide access to more than 1M hectares of arable farmlands.	90 million
7	Construction of an International Airport at Lethem	Development of new passenger terminal, runway, air traffic control tower, apron, cargo facility, rescue and fire-fighting services, airfield maintenance facility and fuel storage building	41.5 million
8	Upgrading of Hinterland Airstrips	Improvement works of Aishalton, Mabaruma, Matthew’s Ridge, and Paruima Airstrips out of the government-owned 52 airstrips	9.7 million
9	Construction of a Modern Ferry Stelling at Parika	Development of terminal building, passenger waiting shelter, vehicle parking area, and rock revetment coastal defenses.	48.5 million
	Total		1.95 billion

Source: JICA Study Team based on MOPW and the Ministry of Finance

vi. New Demerara Harbour Bridge Construction Project

With regard to the New Demerara Harbour Bridge, the implementation of the project has been determined. In May 2022, a design-build contract with the amount of USD 260 million was signed with Chinese Contractor (China Railway Construction Company Limited (CRCCL))⁴¹. The alignment being curved, the bridge length will be 2.6 km, which is longer than the existing bridge. The bridge structure is a hybrid of cable-stayed bridge and concrete girder bridge.



Source: MOPW, REQUEST FOR PROPOSALS for Consultancy Services for Construction Supervision for the New Demerara River Bridge (Nandy Park to La Grange)

Figure 5-51 Alignment of New Demerara Harbour Bridge

vii. Replacement of Wismar Bridge

A study and design of the replacement of the Wismar Bridge have been completed by an Italian consultant. The proposed bridge is approximately 220 m length, five-span, and two-lane with footpath, prestressed concrete (PC) girder bridge⁴². An officer of MOPW said that the plan was decided to be changed to four-lane bridge when the JICA Study Team met MOPW in November 2022. Thus, the project cost will increase from USD 50 million which is shown in Table 5-38. However, after the survey was carried out in 2020, any progress was not found when the JICA Study Team visited the site in August 2022.

⁴¹ Stabroek News, 26 May 2022, "New bridge over Demerara closer"

⁴² Guyanese Online, 9 July 2020, New Elevated Bridge proposed for Wismar, over Demerara River



Source: Guyanese Online, 9 July 2020, New Elevated Bridge proposed for Wismar, over Demerara River

Figure 5-52 Replacement Plan of Wismar Bridge Construction Plan of Corentyne River Bridge

viii. Construction Project of Corentyne River Bridge

Currently, the Government of Guyana and the Government of Suriname have jointly led the construction of the Corentyne River Bridge, which crosses the Corentyne River connecting the two countries⁴³. The bridge is expected to be 1.17 km from Guyana to Long Island, 2.15 km road through Long Island and a 2.5 km bridge from Long Island to South Drain in Suriname. This bridge is planned to be constructed through the public-private partnership (PPP) model. At present, the government of both countries has sought bidders for the conduct of a feasibility study and preliminary design for the construction of the Corentyne River Bridge. Several big consultant firms such as WSP Caribbean Limited, TYPASA, etc., seem to be interested in this opportunity.

⁴³ Department of Public Information HP: <https://dpi.gov.gy/contractor-to-build-corentyne-river-bridge-to-be-selected-soon/>



Source: MOPW and Ministry of Finance, 2022, Infrastructure Investment Opportunities in Guyana

Figure 5-53 Route of Corentyne River Bridge

b) Japan

JICA has provided support in several fields such as energy sector, but there are no projects in the road/bridge sector.

c) World Bank

Although the World Bank has not funded any project in the transportation sector in recent years, it has provided technical assistance in disaster prevention, including a flood control project called the Resilient, Green, and Inclusive Flood Investment Baseline for the Georgetown Metropolitan Area. The project started in July 2020 and will be completed in February 2023. The project includes an assessment of disaster risks in the Georgetown metropolitan area and a study on the development of a resilient and sustainable city.

The outputs of this project need to be reviewed in the planning of infrastructure and infrastructure development in Georgetown to ensure that disaster risk, particularly flood risk, is taken into account in the project formulation.

d) IDB

IDB has supported many projects on transport sector, which are centered on road expansion and rehabilitation projects. The projects currently being executed are as follows:

Table 5-39 Existing Projects Funded by IDB

No.	Project Name	Approval Date	Abstract
1	Program to Support Climate Resilient Road Infrastructure	N/A	The general objective is to improve the quality, accessibility, resilience, and safety conditions in the intervention area through increasing the paved road coverage. Accordingly, this project will finance the rehabilitation and expansion of 23.5 km of the existing East Bank Demerara Public Road between the communities of Grove and Timehri. The total cost is USD 115 million, where USD 100 million will be funded by IDB while the remaining cost of USD 15 million is financed by the Guyana government.
2	Support for the Design and Implementation of Innovative Mechanisms for the Management of Construction Contracts in Guyana	October 2019	Supporting the Government of Guyana in the design and implementation of efficient tools and practices to improve the technical and environmental management of transport infrastructure works contracts. This is a technical cooperation project with funding of USD 200,000.
3	Road Network Upgrade and Expansion Program	June 2012	Enhancement of urban road network and road safety through three component projects such as the Expansion and Rehabilitation of the Sheriff-Mandela Road, Road Safety Action Plan, implementation support, and institutional strengthening. This is a loan project with a total cost of USD 66.2 million funded by IDB.

Source: JICA Study Team based on IDB

e) CDB

The existing project funded by CDB is Linden to Mabura Hills Road Upgrade Project. The objective is to increase the efficiency, accessibility, safety, and resilience to climate hazards along the road corridor through upgrading of 121 km of road from Linden to Mabura Hills. This project is approved in December 2020 with a total fund of USD 190,265,000.

f) Islamic Development Bank (IsDB)

Guyana became a member country of the Islamic Development Bank (IsDB) in 2016. Since then, IsDB financed 12 projects in Guyana. Regarding the transport sector, the IsDB is financing a project for the rehabilitation of 72 km of the Linden Soesdyke Highway with a total fund of USD 120 million.

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

To address the issues of transportation (bridge) sector in Guyana which are pointed out above, the following strategies are proposed as shown in the table below.

Table 5-40 Strategies of Transport Sector in Guyana

Target	Strategy	Description
Transport Guyana	1. Expansion road network through development of bridge infrastructure	The land is divided by large rivers and there are missing links where vessel is necessary to cross a river even in major economic corridors. Also, some bridges are bottleneck of traffic due to lack of lanes, speed limitation because of floating bridge, and closure during open the bridge. Hence, it is required to expand the road network through development of bridges.
	2. Promotion of asset management	It is anticipated that development of infrastructure is expedited as the economy grows. It is required to develop the mechanism of asset management so that infrastructure can be used for a long period.

Target	Strategy	Description
	3. Effective and efficient investment in infrastructure based on masterplan	In Guyana, as the urbanization has been comparatively slow even in the capital city, Georgetown, severe urban problems has not occurred without national spatial plan so far. However, as it is anticipated that the country expedites industrialization and increase finance resource to invest in infrastructure thanks to production of crude oil, it is required to formulate national logistics and land use plan and to diversify and foster the industry, and then to develop infrastructure which contributes to improve the quality of life based on the said plan.

Source: JICA Study Team

With regard to the bridge infrastructure stated in the Strategy 1, the following table lists Guyanese major bridges and missing links, as well as the status of implementation of projects there.

Table 5-41 Guyanese Major Bridges and Missing Links

No.	River	Bridge or Missing Link	Status
1	Demerara River	Demerara Harbour Bridge	The replacement is planned. A Chinese contractor (China Railway Construction Company Limited) was selected.
2	Demerara River	New Demerara River Bridge in Georgetown	Except for Demerara Harbour Bridge and its replacement, any other plan to construct a bridge is not confirmed in Georgetown. However, a problem remains in the access between Georgetown downtown and the west bank of the Demerara River as both existing and new Demerara Harbour Bridges are 5 km away from downtown, or the mouth of the river.
3	Demerara River	New Demerara River Bridge in Soesdyke	Construction of a new bridge in Soesdyke near the International Airport is proposed in the Vision 2040.
4	Demerara River	Wismar Bridge	There is a plan to replace with new bridge of two lanes. Although study and design were conducted in 2020, any progress has not been found. The plan was revised from two lanes to four lanes.
5	Esequibo River	Esequibo River mouth	Any plan has not been confirmed as of August 2020, although there is an idea of construction of bridge. The width of the river is 10 km including towhead between Parika, town at the east bank of Esquibo River and the opposite side.
6	Esequibo River	Kurupukari (crossing point of Linden - Lethem Road)	Any plan has not been confirmed as of August 2020, although there is an idea of construction of bridge. The width of river is approximately 500 m.
7	Esequibo River	Bartica Floating Bridge	A floating bridge is planned between Bartica, mining city at the confluence of the Esequibo and Mazaruni River, and the east bank of the Esequibo River. According to MOPW, the study on floating bridge has been completed and it will be replaced with permanent bridge in the future. The width of the river is approximately 3 km.
8	Takutu River	Takutu Bridge	According to MOPW, a contractor for rehabilitation was selected.
9	Berbice River	Berbice Bridge	According to the Regional Democratic Council (RDC) of the Region 6, although the replacement of floating bridge with permanent bridge is desirable. There is not any plan to do that as of August 2022.
10	Courtyne River	Courtyne River Bridge	According to MOPW, the study has been completed.

Source: JICA Study Team

b) Programs and Projects

The table below lists programs and projects which the Government is recommended to carry out to tackle the issues abovementioned. Regarding the construction and replacement of bridges, the bridge at the mouth of the Esequibo River and the Berbice Bridge are excluded from the list because the magnitude of bridge is quietly large, and any major problem has not occurred, respectively.

Table 5-42 Program and Projects Proposed to be Carried out in Guyana

Target	Strategy	Program / Project	Term
Transport Guyana	1. Expansion road network through development of bridge infrastructure	1-1: New Demerara Harbour Bridge (replacement)	Long
		1-2: Bridge construction project at the mouth of the Demerara River	Long
		1-3: Wismar Bridge replacement project	Middle
		1-4: Kurupukari Bridge (Esequibo River) construction project	Long
		1-5: Takutu Bridge rehabilitation project	Short
		1-6: Bartica Floating Bridge construction project	Long
		1-7: Courtyne River Bridge construction project	Long
	2. Promotion of asset management	2-1: Capacity development project for bridge asset management	Short
3. Effective and efficient investment in infrastructure based on masterplan	3-1: Data collection study for formulation of masterplan	Short	

Note: Short term: 2023-2025, Middle term: 2023-2027, Long term: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

Criteria shown the table below is set to select program/projects which is suitable for JICA's support. Judging from the table below, the preferable modalities for cooperation in Guyana are i) ODA loan and ii) technical cooperation targeting for CARICOM member countries.

In Item (1) of the table below, it is mentioned that attention should be paid for the status of penetration of Japanese companies. For example, MODEC received an order for Floating Production, Storage & Offloading System (FPSO) of Front End Engineering Design from a subsidiary of ExxonMobil⁴⁴.

Table 5-43 Criteria of Selection of Program/Project (Guyana)

Criteria	Description
(1) Compatibility with Japan's Country-wise Development Cooperation Policy	The Development Cooperation Policy to Guyana describes disaster risk reduction as an important sector. However, the policy was formulated in 2016, and the oil production had not started. Indeed, the policy states that attention should be paid for the status of penetration of Japanese companies in Guyana.
(2) Compatibility with JICA's Global Agenda	JICA sets "Toward the world where everyone and everything can move safely and freely" as the global agenda in transport sector and describes road asset management as cooperation policies. In disaster risk reduction and reconstruction sector, global agenda proposes to enhance the governance for disaster risk reduction.
(3) Modality applicable in Belize	Guyana is expected to observe economic growth due to production of oil and has been categorized as middle-income country. Thus, ODA loan is prioritized rather than grant aid. On the other hand, co-finance with the other donor is an option because Japan does not have a track record of ODA Loan targeting Guyana and it seems difficult to carry out to mobilize ODA loan in short term. Given that Guyana has small population and the headquarters of CARICOM, it is recommended to carry out technical cooperation for several countries.

Source: JICA Study Team based on MOFA and JICA

Based on the criteria above, prioritized programs and projects are selected as shown below.

Table 5-44 Prioritized Programs/Projects in Guyana

Target	Strategy	Program / Project	Modality	Term	Implementation Agency
Transport Guyana	1. Expansion road network through development of bridge infrastructure	1-2: Bridge construction project at the mouth of the Demerara River	ODA loan	Long	MOPW
		1-3: Wismar Bridge replacement project	ODA loan	Middle	MOPW

⁴⁴ MODEC, Press release, 1 November 2022, "MODEC awarded FEED contract for ExxonMobil's "Uaru" project in Guyana"

Target	Strategy	Program / Project	Modality	Term	Implementation Agency
	2. Promotion of asset management	2-1: Capacity development project for bridge asset management	Technical cooperation Training in Japan or third country	Short	MOPW
	3. Effective and efficient investment in infrastructure based on national logistics and land use plan	3-1: Data collection study for formulation of masterplan	Technical cooperation	Short	MOPW

Source: JICA Study Team

a) 1-2: Bridge construction project at the mouth of the Demerara River

In Project 1-2, it is proposed to construct a new bridge at the mouth of the Demerara River, where is downstream side from the location of existing and planned Demerara Harbour Bridge. By this project, it is anticipated that the access between the downtown of Georgetown and the west bank of the Demerara River is improved and that the redundancy of the bridge over the Demerara River is secured.

b) 1-3: Wismar Bridge Replacement Project

In Project 1-3: Wismar Bridge Replacement Project, it is proposed to replace the existing Wismar Bridge and increase the number of lanes from one lane to two lanes or more, based on the result of review of the existing study. Traffic volume on the Wismar Bridge has increased 1.7 times in the five years from 2012 to 2016 and is expected to increase further because of future economic growth. Currently, CDB funds are being used to improve the road between Linden and Mabura Hills and IDB funds are being used to improve the road between Soesdyke and Linden, both of which are expected to have synergistic effects with this project. The project will also contribute to facilitating and revitalizing mobility in Linden, the second largest city in the country, as the sidewalks are currently narrow, and the downstream sidewalks are not usable. In addition, the Wismar Bridge is located on the international corridor from Northern Brazil (Roraima State) across Guyana to Georgetown, which is the shortest route by sea to the Roraima State, so the project is expected to benefit neighboring countries.

c) 2-1: Capacity development project for bridge asset management

In the Project 2-1: Capacity development project for bridge asset management, it is proposed that target countries will be some CARICOM member countries. Technology transfer of asset management of bridges will be carried out and equipment for maintenance will be provided. From MOPW, apart from bridge asset management, interest in technical cooperation for design and project evaluation (cost and benefit analysis) was expressed.

d) 3-1: Data Collection Study for Formulation of Master Plan

Regarding Project 3-1: Data Collection Study for Formulation of Master Plan, given that Guyana has achieved commercial oil production and is rapidly planning and implementing development projects at the national level, the implementation structure and schedule of the "Infrastructure Investment Opportunities in Guyana" formulated in July 2022 will be reviewed. The project team will also confirm whether or not a sectoral master plan is necessary and will identify the direction of Guyana's future infrastructure development.

5.3.4 Costa Rica (Urban Railway)

(1) Overview of Urban Railway Sector

1) Regulations, Organization, and Standards

In Costa Rica, the Costa Rican Railway Institute (Instituto Costarricense de Ferrocarriles, INCOFER) is responsible for the operation and maintenance of the railway. INCOFER was established as a government agency in 1985 under Decree No. 7001 and its supervisory authority is the Ministry of Public Works and Transport (Ministerio de Obras Públicas y Transporte (MOPT)). Decree No. 7001 was amended by "Fortalecimiento del Instituto Costarricense de Ferrocarriles (INCOFER) y Promoción del Tren Eléctrico Interurbano de la Gran Área Metropolitana" which was enacted in 2016 to strengthen the railway sector. As shown in the table below, Decree No. 9366 contains the provisions to strengthen INCOFER's authority toward the development of urban railway in the San Jose Metropolitan Area (Gran Área Metropolitana (GAM)). It is noted that the word "Urban Railway" is used in this report since it connects cities within the San Jose Metropolitan Area even though Decree No. 9366 refers to "Interurban Electrified Railway (Tren Eléctrico Interurbano)".

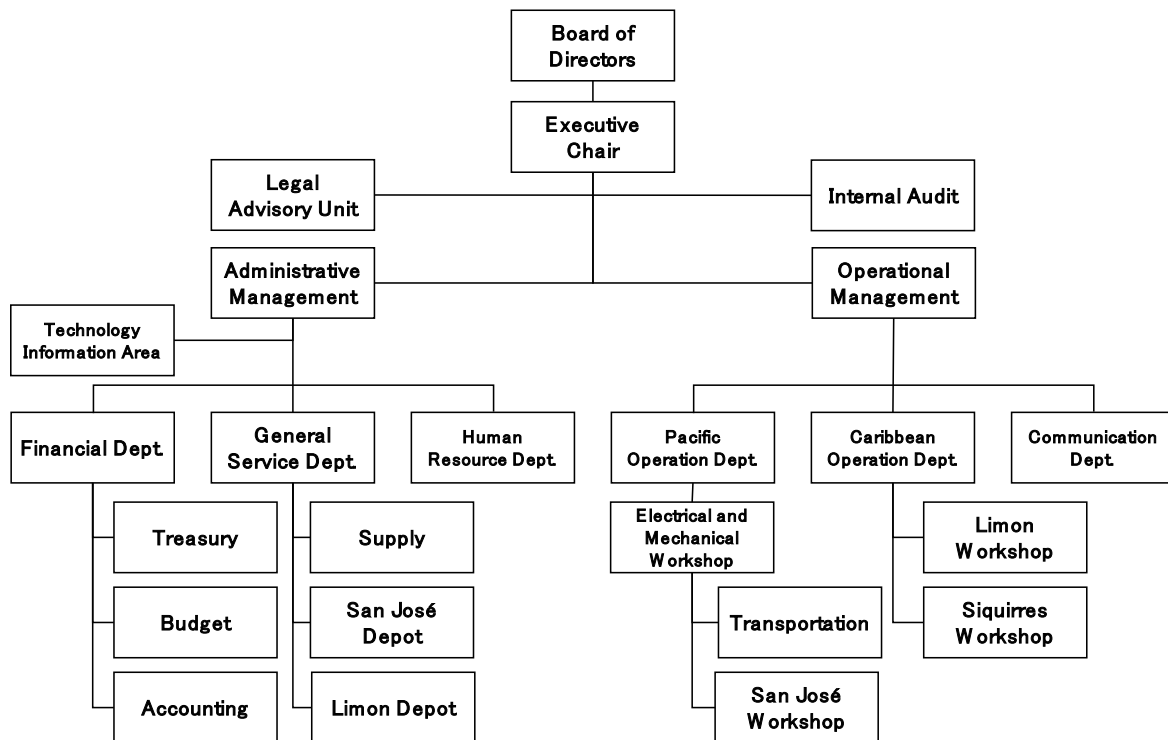
The technical standard of the American Railway Engineering and Maintenance-of-way Association (AREMA) has been applied. In addition, common technical standards for railway in Central America are being developed with CABEI's funds.

INCOFER has about 55 employees, and its organization chart is shown in Figure 5-54. The technical level of the staff is considered to be at a certain level due to the regular operation of trains and the ongoing improvement of track and other works. However, increasing staff and training will be necessary for further development of urban railway in the future.

Table 5-45 Summary of Provisions on Urban Railway in Decree No. 9366

Clause No.	Contents of Decree
Clause 3	Planning for an intercity electrified railway in the San Jose metropolitan area contribute to the public welfare.
Clause 4	With respect to the development of an intercity electrified railway in the San Jose Metropolitan Area, INCOFER can work with national and international public and private organizations, and INCOFER will take ownership of the project.
Clause 6	INCOFER is exempt from taxation with respect to contracts for the construction, operation, and maintenance of an intercity electrified railway in the San Jose Metropolitan Area.
Clause 7	Authorize INCOFER to invest in real estate to secure financing for the development of an intercity electrified railway in the San Jose Metropolitan Area.

Source: JICA Study Team based on Decree No. 9366 in Costa Rica



Source: JICA Study Team based on materials provided by INCOFER

Figure 5-54 Organization Chart of INCOFER

2) Current Situation of Urban Railway

a) Outline of Costa Rica's Railway

In Costa Rica, the railway opened in 1871 and was used to transport bananas and coffee beans. As mentioned above, INCOFER was established in 1985; however, train service was suspended between 1995 and 1998 due to its debt situation.

While Costa Rica had a railway network of 537 km before, trains are currently operated on only 168.5 km of track, 72.5 km in the San Jose Metropolitan Area and 96 km in the eastern Limón Province. Passenger trains operate in the San Jose Metropolitan Area, and freight and tourist trains are operated in Limón Province.



Source: JICA Study Team

Figure 5-55 Railway Network in Costa Rica

b) Outline of Urban Transportation in the San Jose Metropolitan Area

San Jose, the capital of Costa Rica, is surrounded by its satellite cities such as Alajuela and Cartago, and the metropolitan area has a population of nearly 3 million. This represents majority of the country's total population (5.09 million (World Bank, 2020)). Traffic congestion has become a serious social problem in recent years, partly because there is only one main road connecting San Jose and each of the satellite cities. The average speed of automobiles within the metropolitan area is about 14-15 km/h⁴⁵. Reports indicate that between 2014 and 2019, the average travel time for the same distance within the city has increased by about 40%. The economic loss due to traffic congestion in the San Jose Metropolitan Area is estimated to be as high as 3.8% of GDP.⁴⁶ Under these circumstances, the convenience of automobile traffic is low, with restrictions on entry into the city based on vehicle plate numbers as a countermeasure against traffic congestion.

In the San Jose Metropolitan Area, the modal share in 2017 was 42% for private cars, 41% for buses, 9% for taxis, 7% for motorcycles, and only 1% for railway⁴⁷. The share of public transportation (buses and railway) decreases to about two-thirds over the past 10 years since it was 64% in 2007⁴⁸. Buses are operated by several private operators, and there are several issues such as the complexity of the routes. Considering the population scale of the San Jose Metropolitan Area and the state of road traffic, it is desirable to develop a railway-based public transportation network.

⁴⁵ Green Climate Fund, 2021, "Funding Proposal for FP166: Light Rail Transit for the Greater Metropolitan Area (GAM)" and PEN-CONAE 2018

⁴⁶ MOPT, INCOFER, "TREN ELÉCTRICO DEL GRAN ÁREA METROPOLITANA"

⁴⁷ Green Climate Fund, 2021, "Funding Proposal for FP166: Light Rail Transit for the Greater Metropolitan Area (GAM)" and MINAE 2017

⁴⁸ Green Climate Fund, 2021, "Funding Proposal for FP166: Light Rail Transit for the Greater Metropolitan Area (GAM)" and L.C.R. Logística S.A., 2007



Source: The Costa Rica Times, 3 Apr. 2017 “The Problems of Living in San Jose, Costa Rica”



Photo: JICA Study Team

Figure 5-56 Traffic Congestion in San Jose

Figure 5-57 Bus Stop in the Center of San Jose

c) Outline of Railway in the San Jose Metropolitan Area

In the San Jose Metropolitan Area, three lines of railway are operated between San Jose and its satellite cities: Heredia-Alajuela, Cartago, and Belen. Route maps, railway specifications, and outline of each route are shown in the following figure and tables. The railway is basically single track and unelectrified. There are train-switching facilities at stations and between stations. Fares are determined by the Autoridad Reguladora de Los Servicios Públicos (ARESEP), which oversees the pricing of electricity and other utilities.

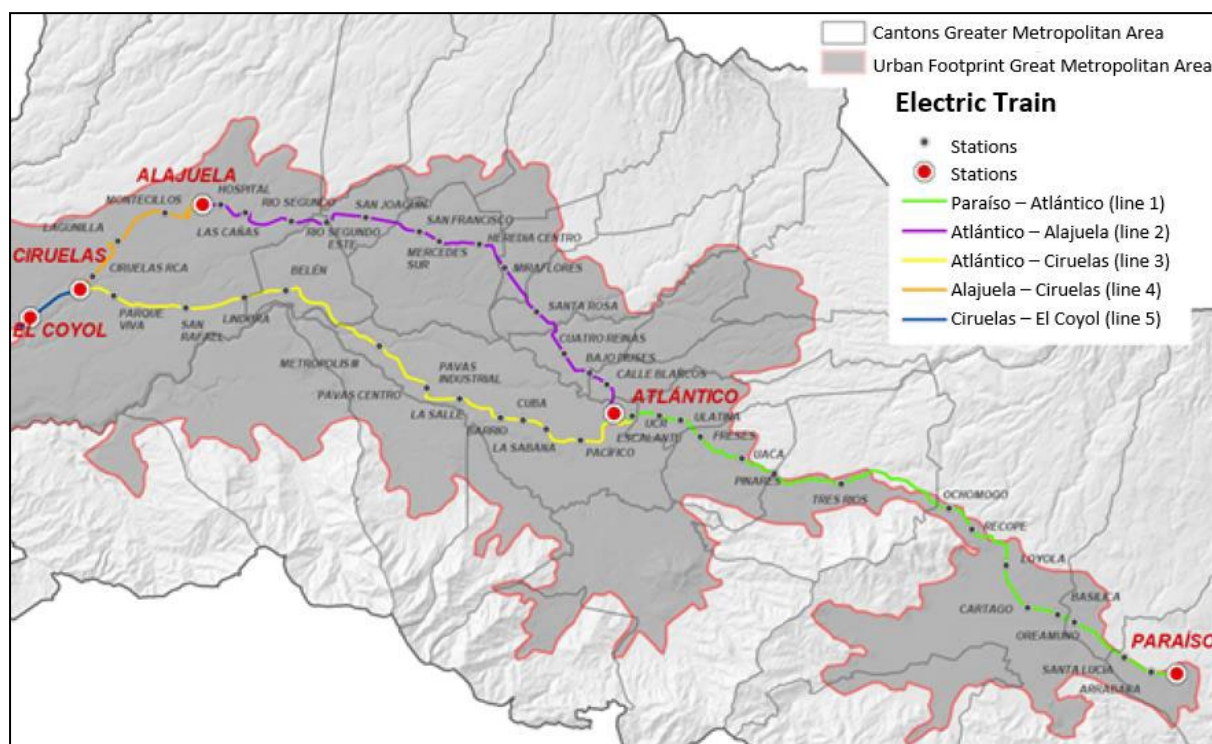
The line to Alajuela runs near San Jose International Airport (Juan Santamaria International Airport), and the nearest station, Bulevar Aeropuerto Station, is located about 1 km from the airport terminal building. The line from San Jose to Cartago has many stations near universities such as the University of Costa Rica and the University of Latina. Indeed, some stations are named after the universities. Some stations are not located in the center of town, such as Alajuela Station, which is about 1 km from the city center.

Although the right of way is basically secured, there are partial encroachments into the right of way (Figure 5-59).

Regarding the rolling stock, INCOFER owns 19 cars of Diesel Multiple Units (DMU) as shown in Figure 5-64, and they procured an additional 8 train sets consisting of 2 cars, i.e., total 16 cars are new DMUs which were manufactured by China Railway Rolling Stock Corporation Limited (CRRC) in 2021 (Figure 5-62). The purchase price was USD 32.6 million according to the Costa Rican presidential office, and the length of new cars is 38 m (about 19 m per car), with a capacity of 372 passengers per train set and a maximum speed of 70 km/h^{49,50}. It is estimated that they currently own 15~17 train sets since older trains are also operated in 2 ~ 4 cars per train set. Considering the development of an urban railway network of more than 70 km, it is necessary to increase the number of rolling stock.

⁴⁹ Railway Gazette International, 22 January 2021, “‘Modern, efficient and sustainable’ trains arrive in Costa Rica”

⁵⁰ Presidency of Costa Rica, 26 April 2021, “NEW TRAINS ARE ALREADY IN OPERATION”



Note: The legend in the figure shows Electric Train; however, the line is not electrified as of 2022. In addition, there are no train services west of Alajuela Station and west of Belen Station as of January 2023.

Source: INCOFER 2020, Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area

Figure 5-58 Railway Network in the San Jose Metropolitan Area

Table 5-46 Railway Specifications in the San Jose Metropolitan Area

Item	Details	Remarks
Gauge	1,067 mm	Narrow gauge, same as conventional lines in Japan
Minimum curve radius	70 m	
Steepest gradient	4%	
Axle load	16 ton	
Effective length of platform at station	50~150 m	It means that trains whose lengths are 50~150 m can pass each other.
Train set	2 or 4 cars per train set	

Source: JICA Study Team based on materials provided by INCOFER

Table 5-47 Outline of Each Route in the San Jose Metropolitan Area

Route	Route length	Number of stations (including San Jose Station)	Travel time	Fare	Number of trains in service	
					Per day	Peak time
San Jose ~ Heredia ~ Alajuela	27.4 km	11 stations	20~30 min (San Jose ~ Heredia), 50~60 min (San Jose ~ Alajuela)	CRC 420 (San Jose ~ Heredia), CRC 585 (Heredia ~ Alajuela)	23 trains	4 ~ 5 trains
San Jose ~ Cartago ~ Paraiso	21.6 km	9 stations	45 ~ 55 min (San Jose ~ Cartago)	CRC 550 (San Jose ~ Cartago)	14 trains	2 ~ 3 trains

Route	Route length	Number of stations (including San Jose Station)	Travel time	Fare	Number of trains in service	
					Per day	Peak time
San Jose ~ Belen	23.5 km	12 stations	25 ~ 35 min (San Jose ~ Belen)	CRC 330 (San Jose ~ Belen)	10 trains	2 trains

Note: The table shows a new fare system announced on 18 January 2023.

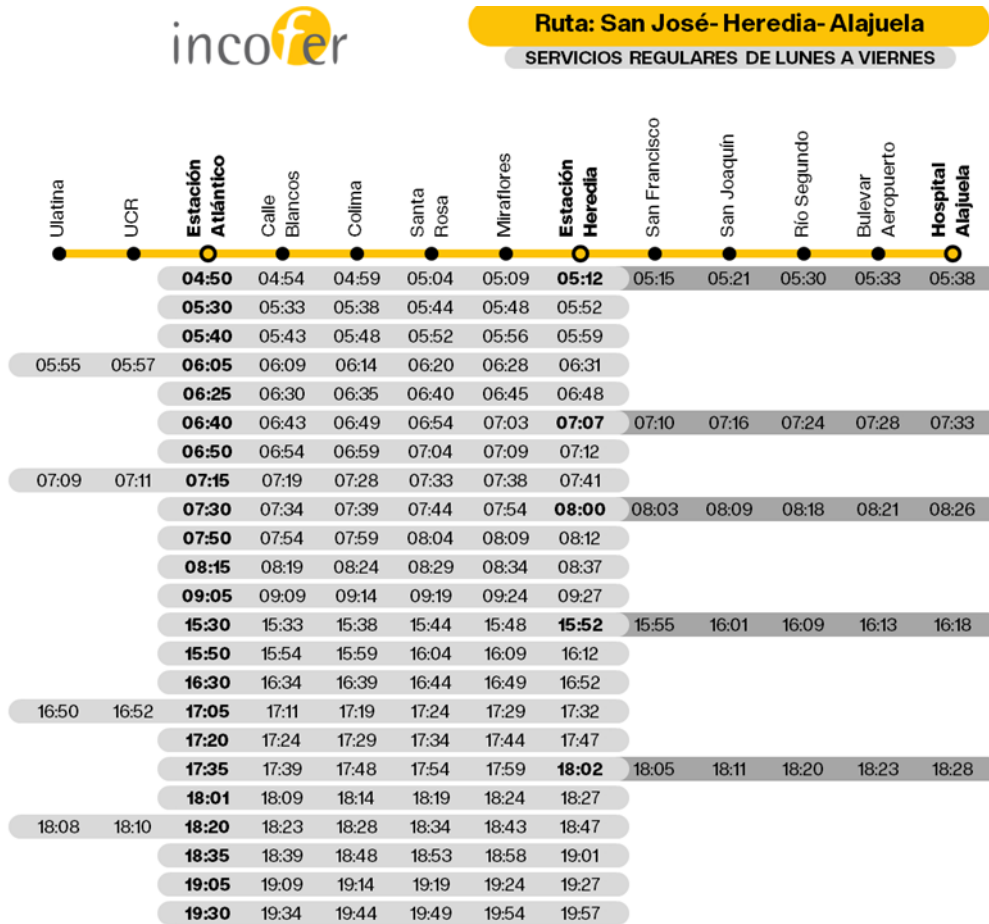
Source: JICA Study Team based on INCOFER website



Source : INCOFER 2020, Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area

Figure 5-59 Example of Encroachment into Right-of-Way

As an example of the train schedule, the following figure shows the timetable of the most frequent train route, from San Jose to Heredia and Alajuela. While trains are operated only during morning and evening commuting hours with three trains per hour during the rush hours of 17:00 and 18:00, there are no trains during the daytime (10:00 to 14:00) and at night (after 20:00). In addition, trains are only operated on weekdays from Monday through Friday and are suspended on weekends and holidays. These trends are similar on other routes. In the future, it is necessary to increase the frequency of train operations, including during the daytime and nighttime, in order to increase the ridership by enhancing convenience. Furthermore, there are cases where trains wait several minutes between stations to wait for the passing of train due to single track. It is considered that the travel time can be further reduced by increasing the number of passing facilities or by using double track.



Note: Atlantico Station is the San Jose Station

Source : INCOFER

Figure 5-60 Train Timetable from San Jose to Heredia / Alajuela

The following photos were taken when a member of the JICA Study Team visited Costa Rica in March 2022 and took the urban rail in San Jose.

When the JICA Study Team members took the train on a weekday morning in April 2022, it was observed that many passengers got off the train from Cartago and passengers heading to Cartago waited in line to board at the Atlantico Station, near the center of San Jose. The seats of the train from San Jose to Cartago which was heading in the opposite direction of the city center, were almost occupied with passengers. Hence, although train service is limited, it can be assumed that the trains are used to a certain extent as a means of transportation within the urban area. The train was generally operated on schedule.

Although the track is maintained and repaired by INCOFER, there is room for improvement in the condition of the track as shown in Figure 5-64, as some sections lack sleeper trees. There are some sections where the track is installed on the road, such as the section between Atlantico and Pacifico Stations in central San Jose (Figure 5-67). If the frequency of service and the number of trains are increased, it is desirable to change from combined track to dedicated track. In addition, the San Jose-Cartago route has sections through mountainous areas as shown in Figure 5-68, with cutting and embankment. Some sections are not protected with gabion, and there is a risk of erosion of the track due to rainfall and damage to the track and rolling stock due to landslides.

Several stations, such as San Jose Atlantico Station and Cartago Station, have bus stops nearby and thus are designed to make the railway station a transportation node.

There are few advertisements inside the trains and at stations, and there are even a few stores inside the stations. While there is room to expand the non-rail business that Japanese and other countries' railway operators are engaged in, the expected revenue is limited, given the current low frequency of operations. It would be desirable to implement the non-rail business in conjunction with measures to improve service levels, such as increasing the number of trains in operation.



Photo : JICA Study Team

Figure 5-61 San Jose Atlantico Station



Photo : JICA Study Team

Figure 5-62 Cartago Station



Photo : JICA Study Team

Figure 5-63 Station Plaza of the San Jose Atlantico Station



Photo : JICA Study Team

Figure 5-64 Passenger Train



Photo : JICA Study Team

Figure 5-65 Inside of Train



Photo : JICA Study Team

Figure 5-66 Track of San Jose Urban Railway



Photo : JICA Study Team

Figure 5-67 Combined Track with Road



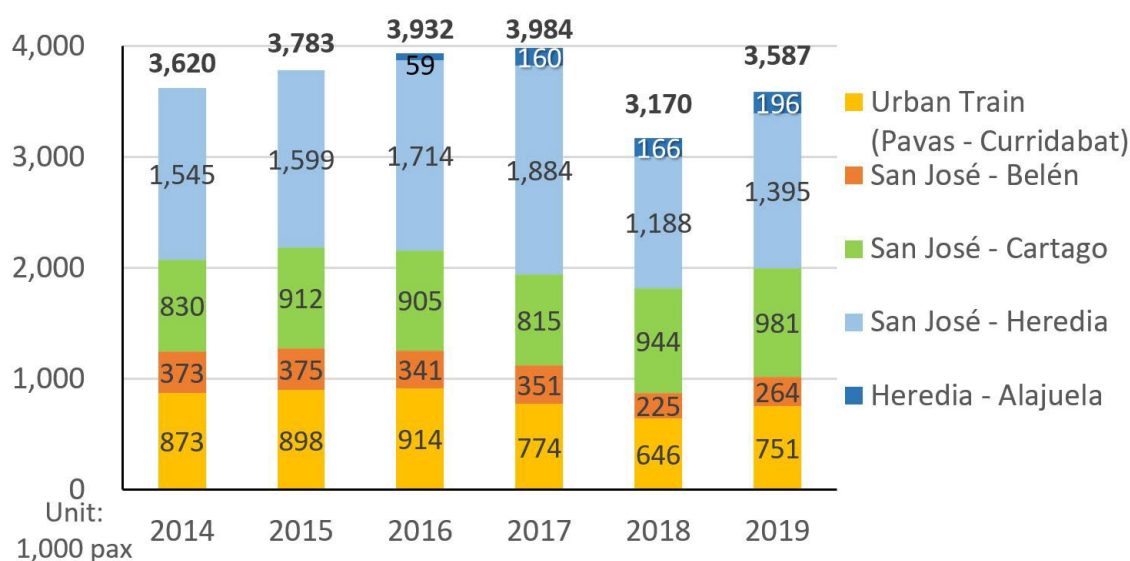
Photo : JICA Study Team

Figure 5-68 Embankment Section between San Jose and Cartago

d) Ridership

Changes in the ridership of the San Jose Urban Railway are shown in the figure below. Although the most recent data could not be found, the number of users has remained around 3 million.⁵¹ After 2019, there have been impacts of COVID-19 (According to the Preliminary Study, measures such as reduced service and limited passenger capacity were taken), as well as the purchase of new rolling stock and other track and platform improvements. Therefore, it is necessary to confirm the number of passengers in 2022 to understand the changes in the number of passengers. The target numbers of passengers in 2022 are available on the INCOFER website and are shown in the table below. Both data show that the San Jose - Heredia and San Jose - Cartago routes are heavily used. On the other hand, the Heredia - Alajuela route has a low frequency of service, so it is possible that increasing the frequency of service would further increase the ridership.

⁵¹ For reference, compared to cities with similarly sized metropolitan area populations, the Sapporo Municipal Subway with an operating length of 48 km has a ridership of 230 million (2018), and the Fukuoka City Subway with an operating length of 29.8 km has a ridership of 171 million (source: Japan Subway Association website).



Note: "Urban Train" refers to the partial section of the San Jose to Belen line and San Jose to Cartago line

Source: JICA Study Team based on "INCOFER, Informe Final de Gestion 2018" and materials provided by INCOFER

Figure 5-69 Changes in Ridership of San Jose Urban Railway

Table 5-48 Target Ridership in 2022

Route	Number of target ridership
Pavas – Curridabat	707,315
San Jose - Belen	377,055
San Jose - Heredia	1,694,665
San Jose - Cartago	1,362,935
Herdia - Alajuela	183,995
Total	4,325,965

Source: JICA Study Team based on INCOFER, PLAN OPERATIVO INSTITUCIONAL 2022

e) Financial Conditions

Regarding the financial condition of INCOFER, the annual balance reports for 2020 and 2021 are shown below. Both years show a deficit of approximately CRC 4.5 billion. Among the income, "Sales of Goods and Services" is considered income from the railway business, which is about CRC 1.2 billion. INCOFER also leases assets (perhaps real estate), and it can be confirmed that it earns about the same amount of rental income as it does from the railway business. On the other hand, there are no revenues from other non-railway business such as advertising.

Expenses required for the railway business are considered "Operating Expenses" and are approximately CRC 8 billion. Currently, it can be confirmed that operating expenses are not covered by fare revenues. Although it is not easy to make the urban railway business profitable due to low fares and other factors, it is necessary to increase the number of users by improving the service level and to increase revenues by strengthening the non-railway business.

Table 5-49 Balance of INCOFER in 2020 and 2021

Item	2020 (CRC)	2021 (CRC)
INCOME		
INCOME AND POSITIVE RESULTS FROM SALES	1,207,141,613.24	1,139,299,581.35
SALES OF GOODS AND SERVICES	1,207,141,613.24	1,139,299,581.35
PROPERTY INCOME	934,955,420.04	917,349,902.76
RENTS AND RIGHTS ON ASSETS	934,955,420.04	917,349,902.76
TRANSFERS	1,354,017,247.64	2,002,663,232.14
CURRENT TRANSFERS	1,354,017,247.64	2,002,663,232.14
OTHER INCOME	116,529,346.53	68,362,043.73
POSITIVE RESULTS BY OWNERSHIP AND BY EXPOSURE	110,218,217.18	65,292,228.41
OTHER INCOME AND POSITIVE RESULTS	6,311,129.35	3,069,815.32
TOTAL INCOME	3,612,643,627.45	4,127,674,759.98
COSTS		
OPERATING EXPENSES	7,843,744,799.32	8,372,923,342.33
PERSONNEL EXPENSES	1,052,984,507.63	1,051,025,959.63
SERVICES	3,510,682,634.24	3,196,726,037.63
MATERIALS AND SUPPLIES CONSUMED	609,128,618.46	718,113,805.66
CONSUMPTION OF GOODS OTHER THAN INVENTORIES	2,593,158,996.67	3,003,157,174.84
LOSSES DUE TO IMPAIRMENT AND DEVALUATION OF ASSETS	3,966,684.81	350,306,219.68
IMPAIRMENT AND LOSS OF INVENTORIES	25,624,200.40	11,353,054.34
IMPAIRMENT OF INVESTMENTS AND ACCOUNTS RECEIVABLE	48,199,157.11	42,241,090.55
FINANCIAL EXPENSES	44,654.00	499,245.97
OTHER FINANCIAL EXPENSES	44,654.00	499,245.97
TRANSFERS	23,326,100.77	45,335,237.06
CURRENT TRANSFERS	23,326,100.77	45,335,237.06
OTHER EXPENSES	324,232,454.84	134,727,311.28
NEGATIVE RESULTS DUE TO HOLDING AND EXPOSURE	90,457,619.90	45,097,561.98
OTHER EXPENSES AND NEGATIVE RESULTS	233,774,834.94	89,629,749.30
TOTAL SPENDS	8,191,348,008.93	8,553,485,136.64
Savings and/or Dissavings for the Period	-4,578,704,381.48	-4,425,810,376.66

Source: INCOFER

Fare revenues by route are shown in the table below, as the revenues for April-June 2022 are available in the INCOFER's audit report. Although not disaggregated by route, sections between San Jose and Heredia, and between San Jose and Cartago have high ridership and fare revenue. In addition, INCOFER also offers electronic payment through a smartphone app, and it can be confirmed that revenues from electronic payments also account for 20-30% of total revenues. Electronic payment is expected to remain effective as it improves convenience for users and reduces the burden on station staff. However, as QR code readers are not currently installed in the stations, the tickets are assumed to be inspected by station staff and conductors as they do for paper tickets. There is room for further considerations of the ticketing system such as using QR code readers or introducing IC card or credit card touch functions, to prepare for future increases in the number of users. The table below does not specify the origin and destination of passengers who use electronic payment. Big data, such as boarding and alighting data, and attribute data of app users (place of residence, age, and the like) can be used to examine the operation plan and so forth, and are expected to be utilized more.

Table 5-50 Fare Revenue of San Jose Urban Railway from April to June 2022

Route	April, 2022	May, 2022	June, 2022	Average	Annual basis
San Jose – Belen	1,965,480	556,920	-	1,261,200	15,134,400
San Jose – Heredia	15,441,300	22,356,795	22,611,540	20,136,545	241,638,540
Heredia - Alajuela	3,471,390	4,854,595	4,045,860	4,123,948	49,487,380
U-Latina – Heredia	1,524,950	2,057,580	2,160,620	1,914,383	22,972,600
San Jose – Metropolis	3,981,920	5,996,640	6,188,160	5,388,907	64,666,880
San Jose – CFIA	159,840	308,690	217,920	228,817	2,745,800
CFIA – Metropolis	2,921,340	4,776,710	4,492,320	4,063,457	48,761,480
San Jose - Cartago	19,907,910	28,013,335	32,776,700	26,899,315	322,791,780
Sub total	49,374,130	68,921,265	72,493,120	63,596,172	763,154,060
Previous month	1,866,620	1,755,965	1,845,095	1,822,560	21,870,720
Total	51,240,750	70,677,230	74,338,215	65,418,732	785,024,780
Electronic payment	17,800,477	26,643,206	28,280,946	24,241,543	290,898,516
Electronic payment (previous month)	1,223,188	1,124,791	1,357,414	1,235,131	14,821,572
Grand total	70,264,415	98,445,227	103,976,575	90,895,406	1,090,744,868

Currency unit: CRC

Source : JICA Study Team based on INCOFER, 2022, INFORME DE CONTROL INTERNO RELACIONADO CON LOS INGRESOS POR VENTA DE BOLETOS PRODUCTO DEL SERVICIO DE TREN DE PASAJEROS EN EL GRAN AREA METROPOLITANA PARA EL PRIMER SEGUNDO TRIMESTRE DE 2022.

3) Existing Plans and Supports by Development Partners

a) National Transportation Plan

In Costa Rica, the National Transportation Plan (Plan Nacional de Transporte 2011-2035) was formulated and various proposals for improving the transportation sector were made, with a target year of 2035. The plan has seven action plans, the sixth of which states the "creation of a new and competitive railway system". The plan lists the sections to be developed which include the San Jose Urban Railway.

b) National Decarbonization Plan

Towards achieving carbon neutrality, the National Decarbonization Plan (Plan Nacional de Descarbonización) was announced in 2019 (see the Green Economy chapter of this report for more information on the National Decarbonization Plan in Costa Rica). The plan also mentions the development of railway since the transportation sector is responsible for 42% of greenhouse gas emissions.

The first of the ten key axis that make up the plan, "Development of a mobility system based on safe, efficient, and renewable public transportation and an active, shareable mobility system," proposes the development of an electrified railway system in the San Jose Metropolitan Area.

Thus, the development of urban railway is considered important from a carbon neutral perspective.

c) Railway Master Plan

Costa Rica's Railway Master Plan was presented in November 2022. The master plan was formulated with the support of the Republic of Korea, and a Korean consultant conducted the study. The master plan focuses mainly on intercity freight railway, but also mentions passenger railway in the San Jose Metropolitan Area, with 84.7 km of lines proposed as urban railway routes. This would be considered as an 84-km urban railway line by rehabilitating extended sections of the existing urban railway route, and not a new development.

In addition, Figure 5-71 shows the specifications of the railway after the rehabilitation, and standard gauge is proposed including the section in the San Jose Metropolitan Area. It can be assumed from the master plan that the freight railway is envisioned to connect to a section of the San Jose Metropolitan Area. In this case, specifications such as axle load, minimum curve radius, and construction gauge should take freight railway into consideration.



Source: INCOFER

Figure 5-70 Railway Master Plan in Costa Rica -1



Source: INCOFER

Figure 5-71 Railway Master Plan in Costa Rica -2

d) Urban Railway Project in San Jose Metropolitan Area

Urban railway projects in the San Jose Metropolitan Area, known as Tren Rapido Pasajeros (TRP) or Tren Electrico, have been the subject of various studies. A representative and most recent example is the study funded by CABEI and completed in January 2020 (hereafter referred to as the "2020 CABEI Study"). This is a feasibility study of urban railway in San Jose and entitled "Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area". The study included a detailed survey such as topographic and geologic survey.

A summary of the study results is shown in the table below.

Table 5-51 Summary of Study on Urban Railway in the San Jose Metropolitan Area (2020 CABEI Study)

Item	Article
Route length	84 km (total of 5 routes) - double track
Number of stations	46 stations (14 of these stations are proposed as transportation nodes)
Gauge	1,435 mm (standard gauge the same as Japan's Shinkansen and most railways in North America, Europe, and China.)
Minimum curve radius	30 m (however, 25 m in the depot)
Steepest gradient	70‰
Structure	In principle, the section is at grade, with some elevated and bridge sections (2.7 km) and open-cut tunnel sections (1.3 km).
Number of depot	4 locations (Paraiso, Pacifico (San Jose), Ciruelas, Las Canas). Among these, rolling stock is overhauled at the Las Canas Depot.
Train headway	5 to 40 minutes headway. Also operates on weekends and holidays.
Passenger transportation	200,000 people per day
Number of trains required	78 train sets. 5-car articulated LRT type train with a capacity of 600 passengers.
Maximum speed (Operating speed)	Urban area: 25 km/h, Semi-urban area: 50 km/h, Suburb: 70 km/h
Electrification	DC 1,500 V and overhead contact line system
Total CAPEX	USD 1,372 million (includes survey and design, utility relocation, and environment-related costs. Land acquisition and other costs are not included. Tentatively, USD 66 million (5% of CAPEX) is accounted separately.)

Source: JICA Study Team based on INCOFER, 2020, Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area



Note: San Jose Station is Atlantico Station and Pacifico Station

Source: INCOFER, 2020, Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area

Figure 5-72 Lines and Stations of San Jose Urban Railway

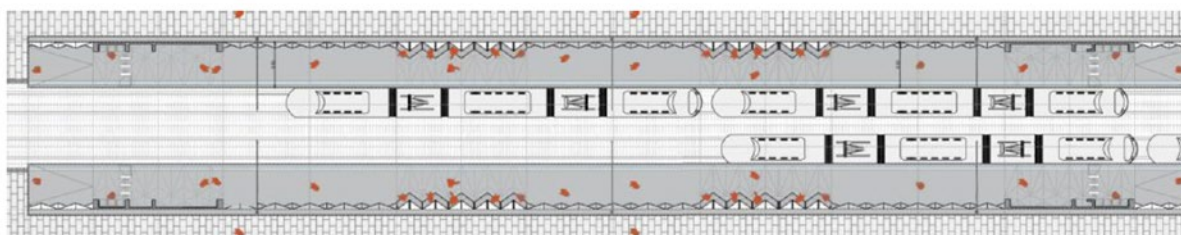


Figure 11: Floor Plan for Station type

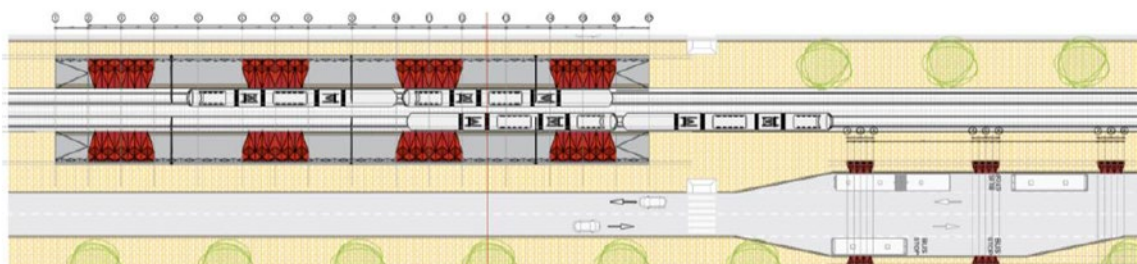


Figure 12: Intermodal station type plan

Source: INCOFER, 2020, Studies for the Technical, Economic-Financial, Environmental, Vulnerability & Social Feasibility for the Construction, Equipment, Test & Commissioning, Operation and Maintenance under Works Concession with Public Service of the Passenger Rapid Train in the Great Metropolitan Area

Figure 5-73 Example of Station Layout

e) Other Trends about Urban Railway in the San Jose Metropolitan Area

CABEI announced in October 2019 that it would provide financing up to USD 550 million for urban railway development in San Jose.⁵² The aforementioned “2020 CABEI Study” was completed, but no specific progress toward implementation has been confirmed, presumably due to the COVID-19 pandemic.

Subsequently, the Green Climate Fund (GCF) decided in July 2021 to grant CABEI a loan of USD 250 million and a donation of USD 21.3 million for an urban railway (LRT) in the San Jose Metropolitan Area.⁵³ According to the GCF report, the total project cost was USD 1,873 million, with the remaining to be financed by loans from other institutions or through self-financing. Out of the aforementioned USD 550 million, USD 250 million will be allocated from this GCF.

The GCF funds will also be used to increase the use of non-motorized transportation (NMT), including the development of a 16 km long bicycle lane, in addition to the development of an urban rail system (assumed to be LRT). The urban railway envisioned to be developed with GCF support has five lines with a total length of approximately 85 km and 46 stations, which is consistent with the aforementioned “2020 CABEI Study”.

Although various efforts abovementioned are underway to develop the San Jose urban railway, including the decision on financing, feasibility study, and completion of the railway master plan

⁵² CABEI, 2019, “CABEI approves US\$550.0 million for the rapid passenger train of the Greater Metropolitan Area of Costa Rica”

⁵³ GCF, 2021, FP166, Light Rail Transit for the Greater Metropolitan Area (GAM)

formulation study as of January 2023, no major improvement projects have been implemented, except for the introduction of new rolling stock.

In May 2022, Costa Rica experienced a change of government. After the new administration took office, a series of plans for the San Jose Urban Railway was reviewed. According to local media reports, the Costa Rican government is considering proceeding with the first phase of a single-track, elevated improvement project limited to the San José-Cartago-Paraiso section⁵⁴. In this case, the government expects the project cost to be USD 500-600 million.

(2) Development and Cooperation Scenario

1) Development Scenarios

a) Development Agenda and Strategy

Strategies to improve the current situation and challenges of economic infrastructure (Transportation (Urban railway)) in Costa Rica are summarized in the table below.

Table 5-52 Strategies of Transport Sector in Costa Rica

Target	Strategy	Details
Transport Costa Rica	1. Rehabilitation of railway infrastructure, doubling track, and elimination of combined tracks	Repair and reinforce existing urban rail track and other infrastructure to increase speed, ensure safety, and overcome vulnerability to disasters. In addition, increase the number of passing facilities and eventually using double track for the line to increase operating frequency and shorten travel time. For sections with combined track, increase speed and reduce the risk of traffic accidents with automobiles and pedestrians by elevating or making the railway underground.
	2. Increase in number of rolling stocks	Proceed with procurement of more rolling stocks to increase the frequency of operations.
	3. Improvement of public transportation convenience through improvement of public transportation network and promotion of TOD	Improve the overall convenience of public transportation by enhancing the connectivity with buses. In addition, promote transit oriented development (TOD) and aim for urban planning with easy access to public transportation.

Source: JICA Study Team

b) Program and Project

The following table shows the programs and projects that the government should implement to address the issues.

Table 5-53 Program and Projects Proposed to be Carried out in Costa Rica

Target	Strategy	Program / Project	Term
Transport Costa Rica	1 Rehabilitation of railway infrastructure, doubling track, and elimination of combined tracks	1-1 Information Collection Study on Potential Japan's Cooperation in Urban Railway Sector	Short
		1-2 Knowledge Co-creation Program in Urban Transportation and Railway	Short
		1-3 San Jose Urban Railway Line 1 (San Jose ~ Cartago ~ Paraiso) Improvement Project	Medium
		1-4 San Jose Urban Railway Line 2 (San Jose ~ Alajuela) Improvement Project	Long
		1-5 San Jose Urban Railway Line 3 (San Jose ~ Belen) Improvement Project	Long
		1-6 San Jose Urban Railway Line 4 (Alajuela ~ Ciruelas) Improvement Project	Long
		1-7 San Jose Urban Railway Line 5 (Ciruelas ~ El Coyol) Improvement Project	Long

⁵⁴ CRHoy, 14 February 2023, Incofer deberá convencer a Chaves de que modernización del tren en la GAM es viable

Target	Strategy	Program / Project	Term
	2 Increase in number of rolling stocks	2-1 Transfer of Japanese Used Rolling Stock	Short
		2-2 Support for Procurement of Battery Train	Medium
	3 Improvement of public transportation convenience through improvement of public transportation network and promotion of TOD	3-1 Reorganization and Convenience Improvement Projects for Buses in San Jose	Long
		3-2 Assistance for MaaS Implementation in San Jose	Medium
		3-3 Project for Promotion of Transit Oriented Development (TOD) in San Jose	Medium

Note: Short: 2023~2025, Medium: 2023~2027, Long: 2023~2032

Source: JICA Study Team

2) Cooperation Scenario

To select between programs and projects on which are suitable for JICA's cooperation, the criteria listed in the following table were established. The development of railway can contribute to improving the vehicle-dependent urban environment. In addition, the development of public transportation can improve accessibility to vocational and educational opportunities, and daily services for low and middle-income people; thus, it contributes to the improvement of disparity. Therefore, cooperation in the urban railway sector is consistent with Japan's cooperation policy.

Based on the table below, it is recommended that i) ODA loan, and ii) Technical cooperation are the preferred modalities when developing a cooperation scenario in Costa Rica. In addition, since Costa Rica is a country in transition to graduation from ODA, it is important to consider public finance other than JICA, such as the Joint Crediting Mechanism (JCM) and the Japan Bank for International Cooperation (JBIC) in terms of modality. For example, JBIC announced in November 2018 that it will establish a credit line totaling USD 100 million for CABEI.⁵⁵ This credit line is part of the Global Action for Reconciling Economic Growth and Environmental Preservation (GREEN) and targets energy projects in Central American countries. This initiative is a useful reference for considering the financing of priority projects.

Table 5-54 Criteria of Selection of Program/Project (Costa Rica)

Criteria	Description
(1) Compatibility with Japan's Country-wise Development Cooperation Policy	The "Country Development Cooperation Policy for Costa Rica" sets "Support for sustainable development with a focus on the environmental sector" as its major goal, and identifies i) Preservation of environmental, and ii) Correction of disparities as priority areas. In addition, the "Business Development Plan for the Republic of Costa Rica" considers CO ₂ and exhaust gas pollution in the transportation sector to be an issue, and states the need to improve the urban environment, such as by increasing railway transportation capacity.
(2) Compatibility with JICA's Global Agenda	JICA's global agenda for the transportation sector is "Toward a world where all people and things can move safely and freely", and its cooperation policies include "Road Asset Management" and "Promotion of Urban Public Transportation". In addition, the global agenda for the urban and regional development sector includes "strengthening urban management".
(3) Modality Applicable in Costa Rica	Costa Rica's GNI per person is USD 12,310 (WB, 2021), which classifies it as an upper-middle-income country on the DAC list. Therefore, grant aid is limited to cooperation by international development institution, and Economic and Social Development Plan, and priority is given to the application of ODA loan and technical cooperation.

Source: JICA Study Team based on the material of Ministry of Foreign Affairs of Japan and JICA

Based on these Criteria of Selection, JICA Study Team selected the priority programs/projects as shown in following table.

⁵⁵ Japan Bank for International Cooperation, Inc. press release, "Establishment of Second Credit Line to the Central American Economic Integration Bank under the Global Environmental Preservation Operations", on November 18, 2018

Table 5-55 Prioritized Programs/Projects in Costa Rica

Target	Strategy	Program/Project	Modality	Term	Implementation Agency
Transport Costa Rica	Rehabilitation of railway infrastructure, doubling track, and elimination of combined tracks	1-1 Information Collection Study on Potential Japan's Cooperation in Urban Railway Sector	Survey (Technical Cooperation)	Short	INCOFER
		1-2 Knowledge Co-creation Program in Urban Transportation and Railway	Knowledge Co-Creation Program	Short	INCOFER
		1-3 San Jose Urban Railway Line 1 (San Jose ~ Cartago ~ Paraiso) Improvement Project	ODA loan	Medium	INCOFER
	Increase in number of rolling stocks	2-1 Transfer of Japanese Used Rolling Stock	Requires consideration	Short	INCOFER
		2-2 Support for Procurement of Battery Train	ODA loan and others	Medium	INCOFER
	Improvement of public transportation convenience through improvement of public transportation network and promotion of TOD	3-2 Assistance for MaaS Implementation in San Jose	Technical Cooperation	Medium	INCOFER
		3-3 Project for Promotion of Transit Oriented Development (TOD) in San Jose	Technical Cooperation	Medium	MOPT, Municipal of San Jose

Note: Short: 2023~2025, Medium: 2023~2027, Long: 2023~2032

Source: JICA Study Team

a) 1-1 Information Collection and Verification Survey on Japan's Cooperation Potential in Urban Railway Sector

With regard to the railway in Costa Rica, while JICA has conducted a master plan study in the field of logistics, there has been no JICA cooperation in recent years in the field of passenger railway, including urban railway. Although this report proposes potential projects for cooperation by Japan, it is recommended to conduct an information collection and confirmation survey first to update the contents of this report since it is necessary to confirm the needs of local governments such as INCOFER. In addition, there are many cities in Central American countries that do not have urban railway or are considered to have room for expansion or improvement, and it is estimated that there are needs for Japan's cooperation in other countries as well. Therefore, in addition to San Jose, it would be a good idea to conduct this project together with other Central American cities (including Guatemala City, which has the largest population among Central American cities, San Pedro Sula, which, like San Jose, has a railway with the same gauge as Japan, and Santo Domingo, where cooperation in the urban transportation field is being coordinated, are also possible candidates). As a similar example, JICA conducted an "Information Collection Study on the Improvement of Urban Transport Using Conventional Railways in Africa". In this survey, urban railways in several cities, such as Dar es Salaam in Tanzania, Nairobi in Kenya, Kinshasa in the Democratic Republic of Congo, and Maputo in Mozambique, are also studied.

b) 1-2 Knowledge Co-Creation Program in Urban Transportation and Railway

In recent years, cooperation in the fields of railway and mobility has been increasing in the Central American and Caribbean region, led by Panama, where the construction of Metro Line 3 is underway. While the needs and interests of local governments are high, and the formation of projects in this field

is expected to continue, there are not many opportunities for local government officials to learn about Japan's technology and know-how. Therefore, it is proposed to conduct a Knowledge Co-Creation Program on Urban Transportation, including urban railway, mobility, TOD, etc., in order to clarify local issues and needs, to promote common understanding between Japan and Costa Rica, and to introduce Japan's practices and technologies in the field of urban transportation.

Through this training, it is expected that Japan's potential for cooperation in the field of urban transportation and urban railway will become more concrete, and connections with the local government will also be established.

Since the training will be conducted in Spanish, it is assumed that other Latin American Spanish-speaking countries will also be targeted.

c) 1-3 San Jose Urban Railway Line 1 (San Jose ~ Cartago ~ Paraiso) Improvement Project

The project will improve the track, alignment, and E&M system such as signaling for the section of Line 1 that is currently designated as a priority route by the government. This project aims to increase train speed and frequency and improve convenience. In implementing the project, it is necessary to consider the structure (elevated or above-ground) and whether double-tracking will be required.

It is desirable to study various financing options such as using CABI or GCF funds for the infrastructure part and Japan's funds for the procurement of rolling stock.

d) 2-1 Transfer of Japanese Used Rolling Stock

Increasing the number of rolling stocks is expected to increase the frequency of train service and improve the convenience of urban railway. Since Costa Rica's railway has the same gauge as Japan's 1,067 mm, the transfer of used railcars from Japan is considered an effective measure. However, in addition to the gauge, other technical conditions, such as construction gauge (size of the cars) and axle load, must also be considered. For example, the locomotive owned by INCOFER (figure below) has a train width of 2,743 mm, which is smaller than that of conventional railways in Japan Railway (2,950 mm). According to the data, the width of the new model made by CRRC is 2,900 mm. As shown in Table 5-56 below, the width of rolling stock in Japan ranges from 2,700 to 2,950 mm; therefore, it is necessary to consider the possibility of introducing these rolling stocks to Costa Rica after checking the dimensions of the cars and the construction gauge of railway in Costa Rica (especially at stations). It is also necessary to consider the cost allocation when transferring the cars and the details of maintenance support service.



Source: INCOFER

Figure 5-74 Specifications of Rolling Stock Used in INCOFER






e) 2-2 Procurement Assistance for Battery-powered Electric Railcar

Costa Rica is committed to carbon neutrality and is proposing to electrify its currently non-electrified railway. However, electrification requires the construction of substation facilities, overhead wires, and other electrical facilities, and thus the investment becomes large. Therefore, even if electrification takes place, it is expected to take time. In addition, since a new DMU was just procured in 2021, DMU is expected to continue to play the primary role on passenger railway in the future.

On the other hand, in recent years, conventional DMUs have been replaced by a rolling stock that is powered by batteries and emits less exhaust gases (Example of Japan is shown in Table 5-56). These train cars are considered more consistent with the policy in Costa Rica. Since many of these rolling stocks have been introduced in recent years, financial and technical assistance for new procurement is a possible cooperation scenario rather than the transfer of used rolling stock.

Table 5-57 shows examples of battery storage vehicles in countries other than Japan. Battery train manufactured by major rolling stock manufacturers in each country will be in service (scheduled) from 2022 to 2023. Therefore, Japan is ahead of other countries in terms of technologies such as diesel hybrid vehicles and battery storage vehicles, which have been in operation since 2007, and Japan has a strong advantage in these technologies because of their number of years in service and other achievements.



Table 5-56 Example of Diesel Multiple Units and Battery Powered Railcar in Japan

Type	Diesel Multiple Unit	Diesel Hybrid Car	Electrical Diesel Multiple Unit	Battery Powered Electric Car	Hydrogen Hybrid Car
Example of railcar model	Kiha 120 series	Kiha E200 series	GV-E400 series	BEC819 series DENCHA	FV-E991 series HYBARI
Photo					
Railway company and manufacturer	JR West / Niigata Transys	JR East / J-Trec (Manufacturer of hybrid system is Hitachi)	JR East (Kawasaki)	JR Kyusyu / Hitachi	JR East / J-Trec
Start of operation	1992	2007	2019	2016	2022 (Started demonstration experiment)
Width	2,700 - 2,800 mm	2,920 mm	2,800 mm	2,950 mm	Unclear
Comments by JICA Study Team	Due to the small width of the rolling stock, it is likely to be able to be introduced even when the construction gauge is small.	It has better environmental performance than a typical DMU since it is a hybrid vehicle.	Due to the recent year of introduction, it would be difficult to transfer cars as a used rolling stock anytime soon.	Since charging facilities are required for electrified sections, investments including infrastructure are needed.	Since JR East has just started a demonstration test in March 2022, immediate deployment in other countries is expected to be difficult. Infrastructure such as hydrogen storage facilities will also be needed.

Note: Current name is used for the name of manufacturer

Source: JICA Study Team based on the materials provided by JR East, JR West, JR Kyusyu, and Internet

Table 5-57 Trend of Battery Train of Countries Other than Japan

Country	France	Germany	China
Outline	Bombardier (now Alstom after the merger) announced that it will supply battery-powered vehicles for SNCF's regional fleet, which is expected to be in service in 2023.	Siemens announced that the Mireo Plus B battery storage vehicle will be in service on German routes by December 2023.	CRRC has signed contracts to manufacture and supply battery storage vehicles in Argentina and Thailand. The Argentine rolling stock is expected to be in service in 2024. The locomotives for Thailand were delivered in August 2022.
Photo	N/A		

Source: JICA Study Team based on Bombardier, Siemens and Internet

f) 3-2 Assistance for MaaS Implementation in San Jose

The project aims to improve the convenience of public transportation in the San Jose Metropolitan Area by providing technical cooperation for the introduction of MaaS, an app-based system for searching routes and schedules and purchasing tickets for urban railway, bus, and other public transportation services. The project also aims to improve technology to utilize big data obtained from apps and existing electronic payments for improving service and profitability, such as examining operation plans.

It is suggested that the details of the project be discussed through the Information Collection Survey and Knowledge Co-creation Program proposed in paragraphs a) and b) above.

g) 3-3 Project to Promote TOD in San Jose

Technical cooperation for the planning and implementation of TOD will be provided in conjunction with the development of the urban rail system. For Line 1, which is being considered for priority development, case study stations will be selected for several stations with different land uses, including stations in urban centers such as San Jose and Cartago, and stations in residential areas, to support the formulation of TOD master plans. In addition, the existence and content of zoning, building regulations, and other systems will be confirmed, and assistance in formulating systems will be provided as needed.

It is suggested that the details of the project be discussed through the Information Collection Survey and Knowledge Co-creation Program proposed in items a) and b) above.

5.4 Recommendations

This chapter makes four recommendations regarding necessary considerations to proceed with the projects proposed in the cooperation scenario.

5.4.1 Enhancement of Understanding Japan's Technologies and Knowledge

In some Central American and Caribbean countries, the presence of Japan and JICA in ODA is not necessarily high, and Japanese companies are less active than companies in North America and Asia. Thus, there are some cases where the local government is not familiar with Japan's advanced technologies and experiences deeply. Such cases can be regarded as a challenge in the assistance of the development quality infrastructure. Hence, it is recommended to increase understanding of Japan's technology through seminars, training and invitations to Japan, and briefings for diplomats in Japan under the surveys conducted by JICA and the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT).

5.4.2 Project Formulation that Considers Benefits for Japanese Enterprises

Due to population, language, and distance from Japan, Japanese companies are less active in Central America and the Caribbean than in other regions, where the hurdles to enter into these regions are considered high. For ODA to act as a bridgehead for Japanese companies to advance into the region, it is necessary to implement projects on a continuous basis. In addition, holding seminars for Japanese companies on the situation in each country and JICA's future support policy would be effective in raising

interest in the region.

5.4.3 Establishment of Cooperation Mechanism with Actors and Funds Other than JICA

JICA's budget alone will limit the number of projects that can be implemented compared to the development needs of each country. In the case of large-scale infrastructure, it is expected to be difficult for JICA to cover such projects alone. It is necessary to consider implementing co-financing and blended finance in collaboration with other public funds (JBIC, JOIN, etc.) and with other donors such as the IDB as a funding scheme.

5.4.4 Collaboration of Authorities Related to Disaster Risk Reduction

The transportation sector is closely related to the field of disaster risk reduction and strengthening cooperation with ministries and agencies in charge of crisis management is essential to enhance resilience to natural disasters. However, there are challenges in the horizontal collaboration among related agencies, such as the lack of participation of implementing agencies like public works agencies in CDEMA's sub-committees for infrastructure planning. Since disaster management is a cross cutting sector, it is necessary to involve related C/P agencies in addition to the implementing agencies when executing projects. Specifically, the Joint Coordination Committee should be held on a regular basis where the persons in charge of related agencies should be invited to participate in the discussions to share information and provide opportunities to strengthen cooperation among the agencies.

6. Economic Infrastructure Development (Construction Method and Material)

6.1 Outline of the Study

In this study, bamboo is focused on as a construction material because bamboo has recently attracted more attention due to its strength and speed of growth. The target country is El Salvador because it has a high interest in utilization of bamboo and has requested the Government of Japan for support.

The study scope is shown in the table below. Based on this scope, literature survey and the interview of experts were carried out in Japan while site visits and meetings with related authorities were conducted during the field survey.

Table 6-1 Survey Scope by Sector (Construction Method and Material)

No.	Item	Survey Scope	
1	Sector Targets	Investigate economic infrastructure development needs and formulate development cooperation scenarios for infrastructure development.	
2	Scope Update	Construction Method and Material	Conduct survey of existing plans, identify maintenance needs for bridges on economic corridors, and determine the applicability of Japanese technology.
3	[Task 2]	Conduct the literature reviews on the general conditions and existing plans of each target economic infrastructure in the survey target countries, as well as the results of Japan's assistance so far. Based on the results, organize the issues to be confirmed during the field survey.	
4	[Task 3]	Conduct interviews with related ministries, other donors (IDB, etc.), and JICA overseas offices, conduct field surveys, identify issues, and grasp local needs.	
5	[Task 8]	Finalization of development and cooperation scenarios	Finalize the development scenario (draft) and cooperation scenario (draft) based on comments from JICA. (As a result of the study, the cooperation scenario is determined not to be prepared)

Source: JICA Study Team

6.2 Overview of Economic Infrastructure Development (Construction Method and Material) in Central America

Bamboo is distributed broadly all over the world, especially in tropical, semi-tropical and temperate zone including Central America and the Caribbean region. Bamboo has recently attracted more attention as a construction material because of its strength and speed of growth. Thus, the regulations to use bamboo as structural material has been formulated.

For example, ISO22157 “Bamboo Structures - Determination of Physical and Mechanical Properties of Bamboo Culms - Test Methods” is prepared to define the testing method to use bamboo as structural material.

There is an international organization named International Bamboo and Rattan Organization (INBAR), which promotes the utilization of bamboo. INBAR has its headquarters in China and has 48 member countries (Japan is not a member). Among the Central American and the Caribbean countries, Cuba, Jamaica, Panama, and Suriname are members, while El Salvador is not associated. The following table lists the examples of INBAR’s activities.

Table 6-2 Examples of INBAR's Activities

No.	Country	Description
1	Ecuador	INBAR supports a program to foster bamboo industry and a study on utilization of bamboo as construction material together with <i>Agencia Española de Cooperación Internación para Desarrollo: AECID</i> in 2021-2023
2	India and Malaysia	INBAR carries out technical assistance regarding lamination of bamboo together with <i>Commonwealth Educational Media Center for Asia</i> in 2021-2022.
3	Nepal	INBAR supported the construction of library and school for the reconstruction project from the earthquake in April 2015.

Source: JICA Study Team based on INBAR

6.3 Overview and Development Scenario of Construction Material and Method Sector in Focus Country

6.3.1 El Salvador

(1) Overview

1) Bamboo Production in El Salvador

a) Vegetation

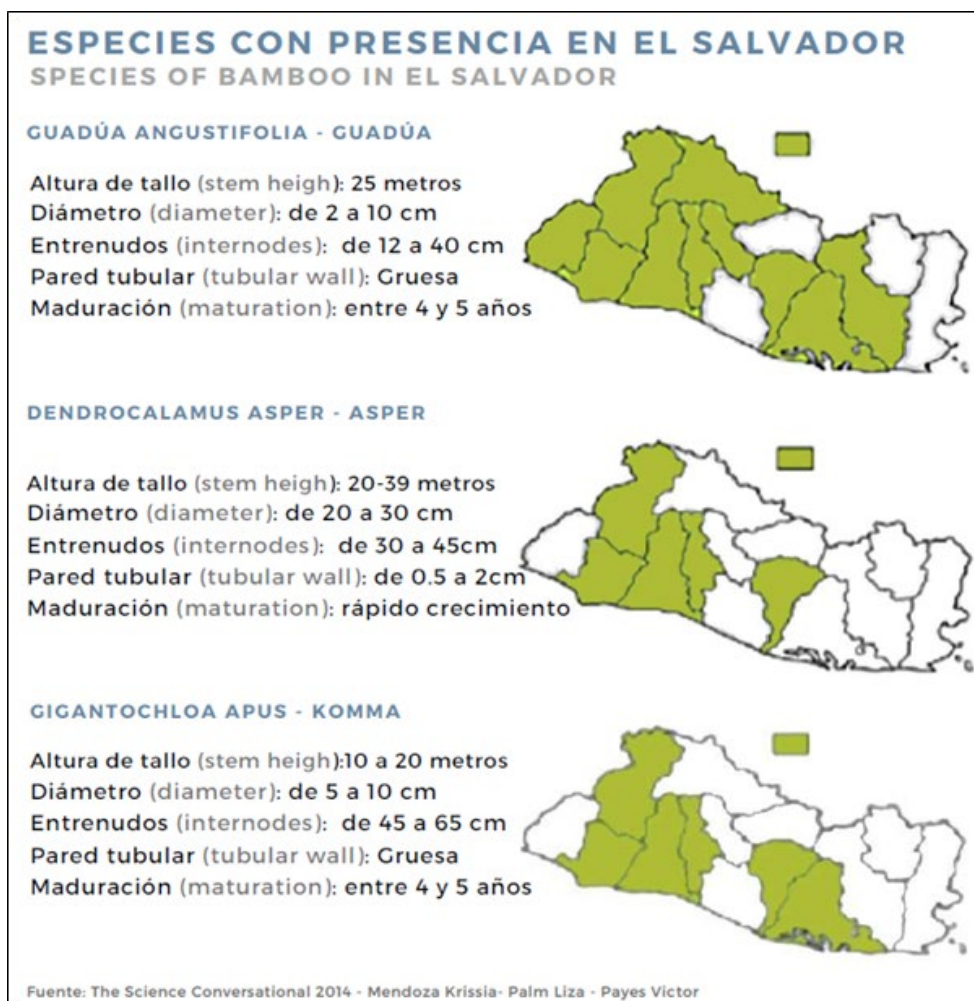
According to the Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería, MAG), there are eight genera and twenty species of bamboo (table below) in El Salvador. Not all of them are domestic species. There are also foreign species such as *Dendrocalamus asper*, which will be described later.

Table 6-3 Bamboo Growing in El Salvador

Genera	Species
<i>Bambusa</i>	<i>Bambusa dolichoclada</i> , <i>B. longispiculata</i> , <i>B. tulda</i> , <i>B. ventricosa</i> , <i>B. vulgaris</i> , <i>B. textilis</i> , <i>B. oldhamii</i> , <i>B. tuldooides</i> ,
<i>Chusquea</i>	<i>Chusquea coronalis</i>
<i>Dendrocalamus</i>	<i>Dendrocalamus asper</i> , <i>D. latiflorus</i> , <i>D. strictus</i>
<i>Gigantochloa</i>	<i>Gigantochloa verticillata</i> , <i>G. apus</i>
<i>Guadua</i>	<i>Guadua angustifolia</i> , <i>G. paniculata</i> , <i>G. amplexifolia</i>
<i>Phyllostachys</i>	<i>Phyllostachys makinoi</i>
<i>Ripidocladum</i>	<i>Ripidocladum racemiflorum</i>
<i>Indocalamus</i>	<i>Indocalamus tessellatus</i>

Source: MAG

Among the above, three species, *Guadua angustifolia*, *Dendrocalamus asper*, and *Gigantochloa apus*, have been selected by the Ministry of Housing (Ministerio de Vivienda, MIVI) as residential building materials based on their strength and size.



Source: MIVI

Figure 6-1 Species and Characteristics of Bamboos Used for Residential Building Materials

b) Bamboo Forestry (La Libertad Prefecture)

A field survey was conducted with MAG members, targeting the bamboo forest in Jayaque City, La Libertad Prefecture, where the above-mentioned *Dendrocalamus asper* is planted. This bamboo forest used to be a coffee field, but since 2008, bamboos (five species in total, mainly *Dendrocalamus asper*) have been planted due to the erosion of the slopes. About eight stems grow on each plant (called Makoya), and as of August 2022, 109 plants have been planted on a slope of 1.5 ha. As a result, slope erosion has been prevented.

According to MAG representative, the *Dendrocalamus asper* cultivated in this area require regular maintenance until four years of age and can be cut from six years of age or older. 9-12 years of age is the suitable age, growing to the maximum diameter at 12 years of age. There is a certain level of knowledge in bamboo production management.

In addition, although bamboos are cut according to an order and used as roofing materials, etc., they are not used commercially on a large scale due to the limited number of users. There are also machines that process bamboo into chips, and the chips are used as fertilizer. Because the bamboo forest is located

on a steep slope deep in the mountains and the access road is an unpaved mountain road, bamboos will be cut during the dry season (December to April) when it is accessible by car.

Moreover, the MAG has a plan to expand the bamboo farm to 7,000 ha (500 ha in Phase 1).



Source: JICA Study Team

Figure 6-2 Dendrocalamus Bamboo Forest in Jayaque

In Ciudad Arce, La Libertad Province, Centro Nacional de Tecnología Agropecuaria y Forestal (CENTA) and the Centro de Producto Estratégico (CEPE) are based, both of which are agricultural and forestry product testing and training facilities. CENTA is an agricultural experiment station with 55 ha of land where various agricultural products such as maize, mangoes, yucca potatoes, beans (Frijol), among others, are cultivated and studied. In addition, farmers are trained with the said products in this facility. Several species of bamboo, including Dendrocalamus, are planted along the Amayo River within the site to prevent the river from overflowing. Bamboos are maintained by the staff, including pruning. In addition, bamboo seedlings are grown at CEPE, which is located near CENTA. Once the seedlings have grown to a certain degree, they are distributed to local farmers.

According to MAG, they are considering building similar facilities in the eastern La Union and San Miguel regions, which have different climates, and are actively conducting demonstration experiments to expand bamboo farms.



Source: JICA Study Team

Figure 6-3 CENTA (Maize Farm)



Source: JICA Study Team

Figure 6-4 Bamboo Forest in CENTA



Source: JICA Study Team

Figure 6-5 Bamboo Nursery in CEPE

2) Bamboo Processing in El Salvador

According to interviews with the National Development Agency and the MAG, the bamboo industry in El Salvador is not sufficiently developed, and the production and processing technology for using bamboo as a building material has not been fully developed. The above-mentioned bamboo farm is using bamboos for roofing materials, fertilizers, etc., but the distribution volume is extremely small. On the other hand, there are a few cases of using bamboos in architectural exteriors such as roofing materials, fences and decorations, and crafts, etc.



Source: JICA Study Team

Figure 6-6 Existing Scenes of Bamboo Usage (Left: Exterior, Middle: Bag, Right: Soap)

3) Housing Situation in El Salvador

a) General

The shortage of housing in El Salvador has become a serious issue. According to the NGO FUNDASAL (Fundación Salvadoreña de Desarrollo y Vivienda Mínima), the shortage is estimated at about 360,000 units, of which 320,000 are qualitatively insufficient and 40,000 are quantitatively insufficient.

According to the MIVI minister, many people live in dangerous places, such as slopes or near water, and many households were affected and threatened by the flooding and landslides caused by Hurricane Amanda in 2020.

b) Technical Standards for Architecture/Structure in El Salvador

The table below shows the technical standards for architecture and structure in El Salvador.

Table 6-4 Technical Standards for Architecture and Structure in El Salvador

No.	Law/Standard Name	Article
1	City Planning and Construction Act (Ley de Urbanismo y Construcción)	Revised 1991
2	Seismic Design Technical Standards (Norma Técnica para el Diseño por Sismo: NTDS)	Established in 1994
3	Regulations on Structural Safety of Building (Reglamento para la Seguridad Estructural de las Construcciones: RESESCO)	Established in 1996

Source: JICA Study Team

However, many new buildings in the San Salvador metropolitan area use standards from the U.S. and other countries. The reason is the lack of construction regulations that are consistent with the current situation in El Salvador¹. As of 2022, JICA is implementing the technical cooperation project called Capacity Strengthening Project for Seismic Evaluation and Reinforcement of Buildings in Metropolitan Area, El Salvador 2022-2026” (in Japanese), and is supporting the development of manuals and guides for seismic diagnosis and seismic retrofit design in this project. In addition, the IDB has also initiated the “Project of Revision of National Regulations for Seismic Design and Construction and National Plan for Seismic Vulnerability” (2018-2023) with the Ministry of Public Works (MOPT), the Ministry of Environment and Natural Resources (MARN), and José Simeón Cañas Central American University (UCA) as counterparts, funded by the Japan Special Fund. The technical standards for seismic design established in 1994 will be updated in the project.

In addition, there are no standards for using bamboo in housing. The Peruvian standards are used in the MIVI initiative, described below.

c) Housing Construction Method

As construction methods for low- and middle-income housing, the following four construction methods were studied in “Project of Earthquake-Resistant Popular Housing Construction Technology Improvement in El Salvador,” which was implemented from 2003 to 2008 by JICA. In order to promote bamboo housing in the future, it will be necessary to compare these methods in terms of cost, workability, earthquake resistance, etc.

Table 6-5 Major Construction Methods of Houses in El Salvador

Item	Block Panel	Soil Cement	Improved Adobe	Concrete Block
Feature	A construction method in which precast concrete pillars are erected and concrete panels are stacked between the pillars to construct walls.	A method of constructing framework masonry using soil cement blocks that are mixed with soil and cement and hardened by drying without burning.	A construction method that improves the adobe (soil wall) created by the traditional construction method. This method has retaining wall, concrete foundation, and upper beams, and use cane to reinforce.	A method of constructing masonry structure by arranging reinforcing bars vertically and horizontally, piling up perforated concrete blocks, and bonding them with mortar.
Pros	Easy and fast construction process.	Applicable in areas where obtaining clay is hard and making adobe or fired bricks is difficult.	Low cost. Due to the traditional construction method, there are many skilled workers in the country.	The construction process is easy and there are many skilled workers in the country.

¹ JICA,2021: Request of Proposal for Capacity Strengthening Project for Seismic Evaluation and Reinforcement of Buildings in Metropolitan Area, El Salvador 2022-2026 (in Japanese)

Item	Block Panel	Soil Cement	Improved Adobe	Concrete Block
Cons	Construction cost is relatively high because construction contractors are mostly limited to FUNDESAL	The construction period is long because it takes time to dry the bricks.	Higher cost than traditional Adobe method. It takes time for bricks to become usable.	Construction cost is high due to the use of concrete blocks and steel materials.

Source: JICA Study Team based on the Report on the Evaluation at the end of the Project for Earthquake-Resistant Popular Housing Construction Technology Improvement in El Salvador (2018)

d) Examples of Building Using Bamboo in El Salvador

An example of a building using bamboo as a structural material in El Salvador is located in Suchitoto city. This building was constructed in 2013 and is used as an office for a local women's association. Bamboos are used as decorative materials for the walls as well as for the posts and beams that support the roof. This method has been introduced in standards and papers in other countries, only junctions with the foundation are filled with concrete. The bamboo used is *Dendrocalamus asper*, imported from Mexico and installed by contractor in El Salvador. It has been nine years since the building was constructed, but no irregularities including insect damage, have been reported so far during the annual visual inspection. However, cracks have been observed in some parts, and there is a possibility that the building has deteriorated. The construction cost at the time of construction was about the same as other methods.

Since there are gaps in the bamboo walls, plastic coverings are also provided to prevent wind and rain entering the building. As a result, ventilation was poor, and the room was quite hot and humid during the field survey.



Source: JICA Study Team

Figure 6-7 Building Using Bamboo in Suchitoto City

4) Presidential Agency

The Presidential Agency has a high interest in bamboo housing, and is functioning as a bridge

between the MAG, the MIVI, and others.

5) Plan by the MAG

a) Overview

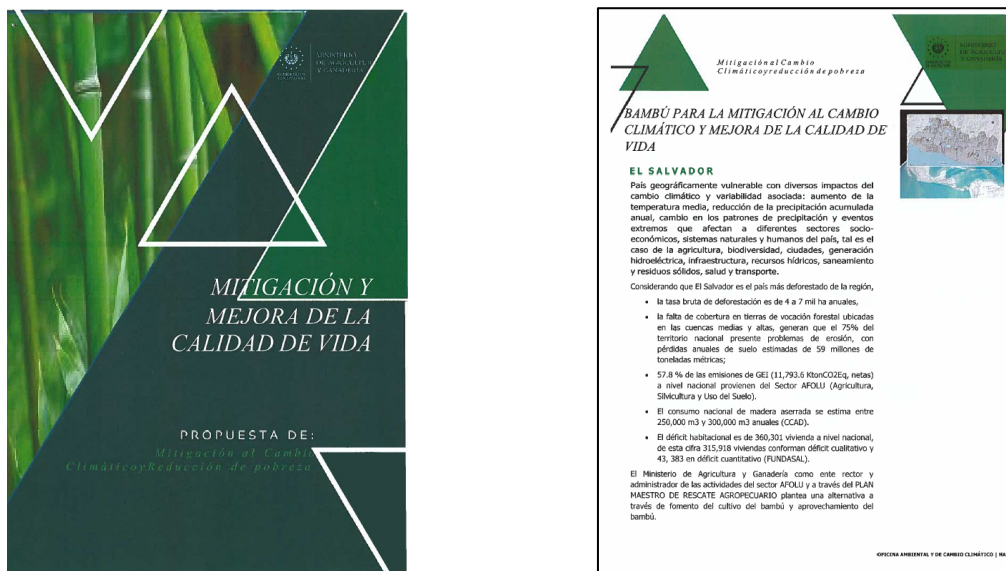
In El Salvador, forests are decreasing at a rate of 4,000 to 7,000 ha annually due to deforestation. As a result, 75% of the country is exposed to the risk of soil erosion, and it is estimated that about 59 million tons of soil is washed away annually by rainfall and rivers².

On the other hand, the housing shortage is also a serious issue in El Salvador, with a shortage of approximately 360,000 housing units, of which 320,000 are considered to be qualitatively insufficient and 40,000 are considered to be quantitatively insufficient.

Under these situations, the Environment and Climate Change Division (Oficina Ambiental y de Cambio Climático) of MAG focused on bamboo, which grows quickly, has extensive underground roots, and is rich in water retention capacity, to control soil runoff through bamboo cultivation. In addition, this division has developed a plan named “Mitigación y Mejora de la Calidad de Vida (Mitigation and improvement of the quality of life)” to supply housing by using bamboo as a building material.

The target areas are the Lempa River Basin, which is the largest river in the country, the central part (around Ilopango Lake), the eastern part (Grande River Basin), and the western part (Sensunapan River Basin). The Lempa River basin is the priority area.

The plan for the next 10 years includes initiating projects in the Lempa River basin, establishing a bamboo cultivation center, constructing 125,000 bamboo housing units, etc.



Source: MAG

Figure 6-8 Plan of Promotion Bamboo Housing by the MAG

In addition, in February 2022, the MAG has planted 250 bamboo seedlings in the Ivu area along the Arenal Monserrat River in San Salvador. This initiative is intended to promote environmental conservation and prevent of landslide and soil erosion, as well as to revitalize the area in the future

² MAG, Mitigación y Mejora de la Calidad de Vida

through the production of handicrafts using bamboo materials.

b) Plan for Bamboo Plantation

The MAG has created a report about the promotion of bamboo housing, titled “Cultivo, Desarrollo e Industrialización del Bambú para Construcción de Vivienda Digna Eco – Sustentable -Basada en Produccion de Bambú Estructural para Construcción de Vivienda”.

For developing 500 ha of bamboo plantation of the above-mentioned three species (*Guadua angustifolia*, *Dendrocalamus asper*, and *Gigantochloa apus*), this plan has set the following six goals.

- Bamboo Plantation Development (*Guadua angustifolia*, *Dendrocalamus asper*, *Gigantochloa apus*)
- Technical and Scientific Capacity Development for Bamboo Value Chain
- Developmet of Bamboo Training School (including equipment)
- Construction of ten prototype housing in three regions
- Creation of 200 small businesses (households) related to bamboo materials
- Construction of bamboo processing facilities (including equipment)

The MAG has estimated the cost of bamboo plantation at \$2,400 per ha and the cost required to realize the above six goals at USD 2.2 million.

Since the site for the plantation has not been determined yet, the selection of a site will be necessary in the future in order to achieve the above goals. At that time, it is necessary to pay attention to other agricultural products and non-agricultural land use.

6) MIVI’s Idea and Activities

a) Idea on Development of Housing

Ministerio de Vivienda, or Ministry of Housing (MIVI) which oversees housing sector (former Viceministerio de Vivienda y Desarrollo Urbano (VMVDU)) has implemented programs for development of houses, protection of historical area, and improvement of housing environment.

In 2020, a regulation was amended to provide public houses. In Nejapa City, which is north to San Salvador, housing development project is under implementation for affected people of disaster. MIVI contemplates to construct a number of bamboo houses out of 25 plots. In hour plots, concrete houses (10 m x 20 m) were constructed, and their construction cost per one house was approximately USD 20,000.

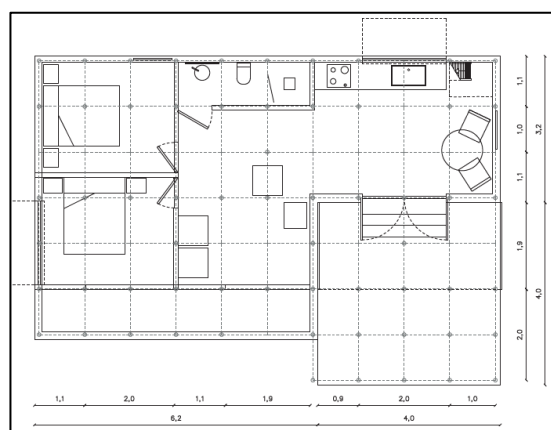


Source: JICA Study Team

Figure 6-9 Site for Housing Development and Houses in Nejapa City

b) Outline of the Design of Bamboo Houses

MIVI prepared some drawings of bamboo prototype house for themselves. In design of bamboo material, a Peruvian standard is used while El Salvadoran standards are used for the other material. MIVI said that they know the other countries' standards such as India and ISO and refer to them as well, and that they need to prepare their own standard for bamboo. The species bamboo used in the design is *guadua angustifolia*, which is used by combining nine trunks into one column. The construction cost is not included in the design.



Source: MIVI

Figure 6-10 Design of Bamboo House by MIVI

7) Assistance by Development Partners

a) Japan

While JICA has supported the formulation of seismic design standards, has not conducted any assistance related to bamboo. With regard to bamboo, JICA is implementing “Study for formulation of detailed plan of project for promotion of utilization of bamboo resource” in the northeast area of India.

On the other hand, the Ministry of Land, Infrastructure, and Transport of Japan conducted a seminar to MIVI regarding public housing system in Japan in March 2021.

(2) Development Scenario in El Salvador

The Government of El Salvador intends to tackle with the problem of i) decrease in forest and erosion of land, and ii) quantitative and qualitative shortage of houses by cultivating bamboo forest and building bamboo houses with the bamboo. Although several actions abovementioned are taken, some issues remain because bamboo has not been used much so far. The strategies to overcome the issues are listed in the table below.

Table 6-6 Strategies of Construction Material and Method Sector in El Salvador

Target	Strategy	Description
Construction Material and Method El Salvador	1. Enhancement of bamboo industry and supply chain	As the bamboo usage is limited in El Salvador, the knowhow about the supply chain consisting of i) cultivation, ii) harvesting, iii) processing, and iv) distribution and consumption, has not been advanced much. It is required to enhance the capacity at each phase of supply chain and linkage to expedite the bamboo distribution.

Target	Strategy	Description
	2. Improvement of capacity of housing policy including affordable housing	El Salvador suffers from quantitative and qualitative shortage of houses and illegal settlement in the area of high risk of disaster. To protect the citizen's lives and improve the living environment, it is recommended to implement housing policy actively by using public housing scheme which was formulated recently.
	3. Capacity development for design, construction, and maintenance of bamboo houses	Bamboo houses attracts attention in terms of lowering of the cost and affordable houses. On the other hand, El Salvador does not have standards on bamboo houses and lacks knowhow of design, construction, and maintenance of bamboo houses because the number of cases of bamboo houses is few. It is necessary to prepare manual about the usage of bamboo in houses and to train technicians.

Source: JICA Study Team

The table below lists programs and projects which the Government is recommended to carry out to tackle the issues abovementioned.

Table 6-7 Program and Projects Proposed to be Carried out in El Salvador

Target	Strategy	Program / Project	Description and Implementation Period
Construction Material and Method El Salvador	1. Enhancement of bamboo industry and supply chain	1-1: Program to strengthen the capacity to produce bamboo	<ol style="list-style-type: none"> Preparation of strategy of allocation of bamboo plantation (including disaster risk reduction and forest protection) Logistics and distribution plan between producing and consuming areas Development of bamboo plantation Capacity development of cultivation of bamboo Implementation Period: Long
		1-2: Program for processing bamboo and industrialization	<ol style="list-style-type: none"> Capacity development to establish supply chain of bamboo in technical and scientific area Development of school of bamboo (including equipment) Creation of 200 small enterprises (households) engaged in bamboo Construction of bamboo processing factory (including equipment) Implementation Period: Long
	2. Improvement of capacity of housing policy including affordable housing	2-1: Affordable housing policy	<ol style="list-style-type: none"> Census on houses (shortage in the quality of houses, settlement in area with high risk of disaster, and analysis of family budget of low-income people) Policy for affordable houses Implementation Period: Short
		2-2: Program for assistance in development of public houses	<ol style="list-style-type: none"> Supply strategy of public houses Capacity development project for public houses (danchi) Development of public houses Implementation Period: Long
	3. Capacity development for design, construction, and maintenance of bamboo houses	3-1: Project for formulation of manual of design and construction of bamboo houses	<ol style="list-style-type: none"> Construction of prototype house and social experiment Formulation of manual and standard of design and construction of bamboo houses Strategy of promotion of bamboo houses Implementation Period: Short (Middle for experiment)

Note 1: Short term: 2023-2025, Middle term: 2023-2027, Long term: 2023-2032

Note 2: The contents of Programs 2 refers to the MAG's report "Cultivo, Desarrollo e Industrialización del Bambú para Construcción de Vivienda Digna Eco-Sustentable -Basada en Producción de Bambú Estructural para Construcción de Vivienda"

Source: JICA Study Team

(3) Input to the Government of El Salvador

This sector was initiated based on a request from the Government of El Salvador for the construction of bamboo prototype houses and preparation of a construction manual. During the survey period, however, as a result of discussion, it was confirmed that Japan would not aid in the building materials

and construction methods sector (cultivation and utilization of bamboo) at this time because bamboo is not designated as a construction material in Japan's Building Standard Act.

In this Study, instead of proposing a cooperation scenario, the JICA Study Team will prepare a roadmap for the Government of El Salvador and collect information and share materials on cases in Japan and other countries related to bamboo, so that the Government of El Salvador can use them as reference for future activities.

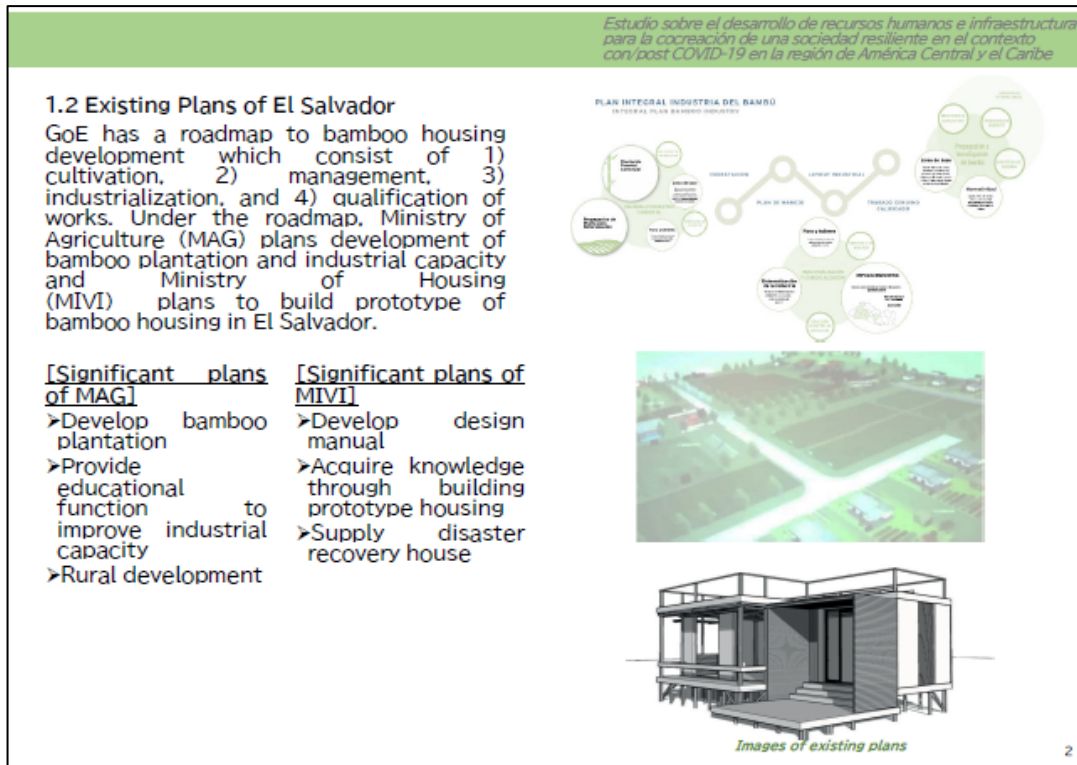
1) Roadmap to Supply of Bamboo Housing

On November 11, 2022, a roadmap for the realization of bamboo housing was proposed and explained to ESCO, MAG, and MIVI. The proposed roadmap, in line with the above development scenario, is as follows:



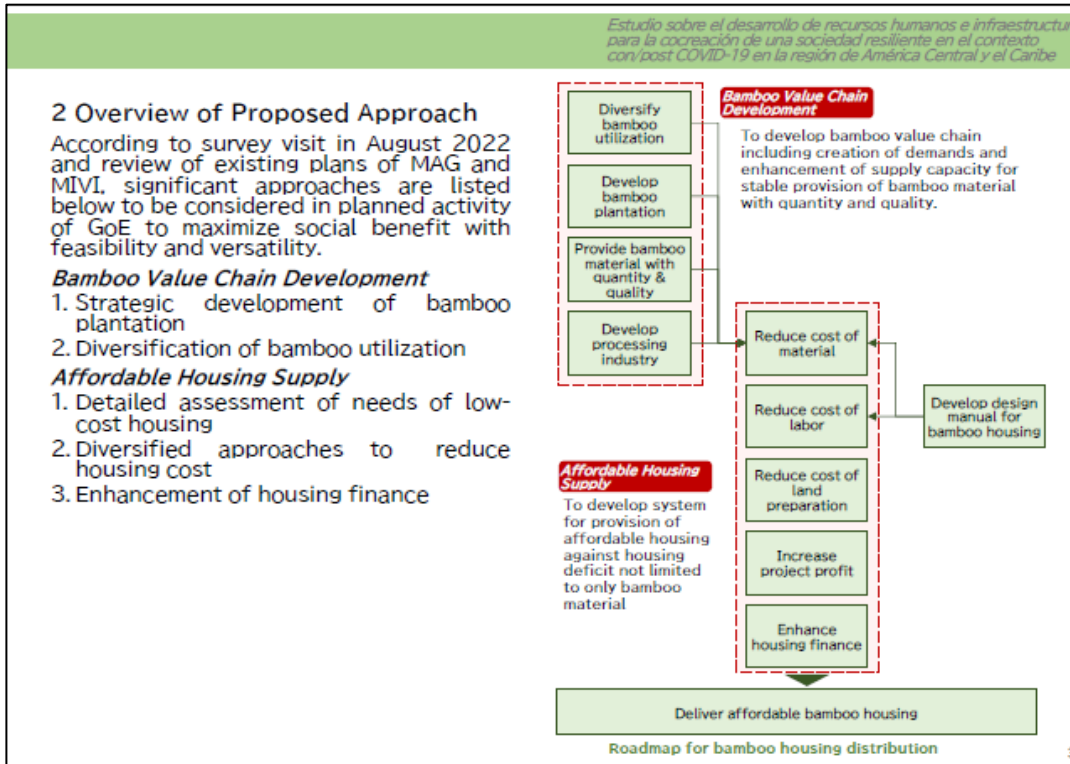
Source: JICA Study Team

Figure 6-11 Roadmap to Supply of Bamboo Housing in El Salvador (1/8)



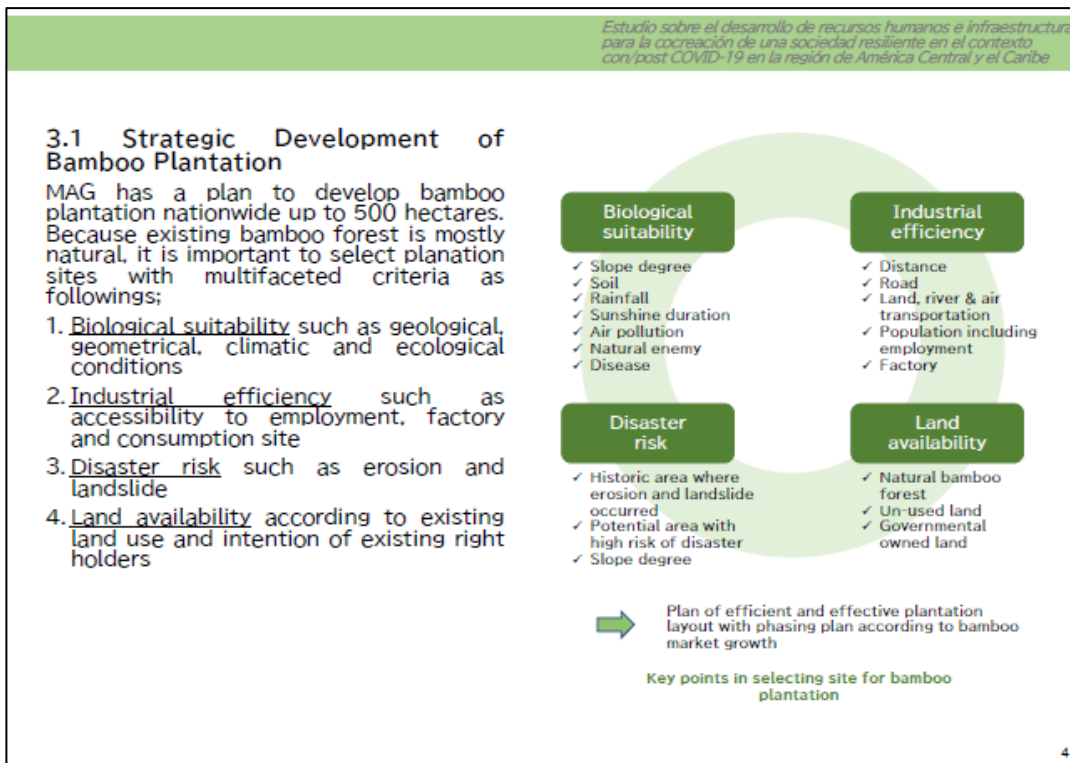
Source: JICA Study Team

Figure 6-12 Roadmap to Supply of Bamboo Housing in El Salvador (2/8)



Source: JICA Study Team

Figure 6-13 Roadmap to Supply of Bamboo Housing in El Salvador (3/8)



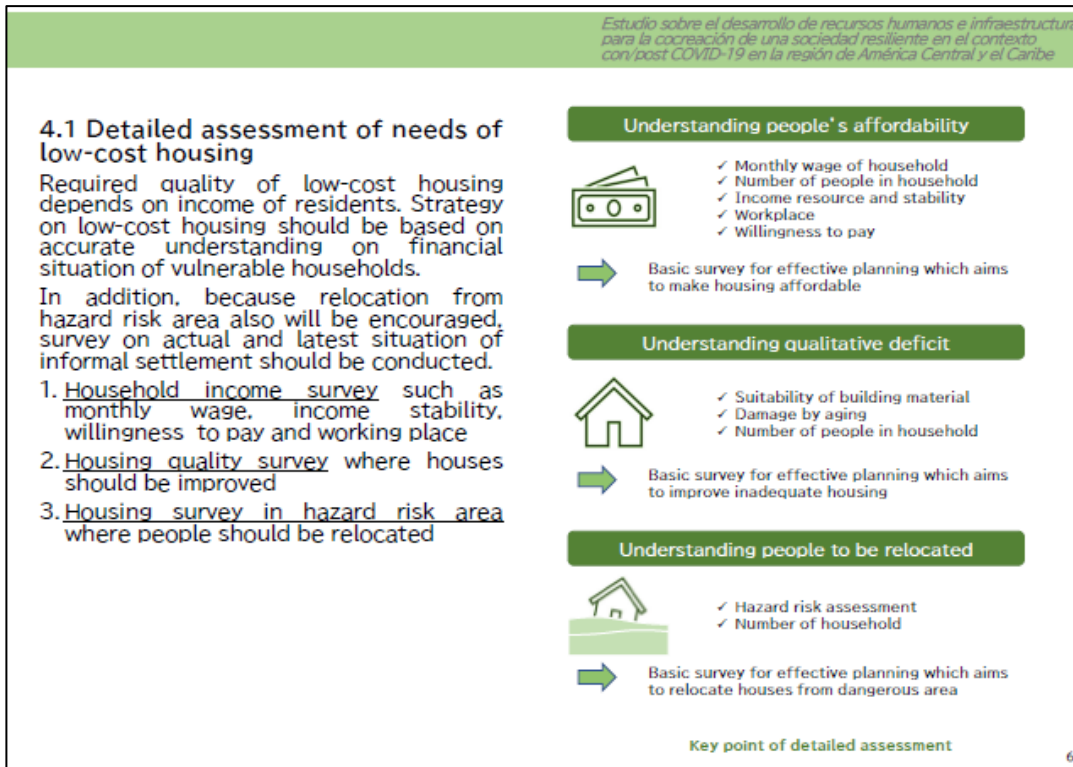
Source: JICA Study Team

Figure 6-14 Roadmap to Supply of Bamboo Housing in El Salvador (4/8)



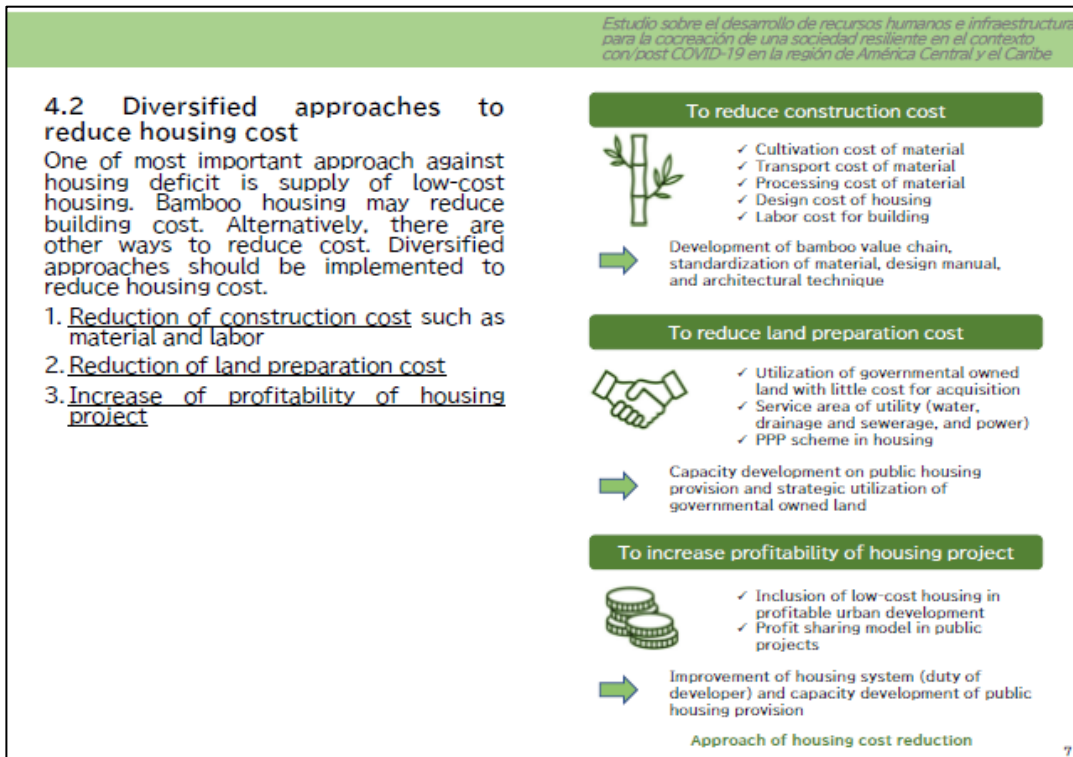
Source: JICA Study Team

Figure 6-15 Roadmap to Supply of Bamboo Housing in El Salvador (5/8)



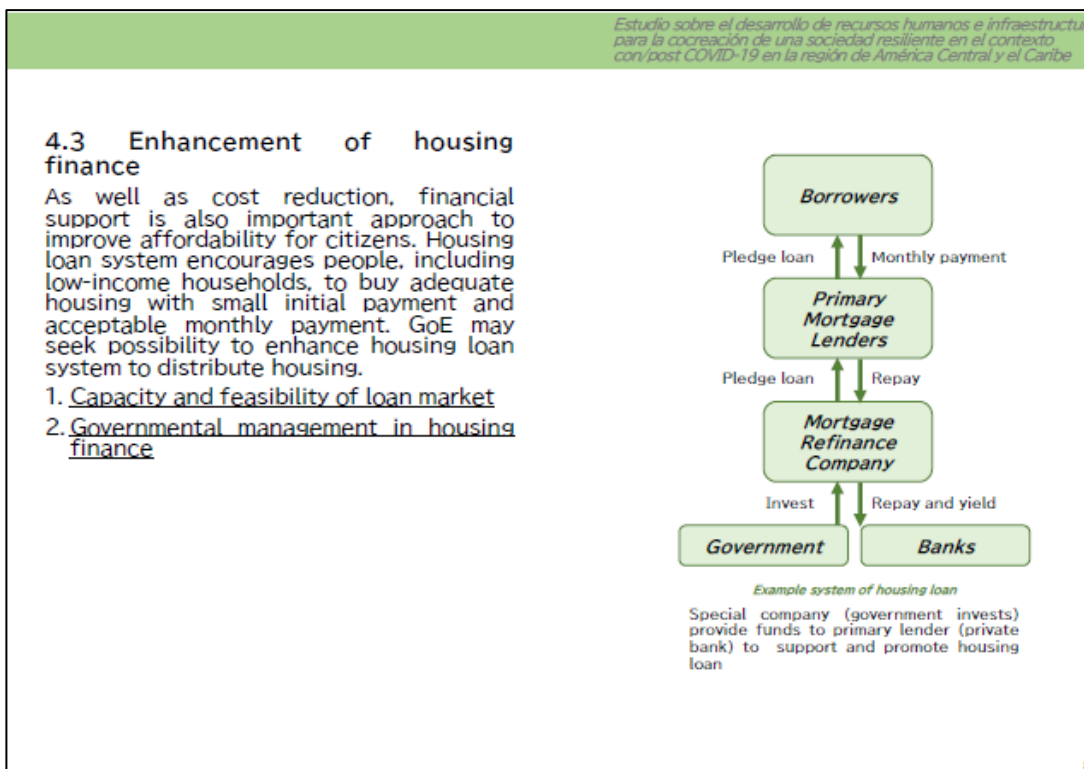
Source: JICA Study Team

Figure 6-16 Roadmap to Supply of Bamboo Housing in El Salvador (6/8)



Source: JICA Study Team

Figure 6-17 Roadmap to Supply of Bamboo Housing in El Salvador (7/8)



Source: JICA Study Team

Figure 6-18 Roadmap to Supply of Bamboo Housing in El Salvador (8/8)

2) Usage of Bamboo in Japan and the Other Countries

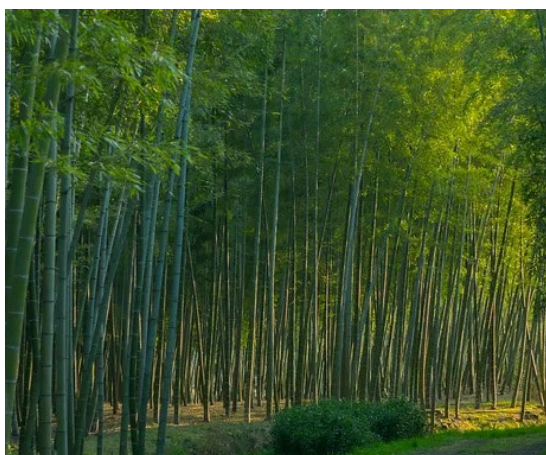
a) Overview

i. Bamboo and Bamboo Forest in Japan

In Japan, bamboo has been used since ancient times for various purposes, including household goods, musical instruments, interior materials, and food (bamboo shoots). In recent years, however, bamboo forests and bamboo shoot production have been declining due to the substitution of plastics and the increase in bamboo shoot imports. As a result, bamboo forests are increasingly neglected and encroachment into village forests has become an issue.

Bamboo is a fast-growing species, therefore, for the cultivation of high-quality bamboos and bamboo shoots, it is necessary to take care of them, such as density control. In Japan, the aging of the population is causing a shortage of bamboo farmers, but there are examples of large-scale bamboo farms in Tochigi Prefecture and in Yamaguchi Prefecture. In addition, the distribution of bamboo forests and the amount of resources are being analyzed using a Geographic Information System (GIS).

The other ways of utilization of bamboo are craft, furniture, pavement, power generation with bamboo chip, and cellulose nanofiber (CNF).



Source: Wakayama Firm, Tochigi Pref., Japan



Source: Forestry Agency of Japan. Yamaguchi Pref., Japan

Figure 6-19 Example of Well-controlled Bamboo Forest

Figure 6-20 Control of Bamboo Forest with GIS

ii. Bamboo and Bamboo Forest in the Other Countries

In other countries, bamboo is cultivated for construction, food, erosion control, as a natural fence (for cattle or for wind protection), for eco-tourism and for furniture.

In Mexico, the Agroecology and Permaculture Center – Las Cañadas, in Huatusco, Veracruz, utilizes bamboo for the above-mentioned uses, but also cultivate bamboo to be sold. Several species of bamboo are cultivated in 2 plantations. The first plantation has 55 bamboo plants of the *Bambusa oldhamii* species, distributed over a 1,270 square meter surface lot. The second plantation consists of 18 different species mixed together, distributed over an 8,341 square meter surface lot. Their bamboo is harvested at 4 years of growth, the determined age for the best bamboo conditions for the material to be used in construction purposes and most other applications. A marking, color-coded system is used to record the plant's age and proper harvesting time.



Bamboo windbreak



Harvested bamboo



Marking of bamboo by age

Source: Agroecology and Permaculture Center

Figure 6-21 Bamboo Forest in Veracruz, Mexico

In Colombia, companies have expanded the already famous coffee region of the country to include bamboo agrotourism services. The “Finca El Bambusal” cultivates several species of bamboo, distributed over a 10,000 square meter surface lot, at 1,256 meters above sea level. Their services include trainings & seminars, the selling organic products, and selling live bamboo plants.

In Brazil, the Brazilian Association of Bambu³ (Bambu BR Associação Brasileira do Bambu) serves as a link for multiple companies in the bamboo production chain, that utilize bamboo for bio-architecture and construction, but also for personal care products such as oral hygiene products.

³ Associação Brasileira do Bambu, <https://www.bambubr.com/>



Source: El Paraiso del Bambu y la Guadua



Source: Casa & Bambu

Figure 6-22 Bamboo Forest Facility in Colombia

Figure 6-23 Bamboo Plantation in Brazil

b) Current Status of Bamboo Usage in the Housing Sector

i. Current Status of Bamboo Usage in the Housing Sector in Japan

Bamboo is mainly used for interior and fences and not used as a structural member. This is because the Japan’s Building Standard Act stipulates specific materials that fit the Japan Industrial Standards (JIS) and Japan Agricultural Standards (JAS). As the structural usage of bamboo is not regulated in neither JIS nor JAS, bamboo is only used for interior purposes in Japan.


(Quality of Building Materials)

Article 37: Those building materials as wood, steel, concrete, and other materials specified by the Minister of Land, Infrastructure, Transport and Tourism used for the foundations, principal building parts, and other parts of buildings specified by Cabinet Order which are important from the viewpoint of safety, fire prevention, and sanitation (hereinafter in this Article referred to as “designated building materials”) must come under any of the following items:

- (i) Those qualities conform to the Japanese Industrial Standards or the Japanese Agricultural Standards designated for each designated building material by the Minister of Land, Infrastructure, Transport and Tourism;
- (ii) In addition to building materials set forth the preceding item, those approved by the Minister of Land, Infrastructure, Transport and Tourism as conforming to technical criteria for each designated building material specified by the Minister concerning the quality necessary for safety, fire prevention, and sanitation.


On the other hand, several activities are taken to solve the issue of neglected bamboo forest and promote the usage of bamboo in public and private sector^{4,5}. The table below shows the activities and uses of bamboo for temporary building.

Table 6-8 Activities to Promote the Usage of Bamboo in Construction Material Sector in Japan

No.	Usage	Description	Image
1	Bamboo Green House Project	Kyoto University supports the installment of greenhouses made of bamboo.	

⁴ Forestry Agency of Japan, Toward the utilization of bamboo, <https://www.rinya.maff.go.jp/j/tokuyou/take-riyou/index.html>

⁵ Bamboo Innovation Group in Japan, <http://bamboo-big.com/index.html>




No.	Usage	Description	Image
2	New Bamboo Building	Shiga Prefectural University conducts a project to build bamboo buildings.	

Source: JICA Study Team based on Bamboo Innovation Group in Japan

ii. Current Status of Bamboo Usage in the Housing Sector in the Other Country

The examples of houses and buildings where bamboo is used, are listed below (examples outside Central America are included for reference). As the table shows, bamboo houses are becoming common.

Table 6-9 Overseas Examples of Usage of Bamboo in the Construction Material Sector

No.	Usage	Country	Description	Image
1	Pavilion	Mexico	A Mexican design firm, CO-LAB designed a pavilion using laminated bamboo in Quintana Roo, Mexico.	
2	House	Philippines	A startup, CUBO constructs affordable houses using laminated bamboo.	
3	Hotel Complex	Indonesia	There are many buildings in which bamboo is used as a main member in Green Village Bali, Bali Island, Indonesia. The design was prepared by IBUKU having its base in Bali.	

Source: JICA Study Team based on CO-LAB, CUBO, Green Village Bali, and IBUKU

c) Substitute of Single Use Plastic with Bamboo

In recent years, the problem of marine plastic waste and massive use and dumping of plastics have become social issues. Particular attention has been focused on substituting single-use plastics. Various efforts are underway to replace plastics with paper, wood, and bamboo.

i. Example in Japan

In Japan, a company in Kumamoto Prefecture is working to make straws from the plant fiber (cellulose) contained in bamboo. Some of the processing of this product is done in Taiwan.



Source: Amica Terra

Figure 6-24 Straw Made from Bamboo

ii. Examples in the Other Countries

INBAR also announced in November 2022 an initiative entitled "Bamboo as a Substitute for Plastic" Initiative. This initiative consists of five pillars, including promotion of R&D and market expansion. As of December 2022, INBAR has not informed any specific projects since the announcement of this initiative.



Source: INBAR

Figure 6-25 INBAR's "Bamboo as a Substitute for Plastic" Initiative

In Panama, Law 187 of 2020 establishes bamboo as one of several materials allowed for substituting single-use plastic products. The recent law came into effect in July 2021, focusing on the gradual replacement of 11 specific single-use, plastic articles. The adaptation process is expected to last until December 2023. The law prohibits the use and commercialization of the following products:

#Starting in July 2021:

1. plastic ear swabs,
2. plastic coverings for clothes at dry cleaner businesses,
3. plastic rods to hold balloons,
4. plastic toothpicks,
5. plastic cocktail sticks,
6. plastic sticks for candy,
7. plastic can-holding rings

#Starting in July 2022:

8. plastic egg containers/cartons
9. plastic drink mixer sticks
10. plastic disposable dishes

#Starting in December 2023:

11. plastic straws

Laws such as this one in Panama, similar laws and efforts in Colombia, Chile; or local municipal efforts in Brazil and Mexico; all contribute to replacing single-use plastics with environmentally sustainable materials. These efforts recognize the potential of bamboo products through its wood, pulp, or fibers. Some bamboo products are already available for purchase, including toothbrushes, ear swabs, toothpicks, drink mixer / cocktail sticks, baby wipes, baby diapers, reusable bamboo cleaning towels, cutlery, food trays, cooking utensils, bed linen and sheets, among others.



Source: Ligon

Figure 6-26 Bamboo Cutlery (Chile)



Source: Isshah

Figure 6-27 Bamboo Swab (China)

d) Processing of Bamboo

i. Processing of Bamboo in Japan

The use of bamboo for building materials and other commercial uses requires processing. Based on the discussions with the President's Office, they are interested in the technology to process bamboo into straight pieces. In Japan, bamboo is processed, through led fat-removal, to prevent insects and straighten bends, in which the bamboo is soaked in hot water or burned over a fire.



Source: Taketora, Japan

Figure 6-28 Example of Fat-Removal

ii. Processing of Bamboo in the Other Countries

In the other countries, as well, major methods involve water and heat. Processes that involve cold water require less energy and effort but take a longer period. This is convenient when processing larger quantities of bamboo. On the contrary, processes that involve hot water require more energy and resources, but can make the straightening process faster. Hot water processes require a water temperature of approximately 65°C and 93°C. Traditionally, manual methods require fixing one end of the bamboo in place and bending the free end repeatedly while the bamboo is hot. Cooking oil can also be applied to the bamboo before boiling the material, this can help to make it softer and easier to straighten.

For the soaking process, a metal rod can be used to puncture the inner nodes of the bamboo so water can enter all the inner chambers of the bamboo before boiling it. Furthermore, soaking the bamboo overnight before the work on it can make the process easier.

Other heat-related methods involve using a heat gun or heating iron. These methods require moving the tool across the entire piece of bamboo to achieve an even distribution of the effect. It is important to never leave a hot element directly over the bamboo, as it may cause irreversible discoloration. Processed or freshly cut bamboo should also be preserved in the shade or away from direct sunlight.

Finally, if these processes are ineffective, sandpaper can be used to straighten the bamboo at specific bending points, however, the bamboo should not be soaked or heated if sandpaper is used since it may damage the weakened material. Using a knife or blade may also weaken the material or split the bamboo.

To treat and cure the bamboo, borax and boric acid can be added to the cold water soaking process. This process can protect the bamboo and extend its usable lifespan for an additional 50-80 years. These chemicals will treat the bamboo and, over time, extract the natural sugars contained within the plant. This will make the bamboo less attractive to bugs and pests.



Source: Dragonfly Bamboo

Figure 6-29 Processing Bamboo with Flame (Vietnam)

Ecuador's "Central del Bambú Andoas" (CENBA), located in Pichincha province, is the region's only bamboo processing plant. The raw material is first placed through a debarker machine to remove any branches and external irregularities. Then, the bamboo is submerged in a water and borax solution for a 5-day period. After this process, the bamboo is set to dry in a temperature-controlled, dry chamber for 15 days. The entire process can last between 20 to 25 days. The bamboo is then ready for sale.

Several machines are used to process bamboo for different results. The bamboo splitting machine utilizes removable radial blades which can be replaced depending on the number of splits desired. Mechanical parts and energy then push the bamboo towards the blades and the split pieces continue to a collection pile on the other side of the blades. Other machinery uses a drill-like spinning tool to create cups by hollowing out the interior of the bamboo and also treating the outer shell.

There are several machines to treat bamboo into several different products such as toothpicks, forks, spoons, larger cooking utensils, rugs, flooring, plywood, among others. Manual and automatic versions of each machine are usually available.



Source: CENBA



Source: CENBA

Figure 6-30 Central del Bambú Andoas (CENBA)

Figure 6-31 Drying of Bamboo



Source: YouTube of INBAR LAC, “Transformación del bambú”

Figure 6-32 Processing of Bamboo with Debarker

7. Social Infrastructure Development (Education)

7.1 Outline of the Study

7.1.1 Survey Scope

Desk-top survey, interviews, and field survey were conducted between May and November 2022 to prepare a development scenario and a cooperation scenario for JICA for improving the education sector of the target countries. The Table below shows the study scopes for the education sector.

Table 7-1 Survey Scope by Sector (Education)

No.	Item	Scope of Work	
1	Sector Targets	Developing cooperation scenarios in the education sector necessary to narrow the inequalities uncovered or widened by the COVID-19 pandemic and to ensure that learning continues in the event of the outbreak of diseases or natural disasters in the future.	
2	Scope	In order to assist the counterpart government in strengthening the education sector under the with/post-COVID-19 environment, information will be collected and analyzed about the uncovered challenges in education sector and the gaps widened by the COVID-19 pandemic, and the efforts for ensuring the continuity of learning such as remote and/or hybrid (classroom learning and online) education in the event of the outbreak of diseases or natural disasters.	
3	【Task 2】 (Desktop Study)	Education Policy and Basic Education Information in the With/Post COVID-19 Environment	Key points of national education policies and plans, especially the priority issues after COVID-19. Education indicators (enrolment rate, learning achievement level, etc.) and identification of education gaps and key factors contributing to such gaps (e.g. rural/urban, languages, poverty, disability, gender.) Initiatives for learning recovery after the long school closure periods and progress
		Status of Environment for Utilization of ICT in Education	Current situation of use of ICT in school education Status of access to the equipment /tools and internet from home, and the government's initiatives Current status of awareness-raising and training on remote/hybrid classes for school managers, teachers, families, students, local communities, and other stakeholders Assistance in education sector by major donors and private sector participation in remote/hybrid education
		Selection of Field Survey Target Country	Saint Lucia and Jamaica: Collection of basic education information, information about Organisation of Eastern Caribbean States (OECS) and Caribbean Examinations Council (CXC) Guatemala: Collection of information regarding remote learning that can contribute to the sustainability of JICA's previous cooperation's outputs and future assistance program. Guyana Literature Review: Basic information on Education sector Mexico Literature Review: Distance education using satellite TV (JICA's previous assistance)
4	【Task 3】	The survey will be conducted in the selected countries and priority themes, which is determined in Task 2 above. The study methods will include interviews with school principals and teachers, major donors, as well as visits to schools (model schools and rural areas).	
5	【Task 8】	Finalize Development /Cooperation Scenarios	Proposal of the cooperation scenarios will be made for the countries with field visit, based on the policies of the counterpart governments, donors, and Japan's assistance policies and ongoing/recent activities in each country.

Source: JICA Study Team

7.2 Overview of Education in the Region

7.2.1 Educational Policies in LAC Region

(1) Educational Policies and Guidelines in Central American Region

1) Policies of *Sistema de la Integración Centroamericana (SICA)- Coordinación Educativa y Cultural Centroamericana (CECC)*

Coordinación Educativa y Cultural Centroamericana (CECC) is the agency for Education Sector of the Central American Integration System (*Sistema de la Integración Centroamericana, SICA*). The CECC holds bi-annual meetings of the Ministers of Education and Culture of its member countries to exchange information and make policy recommendations. The table below shows the education policies issued by SICA/CECC, as well as measures and policies in the time of COVID-19.

Table 7-2 Educational Policies of SICA-CECC

Year	Title	Key Contents
CECC (2013, Revised in 2016 ¹)	Central American Education Policy (PEC) 2013-2030	<p>General Objective: To guarantee an inclusive and equitable quality education and promote permanent learning opportunities for everyone.</p> <p>Specific Objectives:</p> <ol style="list-style-type: none"> 1: Every child between the ages of 0 and 3 year-old of the member countries of the SICA will receive initial attention and education. 2: Every child will complete a full cycle of free schooling of, at least, 9 mandatory years, with quality learning achievements. All the non-schooled children and youth have access to a quality education, through different modalities. 3: The two-year post-basic education will be a strategic education extension to offer the adolescents extending their academic training as well as the knowledge and skills related with employment and dignified survival of the person and family. 4: The education system reduces and seeks to eliminate the disparities and inequalities among the students due to gender, social origin, age, income level, special needs, religion or ethnic group. 5: Member countries will carry out improvement in the processes of recruitment, training, update and accreditation of educators, for all education levels. 6: The education systems of the SICA member countries on all levels will adopt an extended concept of quality that includes theoretical-practical learning for sustainable human development, the values and attitudes for the exercise of citizenship, and the permanent construction of a democratic and peace culture, as well as the answer to the emerging social needs in the region.
CECC (2021)	Global Citizenship Education Policy and Recommendations Report For SICA Countries	A proposal to strengthen global citizenship education in SICA member countries from the perspective of education policy, curriculum, teacher, school, community, and youth leadership.
CECC (2020)	Contingency Plan in Education for the SICA Region	<p>A plan developed to systematize the experience of each country's efforts in continuing teaching and learning in schools in the Coronavirus 2019 (COVID-19) disaster, and to prepare for the reopening of schools as better educational systems by adjusting learning content, renewing teaching and learning methods, and applying the lessons learned from experience. The recommendations of the ministerial meeting are as follows:</p> <ul style="list-style-type: none"> • Complementarity between countries and the production and use of resources for the remote component of education systems. • New teacher competencies/skills required • Shared criteria for the return of classes and the continuity of learning • Curriculum (aspect of contents, including application of the curriculum in emergency situations, and considerations for curriculum development:

¹ Initially prepared as a policy for 2013-2021. It was revised and extended up to 2030 to adjust to SDGs in 2016.

		vulnerability, learning assessment, and teaching methods) • Effective international cooperation
CECC (2020)	Hoja De Ruta De La Región SICA Para La Seguridad Escolar Roadmap of SICA Region for Safe School	Guidance of Safe School Initiative in the SICA region. It explains the guidance with regard to the following aspects for the region and the member countries. <Overall Plans> • National policy and plans • Human and financial resources <Safe School and Education Facilities> • Evaluation tool for safety level of school and education facilities • Processes and tools to assess the security level of schools/educational centers. • Minimum standard for school safety (Preparedness and Response to Emergencies in School) • School safety plan • Stakeholder partnership (Risk Reduction and Enhancement of Resilience) • Review and update disaster risk reduction and management and resilience components in the curricula.

Source: JICA Study Team based on the policy document

2) Policies of Organization of American States (OAS)

The Ministers of Education of the member states of the Organization of American States (OAS) organize the Inter-American Meetings of Ministers of Education approximately every two years, in order to discuss current issues in education policy and practice, establish a regional agenda for educational cooperation, and review the progress made on mandates related to education. The Ministers agreed to establish Inter-American Education Agenda (IEA) in the 8th Meeting of Ministers of Education in 2015, and the IEA was approved in the 9th meeting in 2017. The priority theme of the IEA are as follows. Objectives and activity plan (2017-2022) was also developed for each themes².

1. Quality, Inclusive and Equitable Education
2. Strengthening of the Teaching Profession
3. Comprehensive Early Childhood Care

As of end of 2022, the new IEA themes are under discussion among the OAS member states³.

(2) Educational Policies and Guidelines in the Caribbean Region

1) Policies of CARICOM and OECS

Caribbean Community (CARICOM) and Organisation of Eastern Caribbean States (OECS) have issued common policies, guidelines, and regulations for continuous improvement of quality of education in the region and have been supporting member states in their implementation. Table 7-3 indicates the key education policies and guidelines of CARICOM and OECS including COVID-19 measures.

Table 7-3 Policies and Guidelines of CARICOM/OECS

Organization Year	Title	Key Contents
CARICOM (2017)	Human Resource Development 2030 Strategy -Unlocking Caribbean Human Potential	Priorities: • Established globally competitive human resource development system • Empowered regional people

² OAS, 2017, Inter-American Education Agenda (Adopted at the ninth plenary session, held on February 10, 2017, and reviewed by the Style Committee)

³ https://www.oas.org/en/sedi/dhdee/Inter_American_Education_Agenda.asp (Accessed on 2023/1/13)

		<ul style="list-style-type: none"> • Inefficiencies in education systems eliminated <p>Strategic imperatives:</p> <ul style="list-style-type: none"> • Access and participation • Equity • Quality • Relevance
OECS (2012)	OECS Education Sector Strategy 2012-2026	<p>Vision: Every Learner Succeed</p> <p>Goal: To contribute to the socio-economic advancement of the OECS through a quality education system that enables learners of all ages to reach their true potential.</p> <p>Seven strategic imperatives:</p> <ol style="list-style-type: none"> 1. Leadership & Accountability 2. Teacher Professional Development 3. Teaching & Learning 4. Curriculum & Assessment 5. Early Childhood Education 6. Technical and Vocational Education and Training (TVET) 7. Tertiary Education
OECS (2022)	OECS Declaration on Education	<p>Foster the whole person development through education</p> <ul style="list-style-type: none"> • Enhancing resilience • Quality and equity • Digital transformation • Evidence-based curriculum and assessment reform • Expanded and multiple learning pathways • Strengthening stakeholder participation and accountability • Intersectoral support for the most vulnerable • Expansion of public- and private-sector relationships
OECS (2022)	Handbook on Purposeful Play and Active Learning for Early Childhood and Primary Learners	Developed to help teachers in early childhood and primary school settings promote quality active learning in a COVID-19 environment or in other situations, such as in the aftermath of a natural hazard or disaster.
OECS (2022)	Policy Guidance on Learning Management Systems (LMS)	Developed to ensure an effective transition to distributed learning which has contributed to building the capacity of Ministries of Education of member states to better respond to future crises.
CARICOM (2017?)	The CARICOM Qualifications Framework: A Model for Enabling Regional Seamless Human Resource Development	A framework to allow development and movement of human resource within the CARICOM region
CARICOM (2020)	CARICOM Standards for the Teaching Profession: Teachers, Educational Leaders and Teacher Educators	Indicating the qualification standard required for teachers and school leaders in the Caribbean states. It was developed with support of Japan-CARICOM Friendship and Cooperation Fund

Source: JICA Study Team based on the policy document and interview

Table 7-4 COVID-19 Measures / Guidelines of CARICOM/OECS

Organization Year	Title	Key Contents
CDB/ CARICOM/ OECS (2021)	CDB/CARICOM/ OECS Model Learning Recovery and Improvement Strategy for Caribbean Schools "Let's Reap!"	Actions to be taken for school reopening are categorized, and clarified the actors involved: government, schools and the communities. It indicates the importance of coordination and communication among the stakeholders more than ever.
OECS (2020)	OECS Education Sector Response and Recovery Strategy to COVID-19 (Period-specific short-term strategy and thus the actions are already taken.)	Enhance the resilience of the education sector by strengthening the response of the Ministry of Education and schools in disasters and emergencies. It indicates the measures and challenges from the emergency response to the recovery period.
OECS (2021)	OECS Guidelines for Continuity of Learning	The guidelines have been designed to provide support to the member countries as ministries/departments develop continuity of learning plans. It shows necessary information to be collected.

Source: JICA Study Team based on the policy document

2) Roles of Caribbean Examinations Council (CXC)

In accordance with CARICOM’s policy on human resource development, the Caribbean Examinations Council (CXC) designs and implements common examinations and assessments in the CARICOM region. It also prepares corresponding syllabi and curricula, and plans and implements teacher training programs.

The CXC has its headquarters functions in Barbados and a western zone office in Jamaica. The Barbados office is responsible for the administrative and human resources functions as headquarters, corporate ICT, examinations design, implementation, and evaluation and analysis, while the Jamaica office is responsible for the syllabi and curricula development, teacher training, and research and development.

The CXC offers examinations according to the level of education/training, such as primary education leaving certificates, secondary education, post-secondary education, as well as skills qualification based on the Caribbean Qualifications Framework (See Table 7-5)⁴. CXC has articulation agreement with universities in the United States of America (USA) and Canada to facilitate students’ transition when transferring with a CXC Caribbean Advanced Proficiency Exam (CAPE) qualification⁵.

Regarding primary education, CXC has issued learning standards that indicate the knowledge and abilities to be acquired by the end of the school year, while the implementation of the standards is left to the discretion of each member state. Jamaica has its own curricula for primary education following the learning standards. For Saint Lucia, they are currently working on revising a common primary education curricular with the other OECS member states. As for the secondary level, both countries were using the syllabi which detailed the educational contents developed by CXC. Member countries have access to all materials, including learning standards and syllabi, on the website.

Table 7-5 Examinations Implemented by CXC

Examination Type	CPEA: Caribbean Primary Exit Assessment	CCSLC: Caribbean Certificate of Secondary Level Competence	CSEC: Caribbean Secondary Education Certificate	CAPE: Caribbean Advanced Proficiency Exam	CVQ: Caribbean Vocational Qualification
Level	Primary school graduates	Secondary school graduates	Secondary school graduates (academic)	University / employment level	Work-related skills
Requirement	6 years primary education	3 years secondary education	5 years secondary education, 16yo+	2 years post-secondary education, 18 yo+	According to the qualification level
Materials	Standard	Syllabus, past exams, teaching/learning guide, etc.			Handbook

Source: JICA Study Team based on the CXC website

CARICOM held its launch event for a task force on digital skills in September 2021. The task force plans to identify the core digital skills needed in the market. CXC is considering strengthening its efforts for digital skills development that can help learners to gain qualification including Caribbean Vocational Qualification (CVQ). In addition, the CXC is planning to work on strengthening its educational human resources in line with the recently developed CARICOM skill standards for teaching professions.

⁴ Exam results are informed to the participating member states. Member states can disclose the information, but it is not openly announced by CXC.

⁵ <https://www.cxc.org/examinations/cape/articulation-agreements/> (Accessed on 2022/11/5)

3) Roles of OECS

The OECS' vision for education is "Every Learner Succeeds" and its goal is to contribute in advancing socio-economic development through quality education that allows all citizens to reach their full potential".

The OECS member states agreed to cooperate in the education sector in 1992. The member states agreed to reform their education system and harmonized the education system including teachers' conditions under the ten years strategy (1991-2000). The unit to support this reform was renamed to Education Development and Management Unit (EDMU).

The major role of EDMU is to coordinate education development and promote regional integration through the harmonization of policies. EDMU is responsible for providing guidance and standards for member states to implement the decisions of the OECS Council of Ministers of Education. The OECS has developed a common curriculum, trained teachers, strengthened the management of ministries of education through a common management approach, coordinated technical assistance and funding from international development partners for education development in the region, provided model education legislation, and offered guidance for education development in member countries.

In May 2012, the Council of Ministers of Education adopted the OECS Education Sector Strategy (OESS 2012-2020). The OESS was extended to remain in effect until 2026, as the member states concluded that its contents are compatible with the current situation even with COVID-19. On the other hand, new challenges and themes in education sector emerged since COVID-19, and the OECS Declaration on Education (OECS Declaration on Education) was issued.

The OECS had been revising a common curriculum at the primary level (as of November 2022). Five of the member countries have agreed to adopt the CXC's Caribbean Primary Exit Assessment (CPEA), making it a basis of the curriculum target. As of July 2022, curriculum reviews have been conducted and training on curriculum revision has been provided to team members from each member country that will participate in the work. The curriculum revision is implemented as part of the Program for Educational Advancement and Relevant Learning (PEARL).

The response strategy for COVID-19 was developed with a total of USD 3 million from the Global Partnership for Education (GPE) and United Nations International Children's Emergency Fund (UNICEF), which was wrapped up at the end of June 2022. The strategy's focus was on the Academic Recovery Program. Stakeholder engagement findings reported that 98% of schools in the OECS member states now have internet access, yet mostly for administrative purposes. Through the implementation of the Academic Recovery Program, 695 teachers completed a certificate course in Effective Pedagogy in Distributed Teaching and Learning. These teachers are now equipped to navigate teaching in a distributed environment in future crisis situation. Maintenance and management of this system will be a task to be addressed in the future. However, issues remain in terms of the unstable internet connection in classrooms and the quality of teaching materials that are in line with the Caribbean region's culture, traditions, and current situation⁶.

⁶ Interview with OECS-EDMU on 23 June 2022

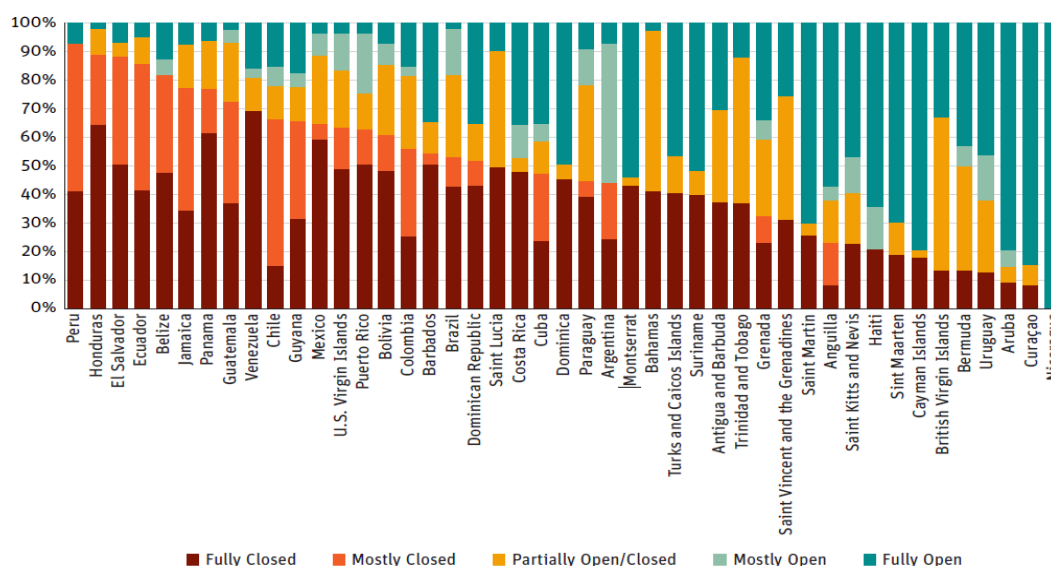
7.2.2 Impact of COVID-19 on Education in the LAC Region

For many years even before COVID-19, the LAC region had been experiencing serious educational challenges such as low school enrolment, low learning achievement, and disparity with the remote and indigenous populations. There has been an urgent need to take action to improve such situation.

In February 2020, as COVID-19 spread across the world, countries adopted policies to restrict the movement of people, forcing many schools to close. According to the “Two Years After Saving a Generation” published by the World Bank, due to the COVID-19 pandemic, schools were closed for an average of 141 days worldwide between February 2020 and February 2022⁷. While some countries reopened schools relatively early, the closure period was particularly long in the LAC region, averaging 225 days. While Nicaragua chose to stay fully open without closing the schools, some countries, such as Venezuela, Honduras, Panama, and Mexico, chose to close completely for almost a year.

Figure 1.8. School closure intensity (%) by country, March 2020 - March 2022

(share of school weeks, by intensity of closure)



Source: Own calculations based on UNESCO and UNICEF's LAC COVID-19 Education Response Updates from March 1, 2020 through March 31, 2022.

Source: World Bank (2022)

Figure 7-1 Intensity of School Closure (March 2020-March 2022)

The World Bank warns that LAC is the region with the largest increase in “learning poverty,” defined as the percentage of 10-year-old unable to read and understand simple texts. As of 2019, learning poverty in low- and middle-income countries was estimated to be 57% on average, while that for LAC region was 52.3%. However, it is projected the average for LAC region will reach 79.0% by 2022, well above the projected average for low- and middle-income countries (70.0%)⁸.

During the school closure period, governments took various initiatives to ensure the continued provision of education, including the development of online platforms, radio, television, and print teaching material packages. Governments also supported teachers for delivery of education such as training for teachers about the methods of distance and online education, support for the creation of teaching/learning materials, and the provision of equipment including devices. The support also reached

⁷ World Bank, 2022, Two Years After Saving A Generation

⁸ World Bank, 2022, Two Years After Saving A Generation

to the parents and caretakers of students who help the children's learning at home, such as development of guidance notes for parents, communication with parents/caretakers via regular phone calls and WhatsApp, etc.⁹

Despite these efforts, not all students could have enjoyed education opportunities over the past few years. The Preliminary Study pointed out the following additional challenges on top of already existing issues in the education sector. They are inadequate access and internet environment for distance education, lack of know-how and digital materials related to distance education, lack of preparation of teachers and schools for distance education, lack of support for parents, delays in implementing learning achievement assessment and monitoring and evaluation, loss of learning opportunities for students with disabilities, inadequate sanitation environment, and nutritional issues due to the discontinued school lunch¹⁰.

7.2.3 Selecting the Focus Countries for Education Sector for the Study

The selection of focus countries for the education sector was, first of all, based on the Japan's country assistance policy, JICA's past assistance experience, and the JICA's Country Analysis Paper (JCAP). Considering the level of learning achievement, concerns about loss of educational opportunities due to long school closure period, and the possibilities for regional cooperation, JICA and the study team agreed to conduct the field survey for three countries.

For the Latin American region, Guatemala was selected where the educational indicators (learning achievement and school enrolment rate) suggest a severe situation of the sector. JICA had dispatched a math advisor to Guatemala between 2019-2021 and is also preparing a Regional Cooperation to produce video teaching/learning materials on math leveraging El Salvador's experience. El Salvador and Honduras were not targeted because requests for assistance have been raised by these government and a detail study was underway parallel to this study.

In the Caribbean region, Japan's country assistance policy's focus has been mainly on disaster risk reduction and fisheries. The dispatch of the Japan Overseas Cooperation Volunteers (JOCV) has been the major modality of assistance in the education sector. When JCAP was renewed in 2022, JICA indicated its readiness to assist education sector for its importance in building a resilient society. Accordingly, Saint Lucia, where the JICA office and the OECS headquarters are located, and Jamaica, where the JICA office and the CXC Western Caribbean Regional Office are located, were selected to collect key information about the education sector in the Caribbean region. For Mexico and Guyana, it was decided to conduct desk research. In addition, survey themes were selected through discussions with JICA, as shown in Table 7-7.

⁹ World Bank, 2021, Acting now to protect the human capital of our children -the cost of and response to COVID-19 pandemic's impact on the education sector in Latin America and the Caribbean

¹⁰ JICA, 2021, Data Collection Survey on Development Cooperation With/Post COVID-19 Society in Central America and the Caribbean Region

Table 7-6 Overview of the Focus Countries

Region	Central America		Caribbean		
Country	Guatemala	Mexico	Jamaica	Saint Lucia	Guyana
Regional Organization	CSUCA*	-	CXC Western Zone Office	OECS EDMU	-
Learning Achievement (Score)	Math : 657 Reading : 645 Science : 661 (ERCE** ¹¹ Average of 6 th Grade)	Math : 758 Reading : 726 Science : 726 (ERCE Average of 6 th Grade)	Math : 37 English : 73 (CSEC*** ¹²)	Math : 49 English : 77 (CSEC)	Math : 32 English : 68 (CSEC)
Remote Learning-Readiness Index **** ¹³	3	3	5	3	4
Days of School Closure (2020/2/16~2021/10/31) ¹⁴	Closed : 229 Partial : 294 Break : 72	Closed : 374 Partial : 96 Break : 118	Closed : 178 Partial : 217 Break : 203	Closed : 246 Partial : 201 Break : 134	Closed : 188 Partial : 256 Break : 151
Japan's Policy	Country Assistance Policy (MOFA)	Country Assistance Policy (MOFA)	JCAP & Country Assistance Policy (MOFA)	JCAP	JCAP

*CSUCA: Consejo Superior Universitario Centroamericano (CSUCA)

** ERCE: Fourth Regional Comparative and Explanatory Study (2019)

***CSEC: Caribbean Secondary Education Certificate, Results of 2021. Regional average is: Math 41, Language 74

****The Remote Learning Readiness Index (RLRI) is composed of three domains: households, a government's policy response capacity, and the emergency preparedness of the national education sector. Maximum score is 5.

Bold Frame: Field visit target countries

Source: JICA Study Team based on various information

Table 7-7 Study Themes for Each Focus Country

Region	Country	Themes
Central America	Guatemala	To confirm the environment for remote learning that meets the needs of the schools/ teachers/students in order to sustain and develop the achievements of JICA's past support and to implement the regional cooperation that is planned in the future. The Study will also look into the use and effectiveness of remote learning materials.
	Mexico	Based on JICA's previous cooperation experience, investigate the current status of remote secondary education (Telesecundaria, Telebachilleratos). Compile information that can be used for future South-South and triangular cooperation, mainly through the collection of good practices.
Caribbean	Guyana	To collect basic information that will contribute to the rollout of support for the education sector in the CARICOM region, in light of the 2022 JCAP revision. Previous JOCV's results and networks should be considered in the survey.
	Jamaica	
	Saint Lucia	

Source: JICA Study Team

¹¹ Scores are expressed in points, with 700 points as the regional mean and 100 points as the standard deviation, allowing the comparison from the ERCE (2019) and TERCE (2013).

¹² https://www.datawrapper.de/_/9qI2J/ (Accessed on 2022/9/4)

¹³ <https://data.unicef.org/resources/remote-learning-readiness-index/>

¹⁴ UNESCO Website

https://web.archive.org/web/20220629024039/https://en.unesco.org/sites/default/files/covid_impact_education_full.csv.zip (Accessed on 2023/1/16).

7.3 Overview of Focus Countries

7.3.1 Guatemala

(1) Education Sector Overview -Guatemala

1) Education Policies and Administration

a) Education Policies

In its general government policy, *Politica General de Gobierno* (PGG) 2020-2024, the Government of Guatemala states that one of the fundamental problems of Guatemalan society is poverty and identifies education as one of the critical sectors for solving this issue. The policy set the strategic objective of breaking the vicious cycle of poverty through skills development necessary for vulnerable people to obtain jobs and the implementation of social security programs that condition children's enrolment in school. Based on the PGG 2020-2024, the Ministry of Education (*Ministerio de Educación*, MINEDUC) has developed the MINEDUC's Institutional Strategy 2020-2024. The strategy indicated the following strategic target areas and actions to take as indicated in the table below.

Table 7-8 Objectives of the Institutional Strategy (Guatemala)

Key Area	Strategic Area	Action
Improve Enrolment	Expansion of coverage: enrolment, attendance, and permanence of children and young people in public educational centers with the purpose of improving their capabilities and achieving their integral development.	
	Early Education	Comprehensive attention to children from 0 to 5 years of age with actions in the area of health, nutrition, support to parents, and early stimulation in order to facilitate access to formal education, and socialization processes to learn to live together.
	Extra School Education	Provides children and youth with training/education processes through alternative modalities than formal school education.
	School Medical Insurance	A program for pre-primary and primary students of public schools, developed to expand the coverage of care. The objective is to retain students in the educational process.
	School Meals	A program designed to achieve increased enrolment, school retention, and dropout prevention by providing food supplement and enhancing comprehensive care for the students.
	Scholarship	Provide opportunities to young people who, for whatever reason, are unable to continue their studies.
	School Infrastructure	Construct, refurbish, and expand school facilities, according to the school needs, which guarantee educational quality.
Improve Quality of Education	The quality of education lies in it being scientific, critical, participatory, democratic, and dynamic. For this, it is necessary to realize and regulate the development of essential processes such as planning, evaluation, monitoring, and supervision of educational programs.	
	Curricular Transformation	Curricular development through classroom learning strategies that respond to cultural contexts - ethnic, cultural and linguistic – with a focus on inclusiveness.
	Inclusive Education	An approach based on the educational reform to ensure the educational service pays more attention to quality and cultural relevance.
	Middle level education	Strengthening both formal and non-formal education in Ciclo Basico (lower secondary) and Diversificados (upper secondary) to meet the needs of the population inside and outside formal schools.
	Technological innovation	ICT is a tool to respond to the new challenges in the millennium context. Integration of ICT in the learning process shall enable to enhance competencies to treat, manage, and share information using the support of technology.
	Teacher Training	Establish strategies to improve pre-service and in-service teacher training through continuous professional development (CPD) to improve quality of education.
Literacy	Literacy is the initial step of the systematic process of comprehensive basic education. This shall be associated to the development of skills and knowledge responding to the socio-cultural and economic needs of the locals.	

Key Area	Strategic Area	Action
Education Management		Strengthen the dialogue between schools and the community regarding the curriculum to create a more dynamic educational community. In doing so, education will be more beneficial to residents and internal efficiencies (enrolment, retention, and promotion) will be improved.

Source: JICA Study Team based on the Institutional Strategy 2020-2024

According to the National Consultation Report prepared for the Transforming Education Summit 2022 (TES) organized in September 2022, MINEDUC is preparing an educational innovation and transformation program (*Programa Innovación y Transformación Educativa*), which talks about seven key areas of intervention¹⁵:

- 1) Curricular matching for the 21st century.
- 2) Recovery and leveling of learning in the areas of communication and language and mathematics.
- 3) Improvement of the educators' capacity for the management of early childhood care.
- 4) Teacher training in digital competencies and technological innovations.
- 5) Promotion of virtual environments for educational inclusion of youth non-formal modality.
- 6) Equivalency and equalization of learning for migrant and returnee children and youth.
- 7) Schools equipped with safe and clean environment to enhance resilience to unforeseen events.

b) Educational Administration

i) Educational System

Guatemala's education system is composed of primary education (6 years), lower secondary education (*Ciclo Basico*: 3 years), and upper secondary education (*Ciclo Diversificado* 2~3 years), with primary and lower secondary education being compulsory. The school calendar begins in January and ends in October. *Ciclo Diversificados* include courses such as general study of humanities (2 years) and professional studies (3 years) in agricultural, education (preprimary teacher training), bookkeeping, etc.

ii) Organization

MINEDUC has four key sections: Technical Issues, Administration, Bilingual and Intercultural, and Extra Schools and Alternative Education. Key Technical DGs are listed as below.

Table 7-9 Key Technical DGs (Guatemala)

Name	English	Role
Dirección General de Currículo (DIGECUR)	General Directorate of Curriculum	Developing the National Basic Curriculum (CNB) and guidelines for all levels of education
Dirección General de Gestión de Calidad Educativa (DIGECADE)	Educational Quality Management	Develop teaching materials based on the curriculum, establish policies and strategies for teacher training, promote innovative educational models, provide technical assistance to relevant agencies and ministries, and integrate ICT into education.
Dirección General de Acreditación y Certificación (DIGEACE)	Accreditation and Certification	Accreditation and certification of educational institutions and teachers to ensure the quality of education
Dirección General de Evaluación e Investigación Educativa (DIGEDUCA)	Educational Evaluation and Research	Development, evaluation, and analysis of learning assessment and feedback to the curriculum from preprimary to upper secondary education. Evaluation of teachers for preprimary and primary education.
Dirección General de Educación Extraescolar	Extra-school Education	Provision of education to over-aged children and youth through modes of education other than formal school

¹⁵ MINEDUC, 2022, Preliminary Executive Summary 28 June 2022, National Consultation for the Transforming Education Summit 2022 (TES)

(DIGEEX)		education
Dirección General de educación Bilingüe Intercultural (DIGEBI)	Bilingual and Cultural Education	Promotes education in two languages: the native language (L1) and Spanish (L2), which promotes coexistence of people of different cultures, aimed at the four ethnic groups that coexist in the Guatemalan land: Mayan, Garifuna, Xinka and Ladino.

Source: JICA Study Team based on MINEDUC Website

According to the DIGECUR (*Dirección General de Currículo*), the National Base Curriculum, (*Curriculo Nacional Base: CNB*), is revised upon necessity responding to the results of the examination conducted by the *Dirección General de Evaluación e Investigación Educativa* (DIGEDUCA) and national policies. At the time of interview in November 2022, the CNB for Grade 1 to Grade 6 of primary education was under revision for the first time since 2005¹⁶.

At the level of department (*Departamentos*), the *Dirección Departamental de Educación* (DIDEDUC) is established in each department. The DIDEDUC is responsible for implementing the policies and plans of the Ministry of Education. The DIDEDUC has a technical department that supports both administrative and technical aspects of the schools. The DIDEDUC budget depends on allocations from the central government and has basically no funds of its own. DIDEDUC also establish educational districts separate from administrative districts.

At the level of municipality (*Municipalidad*), a Coordinator, (*Coordinador Técnico Administrativo: CTA*) or an educational supervisor is assigned, who monitors the schools of the assigned area.

Furthermore, educational accompanying system, *Sistema de Acompañamiento Escolar* (SINAE) was introduced in 2017 as a system to monitor school situations and provide the necessary coaching¹⁷. SINAEs are established in each educational district designated by the department, and their basic structure consists of three members, namely: a district coordinator, an administrative assessor, and a pedagogical assessor. SINAEs are responsible for monitoring the implementation of the classes. There are 8 departments which introduced SINAE so far of the 22 departments. They are San Marcos, Quetzaltenango, Sololá, Quiché, Alta Verapaz, Huehuetenango, Chiquimula and Totonicapán.

Schools are classified into three categories according to the administrative body, i.e.: national (public), private, and cooperatives. Cooperative schools are managed by cooperatives which is co-financed by the contribution of MINEDUC, municipality, and parents/caretakers.

iii) Budget

Education sector expenditure as a percentage of gross domestic product (GDP) was 3.3% (2020). Spending has been increasing year after year, confirming that the government is putting value on education. However, it is 1.3 percentage points lower than the average for the LAC region.

¹⁶ Interview with DIGECUR on 2022/11/14

¹⁷ SINAE is a system introduced and officialized through the support of USAID. SINAE coordinates the educational officers and teachers, organizes a regular meeting called “learning community” to share experience and knowledge, and to ultimately resolve issues and challenges of the teachers.



Source: JICA Study Team based on World Bank

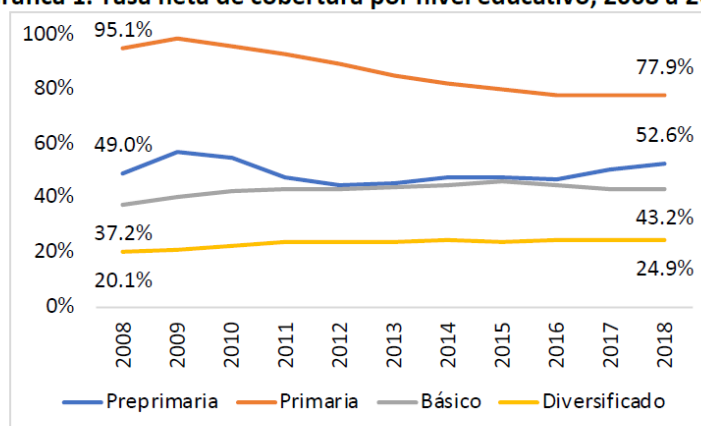
Figure 7-2 Government Expenditure on Education, Total % of GDP (2010-2021) (Guatemala)

2) Situation of Education Sector

a) School Enrolment

Guatemala faces challenges in terms of school enrolment. The figure below shows the net enrolment rates at the pre-primary, primary, lower secondary (*Ciclo Básico*), and upper secondary (*Ciclo Diversificado*) levels of education, as well as the change over time from 2008 to 2018. While enrolment in pre-primary and upper secondary education levels is on a slight upward trend, the enrolment rate in primary school, although compulsory, is less than 80%, and in *Ciclo Básico*, less than 50%.¹⁸

Gráfica 1. Tasa neta de cobertura por nivel educativo, 2008 a 2018



Fuente: CIEN, con base en datos del MINEDUC.

Source: CIEN (2019)

Figure 7-3 Net Enrolment Rate by Level of Education (2008 – 2018) (Guatemala)

The table below shows the number of registered students and the net enrolment rate for each level of

¹⁸ CIEN, 2019, El Sistema Educativo en Guatemala, Centro para la Empresa Privada Internacional -CIPE- y de la Fundación ATLAS.

education from 2019 to 2021. Comparing 2019 and 2021, there is a slight improvement in pre-primary and primary education, while there is a decrease in lower secondary and upper secondary education.

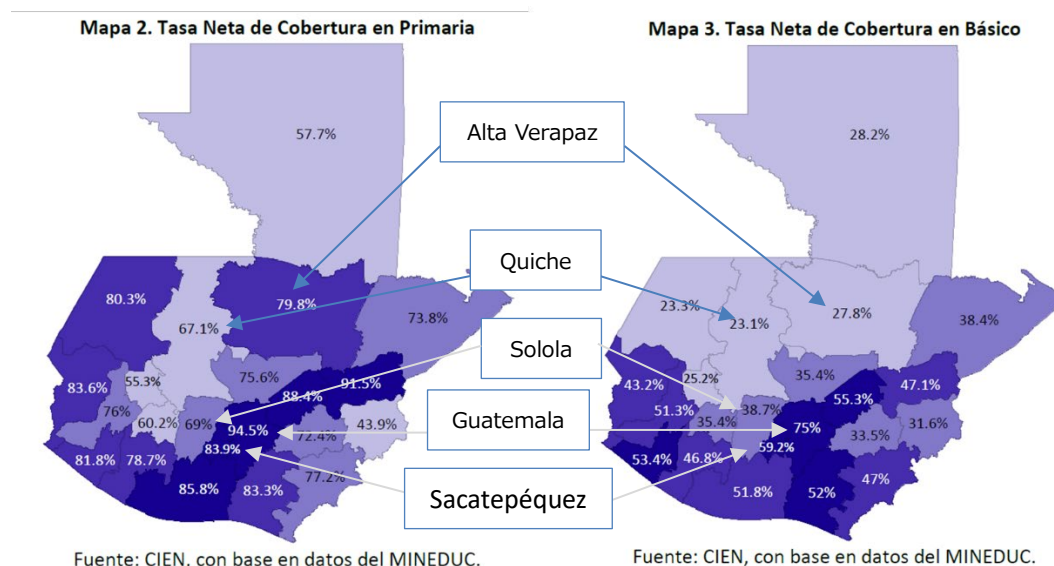
Table 7-10 Net Enrolment Rate by Education Level (Guatemala)

Level	2019	2020	2021
Preprimary	61.96%	60.75%	62.61%
Primary	93.44%	93.71%	95.04%
Lower secondary	49.09%	49.21%	47.87%
Upper secondary	25.72%	26.16%	25.22%

Source: JICA Study Team based on the annual educational statistics

Regional disparities are also severe. Figure 7-4 shows the net enrolment rates for primary and lower secondary education (as of 2017) department by department¹⁹. The Guatemala department had the highest enrolment rate, with 94.5% for primary education and 75% for secondary education. The difference from the lowest department is 50.6 percentage points for primary education and 51.9 percentage points for secondary education.

Factors causing disparities in educational indicators include place of residence (urban/rural), economic status, and ethnicity. For example, the primary education completion rate for non-indigenous population was 66%, compared to 42% for the Quiché, and 20% for the Q’Eqchi, as the lowest²⁰.



Source: CIEN (2019)

Figure 7-4 Enrolment Rate by Department (Left: Primary, Right: Ciclo Básico) (2008 – 2018) (Guatemala)

b) Learning Achievement

The low learning achievement is also a challenge. Below table shows the comparison of results of the Third and Fourth Regional Comparative and Explanatory Study (TERCE, 2013 and ERCE, 2019), a unique Latin American education quality survey conducted regularly by the United Nations Educational,

¹⁹ CIEN, 2019, El Sistema Educativo en Guatemala, Centro para la Empresa Privada Internacional -CIPE- y de la Fundación ATLAS.

²⁰ https://www.education-inequalities.org/countries/guatemala/comp_prim_v2#ageGroups=%5B%22comp_prim_v2%22%5D&years=%5B%222000%22%5D, Data of the year 2000. (Accessed on 2022/9/19)

Scientific and Cultural Organization (UNESCO) Santiago office and the Latin American Institute for Quality Evaluation of Education. Guatemala’s overall position got lower, also, the scores for all subjects (reading, math, science) are lowered too from TERCE to ERCE.

Table 7-11 Results of TERCE 2013 and ERCE 2019 for 6th Grade (Guatemala)

6 th grade	Reading	Math	Science
TERCE, 2013 10 th of 15 countries	677.65 (10th)	672.49 (10th)	683.71 (10th)
ERCE, 2019 14 th of 16 countries	645.27 (15th)	657.28 (13th)	660.77 (14th)

Note: Scores are expressed in points, with 700 points as the regional mean and 100 points as the standard deviation, allowing the comparison from the ERCE (2019) and TERCE (2013).

Source: JICA Study Team based on UNESCO data: <https://ileceunesco.org/>

Gaps in learning achievement exists according to the area of residents, language, and economic status. The table below shows the results of the international examination “Programme for International Student Assessment (PISA)” at the end of primary and secondary education. The examination was conducted by the Organisation for Economic Co-operation and Development (OECD).

Table 7-12 PISA Examination Results by Status (Guatemala)

Subject	Year	Residents		Language		Economic Status	
		Rural	Urban	Non-mother tongue	Mother tongue	Lower	Upper
Reading	End of Primary (2013)	70%	90%	68%	78%	61%	95
	End of Secondary (2015)	45%	77%	32%	71%	53%	91%
Math	End of Primary (2013)	30%	56%	34%	40%	20%	67%
	End of Secondary (2015)	15%	46%	13%	39%	19%	67%

Source: JICA Study Team based on the UNESCO website <https://www.education-inequalities.org/countries/guatemala>

c) Teacher

The teacher training system in Guatemala was revised in 2012. Previously, pre-primary and primary teachers only had to study in the upper secondary education (*Diversificado*) to become a teacher. The revised system requires that after taking the two-year education at *Diversificado*, the candidates have to take a three-year specialized course at the university level (*Formación Inicial Docente: FID*), which began in 2015. Scholarship is available for FID courses²¹. FID is conducted at the national university, *Universidad de San Carlos de Guatemala :USAC*.

For the in-service teachers, specialized teachers’ professional skills development program, there is the *Programa Académico de Desarrollo Profesional Docente*, (PADEP). There is a PADEP-D course for primary level teachers and PADEP-CB for lower secondary level teachers. The course was conducted online for the entire period. Since the course targets the in-service teachers, it is conducted from 7:00 am to 6:00 pm every Saturday.

PADEP-CB was implemented supported by the United States of America (USA)’s assistance through the Millennium Challenge Corp (MCC). The participants of the PADEP-CB receive tablets for learning. The first batch started in 2018 was conducted by three private universities (Universidad del Valle, Universidad InterNaciones, Universidad Panamericana). The second batch was implemented fully

²¹ MINEDUC, 2016, Programas De Formacion Docente Del Ministerio De Educación

online by the USAC- Training School for Secondary Education Teachers (*Escuela de Formación de Profesores de Enseñanza Media*: EFPEM) since 2021²². EFPEM-USAC is negotiating with MINEDUC to continuously implement the course in the coming years²³.

Despite these efforts to continuously improve the teachers' professional capacity, even though there are some cases where teachers' mindset has changed, the results of the students' examination did not exhibit different scores students of teachers who are trained and those who are not trained²⁴.

At present, training on the use of ICT in education for teachers is limited to one-off, ad hoc practices. According to the EFPEM-USAC, the teaching methods using ICT are not included as training subject²⁵.

3) Situation of Education in With/Post COVID-19 Environment

a) Government Policy and Initiative With/Post COVID-19 Environment

i) School Closure and Reopening

The Government of Guatemala developed the "Comprehensive Plan for COVID-19 Prevention, Response and Recovery²⁶" in September 2020 to manage the situation, based on the "Governing System for Risk and Disaster Management for School Safety (2014)²⁷". Then in April 2022, the "Guideline for face-to-face Classroom Teaching at the Educational Institutions²⁸" was developed. The comprehensive plan and the guideline provided instructions for the safe reopening of schools, including ensuring school hygiene and safety, and face-to-face classes were resumed in phases, starting with schools where the environment was ready. The government has also developed various other guidelines, including protocols for physical education classes, psychological support protocols, and protocols for principals.

In case of Guatemala, the government closed schools completely for COVID-19 on March 16, 2020, and began distance education via online, TV, and radio; schools were partially reopened on January 4, 2021, and then fully reopened in February 2022. All schools were fully reopened in June 2022. Full closure lasted for 33 weeks and partial closure for 53 weeks²⁹.

ii) Teaching Material and Teachers

To continue to provide education to students during the school closure period, the government used online, TV, radio, and other means. The "Learn at Home and in the Classroom (*Aprendo en Casa y Clase*)" online program was developed with the support of UNICEF and Canada, and the content for students and parents was posted on the website. A virtual library was also prepared on the MINEDUC website. In addition, programs on math and reading were broadcast via television, and printed materials were distributed where the internet connectivity is extremely weak. JICA also assisted in the distribution

²² MCC, 2021, Threshold Program Summary

²³ Interview with Professor from the USAC-EFPEM (La Escuela de Formación de Profesores de Enseñanza Media) on 2022/8/26. Key target departments are: San Marcos, Huehuetenango, Quetzaltenango, Baja Verapaz, Guatemala City. Participants of the PADEP-CB received tablets to attend course supported by the American agency. PADEP-D participants uses their own devices.

²⁴ CIEN, 2021, Una Estrategia para el Uso de la Tecnología en la Educación,

²⁵ Interview with Professor from the USAC-EFPEM (La Escuela de Formación de Profesores de Enseñanza Media) on 2022/8/26.

²⁶ Spanish Title: *Plan Integral para la Prevención respuesta y Recuperación ante el COVID-19*

²⁷ Spanish Title: *Sistema de Gobernanza para la Gestión de Riesgos y Desastres para la Seguridad Escolar*

²⁸ Spanish Title: *Lineamientos para la Presencialidad en los Centros Educativos*

²⁹ <https://covid19.uis.unesco.org/global-monitoring-school-closures-covid19/> (Accessed on 2022/8/30)

of lower secondary's math textbooks.

During the school closure period due to COVID-19, MINEDUC worked to equip teachers on the use of ICT in education. A teacher training page was set up on the MINEDUC website, offering training on online teaching methods, as well as various courses such as providing guidance on curriculum priorities and learning recovery, alternative learning methods outside of class, and psychosocial management for teachers. An information page for teachers was also prepared on the Aprendo en Casa y Clase platform to support the implementation of classes for teachers.

MINEDUC has designed an emergency curriculum (*Currículo Emergente 2022*) and communicated it to each school in order to make up for the learning delays during the school closure period. However, the content of the emergency curriculum is merely a list of learning units, and it is left to teachers in the schools to determine how to teach in a time-efficient manner, what drills to have students do, and what kind of teaching/learning methods to use.

iii) Infrastructure and Access for ICT

There are 71% of household with television, 65% with radio, 21% with computers and 17% with access to internet in Guatemala according to the census of 2018³⁰. As for the internet infrastructure and access, UNICEF's Remote Learning Readiness Index placed Guatemala as Level 3, "the country's remote learning systems can be regarded as relatively resilient, although serious concerns still remain about the potential for learning loss and the extent to which learning can continue in case of disrupted in-person instruction"³¹. The UNICEF report on the status of internet access by region and socioeconomic status is shown in the table below.

Table 7-13 Internet Connectivity by School Level (2014/2015) (Guatemala)

	Rural	Urban	Poor	Rich	Total
All school age	3	18	0	45	9
Primary	2	16	0	43	8
Lower secondary	3	20	0	49	10
Upper secondary	4	24	0	52	12

Source: UNICEF Global database on school-age digital connectivity

With regard to the future of usage of ICT in education, MINEDUC indicated in the educational innovation and transformation program (*Programa Innovación y Transformación Educativa*) that the government will emphasize the use of digital devices and social media, the development of a digital society and technological innovation, and the assessment of learning in a virtual environment, as well as improving connectivity between schools³².

The unit that promotes the use of ICT in education is called Innova, a unit within the Department of Educational Quality Management (DIGECADE) of the MINEDUC. The table below indicates the ongoing programs for promotion of ICT in education.

³⁰ Instituto Nacional de Estadística (INE), 2018, XII Censo Nacional de Población y VII de Vivienda - 2018

³¹ Remote Learning Readiness Index is measured at the national scale, and not disparities within the country.

³² MINEDUC, 2022, Resumen ejecutivo preliminar 28 de junio de 2022 Consulta nacional para la Cumbre sobre la Transformación de la Educación 2022 (TES)

Table 7-14 Programs for ICT in Education: Contents and Situation (Guatemala)

Program	Year	Contents and Situation
Aprendo en Casa y Clase	2020-	The project staff in DIGECADE created video materials and began distributing them on YouTube. Currently, these materials are shown as an educational TV program rather than on YouTube. The Aprendo en Casa y Clase website itself is currently mainly used as a platform for various information for students, parents, and teachers
MINEDUC Digital Canadian government, UNICEF	-	MINEDUC Digital is a program for all those who want to learn online, rather than on campus.
Technology in Class (Tomi) IDB	-2022	Equipment kits containing a data server, tablets (25 terminals), and a projector were distributed to 1,896 elementary schools; distribution was completed in November 2022 ³³ . The data server stores CNB and textbook data, which students can read using the terminals. Teachers can also use the Tomi app to create audiovisual materials and share them with other Tomi users. Target: Primary schools; Innova hopes to expand to secondary schools in the future.

Source: JICA Study Team based on interview

In addition to the Tomi and programs listed in the above table, similar programs were found as being offered in schools by non-government organization (NGOs) and other organizations, but the extent to which each of these programs are being implemented could not be confirmed. The table below shows similar programs identified in this study. In addition to the programs listed in the table below, FODIGUA (*Fondo de Desarrollo Indígena Guatemalteco*) is planning to install computers in secondary schools in Solola³⁴.

Table 7-15 Technology in Education Programs Run by NGOs (Guatemala)

Program	Support party	Contents
Profuturo	Funsepa, Torresbiarte Foundation	The platform called Profuturo, developed by <i>Fundación Telefónica and Fundación la Caixa</i> , allows students to study using PDF and audiovisual materials. The kit includes a data server and a tablet or desktop screen; materials developed by educators from other countries using Profuturo are also accessible. Funsepa works under an agreement with the MINEDUC, but the decisions on where to distribute the system is based on direct communication of Funsepa and schools. According to the schools that have implemented the system, Profuturo training sessions are held regularly, and teachers continue to attend training sessions after implementation. Introduced to primary schools.
Rachel Plus	World Possible	Platform developed by World Possible, which is a kit of a Rachel Plus server, Wi-fi antenna, and Google Chrome books. The server stores the CNB and CNB-based textbooks ³⁵ . The equipment also includes contact information for technical consultation, and according to the schools that have installed the system, there are follow-up visits from World Possible. Introduced to primary schools.

Source: JICA Study Team based on interview

³³ According to the annual statistics (Anuario Estadístico de la educación de Guatemala, 2020), there are 19,942 primary schools in total. Of which, 16,499 are national schools.

³⁴ Interview at DIEDUC in Solola on 2022/11/21

³⁵ Observed at the time of school visit to Solola on 2022/11/22. Although, because the devices are not connected to internet, the textbook was not automatically updated.



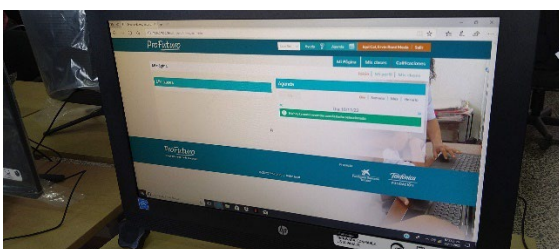
Tomi kit. (Projector, speaker, data sever (round device), tablets (25 devices)



Tomi students interface of Tomi. In addition to MINEDUC resource such as CNB, other Tomi community users' materials can be downloaded.



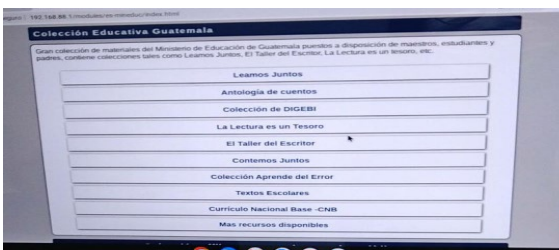
Aprendo en Casa y Clas: Shooting. The equipment for making the video is rented. (Photo from DIGECADE)



Student's interface of Profuturo. There are desk-top type set-ups (like this photo) and also tablet type. One laptop is included as a server.



Rachel-Plus (Sever equipment)



Portal site to access to MINEDUC resources including CNB and textbooks (intra-net) for Rachel-Plus. (no internet)

Photo: JICA Study Team except one on middle row left

Figure 7-5 ICT Tools and Equipment for Education Sector Programs (Guatemala)

Through the field survey, the study team met with some directorate of MINEDUC, DIDEDUC and schools. The interviewees expressed different levels of interest in the use of ICT. For example, DIGEDUCA has already conducted a pilot online examination at the high school level and plans to work on making examinations fully online in the future. DIGEDUCA have also started developing a learning assessment digital application for primary students. On the other hand, at the department level and at the school level, the availability of computers and initiatives regarding the use of computers in the classroom were limited (The following sections explain the details).

Currently, the majority of these ICT in classroom initiatives such as Tomi and Profuturo were for primary schools, and only few cases were observed for secondary schools and above.

b) Challenges of Department/School in With/Post COVID-19 Environment

i) Current Situation and Challenges of DIDEDUC

During the field survey, the study team conducted interview with DIDEDUC in Quiché, Alta Verapaz, and Solola. The following table shows the overview of each DIDEDUC.

Table 7-16 Overview of DIDEDUC (Guatemala)

Department	Organogram Type	Overview
Quiché	Type C	Quiché has two DIDEDUCs due to its large size and difficult accessibility, of which the office in Santa Cruz del Quiché has oversight of over 20 of the total 21 districts. There are 2,500 schools in Quiché, of which 1,800 are public.
Alta Verapaz	Type C	Alta Verapaz has 17 municipalities, and 7 of them has SINAE.
Sololá	Type B	Sololá has 19 municipalities, and 25 educational districts. There are 8 SINAE offices, and some SINAE offices cover 2-3 educational districts. According to the online survey conducted by DIDEDUC, there are 137 schools (approx. 70%) that has no internet. 62 schools received Tomi.

Note: Organogram type A-C: C is large scale DIDEDUC, basically same structure as MINEDUC.

Source: JICA Study Team based on interview and statistics results

The primary role of DIDEDUC was to provide support and training for personnel and to implement educational services. The budget for DIDEDUC operations and activities is also allocated from MINEDUC, and there is no allocation from the department budget. At the department level, coordinators are assigned to each educational level to supervise primary, lower secondary, and upper secondary level schools in the department. Some departments established SINAE for educational district. At the municipality level, CTAs monitor and supervise schools on a regular basis in their areas of responsibility, regardless of educational level.

The DIDEDUC, under the direction of MINEDUC, conducts a training session for teachers on CNB at the beginning of the academic year. The training sessions may be conducted directly by DIDEDUC or through SINAE. In addition, the DIDEDUC will respond to other requests from the MINEDUC directorates such as to provide training or to disseminate information. During the interview at the DIDEDUC in Quiché, it was reported that the DIDEDUC coordinates stakeholders in the department regarding the seminars and trainings conducted by MINEDUC. DIDEDUC also organized trainings on pedagogical method using ICT for teachers.

On the other hand, the content of communication was mainly limited to information provided by the MINEDUC. Reporting from school to MINEDUC is mainly about the number of students and the progress of CNB. There is limited feedback for key educational aspects, such as the contents of CNB and textbooks, or training needs of teachers.

ii) Situation of School Monitoring by SINAE

The JICA Study Team visited two SINAE offices each in Alta Verapaz and Solola. Both departments introduced SINAE in 2018 and since then, the number of educational districts with SINAE has gradually expanded.

Table 7-17 Overview of SINAE (Guatemala)

Dept.	District	Overview
Alta Verapaz	San Juan Chamelco	Established in 2017, SINAE is staffed by a coordinator and a pedagogical assessor. They are in charge of 182 schools: 79 pre-schools, 80 primary schools, 16 lower secondary schools, and 5 higher secondary schools. In Alta Verapaz, the pedagogical assessor rotates the districts they are assigned to, which sometimes causes interruptions of activities, but it also has the advantage of making them recognize challenges from different perspectives. It is difficult to visit all schools due to the large number of target schools and their remoteness.
	San Cristobal Verapaz	Established in 2022. A coordinator, a pedagogical assessor, and a school program officer (staff in charge of school meals, distribution of school supplies, etc.) are in place. The number of schools served is 68 (25 pre-schools, 35 elementary schools, and 8 secondary schools). There are no high schools in the district. The number of teachers covered is

Dept.	District	Overview
		approximately 200. In the district in charge, Tomi has been implemented in four schools and Profuturo in five schools. Setting up a Learning Community is under preparation. A Learning Community of secondary school teachers is also being established, which is a new initiative (mostly targeting the primary schools)
Solola	Solola	Established in 2018, it has a coordinator, a pedagogical assessor, and an administrative assessor. In total, 69 schools are in charge, of which 29 are primary schools and 11 are secondary schools. The Learning Community is organized and conducts similar activities, although not strictly according to the guidelines.
	Sant Andres	Established in 2018, it has a coordinator, a pedagogical assessor, and an administrative assessor. In total, 61 schools are in charge: 26 pre-schools, 23 primary schools, 9 lower secondary schools, and 3 upper secondary schools. There are 220 primary school teachers and 40 lower secondary school teachers. Under DIDEDUC policy, the coordinator is assigned to coach three schools each month, the administrative assessor will coach 12 schools each month, and the pedagogical assessor is to coach 20 teachers each month. This is basically achievable. The district has Tomi in three schools, 360 Grades in four schools, and Rachel in six schools (all elementary schools). There are plans for desktop PCs in one lower secondary school. The Learning Community is organized and conducts similar activities, although not strictly according to the guidelines.

Source: JICA Study Team based on interviews and statistics data

SINAE activities are basically conducted in accordance with the manual. The situation of each school is assessed based on the school diagnosis checklist described in the manual, and an annual plan is prepared based on this assessment. The administrative assessor coaches the principal on effective and transparent use of the budget, teacher management, etc. The pedagogical assessor provides guidance on how to plan classes each year, how to create academic achievement tests, and how to teach specific subjects (especially math and reading).

DIDEDUC and SINAE reported that the introduction of SINAE has led to changes in the school environment, such as the increased use of textbooks and sharing of knowledge among teachers. For example, San Juan Chamelco regularly holds training sessions through the Learning Community using teachers who are good at teaching math as models. In Sant Andres, the school repetition rate was 7% before the establishment of SINAE, but it improved to 3% in 2022. On the other hand, in both departments, there is a strong reluctance towards monitoring and coaching, especially among experienced teachers, and some districts are not yet ready for having SINAE. A number of districts have seen improvements in educational indicators as a result of SINAE activities, and the number of districts that have decided to implement SINAE is gradually increasing after seeing such examples.

In response to the requests from teachers, SINAE in San Andres, Solola, in collaboration with DIDEDUC, organized a workshop on the creation of an academic diagnostic test. By conducting the workshop for teachers in a highly participatory way and sending the signal that they were not being "ordered" by DIDEDUC/SINAE, they were able to increase teacher agreement and buy-in, motivate them to participate in SINAE activities, and make the activities more effective.

Regarding the promotion of the use of information communication technology (ICT) in schools and classrooms, SINAE members recognized that it was their role and encouraged schools to actively use ICT, but briefings and training sessions on the ICT kit were only provided to school principals and teachers, and no awareness-raising or training for DIDEDUC and SINAE was conducted.

iii) Situation and Challenges of School

① Primary School

The survey team visited one national primary school in each of Quiché, Sacatepéquez, Alta Verapaz and Solola. Schools receive budget allocations based on the number of students. The budget allocation is not based on school plans. GTQ 90 per student per year and school lunch expenses (currently, food is distributed instead of school lunch at GTQ 180 /month/person). Equipment and supplies such as desks and computers are allocated by the Ministry of Education or are supported by private companies.

In the two schools in Quiché, which the study team visited for this survey, there was no particular increase or decrease in the number of students enrolled compared with the pre-COVID-19 period, probably because they are in urban areas and relatively easy to commute to school, and the students are returning to school. As a countermeasure against COVID-19 infection, the school has been set up as a distributed system (students attend school every other day) or two shifts, and class hours have been reduced to shorter than usual.

(Use of the Textbook)

National textbooks are distributed annually to all first-year students in national schools. This allows students to write directly in the textbooks. However, from the second grade onward (including lower secondary schools; there are no national textbooks for upper secondary schools), textbooks are distributed to schools once every few years (3-4 years), so students are not allowed to write in the textbooks. In all the schools visited in Quiché, Sacatepéquez, and Solola, it was observed that in first grade classrooms, students were using the national textbooks for math developed with JICA assistance, and were engaged in exercises.

On the other hand, during the classroom observation, it was found that in some classes, teachers did not make any introduction or summary of the topic of the day at the beginning and end of the class, respectively. Some classes had no time for students to work on calculation exercises in the textbooks, and in some cases, students did not open the textbooks, indicating that there is room for improving the use of the textbook³⁶.

In Solola, SINAE pedagogical assessors participated in the workshop on how to use a math textbook and watched model-classroom video conducted by MINEDUC. The pedagogical assessor developed his/her own material based on the workshop and video, and conducted training sessions for the teachers. During the school visitation, the principals and teachers explained how SINAE promotes and supports teachers to use the textbooks. Also in Alta Verapaz, when teachers are found not using the textbook, SINAE supports to solve the bottlenecks for the teachers.

(Use of ICT)

The national school has to pay for the internet connection, as it is not included in the annual budget. At the school in Sacatepéquez, the principal had an internet subscription using her own pocket money and made it available in the principal's office. Also, in order for individuals to access the internet from their smartphones or other devices, they need at least GTQ 5, but this is not enough to watch videos

³⁶ During the survey, in Sacatepéquez and Quiché, teachers mentioned that they did not participate in/did not know about the workshop on the new mathematics textbook and model classes conducted by MINEDUC.

learning materials. Therefore, few children studied using online materials such as *Aprendo en Casa y Class* during the school closure period. Although schools distributed printed materials, in some cases, parents solved the problems or did not obtain parental support, and as a result, the students did not learn. In order to catch up on learning, each school has responded by shortening class for minor subjects (e.g., music, physical education, etc.).

The primary school in Sacatepéquez had a computer lab with 20 desktop computers³⁷. Schools in Alta Verapaz and Solola were equipped with ICT tools of the (Tomi, Profuturo and Rachel). Although, these schools were not connected to internet. A teacher at Sacatepéquez had studied computer science before and was interested in using ICT in the classroom but did not have the environment to put it into practice.

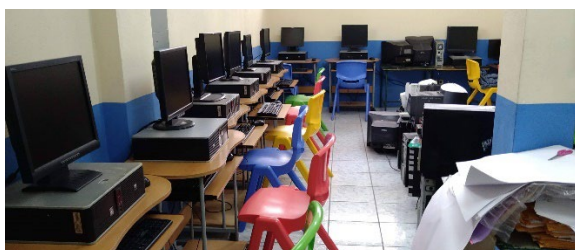
The schools have received ICT equipment (Tomi) from MINEDUC, and it is expected that the schools will be utilizing the machines in coming year³⁸. Some teachers, however expressed their worry for setting up these devices, because despite that they were trained several times for the software, they did not receive enough explanation about operation and set-up of the hardware³⁹.



Calculation of Area (5th grade)- Quiché



Exercise using textbook to learn numbers (1st grade) - Sacatepéquez



Computer Lab -Sacatepéquez



ICT Equipment Tomi -Sacatepéquez



Funsepa and Torresbiarte Foundation supported the introduction of Profuturo in schools -Alta Verapaz



Server-Laptop for Profuturo -Alta Verapaz

Photo: JICA Study Team

Figure 7-6 Class Observation in Quiché and Sacatepéquez (Guatemala)

³⁷ For the primary school in Sacatepequez, Funsepa (a local NGO) provided 16 computers, while the government provided 4. Rehabilitation of the PC Lab was supported by TIGO (private telecommunication company).

³⁸ Guatemala government received a loan from IDB to introduce Tomi (ICT in education tool) produced by Colombian company in primary schools <https://tomi.digital/es/28977/guatemala>

³⁹ Interview at Primary School in Alta Verapaz on 2022/11/16

② Lower Secondary School (Ciclo Basico)

The study team visited two secondary schools in Quiché, one public school and one cooperative-run school⁴⁰. In the public secondary school, all teachers, including the principal, were on annual contracts. The public secondary school received a budget allocation of GTQ 100 per student per year, most of which was used for sanitation and hygiene-related items for COVID-19 prevention measures. The school's computers and printers are donated by parents.

In both schools, there has been no significant change in enrolment between pre-COVID-19 and now, and students are returning. Currently, the schools are taking preventive measures against COVID-19 such as distributed school attendance (students go to school twice a week). Both schools were, however, concerned about the current very low rate of students advancing to secondary school. In Quiché, a comparison of the net enrolment rate between 2019 and 2021 shows an improvement from 88.94% to 90.53% for primary level, while it decreased from 29.04% to 27.39% for the lower secondary level⁴¹. One of the factors that influenced this is the drop in household income due to COVID-19. Other reasons cited include parents' low interest in education, low expectations of return on educational investment, and the cost of commuting to school (40 minutes by bus, GTQ 20/day bus fare). It was also noted that students' hopes and dreams for the future may not be communicated to parents and schools. The cooperative-run secondary schools are making efforts to visit primary schools to encourage students to continue on to secondary school. It was suggested that MINEDUC's budget allocation could be shifted to strengthening secondary education.

In the public secondary schools, the teachers jointly pay for the monthly internet fee of GTQ 239 out of pocket money, although they are encouraged to use ICT. The use of *Aprendo en Casa y Class* during school closure periods is reportedly limited, as is the case in elementary schools. Less than 20% of the students were able to connect to the internet and take online classes, for the case of the public school. Access to radio and television was available, but teachers did not have any specific information if students had accessed and studied using these means. All teachers have received online and/or offline training on online education methods held by MINEDUC and DIEDUC. They also commented that teachers are sharing information and experience through the Learning Community by SINAE, and it helps in improving their teaching skills.

When schools were closed, MINEDUC distributed mathematics, science, and language textbooks to public secondary schools, and these materials were used to educate students rather than online. Although textbooks are not normally distributed by the government to cooperative-run schools, mathematics textbooks were distributed through JICA assistance responding to the COVID-19 pandemic. A mathematics teacher of the cooperative-run school had watched a video of a model lesson prepared by MINEDUC and commented that it was very easy to use and easy to teach as there were plenty of exercises for the students. Since there will be no additional distributions in the future, students have to return their textbooks as they graduate after three years. The school representatives expressed their high expectations for continued distribution.

⁴⁰ The public secondary school building is a multi-functional facility that provides vocational education in the morning and functions as a secondary school in the afternoon. The cooperative secondary school was a complex with three separate schools on one site.

⁴¹ MINEDUC, Guatemala Education Annual Statistics Report -Quiche (2019 and 2021)

As a response to delays in learning due to the school closure period and as a way to compensate for the shortened class time, the students were given homework assignments using distributed textbooks, and the time spent at school was used for exercises and clarification of questions. There was no indication of the use of video, television, or other teaching aids.

Both schools offer computer classes, but do not have on-campus computer labs, and contract with an external computer academy to conduct classes. Of the 39 secondary schools in Quiché, only four have computer labs⁴².

During the mathematics class observation, possibly due to the shortened teaching hours, it was observed that although national textbooks are used, there was no clear step-by-step explanation to ease students' understanding. Calculations written on the white board were advanced compared with the example introduced initially. No scene was observed where students open the textbooks and do exercises.



Photo: JICA Study Team

Figure 7-7 Second Year Students of Ciclo Basico in Quiché (Guatemala)

4) Development Partners' Assistance

The education sector development partners, UNICEF as a coordinator, including JICA, World Bank, Plan International, Save the Children, and private foundations coordinate their assistance through regular education sector local group meetings (called RIED). UNICEF is also the managing agency for GPE grant support⁴³.

UNICEF, in cooperation with the Ministry of Education, is supporting the establishment of Digital Hubs for non-formal education. This will help out-of-school youth to continue their education, by allowing them to learn educational content produced by MINEDUC in a free internet access environment, or by downloading it to study at home. The Digital Hub will be installed in 26 locations in the future with the support of the GPE.

Table 7-18 Development Partners' Assistance Policy (Guatemala)

Organization	Policy Priority
UNICEF (interview)	<ul style="list-style-type: none"> • Early Childhood Education (Critical period for developing study habits and growing both physically and psychologically) • Non-formal, alternative education (more OOSC than schooling children)
Inter-American Development Bank (IDB) Group Country Strategy 2021-2024	Expand basic service delivery especially to the vulnerable group, strengthen education access and quality (2017-2020 experience: Rehabilitation of pre-primary and primary schools, equipment and books, strengthened in-service teacher training program (PADEP) to prepare teachers for primary education.)

⁴² As the computer academy is extra-school contract, students have to pay additional cost.

⁴³ GPE approved Guatemala to be partner country since 2022.

USAID Country Development Cooperation Strategy 2020-2025	USAID will also improve the provision of services, including education, by strengthening national-level service delivery, supporting the decentralization of basic services, and bridging service provision with indigenous systems and institutions.
EU Multi Annual Indicative Programme 2021-2027	Universal access to quality social services

Source: JICA Study Team based on policy documents and interview

(2) Development and Cooperation Scenario of Education Sector -Guatemala

1) Development Scenario

a) Development Challenges and Strategy

The Government of Guatemala considers education as one of the crucial sectors that is fundamental for reducing poverty. The MINEDUC’s Institutional Strategy 2020-2024 identifies four key areas of challenges and set action targets. Regarding the action plan for the realization of the institutional strategy, it was found that directorates and officers, and roles for each action were not clearly defined. For the improvement of the quality of education (especially in reading and mathematics), there were cases where teaching materials developed by MINEDUC were not reaching out to the teachers along with the guidance. Based on the findings, JICA study team illustrate the overview to enhance the education sector aligning to the Institutional Strategy.

Table 7-19 Strategies for Enhancing Education Sector and Summary (Guatemala)

Target	Strategic Area	Contents
Education Guatemala	0. Strengthen capacity to execute policies	Develop an implementation plan to achieve the institutional strategy and clarify the roles and activities of each directorate. In doing so, it will provide opportunities for inter-directorate collaboration within MINEDUC and consultations with the DIEDUC, CTAs, schools and PTAs, the private sector, and NGOs, to allow the bottom-up approach to improve the situation.
	1. Improve Enrolment	Enhance initiatives to incentivize school attendance (school meals and health care), provide scholarships, and conduct awareness-raising activities. Promote pre-school education. Improve access through infrastructure development (school buildings, safety and sanitation) and strengthening out-of-school education.
	2. Improve Quality of Education	To improve the quality of education through language and mathematics, curriculum revision, teacher training, and ICT environment development in order to foster the reading comprehension and logical thinking required in the 21st century society. Focus on lower secondary education. Provide education services that account for individual characteristics (ethnicity, language, culture, disability, and gender). Strengthen the Continuous Professional Development (CPD) system for pre-service teacher training.
	3. Literacy	Strengthen literacy education (not just reading and writing skills, but the minimum literacy and numeracy skills necessary for socio-economic activities) and address socio-cultural and economic needs.
	4. Education Management	Promote dialogue among schools, and communities regarding the curriculum, thereby contribute to improved educational indicators (enrollment, school entry, etc.).

Source: JICA Study Team

b) Program and Project

The table below indicates some of the desirable programs/projects for MINEDUC to materialize the strategies for enhancing Guatemala’s education sector.

Table 7-20 Programs/Projects for Strategies for Enhancing Education Sector (Guatemala)

Target	Strategic Area	Program /Project	Duration
Education Guatemala	0. Strengthen capacity to execute policies	0-1. Develop, monitor and evaluate action plans to achieve the institutional strategy of MINEDUC	Middle

	1. Improve Enrolment	1-1. Implement awareness-raising activities on education	Short
		1-2. Enhance pre-school and non-formal education	Middle
		1-3. Attract students with incentives (school meals, scholarships, etc.)	Middle
		1-4. Improve school infrastructure	Long
	2. Improve Quality of Education	2-1. Revise curriculum	Short
		2-2. Prepare and distribute textbooks and teaching materials	Short
		2-3. Introduce digital teaching materials to assist teaching and learning	Short
		2-4. Build capacity of teachers (math, use of textbook and digital materials)	Short
		2-5. Review teacher training system	Middle
		2-6. Install equipment to enable the use of ICT in schools	Middle
	3. Literacy	3-1. Strengthen literacy education	Middle
		3-2. Strengthen access to post-literacy education services	Middle
		3-3. Strengthen linkage between literacy and labor market needs	Middle
4. Education Management	4-1. Implement dialogue on education content among community, school and DDEDUC	Middle	
	4-2. Establish and strengthen the capacity of community-school association/group	Middle	
	4-3. Improve school management (review of mid-term school operational plan, budget review, annual program, and procurement plan)	Middle	

Note: Short: 2023-2025, Middle: 2023-2027, Long: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

a) Suggested List of Cooperation by JICA and its Roadmap

From the above list of program/project, JICA's cooperation scenarios are proposed considering aspects in the table below.

Table 7-21 Aspects of Consideration for JICA's Cooperation Scenarios (Guatemala)

Aspects	Contents
Consistency with the development strategy of the Government of Japan	Priority Area: Socioeconomic Development in Rural Areas Japan will support social development (health, hygiene and education, among others) with a focus on basic needs, and economic development with the objective of maintaining and improving the standard of living in areas where marginal and indigenous populations are concentrated, in order to contribute to mitigate inequality.
Consistency with the JICA's global agenda	"Develop textbooks and teaching materials to improve learning" and "Provide education to all, with no one left behind" as one of the key approaches in education sector development
An applicable scheme in Guatemala	Technical assistance (TA), grant aid, technical cooperation (dispatch of experts, JOCV, training in Japan or third country, follow-up cooperation), public-private partnership
Effective utilization of the outputs of the previous projects implemented by JICA	In Guatemala: Expert: Math Education Advisor (2020.1-2022.1) Project for the Improvement of Quality of Lower Secondary Mathematics Education (2016.11-2019.7) Expert: Education Advisor (2013.3-2015.3) Project for the Improvement of Mathematics Education (Phases 1 and 2) (2006.4-2009.3) (2009.11-2012.10) Project for the Improvement of Primary Schools with Community Participation (2006.6-2008.5) Volunteer (Primary school, Mathematics education) In the Region: Leveraging experience in assisting the education sector in neighboring countries such as El Salvador, Nicaragua, Honduras, etc.
Synergetic effect with future cooperation plan	The cooperation between the Ministry of Education of El Salvador and MINEDUC of Guatemala, supports MINEDUC in the production of digital learning materials in math based on the ESMATE (Project for the Improvement of Mathematics Teaching in Primary and Secondary Education) experience, which is ongoing as of end of 2022. Future cooperation should contribute to the implementation and promotion of the outputs of such cooperation.

Source: JICA Study Team

The following programs/projects were selected as possible priority for JICA’s assistance examining the aspects indicated above. There will be further consultation with MINEDUC for confirmation of the feasibility and the relevance to its policy direction. These programs/projects are not necessarily to be implemented as standalone project, but best combination can be considered.

Table 7-22 List of Proposed JICA Assistance (Guatemala)

Target	Strategic Area	Program /Project	Scheme
Education Guatemala	0. Strengthen capacity to execute policies	0-1. Develop, monitor and evaluate action plans to achieve the institutional strategy of MINEDUC	Expert dispatch
	2. Improve Quality of Education	2-3. Introduce digital teaching materials to assist teaching and learning • Monitor the development of digital teaching/learning materials. (ESMATE’s regional assistance)	Follow-up cooperation (local consultant) *ongoing
		2-4. Build capacity of teachers (math, use of textbook and digital materials) • Support appropriate use of textbooks and teaching materials in schools by DIDEDUC and CTA. Utilize existing mechanism (SINAE, CTA). • Learn best practices from neighboring countries and Japan, and adapt them to the Guatemalan environment. • Provide ICT equipment and materials at DIDEDUC and teacher training institutions in the pilot department, and prepare the teaching environment for ICT-integrated teaching methods in teacher training and in-service teacher training courses.	Expert (collaborate with JOCV / follow-up cooperation)
	2-6. Installation of equipment to enable the use of ICT in schools • Prepare the local network (intra-net) within the school to enable teachers and students to download the digital learning materials via the school server, which will enable them to work /study at home. • Train teachers and DIDEDUC staff on hardware and software.	Grant Aid	

Source: JICA Study Team

Roadmap for the proposed cooperation is indicated below.

	2023	2024	2025	2026	2027	2028	2029	
Strategic Objective 0: Strengthen capacity to execute policies: Dispatch of Education Policy Advisor								
0-1. Develop, monitor and evaluate action plans to achieve the institutional strategy of MINEDUC	Agreement with MINEDUC							
Strategic Objective 2: Improve Quality of Education								
2-3. Introduce digital teaching materials to assist teaching and learning	⇒	Follow-up						
2-4. Build capacity of teachers (math, use of textbook and digital materials)								
Situation Analysis: DIDEDUC, SINAE	⇒							
Capacity building of teachers through DIDEDUC and SINAE		⇒						
2-6. Installation of equipment to enable the use of ICT in schools					⇒	Follow-up		

Source: JICA Study Team

Figure 7-8 Proposed Roadmap for Cooperation of Education Sector (Guatemala)

Sections below describes details of the proposed cooperation.

b) Strategic Objective 0: Strengthen capacity to execute policies: Dispatch of Education Policy Advisor (Mathematics)

From the interviews at MINEDUC, it was found that inter-directorate collaboration within the ministry is limited, and even within directorate, project-based activities tend to lack coordination among

activities. At this stage, rather than providing support for the overall institutional strategic plan, it would be more appropriate for the policy advisor to specialize in mathematics education. Through this advisory work, the institution’s capacity would be enhanced, and a model could be created to strengthen the system in a similar manner other than mathematics as well. It will be important to conduct a diagnostic review by the development policy advisor currently dispatched by JICA and a situation assessment by a local consultant to confirm the feasibility of implementation and the level of interest in the proposal from the Guatemalan government.

The current institutional strategic plan is in effect until early 2024, and if this type of cooperation is to be provided, the time is appropriate after 2024, considering the presidential election expected to be in June 2023.

Table 7-23 Overview of Proposed Education Policy Advisor (Mathematics) (Guatemala)

Item	Contents
Title	Education Policy Advisor (Mathematics)
Priority	Possible Project (C)
Country	Guatemala
Project Site	Guatemala City and Pilot Department
Scheme	Technical Cooperation / Expert Dispatch
Period	March 2025-February 2027
Counterpart	MINEDUC (General Directorate for Technical Issues)
Project Objective	A cycle of math education will be strengthened, covering curriculum revision, textbook development and distribution, notification to and training of teachers, assessment of students' achievement, and feedback to the MINEDUC.
Outputs	A cross-directorate action plan for mathematics education, based on the institutional strategic plan, will be developed and regularly monitored.
Activities	<ul style="list-style-type: none"> Organize the flow of work within MINEDUC regarding the implementation of MINEDUC institutional strategic plan Support the development of cross-directorate action plans concerning math education Assist in organizing meetings for monitoring the implementation of the activity plan Assist in liaison and coordination with DIEDUC in pilot departments
Remarks	<ul style="list-style-type: none"> It is desirable to conduct feasibility study and confirm the interest of the government by the policy adviser who is currently dispatched to Guatemala, and also by a local consultant. This assistance can make synergetic impact if combined with the following suggested project of mathematics quality improvement projects.

Source: JICA Study Team

c) Strategic Objective 2: Quality of Education: Enhance Mathematics Education

With regard to above proposal 2-3 “Introduce digital teaching materials to assist teaching and learning”, MINEDUC, with the support of the Ministry of Education of El Salvador /Project for the Improvement of Mathematics Teaching in Primary and Secondary Education (commonly known as ESMATE) in El Salvador, has already agreed for creating animated educational video materials for mathematics that are in line with textbooks and CNB.

i) Enhance Math Teachers’ Teaching Capacity through Effective Use of Textbook and Digital Teaching/Learning Materials

The JICA Study Team has recognized high evaluations from the schools visited that the textbooks

developed and distributed with JICA assistance at the time of the COVID-19 pandemic were very beneficial for the students to continue their learning. On the other hand, it was observed that the use of textbooks within the classroom varied.

The Guatemalan education sector is characterized by the establishment of an information transmission network from MINEDUC to the departments and municipalities, allowing directions to reach schools even in the rural and remote areas. For example, CNB orientation session is held by MINEDUC for DIDEDUC at the beginning of the school year, and DIDEDUC provides the same orientation to schools through SINAE and CTAs. SINAE and Learning Community, as mentioned above, are gradually being accepted, and activities that can be considered good examples are coming up.

The use of these existing communication lines and mechanisms to promote the use of high-quality teaching materials such as textbooks, which are the result of JICA's cooperation, and digital teaching materials, which will be created in cooperation with JICA, will not only make use of the results of past support, but also provide a model for effective use of existing systems and mechanisms. It is critical to maintain close communication with the central government/MINEDUC and link activities on the ground to the policy level in order to be a viable model.

During 2023, the current status (such as composition of DIDEDUC, status of establishment of SINAE, and status of activities of teachers' unions) of potential pilot sites for the project will be surveyed. After agreeing on the selection of pilot sites, implementation of the project shall be started in 2024.

Table 7-24 Overview of the Proposed Project for Improving Mathematics Learning through Effective Use of Textbook and Teaching/Learning Materials (Guatemala)

Item	Contents
Title	Project for Improving Mathematics Learning through Effective Use of Textbook and Teaching/Learning Materials
Priority	Priority Project (A)
Country	Guatemala
Project Site	Pilot department (candidate departments: Alta Verapaz, Solola)
Scheme	Expert dispatch (work collaboratively with JOCV)
Period	August 2024 – July 2027 (3 years)
Counterpart	MINEDUC
Other Key Stakeholders	DIDEDUC-CTA/SINAE
Project Objective	A cycle of educational improvement will be established through the promotion of the effective use of textbooks and supplementary materials in secondary schools.
Outputs	<ul style="list-style-type: none"> Textbooks and digital supplementary materials are distributed to each school. DIDEDUC-CTA/SINAE's ability to support teachers will be strengthened (through math teaching support as a model case). Interactive communication between MINEDUC-DIDEDUC/CTA/SINAE will be strengthened (feedback from the situation at school)
Activities	<ul style="list-style-type: none"> Support distribution of textbooks and digital materials (textbook PDFs and video materials) Provide ICT equipment to model schools (financial support for the procurement of platforms such as Tomi) or target secondary schools that already have platforms in place Conduct training for DIDEDUC-CTA- SINAE (training on effective use of textbook, facilitator training, preparation of Learning Community activity plans, connection and use of ICT equipment, etc.) Support the organization of Learning Community meetings with secondary school teachers with DIDEDUC-SINAE.
Notes	<ul style="list-style-type: none"> Collaborate with the MINEDUC's activities of developing digital teaching/learning materials with the effort of neighboring countries, especially ESMATE. Coordinate with the activities of JOCV, assigned to department and municipalities. Regarding the introduction of ICT equipment, it is desirable that it conforms to the

	<p>equipment recommended by the government. No policy for ICT equipment at the secondary school level has been identified.</p> <ul style="list-style-type: none"> • Keep close communication with MINEDUC to facilitate the policy development at national level. Keep communication with the policy advisor, if someone is assigned. • It is also a possibility to have two pilot sites, one with SINAE and one without. .
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Source: JICA Study Team

ii) ICT Equipment Installation in Schools

The Guatemalan government has also been active in introducing ICT technology in classrooms. Currently, with Tomi implementation and NGO support in the wake of the COVID-19. However, most of these equipment installations have been targeted at the primary school level, with little input into lower secondary and above.

There are several types of sets of ICT devices being installed, yet there is no information on which systems are easy for schools and students to use, easy to maintain and use for a long time, or less expensive to update. Furthermore, the policy on the use of ICT in education has not yet been fully shared within MINEDUC. Considering the situation, it is not a support that JICA can immediately initiate. However, the improvement of the educational environment in secondary schools can be aligned with the nationwide dissemination of the outputs of the project to strengthen mathematics education in lower secondary schools, as described in c)-i), and the synergistic effect (multiplier effect) can be expected. Firstly, it is critical to check the evaluation of the current ICT tools in classroom and design the best set of ICT devices for the pilot site context.

Table 7-25 Overview of the Proposed Project on Enhancing School Environment (Guatemala)

Item	Contents
Title	Project on Enhancing School Environment
Priority	Possible Project (C)
Country	Guatemala
Project Site	Nation-wide, pilot department
Scheme	Grant aid (equipment)
Period	2027 (1 year)
Counterpart	MINEDUC and DIDEUC of Pilot department
Project Objective	ICT-integrated educational environment is established in secondary schools.
Outputs	<ul style="list-style-type: none"> • ICT equipment for classrooms will be installed (that functions both online and offline) • Capacity of DIDEUC/CTA/SINAE personnel to install, operate, and fully utilize ICT equipment will be strengthened
Activities	<ul style="list-style-type: none"> • Equipment selection and provision • Training for MINEDUC, DIDEUC, CTA, SINAE as supporters of school • Support installation of the equipment in schools and organize training of staff for installation and operation • Support follow-up to schools by CTAs and SINAEs

Source: JICA Study Team

7.3.2 Mexico

(1) Education Sector Overview -Mexico (Desktop Survey)

1) Education Policies and Administration

a) Education Policies

The Mexican government, in its National Development Plan (*Plan Nacional de Desarrollo 2019-2024*) published in 2019, states that education is a right and aims to improve the learning environment

and guarantee access to education for all. The Ministry of Education (*Secretaría de Educación Pública* (SEP)) has stated in its organizational vision that by 2030, all Mexicans will have access to modern, quality education and will acquire the knowledge, skills, and values they deserve, and has set forth the education-related policies listed in the table below.

Table 7-26 National Education Policy (Mexico)

Title	Year	Key Direction / Priority
La Nueva Escuela Mexicana (NEM)	2018	The NEM defines public education in Mexico, corresponding to ages 0-23. It states that it guarantees the right to education for all girls, boys, adolescents, and young people in Mexico. It was formulated following the inauguration of the President in 2018. Its guidelines include the following: <ul style="list-style-type: none"> • Reevaluation of the value of teachers • Development of educational infrastructure • Enhancement of the governance system • Revision of learning achievement target, pedagogical/didactic method and contents of education.
Programa Sectorial de Educación (PSE) 2020-2024	2020	Key Objectives <ul style="list-style-type: none"> • Guarantee the right to an equitable, inclusive and culturally diverse education that is essential for the best interests of all girls, boys, men, adolescents and young people • Guarantee the right to a good and appropriate education of all sorts and levels, based on the national education system (SEN). • Reconfirming teachers as an essential element of the educational process and fully respecting their right to competence and continuous improvement of their position. • Improve the environment of the teaching and learning process for different types and levels, based on the national education system. • Guarantee the right of the people to exercise and sports, with a focus on the educational field, social inclusion and the promotion of healthy lifestyles. • Strengthen national leadership and the participation of all sectors and social groups to achieve the transformation of the national education system with a focus on girls, boys, adolescents, youth and adult learning.
La Estrategia Nacional de Educación Inclusiva	2019	A strategy that focuses on guaranteeing the right to education for all girls, boys, children, adolescents and young people, regardless of their abilities, environment, needs, learning speed or learning style. It establishes the following six axes, each with its own action plan, indicators, and areas of promotion and agencies in charge. <p>【Strategic Axes】</p> <ul style="list-style-type: none"> • Consistency and harmonization with laws and standards • Development of models of care from an inclusive perspective • Training of educators • Integrated information system on inclusive education • Accessible education centers for learning and participation • Intersectoral collaboration and communication
10 Sugerencias para la educación durante la emergencia por Covid-19	2020	Prepared by the National Commission for the Continuous Improvement of Education (<i>La Comisión Nacional para la Mejora Continua de la Educación</i> (Mejoredu)) to protect the right to education and the health and safety of all girls, boys, children, adolescents, and young people in emergency situations. Ten recommendations to SEP, education authorities, educators, and education professionals, and parents of children. It analyzes and organizes the roles and actions of each of the actors.
Estrategia de Educación a Distancia: Transformación e innovación para México	2020	A Strategy by SEP, YouTube, and Google for Education. Using Google for Education and YouTube, the objective is that SEP provides quality education in the time of pandemic, builds a sustainable distance education backbone system, and helps students cultivate digital skills. <p>【Strategic Axes】</p> <ul style="list-style-type: none"> • Establishment of a distance education platform for SEP; • Hosting webinars for educators, parents, and students for distance education aligned with La Nueva Escuela Mexicana (NEM); • Supporting curriculum-aligned educational content and curation, editing, and distribution of videos via YouTube; • Quantify the effectiveness of the program by identifying active users and distance learning tools, and by using the results of a questionnaire survey of teachers regarding teaching materials and content.

Source: JICA Study Team based on policy documents

b) Educational Administration

i) Education System

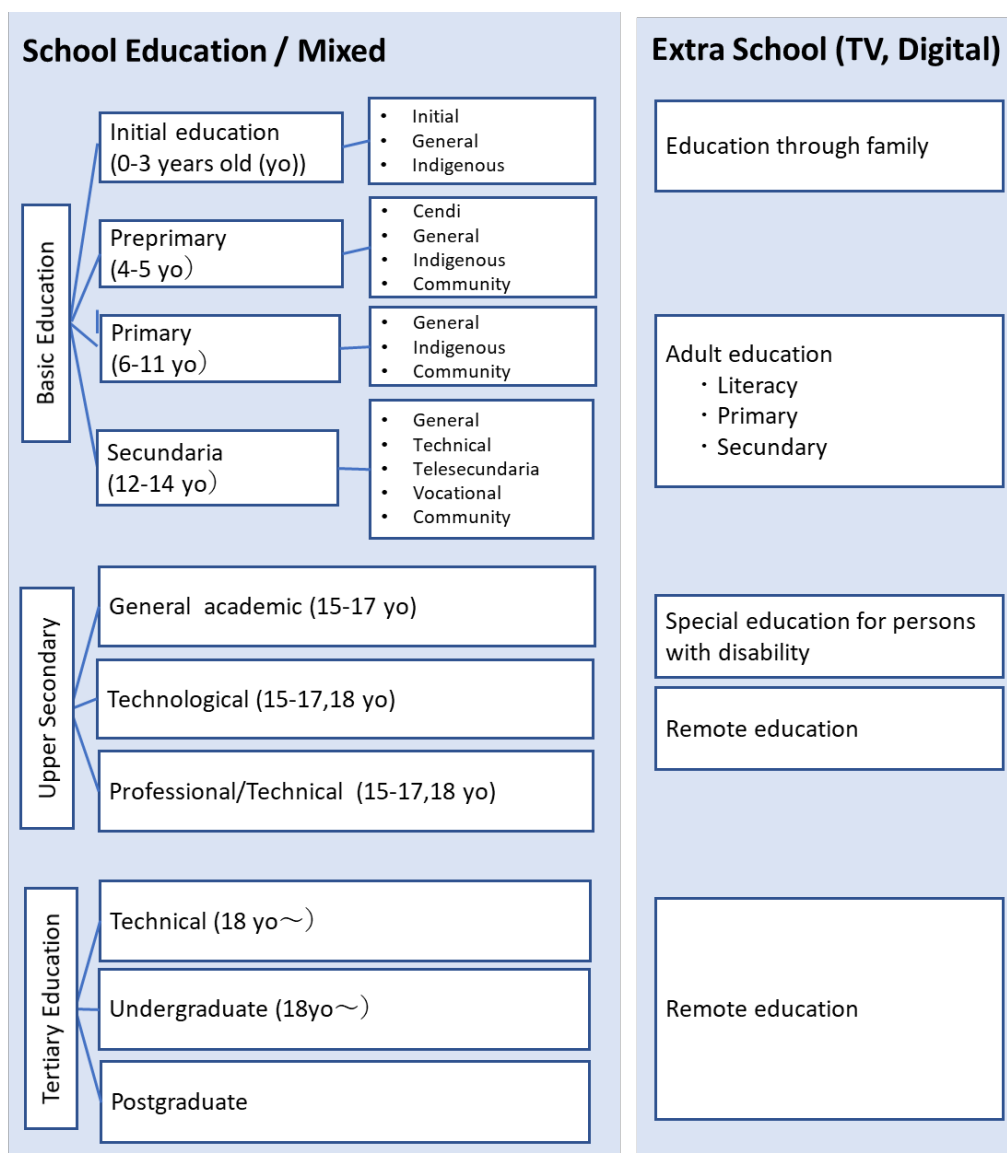
Mexico's education system (*El Sistema Educativo Nacional*) is undergoing a period of transformation following the constitutional reform (*Reforma Constitucional*) that began in 2019. This constitutional reform revised Article III, which stipulates the right to education (May 15, 2019), thereby guaranteeing the right to education for all girls, boys, adolescents, and young people in Mexico. From 2019, compulsory education starts from 3 to 17 years old and is divided into pre-school education (3-5 years old), primary education (6-11 years old), lower secondary education (12-14 years old), and upper secondary education (15-17 years old). Pre-primary education through lower secondary education is regarded as basic education. The Mexican school calendar begins in September and ends in June of the following year.

Basic education can be broadly classified into general education and community education. General education is provided in both urban and rural areas, and generally has sufficient teaching materials and teachers. Community education, on the other hand, is provided in rural and remote areas. Community education is often provided by community education leaders who have just completed their basic education and are not teachers, and who serve as teachers in exchange for scholarships and other benefits.

Lower secondary education includes general education, technical education, *telesecundaria*, courses for workers, and community education. Technical education is a preparatory course before going to technological education, and courses for workers is targeting those who are working or over-aged for schooling. *Telesecundaria* is a satellite education, especially targeting young people in the rural and remote areas.

In addition to the regular schools, there are also technical schools (*Bachillerato Tecnológico*) and vocational technical schools (*Profesional Técnico*), *Telebachillerato* in the upper secondary education system. The technical school offers technical training in addition to the regular high school subjects, and students can obtain a high school diploma and a technical training certificate⁴⁴. Vocational-technical schools specialize in technical training for employment and do not offer university entrance. *Telebachillerato* is a satellite education, same as *telesecundaria*.

⁴⁴ <https://www.unila.edu.mx/educacion-media-superior-obligatoria-mexico/> Accessed on 2022/11/10



Source: Study Team based on SEP, Esquema 2.1.1 Estructura del Sistema Educativo Nacional

Figure 7-9 Education System (Mexico)

ii) Organizations

The Mexican Ministry of Education (*Secretaría de Educación Pública* : SEP) has the Directorate General of Basic Education, Secondary Education, and Higher Education. *Telesecundaria* is run under the Directorate General of Basic Education while *Telebachillerato* is under the Directorate General of Secondary Education. The Directorate General of Television Education (DGTVE), had been responsible of emission of television education through satellite educational channels⁴⁵. DGTVE have been also developing video materials to bridge the educational gaps especially for rural area, and respond to emergency situation such as natural calamity. The *Centro de Entrenamiento de Televisión Educativa* (CETE), which is responsible of preparation and emission of the materials for *telesecundaria* and

⁴⁵ https://www.gob.mx/cms/uploads/attachment/file/690679/SEP-ESTRUCTURA_BASICA_1_DE_ENERO_DE_2022.pdf (SEP Organogram Chart2022.1) (Accessed on 2022/11/10)

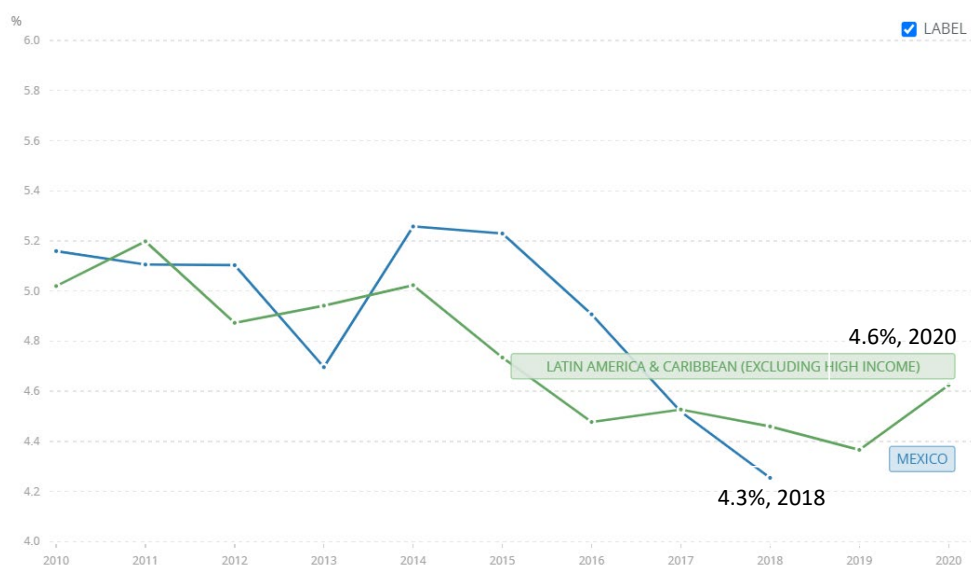
telebachillerato, was established in 1992 under DGTVE with the cooperation of JICA.

There was a change in the organogram in January 2022, and the DGTVE was integrated into Dirección General @prende.mx (DG@prende.mx). @prende.mx was initially created as Coordination General in 2014 for digital inclusion and improving digital literacy, and planned, coordinated, implemented and evaluated the relevant programs. With the integration of DGTVE, it is now responsible for the delivery of distance education via TV, radio, and internet, the creation of educational programs and content, as well as the creation and management of distance learning classes⁴⁶⁴⁷. With this change, CETE also changed to Directorate of Center of Television and Audiovisual Education (*Dirección del Centro de Capacitación Televisiva y Audiovisual*, CTA) under DG@prende.mx. Re-structuring of CTA is still ongoing as of January 2023. CTA is responsible of developing programs for *telesecundaria* and *telebachillerato*, and also training of educators who will use these programs⁴⁸.

Mexico is a federal republic, and each state has its own Department of Education. SEP determines the national educational plans, programs, and compulsory subjects. The educational materials approved by SEP are distributed in the states. However, it is possible to adjust the content of projects and programs (language, non-compulsory subjects, etc.) to meet the needs of each state, such as the actual situation and religion of each state.

iii) Budget

Education sector expenditure as a percentage of GDP in 2018 was 4.3%, down from 5.3% in 2014. It was on a decreasing trend.



Source: World Bank

Figure 7-10 Government Expenditure on Education, Total % of GDP (2010-2021) (Mexico)

⁴⁶ https://www.gob.mx/cms/uploads/attachment/file/759084/ORGANIGRAMA_N00__PRENDE.MX.pdf
<https://elceo.com/politica/sep-desaparece-a-la-dgtve-sin-definir-si-aprende-mx-asume-control-de-contenido-educativo/>
 (Accessed on 2022/11/10)

⁴⁷ Audiovisual Television Training Center (CTA) Interview on 2023/1/13

⁴⁸ Audiovisual Television Training Center (CTA) Interview on 2023/1/13

2) Situation of Education Sector

Primary school enrolment rate is nearly 100% in Mexico, with slight decrease in the year 2020 and 2021 in the time of the outbreak of COVID-19.

Table 7-27 Net Enrolment Rate for Each Level of Basic Education (Mexico)

Levels	Year	2015	2016	2017	2018	2019	2020	2021
Preprimary		71.8	73.9	73.3	71.8	71.4	65.6	63.3
Primary		98.8	98.5	98.5	98.7	98.3	97.4	96.3
Lower secondary		87.9	86.3	84.3	84	83.8	84.2	83.9

Source: Study Team based on the statistics of Instituto Nacional de Estadística y Geografía (INEGI)

According to the OECD, socioeconomic disparities affect learning in Mexico more than gender or migrant status. Socioeconomic disparities in each state are also reflected in educational disparities. The difference between the states with the highest and lowest basic education enrollment rates is more than 25%⁴⁹. The states of Chiapas, Oaxaca, Veracruz, and Guerrero have the lowest GDP per capita in the country and the highest rates of poverty. In these states, two out of every five people (43.5%) are indigenous, and 51.2% speak indigenous languages. These indigenous people often have lower school enrollment and lower literacy rates than the rest of the population⁵⁰. In community education in rural and indigenous areas, as many as 10.1% drop out of primary education⁵¹.

Gaps in learning attainment also affect subsequent earnings, with 32% of those who did not go to high school aged 25-64 earning only half or less than the average wage. This is five percentage points higher than the OECD average of 27%⁵².

Below Table 7-28 shows the comparison of results of the Third and Fourth Regional Comparative and Explanatory Study (TERCE, 2013 and ERCE, 2019). Mexico is at a comparatively higher rank among the Latin American countries. On the other hand, when it comes to the OECD's PISA results, the result shows lower score than OECD average (See Table 7-29). Test takers who achieved the Level 2 "understand the basic contents of the subject" 55% for reading, 44% for mathematics, 53% for science⁵³.

Table 7-28 Results of TERCE 2013 and ERCE 2019 for 6th Grade (Mexico)

6 th Grade	Reading	Math	Science
TERCE, 2013 3rd of 15 countries	734.51 (4th)	768.10 (2th)	731.96 (4th)
ERCE, 2019 3rd of 16 countries	725.56 (6th)	757.94 (3th)	726.06 (4th)

Source: JICA Study Team based on UNESCO <https://ileceunesco.org/>

Table 7-29 PISA Results Comparison Mexico- OECD Average

15 Years Old	Reading	Math	Science
Mexico average	420 points	409 points	419 points
OECD Average	487 points	489 points	489 points

Source: OECD Results from PISA 2018

⁴⁹ SEP, 2020, Programa Sectorial de Education 2020-2024

⁵⁰ Acuerdo Educativo Nacional, Estrategia Nacional de Educacion Inclusiva

⁵¹ SEP, 2020, Programa Sectorial de Education 2020-2024

⁵² <https://www.oecd-ilibrary.org/sites/2a39f90d-en/index.html?itemId=/content/component/2a39f90d-en> (Accessed on 2022/8/8)

⁵³ OECD, 2019, Programme for International Student Assessment (PISA) Results from PISA 2018 Country Note for Mexico

Regarding the disparity in academic achievement by school type, there were variations in reading and mathematics. For example, in the 2019 school year, the percentage of Level 1 (out of 4 levels) students who were found to have difficulty with their learning status on the third grade reading test in secondary school was 13.6% in private schools, 33.84% in regular public schools, 46.16% in *telesecundarias*, and 48.65% in community education, compared with a national average of 37.96%. In mathematics, the national average was 58.7%, compared with 33.6% in private schools, 62.3% in regular public schools, 55.4% in *telesecundaria*, and 59.2% in community education⁵⁴.

3) Situation of Education in With/Post COVID-19 Environment

In response to the spread of COVID-19, Mexico closed schools completely for 214 days in primary and secondary schools and 264 days in high schools between January 1, 2020 and May 20, 2021⁵⁵. These are longer closures than the OECS average of 78 days for primary schools, 92 days for secondary schools, and 101 days for high schools.

In accordance with the Distance Education Strategy (*Estrategia de Educación a Distancia*), which went into effect on April 22, 2020, compulsory Mexican education in the time of COVID-19 is primarily based on (1) education through digital platforms, (2) educational programs on television, and (3) education by telephone. This decision was made in response to the results of the census of March 2020, which surveyed the television and internet communication environment in homes with children (93.1% of households had a TV, 38.3% had a computer or tablet, and 90% had a mobile phone), and the results of a telephone survey on education in the COVID-19 environment⁵⁶.

In the meantime, the Ministry of Education worked on (1) to utilize online platforms, posting guidebooks and other instructional materials for teachers and parents on its website, as well as providing workbooks and downloadable materials for students. The Ministry of Education also made efforts (2) to provide students with access to education through television (TV) broadcasts, utilizing the rich content of educational TV programs.

Satellite-based programs such as *Telesecundaria* and *Telebachillerato* are well established as a form of education in Mexico. This allowed Mexico to have a corresponding program in place just a week after school closure was notified due to COVID-19. In August 2020, the government had made agreement with private TV stations and expanded its educational channels⁵⁷. Additional measures have been taken to prevent and complement learning loss, such as the distribution of printed materials to educational institutions, especially for vulnerable groups⁵⁸.

The programs utilizing TV and online materials was named “*Aprende en Casa*” (learn at home) and broadcasted through multiple channels for pre-primary, primary, lower secondary, upper secondary and for the parents/family. In these efforts, new approaches were taken, such as the introduction of subjects such as “healthy lifestyles” and introduction of the traditions and culture of each state, in conjunction

⁵⁴ https://media.educacioncampeche.gob.mx/file/file_3aeff7bc4f99066af6182741abfdd.pdf (Accessed on 2022/11/8)

⁵⁵ <https://www.oecd-ilibrary.org/sites/2a39f90d-en/index.html?itemId=/content/component/2a39f90d-en> (Accessed on 2022/8/8)

⁵⁶ *Indicadores nacionales de la mejora continua de la educación en México Cifras del ciclo escolar 2019-2020* https://entredocentes.mejoredu.gob.mx/images/publicaciones/indicadores_nacionales_2021.pdf (Accessed on 2022/10/30)

⁵⁷ <https://www.imagenradio.com.mx/televisoras-apoyaran-ciclo-escolar-suscriben-acuerdo-historico> (Accessed on 2022/12/27)

⁵⁸ IDB, 2020, Education in the times of coronavirus: Latin America and the Caribbean’s education systems in the face of COVID-19

with simply teaching academic subjects. In addition, bilingual class programs were produced in 16 indigenous languages, besides Spanish. Furthermore, 90% of families registered with the national education system were able to receive education through telephone consultations.

Despite various government measures, learning loss remains a major challenge in Mexico. As of October 2021, 8% of families with children aged 4-17 reported that they were not enrolled in the class of 2021-22. Fifty percent of 14-17 years old dropped out of school, 53% of whom were boys. In addition, about 40% of parents believed that the primary and secondary school environment was not safe⁵⁹.

4) Situation of Remote Education

The Mexican government has identified challenges in the current education system, especially in response to emergencies, following the outbreak of COVID-19: The need to devise ways to ensure that students can continuously access classes online, and to secure the learning environment (family support, infrastructure such as the internet and computers). Also, the lack of support for teachers in conducting classes from home and other places using digital technology, such as suitable teaching materials, class management system, and digital technology, both from the teaching methodological and technical perspectives⁶⁰.

(Situation of Telesecundaria and Telebachillerato)

Since the 1960s, when satellite television became available, Mexico has been actively using this technology to bring education to rural areas, and in 1968 the "Telesecundaria (Grade 7-9)," distance secondary school programs were recognized as Mexico's official educational system and was rolled out nationwide. Following that, the "Telebachillerato (Grades 10-12)", was created in the Veracruz in the 1980s. By 2013, Telebachillerato had been implemented in the nine states of Mexico. Subsequently, the Mexican government decided to implement Telebachillerato nationwide and it opened as a pilot phase with 253 schools, enrolling 4,500 students in the 2013/14 academic year⁶¹.

Telebachillerato is implemented in regions where the population is less than 2,500 and there are no institutions nearby to provide upper secondary education. By utilizing the infrastructure of secondary schools and *telesecundaria*, it is expected to contribute to efficiently expanding educational outreach and improving enrollment and quality of education without additional buildings⁶².

At Telesecundaria, students attend school, watch a 15-minute video lecture, and then work on exercises based on the material (35 minutes) under the guidance of a teacher. As for Telebachillerato, it is composed of a 30-minute video lecture, a 15-minute discussion, and 15 minutes of exercises⁶³. There is an online platform telesecundaria.sep.gob.mx for telesecundaria. All the teaching/learning material are available from the site. There is also an online application for telesecundaria where people can watch video materials. Recently, SEP has created an online platform where all the educational materials for public education from primary up to upper secondary are available. Upgrading of the site is ongoing to

⁵⁹ UNICEF, 2021, ENCOVID-19 Infancia Resultados mayo de 2020 a octubre de 2021

⁶⁰ ANEXO_DEL_ACUERDO_14_08_22.pdf (www.gob.mx) (Accessed on 2022/10/30)

⁶¹ Antuna Contreras, R., 2019, Telebachilleratos Comunitarios En La Actualidad (2019)

⁶² <https://educacionmediasuperior.sep.gob.mx/telebachilleratos> (Accessed on 2022/11/20)

⁶³ Government of Alberta-Canada, 2015, International Education Guide -For The Assessment Of Education From Mexico

enable educational material downloadable by grade^{64,65}.

(Impact of Telesecundaria and Telebachillerato)

The education program using satellite television system has been expanded to remote areas as well as urban areas to meet the needs of students who have difficulty attending school. There were 641 million students registered in lower secondary education for the academic year 2019/20. One fourth of them were registered at regular school, 27.1% registered in technical school, and 21.1% were in *telesecundaria*. Six out of ten public secondary schools were *telesecundaria* and one out of five students were enrolled in *telesecundaria*⁶⁶.

Similarly, *telebachillerato* is also expanding as shown in Table 7-30. In the states of Veracruz and Oaxaca, the percentage of *telebachillerato* has reached half. In Chiapas, *telebachillerato* accounted for 35% of the total number of schools⁶⁷.

Table 7-30 Trend of Tele-education (Mexico)

Number of	Telesecundaria			Telebachillerato (State / Community, Total)		
	2013-14	2018-2019	2019-2020	2013-14	2018-2019	2019-2020
School	18,420	18,741	18,754	2,190	5,297	5,306
Student	1,369,638	1,379,920	1,348,955	185,814	329,194	332,716
Teacher	70,110	71,644	72,194	8,134	18,367	18,424

Source: JICA Study Team based on *Indicadores Nacionales de la Mejora Continua de la Educación en México* (2020) and (2021)

Research showed that beyond the impact in numbers, studies on the qualitative effects of *Telesecundaria* show that one additional *Telesecundaria* per 50 children leads to a 13.3 percentage point increase in average secondary school enrolment, as well as an average of 0.8 additional years of schooling⁶⁸. The research also confirms that an increase of one year of education increases income by 12.5-13.9% in the long run, which may be due to the shift of educated people from agriculture and informal sector employment to formal employment, as well as an increase in labor force participation⁶⁹.

(Challenges for Uplifting of the Distance Education System)

It is clear that *Telesecundaria* and *Telebachillerato* play a critical role in the provision of educational services. Yet there is room for improvement. For example, there is an analysis of the students' performance of enrolled in *Telesecundaria* is showing lower than that of students attending regular schools in some years⁷⁰. According to the CTAs, they recognize that the results of their performance vary by exam type and year, and that there are various factors that may affect students' performance, and that they are not particularly poor academically compared to other types of education. CTA also

⁶⁴ <https://nuevaescuelamexicana.sep.gob.mx/> (Accessed on 13 January 2023)

⁶⁵ Audiovisual Television Training Center (CTA) Interview on 2023/1/13

⁶⁶

As of January 2020. <https://www.gob.mx/aprendemx/articulos/la-telesecundaria-celebra-su-52-aniversario?idiom=es> (Accessed on 2022/8/10)

⁶⁷ *Indicadores Nacionales de la Mejora Continua de la Educación en México* (Ver. 2021)

⁶⁸ Navarro-Sola, Laila, December 2021, Secondary Schools with Televised Lessons: The Labor Market Returns of the Mexican *Telesecundaria*

⁶⁹ Navarro-Sola, Laila, December 2021, Secondary Schools with Televised Lessons: The Labor Market Returns of the Mexican *Telesecundaria*

⁷⁰ Government of Albarta, 2015, International Education Guide -For The Assessment Of Education From Mexico

recognize that improving the quality of education is an important issue⁷¹.

A survey conducted by the states and the country between 2021 and 2022 showed that the equipment for antennas to receive satellite signals is not maintained and many schools are not actually connected. The government announced that it would invest more than 600 million Mexican pesos to improve *Telesecundaria* and *Telebachillerato* in more than 24,000 schools⁷². The renovation, including improvement of the satellite system and internet connectivity is in a proposal stage and it may commence if the activity is approved in 2023⁷³.

7.3.3 Jamaica

(1) Education Sector Overview -Jamaica

1) Education Policies and Administration

a) Education Policies

The table below lists Jamaica’s education sector’s policies and their key contents.

Table 7-31 National Development Policy and Education Policy (Jamaica)

Title	Year	Key Direction / Priority
Vision 2030 National Development Plan -Education Sector Plan	2009	Goals <ul style="list-style-type: none"> • Teaching and learning systems that are of international standard • World-class school environment • Attainment of equal and inclusive access and retention to ensure completion of secondary education and continuation to the tertiary level • Decentralized systems for quality leadership, management and resourcing
ICT in Education Policy	2022	ICT: Transforming Lives, Empowering Citizens and Enabling National Development’ Policy Goals <ul style="list-style-type: none"> • Transforming the Teaching and Learning Process • Learning Opportunities for All • Efficient Management and Administration of the Education System • Promoting the Development of ICT Innovations
Policy on Special Education Access, Equity And Relevance	2017	Policy Goal: <ul style="list-style-type: none"> • To promote equity and access to educational opportunities for children and youth with special needs at all levels of the education system. • To promote a system of inclusive education where possible, recognizing that some children may be best served in segregated facilities or homebased programmes.
Education in Emergencies -A Manual for the Reopening of the Educational Institutions	2020	Manual for school reopening under the preventative measures for the COVID-19 infection. Objective of the manual is to ensure continued education in the time of emergency. The manual supported the promotion of hybrid (online and face to face) education system.

Source: JICA Study Team based on policy documents

In 2020, the Government of Jamaica established the Jamaica Education Transformation Commission, which conducted an education sector review; in January 2022, the Reform of Education in Jamaica in 2021 Report was released and a launch event was held. The report covers from pre-school to tertiary education and contains 109 recommendations (of which 54 are priority recommendations). In March 2022, the government established the Education Transformation Oversight Committee, which is

⁷¹ Audiovisual Television Training Center (CTA) Interview on 2023/1/13

⁷² <https://www.gob.mx/sep/es/articulos/boletin-sep-no-151-reconectara-sep-mas-de-24-mil-telesecundarias-y-telebachilleratos-para-ciclo-escolar-2022-2023> (Accessed on 2022/8/15)

⁷³ Audiovisual Television Training Center (CTA) Interview on 2023/1/13

expected to submit a project implementation plan and budget proposal by October⁷⁴.

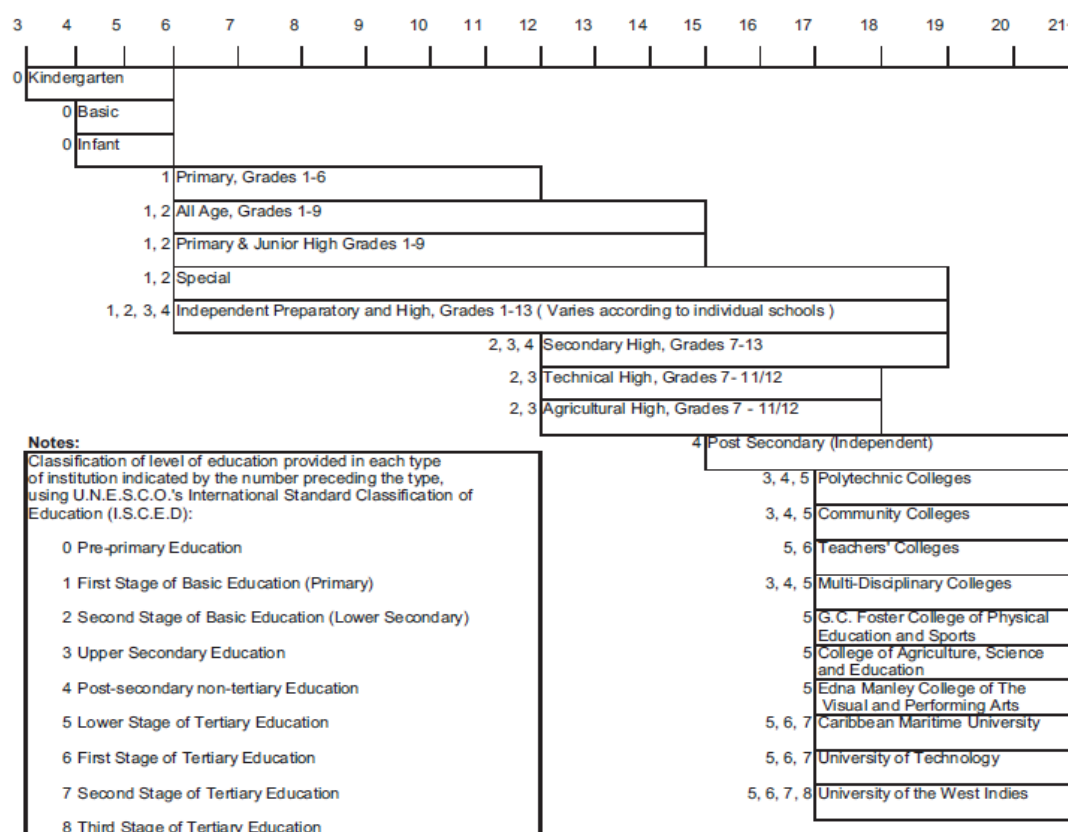
According to interviews at the Ministry of Education and Youth (MOEY, the current nine priorities of MOEY are as follows:

- Bridging the Digital Divide
- Child and Youth Development
- Child Care and Protection
- Lifelong Learning
- Governance and Accountability
- Information and Communication
- Quality Education and Training
- Stakeholder Engagement
- Parenting Support

b) Educational Administration

i) Educational System

Jamaica's education system is composed of pre-school, primary (6 years), and secondary (5 years), with only 6 years of primary education being compulsory. MOEY has adopted a strategy called "Kindergarten to G13" to promote schooling for all citizens from pre-school to high school graduation. To this end, MOEY is currently working to extend secondary education to seven years in order to ensure that students acquire the skills and knowledge necessary for the labor market and to facilitate the transition to tertiary education and employment. Extending the length of schooling will also discourage youths from engaging in crime and unproductive activities⁷⁵.



Source: The Government of Jamaica, Education Statistics 2018/2019

Figure 7-11 Formal Education System in Jamaica, Age by Single Year

⁷⁴ <https://our.today/etoc-says-planning-now-taking-place-to-transform-education-sector/>

⁷⁵ Ministry Of Education, Youth and Information, 2021, SIXTH FORM PATHWAYS PROGRAMME - For 7 Years of Secondary Education in Jamaica

ii) Organizations

The Ministry of Education and Youth (MOEY) is composed of Planning and Development Division, Finance and Accounts Division, Human Resource Management & Administration Division, Strategic Reform Division, Project Management Division, Legal Affairs Unit and Internal Audit, and specialized divisions of Educational Services Division, Youth Division, and Information Division.

Under the Education Service Division, there are the Schools' Operations Branch, Curriculum & Support Service Branch, Tertiary Branch, Regional Guidance & Counselling Branch, and Region offices.

Jamaica has seven educational regions, and each has regional offices of MOEY that conduct monitoring and support the schools in the region. A mathematics coordinator, literacy coordinator, and community relation education officers to promote home-school linkages are assigned to each regional office (although some posts are still vacant).

iii) Budget

Education sector expenditure as a percentage of GDP in 2021 was 6%, up from 5.6% in 2020. This is the same as the Caribbean small states average and higher than the LAC region (excluding high-income countries).

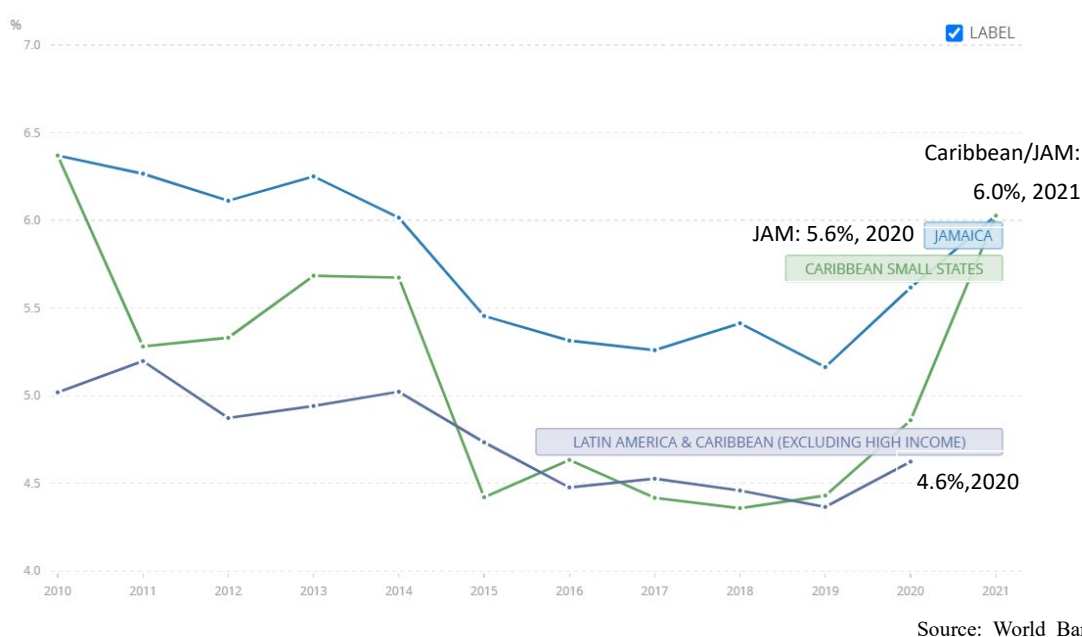


Figure 7-12 Government Expenditure on Education, Total % of GDP (2010-2021)

2) Situation of Education Sector

a) School Enrolment

Jamaica's gross enrolment rate was 85.1% (2019) for primary education and 85.4% (2019) for secondary education. About 46,930 (23,875 boys and 23,055 girls) of primary school age children were

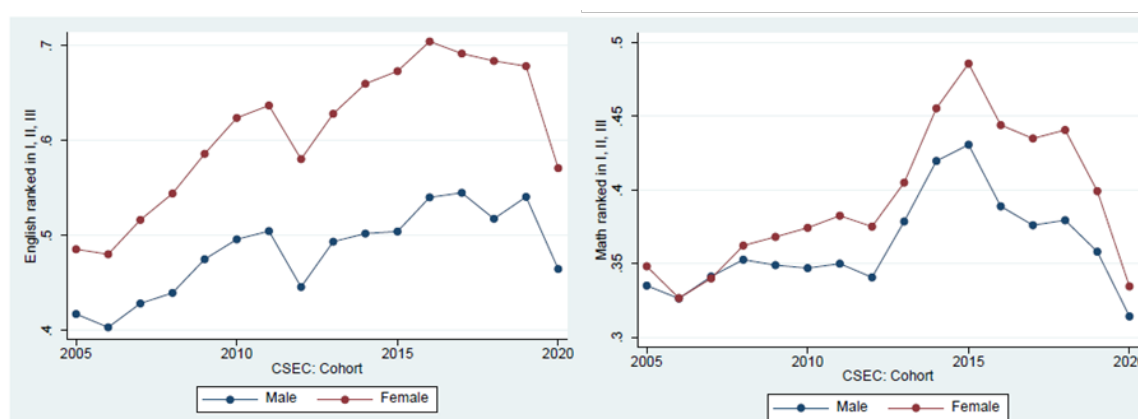
not in school (2019)⁷⁶.

Disparities by the areas of residence and socioeconomic status were also observed. For example, the secondary school completion rate was 98% for the wealthiest families, while it was only 86% for the poorest families. The gap widened in high school enrolment rates, from 99% for the wealthiest families to 80% for the poorest, and high school completion rates of 96% and 46%, respectively. The high school completion rate in Kingston was 82%, dropping to 70% in rural areas⁷⁷.

Besides, according to 2011 statistics, the enrollment rate of children with disabilities (5-17 years old) was 72.6%. There were 38 schools which accepted children with special education needs in the 2018/19 school year, of which 12 were types of regular schools with special education units, 6 were inclusive schools, and the others were specialized schools, including those with intellectual disabilities (seven schools), hearing challenges (five schools), and visual challenges (one school)⁷⁸. According to MOEY, the special needs of children with developmental and learning disabilities are increasing, but currently there are only three institutions nationwide assessing the special needs of children, and these institutions are concentrated in Kingston. Furthermore, they are not fully functioning due to lack of staff and equipment⁷⁹. MOEY seeks to strengthen its efforts to address the special education needs, including the establishment of a new institution to diagnose special education needs and the preparation of equipment and tools necessary for diagnosis⁸⁰.

b) Learning Achievement

There is a challenge in educational achievement. Only 28% (23% of boys and 31% of girls) were able to exceed the passing line in five subjects, including English and Math, at CSEC (2019). The scores in both English and Math have been declining since 2015-16, with a particularly steep drop in Math.



Source: JETC, 2021, Jamaican Students Exam Performance in the 21st Century: Patterns and Puzzles

Figure 7-13 Results of CSEC (2005-2020) Left: English, Right: Math

With regard to CSEC scores, a comparison of Math and English scores from 2019 to 2021 shows an

⁷⁶ <https://datatopics.worldbank.org/education/country/jamaica> (Accessed on 2022/6/7)

⁷⁷ <https://www.education-inequalities.org/countries/jamaica> (Accessed on 2022/6/7)

⁷⁸ Annicia Gayle-Geddes, 2020, Background paper prepared for the 2020 GEM Report Latin America and the Caribbean: Inclusion and Education: All means all, Disability and Education in Jamaica, Analysis of Policy and praxis. School enrolment rate of the students without disability is 95.4%, while that of girls with disability is 75.8% and boys with disability is 69.8%.

⁷⁹ Interview with Ministry of Education on 2022/11/10

⁸⁰ Interview with Ministry of Education on 2022/9/1

11.9-point drop in the 2022 passing rate for English and a 17.4-point drop for Math. This is presumably due to learning delays caused by the impact of COVID-19. MOEY has implemented the National School Learning and Intervention Plan (NSLIP) to address the learning delays and learning gaps. NSLIP involved a team of primary and secondary math coaches and specialists who consulted with principals, and parents, and coached teachers^{81,82}.

Table 7-32 CSEC Pass Rate, English and Math, Trend 2019-2022 (Jamaica)

Subject / Year	2019	2020	2021	2022
English	82.8%	83.9%	73.3%	69.9%
Math	54.6%	61.2%	38.2%	37.2%

Source: JICA Study Team based on the Ministry of Education's announcement report and website

According to the Human Capital Index (2020) published by the World Bank, a child born today in Jamaica may gain only half (53%) as much productivity as if he or she enjoyed full health and education. This means that a child who starts school at age 4 in Jamaica can expect to complete 11.4 years of schooling by age 18, but that child will actually gain the equivalent of 7.1 years of achievement. Furthermore, the COVID-19 pandemic could lower this to the equivalent of 5.8 years⁸³.

c) Teacher

One factor that influences children's learning is teachers. In Jamaica, a bachelor's degree (university degree) in education, including a teaching internship program, was made a requirement for teacher recruitment in the early 2010s. Special Education is a part of the curriculum of teacher training. If a student has a bachelor's degree in a professional program other than education, an additional one-year education degree is required to qualify as a teacher. Regarding teacher certification status, at the primary level, 100% of teachers are certified⁸⁴.

Jamaican teachers, who are native English speakers and hold credentials, are reportedly in great demand for teacher recruitment from other English-speaking countries, especially the United States and the United Kingdom. Every year there is a labor migration of teachers to the U.S., U.K., Canada, etc. To make up for this deficit, retired teachers and newly graduated teachers are being recruited. The shortage of science and mathematics teachers, in particular, is listed as a pressing issue in the Jamaica Education Reform Report. The number of teachers who left the system in 2022 is particularly high, although the exact number is not yet known, and an article on 1st September 2022 indicated that 248 teachers have reportedly submitted their resignations⁸⁵.

⁸¹ <https://moey.gov.jm/improved-performances-in-several-csec-and-cape-subjects/> (Accessed on 2022/9/12)

⁸² Remarks by Hon. Fayval Williams Minister of Education, Youth and Information at Press Conference on CSEC / CAPE 2021 Exams Results 9:00 a.m. October 18, 2021

⁸³ World Bank, UNICEF, 2021, Public Expenditure Review of the Education Sector in Jamaica

⁸⁴ UNESCO, 2020, Reopening schools in Latin America and the Caribbean -Key points, challenges, and dilemmas to plan a safe return to in-person classes

⁸⁵ <https://jamaica-gleaner.com/article/news/20220901/almost-50-jump-teacher-resignations-july> (Accessed on 2022/9/10)

3) Situation of Education in With/Post COVID-19 Environment

a) Government Policy and Initiative With/Post COVID-19 Environment

i) School Closure and Reopening

The Government of Jamaica closed schools completely for COVID-19 beginning March 2020, and started distance education via online TV and radio. The period of complete school closure lasted for 26 weeks, and partial closure for 44 weeks⁸⁶. In May 2020, Jamaica developed the "Education in Emergencies - Manual for Reopening Educational Institutions". Gradually, schools started hybrid (face-to-face and online) and/or staggered school attendance. School reopened fully for face-to-face instruction from March 2022.

When schools resumed, the government started the Yard to Yard Child Find program for children who did not return to school, identified children at risk of dropping out and addressed each child individually, and applied the incentives through The Programme of Advancement Through Health and Education (PATH), (implemented in cooperation with the Ministry of Labour Social Security), a conditional cash transfer program, to get children enrolled/ come back to school⁸⁷.

When schools reopened, they were to conduct a student assessment for each grade prepared by MOEY and draw up an annual plan in accordance with the NSLIP. In response to these annual plans submitted by the schools, the government provided summer courses, extracurricular classes, and homework programs. These activities were implemented in a bottom-up manner, with schools involving the local community and parents in the planning process, and the government supporting the implementation of the plan. Private companies also participated as service providers in the implementation of these plans⁸⁸.

ii) Teaching Material and Teachers

During the period of COVID-19 induced school closure, MOEY promoted online classrooms, encouraged the use of Google Classroom to each school, and distributed Gmail accounts to all education officers and students. To mitigate the impact of school closures on learning, in May 2020, the MOE prepared a manual showing on how to prioritize the curriculum and apply this to teaching and learning. Moreover, they shared a guide on how to use distance learning tools (online, TV, radio, and print materials) to effectively promote teaching and learning and added a focus on socio-emotional learning and psychosocial first aid in regular classes with support from UNICEF.

MOEY set up a website (educate.gov.jm) containing a variety of contents that can be downloaded and studied at home⁸⁹. With the cooperation of private companies, a rich variety of online learning materials are posted on the website. MOEY also continues to work to develop learning apps to enable students to learn in a variety of ways.

Teachers and the officers of MOEY also created teaching materials, posted model lesson plans, and assisting teachers in their work. As a tool to support teachers, the online instructional leadership course was launched by the National College for Educational Leadership with the support of UNICEF. It

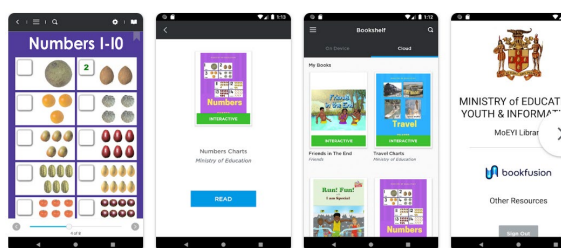
⁸⁶ UNESCO map on school closures (<https://en.unesco.org/covid19/educationresponse>) and UIS, March 2022 (Accessed on 2022/8/30)

⁸⁷ Interview with Ministry of Education on 2022/9/1

⁸⁸ <https://www.facebook.com/watch/?v=1150861562055653> (Accessed on 2022/9/8)

⁸⁹ <https://educate.gov.jm/index.php/resources/>

provides training on tools and communication methods to improve online teaching and learning. Approximately 2,500 principals and teachers received training by September 2021. UNESCO's Distance Learning and Teacher Training Strategies in the Caribbean SIDS, was also deployed in Jamaica in cooperation with the Jamaica Teaching Council (JTC), supported by UNICEF and the German government, and is now available to 20 master trainers and 7,000 teachers in Jamaica⁹⁰. In Jamaica, in-service teachers are registered with JTC and in-service training is provided mainly through JTC. Teacher training will be investigated next time.



Learning Application developed by MOEY in collaboration with private company



Workshop on mathematics teaching method by the curriculum officer of MOEY

Source: Left: Google Play Screenshot, Right: Photo by Study Team

Figure 7-14 Learning Application Developed and Teacher Training by MOEY

MOEY is currently working on building an Education Management System (EMIS), utilizing Google Classroom. This will be developed in combination with the national ID system, which is currently underway. The Government of Jamaica is placing emphasis on the acquisition of digital skills in schools, and is working on the digitization of textbooks, and the introduction of programming classes⁹¹.

iii) Infrastructure and Access to ICT

According to UNESCO, 94.3% of Jamaican households have access to mobile phones, 73.2% to radio, and 89.9% to television. In addition, 85.2% of primary schools, 46.8% of secondary schools, and 100% of high schools have computers for educational purposes, while 78.8% of primary schools, 46.8% of secondary schools, and 91.2% of high schools have internet access⁹².

The Government of Jamaica worked to develop and provide a variety of online tools when schools closed, as well as to improve device and internet access.

One Laptop or Tablet Per Child was rolled out to distribute devices that students can use to study. Approximately 26,000 tablets and laptops were distributed as of September 2022⁹³. Through the PATH program, 65,000 tablets were distributed to students in grades 4-9 and 14,871 laptops to students in grades 10-13. In addition, the Own Your Own Device Program was rolled out and JMD 20,000 vouchers were distributed to 36,000 students. Currently, the Phase 2 of the program is being rolled out, with JMD 30,000 vouchers distributed to 25,000 teachers. In addition, the Laptop for Teachers initiative is being implemented in collaboration with MOEY and the Jamaica Teachers Association, with vouchers

⁹⁰ <https://en.unesco.org/distance-education-caribbean> (Accessed on 2022/6/30)

⁹¹ Interview with Ministry of Education on 2022/9/2

⁹² UNESCO, 2020, Reopening schools in Latin America and the Caribbean -Key points, challenges, and dilemmas to plan a safe return to in-person classes

⁹³ Jamaican government provide tablets for students in lower secondary, and laptops for upper secondary.

distributed to 8,852 teachers.

UNICEF supported the distribution of tablets for learning to over 500 children with special needs and the introduction of the Accessible Digital Textbook (ADT) programme - an inclusive digital reading materials for children with reading disabilities.

In terms of improving internet access, in cooperation with the Ministry of Science, Energy and Technology (MSET)-Universal Service Fund (USF), public Wi-Fi is increasingly being made available mainly in public facilities, with fiber optics to be expanded by 2025. Schools used to provide internet access from their own budgets, but now the MOEY is developing connectivity based on the number of students. While 100% of high schools are already covered, some primary schools are still not yet equipped with internet. Furthermore, even though there is internet coverage, if the access points installed in schools are outdated, connection instability will not be resolved. Replacement of the old access point is a foreseen issue⁹⁴.

As for home internet access for students, during the period of the pandemic induced school closure, the government contracted with private telecommunication providers such as Digicel and Flow, to provide access to students to view and download educational websites at no cost. In addition, in order to enable students to learn via radio and TV without having to solely rely on the availability of devices/internet, a satellite TV system was installed in schools (100 schools), and MOEY used its own TV channel to broadcast educational and radio programs.

b) Challenges of School in With/Post COVID-19 Environment (Interview with a Teacher)

i) Interview from Primary School Teacher

An interview was conducted with a primary school teacher who had studied in Japan supported by JICA. The following is a summary of the interview.

She works at a primary school about an hour away from Kingston, with approximately 600 students in grades 1-6. There are about 30 teachers. The school is a two-story building, but due to the condition of the stairs, only the first floor is used, so students currently commute to school in shifts. There are only two toilets for girls and two for boys, so it is difficult to say that the sanitary environment is adequate. The school has ten computers and only one projector.

The new academic year began in September 2021 and at first, it was online. Currently, she is in charge of second grade students. MOEY provided many training opportunities on ICT-based teaching methods, and teachers were getting ready, but in many cases, it was difficult to do technical things such as students uploading homework assignments using Google Classroom. Students used WhatsApp to send pictures of their homework assignments, and teachers wrote on them and returned them.

Many of the students were not able to attend classes during the online period in reality. Only about half of the students were able to participate in the online classes, and even when they were able to, the connection was unstable, and many were barely connected. Teachers bought internet bundles using their own money for stable connections. When families could afford it, they also purchased internet access

⁹⁴ Interview with Ministry of Education on 2022/9/2

to prepare a favorable learning environment.

Although face-to-face classes resumed in January 2022, it is difficult to control the situation in the classes because there is a big gap between the learning status of children who were able to attend classes online and those who were not. In addition, as mentioned above, class hours are shortened due to the two-shift system, making it difficult for students to catch up on their learning.

At the beginning of the school year, students are supposed to take an assessment test to check their learning status, but not all grades have the same assessment tools, so some teachers do not administer the test.

Although there are a variety of digital teaching materials available for use in the classroom, there is still a lack of them. In addition to digital teaching materials, teaching aids are not available in Jamaica, or if they are, they are expensive. Teachers are very busy, grading students' homework via WhatsApp and creating teaching aids after school hours.

There is a system in place for teachers to undergo two assessments each year. Since these assessments are based on international standards, teachers are under pressure because what they cannot do due to lack of school environment can lead to low evaluations. Recent expansion of the workloads due to COVID-19, adding to various other pressures in life, it can be that in some cases, teachers have somehow lost their sense of fulfillment in the teaching profession.

In addition, one of the best public secondary schools in Kingston requires students to have a computer when they enter the school, and they have been able to handle the sudden shift to online due to school closures without any difficulty. However, since it remains the case that public school budgets are limited, the PTA will be called upon to help with school equipment and other needs.

ii) **Public Primary School**

The JICA Study Team visited Alpha Primary School, located in the central part of Kingston⁹⁵. The school is a public primary school that offers one year of pre-school (Kindergarten) and Grades 1 to 6. The school has 34 teachers, 25 classrooms, and 925 students, with a maximum class size of approximately 35 students. Three teachers resigned around August/September 2022, which was more than in previous years (1 or 2), but the school successfully found replacements.

According to the school principal, not all teachers are good at mathematics, and it can happen that teachers may provide inaccurate instruction, and there can be reproduction of misunderstandings. The principal highly appreciated the teaching by the JOCV teachers and hopes to strengthen the teaching methods at the school to make learning math even more enjoyable for the students learning from such different methodology. The principal receives information by e-mail and letter regarding teacher training, such as math class workshops held by MOEY, and the school sends some teachers to attend every time for such occasion.

Currently, there is no distributed school attendance for COVID-19 prevention measures, and all students attend school every day. Google Classroom continues to be used for communication with students, such as distributing and collecting homework, and for learning management, such as registering exam results, but online classes are not currently being conducted. The school has access to

⁹⁵ Visited Alpha Primary School on November 11, 2022

internet, but not enough network bandwidth is an issue. In addition, projectors and other equipment are in short supply, and in many cases, teachers bring in their personal devices. The principal made some efforts to improve the learning environment and recently purchased mathematics learning materials and one projector. However, these are all expensive and cannot be purchased all at once. Lack of resources is a challenge, and the school administration communicates with the parents-teachers association (PTA) to get support for filling the shortage.

The delays in learning caused by COVID-19 are serious. Schools conduct periodic academic testing, and the results show that children with significant delays in learning are particularly prevalent in the lower and middle grades. For example, 76 students in the second grade, or about half of the students, and 23 students in the fourth grade, or about 20%, were diagnosed as having learning delays. Fifth and sixth graders, who had completed basic learning before COVID-19, are in a relatively better situation. As the grade goes lower, schools got closed before the young children gained the habit of studying/learning and students' progress depends on the availability of parental guidance and support, learning environment, and other factors.

For students who are behind in learning, team teaching has been adopted, and efforts are being made to make up for delays by providing supplementary classes and materials for each group according to their proficiency level. In addition, the school is trying to introduce an Individualized Education Program, but it is not easy to support each individual student. The school does not have a support teacher for special education assigned to the school.

In a classroom observation of a fourth-grade math class teaching fractions, the teacher prepared a lesson plan and followed it. Both teachers and students seemed to be familiar with the use of ICT tools in classroom. The teachers used a projector to display educational videos from YouTube and allowed time for students to research and present the definition of fractions using devices they had brought with them. In addition, the teacher was making efforts to engage students, such as group work using the plastic fractions teaching aids. On the other hand, the projection screen for video materials was small and the sound was not sufficiently audible (teachers brought their own personally purchased projectors due to shortage of equipment at school), and not all children had tablets, laptops, or other devices, nor they borrow from the school.



Showing on a whiteboard is the projection of YouTube video on Mathematics /Fractions



Students using their devices to find and present the definition of fractions. Little less than half of the class had their devices out (not counting precisely).

Photo: JICA Study Team

Figure 7-15 Public Primary School- Class Observation in Jamaica

iii) Special Education School

The JICA Study Team visited the Randolph Lopez School of Hope (RLSOH), a special needs school

operated by the Jamaican Association on Intellectual Disability (JAID). JAID operates five schools under its direct management and is also responsible for providing classes in special needs units set up in regular schools.

The RLSOH serves 516 children aged 6-21 (as of November 2022). The primary education age group will study functional literacy and other subjects and participate in club activities, while the secondary education age group will work on skill acquisition. In Grades 7-8, students learn a variety of skills and identify areas of interest, while in Grades 9-10, they specialize in one skill. Competency-based training methodology is adopted, and certification can be obtained. Courses are offered to students with severe disabilities to help them learn how to live independently. A computer lab is set for students to learn how to use basic software. The school recognizes the need to prepare students for the coming internet society.

During COVID-19, online classes were conducted and a package of learning materials were distributed. According to interviews with the Special Education Needs Unit of MOEY, the use of ICT increased dramatically in special education needs since COVID-19. It is still being used for home schooling and other purposes. In the meantime, although the special education needs unit would like to promote active use of assistive technology, there are cases where it is viewed as a cost burden or as a special treatment for only few students.

Students at RLSOH are assisted in acquiring skills, as preparation for post-graduation. JAID is also working to prepare work-space by creating job opportunity such as sewing school uniforms and selling arts and crafts, but in reality, many students lose contact with the social activities after graduation. Current job creation activities are project-based and not sustainable, which is the challenge faced by JAID.



A "Home Life Room" demo room with kitchen. On the right hand side, there is also bathroom and bedroom



One of the student's work in a famous restaurant in Kingston. One student won 2nd prize in a national cooking competition

Photo: JICA Study Team

Figure 7-16 Special Education School in Jamaica

4) Development Partners' Assistance

In the education sector, UNICEF, UNESCO, WB, IDB, and the European Union (EU) are major partners and hold quarterly meetings. Private foundations are also active in supporting education (e.g., Digicel Foundation).

The following is a list of projects received from MOEY.

Table 7-33 Development Partners' Assistance (Jamaica)

Priority of Government	Projects	Contents	Partner
Bridging Digital Divide	Caribbean mobile digital classroom project 2018-2020, USD1.5million	Reducing the education gap through ICT, promoting digital education for the most disadvantaged children	OAS
	Virtual Instructional Leadership 2020-2020, USD0.01million	Preparation of e-learning course for principals and teachers	UNICEF
Child and Youth Development	Early childhood supports (various)	Teacher training, teaching materials, etc.	UNICEF
	Unleashing the potential of Jamaican Youth through empowerment and training 2021-2024, USD1.7million	Strengthening the skills and capacities of unemployed and low-income youth	IDB
Child Care and Protection	The partnership for literacy enhancement for the deaf project 2017-2021, USD2.7million	Strengthening education for children with hearing impairment, sign language curriculum and training	USAID
	Brain Building Boost Project, 2020–2021	Support introduction to inclusive education methodology in nursery institutions.	UNICEF
	School to Work Transition Program	Employment support for students with disabilities. Implementation of sensitization to companies and schools. Creation of manuals and pilot projects for employment support and host companies	UNICEF
	School-wide positive behavior system national scale-up 2020-22022, SD0.12million	Developing guidelines for school safety and protection, etc.	UNICEF
Governance and Accountability	Public expenditure review 2020-2021, USD0.6million	Analysis of education budget and expenditure	World Bank, UNICEF
Information and Telecommunications	Digital Transformation for School management 2021-2023, USD0.2million	Supporting school-level financial analysis and student management to support effective and efficient resource allocation	IDB
	Caribbean mobile digital classrooms project 2018-2020	Reduce educational disparities and promote digital education for disadvantaged children using ICT (Profuturo Expert)	OAS

Source: JICA Study Team based on the list of projects received from the planning and development branch of MOEY

(2) Development and Cooperation Scenario of Education Sector -Jamaica

1) Development Scenario

a) Development Challenges and Strategy

The Government of Jamaica expressed its strong commitment to improving the education sector in its Vision 2030. On the other hand, this study found challenges, such as the delayed response to learning interruptions caused by the school closures due to COVID-19, the additional workload imposed on teachers, the slow development of the educational environment (digital divide), and even slower response to children with special needs.

The study team suggested the following strategies for enhancing the Jamaica's education sector based on the findings from the desktop-review and field survey, in line with MOEY's 9 priority agenda.

Table 7-34 Summary of Strategies for Enhancing Education Sector (Jamaica)

Target	Strategic Area	Contents
Education Jamaica	1. Bridging the Digital Divide	Prevent the widening of educational disparities by improving the educational environment through the distribution of devices and internet access to children and youth.
	2. Child and Youth Development	Support the process by which all children and youth develop their full potential through preschool, primary, secondary, and postsecondary education, as well

		non-formal education. In addition, strengthen special needs and inclusive education to ensure that all children have the opportunity to learn.
	3. Child Care and Protection	Protect children from direct and indirect risks (including disciplinary and corporal punishment by family members and educators) and guarantee their psychological and physical safety. Expand early childhood education and work to create a healthy environment from an early age.
	4. Lifelong Learning	Provide educational opportunities from early childhood to adults' reskilling/training to enable skill acquisition. Contribute to the reduction of unemployment and NEET (Not in Education, Employment or Training) rates and develop human resources that will contribute to the sustainable development of Jamaica.
	5. Governance and Accountability	Develop an evidence-based policy making through the development of EMIS and ensure transparency in the decision-making process. Achieve fiscal transparency and efficient budget allocation based on Public Expenditure Review.
	6. Information and Telecommunications	To improve the ICT environment in educational facilities and strengthen the capacity to conduct classes using ICT so that students can efficiently and effectively acquire the skills required in the 21st century's society and economy.
	7. Quality Education and Training	Strengthen reading, science and math, and STEAM education. Strive to improve the quality of education from the preschool stage through teacher training and educational environment improvement. Strengthen the research function of the National Education Inspectorate (NEI).
	8. Stakeholder Engagement	Create a framework to ensure the safety and support the growth of children and students in cooperation with all stakeholders, including parents, diaspora organizations, businesses, and the community.
	9. Parenting Support	Support for parents with limited financial capacity (school lunches, fee waivers, etc.), and/or with specific needs. Strengthen the engagement of fathers and male caregivers in education.

Source: JICA Study Team

b) Program and Project

The table below indicates the desirable programs/projects to materialize the above strategies for enhancing Jamaica's education sector.

Table 7-35 Programs/Projects Strategies for Enhancing Education Sector (Jamaica)

Target	Strategic Area	Program /Project	Duration
Education Jamaica	1. Bridging the Digital Divide	1-1. Ensure access to devices through a device distribution and lending system	Short
		1-2. Provide free internet access (schools, public facilities)	Short
		1-3. Maintain device and internet infrastructure	Middle
		1-4. Reinforce device access and digital literacy of teachers and staff	Middle
	2. Child and Youth Development	2-1. Strengthen inclusive and special needs education (review of the system, improvement of school environment, development of teaching materials, etc.)	Middle-Long
		2-2. Strengthen the operation of institutions for the examination and diagnosis of special needs	Short-Middle
		2-3. Teacher training for inclusive and special needs education	Middle
	3. Child Care and Protection	3-1. Identify and protect at-risk children	Middle
		3-2. Assign social workers, public health nurses and counselors	Middle
		3-3. Strengthen the referral system between schools and health institutions	Middle
	4. Lifelong Learning	4-1. Develop facilities and equipment for model TVET schools	Middle
		4-2. Develop career development and entrepreneurship curricula	Short
		4-3. Train TVET school teachers	Middle
	5. Governance and Accountability	5-1. Implement EMIS and make decisions based on evidence	Middle
		5-2. Conduct regular meetings with teachers, students, parents, and other educational stakeholders	Middle
		5-3. Review budget allocation based on the results of public expenditure review	Short
	6. Information and Telecommunications	6-1. Formulate action plans based on ICT in Education policy	Short
		6-2. Provide training for teachers on teaching methods using ICT in education	Middle

Target	Strategic Area	Program /Project	Duration
	Quality Education and Training	7-1. Strengthen pre-school education (school facilities, curriculum)	Long
		7-2. Strengthen primary and secondary education (facilities, teaching materials, teacher capacity building)	Long
		7-3. Develop and implement STEAM education strategy	Middle-Long
		7-4. Develop STEAM educational materials (digital materials, programming)	Middle-Long
		7-5. Establish STEAM model schools (6 schools nationwide)	Middle
		7-6. Strengthen teacher support system (CPD and daily monitoring and support) Enhance capacity of education officers in the core curriculum office and regional offices of MOEY	Middle-Long
		7-7. Enhance National Education Inspectorate	Middle
	Stakeholder Engagement	8-1. Establishment of school management committee in community	Middle
	Parenting Support	9-1. financial support for school meals, uniforms, textbooks, etc.	Long
		9-2. awareness-raising for parents regarding education and special needs education	Middle-Long

Note: Short: 2023-2025, Middle: 2023-2027, Long: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

a) Suggested List of Cooperation by JICA and its Roadmap

Cooperation scenarios of JICA/Japan were prepared considering aspects in the table below. Regarding the Caribbean region, the JCAP states that cooperation will focus on JOCV dispatch and training schemes for the time being, while formulating future technical and financial cooperation projects through dialogue.

Table 7-36 Aspects of Consideration for Developing JICA's Cooperation Scenarios (Jamaica)

Aspects	Contents
Consistency with the development strategy of the Government of Japan	Priority Area: Disparity Reduction The Government of Japan tries to expand human resource development and employment opportunities by providing the resources with a focus on the training area to support the improvement of SMEs' productivity and the expansion of vocational and skills training targeting also persons with disabilities or vulnerabilities.
Consistency with JCAP	Program for Strengthening the Education Sector: Improving Quality and Access to Education Improving the quality of education is important to prevent cases of out-migration in search of better education and employment. The gender disparity in the country and limited schooling opportunities for people with disabilities are also critical challenges. JICA shall consider assistance that can contribute to improving the quality of, and access to, education, including enhancement of inclusive education. Since the situation of the education sector differs from country to country, JICA will assist mainly through JOCV schemes and training schemes, and seek formulating future technical and financial cooperation projects through dialogue with governments.
Consistency with the JICA's global agenda	"Develop textbooks and teaching materials to improve learning" and "Provide education to all, with no one left behind" as one of the key approaches in education sector development
An applicable modality in Guatemala	Technical assistance (TA), grant aid, technical cooperation (dispatch of experts, JOCV, training in Japan or third country, follow-up cooperation), public-private partnership
Effective use of the outputs of JICA's previous assistance	JOCV: Mathematics teachers, ICT, etc. Technical Assistance Project: The Technical and Vocational Education and Training (TVET) Improvement Project at Technical High Schools in Jamaica (May 1997-April 2002)
Cooperation with OECS	The Government of Jamaica has expressed their expectations for JICA's cooperation in the education sector: (1) Strengthening STEM education and (2) promoting the use of ICT in education

Source: JICA Study Team

The following programs/projects were suggested as priority for JICA’s possible assistance. Further consultation with MOYE shall be conducted for confirmation of the feasibility and relevance to its policy direction.

Table 7-37 List of Proposed JICA Assistance (Jamaica)

Target	Strategic Area	Program /Project	Scheme
Education Jamaica	2. Child and Youth Development	<i>Inclusive / Special Education Needs</i>	
		2-1. Strengthen inclusive and special needs education (review of the system, improvement of school environment, development of teaching materials, etc.)	- Knowledge Co-creation Program (KCCP), Alumni - Expert dispatch, - JOCV
	2-2. Strengthen the operation of institutions for the examination and diagnosis of special needs	- Grant Assistance For Grassroots Human Security Projects (MOFA) - JOCV	
	7. Quality Education and Training	<i>Mathematics</i>	
7-2. Strengthen primary and secondary education (teacher capacity building) 7-6. Enhance capacity of education officers (math) in the core curriculum office and regional offices of MOEY		- Expert dispatch, - JOCV	

Source: JICA Study Team

Roadmap for the proposed cooperation is indicated below.

	2023	2024	2025	2026	2027	2028	2029
Strategic Objective 2: Child and Youth Development: Inclusive / Special education needs							
2-1 Strengthen inclusive and special needs education	KCCP → support developing educational programs						
2-2 Strengthen the operation of institutions for the examination and diagnosis of special needs	→ Follow-up						
Strategic Objective 7: Quality of Education and Training (Mathematics)							
Strategic dispatch of JOCV for strengthening math education)	→						
Enhance rural education (math) utilizing the math coordinators in regional office	Survey →						

Source: JICA Study Team

Figure 7-17 Roadmap for Education Sector Cooperation (Jamaica)

Sections below describes details of the proposed cooperation.

b) Strategic Area 2: Child and Youth Development: Strengthen Inclusive / Special Needs Education-Toward Project Formulation

The Government of Jamaica has made inclusive education a government policy, although a revised policy on special education needs/inclusive education has not been approved. Resources for inclusive education (teacher and health care personnel, accessible school facilities and assistive technology, and operating costs) need to be further enhanced. Special education schools, therefore, continue to be an important part of the education system.

Since the policy position on inclusive education and special education needs is not clear at present, and there will be the CARICOM regional policy in near future. In addition, since there is assistance from UNICEF and other organizations, it is recommended that JICA to know more about the other

partners previous and ongoing activities, and also to work to inform about JICA’s previous assistances to Jamaica (ex. dispatch of JOCV, Knowledge Co-Creation Program (KCCP)) in order to work in a harmonized manner. This can be done through a development partners’ meeting and other opportunities, so as to gain trust from the stakeholders.

Table 7-38 Strengthen Inclusive / Special Needs Education—Toward Project Formulation (Jamaica)

Item	Contents
Inclusive / Special Needs Education	<p>Scheme: Mainly support through JOCV, KCCP, and activities of alumni associations of trainees. In the future, the formulation of a special needs education program (technical cooperation) shall be considered.</p> <p>Content: Promote participation in KCCP "inclusive education" and "school health," and introduce Japan's strengths, such as educational programs for different types of disabilities, optimal individualized educational planning, and employment support. After participating in the KCCP, consider offering support in implementing action plans through alumni associations and JOCV.</p> <p>In Jamaica, the School to Work Transition program is being rolled out for young people with disabilities with the cooperation of UNICEF, and a coordinated effort through the dispatch of JOCVs (either to UNICEF or to schools implementing School to Work Transition for this group of students) could also be effective.</p> <p>Target: Not only special education and inclusive schools, but also regular schools and regular classes will be targeted to support the preparation for the coming of inclusive education in future.</p>
Enhance diagnostic institution for children with special educational needs	<p>Scheme: Grant Assistance for Grassroots Human Security (Ministry of Foreign Affairs)</p> <p>Description: Currently, there are only three institutions in Jamaica that diagnose the special education needs of children. In rural areas where there are no facilities, efforts are being made to appoint a child diagnostic support team at the regional education office. Since there is a need for the preparation of diagnostic tools in order to properly diagnose the developmental status of children and to ensure that they receive the education and care they need, these needs shall be fulfilled in a short period of time. Tools needed for diagnosis include the Autism Diagnostic Rating Scale, the Wide Range Achievement Test, and the Vineland Adaptive Behavior Scale.</p>

Source: JICA Study Team

c) Strategic Area 7: Quality Education and Training (Math)

Jamaica faces challenges in terms of students' achievement, particularly in mathematics. CSEC results show that performance has dropped further after the COVID-19 pandemic, with only 37.2% passing in mathematics. It is possible that the teachers themselves are teaching with an incorrect understanding of the subject.

JICA has been working with Naruto University of Education to improve subject instruction by introducing math drills and dispatching volunteers. The Jamaican counterpart (Core Curriculum Office, MOEY) has also been working diligently, but has limited resources. In order to promote improvements more efficiently at school, it is desirable to work in cooperation with the math coordinators assigned to each of MOEY's Regional Offices. JICA Jamaica office is considering strategic dispatch of JOCVs to the regional offices, and their effective use can be an additional asset.

On the other hand, the policy intervention, such as the establishment of a collaborative mechanism between the math coordination, is overbearing for the JOCV. Guidance by university faculty or expert is desirable.

Table 7-39 Overview of Proposed Expert Dispatch for Strengthening Mathematics Education (Jamaica)

Item	Contents
Project name	Project for Strengthening Mathematics Education
Priority	Priority Project (A)
Target Country	Jamaica
Project Site	Select pilot region
Scheme	Technical assistance project combining expert dispatch and JOCV
Cooperation Period	February 2024 – February 2026 (2 years)
Counterpart	MOEY
Other Concerned Agencies	Regional Education Office
Project Objectives	Math coordinators' capacity for coaching schools and teachers will be strengthened, and children's learning will be improved
Outputs	<ul style="list-style-type: none"> A support mechanism between the core curriculum office, math coordinators (national and regional) and schools will be established. A mechanism will be established that allows schools to feedback on challenges they face to MOEY.
Activities	<ul style="list-style-type: none"> Confirm communication/cooperation between the Curriculum Bureau, math coordinators (national), and math coordinators (regional) to strengthen math education. Organize regular meetings of math coordinators Gather information on the current situation/issues at schools/education sites (using JOCV reports)
Notes	<ul style="list-style-type: none"> Dispatch short-term experts assuming collaboration with JOCV (Math Learning Corps). Possibly make it a collaborative project with Naruto University of Education

Source: JICA Study Team

7.3.4 Saint Lucia

(1) Education Sector Overview -Saint Lucia

1) Education Policies and Administration

a) Education Policies

The table below lists Saint Lucia's education sector's policies and their key contents.

Table 7-40 National Development Policy and Education Policy (Saint Lucia)

Title	Year	Key Direction / Priority
Saint Lucia's Medium Term Development Strategy 2020-2023	2020	The vision for the Education Sector is to improve the quality of, and access to, education. <ul style="list-style-type: none"> Increase enrolment in pre-primary education Introduce curricula that meet the changing human resource demand of the global economy Improve the quality and delivery of education through teacher training and the use of ICT Improve access to post-secondary and Tertiary Programmes Strengthen and expand the TVET program
Education Sector Development Plan -Priorities and Strategies- 2015-2020	2015	Crosscutting Theme <ul style="list-style-type: none"> Alignment of Purpose: National and Regional Alignment, Harmonization & Gender Equity Service Excellence and System Integration Educational Leadership, Governance and Accountability Resource Stewardship and Risk Management Subsector Priorities <ul style="list-style-type: none"> Education as a Human Rights Learner Achievement Quality of Education System Education Infrastructure and Capacity
Education Sector Continuity Plan for Schools in Saint Lucia	2020, 2022 (Revision)	Prepared building on the previously established protocols in the "Guidelines for the Reopening of School" and COVID-19 Protocols for the Early Childhood Education Sector. It is to support the school community and parents/guardians in the provision and management of

		the teaching/learning process.
ICT in Education Policy and Strategy 2019-2022	2019	Strategic Objectives <ul style="list-style-type: none"> • Improving ICT infrastructure in educational institutions • Strengthening the capacity of teachers to integrate ICT in education • Integrating ICT in teaching and learning • Managing the ICT in Education implementation

Source: JICA Study Team based on policy documents and interview

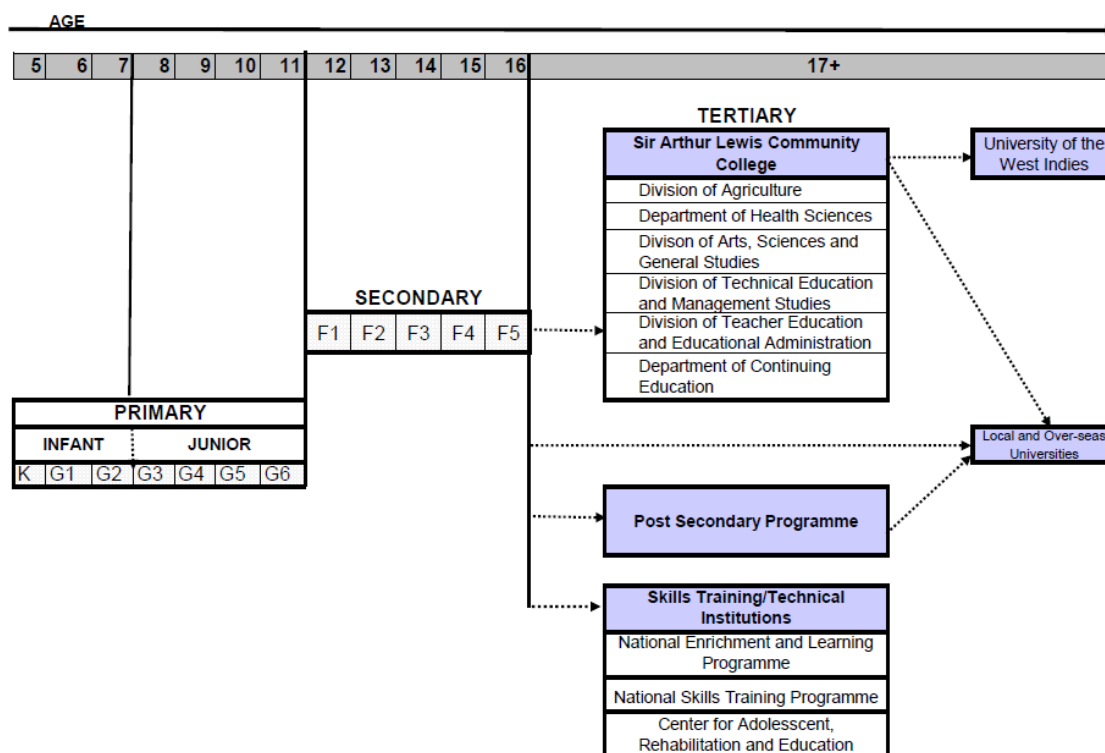
Saint Lucian government is working on the revision of the Education Act and the update of the Education Sector Development Plan 2015-2020 at the time of this study. Consultants were conducting to review the Education Law and identify challenges/bottlenecks (as of August 2022)⁹⁶. In addition, the Special Needs Education Policy, which is already outdated and not currently in use, will be revised for Saint Lucia after the revision process of the Special Needs Education Policy at the CARICOM level is completed (estimated March 2023). The new policy for Saint Lucia is expected to be formulated in December 2023⁹⁷.

b) Educational Administration

i) Educational System

The education system in Saint Lucia is composed of pre-school, primary (1 year of early childhood education + 6 years), secondary (5 years), and higher education (colleges, technical training), with compulsory education of primary and secondary education (10 years after entering at age 5).

STRUCTURE OF THE EDUCATION SYSTEM OF ST. LUCIA 2018/19



Source: Government of Saint Lucia, Education Statistical Digest, 2020

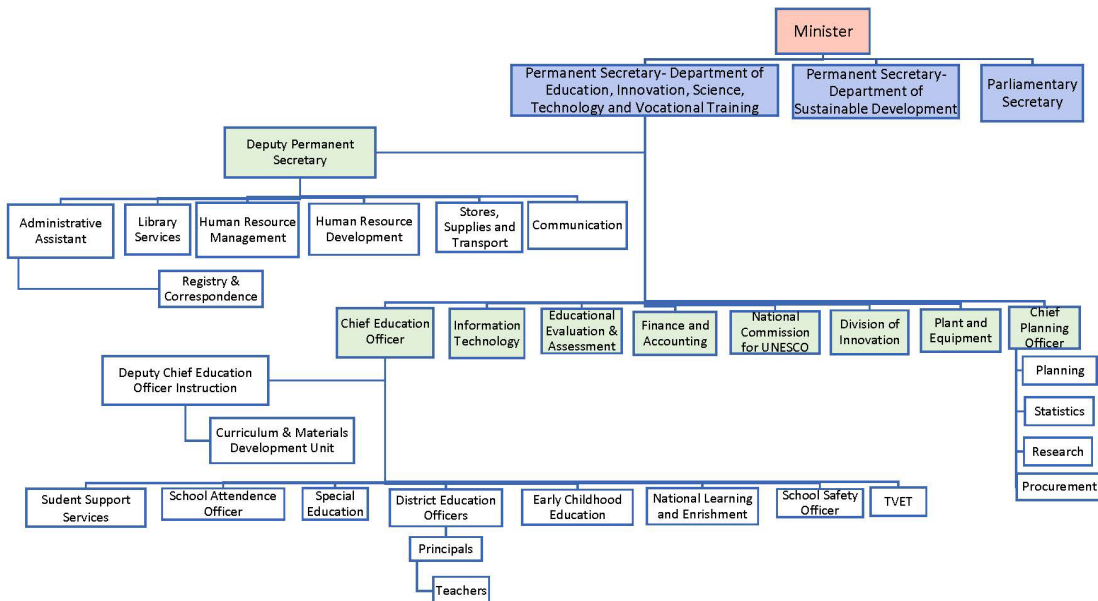
Figure 7-18 Education System of Saint Lucia

⁹⁶ As a part of the CDB’s cooperation project: Education Quality Improvement Project (EQuIP)

⁹⁷ Interview with EQuIP on 2022/12/6. CARICOM-level policy revision is also conducted with the support of CDB. Currently a study and analysis on current situation of the CARICOM member countries is conducted.

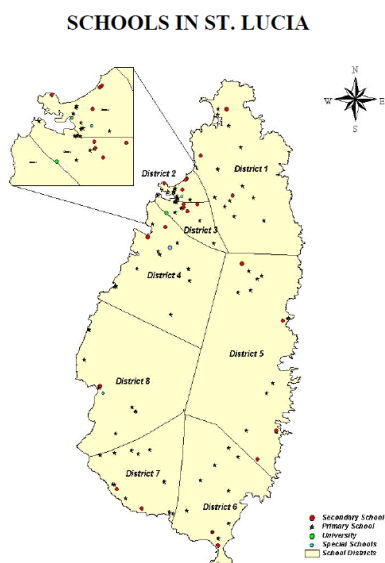
ii) Organization

The Ministry of Education, Sustainable Development, Innovation, Science, Technology and Vocational Training (hereinafter “the Ministry of Education”) is the oversight authority, while the Department of Education takes care of matters on education. Under the Chief Education Officer, the Department is composed of, Curriculum and Materials Development Unit, Special Education Unit, Early Childhood Education Unit, National Learning and Enrichment Unit, TVET Unit, Students Support Services Unit, School Safety Officer, and District Education Offices.



Source: Collected from the Department of Education

Figure 7-19 Organogram of Department of Education



Source: Government of Saint Lucia, Education Statistical Digest, 2020

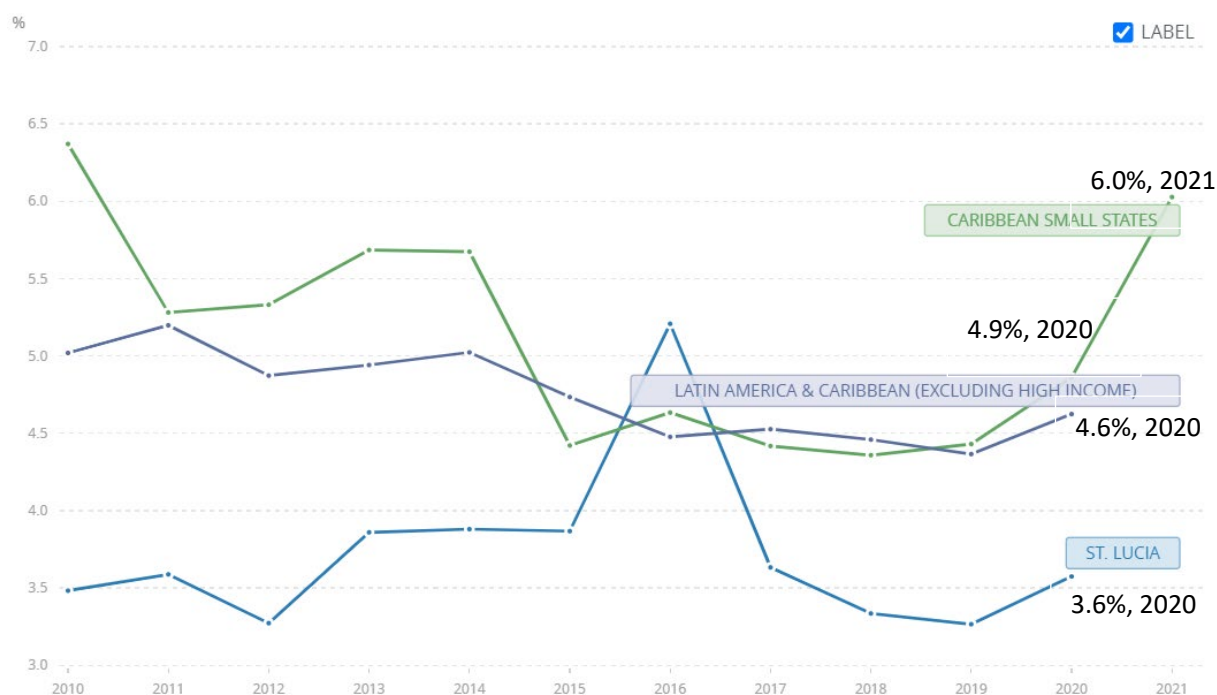
Figure 7-20 Education Districts (Saint Lucia)

Saint Lucia is divided into eight education districts. Each has a District Education Office, which is the executor of the Department of Education’s plans. Each District Education Office is staffed with a District Education Office Director, a school counselor, a science and math coordinator, and a literacy coordinator.

The office meets with the principals at the beginning of each school calendar year to develop and implement an annual plan. The district education office is given operational discretion but without fund allocation. Therefore, in implementing the activity plan, the district education office has to either request the Department of Education or raise funds on its own.

iii) Budget

Education sector spending as a percentage of GDP in 2020 was 3.6%.. Saint Lucia's education sector spending as a percentage of GDP is lower than that of the Caribbean small states and the LAC region (excluding high-income countries).



Source: JICA Study Team based on World Bank

Figure 7-21 Government Expenditure on Education, Total % of GDP (2010-2021)

2) Situation of Education Sector

a) School Enrolment

There are 74 public and 7 private primary schools, 22 public and 3 private secondary schools, and 1 public and 2 private institutions of higher education. For special education, there are 5 public schools, with 395 students enrolled in 2018/19⁹⁸.

In Saint Lucia, the net enrolment rate in primary and secondary education is 103.0% and 91.0%, respectively, while that in pre-primary education is less than 50%.

Table 7-41 School Enrolment Rate (Saint Lucia)

Enrolment Rate	Gross Enrolment			Net Enrolment			
	Year	2017/18	2018/19	2019/20	2017/18	2018/19	2019/20
Pre-primary		46.5	45.9	45.1	46.1	45.4	44.7
Primary		101	103	103	94.6	95.0	96.0
Secondary		92.6	90.3	91.0	83.7	81.7	84.0

Source: Government of Saint Lucia, Education Statistical Digest, 2020

The primary to secondary enrolment rate was 91.0% in 2019/20, down from 94.8% in the year before

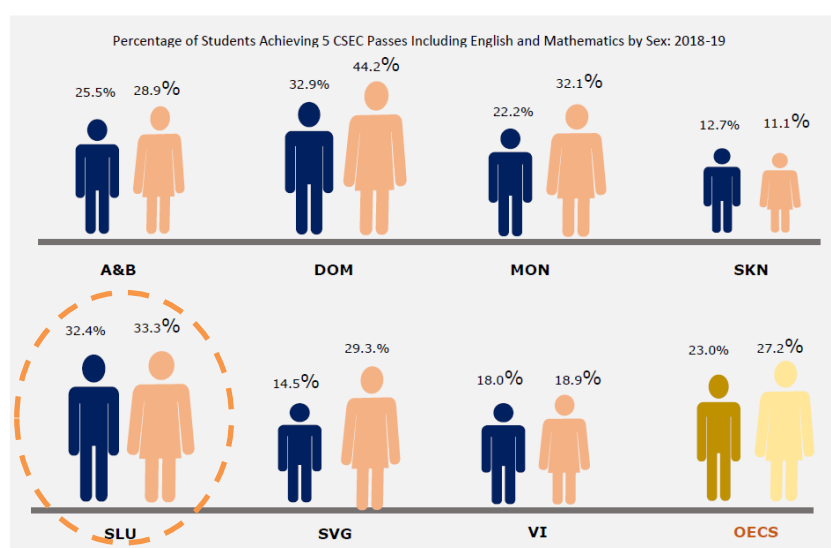
⁹⁸ OECS, 2019, Education Statistical Digest for the Academic Year 2018-2019, Saint Lucia has the largest number of students (395) in OECS. Saint Vincent and Grenadine (116), Saint Kitts and Nevis (112), Antigua Barbuda (90)

that and 96.2% in the year before that. Thereafter, advancement to higher education generally drops to around 20%, with 40% of males and 60% of females⁹⁹. According to the World Bank, the youth unemployment rate is as high as 38.7% (2021), indicating a mismatch between the youth participating in the labor force and the market¹⁰⁰.

Disparities by residential area and socioeconomic status are observed. For example, the percentage of primary school students who repeat a grade was only 1.6% in District 2, while in District 7 was 4.7%.

b) Learning Achievement

Only 32.4% of boys and 33.3% of girls were able to exceed the passing line in five subjects, including English and mathematics of the CSEC. This is, however, the second highest level when compared with the OECS average¹⁰¹.



Source: OECS, 2020, Education Statistical Digest -Statistics on Education for the Academic Year 2018-19

Figure 7-22 Percentage of Students Achieving 5 CSEC Passes including English and Math by Sex: 2018-19

According to the Department of Education's Assessment Unit, an analysis of assessment test result showed that children's "reading skills" were low (students could understand the main idea of the text they heard, but not of the text they read), and in math, their performance drops for the topic of fractions. According to the Unit, this analysis result is available in a database that can be accessed by each school online, but the Unit has no information about instances where the district education offices or teachers interpreted the data and incorporated it into their teaching.

At present, there is a lack of monitoring and evaluation of the quality of education due to the absence of the inspection office and the research institute of education. As a result, there is a shortage of information to promote the development of evidence-based policies and strategies, and a lack of feedback towards improvement at the school level¹⁰².

⁹⁹ OECS, 2019, Education Statistical Digest for the Academic Year 2018-2019

¹⁰⁰ <https://data.worldbank.org/indicator/SL.UEM.1524.ZS?locations=LC> (Accessed on 2022/9/10)

¹⁰¹ Abbreviations of country names: A&B: Antigua and Barbuda, DOM: Commonwealth of Dominica, MON: Montserrat, SKN: Saint Kitts and Nevis, SLU: Saint Lucia, SVG: Saint Vincent and the Grenadines, VI: British Virgin Islands

¹⁰² Interview with EQuIP on 2022/12/6

Some children with special needs who attend regular schools are automatically promoted to higher grades without participating in academic tests, due to parental delinquency or economic reasons, and graduate without receiving enough attention for learning and acquiring knowledge¹⁰³. The Special Education Unit of the Department of Education, which is responsible for diagnosing the special needs of students, has four staff members who diagnose and identify the support needed by students (e.g., academic, language, cognitive function). The diagnostic process, which involves checking birth status and testing academic performance to make a comprehensive assessment, is a time-consuming process¹⁰⁴. As a result, many students are waiting for a diagnosis and have no choice but to continue attending regular schools until a diagnosis is confirmed.

With the support of EQUiP, the Department of Education has conducted a curriculum review from pre-school to lower secondary (Kindergarten to Grade 9) and developed guidelines and manuals for operating a curriculum that takes special needs into consideration. The guidelines and manuals have been shared with the PEARL Project implemented by the OECS and are expected to be applied to the new curriculum¹⁰⁵.

c) Teacher

In Saint Lucia, 90% of teachers at the primary school level and 77% at the lower secondary school level have completed teacher training (2018). Sixty-eight percent of primary school teachers and 71% of lower secondary school teachers are female¹⁰⁶.

For new teachers, the minimum qualification to become a teacher of pre-school is the CSEC, and to become a teacher in primary education, the teacher must have passed five CSEC subjects (levels 1, 2, and 3), including English and mathematics. For lower secondary education, passing the General Certificate of Education Advanced (A-level or CAPE) is required, and a certificate from Sir Arthur Lewis Community College (SALCC) is also recognized as equivalent to A-level certification. SALCC accounts for 80% of new teacher training.

There is no regular refresher training program for in-service teachers, but there are several training courses for teachers who are not certified to teach or who are changing their position as teachers. In the Eastern Caribbean Region, the Joint Board of Teacher Education (ECJBTE) has been established to ensure the quality of teachers, and a two-year ECJBTE certified program (Associate level) is available in Saint Lucia at SALCC. The table below lists the in-service teacher training programs available in Saint Lucia.

Table 7-42 In-service Teacher Training Programs (Saint Lucia)

Program	Duration	Training Institution	Target
Associate Degree in Primary or Secondary Education (ADE)	2 years (full time)	ECJBTE/SALCC	Untrained Teachers
Diploma in Education	1 year (part-time)	School of Education, University of West Indies (UWI)- Cave-Hill Campus/SALCC	Graduate Teachers

¹⁰³ Knight, V., Marshall, J., Depradine, K., & Moody-Marshall, R. (2021). Country review. Challenges and opportunities in the education system of Saint Lucia. Serie Working Papers SUMMA. N° 15. Published by SUMMA. Santiago de Chile.

¹⁰⁴ Students with vision challenges enroll in regular school. Blind Welfare Association send support staff to school for the child to get used to the school environment Interview with Department of Education on 2022/11/5

¹⁰⁵ Interview with EQUiP on 2022/12/6

¹⁰⁶ Knight, V., Marshall, J., Depradine, K., & Moody-Marshall, R. (2021). Country review. Challenges and opportunities in the education system of Saint Lucia. Serie Working Papers SUMMA. N° 15. Published by SUMMA. Santiago de Chile.

Program	Duration	Training Institution	Target
Bachelor's Degree in Education (Educational Leadership, Social Studies)	3 years(part-time)	School of Education, UWI, Cave-Hill Campus/SALCC	Trained Teachers
Bachelor's Degree in Primary Education	4 years/ 2 years (full time)	SALCC	Untrained and Trained Teachers respectively

Source: Knight, V., Marshall, J., Depradine, K., & Moody-Marshall, R. (2021). Country review. Challenges and Opportunities in the Education System of Saint Lucia. Series Working Papers SUMMA. N° 15. Published by SUMMA. Santiago de Chile.

In teacher training schools, special education was not a required subject in Saint Lucia. Since 2021 however, SALCC has offered a bachelor's course in teacher training, and special education needs of children is now one of the compulsory subjects¹⁰⁷. In addition, SALCC partnered with a Canadian university to offer a one-year special education diploma course beginning in 2021/22. During the first one-year period, SALCC faculty members were given the opportunity to assist managing the course alongside of the Canadian university and gained lecturing skills of the subjects. The course is offered by SALCC alone from the 2022/23 academic year¹⁰⁸. The Special Education Division of the Department of Education provides support to the special education teachers assigned to each regular school.

3) Situation of Education in With/Post COVID-19 Environment

a) Government Policy and Initiative With/Post COVID-19 Environment

i) School Closure and Reopening

The Government of Saint Lucia closed schools completely for COVID-19 beginning March 2020, and has started distance education via online TV and radio. The period of complete school closure in Saint Lucia lasted for 39 weeks, and partial closure for 26 weeks¹⁰⁹. In accordance with the “Education Sector Continuity Plan for Schools in Saint Lucia”, the Department of Education has implemented various initiatives, including the use of ICT in online classrooms, the provision of teaching materials through online platforms, and the distribution of teaching materials through print media. The priority action items set forth by the Government of Saint Lucia in the with/post COVID-19 environment are as follows¹¹⁰.

- Provision of Electronic Devices for Teachers and Students
- Psychosocial Support
- Provision of Meals for Less Fortunate Students
- Activities to Deal with Psycho Social Needs of Teachers
- Development of Videos for Special Needs Students to Explain the Current Situation.
- Bridging the Digital Divide

A national project led by the IT Unit of the Department of Education has created Google accounts for all Saint Lucia students, including pre-primary students, and has enabled all teachers and students to

¹⁰⁷ Interview with Department of Education on 2022/11/5. Until 2020, SALCC was providing only a 2-years-long associate diploma teacher training course.

¹⁰⁸ Interview with Department of Education on 2022/11/5. Special Education Course developed by the Canadian Mont-Saint-Vincent University was implemented by the EQuIP project supported by CDB. 2021/22 academic year graduated 75 in-service teachers and registered another 75 in-service teachers in the 2022/23. EQuIP currently pays the tuition fee.

¹⁰⁹ UNESCO map on school closures (<https://en.unesco.org/covid19/educationresponse>) and UIS, March 2022 (Accessed on 2022/8/30)

¹¹⁰ OECS Commission, 2020, Education Development Management Unit, OECS Education Sector Response and Recovery Strategy to COVID-19

have access to Google Classroom¹¹¹. The government has a policy of continuing to promote educational use of ICT and the establishment of an environment in which online classroom technology can be used to avoid school disruption in the event of future external shocks.

As for the EMIS, Saint Lucia had previously been working on this and all secondary schools had access to EMIS, but it was not working effectively. The EMIS features were not well configured for the Saint Lucian school environment, and also it was not web-based initially. All schools have been assigned a Google account since COVID-19, which allowed the schools to easily store information through the Google Classroom. Currently, the Ministry of Education is working on enhancing EMIS with the support of GPE.



EMIS workshop by GPE-PEARL project



Assessment Unit of the Ministry of Education, Verifying the Database of the Examination Results

Photo: JICA Study Team

Figure 7-23 Ministry of Education: EMIS Workshop and Assessment Unit

ii) Teaching Material and Teachers

In order to ensure that classes can continue during the school closure period, Google Classroom was set up and Gmail accounts were distributed, along with information on the use of various teaching materials provided by CXC and OECS on their online platforms. The ICT Unit provided training on how to use Google Classroom. In addition, training for teachers on how to use ICT in the classroom was conducted with the support of many partners, including Taiwan, OAS, OECS, and UNESCO.

According to an interview with the Department of Education, a previous pilot project with a private company to develop a secondary level e-book did not go well because the content did not fit into the CXC curriculum. The Department of Education is currently working with the same company to develop an E-book for the primary education level. Although the OECS platform provides access to a variety of educational materials, the Department of Education sees that the challenges remain in creating user-friendly content that is more in line with the actual situation in the Caribbean region.

The OECS is currently implementing a teaching material development program called iLearn. This is an initiative to train 300 teachers from OECS member countries in the development of teaching materials and to enable them to create teaching materials and make them available for use in their respective member countries.

iii) Infrastructure and Access to ICT

Saint Lucia has been working on the integration of ICT in education since 1999/2000, and the

¹¹¹ Interview with Department of Education by JICA Saint Lucia Office, January 2022

Education Sector ICT Policy and Strategy 2019-2022 was ratified in 2019. UNESCO reports that the introduction of computers in schools for educational purposes is 98.8% in primary schools, and 100% in secondary schools, and internet access is 98.8% in primary schools, and 100% in secondary schools¹¹².

With the support of the Taiwanese government, Gi-Net, an initiative to provide free wi-fi access in public spaces, was implemented, and it has been reported that when schools were initially closed due to the COVID-19 outbreak, Gi-Net helped to encourage students and teachers to go online. However, wi-fi access is currently unavailable. According to the Taiwan's International Cooperation and Development Fund, the project was time-bound and the devices and equipment are transferred to the Saint Lucia government¹¹³.

There is also the World Bank's Caribbean Regional Communications Infrastructure Program (CARCIP), which developed a fiber-optic ring connecting internet to public education institutions including Saint Lucia¹¹⁴.

Efforts are also underway to establish model schools using ICT. The government plans to allocate one pilot school in each school district to receive a set of equipment packaged with e-books, tablets, and televisions. In addition, with Taiwan's support, one Smart Classroom has been installed in each school district, where large screens, cameras, and other equipment are installed to create an environment for more interactive remote classes and conferences, and model classes can be delivered.

Tablets and PCs were also introduced in special education schools at the time of COVID-19. The special education schools also introduced the devices after discussing with the parents and agreeing that the tools were for learning purposes and that the families would have to compensate for any damage out of school use¹¹⁵.

On the other hand, some educators have voiced out that even if there is internet access in districts, individual access is very limited due to the cost of internet usage fees, availability of electricity, and devices.

b) Challenges of District/School in With/Post COVID-19 Environment

i) Situation and Challenges of District Education Office

During the first field survey, District 1, District 2, and District 3 education offices were visited to obtain information on the current situation. These three districts are located in the northern part of Saint Lucia, as the southern part could not be visited during this survey.

In the interviews, all district education officers mentioned that it is imperative to further enhance ICT so that students can learn better by incorporating ICT into their classes. The education officers stated that ICT should be used as one of the tools to help children learn better, not only for distance education during emergencies, and that the responsible use of digital tools should be understood as early as possible, considering the working environment that students will be exposed to when they get a job in the future. The officers also mentioned the need to strengthen the linkage between learning content and

¹¹² UNESCO, 2020, Reopening schools in Latin America and the Caribbean -Key points, challenges, and dilemmas to plan a safe return to in-person classes

¹¹³ Interview with Taiwan's International Cooperation and Development Fund (2022/8/18)

¹¹⁴ <https://www.worldbank.org/en/results/2022/05/11/building-the-caribbean-digital-economy-bit-by-bit> (Accessed on 2023/2/12)

¹¹⁵ Lady Gordon Opportunity Centre interview on 2022/11/8

the labor market.

On the other hand, while the District Education Office has a math coordinator and a literacy coordinator, it does not have an ICT coordinator. This makes it difficult to respond to the various technical challenges faced by each school that has transitioned online. It was requested from the education officers for the official establishment and staffing of this post as soon as possible.

Learning delays due to long school closures have also become an issue. Learning has always been low, especially in mathematics, but the COVID-19 has caused serious gaps between individuals and between schools. Each district is conducting its own campaigns, such as math month, in an effort to recover learning.

Regarding the needs of special needs education, the District Education Office expressed its concern over the rapidly increasing number of children with special needs. Currently, there is no budget to establish new special needs schools, and the Ministry of Education is promoting inclusive education. Both the Department of Education and the District Education Office were of the opinion that there is a growing need for special needs education and that immediate improvements are imperative. In order to implement inclusive education, it is necessary to assign school counselors, physical therapists, and other personnel with expertise and knowledge to schools, but currently, there is only one counselor in each district, and it is difficult to visit all district schools on a daily basis.

ii) Public Primary School

The Study Team visited a public elementary school in District 5, which was established in 1995 and serves 121 students in Grades 1-6 and 5-year old in kindergarten class¹¹⁶. There was no particular increase or decrease in the number of students in light of the COVID-19. Currently, the school does not have a distributed attendance system, and all children attend school every day. The school has 13 teachers, other than 10 classroom teachers, other teaches physical education, French, and special education. The special education teacher did not have any specialized training in special education, but was assigned because she was good at it. All teachers, except for the physical education teacher, were women.

The school has internet access, but stability is a problem. Students are not using the devices all time in the classroom during school hours, but Google Classroom is used for homework and exercises. According to the principal, the school has not completely stopped online classes, although all students have returned to school physically. However, only about 50% of the students have access to the devices. Students are required to purchase textbooks.

The theme of the fourth-grade class was single-digit multiplication. The teacher gave problems from the situations in daily life where multiplication was necessary, such as coconut farms and mangoes shopping. The textbook was from Macmillan, but on the day of the visit, the students did not open their textbooks during class. The students solved four problems during class, and the class ended with the communication that homework will be posted to Google Classroom.

In the fourth-grade class, there was a slower-paced learner, and the teacher in charge of special education was beside him during the class, watching over him and providing support when necessary.

¹¹⁶ Ti Rocher Micoud Combined School visit, 2022/11/8

According to the teacher, there are four children with special needs in the fourth-grade class, and the teacher, in consultation with the special education staff, has created learning materials tailored to their progress and is helping them catch up with the other students through homework and other activities.

According to the teacher, Macmillan textbook is used in for the math class. The class which the Study Team observed was mainly exercises and thus the team could not see how the textbooks were used.



Kindergarten Class. Learning the concept of number. Placing the red plastic pieces in the circle according to the instructed number.



Kindergarten Class. There were 16 students attending.



4th Grade Class. 8 Students attended. 4th Grade is divided into 2 classes because of the number of students.



4th Grade Class. Studying with a support of special education teacher.

Photo: JICA Study Team

Figure 7-24 Primary School (Saint Lucia)

iii) Special Education School

According to interviews with the Special Education Unit of the Department of Education, while the government has a policy of promoting inclusive education, it also continues to value existing special education programs, because achieving inclusive education takes time and costly. The Special Education Unit was established in 2000 only, and for a long time, special education needs has been treated as a private issue. There are six special education schools, five public and one private, of which the Lady Gordon Opportunity Centre was visited during this study¹¹⁷.

The Lady Gordon Opportunity Centre was established in 1973 for hearing impaired children and was renamed in 2003 and started to accommodate children with any disabilities. Located in the city of Castries, children commute to the school either by public bus or by small buses operated by the Department of Education, which hires the drivers and the parents rent the buses. In some cases, students who cannot afford the cost of commuting to school or access to public transportation give up their education.

At the time of the study team's visit, the centre accepts 95 children (including 38 girls) between the ages of 5 and 16 with special educational needs. The number of students with disabilities varies from Down syndrome, autism, limb disabilities, and developmental delays. Over the past 2-3 years, the

¹¹⁷ Lady Gordon Opportunity Centre Visit on 2022/11/8

number of students with attention deficit hyperactivity disorder (ADHD) and those who have difficulty controlling their emotions have been increasing.

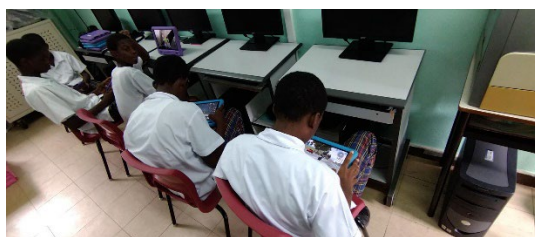
Beside the principal, there are 13 teachers and 4 assistant teachers; 3 have master's degrees in special education, 8 have taken and completed a special education diploma course in 2021 provided in partnership with a Canadian university, and 2 are currently taking the same course at SALCC.

Children who are diagnosed with a disability at an early age, such as a hearing impairment, are enrolled in the center at school-entry age, while those with a learning disability or other diagnosed disability are transferred only after the diagnosis is made. Students usually stay at the school until they are 15-16 years old, but in longer cases, they stay until they are around 20 years old. The Lady Gordon Opportunity Centre has established a collaborative relationship with an adjacent primary school to assist students in attending classes in the regular school setting as much as possible.

The campus has classrooms, a computer lab, a sensory room (a room prepared to help calm people with sensory sensitivities or in panic situations), a sewing room, and a library. The students are not divided by grade level, but by the level at which they have the capacity to participate. For students with severe disabilities, an adaptive life program is implemented to teach them how to use the kitchen, bedrooms, etc., so that they can live their daily lives independently. The Department of Education does not have a standardized program for special education, thus each school develops programs on its own.

The challenge is what happens after the students graduate, and the centre has built a sewing room with the financial support of a private company. In the future, the center hopes to teach kitchen gardens and life skills, and is consulting with government agencies and others related to the promotion of small and medium enterprises. Currently, the centre encourages students to participate in the church-run Centre for Adolescent Renewal & Education (C.A.R.E.) in Saint Lucia, which offers skills training in such as auto mechanics, food processing, and refrigeration technology¹¹⁸.

The principal believes that realizing inclusive education is quite significant, but that the current human resources alone are not in a position to provide adequate care for the students, and that it must be promoted in a phased manner. In particular, early intervention from early childhood is necessary, and awareness of family is essential for this purpose. The centre holds parent meetings and workshops, but many parents do not wish to participate in these meetings, and the school believes that it is essential to strengthen interventions for parents.



PC room of the Centre. Students learn Microsoft applications. Teachers also use it as reward for good students. (enjoying games before leaving school)



Sensory & Self-Regulatory Room

Photo: JICA Study Team

Figure 7-25 Special Education School in Saint Lucia

¹¹⁸ CARE facilities are in 4 places: Anse La Raye, Gros Islet, Odsan or Soufriere

4) Development Partners' Assistance

The table below shows the development partners' key assistance in Saint Lucia.

Table 7-43 Development Partners' Assistance (Saint Lucia)

Policy Priority	Project	Contents	Partner
Early Childhood and Special Education Needs	<u>Equip: Education Quality Improvement Project 2019-?</u>	Improve the teaching and learning environment Improve quality, market relevance, and educational effectiveness Strengthening special education needs, Policy development, Assistance to development and implementation of training program for special education teachers Leadership and operational efficiency	CDB/WB
	PEARL: OECS Program for Educational Advancement and Relevant Learning (OECS PEARL), 2021-2025	Improving quality and equitable access to early childhood education Special education needs survey Enhanced curriculum (for K to G12) and assessment Enhancing leadership and management Program management, institutional capacity building, monitoring and evaluation	OECS GPE
ICT	Profuturo	Teacher training on ICT-based teaching methods, etc.	OAS
	ConnectEd 2021-2023	Improve the digital literacy of primary and secondary learners, and youth gain employable skills	USAID
	DECI: Digital Education Capacity-Strengthening Initiative 2022-2023	Digital teaching platforms, transition to distributed and immersive learning environments; creation of 2,000 digital teaching materials for K1-K3	OECS, USAID, UNICEF
	<u>Gi-Net (Complete)</u>	Implementation of free wi-fi access in public institutions and spaces, including schools	Taiwan
	<u>Smart Classroom (Complete)</u>	Smart classroom equipment installation in 8 schools	Taiwan
TVET	<u>HCRP: Human Capital Resilience Project for Saint Lucia 2020-2025</u>	Improving skills acquisition and labor market relevance Expanding the efficiency and coverage of the social protection system	WB
	<u>Jennes (2021- 10 months)</u>	Provide vocational skills in IT, health, childcare, hospitality, etc.	Taiwan

Note: Underlines projects are only for Saint Lucia
Source: JICA Study Team based on interview and website information

(2) Development and Cooperation Scenario of Education Sector -Saint Lucia

1) Development Scenario

a) Development Challenges and Strategy

The Saint Lucia's Midterm Development Strategy (2020-2023) aims at "Economic Growth on the A.R.I.S.E." – laying the platform for Accelerated, Resilient, Inclusive, Sustainable, and Equitably Shared Economic Growth, and emphasizes on the enhancement of the education sector as one of the key areas. The study team suggested the following strategy for enhancing Saint Lucia's education sector based on the findings from the desktop review and field survey, in line with the Ministry of Education's top priority agenda.

Table 7-44 Strategies for Enhancing Education Sector and Summary (Saint Lucia)

Target	Strategic Area	Contents
Education Saint Lucia	1. Promotion of inclusive education	- Improve the inclusive education system to meet growing special education needs and to ensure that every child receives an education that is appropriate to his or her unique needs - Strengthen school health and safety
	2. Math education	- In mathematics, where achievement is particularly low, teacher training, implementation of curricula and textbooks, and supplementary learning materials will be used to improve students' understanding of the subject. - Support countries in applying the OECS primary education curriculum, which is expected to be finalized in 2025, by ensuring teacher training, development of teaching materials, and implementation of assessments
	3. Use of ICT in education	- Promote the use of ICT in education through the distribution and lending of student devices and the development of in-school infrastructure
	4. TVET and career education	- Strengthen the management of TVET institutions - Strengthen partnerships with local industries and businesses to enhance support for entrepreneurship and employment and utilization of microfinance

Source: JICA Study Team

b) Program and Project

The table below indicates the desirable programs/projects to materialize the strategies for enhancing Saint Lucia's education sector.

Table 7-45 Programs/Projects Strategies for Enhancing Education Sector (Saint Lucia)

Target	Strategic Area	Program /Project	Duration
Education Saint Lucia	1. Promotion of inclusive education	1-1. Review of school health and inclusive education systems	Short
		1-2. Assignment and capacity building of school health workers and counselors in district education offices and schools	Middle
		1-3. Improvement of facility environment	Long
	2. Math education	2-1. Implementation and analysis of assessment of learning achievement in mathematics	Short
		2-2. Curriculum and lesson planning and implementation based on the learning assessment	Short
		2-3. Development of math teaching/learning materials including digital teaching materials	Short
		2-4. Preparation of teacher's guides	Short
		2-5. In-service teacher training	Middle
		2-6. Training of math coordinators in the curriculum unit of the Ministry of Education and the District Education Offices	Middle
	3. Use of ICT in education	3-1. Reinforcement of ICT infrastructure in schools	Short
		3-2. Introduction of ICT-based teaching courses in teacher training programs (curriculum and teaching materials development)	Short
		3-3. Assignment and capacity building of ICT coordinators in district education offices and schools	Middle
	4. TVET and career education	4-1. Development of facilities and equipment for the model TVET school (e.g. Fablab)	Short
		4-2. Development of career development curriculum and entrepreneurship curriculum	Short
		4-3. Promotion of private partnerships (internships and dual training)	Middle
		4-4. Training of TVET school teachers	Middle
	Common	Collaboration with OECS	Long

Note: Short: 2023-2025, Middle: 2023-2027, Long: 2023-2032

Source: JICA Study Team

2) Cooperation Scenario

a) Suggested List of Cooperation by JICA and its Roadmap

Cooperation scenarios of JICA/Japan were prepared considering aspects in the table below.

Table 7-46 Aspects of Consideration for Developing JICA's Cooperation Scenarios (Saint Lucia)

Aspects	Contents
Consistency with JCAP	Program for Strengthening the Education Sector: Improving Quality and Access to Education Improving the quality of education is important to prevent cases of out-migration in search of better education and employment. The gender disparity in the country and limited schooling opportunities for people with disabilities are also critical challenges. JICA shall consider assistance that can contribute to improving the quality of and access to education, including enhancement of inclusive education. Since the situation of the education sector differs from country to country, JICA will assist mainly through JOCV schemes and training schemes, and seek formulating future technical and financial cooperation projects through dialogue with governments.
Consistency with the JICA's global agenda	"Develop textbooks and teaching materials to improve learning" and "Provide education to all, with no one left behind" as one of the key approaches in education sector development
An applicable modality in Guatemala	Technical assistance (TA), grant aid, technical cooperation (dispatch of experts, JOCV, training in Japan or third country, follow-up cooperation), public-private partnership
Effective use of the outputs of JICA's previous assistance	JOCV: Mathematics teachers, audio-visual learning materials, ICT, music, occupational therapist
Cooperation with OECS	Consider regional cooperation through OECS, taking into account the cost effectiveness and extended benefits to the other Caribbean states, EDMU is located in Saint Lucia and easy to communicate.

Source: JICA Study Team

Considering the aspects indicated in the table above, the following programs/projects were selected as possible priority for JICA's assistance. Further consultation shall be made with OECS and the Ministry of Education to confirm the feasibility and priority. These programs/projects are not necessarily to be implemented as standalone project, but best combination can be considered.

In Saint Lucia, JOCVs will be assigned to all eight district education offices, and one in training schools. It is hoped that the regular survey by the JOCV (simple questionnaires and statistical data collection) will lead to evidence-based assistance policy decisions.

In particular, improving the inclusive education and mathematics education are the areas in which JICA has strengths, and thus are high priorities for assistance. With regard to the strengthening of math education, the OECS curriculum revision is currently underway and is scheduled to be completed by 2025. Therefore, supporting the application of the revised curriculum in Saint Lucia as a pilot case could be a good opportunity to spread good practices and lessons learnt for the Caribbean region.

Table 7-47 List of Proposed JICA Assistance (Saint Lucia)

Target	Strategic Area	Program /Project	Duration
Education Saint Lucia	1. Promotion of inclusive education (special needs and school health)	1-1. Review of school health and inclusive education systems	- KCCP
		1-3. Improvement of facility environment	- Grant Assistance for Grass-Roots Human Security Projects (MOFA)
	2. STEAM education	2-1. Implementation and analysis of assessment of learning achievement in mathematics	- KCCP - Expert dispatch

Target	Strategic Area	Program /Project	Duration
		2-2. Curriculum and lesson planning and implementation based on the learning assessment	- KCCP - Expert dispatch - JOCV
		2-6. Training of math coordinators in the curriculum unit of the Ministry of Education and the District Education Offices	- Expert dispatch - JOCV
	Common	Collaboration with OECS	- TA (Expert dispatch, coordinate with OECS)

Source: JICA Study Team

Roadmap for the proposed cooperation is indicated below.

	2023	2024	2025	2026	2027	2028	2029
Strategic Area 1. Promotion of inclusive education							
1-1. Review of school health and inclusive education systems	KCCP	→ Support development of educational program					
1-3. Improvement of facility environment	→		Follow-up				
Strategic Area 2: Mathematics education							
2-1.2-2 Analysis of assessment of learning achievement in mathematics and education planning and implementation based on the results	Collaborate with University,	→ Joint research					
2-6. Training of math coordinators in the curriculum unit of the Ministry of Education and the District Education Offices	JOCV	→ Learn & Coordinate with PEARL					
Common: Collaboration with OECS		Information sharing	→				

Source: JICA Study Team

Figure 7-26 Roadmap for Education Sector Cooperation (Saint Lucia)

Sections below describes details of the proposed cooperation.

b) Strategic Objective 1 : Strengthen Inclusive / Special Needs Education—Toward Project Formulation

Since the policy on special needs education is expected to be formulated by the end of 2023, at this stage, it is desirable to boost trust in Japan's commitment to support efforts through the utilization of the Ministry of Foreign Affairs' Grant Assistance for Grassroots Human Security, dispatching JOCVs, and promoting participation in Knowledge Co-Creation Programs (KCCP). For example, support for educational programs according to the type of disability and the use of assistive technologies such as the Digital Accessible Information System (DAISY), which was piloted (training) in the preceding study, can be considered. It is important to continue to provide support even on a small scale, and maintain close communication with the government of Saint Lucia so that when policies are formulated, JICA can design programs and projects in a timely manner to realize the policies which are in high needs of support.

With regard to inclusive education, it is also linked to CARICOM's regional policy. It is expected that Saint Lucia will be supported to become a model case in the region, and that efforts will be made to envision benefits not only for Saint Lucia but also for the region.

Table 7-48 Strengthen Inclusive / Special Needs Education—Toward Project Formulation (Saint Lucia)

Item	Contents
Strengthen inclusive/special needs education	<p>Scheme: Mainly support through JOCV, KCCP, and activities of alumni associations of trainees. In the future, the formulation of a special needs education program (technical cooperation) shall be considered.</p> <p>Content: Promote participation in KCCP "inclusive education" and "school health," and introduce Japan's strengths, such as educational programs for different types of disabilities, optimal individualized educational planning, and employment support. After participating in the KCCP, consider offering support in implementing action plans through alumni associations and JOCV. (Attention to the timing of the policy approval)</p> <p>Target: Not only special education and inclusive schools, but also regular schools and regular classes will be targeted to support the preparation for the coming of inclusive education in the future.</p>
Enhance facilities	<p>Scheme: Grant Assistance for Grassroots Human Security (Ministry of Foreign Affairs)</p> <p>Description: A need was indicated for a wheelchair-accessible bus to be used for commuting to and from special needs schools (Dunnottar School). Through these activities, facility needs for inclusive education will be identified.</p>

Source: JICA Study Team

c) Strategic Objective 2: Math Education

The OECS is currently working toward the revision of a common curriculum, with the first version scheduled to be piloted in September 2024. Full-scale rollout will follow a little later, but in order for the Department of Education and Curriculum Office to provide adequate support to schools, the Ministry of Education's field support arrangements must be in place. Currently, the JICA Saint Lucia Office is planning to strategically dispatch JOCVs. The situation in the classrooms can be monitored through them.

The Department of Education has pointed out that the results of academic performance tests are not effectively reflected in classroom teaching. By collaborating with SALCC (or UWI) on these efforts, it can contribute to strengthening the research functions of national research institutions to contribute to public policy.

Table 7-49 Math Education Enhancement Project (OECS/ Saint Lucia)

Item	Contents
Project Name	OECS Math Education Enhancement Project
Priority	Potential Project (B)
Target Country	OECS – Pilot country: Saint Lucia
Project Site	Saint Lucia (as Pilot country)
Scheme	Expert dispatch, in collaboration with JOCV
Cooperation Period	July 2024 - June 2027 (2 years + 1 year)
Counterpart	OECS, Ministry of Education of Saint Lucia
Other Concerned Agencies	OECS member countries
Project Objectives	To improve the delivery of math education in OECS (pilot country: Saint Lucia) and become a model case to improved math performance. (Expanding that initiative to other member countries). The model should be introduced to the member countries.
Outputs	<ul style="list-style-type: none"> • Math coordinator functions is enhanced • Math exam performance in target schools and target grades is improved • Teaching material (by Audiovisual materials JOCV)
Activities	<ul style="list-style-type: none"> • Support analysis of academic performance assessment in mathematics • Formulation of curriculum teaching plans based on the results of the analysis • Establish cooperation with math coordinators in the curriculum office and the district education office • Implement supportive monitoring to schools (JOVC supports math coordinators)

	<ul style="list-style-type: none"> • Provide feedback to curriculum office
Notes	<ul style="list-style-type: none"> • It is imperative to coordinate with the PEARL project activities as a preliminary survey. • Incorporate into the plan with a view to roll out to member countries through the OECS • Considering cost-effectiveness, introduce activities to member countries from the initial stage to motivate the Ministry of Education of Saint Lucia as a "pioneering model", while also picking up good practices in member countries and aiming to create an environment for learning from each other. • It would be advisable to conduct further survey for collaborative implementation arrangement with OECS.

Source: JICA Study Team

7.3.5 Guyana

(1) Education Sector Overview -Guyana (Desktop Survey)

1) Education Policy and Situation

a) Education Policy

The table below lists Guyana’s general development policies, education sector’s policies and their key contents.

Table 7-50 National Development Policy and Education Policy (Guyana)

Title	Year	Key Direction / Priority
Green State Development Strategy Vision 2040	2019	<p>Vision: “An inclusive and prosperous Guyana that provides a good quality of life for all its citizens based on sound education and social protection, low carbon and resilient development, providing new economic opportunities, justice and political empowerment”</p> <p>Policy Recommendations for Education:</p> <ol style="list-style-type: none"> 1. Redouble efforts to aim 100% enrolment and completion of compulsory period of schooling 2. Special attention to the children with special needs 3. Promote better worker compensation packages, incentives and performance measures for recruiting and retaining top quality teachers to the education system 4. New teacher training institutions must be accredited to national (and international) standards 5. More male teachers in teaching profession 6. Recognize and reward good teachers, results and excellence 7. School principals and teachers from the same grades must conference annually 8. Fully implement curriculum changes to educate on the sustainable development Agenda 9. Indigenous children should benefit from culturally-appropriate instructional materials and methods. 10. Schools, classrooms, and dormitories have improved designs, facilities and access 11. Schools must celebrate where feasible annual national events and cultural diversity 12. Benchmark and recognise top performance 13. Community alliances should be tied to school and teacher performance benchmarks 14. Eliminate the dead-ends in the education system 15. Strengthen TVET for preparing students for the labour market
Low Carbon Development Strategy Vision 2030	2022	<p>Low Carbon Development Vision 2030</p> <p>Target of the Education Area :</p> <ul style="list-style-type: none"> • Improved Climate and Environmental Literacy. • Caring for the Environment • Learning about Guyana’s world class nature <p>Efforts for Realizing Strategic Goals :</p> <ul style="list-style-type: none"> • Strengthening of education in science, technology, engineering and mathematics (STEM) • Supporting the delivery of climate and environmental education in schools

Title	Year	Key Direction / Priority
		<ul style="list-style-type: none"> Improving skills training for the low carbon economy Building educational establishments that reflect environmental principles
Education Sector (Strategic) Plan 2021-2025-Vision 2030	2021	<p>Vision: Providing opportunities for quality, equitable education and lifelong learning for all.</p> <p>Policy Priorities:</p> <ul style="list-style-type: none"> Improving governance and accountability Improving performance at all levels Improving the efficiency of the Education System Reducing inequities in Education Contributing to lifelong learning and employability
National Risk Management Policy for the Education Sector in Guyana	2021	<p>To enhance risk management and responses in education sector</p> <p>Strategic Objectives:</p> <ul style="list-style-type: none"> Access: Ensure equitable access to education and a safe and protective learning environment to all children and youth affected by crises Quality: Improve teaching and learning processes and modalities in crises Management: Improve capacities for managing crises

Source: JICA Study Team based on policy documents

Guyana's unemployment rate was 16.4% in total (2021), but the youth unemployment rate was as high as 29.8% (2021). In 2019, before COVID-19, the rate was 26.2%, where an increase of 3.5 percentage points can be observed¹¹⁹. The World Bank reports an expectation that there will be a creation of a good number of jobs. On the other hand, the same report underpins the importance and necessity of job creation through the revitalization and diversification of the existing economy, citing Trinidad and Tobago, where the contribution of oil and gas to the GDP reaches 32%, while that to employment is only 3.4%¹²⁰.

The Government of Guyana has implemented the National Training Project for Youth Empowerment (NTPYE) since 2016; the technical and vocational education and training (TVET) sector has expanded by 67% between 2015 and 2018 as the coming economic transformation requires diverse skills¹²¹.

b) Educational Administration

i) Educational System

Guyana's education system consists of pre-school, primary (six years), secondary (five years), post-secondary (two years), and tertiary education. There are two types of secondary schools: general secondary schools, which provide five years of integrated education, and secondary departments of primary schools, which are annexed to primary schools and provide either five years of general education or three years of vocational education. The latter are often established in places where there are few secondary schools in the community and access to education is difficult, such as the hinterlands¹²². In Guyana, education is free and compulsory from the age of 5 years and 7 months to 16 years¹²³. This includes at least 3 years of secondary education.

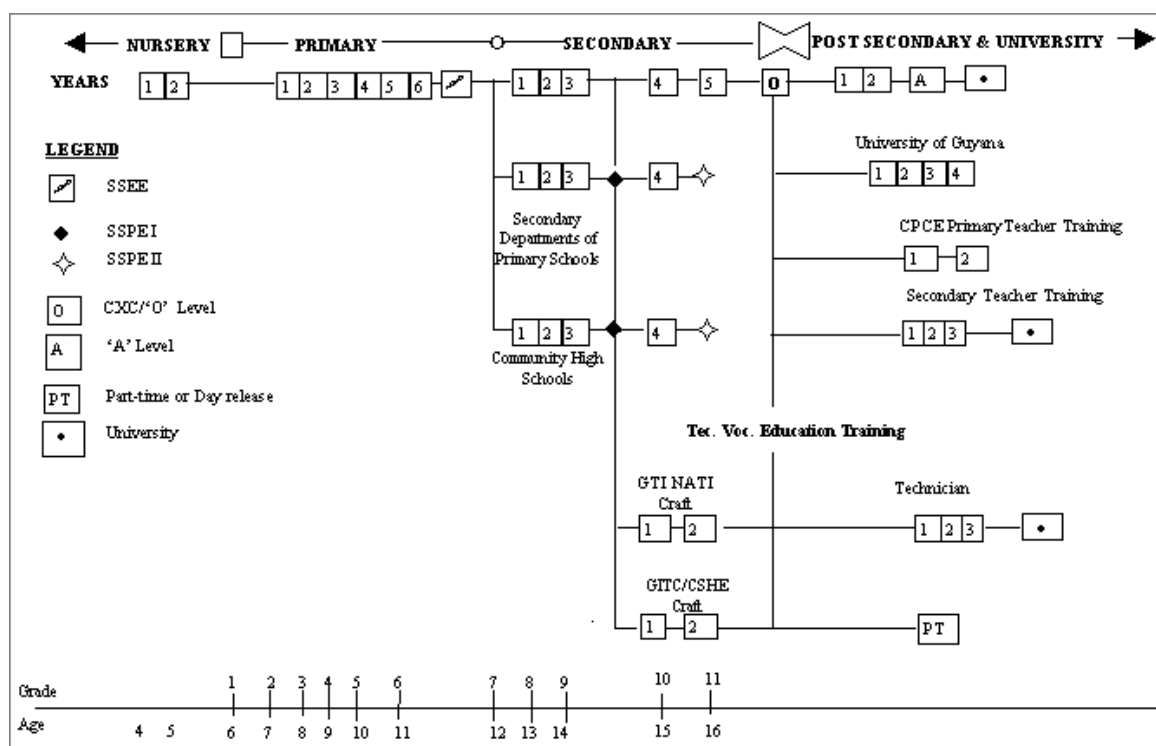
¹¹⁹ <https://data.worldbank.org/indicator/SL.UEM.1524.ZS?locations=GY> ILO modeled estimate (Accessed on 2022/9/19)

¹²⁰ World Bank, 2020, A Pivotal Moment for Guyana: Realizing the Opportunities – Systematic Country Diagnostic

¹²¹ Government of Guyana, 2019, Guyana Voluntary National Review 2019

¹²² UNESCO World Data on Education VII Ed. 2010/11

¹²³ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11.



Source: UNESCO World Data on Education VII Ed. 2010/11

Figure 7-27 Education System in Guyana

ii) Organization

The Ministry of Education in Guyana is headed by the Minister of Education and then the Undersecretary. The Chief Education Officer, and under them, is responsible for the operation of the education system. Under the Chief Education Officer are three Deputy Chief Education Officers, responsible for the development, administration, and technology. Their responsibilities are listed in the table below¹²⁴.

Table 7-51 Ministry of Education: Three Deputy Chief Education Officers and their Areas of Responsibility (Guyana)

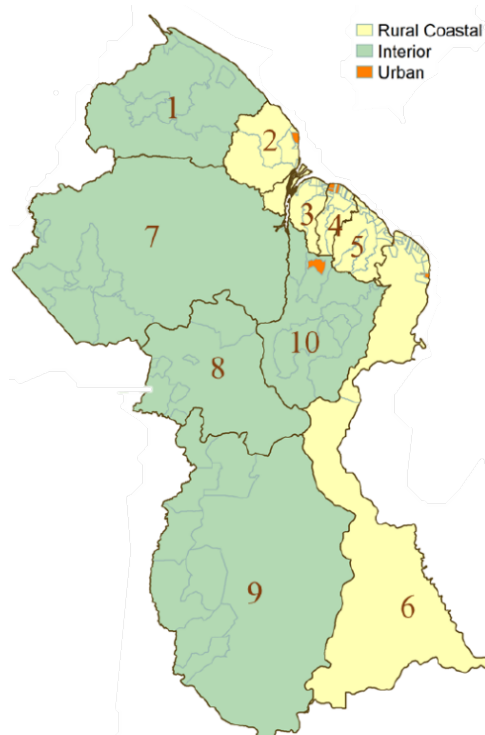
Deputy Chief Education Officer	Office in-charge	Contents
Development	Monitoring, Evaluating, Reporting and Development Unit (MERD)	Cyril Potter College of Education National Centre for Educational Resource Development (NCERD)
Administration	Policy Implementation and Monitoring Unit (PIM)	Supervise and assist the Assistant Chief Education Officer in overseeing pre-school, primary, and secondary education.
Technical Education	TVET Unit	Vocational and technical education and trainings

Source: JICA Study Team based on UNESCO World Data on Education VII Ed. 2010/11 and R., Moser, C., Ziegler, N. (2021) Country Review

Organogram of the Guyana’s Ministry of Education was not available on the website. At the interview

¹²⁴ Organogram of the Guyana’s Ministry of Education was not available on the website. At the interview with NCERD, it was informed that the organograms of both Ministry of Education and NCERD are not updated for a while and it is now being audited and revised at this year 2022.

with NCERD, it was informed that the organograms of both Ministry of Education and National Centre for Educational Resource Development (NCERD) are not updated for a while and it is now being audited and revised at this year 2022.¹²⁵



The Ministry of Education is responsible for national education policy, coordination, monitoring and evaluation, educational service delivery, testing, curriculum, teacher training, and research and development. Guyana, on the other hand, is divided into ten administrative districts and Georgetown. Each Regional Democratic Council (RDC) is responsible for education in their respective districts. A map of the administrative districts is shown in the figure left.

The NCERD was established under the Ministry of Education for the main purpose of planning and implementing in-service teacher training. NCERD has six units responsible of curriculum and teaching material development, distance learning, assessment of learning achievement, etc. (See Table 7-52)¹²⁶. According to the NCERD, by having all units under one NCERD umbrella, it is expected that there would be better collaboration and coordination.

Source: World Bank, 2020, A Pivotal Moment for Guyana: Realizing the Opportunities

Figure 7-28 Administrative Division (Guyana)

Table 7-52 Six Units of the NCERD (Guyana)

Unit	Responsibility
Curriculum Development and Implementation	Development of curriculum, assessment, and evaluation for pre-primary, primary, and secondary education and preparation of teaching materials, including textbooks, and curriculum guides for teachers. Implementing teacher training.
Science and Technology	(Unknown as not mentioned in the document)
Measurement, Evaluation and Research	Development of secondary school entrance exams for children of 11 years and older, secondary school learning achievement exams, and preliminary exams for CXC examinations, etc.
Learning Resources Development	Development of multi-media teaching materials for schools, learning resources. A printing facility is also available.
Distance Education and Information	Conducting and distributing model lessons for national radio, etc.
School Library	Library management

Source: JICA Study Team based on interview with NCERD and UNESCO World Data on Education VII Ed. 2010/11

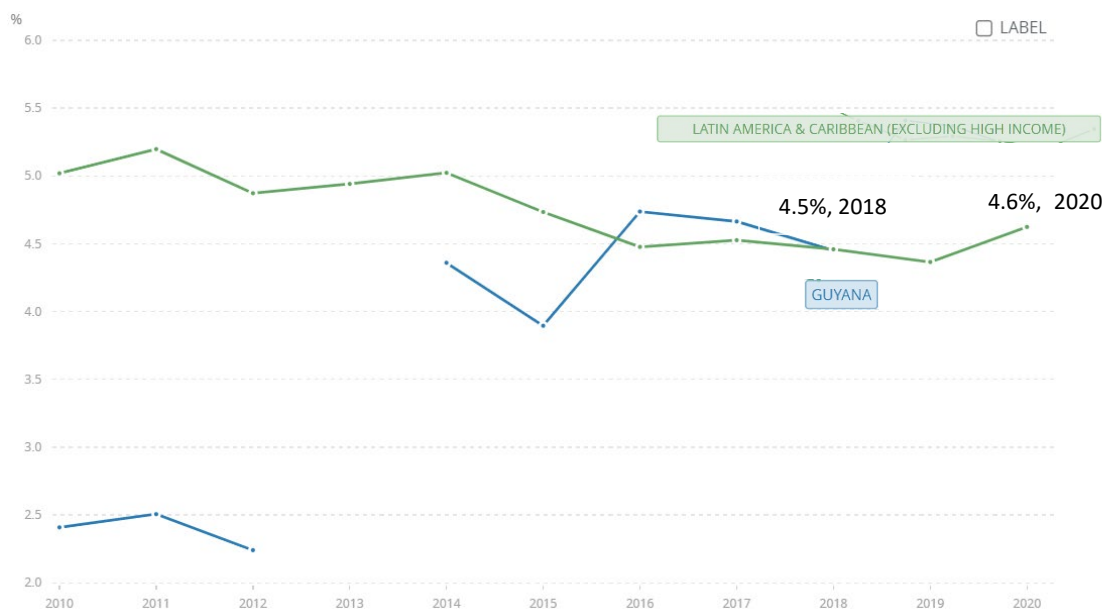
According to interviews with NCERD, a Special Education Needs Unit has also been established within NCERD, which is working to promote special needs education in cooperation with the Special Education Needs Diagnostic Center of the Ministry of Education.

¹²⁵ Interview with NCERD on 2022/7/22

¹²⁶ UNESCO World Data on Education VII Ed. 2010/11

iii) Budget

Education sector spending as a percentage of GDP in 2018 was 4.5%. Guyana’s education sector spending as a percentage of GDP is at the same level of the Caribbean small states and the LAC region (excluding high-income countries).



Source: World Bank

Figure 7-29 Government Expenditure on Education, Total % of GDP (2010-2020)

2) Situation of Education Sector

a) School Enrolment

There are 436 primary schools nationwide, 115 regular secondary schools and 127 primary annexed secondary schools, and two public institutions of higher education (the University of Guyana and the Cyril Potter College of Education). There were six public special needs schools, with 423 students enrolled in 2016/17¹²⁷.

Since information on enrollment rates is not available from the Ministry of Education’ statistics or the UNESCO Institute of Statistics, the following shows some data from several sources.

Table 7-53 Key Educational Indicators (Guyana)

Indicator	Current Situation	Source
Enrolment	Pre-primary: 61% (Hinterland 49%)	World Bank, 2020, A Pivotal Moment for Guyana: Realizing the Opportunities – Systematic Country Diagnostic
	Primary: 96%	Government of Guyana, 2019, Guyana Voluntary National Review
	Secondary: Female 84.4%, Male 80.3%	World Bank, 2021, “Guyana Country Gender Scorecard”
	Tertiary: Female 15.4%, Male 7.8% ¹²⁸	
Education Budget	Percentage of National Budget: 15%, 2018 Percentage of GDP: 5.6%, 2017	Government of Guyana, 2019, Guyana Voluntary National Review

Source: JICA Study Team based on various source

¹²⁷ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11.

¹²⁸ World Bank, 2021, “Guyana Country Gender Scorecard”

In particular, school distances and high commuting costs in remote riverine areas and hinterland regions affect enrollment rates. In Regions 1, 7, 8, and 9, primary school-annexed secondary schools account for more than half of secondary school enrollment (see table below, bold numbers). Many of the hinterland regions are inhabited by Amerindian populations.

Table 7-54 Number of Schools, by Region (Guyana)

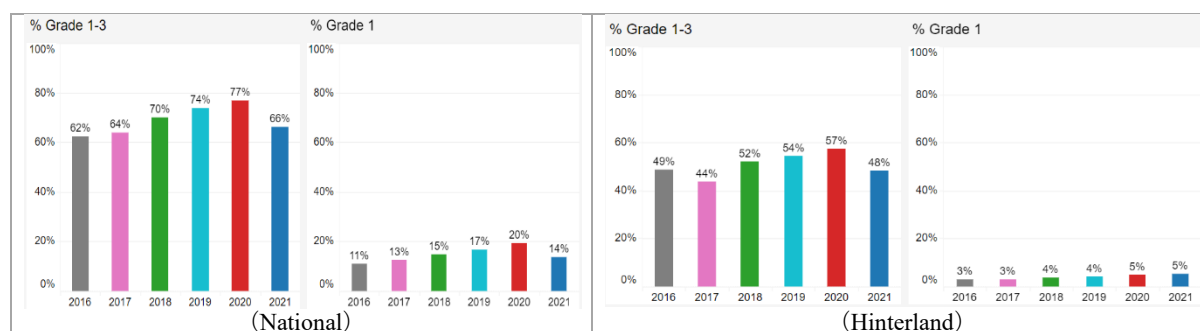
School	Nation	GT	1	2	3	4	5	6	7	8	9	10
Primary	436	29	42	38	59	55	30	53	28	23	48	31
Secondary	115	30	3	6	14	17	9	17	3	3	4	7
Annex secondary	127	0	31	5	14	14	0	4	9	14	36	0

Note: GT=Georgetown, Number signifies the region number

Source: JICA Study Team based on the Ministry of Education, 2017, Education Statistical Digest 2016-2017

b) Learning Achievement

According to Guyana's National Examination and Assessment of Academic Achievement for Grade 11 students, only 66% were able to pass this exam in 2021. Only 48% passed from schools in the hinterland regions. In addition, only 14% of students passed the exam reaching a "sufficient level of understanding (Grade 1)". Only 5% of students from the hinterland regions have reached Grade 1 level. While grades were on the improving trend in general from 2016 until 2020, the passing rate declined in 2021.



Source: Ministry of Education Guyana, 2022 May, Grade 11 National Assessment: National Reports and Analysis

Figure 7-30 11th Grade Learning Achievement Results (2016-2021) National and Hinterland Comparison

The CSEC results also reveal regional disparities within Guyana. In particular, the disparity between the coastal region's capital, Georgetown, Region 2, and the inland regions, Regions 1, 7, and 8, is noticeable.

Table 7-55 CSEC (2019/2020) Results by Region (Guyana)

Subjects	Nation	GT	1	2	3	4	5	6	7	8	9	10
Test takers	6,526	1,696	277	476	731	973	446	918	152	119	296	442
English	80%	85%	66%	86%	81%	81%	82%	79%	64%	51%	64%	85%
Math	49%	61%	14%	51%	53%	52%	48%	47%	15%	11%	24%	46%

Note: GT=Georgetown, Number signifies the region number / Bold: Top 3, Gray-shaded: Bottom 3

Source: JICA Study Team based on the Ministry of Education, 2017, Education Statistical Digest 2016-2017

Compared with the Caribbean regional average of CSEC results and other member states in the region, the passing rates for both math and English of Guyana are lower.

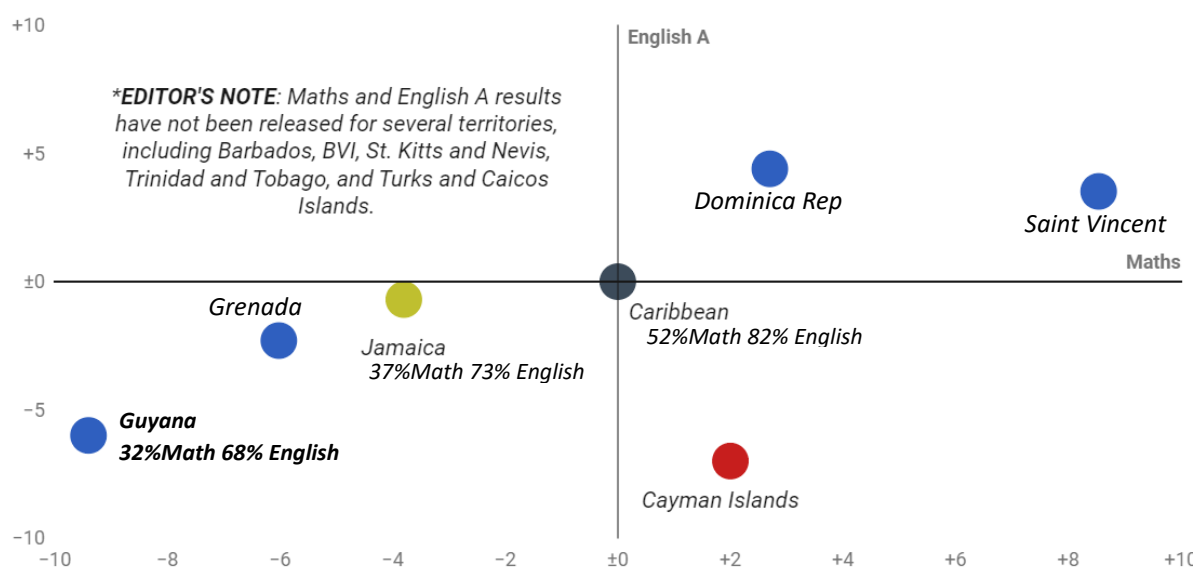


Chart: Cayman Current • Created with Datawrapper

Source: Cayman Education News, 2022 May, Data Report 2021: Key observations from 2021 CSEC results

Figure 7-31 Result of CSEC (2021) Comparison among Caribbean Member States

However, according to the Human Capital Index (2020) published by the World Bank¹²⁹, the productivity gained by a child born today in Guyana is only half that of a child who enjoys health and education fully. This means that a child who completes 12.2 years of schooling will actually gain only the equivalent of 6.8 years of academic achievement¹³⁰. In Guyana, returns on education are particularly low (6.4% in Guyana compared with the Central American and Caribbean regional average of 9.4%)¹³¹. This situation does not contribute to increase the interest in educational investment.

In Guyana, the curriculum has not been revised since the 1990s and remains outdated; therefore, since 2018, NCERD has taken the lead in revising the curriculum. For Grades 10-11 in secondary education, the CXC syllabus is applied, while the Grades 1-9 curriculum is being revised. The new curriculum focuses on developing the students' ability to learn, adjusting the timetable to allow more time for dialogue, and shifting the role of teachers to that of facilitators rather than student supervisors. The pilot implementation of the new curriculum was expected to start from September 2022, after the training of teachers in June 2022, which helped teachers to totally understand the change of education style¹³².

c) Teacher

Teacher training is primarily provided by the Cyril Potter College of Education, which offers one of two courses to become a teacher. Most students choose the two-year Associate's degree course, but the

¹²⁹ <https://www.worldbank.org/ja/news/press-release/2018/10/11/if-countries-act-now-children-born-today-could-be-healthier-wealthier-more-productive> [The HCI reflects the productivity as a future worker of a child born today, compared with what it could be if he or she had full health and complete, high-quality education, on a scale from zero to one, with 1 as the best possible score. A country score of 0.5, for example, means that individuals – and the country as a whole – are forgoing half their future economic potential. Calculated over 50 years, this translates into deep economic losses: a 1.4 percent annual loss in GDP growth] (Accessed on 2022/9/19)

¹³⁰ World Bank, 2020, Project Information Document for Guyana COVID-19 Emergency Response Project

¹³¹ World Bank, 2020, A Pivotal Moment for Guyana: Realizing the Opportunities – Systematic Country Diagnostic

¹³² Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11. Interview with NCERD on 2022/7/22

college also offers a three-year Trained Teacher's Certificate. After completing courses at the college, students can also earn a Bachelor of Education or Master of Education degree from the Faculty of Education at the University of Guyana. Although teachers can be hired without these qualifications, the Ministry of Education gives priority to qualified teachers in order to increase their percentage¹³³.

The NCERD is responsible for the training of in-service teachers. In some cases, especially in hinterlands where there is a shortage of teachers, teachers are hired even if they have not undergone teacher training, assuming that they will undergo training after being hired. In the 2016/17 school year, 78.6% of primary school teachers and 69.4% of secondary school teachers were trained¹³⁴. In addition, there is a shortage of teachers in math and science¹³⁵. The Government of Guyana is working with the Cyril Potter College of Education to increase the proportion of trained teachers to 80%. The Ministry of Education also holds Continuous Professional Development (CPD) workshops each summer with an average of 500 participants. The Education Sector Plan also calls for enhancing CPD workshops.

The table below shows the number of teachers trained and the ratio of students to teachers trained. The number of trained teachers is noticeably lower in the hinterland regions compared with the coastal regions and Georgetown.

Table 7-56 Number of Teacher, Trained Teacher, and Ratio of Students over a Trained Teacher (Primary education, 2016/2017), by Region (Guyana)

Item	Nation	GT	1	2	3	4	5	6	7	8	9	10
Teacher	3,885	533	228	323	532	760	275	517	160	74	188	295
Trained	3,054	480	118	248	451	638	227	440	88	19	95	250
Students	80,326	12,455	5,398	5,627	10,273	15,807	5,332	10,894	3,273	1,785	4,489	4,993
Students/ Trained teacher	26	26	46	23	23	25	23	25	37	94	47	20

Note: GT=Georgetown, Number signifies the Region number

Source: JICA Study Team based on Ministry of Education, 2017, Education Statistical Digest 2016-2017

Table 7-57 Number of Teacher, Trained Teacher, and Ratio of Students over a Trained Teacher (Secondary education, 2016/2017), by Region (Guyana)

Item	Nation	GT	1	2	3	4	5	6	7	8	9	10
< Secondary Unit Annex to Primary >												
Teacher	283	NA	77	1	45	73	NA	11	10	17	49	NA
Trained	131		22	1	35	50		5	0	3	15	
Students	5,774		1,707	21	1,033	1,143		191	221	272	1,186	
Students/ Trained teacher	44		78	21	30	23		38	0	91	79	
< General Secondary >												
Teacher	3,692	925	94	278	426	576	292	588	82	40	93	298
Trained	2,629	671	39	232	320	390	188	406	54	15	39	275
Students	5,8302	15,042	2,084	4,127	6,080	9,000	4,527	8,705	1,708	826	1,934	4,269

¹³³ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11. and Interview with NCERD on 2022/7/22

¹³⁴ Ministry of Education, Guyana, 2020, Education Statistical Digest 2019-2020

¹³⁵ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11. and Interview with NCERD on 2022/7/22

Students/ Trained teacher	22	22	53	18	19	23	24	21	32	55	50	16
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Note: GT=Georgetown, Number signifies the Region number

Source: JICA Study Team based on Ministry of Education, 2017, Education Statistical Digest 2016-2017

Most teachers in Guyana are women, with 89.4% (411 males and 3,474 females) in primary education and 75.2% (985 males and 2,979 females) in secondary education.

3) Situation of Education in With/Post COVID-19 Environment

a) School Closure and Reopening

School closed for 68 weeks since March 13, 2020 due to COVID-19, with partial reopening in June for students taking CXC exams¹³⁶. In the new school year that began in September 2020, the project combined various distance education methods, including online, print materials, television, and radio. In particular, in order to bring education to hinterland and indigenous students in areas with unstable electricity and internet access, distance education was provided via TV, radio, and newspapers, and worksheets/workbooks were distributed. The government also worked on interactive radio broadcasting to improve access to education especially for the indigenous population¹³⁷. There are reports that radio-based education was preferred in Guyana¹³⁸.

When the COVID-19 outbreak began, Guyana was in the midst of a change of government and the budget had not yet been passed, which caused delays in the initial response. It was not until after August 2020 when the new administration took office, that a rapid response was implemented¹³⁹.

The Ministry of Education developed guidelines for the reopening of schools and also prepared an intensive curriculum and teaching materials to make up for the lost learning hours. After schools reopen, the government continues to improve school facilities, especially in hinterlands, to promote learning through a combination of education by television and instruction by teachers, in order to ensure quality of education¹⁴⁰.

b) Teaching Materials and Teachers

The Government of Guyana has made efforts to create educational materials to accommodate diverse educational methods and has made these available on the Ministry of Education's website for downloading at schools and at home. In addition, the Guyana Learning Channel, which is the responsibility of the Distance Education and Information Unit of the NCERD, expanded its channels to six stations to make its programs available in areas where they had not previously been broadcast. Even when the COVID-19 pandemic made it difficult to educate students in schools, lessons were delivered

¹³⁶ <https://en.unesco.org/covid19/educationresponse#durationschoolclosures> (Accessed on 2022/6/7)

¹³⁷ Guyana's Response to the OHCHR Request for information in preparation of its Report to the High Level Political Forum on the Sustainable Development Goals and the Rights of the Child- Human Rights Council Resolution 37/20 "Rights of the Child", November 25, 2020
<https://ohchr.org/Documents/Issues/Children/ReportProtectionRightsChild/memberStates/Guyana.docx>(Accessed on 2022/6/6)

¹³⁸ IDB, 2020 May, Education in times of coronavirus: Latin America and the Caribbean's education systems in the face of COVID-19

¹³⁹ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11.

¹⁴⁰ Interview with NCERD on 2022/7/22 and <https://education.gov.gy/en/index.php/media2/news-events/3697-expansion-of-learning-channel-kicks-into-full-gear> (Accessed on 2022/10/31)

according to the timetable, allowing students to continue their learning¹⁴¹. The Guyana Learning Channel also has a channel on YouTube.

NCERD has increased the number of technical staff, especially those working on the development of multimedia teaching materials, for the period 2021-2022 in order to reinforce distance education via TV, radio, and online. This has enabled an increase in the number of teaching materials to deliver educational content more relevant to local realities. In the future, NCERD hopes to further improve the quality of educational materials¹⁴².

For online classes, teachers used Zoom and Google Classroom, and encouraged students to register for personal communication apps such as WhatsApp and Facebook Messenger to create an environment that facilitates communication even when not meeting in person.

The Ministry of Education has placed emphasis on strengthening the ICT skills of teachers, and in the 2020/21 school year, all teachers, regardless of whether the schools have online environment or not, were required to take a training course on how to conduct online classes provided by ProFuturo. At the Cyril Potter College of Education, in addition to incorporating Moodle into the implementation of classes, efforts are being made to teach classes about technology and innovations that can be used when they teach at schools¹⁴³.

In the implementation of education in light of the risk of COVID-19 infection, teachers' work has become more complicated as they have to manage students and conduct classes using multiple modalities. According to NCERD, the Government of Guyana has also formulated an EMIS policy and is currently developing a pilot project as Phase 1, which is expected to reduce the increased workload of teachers.

c) Infrastructure and Access to ICT

In Guyana, 37.3% of the population has access to the internet (2017). There are also challenges with electricity supply, which is a serious issue, especially in the hinterland regions. Internet access in public schools is also quite limited outside of Georgetown and its suburbs¹⁴⁴.

Lack of ICT infrastructure affects the enrolment. An average of 1.53 children per family attended school, but this number decreased to 0.6 after the COVID-19 pandemic. This trend was observed especially in the hinterlands. The most common reasons given by families (55.2%) were the unavailability of online distance learning, followed by lack of internet access (32%), lack of equipment (22.9%), and internet speed and stability (14.1%). There are regional differences in this response trend, for example, where access to the internet was the biggest challenge: Region 1 at 66.3% while Region 4 at 18.4%¹⁴⁵. As of 2018, 25% of primary schools and 94% of secondary schools had computers for the teaching purpose¹⁴⁶.

According to Guyana's Education Sector Risk Management Policy, the country plans to strengthen the

¹⁴¹ Interview with NCERD on 2022/7/22

¹⁴² Interview with NCERD on 2022/7/22

¹⁴³ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11.

¹⁴⁴ Stone, R., Moser, C., Ziegler, N., 2021, Country Review. Challenges and opportunities in the education system of Guyana. Serie Working Papers SUMMA. No.11.

¹⁴⁵ UNDP, 2020, Socio-Economic Impact Assessment of COVID-19 on Households in Guyana

¹⁴⁶ Government of Guyana, 2019, Guyana Voluntary National Review 2019

digital infrastructure to support learning in vulnerable communities to achieve equitable educational opportunities, including school mapping, a database of ICT tools in schools, agreements on cooperation between government and private agencies, the provision of radio equipment to hinterland areas, and subsidies for the most vulnerable students in inland and riverine areas¹⁴⁷.

4) Development Partners' Assistance

The table below shows the development partners' key assistance in Guyana.

Table 7-58 Development Partners' Assistance (Guyana)

Government Target	Projects	Contents	Partner
Lifelong Learning and Employability	Guyana Strengthening Human Capital through Education Project	Support for access to secondary education (Grades 7-9), implementation of the new curriculum, teachers, and enhancing the TVET field	World Bank
Improving Performance at All Educational Levels & Governance and Accountability	Education Sector Improvement Project 2017-2023	Strengthen mathematics education and the Faculty of Health Science at the University of Guyana	World Bank
	The Guyana Education Sector Project, June 2021~	Improved learning in nursery schools (new curriculum teaching methods, child-centered teaching methods, etc.), increased use of technology in primary schools (introduction of computers and tablets, smart classrooms), Enhancement of technology-assisted learning and strengthening of EMIS (pre-school, primary and secondary education)	GPE
Internal efficiency	Secondary Education Improvement Project 2014-2023	Strengthening mathematics teaching skills and increasing enrollment in secondary education; building schools	World Bank
Reducing Disparities	Guyana's Learning Pods 2022-2025	Support for the education of vulnerable students, support for "STEM Guyana" Private Partnership Programs	IDB-Lab

Source: JICA Study Team based on interview and website information

¹⁴⁷ Guyana Ministry of Education, 2021, National Risk Management Policy for the Education Sector in Guyana

8. Social Infrastructure (Health Care)

8.1 Outline of the Study

Desk and field research were conducted to formulate a development scenario and a cooperation scenario for improving health care in the target countries. Table 8-1 shows survey scope for social infrastructure development (2)/health sector.

Table 8-1 Survey Scope (Social Infrastructure Development (2)/Healthcare)

No.	Task	Subsector	Scope of Work
1	Sector Targets		Based on the vulnerabilities and challenges related to health care identified through the preliminary study, priority issues related to health care under the with/post COVID-19 in the studied countries will be identified, and development and cooperation scenarios for achieving universal health coverage (UHC) will be developed.
2	Scope Update		Based on the desk review and discussions with Japan International Cooperation Agency (JICA), select the countries to be studied in the field and establish priority themes for the study, and update the scope of work. Desk studies will be conducted for El Salvador, St. Lucia, and Guyana. Field surveys will be conducted in El Salvador and St. Lucia. A study will be conducted in El Salvador with the aim of strengthening core hospitals (provision of equipment) at the secondary level through grant assistance. In addition, detailed information on PHC and NCDs will be collected. As cooperation and surveys related to health care have not yet been conducted in St. Lucia and Guyana, general information related to health care will be collected as broadly as possible, while focusing to some extent on priority issues such as non-communicable diseases (NCDs) and primary health care (PHC). Consider grant assistance (facility and equipment maintenance) and broad-based technical cooperation targeting regional institutions such as Caribbean Public Health Agency (CARPHA) and Organisation of Eastern Caribbean States (OECS).
3	Task 2 Literature Review	Collection and analysis of basic information on health and medical care in the studied countries (e.g., health system/UHC)	(Main collection contents) Confirmation of the current status of key health indicators, medium- to long-term development plans, status of implementation, priority issues, etc. Health system (finance, human resources, facilities and equipment, ICT, etc.) Plan and activities of international organizations, development partners, etc. Trends in projects underway and planned
		Gathering and analyzing information on priority research themes in the studied countries (Strengthening core hospitals and medical facilities, PHC, NCDs, maternal and child health, health emergency response, etc.)	(Main collection contents) Current status, issues, and needs in each theme -Diagnosis/treatment and referral systems for NCDs, PHC activities, maternal and child health/nutrition status, planning and progress on health emergency response, health promotion, etc. (El Salvador) chronic kidney disease, heart disease, hypertension, cancer, diabetes, chronic obstructive pulmonary disease (COPD) (Saint Lucia) intraregional cooperation status
4	Task 3 Field Survey	Collection and analysis of detailed information on priority research topics, needs (field survey (1))	In priority field survey countries, interviews will be conducted with relevant ministries such as the Ministry of Health, other donors (The Pan American Health Organization (PAHO), Inter-American Development Bank (IDB), etc.), JICA overseas offices, and medical facilities (hospitals, PHC facilities, etc.) to identify priority issues and understand local needs. In medical facilities, the sufficiency of medical equipment will be checked together with their utilization and maintenance status, equipment needs, etc. In El Salvador, secondary hospitals in rural areas will also be considered as a target for the study. Based on the results of the study, a development scenario and a cooperation scenario will be prepared.
		Explanation and review of development scenarios and cooperation scenarios, and collection of additional information (field survey (2))	Explain the development scenarios and cooperation scenarios to government agencies, regional organizations/development partners, and JICA, obtain feedback, and revise the scenarios. If there are items for which information could not be collected during the first field survey, additional information should be collected in succeeding attempts.
5	Tasks 4-6	Selection, planning, and implementation of pilot	Although the healthcare sector will not be anticipated in pilot projects, some advises should be given to the pilot projects from a

No.	Task	Subsector	Scope of Work
		projects	healthcare perspective.
6	Task 8 Recommendations	Finalize development and cooperation scenarios	Finalize development and cooperation scenarios based on feedback obtained from government agencies, regional organizations/development partners, and JICA. Saint Lucia has a high gross national income (GNI) per capita and Guyana is an oil-producing country. Justification should be considered when forming grant assistance in both countries.

Source: JICA Study Team

8.1.1 Selection of Priority Countries and Survey Items in the Social Infrastructure Development (2)/Healthcare Sector

As the survey targets countries in Social Infrastructure Development (2)/Healthcare sector based on the importance of the health sector in each country and the country development policy of the Ministry of Foreign Affairs, after consultation with JICA, El Salvador in the Central America, and Saint Lucia and Guyana in the Caribbean region were selected. Of these, El Salvador and Saint Lucia conducted field surveys. Table 8-2 shows the survey priority items in the target countries of the field survey.

Table 8-2 Priority Items of the Field Survey in the Health Sector

Target Country for Field Survey	Survey Priority Items
El Salvador	Issues related to medical equipment/equipment maintenance, issues related to NCDs (prevention, examination/diagnosis, treatment), ability to provide medical services at secondary hospitals, health planning and implementation status, PHC activities (prevention and early detection of NCDs, inspection system, health promotion, etc.), referral system (collaboration between primary and secondary medical facilities), and development partner trends
Saint Lucia	Status and issues of regional cooperation such as OECS, issues related to NCDs (prevention, examination/diagnosis, treatment), secondary hospitals' ability to provide medical services, health planning and implementation status, PHC activities (NCD prevention, testing system for early detection, health promotion, etc.), referral system (coordination between primary and secondary medical facilities), medical care issues related to equipment and equipment maintenance, trends in development partners, and issues related to healthcare unique to small island countries

Source: JICA Study Team

8.2 Overview of Health Care Sector in the Region

8.2.1 Current Status and Issues of NCDs

Non-communicable diseases (NCDs) such as diabetes, cancer, cardiovascular disease, and chronic respiratory disease are on the rise in Central America and the Caribbean, and 82% of them are the cause of all deaths, 10% from infectious diseases, maternal and perinatal diseases, and 8% from injuries.¹ Compared to NCDs accounting for 77% of all deaths in low- and middle-income countries, the mortality rate due to NCDs in Central America and the Caribbean is high². According to a report by The Organization for Economic Co-operation and Development (OECD) / World Bank, in Central America and the Caribbean, there are many deaths due to diabetes, and the survival rate of myocardial infarction and cerebral infarction tends to be low. Deaths from cancer are also increasing. This is due to the lack of advanced medical technology (computerized tomography (CT), magnetic resonance imaging (MRI), mammography, radiation therapy, etc.) and medical personnel. Malnutrition and underlying diseases

¹ Health at a Glance: Latin America and the Caribbean 2020 (OECD, 2020)

² <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases> (accessed January 13, 2023)

such as diabetes and hypertension have been pointed out as factors that increase the risk of COVID-19 infection and deterioration. Undernutrition affects immunity, and obesity and aging are highly related to underlying diseases such as diabetes. In addition, it is estimated that 32% of the population of this area will be over 65 years old by 2100 with the highest proportion of elderly population in the world (IMF, 2018). In addition, the aging population is expected to create many cardiovascular disease and cancer patients in the next few decades. Also, Increased healthcare costs and increased pressure on healthcare providers are expected.

Latin America has the highest death rate from chronic kidney disease in the world. Over the past two decades, Central America has reported increasing cases of chronic kidney disease among male agricultural workers due to non-traditional causes, mainly inappropriate use of pesticides, working conditions in extreme heat, and lack of hydration. In El Salvador, mortality from this cause increased from 18.7 per 100,000 in 1997 to 47.4 per 100,000 in 2012.³ LANCET (2014) also reported that although the cause of the epidemic of chronic kidney disease is not clear, there is a consensus among researchers about its multifactorial nature and its relationship with social, environmental, and economic determinants. Pesticide exposure, heat stress with dehydration, excessive intake of high-sugar beverages, exposure to heavy metals, use of non-steroidal anti-inflammatory drugs, alcohol, and infectious diseases are contributing factors to the epidemic of chronic kidney disease.⁴

The World Health Organization (WHO) classifies major risk factors for NCDs as modifiable behavioral and metabolic. Modifiable behavioral risk factors include smoking, physical inactivity, unhealthy diet, and excessive alcohol consumption. Metabolic risk factors include elevated blood pressure, overweight/obesity, hyperglycemia, and hyperlipidemia. Smoking, alcohol consumption, and being overweight are main risk factors for NCDs⁵. Being overweight, in particular, is one of the most important health risk factors in Central America and the Caribbean region, and is considered to be a significant burden in the future. Overweight affects approximately 8% of children under 5 years of age, 28% of adolescents, more than 53% of adult men, and more than 61% of adult women. For a healthy living, 35% of the adult population does not get enough physical activity. None of the countries in Central America and the Caribbean meet the recommended intake of 400 grams of fruits and vegetables per person per day. Sugar consumption far exceeds the recommended amount of 50 grams per person per day, and the consumption of sweetened beverages alone exceeds this amount. Nearly 1 in 4 men and 1 in 10 women aged 15 and over smoke daily, both slightly below the Organization for Economic Co-operation and Development (OECD) average. Among adolescents aged 13 to 15 years, tobacco use was 15% for men and nearly 12% for women. Average alcohol consumption in Central America and the Caribbean is lower than in the OECD, but increased by 3% from 2010 to 2016. Among those who drink, one in two men and one in five women report an episode of heavy drinking in the past 30 days. Nearly 35% and 22% of traffic accidents for men and women are caused by alcohol.⁶

As described above, the prevalence of NCDs is higher in Central America and the Caribbean than in other regions, and it is expected that the prevalence of NCDs will further increase as the population ages. In the Central American and the Caribbean region, each country is promoting the formulation and

³ Sustainable Health Agenda for the Americas 2018-2030 (PAHO, 2017)

⁴ The epidemic of chronic kidney disease in Central America (LANCET, 2014)

⁵ <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases> (WHO, September 2022 access)

⁶ Health at a Glance: Latin America and the Caribbean 2020 (OECD, 2020)

implementation of policies and systems related to NCDs in order to respond to its increasing needs. However, medical service providers are unable to adequately respond to NCDs prevention, early diagnosis, and early treatment due to the lack of medical infrastructure and health personnel. The COVID-19 pandemic has exposed the vulnerability of the medical system, and strengthening of a resilient medical system has become an issue, such as the provision and continuation of high-quality medical services for patients who are prone to becoming seriously ill, such as NCDs patients and the elderly.

In order to respond to the increasing challenges related to NCDs, the Central American and the Caribbean region needs to strengthen medical infrastructure and health personnel. This is essential to build a robust medical system to prevent, early detect, and treat NCDs. The treatment requires significant medical resources (skilled medical personnel, expensive drugs and technology, etc.). It is considered an effective and efficient countermeasure to promote activities centered on NCDs prevention such as smoking cessation, physical activity to prevent overweight and obesity, and improvement of dietary habits. There is also a need to facilitate access to diagnosis and care, as early diagnosis is the key to reduce mortality.

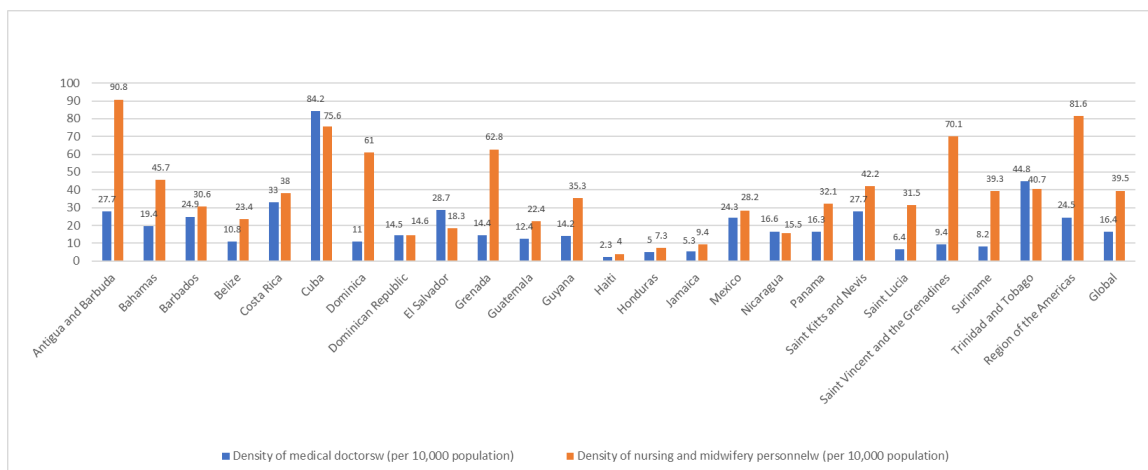
8.2.2 Current Status and Issues of Infectious Diseases, Trauma, and Other Diseases

While the response and improvement of NCDs has lagged other countries, infections and trauma remain major health problems in the region. Infectious diseases such as dengue fever and Zika fever including COVID-19 that has spread all over the world since 2020 threaten the Central American and the Caribbean region. Conventional infectious diseases such as malaria and HIV/AIDS also require continuous countermeasures. Trauma includes traffic accidents, drowning, poisoning, assault, self-harm, and natural disasters. Interpersonal violence was the type of injury that showed the greatest growth, increasing by 33% between 1990 and 2017. Trauma is the leading cause of death and disability in all age groups, claiming more than 635,000 lives in the World Health Organization (WHO) Region of the Americas in 2015, accounting for 9.7% of all deaths. Most countries in Central America and the Caribbean have a “triple burden” of communicable diseases, non-communicable diseases, and violence/trauma. Maternal and child health and undernutrition are priority issues in the Central American region, and non-communicable diseases and overnutrition are priority issues in the Caribbean region.

8.2.3 Current Status and Issues of the Health and Medical Service Delivery System

Based on the regional declaration on the new orientations for primary health care (Declaration of Montevideo) compiled mainly by Pan American Health Organization (PAHO) in 2005, strengthening of PHC is given top priority in the Central American and Caribbean region. The PHC model, which has been adopted in many countries in Central America and the Caribbean, consists of multidisciplinary family health teams established at primary level facilities (e.g., health centers), providing facility-based care and outreach to community and home for preventative, health promotion, and basic care. In the past, maternal and child health was the main focus. It consisted of general practitioners, pediatricians, obstetricians, midwives, nurses, and community health workers. From the results of the field survey, it was found that in response to the increasing need for preventive measures and treatment of NCDs, efforts are being made to treat NCDs in primary care.

In addition, in terms of the provision of secondary and higher health care services, it is pointed out that patients are unable to receive sufficient medical services due to the shortage of hospital beds and health personnel and the high proportion of medical expenses paid by patients. The shortage of health personnel in the Caribbean region is due to the outflow of specialists overseas and to the private sector. The figure below shows the numbers of doctors, nurses, and midwives per 10,000 population in Central America and the Caribbean.



Source: WHO Global Health Workforce statistics database

Figure 8-1 Number of doctors, nurses and midwives per 10,000 population in Central America and the Caribbean

El Salvador has 28.7 doctors per 10,000 population, which is higher than the US regional and global average, but only 18.3 nurses and midwives per 10,000 population, which is well below the average. In Saint Lucia, both numbers are below the averages, especially very low number of doctors at 6.3 per 10,000 population. The numbers of doctors, nurses, and midwives in Guyana are also below the averages. As a means of compensating for the shortage of health personnel, the movement to introduce telemedicine is accelerating, but the private sector is still the main sector, and the disparity with residents who have difficulty accessing internet infrastructure, such as in rural areas, is widening.

In terms of health financing, public health spending in the region averages around 4% of the gross domestic product (GDP), lower than 8-9% in OECD countries and below the PAHO benchmark of 6% for universal health coverage (UHC). It is estimated that 30% of the region's approximately 600 million people are unable to receive necessary medical services due to financial reasons, and 21% are unable to receive necessary medical services due to geographical reasons. As of 2018, public health spending in Latin America and the Caribbean (LAC) could increase by more than 7% by 2045⁷. Further prevalence of NCDs will require more public spending on health services.

⁷ Consecuencias fiscales del envejecimiento poblacional (IDB, 2018)

8.3 Overview of Health Care in each Focus Countries

8.3.1 El Salvador

(1) Overview of Health Care

1) Current Status and Issues of NCDs

In El Salvador, ischemic heart disease accounts for more than 60% of all cardiovascular disease deaths, compared with 35% or less in Saint Lucia, Jamaica, and Dominica. On the other hand, death from stroke is the lowest rate in the Central American and the Caribbean region at less than 23% in El Salvador (IHMI, 2019).

As for cancer, 185 new cancer patients per 100,000 population (12,500-13,500 per year) occur each year. In 2021, the Government of El Salvador enacted a Special Act for Cancer Prevention, Control and Attention to help identify the causes of cancer, prevent its rising incidence, and promote cancer prevention, early detection and treatment. It aims to establish a regulatory and operational framework for planning and executing public policies and programs for cancer.⁸

Chronic kidney disease is the second leading cause of death in men, the fifth leading cause of death over the age of 18, and the third leading cause of hospital death in the adult population. Its features, particularly non-traditional kidney disease⁹ unrelated to traditional risk factors such as diabetes and hypertension, are challenging. According to cross sectional study, the general prevalence of chronic kidney disease in El Salvador was 12.8% (men 18.0%; women 8.7%). Of the chronically ill kidney patients, 13.1% were between 20 and 40 years of age. Among biological risk factors (family history, diabetes, hypertension), the most frequent was hypertension (37.0%). Among nontraditional risk factors (insufficient hydration, consumption of high levels of sugary drinks, overdose of non-steroidal anti-inflammatory drugs, high exposure to agrochemicals in the work environment), high levels of sugary drink consumption (81.0%), insufficient hydration (65.9%), and high levels of exposure to agrochemicals in the work environment (12.6%) were also observed. Prevalence of chronic kidney disease from nontraditional causes was 3.9% (men 6.1%; women 2.2%).¹⁰

In the future, as the aging population in rural areas, it is expected that the required resources in rural areas of healthcare will expand further. The Government of El Salvador implements the prevention and care of NCDs by PHC through *Unidad Comunitaria de Salud Familia* (UCSF) and *Equipos Comunitarios De Salud Familiares* (Ecos) as an important policy. However, it is still not enough to meet the increasing needs for measures against NCDs, and it is considered necessary to allocate more human resources to primary health care facilities, especially to rural areas.

⁸ <https://garciabodan.com/en/help-control-and-prevent-cancer-act-in-el-salvador/> (September 2022 access)

⁹ Currently, there is no clear consensus on the case definition of nontraditional chronic kidney disease (CKDnt), but in general, diabetes, arterial hypertension, glomerular proteinuria, polycystic kidney disease, and obstructive uropathy, is diagnosed when patients meet criteria for chronic kidney disease in the absence of evidence that they are the cause of other recognized causes of chronic kidney disease (Source: Lineamientos técnicos para el abordaje integral de la hipertensión arterial, diabetes mellitus y enfermedad renal crónica en el primer nivel de atención (Ministry of Health in El Salvador, 2021))

¹⁰ The Chronic Kidney Disease Epidemic in El Salvador: A Cross-Sectional Study (2019)

2) Policies and Systems Related to NCDs

a) Health planning and policy

National Development Plan 2019 (Plan Cuscatlán)

President Najib Bukele, who took office in June 2019, presented a new development plan, Plan Cuscatlán, a collection of commitments during the presidential election. In the health sector, the principles of universality, solidarity, equity, subsidiarity, and institutionality are used to guide health care, with the integration of the National Insurance System (Sistema Nacional de Salud) and the realization of UHC through the Primary Health Care Strategy. Other specific goals include financial management to reduce people's out-of-pocket, procurement management of medical equipment and pharmaceuticals, protection of workers in the public sector in terms of human resource development, improvement of working conditions, and allocation of human resources. Also, approaches to social factors related to health, importance of health promotion and health education are indicated. This plan includes the inclusion of cancer treatment in primary health care as a comprehensive cancer care, so that travel to urban areas for treatment and screening is unnecessary.

Five-year Development Plan 2014-2019 (Plan Quinquenal de Desarrollo)

The Five-year Development Plan has 11 goals, the fourth of which mentions the goal of 'quality health services and universal access and coverage. Specific plans are stated to establish an Integrated National Health System (*Sistema Nacional Integrado de Salud: SNIS*), provide quality health services at reasonable prices, ensure access to medicines, strengthen research, and develop human resources.

National Health Plan 2020-2030

This is being formulated. The content is in line with the 2030 Agenda for the Sustainable Development Goals (SDGs), Goal 3 "Good Health and Well-Being for All". In the new health plan, the current issues are lack of communication, long patient waiting times, dissatisfaction of medical staff, inefficient medical services, excessive costs, fragmented medical systems and networks, deterioration and shortage of infrastructure, shortage of medicines, lack of funds, ineffective supply chains, etc. As a response, it is stated that emphasis will be placed on a comprehensive approach to disease, such as health education and screening for early detection of diseases, and a life cycle approach. In NCDs, it will focus on heart disease and hypertension, diabetes, cancer, chronic kidney disease, and chronic lung disease. As a DX, it is also stated that e-health (digital health) will be promoted, such as sharing patient information data between facilities. Strengthening the medical infrastructure is also focused on.

b) Policy on NCDs

In 2019, the "National Policy for a Comprehensive Approach to Noncommunicable Diseases" was formulated. The overall goal of the policy is to strengthen a comprehensive approach to noncommunicable diseases with the participation of other sectors and civil society.

1. Position the comprehensive approach to NCDs on the national multisectoral agenda as a priority public health problem.
2. Foster the promotion of health and the prevention of non-communicable diseases with intra- and intersectoral participation and civil society as part of its comprehensive approach.
3. Strengthen the capacities and skills of the health sector, civil society, and other sectors involved in

the comprehensive approach to NCDs.

4. Strengthen public health surveillance and develop research for decision-making in the comprehensive approach to NCDs.
5. Strengthen the regulatory and legal framework for the comprehensive approach to NCDs.
6. Promote the management of technical and financial resources for the sustainability of the different interventions in the comprehensive approach to NCDs.

c) Medical service provision system

All tertiary care facilities are located in San Salvador (Rosales Hospital, National Women's Hospital, Benjamin Bloom Children's Hospital, and El Salvador Hospital). The El Salvador Hospital used a standby loan for natural disaster recovery from Japan (signed in 2016) to renovate the building, which was originally a convention center, into a hospital. This is a new facility that started operation in June 2020. It has been developed as a hospital specializing in the treatment of COVID-19 and accepts severely ill patients. In addition, vaccination was carried out until August 2022. The total number of beds is 1,000, and it was positioned as a tertiary medical facility. Secondary medical facilities are divided into three types that regional hospitals, provincial hospitals, and basic hospitals. There are two regional hospitals, Santa Ana Hospital and San Miguel Hospital. The Unidad Comunitaria de Salud Familia (UCSF), which provides primary care, is further divided into three levels: UCSF-B (basic), UCSF-I (intermediate), and UCSF-E (*Especializado*).

As the increasing prevalence of NCDs due to changes in the disease structure, health services in El Salvador have shifted from treatment to PHC, which focuses on comprehensive and preventive care. Ecos (Equipos Comunitarios De Salud Familiares) works on health education, including health promotion. El Salvador's efforts to strengthen PHC have been highly evaluated.

Regarding the referral system, UCSF, which is a primary facility, refers to secondary hospitals, such as basic hospitals or provincial hospitals, and basic hospitals and provincial hospitals refer to regional hospitals or tertiary hospitals in the capital. We also provide counter-referrals after diagnosis/treatment.

Besides the Ministry of Health, the main public health service providers in El Salvador are the Salvadoran Social Security Institute (ISSS) and the Solidarity Fund for Health (FOSALUD). Each has established their own health care facility and operates them. However, past surveys have pointed out that budget allocation and referrals are carried out vertically, and that coordination is not going well.

3) Current Situation and Issues Related to Medical Equipment and Medical Service Provision at Secondary Hospitals in Rural Area

a) Current Status and Issues of Medical Equipment and Maintenance

As a result of the field survey, it was found that the medical equipment had deteriorated significantly, and that some of the equipment had malfunctioned or had been partially repaired or replaced. At provincial and basic hospitals, the diagnosis required for the secondary level is not sufficiently performed, and basic laboratory tests (urine tests, blood tests) and examinations and diagnoses using aging X-ray equipment and ultrasonic diagnostic equipment are performed. If diagnostic imaging such as CT is required, patients must be referred from the provincial/basic hospital to a regional hospital or a tertiary level hospital in San Salvador.

Regarding the purchase of medical equipment, the hospital submits the list of equipment it wishes to purchase to the Ministry of Health every year, and purchases are made after receiving budget approval.

As for the maintenance and management of medical equipment, each hospital has a biomedical technician who is in charge of maintenance and management, and they carry out regular maintenance based on the equipment guidelines. Equipment management is carried out using the system of the Ministry of Health, and it is possible to check the status of equipment (purchase time, condition, asset value, etc.) online. In addition, for some equipment (such as computed radiography (CR) systems, biochemical automatic analyzers, etc.), the hospitals have lease agreements and maintenance agreements with private companies. Preventive maintenance/calibration and replacement of laboratory equipment are performed by the company which has a lease contract. Most of the lab equipment are the latest. Reagents are purchased from contract companies. The maintenance contract is renewed annually. For newly purchased equipment, manufacturers and agents/distributors are required by guidelines to provide a three-year warranty period.

Regarding training on the use of medical equipment and preventive maintenance, training on how to use the equipment is conducted by the manufacturers and agents that provide the equipment. On-the-job training (OJT) is provided within the hospital, and training is also conducted in hospitals. General equipment maintenance methods (basic training) are provided by the Ministry of Health.

According to the situation confirmed in this field survey, the regional hospitals (Santa Ana Hospital and San Miguel Hospital) are equipped with medical equipment close to the tertiary level. On the other hand, the basic hospitals are close to the primary level in equipment situation. Even though they are classified as secondary level facilities, there are large differences in the level of medical service provision and hospital functions among regional hospitals, provincial hospitals, and basic hospitals.

b) Current Status and Issues of Medical Service Provision

The prevention of NCDs is mainly implemented by UCSF and Ecos, which are primary medical facilities. On the other hand, secondary hospitals also provide health education while waiting for patients.

Regarding examinations, general X-ray machines and mobile X-ray machines were installed in all secondary hospitals, but most of them were outdated. All hospitals support digitization of images, and X-ray images can be checked on monitors. Three hospitals, namely; Santa Ana Hospital, San Miguel Hospital, and Sonsonate Hospital have computed tomography (CT) scan. Sonsonate Hospital uses a CT provided by the Embassy of Japan as of 2016. San Miguel Hospital is a regional hospital in the east. However, San Miguel hospital has only one CT scan with 6 slices¹¹. No hospital has an MRI. Mammography is available only in regional hospitals. Even regional hospitals only have old endoscopes that are more than ten years old. Since detailed image diagnosis is not possible in most secondary hospitals, it currently refers to a higher facility. Laboratory tests such as urine and blood tests are conducted at basic and provincial hospitals. Pathological tests are only available at regional hospitals.

Regarding the treatment of NCDs, basic and provincial hospitals provide medicines based on the

¹¹ The number of slices is the number of images that can be acquired in one rotation of the tube. The greater the number of slices, the wider the range shoot in one rotation. By increasing the number of slices, a wider range can be imaged more precisely and quickly, leading to a reduction in the patient's burden (examination time, exposure dose, etc.).

diagnosis. Cardiac surgery and brain surgery are performed at regional hospitals and above (however, Santa Ana Hospital does not perform cardiac surgery), and provincial hospitals and basic hospitals do not handle circulatory surgery. Chemotherapy is being handled at a tertiary hospital in San Salvador. Dialysis treatment is also available at regional hospitals. Follow-up of cancer patients and dialysis patients is supported by provincial hospitals and basic hospitals.

Basic hospitals and provincial hospitals mainly provide examinations, consultations for diagnosis, medications for treatment, and preventive education in waiting rooms for early detection of diseases. Surgery for cancer and cardiovascular disease, dialysis treatment for chronic kidney disease will be referred to facilities higher than regional hospitals. Basic/provincial hospitals are supposed to accept referrals from UCSF. However, there is concern about whether basic/provincial hospitals can handle cases, UCSF sometimes decides to refer patients to regional hospitals (which can certainly handle cases). It was confirmed that the coordination between primary and secondary medical care is not necessarily going well.

In addition, almost all hospitals mentioned the lack of medical personnel and specialists as an issue in the provision of medical services at secondary hospitals. In addition, the hospital budget approved by the Ministry of Health is insufficient, and most of it is spent on the purchase of medicines and consumables. It was confirmed that sufficient medical services could not be provided due to the deterioration of equipment and the lack of human resources and budget.

4) Status of Health System, Health Service Provision and Equipment Maintenance for Each Target Facility

The field survey was conducted from August 8 to 19, 2022. The purpose of the survey has two points as follows:

- (1) To identify issues in the health sector of El Salvador (especially issues related to NCDs and issues related to medical equipment in secondary hospitals).
- (2) Formulate JICA's future development and cooperation scenarios based on the identified issues.

In this field survey, a survey was conducted assuming a cooperation scenario for the provision of medical equipment to secondary level facilities in the rural area. The secondary hospitals (excluding regional hospitals) that were the target of this field survey were selected by the Ministry of Health as candidates for JICA support, and there is no overlap with support from other development partners. Table 8-3 below shows the places visited and the main items of information collected for the first field survey.

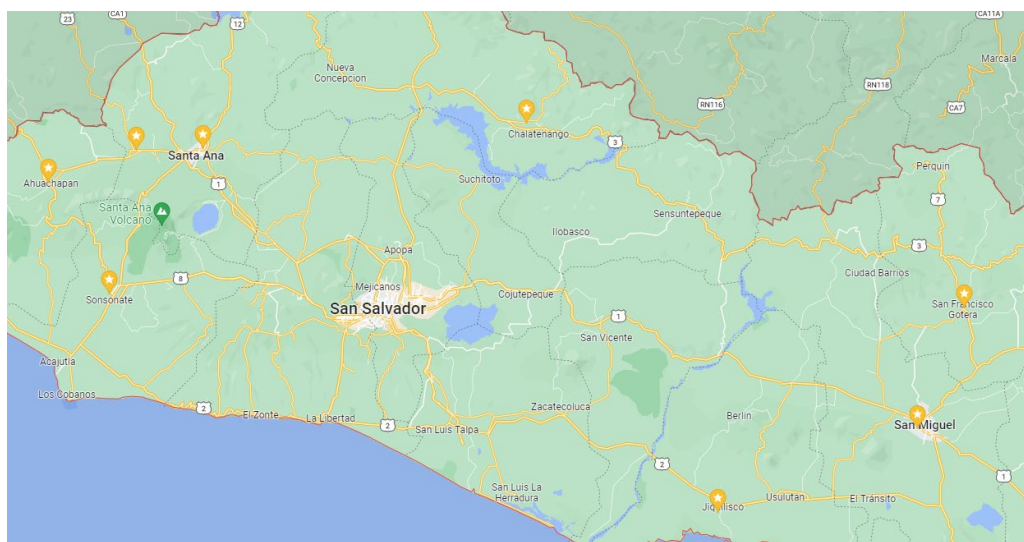
Table 8-3 Sites Visited and Main Items Collected for the Field Survey

Subject	Target Facility Name	Main Collection Items
Ministry of Public Health	Ministry of Health	Health plan, needs, etc.
Regional hospital (secondary)	Santa Ana Hospital, San Miguel Hospital	NCDs, equipment, and referral status
District hospital (secondary)	Chalatenango Hospital, Sonsonate Hospital, Morazan Hospital, Ahuachapan Hospital	NCDs, equipment, and referral status
Basic hospital (secondary)	Charchupa Hospital, Jiquilisco Hospital	NCDs, equipment, and referral status

PHC facility (primary)	USCF-E (Ahuachapan), USCF-I (Sonsonate, Jiquilisco)	Referral system, PHC activities
Regional organizations, Development partners, etc.	IDB, SICA	Current activity status, support plan

Source: JICA Study Team

In addition, the locations of visiting medical facilities for the field survey are shown below.



Source: JICA Study Team based on Google Map

Figure 8-2 Location Map of Facilities Visited during the Field Survey

Below is a summary of the site visit and interviews regarding the health service provision, medical equipment and maintenance status at each facility.

a) Santa Ana Hospital

- The number of people with diabetes will increase by 21% between 2021 and 2022. There are two diabetes specialists in the hospital.
- There is a dialysis center in the hospital that was built two and a half years ago, and treatment with hemodialysis and peritoneal dialysis is possible. The hospital cannot respond well to the increasing dialysis needs. There are 29 hemodialyzers (25-27 for normal use, 2-3 for emergencies), and each machine can be used for 3 hours 3 times a day (approximately 80 people can be dialyzed per day). Around 200 patients are undergoing peritoneal dialysis, and 200 machines are leasing out (many poor patients find it difficult to come to the hospital). There is a training room for peritoneal dialysis, and peritoneal dialysis is performed in the hospital for training. Ten peritoneal dialysis machines for hospitalization, complications, and training. One-third of the budget for consumables is for dialysis patients.
- Mammography and endoscopes are used to examine cancers such as breast cancer, stomach cancer, and colon cancer. The endoscopy area was renovated last year. The endoscope was introduced ten years ago and is still in use today.
- There is a 32-slice CT machine that was introduced two years ago. There is a 3-year free warranty period, which ends in February 2023. It is being used 15-17 times a day. There is a mammogram machine that was donated by a private hospital seven years ago. There is a storage (server) for

storing digital X-ray image data, but it is already full and needs more disk space. In addition, the network within the hospital has not been developed, and images cannot be shared with some departments. General X-ray equipment was introduced 12 years ago. There are four mobile X-ray machines.

- There are two cardiologists, but they do not deal with surgery or catheterization. No external pacemaker. There are electrocardiographs.
- A tertiary hospital in the capital will be a referral destination.
- The biggest issue for hospitals is human resources, followed by medical equipment. Since there is no radiologist, interpretation and diagnosis of X-ray images may be outsourced to a private company (physician who has received specialized training in Mexico and holds a license).
- There are six operating rooms. The facilities and equipment of the hospital are old. Only one operating room was renovated last year.



Dialysis center newly established in 2020. There is also a study room for dialysis patients.



32-slice CT scan introduced in 2020.



Mammography unit donated by a private hospital seven years ago is used.

Photos: JICA Study Team

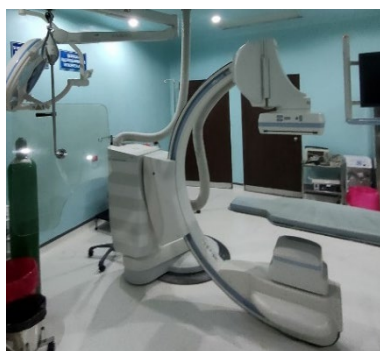
Figure 8-3 Status of medical equipment at Santa Ana Hospital

b) San Miguel Hospital

- A surgical C-arm for Interventional Radiology (IVR) was introduced five years ago and allows cardiac surgery. Patients are also referred from San Salvador for this purpose.
- There are two mobile X-ray machines purchased about 14 years ago and are partially out of order. There are four general X-ray machines. It has been more than ten years since all of them were introduced. These are still being used and maintained by replacing parts.
- The CT scan (6 slices) is 15 years old. It is being used 500 times per month. A private company performs maintenance. Storage of image data is also outsourced to the private company.
- There are two peritoneal dialysis machines for pediatric and 33 hemodialyzers for adults, all of which are lease contracts. One machine is being used for four hours twice a day, with a total of 60 people receiving treatment. The hospital does not have enough dialysis machines. Moreover, due to the lack of manpower and adequate space, it is not possible to increase the number of machines. There are four peritoneal dialysis machines. It is provided for those who find it difficult

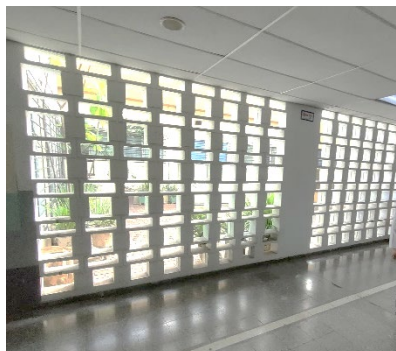
to receive it at home and for training purposes. Medications for dialysis such as dialysis fluid alone cost millions of dollars a year. On the other hand, it is free of charge for patients.

- Problems faced by hospitals include a shortage of medical personnel, limited functionality due to outdated medical equipment, and long waiting times for patients.

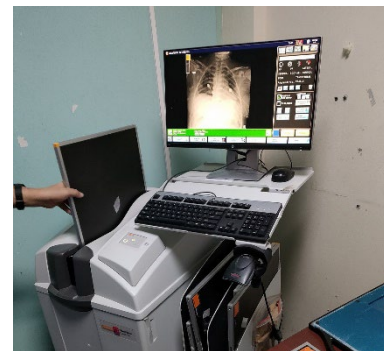


Surgical C-arm X-ray fluoroscope.

This type of machine is only installed in Rosales and San Miguel hospitals.



A courtyard in a hospital that was introduced as a future MRI installation space (expansion place for examination rooms).



Kodak CR system. A digital X-ray image of the imaging plate (IP) can be displayed on a monitor.

Photos: JICA Study Team

Figure 8-4 Status of medical equipment at San Miguel Hospital

c) Chalatenango Hospital

- There is a digital X-ray equipment. The original part was introduced more than ten years ago and has deteriorated significantly. Only the broken parts are replaced and used.
- There are biomedical technicians who perform maintenance and inspections of the equipment based on the equipment guidelines. Requests for equipment purchases are submitted to the Ministry of Health every year, but approval is not granted.
- For some high-priced equipment, maintenance contracts are outsourced to private companies. Urine tests and blood tests are performed in the hospital. Laboratory equipment is leased, and maintenance, equipment replacement, and purchase of consumables such as reagents are contracted with private companies.
- Limited screening due to lack of budget. After a consultation with the patient, a urine test and a blood test are performed depending on the symptoms. Priority is given to risk patients (elderly, etc.).
- Basically, equipment training is only provided by the supplier of the equipment, other than that, OJT is carried out in the hospital. There is no hospital-to-hospital training. Equipment maintenance training (preventive maintenance, etc.) is available from the Ministry of Health. Two biomedical technicians from the hospital are taking the course.
- Chronic lung disease is increasing, but there is no CT scan, they have no choice to refer to a tertiary hospital in San Salvador.
- The radiation room is old, and the protection has been stripped. This needs refurbishment (there are no refurbishment plans at the moment).

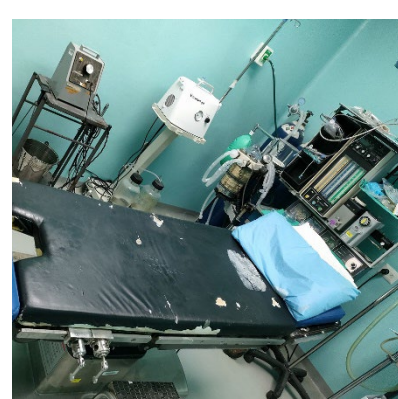
- They need CT scan and mammography. Currently, there is no space for installation, but if it is decided to be installed, the room that is used as storage will be transformed into a radiation room.



Introduced general X-ray equipment 15 years ago. Hospital paid USD 25,000 in 2017 to replace the bulb.



Mobile X-ray equipment. The image is unclear. Introduced 11 years ago.



Operating bed. Worn and the skin is peeling off. The surrounding surgical equipment is also old.

Photos: JICA Study Team

Figure 8-5 Status of medical equipment at Chalatenango Hospital

d) Sonsonate Hospital

- There is a 16-slice CT donated by the Embassy of Japan. It is used about ten times a day. Training on the use of the CT is carried out by the person in charge of training at the Ministry of Health or on-the-job training within the hospital.
- The general X-ray machine is out of order, but a new machine is coming in December 2022 (approved by the Ministry of Health).
- The ultrasonic inspection device was introduced 16 years ago and is currently used while being repaired.
- Mammography is ready to be introduced (installation room), but there is no equipment. Hospital would like to introduce it as soon as possible.
- Patients are referred to tertiary hospitals in San Salvador, occasionally referred to Santa Ana Hospital. The reason is that Sonsonate Hospital also has a CT scan, and the distance is almost the same from here to San Salvador/Santa Ana Hospital.



A 16-slice CT scan donated by the Embassy of Japan in 2016.

The number of hospital beds is not enough, and they respond by setting up beds in the corridors of the hospital.

Using a mobile X-ray device. It is decorated with a giraffe to give pediatric patients a sense of security.

Photos: JICA Study Team

Figure 8-6 Status of Medical Equipment at Sonsonate Hospital

e) Morazan Hospital

- There are two mobile X-ray machines and one general X-ray machine. There is a storage (server) for storing digital images. Since there is only one imaging plate (IP) where the digital image is projected, the general X-ray machine and the mobile type cannot be used at the same time. The hospital plans to receive the budget for an additional IP next year.
- Due to the lack of budget, required equipment cannot be purchased. There is no choice but to purchase it with the surplus of the budget after other aspects have been accounted for, if there will be any.
- The equipment is calibrated within the hospital, but if it cannot be calibrated, it is requested from the Ministry of Health. If it is difficult for the Ministry of Health to respond, it will be outsourced to a private company.
- Blood tests are limited to symptomatic patients due to limited supplies of consumables under the lack of funding. The hospital responds by securing consumables from other hospitals or by referrals to other hospitals.
- The referral destination is San Miguel Hospital. With counter-referrals from San Miguel Hospital, 90% of patients go to UCSF. Patients should go to Morazan Hospital first, but the closest one was selected.
- Diabetes, hypertension, and chronic kidney disease are the leading diseases among NCDs in the hospital. There are few cancer patients. This is because it cannot be detected by cancer screening.
- There is no radiologist as there is a general shortage of health personnel.



General X-ray equipment. The entire equipment was installed 12 years ago and has been partially replaced.

The line used to adjust the irradiation position is distorted due to a failure in the irradiation part of the X-ray equipment.

An operating table donated by Taiwan 30 years ago. The height cannot be adjusted, and it is just a stand. They continue to use it because there is no other operating table.

Photos: JICA Study Team

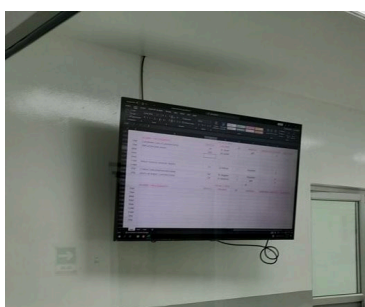
Figure 8-7 Status of Medical Equipment at Morazan Hospital

f) Ahuachapan Hospital

- The budget for equipment to be purchased are reviewed annually. The current situation is that medical supplies and consumables are the majority of total costs. There is no room in the budget to purchase equipment.
- Hospital budget is fluctuating. The hospital budget cut this year was USD 10,000.
- The cycle of purchasing, maintaining, and disposing of equipment follows the guidelines of the Ministry of Health. A bid is made within the hospital to select a contractor. The hospital has two biomedical technicians.
- There is one general X-ray machine. The hospital used to have another one, but it broke down. Two mobile X-ray machines were installed in 2022 and 2013, respectively. Digital image data is stored in an external (private company) storage.
- Santa Ana Hospital will be referred. If it is difficult to treat at Santa Ana Hospital, the patient will be referred to San Salvador.



Patient waiting room and examination room are under construction. Construction is scheduled to be completed in October 2022.



A monitor in the hospital allows patients to see the status of medical examination.



Analytical equipment for laboratory tests has a lease agreement with a private company (all secondary hospitals are in the same situation).

Photos: JICA Study Team

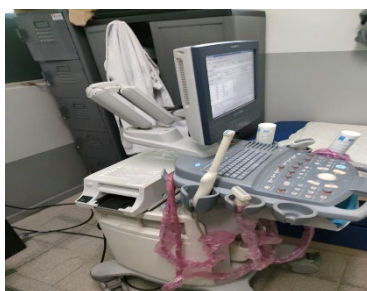
Figure 8-8 Status of Medical Equipment at Ahuachapan Hospital

g) Charchupa Hospital

- The situation is almost the same as that of provincial hospitals. Since it is a basic hospital, equipment situation is worse than that of provincial hospitals. Basic examinations and follow-up of patients are the main activities. Patients are referred to regional and provincial hospitals for detailed examinations.
- There is one general X-ray equipment introduced about 15 years ago. It is partially broken with only one working light out of two. This is used in all departments. The mobile X-ray machine was destroyed and discarded. The storage of digital images is outsourced to a private company.
- Since the budget was allocated to respond to COVID-19, the hospital cannot afford to purchase equipment.
- The hospital basically refers to Santa Ana Hospital. Patients with suspected breast cancer are referred to a tertiary level women's hospital in San Salvador.
- The hospital plans to move the location of the pharmacy. The place where the existing pharmacy is located will be the radiology room, and the existing radiology room will be integrated (expanded).



X-ray equipment introduced about 15 years ago. No mobile X-ray equipment.



One ultrasound system is used in internal medicine, obstetrics and gynecology, pediatrics, and neonatology.



For the expansion of the radiology room, the pharmacy will be moved to another location. Another X-ray machine can be installed.

Photos: JICA Study Team

Figure 8-9 Status of Medical Equipment at Charchupa Hospital

h) Jiquilisco Hospital

- There is one general X-ray machine introduced 20 years ago, which is partly out of order, and two mobile X-ray machines. A new mobile X-ray machine is coming in October. There are 6,000 to 7,000 X-ray inspections performed annually. With this, there is no adequate storage capacity for X-ray image data in the long term. The data is deleted after six months if treatment is completed.
- The hospital does not have a budget for the purchase of equipment. Therefore, they try to save money on other aspects to fund the purchase of needed equipment every year.
- They refer to San Miguel Hospital or Usulután Hospital, which is a provincial hospital.
- The follow-up for peritoneal dialysis patients is conducted here. This area has a high prevalence of chronic kidney disease. Many people work in agriculture, and pesticides are thought to be the

cause.

- The problem is the shortage of specialists. The equipment is old and the units at work are not enough.



Fujifilm's CR system. All radiographs are digital. Equipment is rented (same situation at other secondary hospitals).

X-ray equipment introduced 20 years ago. Some are out of order. They use it through the exchange of parts.

Ultrasound machine donated by Japan.

Photos: JICA Study Team

Figure 8-10 Status of Medical Equipment at Jiquilisco Hospital

i) USCF-E Ahuachapan, USCF-I Sonsonate, USCF-I Jiquilisco

NCDs prevention/follow-up and health education are the main services. In addition to measuring blood sugar and cholesterol levels and blood pressure, urine and blood samples are collected and sent to hospitals (basic hospitals, provincial hospitals, etc.) for analysis. Patients are screened at the primary facility (USCF) and referred to the secondary facility (hospital). In addition, they follow up patients who return by counter-referral (condition check after six months, consultation four times a year). Jiquilisco USCF-I has received support from the World Bank and has been conducting follow-ups for dialysis patients.

There is insufficient supply of essential medicine and a lack of basic equipment. There is also a shortage of human resources for handling NCDs. In addition, the waiting time for patients has become a problem, and it has been confirmed that the referral system is partially not functioning, such as some patients going directly to the secondary hospital without passing through the primary facility. There were also cases where USCF, which understands the lack of capacity (cannot handle patients) of basic hospitals and district hospitals, directly referred to regional hospitals.

5) Development Partner Trends

a) Inter-American Development Bank (IDB)

IDB provided USD 1.7 million of support (vaccination, provision of equipment, etc.) in response to COVID-19. The project is scheduled to end in 2023. Another project was to build a 250-bed secondary-level basic hospital in Nejapa, north of San Salvador, in 2023. However, construction has yet to begin. The Nehapa Hospital construction project is expected to extend its duration by 2-3 years.

In El Salvador, chronic kidney disease among young people is increasing and becoming a problem. Further hemodialysis and kidney transplantation are needed. The IDB is also considering support for measures against NCDs in the future. The planned USD 2.7 million project has been approved by the

US headquarters.

6) Summary of Challenges in Secondary Hospitals in the Rural Area to Respond to NCDs and Provide Medical Services

The following is a summary of the issues regarding NCDs and the capacity to provide medical services in secondary hospitals, which were identified as a result of the field survey.

Issue 1: Insufficient testing and diagnostic capabilities due to deterioration of medical equipment

Due to the deterioration of medical equipment, some old equipment is used in a partially broken or partially repaired. If the level of diagnosis is not sufficient or detailed diagnostic imaging is required, the patient must be referred from the second-level hospital to a regional hospital or a third-level hospital in San Salvador. As a result, the medical resources of regional hospitals and tertiary hospitals, which should concentrate on high-level treatment, are becoming tight. In addition, traffic jams between regional hospitals and San Salvador are severe, especially in the eastern part (San Miguel), where narrow mountain roads require time for emergency transportation to San Salvador. In El Salvador, which is prone to disasters, it is essential to strengthen the functions of base hospitals (regional hospitals and provincial hospitals) that can respond even when traffic is interrupted by landslides. If emergency medical care can be provided quickly at secondary hospitals, referrals to tertiary facilities in the capital will decrease. Eliminating the need to travel to the capital (tertiary hospital) for diagnosis and treatment will reduce the burden on patients and improve patient satisfaction.

Under these circumstances, there is a high demand for equipment such as diagnostic imaging equipment to strengthen the examination and diagnostic capabilities of secondary hospitals. It is desirable to introduce CT scan and the latest X-ray equipment to provincial and basic hospitals, and at the same time to strengthen the functions of regional hospitals. Surgical equipment is also aging, and improvement of the equipment in the surgical department (strengthening the treatment function) is desirable to meet the needs of the hospital.

Issue 2: Insufficient quality and quantity of medical personnel, dealing with the increasing number of NCDs patients

Many hospitals are facing a lack of experts (quality) and health personnel (quantity). At present, the increase in NCDs patients cannot be adequately dealt with. As the number of NCDs patients is expected to continue to increase due to the aging population, there is a strong need to expand and strengthen medical personnel. Although it is difficult to increase the number of health workers immediately, JICA should propose to the government to secure health personnel in the long term, and in the short term, a proposal to respond by strengthening the capacity of existing health personnel and effectively utilizing medical resources with the cooperation of JICA should be made. Strengthening the ability to provide medical services by providing medical equipment, further strengthening PHC activities, strengthening the referral system, and promoting ICT (e-health) and DX are the priority items.

(2) Development and Cooperation Scenario of Health Care Sector

1) Development Scenario

a) Development issues/strategies

Based on the results of the field survey and literature review, aging medical equipment and lack of testing and diagnostic capabilities, increasing numbers of diabetic patients, and high prevalence of chronic kidney disease are issues. Based on the above development issues, development goals and objectives in the health sector were set as follows.

Development goals:

- (1) Improving access to medical care in rural areas
- (2) Strengthening and improving the ability to prevent, diagnose, and treat NCDs in rural areas

Purpose:

To achieve UHC by addressing the growing challenges of NCDs and reducing the disparity in access to healthcare between the urban and rural areas.

To achieve the development goals mentioned above, three strategies were set as shown below.

Table 8-4 Strategies for Health Sector Development in El Salvador and Outlines of Each Strategy

Subject	Strategy	Strategy overview
Health care El Salvador	1. Strengthening the infrastructure of secondary hospitals in rural areas	Strengthen and improve the ability to provide medical services by strengthening infrastructure such as medical equipment at secondary hospitals in rural areas that are unable to meet the increasing needs.
	2. Measures against NCDs	In order to respond to the increasing challenges of NCDs, improve the quality of medical care at secondary hospitals in rural areas, improve diagnostic and treatment capabilities, and strengthen the referral system.
	3. Strengthening PHC	In order to deal with the increasing number of issues related to NCDs, strengthen disease prevention, health education, early detection and diagnosis capability in PHC.

Source: JICA Study Team

b) Programs and Projects

shows the programs and projects considered for implementation in El Salvador based on development issues and strategies.

Table 8-5 Considered for implementation of Programs and Projects in El Salvador

Subject	Strategy	Program and Project	Period
Health care El Salvador	Strengthening the infrastructure of secondary hospitals in rural areas	1-1 Provision of medical equipment to secondary hospitals in rural areas	Short term
		1-2 Strengthening of medical equipment maintenance and management capacity	Middle term
		1-3 Strengthening the capacity of health personnel to utilize medical equipment	Long term
	Measures against NCDs	2-1 Improving diagnostic capabilities / strengthening the capabilities of medical personnel	Middle term
		2-2 Improving quality of medical care at hospitals (Data management, DX promotion)	Middle term
		2-3 Strengthening referral system (medical collaboration)	Middle term
	Strengthening PHC	3-1 Strengthening testing and diagnostic capabilities for NCDs	Middle

Subject	Strategy	Program and Project	Period
		prevention / NCDs early detection	term
		3-2 Strengthen and promote community awareness activities (including maternal and child nutrition improvement and livelihood improvement)	Middle term
		3-3 Provision of medical equipment to primary level medical facilities	Middle term

Note: Short term: 2023-2025 Medium term: 2023-2027 Long term: 2023-2032

Source: JICA study team

c) Related Sector

Collaboration and cooperation with the following sectors can be considered.

Table 8-6 Coordination and Cooperation with Other Sectors

No.	Sector	Contents
1	Information and telecommunications sector	Health Information System (e-health) is being promoted in El Salvador. In the NCDs measures “2-2 Improving quality of medical care at hospitals (Data management, DX promotion)” and “2-3 Strengthening referral system (medical collaboration)” collaboration and cooperation with ICT sector in the promotion of telemedicine including image transfer systems is considered.
2	Education sector	Insufficient capacity of medical staff in “1-3 Capacity building of health personnel related to utilization of medical equipment” and “2-1 Improving diagnostic capacity / Strengthening the capacity of medical workers” for NCDs countermeasures and lack of specialists. For the long-term development of health human resources in the above two areas, collaboration and cooperation with the education sector in higher education and specialized medical education can be considered.

Source: JICA study team

2) Cooperation scenario

a) Viewpoint of selection

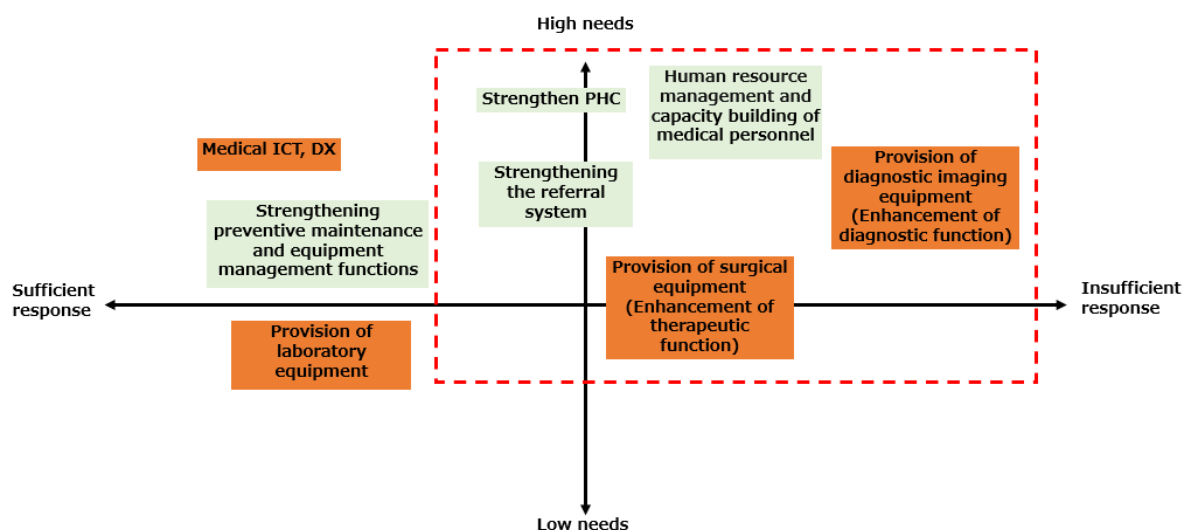
In order to select programs/projects that JICA should conduct in El Salvador's health sector, criteria were established as shown below.

Table 8-7 Criteria for Selection of Programs/Projects for JICA's implementation

Selection Criteria	Content
Needs and responses in the health sector in El Salvador	As a result of the survey, there are high demands in El Salvador for infrastructure strengthening and measures against NCDs, which are being considered for implementation, but sufficient measures have not been taken to meet the needs. Strengthening PHC is an area that El Salvador is focusing on, although further strengthening and expansion are required.
Consistency with the Japanese government's country development cooperation policy and policy for responding to development issues	The Japanese government states that one of the priority areas of El Salvador's development cooperation policy is to "continue to support the development of human resources in the health sector." In addition, in the policy for responding to development issues, it is stated that measures against non-communicable diseases (NCDs) and infrastructure development in the health sector will be promoted.
Consistency with JICA's global agenda	One of JICA's cooperation policies is to "strengthen diagnosis and treatment at core hospitals."
Applicable modalities in El Salvador	The following modalities are envisioned in El Salvador: Grant aid Technical cooperation Dispatch of experts Training in Japan or a third country Japan Overseas Cooperation Volunteers (JOCV)
Effective utilization of results of past projects implemented by JICA	Utilize the results of JICA's past projects in El Salvador.

Source: JICA Study Team

In order to clarify the priority cooperation components in El Salvador, based on the results of the field survey and literature review, the vertical axis shows the support needs in the health sector, and the horizontal axis shows the response status (implementation status) to the country's issues. As an axis, the study team organized the priority of cooperation. The figure below shows the organization of cooperation priorities. Items surrounded by red dashed lines have a particularly high need for cooperation and support, and the country concerned has not sufficiently responded to the issues.



Source: JICA Study Team

Figure 8-11 Arrangement of Priorities for Cooperation in the Health Sector in El Salvador

In terms of hardware, aging equipment is still being used with some parts broken. Provision of diagnostic imaging equipment (strengthening of diagnostic functions) is the most effective way to reduce the number of referrals to tertiary hospitals. Provision of surgical equipment (enhancement of treatment function) is also important.

It is difficult to increase the number of health workers immediately, but while aiming to increase the number of health workers in the long term, it is vital to respond by strengthening the capacity of existing health workers and effectively utilizing medical resources in the short term. In order to deal with the increasing number of NCDs, it is necessary to strengthen PHC activities and strengthen the referral system. From the viewpoint of limited medical and financial resources, it is important to strengthen and promote PHC as a cost-effective manner. To promote e-health (medical ICT/DX), which the Ministry of Health is already strongly promoting, is recommended from the perspective of efficient use of medical resources.

Preventive maintenance/equipment maintenance management and laboratory testing equipment are relatively implemented items, but it is necessary to promote the introduction of medical equipment, including consistency with equipment maintenance management, when providing the above-mentioned medical equipment.

b) Cooperation scenario

Cooperation scenario based on the results of the field survey and literature review, organization of

cooperation priorities, program/project selection criteria, and programs/projects expected to be implemented in the El Salvador health sector over the next 10 years. Below table shows an overview of the cooperation scenario.

In the short term (2-4 years), the provision of medical equipment to secondary hospitals in the rural area is recommended. In the medium to long term (4-10 years), implementation of technical cooperation projects for secondary hospitals/PHC facilities are desirable. Through the synergistic effect of hardware (provision of medical equipment) and software (technical cooperation), the prevention, diagnosis, and treatment of NCDs in rural areas will be strengthened.

Table 8-8 Cooperation Scenario (Health/El Salvador)

Subject	Strategy	Program/Project	Modality
Health El Salvador	Strengthening the infrastructure of secondary hospitals in rural areas	1-1 Provision of medical equipment to regional core hospitals (secondary hospitals)	Grant aid Training in Japan
		1-2 Strengthening of medical equipment maintenance and management capacity	
		1-3 Strengthening the capacity of health personnel to utilize medical equipment	

Source: JICA Study Team

c) Details of the cooperation project: Strengthening of infrastructure (provided equipment)

Based on the results of the field survey, the provision of medical equipment through grant aid is proposed as a cooperation scenario. Depending on the budget scale, medical equipment will be provided with high equipment needs. By providing medical equipment to strengthen the diagnostic and treatment capabilities of secondary hospitals (regional hospitals, provincial/basic hospitals), it is expected that the number of referrals from provincial/basic hospitals to regional hospitals and from regional hospitals to tertiary hospitals in the capital will decrease. This will reduce the burden on patients and lead to improved access to medical care. In addition, even when transportation to the capital is cut off in the event of a disaster such as a landslide, diagnosis and treatment will be available within each region. In El Salvador, strengthening the functions of secondary hospitals in each region has a high cooperation effect because there are many disasters and people need to move through mountain roads.

Table 8-9 Cooperation Scenario: Grant Aid (Provision of Medical Equipment)

Item	Content	Remarks
Name	Provision of medical equipment to secondary hospitals in rural areas to strengthen diagnosis and treatment functions	Secondary hospitals include regional hospitals, provincial hospitals, and basic hospitals.
Priority	Potential Project (B)	
Purpose	(1) Improving access to medical care in the rural areas (2) Improving medical services at the secondary hospitals in rural areas (especially strengthening and improving the ability to diagnose and treat NCDs)	Aiming to achieve UHC by addressing the increasing number of NCDs and correcting disparities in medical access between the capital and rural areas
Budget	500 million – 1 billion yen	The amount can be changed depending on the number of target facilities and the content of equipment provided. In addition to equipment prices, transportation and packaging costs, installation work costs, procurement and management costs, maintenance contract costs, and design and supervision costs are

		included.
Period	Assuming a construction period of 16 to 22 months from the conclusion of the grant agreement (G/A) to acceptance inspection and delivery (6 to 8 months for detailed design, 10 to 14 months for procurement supervision)	Excludes soft components after delivery
Number of target facilities/beneficiary population	3 to 6 hospitals from second level hospitals in rural areas-regional hospitals, provincial hospitals, and basic hospitals. Approximately 500,000 to 2,000,000 population covered by 3 to 6 hospitals.	Since regional hospitals, provincial hospitals, and basic hospitals have their different roles and functions, equipment will be provided according to the functions of the target facilities.
Introduced equipment	MRI, CT, mammography, endoscope, general X-ray equipment, mobile X-ray equipment, ultrasound, operation department equipment (ECG, respirator, electric scalpel, shadowless light, anesthesia machine, defibrillator, patient monitor, operating table, and external pacemaker, depending on needs)	Diagnostic equipment such as diagnostic imaging equipment will be provided mainly to the radiology departments.
Soft Component	Training will be provided to medical personnel by equipment manufacturers and distributors on how to use and maintain advanced equipment such as diagnostic imaging equipment. In addition, a minimum of 3 years warranty and maintenance from the manufacturer/agent is required.	Biomedical technicians will be responsible for daily inspections, management, and maintenance plans. Complex work such as calibration and modification of equipment will be performed by the equipment manufacturers and agents.
Equipment introduction priority	Regional hospitals, provincial hospitals, and basic hospitals (Chalatenango, San Miguel, Morazan) are targeted with high priority. If MRI is installed, target is San Miguel Hospital.	There is a high priority and need for provision to secondary hospitals in the eastern and central regions (details will be described later).
Sustainability	The equipment maintenance system in El Salvador is relatively well established, but it is necessary to implement follow-ups to further improve maintenance capacity. In addition, training is also necessary to improve examination and diagnosis techniques using the introduced equipment. If a technical cooperation project is implemented in the future at the same target hospitals as the recipient of the equipment, high cooperation is expected from the trained personnel because of the synergistic effect of hardware and software.	If it is difficult to follow up through a new technical cooperation project, it is desirable to utilize the results of existing projects and follow up the training by already trained medical staff at tertiary hospitals.
Consistency with policy	The improvement of medical services in rural hospitals outside the metropolitan area is in line with realizing UHC set forth in El Salvador's National Development Plan (Plan Cuscatlán). In addition, the National Development Plan stipulates that "access to appropriate treatment technology" should be ensured in the "procurement management of equipment, medical equipment, and medicines". In addition, the Health Plan 2020-2030, which is currently being formulated, plans to include the strengthening of infrastructure (medical facilities and equipment) as a policy.	Except for regional hospitals, the target hospitals (hospitals for field survey) were selected by the Ministry of Health as candidates for JICA's equipment provision, and it has been confirmed that there is no duplication with other donors.
Expected results	<ul style="list-style-type: none"> -The number of inspections/diagnoses at target facilities will increase. -Appropriate referrals are made, and the referral rate to upper facilities decreases. (Overall Goal/Outcome) <ul style="list-style-type: none"> -Reduce the burden on patients and improve patient satisfaction by realizing an appropriate referral system -Reduced mortality from NCDs under age 70 (increased life expectancy) 	By improving the testing/diagnostic functions of basic hospitals and provincial hospitals, referrals to regional hospitals and tertiary hospitals, excluding severe cases, will decrease. Regional hospitals and tertiary hospitals can also concentrate their resources on higher-level medical care, which is what they should be doing.
Considerations	Since the list of planned equipment purchases by the hospital is updated every year, and in order to secure and prepare installation space (expansion of the radiation room, disposal of malfunctioning equipment, etc.), it is necessary to contact MOH and target hospitals as soon as the details are decided.	Every year, the hospitals prepare an equipment purchase list and submits a budget request to the Ministry of Health.

Source: JICA Study Team

Cooperation Scale, Period, and Target Facilities / Beneficiary Population

The budget of grant aid is assumed to be between JPY 500 million and 1 billion. In addition to equipment prices, transportation and packaging costs, installation work costs, procurement and management costs, maintenance contract costs, and design and supervision costs are included. The amount can be changed depending on the number of target facilities and the content of equipment provided. The period is assumed to be 16 to 22 months (6 to 8 months for detailed design and 10 to 14 months for procurement supervision) from the conclusion of the grant agreement (G/A) to acceptance inspection and delivery.

An estimate of three to six hospitals will be selected from regional hospitals, provincial hospitals, and basic hospitals (all secondary hospitals) according to priority and budget. The beneficiary population will be approximately 500,000 to 2,000,000 (population covered by the three to six hospitals). The details of the target facilities and the proposed priority order will be described later.

Proposed Medical Equipment, Soft Component

MRI, CT, mammography, endoscope, general X-ray equipment, mobile X-ray equipment, ultrasonic diagnostic equipment, and operating department equipment (ECG, ventilator, electric scalpel, shadowless light, anesthesia machine, defibrillator, patient monitor, operating table, external pacemaker, etc., depending on the needs of each facility) are the assumed equipment to be introduced. In order to strengthen diagnostic capabilities, focus on providing diagnostic equipment such as diagnostic imaging equipment to radiology departments should be implemented. Since regional hospitals, provincial hospitals, and basic hospitals have different roles and functions, equipment will be provided according to the functions of the target hospitals. The following shows the proposed equipment to be provided to each target hospital.

Table 8-10 Proposed Medical Equipment at Each Target Hospitals

Name of the hospital	Hospital level	Region	Overview of existing equipment	Introduced equipment plan	Remarks
Santa Ana Hospital	Regional	West	There is a CT (32 slices) that was introduced two years ago. Aging mammography was there. General X-ray equipment 12 years ago was introduced.	General X-ray equipment, mammography, ultrasound equipment, endoscopes, and equipment for Surgery department	Focused on replacing outmoded equipment.
San Miguel Hospital	Regional	East	There are four general X-ray machines and two mobile X-ray machines. Both are old and some of the equipment is broken. There is a mammography.	MRI, CT (more than 32 slices), general and mobile X-ray equipment, mammography, ultrasonic diagnostic equipment, endoscopes, and equipment for Surgery department	MRI will be introduced first time at the hospital. The CT was introduced 15 years ago and has 6 slices, which is inappropriate for a regional hospital (32 slices or more is desirable).
Chalchupa Hospital	Basic	West	General X-ray machines are 10-15 years old and some of them are out of order. No mobile X-ray machine (discarded due to failure).	General and mobile X-ray equipment, ultrasonic diagnostic equipment, and equipment for Surgery department	After expanding the examination room, it will be possible to install one new general X-ray device.
Ahuachapan Hospital	Province	West	There are one general X-ray machine and two mobile X-ray machines (one installed in 2022).	General and mobile X-ray equipment, ultrasonic diagnostic equipment, and equipment for Surgery department	Focused on replacing outdated equipment. If the budget permits, consider introducing a CT.
Sonsonate Hospital	Province	West	In 2016, a CT (16-slice) was provided by the Embassy of Japan. General X-ray equipment is introduced in December 2022.	Mobile X-ray equipment, ultrasound diagnostic equipment, mammography, and equipment for Surgery	Focused on replacing outdated equipment. Mammography is introduced first time.

				department	
Jiquilisco Hospital	Basic	East	There is one general X-ray machine introduced about 20 years ago (partially out of order) and two mobile X-ray machines. One mobile X-ray machine was introduced in October 2022	General X-ray equipment, ultrasonic diagnostic equipment, equipment for Surgery department	Focused on replacing outdated equipment.
Morazan Hospital	Province	East	There is one general X-ray machine introduced 12 years ago, which is partially broken. There are two mobile X-ray machines.	General/mobile X-ray equipment, ultrasonic diagnostic equipment, and equipment for Surgery department	Focused on replacing outdated equipment. According to the 2022 survey, there is only one imaging plate, so two X-ray machines cannot be used at the same time.
Chalatenango Hospital	Province	Central	There is one general X-ray machine and one mobile X-ray machine. Both were introduced over 10 years ago and some of the equipment is broken.	General/mobile X-ray equipment, ultrasonic diagnostic equipment, and equipment for Surgery department	Focused on replacing outdated equipment. If budget permits, consider introducing CT or mammography.

Source: JICA Study Team

Also, from the perspective of supporting the overseas expansion of Japanese manufacturers, consider the introduction of equipment from Japanese medical device companies that have strengths in medical equipment, such as Canon Medical Systems, Olympus, and Fujifilm Medical. According to the results of the field survey, many products of Japanese medical equipment manufacturers are already in use in El Salvador, and it is possible to maintain and support medical equipment through local distributors. The situation of local distributors of representative Japanese medical device manufacturers is shown below.

Table 8-11 Status of Local Distributors of Representative Japanese Medical Device Manufacturers

Japanese Medical Device Manufacturer	Canon Medical Systems	Fujifilm Healthcare	Olympus Medical Systems
Representative medical equipment	Diagnostic imaging equipment, etc.	CR equipment, etc.	Endoscope, etc.
Agency status	There is an agency in El Salvador. BIOMEL, SA de CV	There are three agencies where two of them are from El Salvador. RAF, SA de CV and one in QHA International Inc. Perez Trading Company	There is an Olympus Latin America, Inc. in the United States. The sales and service reception of medical endoscopes and microscopes in the Latin American market.
URL	https://www.biomelemus.com/	https://global.fujifilm.com/en/all-regions/la/sv	http://olympusamerica.com/la/es/

Source: Created by the JICA Study Team based on information from the web

As a soft component, medical professionals must be trained by equipment manufacturers and distributors on the use and maintenance of advanced equipment, such as diagnostic imaging equipment. When providing such equipment to hospitals that have not used MRI or CT in the past, it is particularly important to provide sufficient training on how to use and maintain them. X-ray equipment and ultrasonic diagnostic equipment are already in use at each hospital, so basically no new knowledge about the equipment is required. However, the equipment itself has been significantly improved from the old model. Therefore, training on the use and maintenance of the introduced equipment and the preparation of a manual regarding the use and maintenance of the equipment are required.

For advanced equipment such as diagnostic imaging equipment, a maintenance service contract with the manufacturer/agent for a minimum of three years in total is required for two years in addition to the

original manufacturer's free warranty period (usually one year). In principle, regular inspections are carried out every 3 to 4 months by the manufacturers and agents, and at the same time, biomedical technicians will be given practical guidance on daily inspection items and inspections to improve the maintenance and management capabilities of equipment in hospitals. This maintenance service contract does not include reagents and consumables, which are the responsibility of the hospital. Even after the warranty period has expired, it is desirable that the maintenance contract will be extended and that the manufacturer/agency continue to carry out calibration and correction. In the field survey, many hospitals use Fujifilm Medical's Computed Radiography (CR) equipment under contract with a local agency. Nipro's dialysis machine was being used under a rental contract with a local agent, including maintenance and purchase of consumables. In this way, it is assumed that the target hospitals have already accumulated knowledge about networks with equipment agencies and procurement/maintenance contracts.

Biomedical technicians are assigned to each hospital for equipment maintenance and management. Biomedical technicians formulate equipment maintenance management and procurement plans and coordinate maintenance and handle minor repairs. Even after the introduction of new equipment and with the operation of existing equipment, the creation of maintenance management plans and daily inspections and management of equipment will be the responsibility of the biomedical technicians and engineers. For the long-term and safe use of the equipment, it is essential to establish a system in which complicated work such as calibration and repair of the equipment is carried out by the manufacturer or agency under contract.

Consistency with Development Issues / National Policies

El Salvador has one of the highest rates of chronic kidney disease in Central America and the Caribbean. In addition, the proportion of NCDs in all deaths is high and will continue to increase in the future. In order to deal with the increasing number of NCDs, it is consistent with development issues to improve diagnosis and treatment capabilities by providing medical equipment. In addition, tertiary medical facilities are concentrated in the San Salvador metropolitan area, and it has been pointed out that there is medical disparity between the capital and rural areas. By providing equipment to secondary hospitals in rural areas, it will lead to alleviating the disparity in medical services between the capital and rural areas, which is a development issue in El Salvador.

Consistent with the national policy, the improvement of medical services in rural hospitals outside the metropolitan area will lead to the elimination of disparity in medical care between the metropolitan area and rural areas. This strategy is consistent with UHC that El Salvador has set in its national development plan (Plan Cuscatlán). In addition, the National Development Plan stipulates that "access to appropriate treatment technology" should be ensured in the "procurement management of equipment, medical equipment, and medicines". In the Five-year Development Plan 2014-2019 (Plan Quinquenal de Desarrollo), Item E.4.2. "Progressively expand health care coverage to all citizens and provide timely, accessible, affordable, effective, high-quality and comprehensive medical services", which states, "L.4.2.3. Increase investment in infrastructure, human resources and equipment for the national health system". Furthermore, the Health Plan 2020-2030, which is currently being formulated, plans to include the strengthening of infrastructure (medical facilities and equipment) as a policy. In light of the above, the provision of medical equipment is consistent with the policies of El Salvador.

Furthermore, with the exception of regional hospitals, the target hospitals (hospitals for the field survey) were selected by the Ministry of Health as candidates for JICA's equipment provision, and it has already been confirmed that there is no duplication with other donors. The Ministry of Health also agrees on the direction of JICA's cooperation (provision of medical equipment).

Expected Results

The expected outcomes of the proposed cooperation scenario are that the number of examinations and diagnoses at the target facilities will increase as a result of the provision of necessary medical equipment for secondary medical facilities, and that appropriate referrals are made and the referral rate to upper facilities decreases. Patients who have been transported to tertiary level facilities in San Salvador or who have visited tertiary level facilities directly to receive examination will have access to nearby secondary level facilities at an early stage for consultation, testing and treatment. Improving access to medical services in this way not only reduces the physical and financial burden on patients themselves (time for medical examinations and transportation, medical expenses, transportation expenses), but also reduces the financial burden on patients' families. In addition, the realization of diagnosis/early detection/early treatment of NCDs can be expected to reduce the mortality rate (increase in average life expectancy) from NCDs under the age of 70 in the medium to long term.

Furthermore, by improving the testing/diagnostic functions of basic hospitals and provincial hospitals, the number of referrals to regional hospitals and tertiary hospitals, excluding severe cases, will decrease. Regional hospitals and tertiary hospitals can also concentrate their resources on responding to higher-level medical care, which is what they should be doing.

In addition, even when transportation to the capital is cut off in the event of a disaster such as a landslide, diagnosis and treatment will be possible within each region. In El Salvador, where there are many disasters and there is a lot of movement on mountain roads, strengthening the functions of hospitals in each rural region has a high cooperation effect. Especially in the eastern and central regions, where there are many poor people, strengthening the functions of secondary hospitals through the provision of medical equipment will greatly contribute to health care in El Salvador.

Significance of Japan's Cooperation

Japan has strengths in the medical equipment industry. It is possible to introduce medical equipment from Japanese equipment manufacturers such as Canon Medical Systems, Olympus, Fujifilm, Nihon Kohden, and Fukuda Denshi. These manufacturers have already acquired a global market share for medical equipment like diagnostic imaging equipment, endoscopes, biological monitoring, operating rooms, and ICUs.

d) Information on hospitals scheduled to receive equipment (analysis for prioritization)

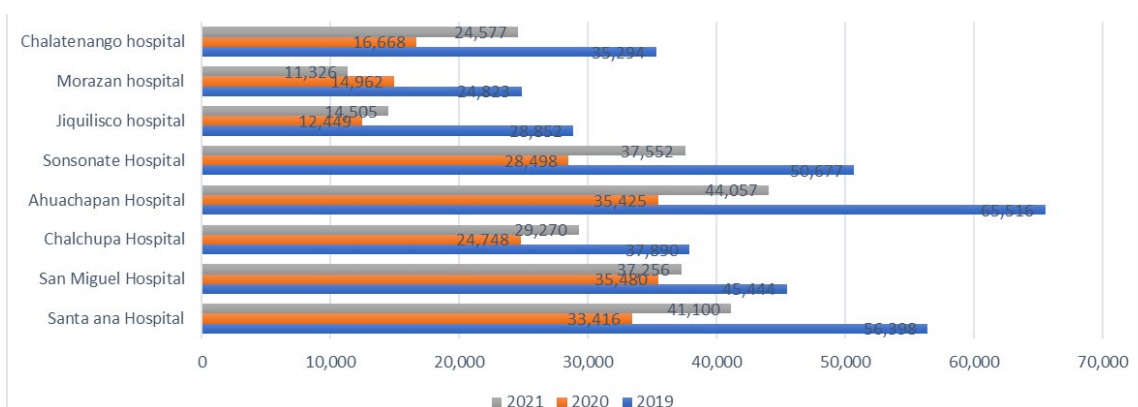
In order to determine the order of priority for the provision of medical equipment, an analysis of target hospitals was conducted based on hospital statistical information obtained from each hospital. As for the bed occupancy rate, Jiquilisco Hospital, Morazan Hospital, and Chalatenango Hospital have vacancies, but other hospitals continue to be fully occupied or nearly full. Apart from regional hospitals, the number of medical staff, doctors, and nurses per 10,000 population at Sonsonate and Morazan

hospitals is small. The basic information of the target hospitals is shown below in tables and figures.

Table 8-12 Statistical Information of Target Hospitals

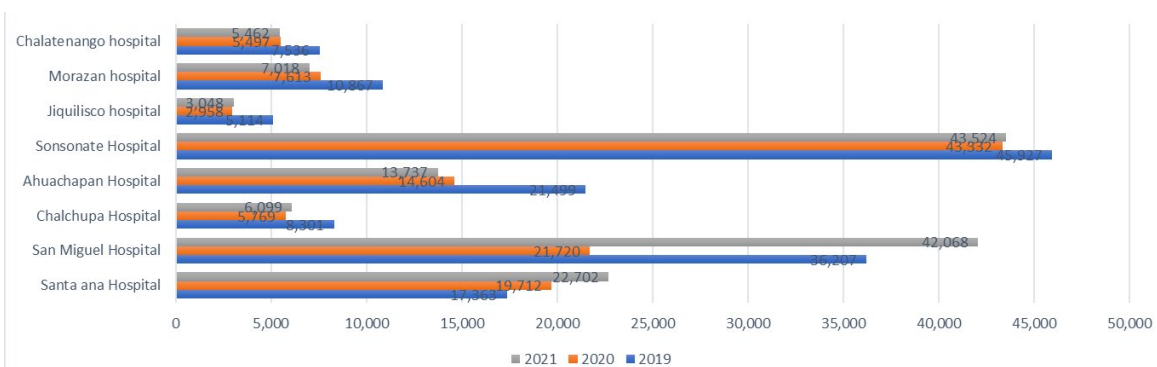
Name of hospitals	Hospital level	Region	Catchment area population	Number of beds	Number of hospital beds per 10,000 people	Bed occupancy rate (%)	Average number of days in hospital	Number of total medical staff	Number of medical staff per 10,000 people	Number of total medical doctors	Number of medical doctors per 10,000 people	Number of total nurses	Number of nurses per 10,000 people
Santa Ana Hospital	Regional	West	1,144,051	469	4.0	85	5.5	1594	13.9.	257	2.1	511	4.4
San Miguel Hospital	Regional	East	870,522	414	4.7	100	3.7	1288	14.7	209	2.4	482	5.5
Chalchupa Hospital	Basic	West	179,297	76	4.2	85	3.5	295	16.4	69	3.8	113	6.3
Ahuachapan Hospital	Province	West	369,000	158	4.2	85	3.2	625	16.9	132	3.5	209	5.6
Sonsonate Hospital	Province	West	504,581	257	5.0	100	3.5	676	13.3	123	2.4	221	4.3
Jiquilisco Hospital	Basic	East	86,576	50	5.7	45	2.7	217	25.0	29	3.3	96	11.0
Morazan Hospital	Province	East	193,369	78	4.0	48	2.65	306	15.8	43	2.2	105	5.4
Chalatenango Hospital	Province	Central	179,255	100	5.5	58	3.7	362	20.1	53	2.9	120	6.6

Source: JICA Study Team based on the hospitals' information



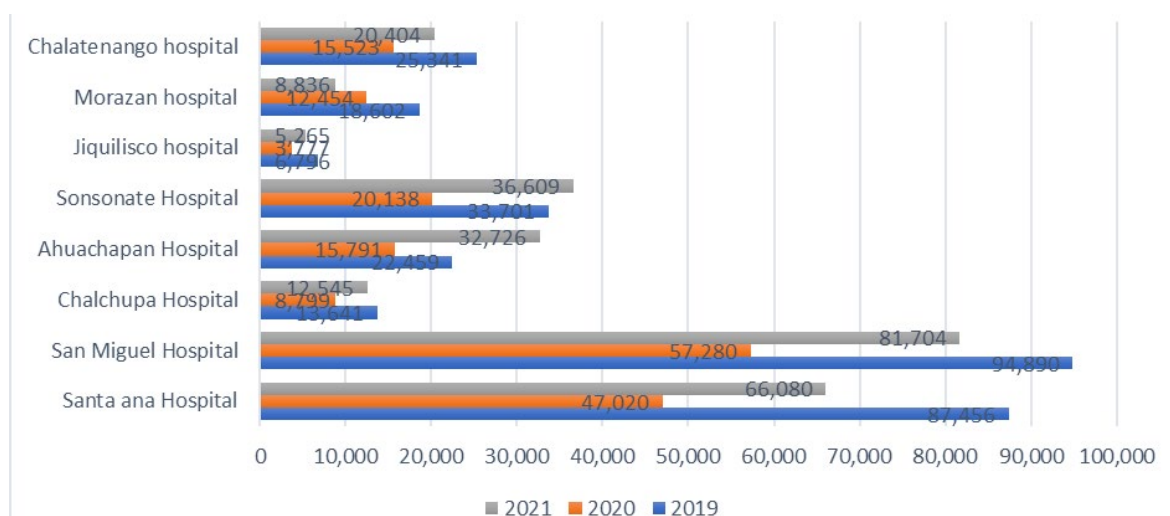
Source: JICA Study team based on the hospitals' information

Figure 8-12 Number of Total Outpatients



Source: JICA Study t-Team based on the hospitals' information

Figure 8-13 Number of Total Inpatients

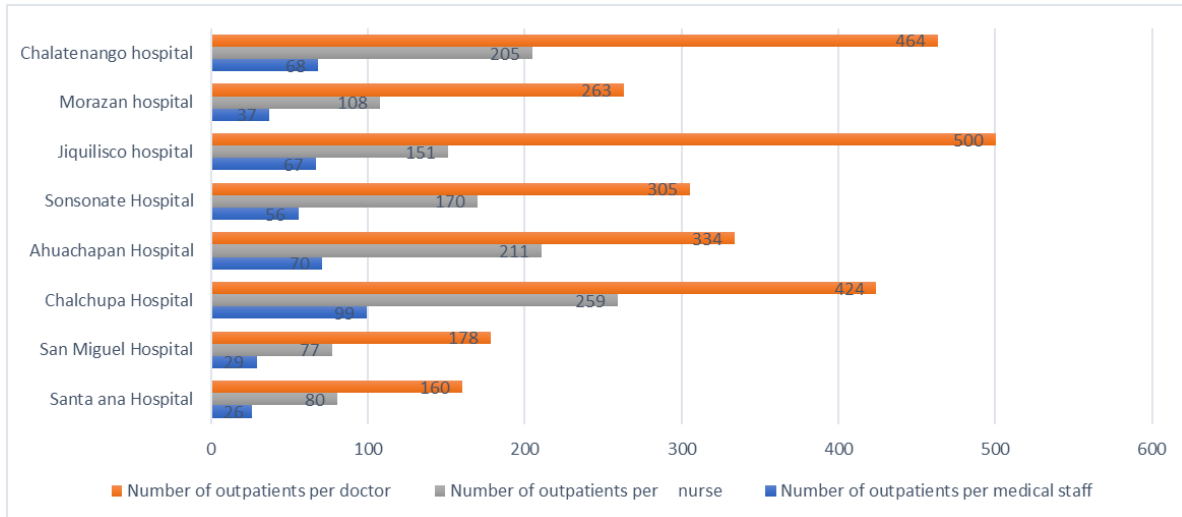


Source: JICA Study Team based on the hospitals' information

Figure 8-14 Number of Examinations on Radiology (X-ray, CT, etc)

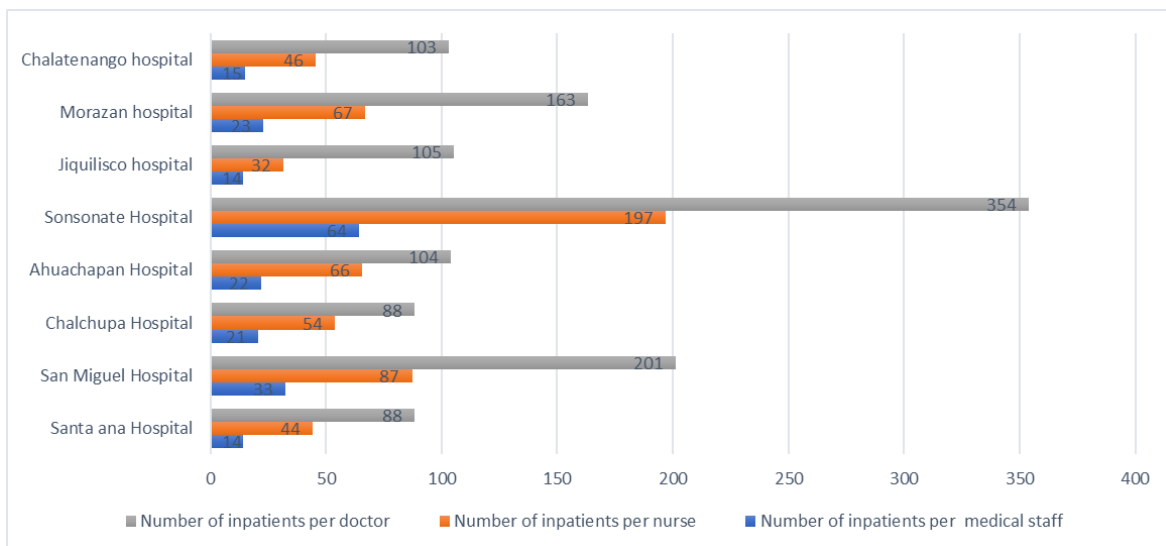
Based on changes and comparisons in the number of outpatients, inpatients, and examinations, it is assumed that both the total number of outpatients and the number of examinations declined in 2020 as a result of patients refraining from visiting hospitals due to the spread of COVID-19. However, it seems to recover in 2021, and combined with the results of the interviews conducted during the field survey, the situation in 2022 is almost completely recovering from the impact of COVID-19. In addition, since there was no significant change in the number of hospitalized patients, there are two possible reasons: the treatment of relatively serious illnesses requiring hospitalization continued, and the increase in the number of hospitalizations due to COVID-19.

Comparing the number of radiological examinations, the number of radiological examinations of San Miguel Hospital and Santa Ana Hospital, which are regional hospitals, is large. It was suggested that the examinations that should be tested at basic hospitals or provincial hospitals are referred to regional hospitals, or patients directly visiting regional hospitals for examinations. This result is consistent with the results of the interviews, and because the basic hospitals and provincial hospitals are not equipped with sufficient medical equipment, they are not able to perform examinations and diagnoses that should be covered by the basic hospitals and provincial hospitals.



Source: JICA Study team based on the hospitals' information

Figure 8-15 Number of Outpatients Per Doctor, Nurse, and Medical Staff (2021)



Source: JICA Study Team based on the hospitals' information

Figure 8-16 Number of Inpatients Per Doctor, Nurse, and Medical Staff (2021)

One of the reasons for the large number of examinations at Sonsonate Hospital is thought to be the Computed Tomography (CT) provided by the Embassy of Japan. Sonsonate Hospital has a large number of inpatients per medical staff, and the bed occupancy rate is 100%. Medical resources are tight.

As a trend in the number of outpatients/inpatients per health worker of each hospital, basic hospitals, like Jiquilisco Hospital and Charchuappa Hospital, have many outpatients per health worker, compared with the number of outpatients per health worker of the provincial hospitals. It is consistent with the role required of each hospital, and the referral system seems to be functioning to a certain extent. The exception is Chalatenango Hospital, which is a provincial hospital, and since the number of statistics at Chalatenango Hospital is close to that of basic hospitals, it is considered necessary to strengthen functions as a provincial hospital. Among regional hospitals, San Miguel Hospital has a large number of inpatients and a bed occupancy rate of 100%. On the other hand, the bed occupancy rates of Morazan

Hospital and Jiquilisco Hospital, both located in the eastern part of the country, are not high at 48% and 45%, respectively. Therefore, patients who should have been treated at Morazan and Jiquilisco hospitals are likely to have gone to San Miguel Hospital.

In addition to the above information and analysis results, summarizes the order of priority for provision of medical equipment based on the existing equipment availability and location of medical facilities (travel time to referral destinations) at each secondary hospital. These are classified according to priority 1 to 5, with priority 5 being very high priority and priority 1 being very low priority.

Table 8-13 Priority of Provision of Medical Equipment to Secondary Hospitals

	Hospital Name	Hospital Level	Cooperation Priority	Equipment Needs	Travel time by vehicle from target hospital to tertiary / regional hospital	Remarks
1	Chalatenango Hospital	Provincial	5	High	2 hours	1 general X-ray and 1 mobile X-ray, both old and partially broken
2	San Miguel Hospital	Regional	4	High	3 hours	4 general X-ray and 2 mobile X-ray, both old and partially broken. Mammography is available. A 6-slides CT is from 15 years ago. Inadequate functions as a regional hospital.
3	Morazan Hospital	Provincial	4	High	50 minutes	2 mobile X-ray machines and 1 general X-ray machine. Since there is only one IP, general and mobile cannot be used at the same time.
4	Ahuachapan Hospital	Provincial	3	Middle	50 minutes	1 general X-ray machine, 2 mobile X-ray machines (1 machine is new)
5	Charchupa Hospital	Basic	3	High	20 minutes	General X-ray, 10-15 years old. There is no mobile X-ray machine
6	Jiquilisco Hospital	Basic	3	Middle	1.5 hours	1 X-ray machine, 2 mobile X-ray machines (1 new machine coming in October 2022)
7	Santa Ana Hospital	Regional	2	Middle	1.5 hours	There is a 32-slices CT that was introduced two years ago.
8	Sonsonate Hospital	Provincial	2	Low	1 hour	A CT was provided by the Japanese Embassy. General X-ray equipment is scheduled to be introduced in December 2022.

Source: JICA Study Team

As a result of the hospital function analysis, the eastern area (Morazan Hospital, Jiquilisco Hospital, San Miguel Hospital) and the central area (Charatenango Hospital) should be given priority for provision of equipment since there is a need for functional enhancement as well as geographical reasons such as travel time to tertiary hospitals in the capital.

e) Sustainability (After Provision of Equipment)

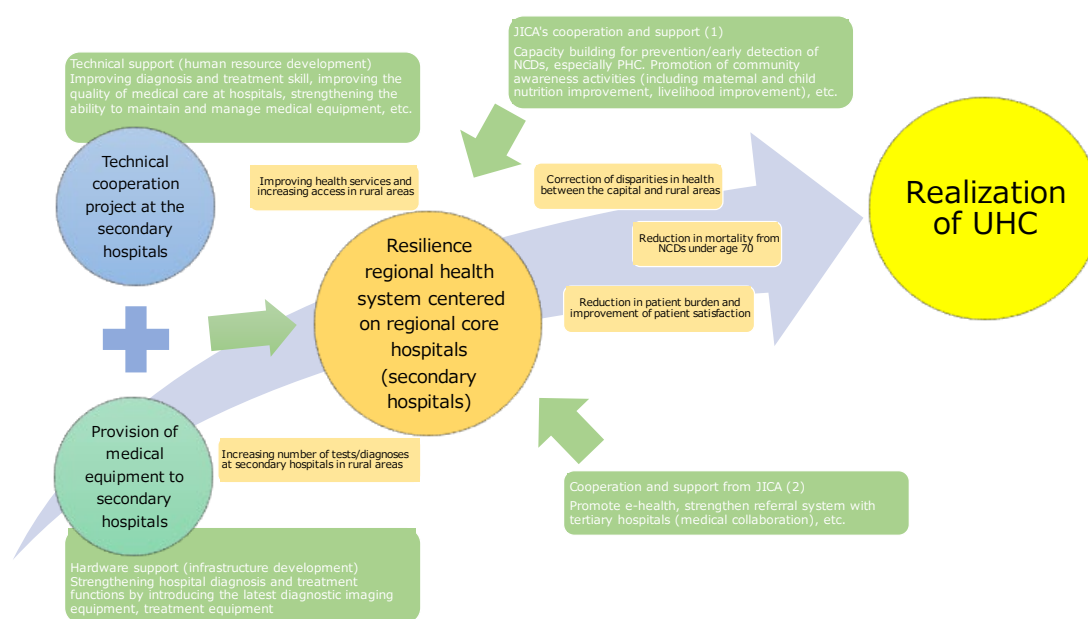
After receiving training on how to use, maintain, and manage the equipment from manufacturers and agencies at the time of equipment provision, training on improving test/diagnosis techniques using the provided equipment as well as training on maintenance and management will be conducted.

As for maintenance, as mentioned above, biomedical technicians and engineers are assigned to each hospital to formulate equipment maintenance and management plans, procurement plans, etc., and to coordinate with agencies. Secondary hospitals have a relatively well-established equipment maintenance system. However, it is hoped that follow-up and training through future technical cooperation projects will lead to further improvements in maintenance and management capacity.

It is strongly recommended to continue the maintenance contract of advanced equipment such as diagnostic imaging equipment with the manufacturer/agency even after the initial warranty period of the manufacturer/agency. Furthermore, it is very important to secure the hospital budget for maintenance in order to ensure the preventive maintenance of equipment.

Regarding the technical improvement of medical staff, it is most desirable to coordinate with a new technical cooperation project and conduct training and follow-up for them at the target hospitals. It is expected that the synergistic effects of hardware and software will lead to maximize the effectiveness of the provided equipment and technical cooperation projects. Possible technical cooperation projects targeting secondary hospitals in which equipment will have been provided include project of hospital quality improvement, project of strengthening countermeasures against NCDs, and project of improvement of the referral system (including strengthening PHC).

If it is difficult to implement the technical cooperation project at the target hospitals, the Ministry of Health should take the initiative to conduct training and follow-up. It is recommended that medical staff from tertiary hospitals who have extensive experience in using equipment such as MRI and CT should be dispatched to the target hospitals. Also, the e-health of El Salvador promoted by its Ministry of Health can be used to conduct remote training. In addition, consider effectively using the results of the existing JICA projects such as the dispatch of the medical staff trained in the existing JICA projects, "Project for Strengthening the Capacities of Medical Emergency Care in the Prehospital Care Setting" and "Project for Capacity Development of ICU Using Telemedicine under COVID-19 Pandemic", as the instructors.



Source: JICA Study Team

Figure 8-17 Proposed Direction of JICA Cooperation in the Medium to Long Term

In addition to providing medical equipment through grant aid, further cooperation and capacity-building support is expected to further improve diagnostic and treatment capabilities in El Salvador. Improving health services and increasing access to health services will, in the medium to long term,

lead to the establishment of a resilient regional health system centered on target hospitals (secondary hospitals) in rural areas, thus achieving UHC.

f) Points to keep in mind when Cooperation Scenario

As an important point when providing medical equipment, the hospital prepares an equipment purchase list and submits a budget request to the Ministry of Health every year so that it is necessary to contact and confirm with the Ministry of Health and the target hospitals before the provision of equipment. In addition, when introducing large equipment such as CT and general X-ray equipment, it is necessary for the hospital to secure and prepare the installation site at least one year before the equipment is installed in the target hospital.

In addition to equipment provision (hardware), combining it with technical assistance (software) such as technical cooperation projects are expected to have a greater effect. It is recommended to plan technical cooperation project while promoting the cooperation scenario of equipment provision.

8.3.2 Saint Lucia

(1) Overview of Health Care in Saint Lucia

1) Current Situation and Challenges of Health Sector

Saint Lucia, like many other Caribbean countries, is aging. Life expectancy at birth in 2016 is 75.0 years for males and 80.7 years for females¹². While life expectancy is increasing, the total fertility rate is 1.4 (2020)¹³, well below the replacement level of 2.1^{14,15}. There is also the problem of the emerging infectious diseases and the double burden of non-communicable diseases. In addition to the increase in NCDs, climate change, vulnerability and countermeasures to natural disasters, and responses to public health crises are issues.

a) Status of NCDs

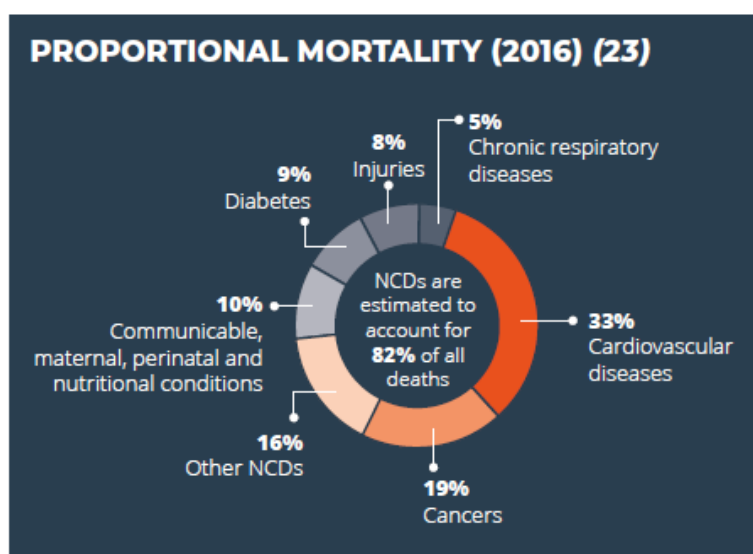
The WHO Country Profiles 2016 estimated the total prevalence of diabetes in Saint Lucia at 14.6%, with diabetes risk factors such as obesity and physical inactivity estimated at 27% and 41.5%, respectively. Both diabetes prevalence and mortality rates are higher in St. Lucia than in Central America and the Caribbean. As of 2016, NCDs accounted for a very high 82% of deaths. Cardiovascular disease related to diabetes and obesity is the most common cause of death at 33%. It also ranks second for cancer deaths at 19%.

12 <https://www.paho.org/en/saint-lucia> (September 2022 access)

13 <https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=LC> (September 2022 access)

14 Health at a Glance: Latin America and the Caribbean 2020 (OECD, 2020)

15 <https://www.worldometers.info/demographics/saint-lucia-demographics/> (September 2022 access)



Source: Health and Climate Change Country Profile 2020

Figure 8-18 Proportion of NCDs Among All Causes of Death

In addition, due to the geographical characteristics of small island countries and the impact of climate change, it is difficult to obtain some foods such as vegetables and fruits. The subsequent difficulty of eating a well-balanced diet leads to malnutrition and lack of micronutrients. In addition, it has been pointed out that the increase in vector-borne diseases such as heatstroke, malaria, and dengue fever due to climate change will reduce outdoor activities and exercise habits, leading to overweight and obesity¹⁶. From the perspective of NCDs prevention, lifestyle improvement (nutrition improvement) to prevent malnutrition, micronutrient deficiency, overweight, and obesity is an urgent issue.

b) National Development Plan/Health Plan

Saint Lucia is working to reform its health sector in line with Goal 3 of the Sustainable Development Goals (SDGs): good health and well-being for all. In 2015, the “Seven Strategic Development Pillars” were formulated around the framework of the SDGs. One of them is “Health and Welfare.”

The St. Lucia Medium-Term Development Strategy 2020-2023, with the support of the Caribbean Development Bank (CDB), includes three key performance areas in the social sector (civil security, education, and health) also the economic sector (agriculture, infrastructure, and tourism) was set. In addition to the six key outcome areas, the global challenges of resilience to climate change and disasters, productivity and competitiveness, gender mainstreaming, and social protection were also included in the medium-term strategy as four cross-cutting thematic areas. In the health sector, the overarching goal is to "expand the provision of affordable and high-quality health care."

The following three strategies are listed as specific strategies to achieve the goals:

1. Raise average immunization coverage for children aged 0-5.
2. Decreases the proportion of diabetics with high fasting blood glucose levels.
3. Decrease the proportion of hypertensive patients.

¹⁶ HEALTH & CLIMATE CHANGE COUNTRY PROFILE 2020 (WHO/PAHO, 2020)

According to the “Voluntary National Review Report on the Implementation of the 2030 Agenda for Sustainable Development” published in 2019, the National Health Insurance Unit within the Ministry of Health should consider the efficiency and sustainability of current funding. It aims to develop and implement a national health financing mechanism to improve accessibility.

The health sector reform prioritizes strengthening the primary level by introducing financial incentives, improving primary level health infrastructure to deliver essential services, and improving care integration at the primary level. Preparedness for public health crises is mentioned as a specific initiative. It also has programs that provide free medicine to all diabetics and hypertensives, regardless of income.

Currently, the formulation of a long-term national development plan up to 2030 is underway.

c) Policy on NCDs

In response to the growing number of NCDs, the Government of St. Lucia has developed the National Chronic Disease Policy (2017-2025) entitled 'Living Your Best Life: A Call to Action to Avoid Premature Death'. The policy states that the Ministry of Health will lead and coordinate public agencies, private companies, and civil society to improve the national NCD program. In addition, since NCD countermeasures cannot be solved by the health sector alone, the NCD Committee is calling for coordination of activities with other sectors and cooperation with all related sectors. It also adopts a participatory and people-centered approach. The policy sets the following four targets for measures against NCDs.

1. Improving risk reduction through the development of public policies and legal frameworks in all sectors aimed at decreasing harmful use of tobacco and alcohol, unhealthy diet, and physical inactivity. It is also aimed at promoting health through the creation of environments conducive to health.
2. Adopting an all-of-government and all-of-society approach aimed at strengthening the role and responsibility of all in addressing NCDs.
3. Strengthening the health care system with the provision of an integrated health care system, which is people-centered and responsive to NCDs.
4. Enhancing NCD surveillance and research components of health for improved observance of trends and prompt preventive responses in the management and control of NCDs.

d) Medical service provision system

Saint Lucia's health system is divided into eight medical districts. There are 34 wellness centers and 2 general clinics offering PHC services. Higher secondary medical services are provided by Owen King European Union (OKEU) Hospital in the north of the island and St. Jude Hospital in the south. There are also two regional hospitals, Soufriere Hospital and Dennery Hospital, and the private Tapion Hospital, which also provides secondary care. Since 2020, the Victoria Hospital in the north has become a central hub for COVID-19 patients as a respiratory hospital (formerly a general hospital). There are three public laboratories on the island (Victoria Hospital, Gros Islet General Clinic, St. Jude Hospital) and six private laboratories. St. Jude Hospital is the second national hospital after OKEU Hospital, but due to a fire in 2009, the stadium is now used as a hospital. There is no progress to construct or relocate the hospital. Secondary health services are important but costly, and the Saint Lucia government is

working to improve quality of health services while ensuring financial sustainability in health services.

The Saint Lucia Health Information System (SLUHIS) has been implemented in all 33 wellness centers and integrated with the Hospital Health Information System (Cellma). This facilitates data transfer of patient records and helps improve the continuity and quality of care provided to patients.

As a result of the 1st field survey of this time, sufficient medical services cannot be provided due to insufficient equipment for medical facilities, shortage of medical personnel, and the shortage of medical supplies. Secondary to tertiary level hospital functions are not sufficient. In particular, shortages of medical personnel are being heard at all facilities, and medical doctors and nurses are being called in from Cuba to deal with short-term employment. Due to a shortage of personnel, some departments only have outpatient consultations by specialists once a month, which causes long waiting times for patients. There is a general shortage of medicines, especially for hypertensive patients. In a situation where all medical resources are under pressure, during interviews with medical workers, some expressed dissatisfaction with their current treatment and working environment.

2) Status of Health System, Medical Service Provision and Equipment Maintenance for Each Target Facility

The field survey was conducted from August 22 to 26 in 2022. The purpose of the survey has two points as follows:

- (1) To identify issues in the healthcare sector of Saint Lucia (especially issues related to NCDs).
- (2) Formulate JICA's future development and cooperation scenarios based on the identified issues.

The table below shows the places visited and the main items of information collected for the first field survey.

Table 8-14 Sites Visited and Main Items Collected for the 1st Field Survey

Subject	Target Facility Name	Main Collection Items
Ministry of Health	Saint Lucia Ministry of Health	Health plan, needs, etc.
National hospital (secondary)	OKEU Hospital	Availability of equipment, diagnosis, and treatment
Specialized hospital (secondary)	Victoria Hospital	Status of equipment, prevention/diagnosis/treatment
District hospital (secondary)	Denry Hospital, Soufrière Hospital	Status of equipment, prevention/diagnosis/treatment
Regional organizations, development partners, etc.	Organization of Eastern Caribbean States (OECS), Taiwan International Cooperation and Development Foundation (ICDF)	Activity status, support plan

Source: JICA Study Team

In addition, the locations of visiting medical facilities for the first field survey are shown below. St. Jude Hospital could not be visited during this field survey due to the schedule of the other party. Although Tapion Hospital is a private hospital, it is a hospital that provides advanced medical care in Saint Lucia, so the location of the facility is also shown in the map.



Source: JICA Study Team based on Google Map

Figure 8-19 Location Map of Facilities Visited during the First Field Survey

Below is an overview of the medical service provision system and equipment availability for each facility visited.

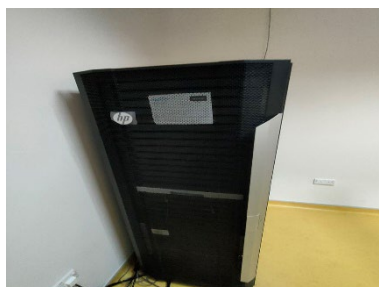
a) Owen King European Union (OKEU) Hospital

It was built in 2017 with support from the EU as a general hospital to replace Victoria Hospital. Some services such as dialysis and rehabilitation have been provided since 2018, and all medical services can be provided from March 2020. OKEU Hospital is the top referral hospital in Saint Lucia. However, there is no tertiary medical level function. For advanced medical care (tertiary level) such as cardiac surgery, patients are referred to neighboring Martinique (French territory). Cancer medicines are in short supply and patients have no choice but to pay and purchase them individually, which seems to be one of the reasons of Saint Lucia's high out-of-pocket costs. Dialysis treatment is provided, and there are 13 hemodialysis machines. Three hours is allotted per person from 5:00 in the morning to 2:00 in the middle of the night, from Monday to Saturday. There are laboratories for conducting blood and urine tests. Advanced laboratory equipment is not available. The hospital supports brain surgery, but the equipment for surgery is rented (borrowed for each operation). Cardiac surgery and catheter surgery cannot be performed. It has a 16-slice CT and a general and mobile X-ray equipment. The hospital has the PACS system. The image data is stored in a server (storage) at the hospital. A biomedical engineer

is there to calibrate the equipment. They have an endoscope, but it is a second-hand item that was donated. The MRI is out of order and cannot be repaired. Mammography is also out of order. Although it is a humid and hot area, there was no air conditioning (A/C) system installed at first, and the equipment was left in a poor environment for first the two years before the hospital opened. Despite the fact that the hospital was newly established in 2019, there is mold growing inside the facility.



The MRI has never been used and has been left out of order. Not repairable



Digital X-ray images are stored in hospital storage.



Hemodialysis machines are in use 21 hours a day due to excessive demand.

Photos: JICA Study Team

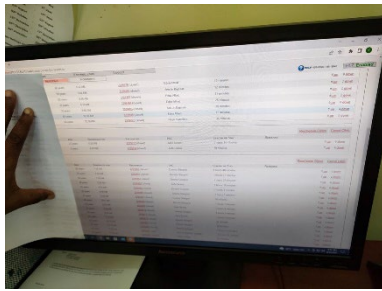
Figure 8-20 Status of Medical Equipment at OKEU Hospital

b) Victoria Hospital

Since 2020, Victoria Hospital has been a specialized respiratory hospital (previously a general hospital) and a central hub for COVID-19 patient care. In order to deal with the shortage of medical workers, the hospital hired Cubans staff. There are 53 Cuban and 34 Saint Lucian registered nurses. There is also a shortage of medicines and medical supplies.

c) Dennerly Hospital

There is no hospitalization function, only outpatient and emergency services are provided. There are five beds for emergency patients. It provides prenatal and postnatal checkups, screenings, vaccinations, trauma care, etc. Screening includes glucose test, blood pressure measurement, palpation for breast cancer, etc. Because there is no laboratory, blood tests are performed only by blood sampling, and analysis is performed at other hospitals. Computers are installed in each department (clinic) so that patient records can be entered and checked. Equipment maintenance personnel are sent from the Ministry of Health. One of the two automatic sphygmomanometers was out of order. There is no X-ray machine and few basic medical equipment. Due to insufficient medical equipment, the functions are limited. There are not enough medical personnel and medicines. Patients are referred to St. Jude Hospital and OKEU Hospital. Cuban medical workers are working in response to the shortage of workers. There is a relocation plan, but no progress has been made.



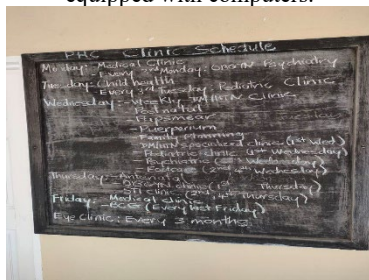
Patient information can be entered and browsed online through the information system of the Ministry of Health. All departments were equipped with computers.



Five beds for emergency patients. Not for planned hospitalization.



Medicine storage room. Not enough medical supplies.



Clinic schedule. Due to lack of human resources, specialists come only once a week or once a month.



A server is installed in the hospital. The ICT environment is relatively developed.



There is a relocation plan, but it has been postponed (timing undecided).

Photos: JICA Study Team

Figure 8-21 Status of Dennery Hospital

d) Soufriere Hospital

There is no hospitalization function, only outpatient and emergency services are mainly provided. There are four beds for emergency patients. There is a laboratory and a general X-ray device. Because of a shortage of medical supplies, the gel used in the ultrasound examination equipment is being used sparingly. The facility has not been renovated since it was built in 1994. Water leaks and damage to the facility are conspicuous. Patient waiting time is a problem. Only one pharmacist who is in charge of the six facilities including this hospital works here. The hospital's pharmacy is open only three times a week. Cuban health workers are employed. Medical equipment was relatively well maintained. Traffic conditions from the capital (Castries) are an issue (traffic jams, mountain roads, etc.).

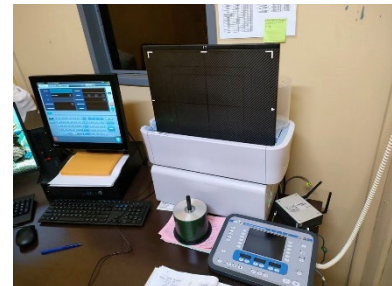
NEW DISPENSING SCHEDULE
For the foreseeable future, there will be one Pharmacist in the region. Therefore, in order to ensure adequate coverage for all six clinics in the Soufriere Clinical Basin, changes have been made to the dispensing times. Clients are advised to take note of the changes as listed, and to make the necessary adjustments to ensure continuous and timely acquisition of their medications.

TIME	DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning	1	Monguon	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	2	Emmanuel	Emmanuel	La Fougère	Soufriere	Soufriere
Morning	3	Emmanuel	Emmanuel	La Fougère	Soufriere	Soufriere
Afternoon	4	Emmanuel	Emmanuel	La Fougère	Soufriere	Soufriere
Morning	5	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	6	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	7	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	8	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	9	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	10	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	11	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	12	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	13	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	14	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	15	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	16	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	17	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	18	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	19	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	20	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	21	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	22	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	23	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	24	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	25	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	26	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	27	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	28	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Morning	29	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere
Afternoon	30	Soufriere	Soufriere	La Fougère	Soufriere	Soufriere

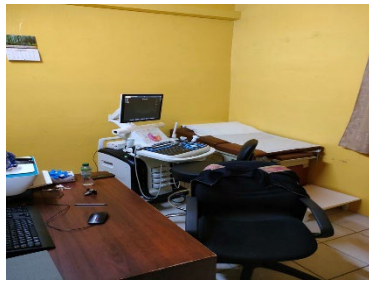
There is only one pharmacist in the area, and the hospital only prescribes medicines three times a week. Notice of the pharmacist's schedule is being shown to the patient.



One general X-ray equipment. Since the voltage is not stable, there is concern about failure. Doctors from Cuba conduct tests including one ultrasound machine.



X-ray images are digital. The image projected onto the imaging plate (IP) is imported into a PC and read on a monitor.



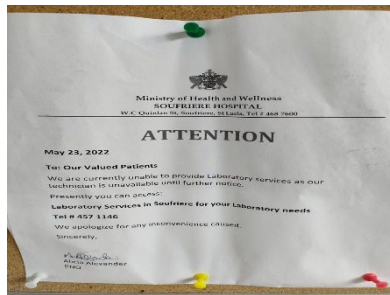
Ultrasound equipment. There is not enough gel for testing, so a small amount is used.



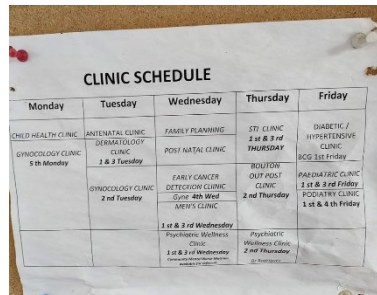
Incubator and infant warmer (open incubator)



There is a laboratory. Basic tests such as blood tests and urine tests are available.



Although the laboratory and equipment area available, the hospital cannot sufficiently respond to requests due to the shortage of medical personnel. Service may be suspended.



Consultations with a specialist are limited to once or twice a month. Crowded with many patients visiting.



The facility has not been renovated since it opened, and is aging. The ceiling collapsed and there was a water leak.

Photos: JICA Study Team

Figure 8-22 Status of Soufriere Hospital

In addition, the second field survey was conducted from November 7 to 18, 2022 with two points: “(1) explanations and discussions with relevant parties for the finalization of the cooperation scenario, and (2) additional information collection for the above scenario finalization.” Interview surveys were mainly conducted with the representatives of OECS health department and the PAHO/WHO in the office for the Eastern Caribbean Countries (ECC). The results of interviews with development partners are described in the next section.

3) Development Partner Trends

a) Organization of Eastern Caribbean States (OECS)

The Health Unit of OECS was established in 2016. At the Health Ministers' Meeting held in Martinique in November 2017, the Ministers of Health of the Eastern Caribbean Region announced the "OGDS (OECS Growth and Development Strategy) Health Agenda 2017-2030" and was approved.

The OGDS Health Agenda 2017-2030 is aligned with the Sustainable Development Goals (SDGs), Caribbean Community Health Cooperation IV (CCHIV) and PAHO's regional strategy. The four goals and Specific actions to achieve goals are as follows:

Table 8-15 Goals and Actions of OECS Growth and Development Strategy (OGDS) Health Agenda 2017 - 2030

Agenda name	OECS Growth and Development Strategy (OGDS) Health Agenda 2017-2030
Goal	<ol style="list-style-type: none"> 1. Healthy Environments and Health Empowerment 2. Equity in access to sustainable quality health services 3. Accessible information for strategic governance in health systems 4. Long-term investment in health
Specific action	<ol style="list-style-type: none"> 1. Share Health Human Resources 2. Facilitate pooled procurement of health equipment and services 3. Collect and share the relevant information to drive the strategic direction of health including quality and outcome indicators 4. Develop and implement common policy and legislative approaches in health 5. Develop and disseminate common messages on healthy living 6. Create healthy environments through appropriate planning, development and community engagement 7. Prioritize prevention and primary care particularly for NCDs 8. Share access to specialized services^[SEP] 9. Jointly prepare for and respond to health emergencies^[SEP] 10. Share Best Practices and conduct common research

Source: OECS website

As a result of local interviews, it was confirmed that the current situation and issues in OECS member countries are similar and that efforts in each country can be tackled by cooperation with OECS. In addition, the activities of OECS are given priority over CARICOM, and they regularly hold ministerial-level meetings and carry out practical activities.

OECS was implementing six health projects: (1) OECS Regional Health Project, (2) EC-DON, (3) Diabetes Prevention and Care Project, (4) Diabetes in Disasters in Eastern Caribbean Island States, (5) HIV TB Elimination Project, and (6) INTERREG Cares Project. Projects (2) to (6) have been completed or suspended as of November 2022, only (1) OECS Regional Health Project is continuing as a health project.

The OECS Regional Health Project is a five-year project from August 2019 to July 2024 with a total of USD 30.6 million supported by the World Bank. This project pursues: (1) improving the preparedness capacity of health systems for public health emergencies in the Eastern Caribbean; (2) building resilience; (3) containing cross-border transmission of disease outbreaks; and (4) mitigating disruptions in the aftermath of an extreme weather event and climate change impacts.

The Diabetes Prevention and Care Project aims to change the lifestyles of people living with diabetes and the general public by promoting healthier diets and regular physical activity. Expected results were that 50 physicians and 150 nurses trained, together with up to 20 senior-level health care providers and 80 additional HCPs and at least 20 diabetes association members. Furthermore, four diabetes/ NCDs clinics established or strengthened on each island (20 clinics) whereby the majority of the population (600,000 people) would have improved access to diabetes/NCDs care. This was a project amounting to USD 400,000 funded by the World Diabetes Foundation (WDF), in collaboration with Caribbean Public Health Agency (CARPHA) and the Windward Islands Research and Education Foundation (WINDREF), in five OECS countries (Antigua and Barbuda, Dominica, Grenada, St. Lucia and St. Vincent). The project was suspended due to time and funding constraints.

The Diabetes in Disasters in Eastern Caribbean Island States project was funded by the World Diabetes Foundation (WDF). This project aims to address and mitigate risks due to natural disasters and subsequent disruption of healthcare for people with diabetes and other NCDs in the event of a hurricane

or any natural disaster. As part of natural disaster risk reduction, it is important to establish a patient registration system integrated with the existing Health Management Information System (HMIS) to ensure continuity of care for patients who move within and outside the region due to natural disasters. This was developing and piloting as a new OECS electronic patient record system. This project was implemented in six OECS member states. About 270,000 people could potentially benefit from the project through disaster risk reduction and improved care. The project was implemented in collaboration with the Caribbean Public Health Agency (CARPHA) and the Windward Islands Research and Education Foundation (WINDREF) and the Caribbean Disaster Emergency Management Agency (CDEMA). The project was suspended due to time and funding constraints.

INTERREG Cooperation, Accessibility, Referrals, E-information System (CARES) was a EUR 5 million project led by the Regional Health Agency of Guadeloupe in the area of health in the Eastern Caribbean. INTERREG CARES resulted from a close collaboration between the OECS member states and public/private health organizations including the Regional Health Agencies of Guadeloupe and Martinique, the Hospital University Centers of Martinique and Guadeloupe, Basse-Terre Hospital Center, Maurice Selbonne Hospital Center, GCS Caraïbes et Archipel, Les Eaux Claires Clinical Center, and CAREST Network. The INTERREG CARES Project was co-funded by the INTERREG Caribbean program under the European Regional Development Fund and the European Development Fund. The project has been completed.

The OECS Pharmaceutical Procurement Service (PPS) is an example of how pooled procurement can reduce costs and enhance the efficiency of health service delivery. Since its implementation in 1986, the OECS PPS has been able to reduce the market cost of medicines in the region by 20 percent and in so doing, collectively saves regional governments an average of USD \$4 million a year (OECS PPS).¹⁷

In an interview with the OECS Health Officer, it was explained that the reason for the suspension of some projects was due to budget exhaustion and project deadlines. All diabetes-related projects have been suspended and only the World Bank's OECS Regional Health project aimed at responding to the public health emergency is currently under implementation. However, even in the suspended projects, certain achievements have been made, such as the development of guidelines and the implementation of pilots. It was also confirmed that there are no priority countries within the OECS and that the OECS does not determine the target countries for projects, as the target countries of projects are determined by the donor's intentions for each project and the donor's partner's country of affiliation.

Projects related to NCDs, especially cancer and diabetes have strong needs in common with OECS member countries and are a priority theme for the OECS. The OECS considers the promotion of prevention, early detection and treatment, management and disease control (including data management) of NCDs to be particularly important. The OECS also responded that it would like to work on medical information systems, digitization and sharing of patient records, and data storage on the cloud to prevent loss of patient data in the event of a disaster. The OECS is also developing its own OECS guidelines; although PAHO/WHO and others are also developing guidelines, it was mentioned that the OECS believes that its own guidelines are necessary for the limited resources of small island countries. Some guidelines, such as diabetes guidelines, have already been formulated.

¹⁷ Caribbean Cooperation in Health Phase IV (CCH IV) Summary of the Regional Health Framework 2016 – 2025 (CARICOM, 2016)

b) Taiwan International and Cooperation Development Foundation (ICDF)

A chronic disease project will be implemented in St. Lucia. Currently, they are waiting for the memorandum of understanding (MOU) to be signed. The amount of project will be USD 1.8 million over the course of five years from 2023. The activities are planned to consist of three components: 1) capacity building for policy making (training in Taiwan); 2) capacity building for medical personnel (1-2 months training in Taiwan); and 3) promotion of community awareness activities.

c) PAHO/WHO in the Office for the Eastern Caribbean Countries (ECC)

PAHO, The Office for the Eastern Caribbean Countries (ECC), headquartered in Barbados, was established in September 2006 to increase PAHO's country presence in the Eastern Caribbean. ECC operates from a building that is kindly provided by the Government of Barbados and its responsibility is to deliver PAHO/WHO's technical cooperation (TC) in the Eastern Caribbean Countries and Territories and the French Departments in the Americas.¹⁸ PAHO has a Framework Agreement with the Caribbean Public Health Agency (CARPHA) through the subregional program coordination (SPC). CARPHA through the SPC will be able to provide technical support in areas such as disease elimination through laboratory diagnoses and source reduction for vector borne diseases. A similar MOU has been signed with the Healthy Caribbean Coalition (HCC) which will also be key in the implementation of the NCD areas of the Country Cooperation Strategy (CCS)¹⁹.

The Caribbean Action Plan on Health and Climate Change was developed in consultation with countries through preparatory meetings and by convening the regional health and environment leaders of the Caribbean during the Third Global Conference on Health and Climate Change, held in St. George's, Grenada, on 16-17 October 2018. The vision of the initiative is to ensure that by 2030, all SIDS health systems are resilient to climate variability and change. The SIDS Initiative has four strategic lines of action, namely:

- Empowerment: Supporting health leadership in SIDS to engage nationally and internationally.
- Evidence: Building the business case for investment.
- Implementation: Preparedness for climate risks and health-promoting mitigation policies.
- Resources: Facilitating access to climate and health finance.

According to the 2017 PAHO Country Survey on Health and Climate Change, the ministries of health raised the following priority actions that should be addressed to best tackle climate change and health challenges: 1) prioritize health issues in the climate change agenda, and in the preparation of reports, plans, and other national documents; 2) increase the number of trained and dedicated staff for health and climate change issues; 3) increase national and health sector budget allocations for climate change actions and programs; 4) receive support for navigating the complex processes to access international and bilateral funds; and 5) increase and improve data generation and results sharing, to support national and regional evidence-based interventions. The SIDS Initiative, and particularly the Caribbean Action

¹⁸ <https://www.paho.org/en/barbados-and-eastern-caribbean-countries> (access, 24th October 2022)

¹⁹ PAHO/WHO MULTI-COUNTRY COOPERATION STRATEGY FOR BARBADOS AND EASTERN CARIBBEAN COUNTRIES (PAHO/WHO, 2018)

Plan, aims to address these priorities²⁰.

In an interview with the representative of the PAHO East Caribbean Countries Office, it was mentioned that none of the Eastern Caribbean countries has a particularly good health system, and that all countries have almost the same health system level and have common challenges. Two important issues common to the East Caribbean countries were (1) diet related to NCDs, especially dietary habits such as excessive sugar intake, and (2) mental health. It was stated that a comprehensive approach is necessary to resolve these issues. It was also mentioned that there is a problem of fragmentation due to the diversification of development partners. The number of development partners has increased, and issues are becoming more diverse and complex, but the coordination capacity of each country's Ministry of Health is not sufficient.

d) CARPHA

The CARPHA in collaboration with PAHO and the CARICOM Secretariat convened regional stakeholders, including representatives from member states, to finalize the development of the regional NCD surveillance system. The initiative aims to improve the monitoring, evaluation and reporting of NCDs and improve the prevention and control of this epidemic at the national level. The proposed surveillance system will ensure that we keep track of mortality data, improving knowledge of the impact caused by NCDs. Additionally, the system will assist in obtaining critical information from healthcare facilities, to assist with treatment and control of NCD. PAHO continues to explore innovative ways to produce critical information, using mobile and web-based technologies, and estimate the risk of COVID-19 mortalities due to underlying health conditions.²¹

CARPHA hosts “The First Annual Caribbean Noncommunicable Disease, Nutrition, Mental Health Focal Points Review and Capacity Building Meeting” in September 2022. The meeting provided an overview of global, regional, and sub-regional commitments and targets for the prevention and control of NCDs and included presentations on promising and best practices to support the national NCD programs including Cancer Surveillance and Food and Nutrition Surveillance Systems. Additionally, participants were given an overview of, and trained on, the data collection, analysis, and reporting aspects of the Regional NCD Surveillance System²².

Caribbean Moves is an initiative aimed at reducing the burden of non-communicable diseases (NCDs) in the Caribbean by engaging with a broad cross-section of public and private sector organizations to promote and support preventive health behaviors (aligned with the World Health Organization’s (WHO) Best Buys for NCD Prevention) and create and facilitate a supportive environment.

e) Republic of Cuba

The Republic of Cuba is an important partner of Saint Lucia and has a history of cooperation in the health sector for more than 20 years. Cuba collaborates in the training of medical professionals, provision of specialized care such as ophthalmology and dialysis, and other areas of health

²⁰ Caribbean Action Plan on Health and Climate Change (PAHO, 2019)

²¹ <https://www.paho.org/en/news/25-11-2021-information-action-towards-regional-integrated-ncd-surveillance-system> (access 18th Nov. 2022)

²² CARPHA hosts the First Annual Caribbean Noncommunicable disease, Nutrition, Mental Health Focal Points Review and Capacity Building Meeting - CARPHA > Articles (access 24th October 2022)

services²³. Cuba also trains and dispatches not only doctors but also nurses and pharmacists, making them an integral part of Saint Lucia's health care system. More than 500 Saint Lucians have studied and graduated from medical schools in Cuba. Cooperation in health care from Cuba, especially the acceptance of Cuban health care workers, is important for health care in Saint Lucia, where health care workers are in short supply.

In 2016, a contract of 1.5 million East Caribbean dollars was signed between Saint Lucia and Cuba, and a 25-person Cuban medical team was dispatched to Saint Lucia²⁴. Nephrology specialists, ophthalmologists, and biomedical engineers in charge of maintenance and management of medical equipment have also been dispatched. Saint Lucia intends to continue to strengthen and advance its cooperative relationship with Cuba²⁵.

4) Summary of Challenges in the Saint Lucia Health Sector

The issues in the healthcare sector in Saint Lucia were found during this field survey are summarized below.

Issue 1: Insufficient capacity to provide medical services to NCDs patients, especially health personnel and pharmaceuticals

There is a serious shortage of medical personnel and medicines. In addition, St. Lucia has little flat land, and it is necessary to travel over mountainous roads in order to get to the capital, which has advanced medical facilities. Access to medical facilities is limited, and if a landslide or other disaster occurs, transportation to the capital will be cut off. In addition, traffic jams occur frequently in the capital, which may lead to delays in responding to emergencies. A high out-of-pocket rate of 45.6% compared with the Caribbean average (32.1%) also hinders access to healthcare facilities. Long waiting time for patients and inadequate medical services are problems. Health information system (Cellma) centrally manages patient information on the system (web) provided by the Ministry of Health, and it is possible to check the patient's medical history, hospital response, etc. on the system from any hospital. It is expected to be used for patient referrals and follow-ups.

In Saint Lucia, it is important to improve the functions of PHC and secondary hospitals in each region in order to avoid the concentration of medical care in the capital. At the same time, in small island country with a small population and economy, medical resources that can be covered on a national basis are limited. It is necessary to further promote regional cooperation through OECS, CARICOM, PAHO, etc., and use medical resources effectively and efficiently.

Issue 2: Increase in NCDs patients, high prevalence of NCDs

The high prevalence of NCDs such as diabetes mellitus and hypertension and the increase in NCDs patients are urgent issues. Given the limited financial resources for medical care, it is desirable to cooperate in measures against NCDs by strengthening PHC in order to promote prevention and health checkups through PHC as a highly cost-effective measure. As a countermeasure against NCDs, it is important to improve lifestyle habits such as nutrition and health promotion. Also, early detection

²³ Web Portal of the Government of Saint Lucia (govt.lc) (access 24th October 2022)

²⁴ CUBA AND ST. LUCIA SIGN HEALTHCARE COOPERATION AGREEMENT - SEE MORE AT: | Montray Kréyol (montraykreyol.org) (access 24th October 2022)

²⁵ <https://www.caribbeannewsglobal.com/st-lucia-cuba-to-strengthen-cooperation-in-health-sector/> (access 24th October 2022)

through examinations and early treatment are necessary.

Issue 3: Lack of medical facilities/equipment:

OKEU Hospital, which is a top referral hospital that started operation in 2018, has inadequate air conditioning equipment, and the environment is not hygienic, shown by the mold growing inside the facility. Diagnostic imaging equipment such as MRI and mammography are out of order and cannot be used. In addition, St. Jude Hospital, which is second to OKEU Hospital, is currently using the stadium as a hospital due to a fire in 2009, and the construction/relocation of the new hospital has not been completed. The need for medical equipment has been confirmed in other secondary hospitals and primary medical facilities (wellness centers), and there is a high need for facility renovation and provision of medical equipment in order to ensure the quality of advanced medical care in Saint Lucia.

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development issues/strategies

Based on the results of the field survey and literature review, development goals and objectives in the health sector were set as follows.

Development goals:

- (1) Build a resilient health system that takes into account the conditions of small island countries
- (2) Strengthening and improving ability to prevent, diagnose and treat NCDs

Purpose:

To address the increasing challenges of NCDs and the health and medical issues related to small island states, such as the impact of climate change.

In order to achieve the development goals mentioned above, four strategies were set as shown below.

Table 8-16 Strategies for Health Sector Development in Saint Lucia and Outlines of Each Strategy

Strategy	Strategy overview
Strengthening of OECS regional cooperation	In island countries with small populations and economies, medical resources that can be covered on a national basis are limited. Therefore, promote regional cooperation further among OECS member countries and use medical resources effectively and efficiently.
Remote island medical experience	The overall environment, including the health environment, of island countries with limited population and economic scale is very similar to that of remote islands in Japan. Utilize Japan's remote island health experience.
Countermeasures against NCDs / Strengthening PHC	In order to respond to the increasing challenges of NCDs, strengthening PHC should be focused on. From the perspective of PHC, efforts will be made to prevent NCDs, detect early (improve testing capabilities), and strengthen referral system.
Strengthening infrastructure	Aim to improve the ability to provide medical services by strengthening the infrastructure of facilities and medical equipment at primary and secondary medical facilities. Also, promote health related ICT/DX for efficient use of medical resources.

Source: JICA study team

b) Programs and Projects

The table below shows the programs/projects considered for implementation in Saint Lucia based on development issues and strategies.

Table 8-17 Considered for Implementation of Programs/Projects in Saint Lucia

Subject	Strategy	Program/Project	Period
Health Saint Lucia	Strengthening of OECS regional cooperation	1-1 Sharing experiences/lessons and strengthening collaboration in the health sector of OECS countries.	Short term
		1-2 Coordination of medical supplies/health information systems	Middle term
		1-3 Effective utilization of human resources and strengthening of capacity through coordination of health human resources	Long term
	Sharing Japan's remote island experience related health	2-1 Sharing the experience of remote island health in Japan	Short term
		2-2 Sharing and utilization of experiences of medical cooperation in Japan (introduction of systems for cooperation with medical information systems, utilization and sharing of health personnel, etc.)	Middle term
		2-3 Medical cooperation through the introduction of technology such as doctor helicopters and drones	Long term
	Countermeasures against NCDs / Strengthening PHC	3-1 Strengthening testing and diagnostic capabilities for NCDs prevention/early detection of NCDs	Middle term
		3-2 Strengthening and promote community awareness activities (including maternal and child nutrition improvement and livelihood improvement)	Middle term
		3-3 Strengthening referral system (medical collaboration)	Middle term
	Strengthening infrastructure	4-1 Renovation of primary/secondary medical facilities	Middle term
		4-2 Provision of medical equipment to primary/secondary medical facilities	Middle term
		4-3 Improvement of health-related ICT infrastructure	Middle term

Source: JICA Study Team

c) Points to note in the development scenario

From the perspective of the six elements of a health system advocated by WHO (leadership and governance, health system financing, health workforce, health information system, medical products, vaccines, and technologies and service delivery), Saint Lucia have health information systems that are relatively stronger. However, health workforce and medical equipment and medicines are major issues. One of the reasons for this is thought to be that health financing are not functioning well. It is necessary to overcome the vulnerability of the health system.

In a situation where various issues are intricately intertwined, in order to overcome the vulnerability of the health system as a whole and prepare for the next public health crisis, cross-sectional efforts (health system enhancement) should be prioritized. In the short and medium term, it is necessary to strengthen medical cooperation and strengthen PHC in order to effectively and efficiently utilize limited medical resources. In the long term, it is desirable to expand and train health workers by referring to the house model of health workers²⁶. In addition, as a countermeasure against NCDs, it is important to intervene to improve nutritional status and reduce the risk of diabetes and hypertension based on scientific evidence, such as a life-course approach through maternal and child health services with a long-term perspective.

2) Cooperation scenario

a) Viewpoint of selection

In order to select programs/projects that JICA should conduct in Saint Lucia's health sector, criteria were established as shown below.

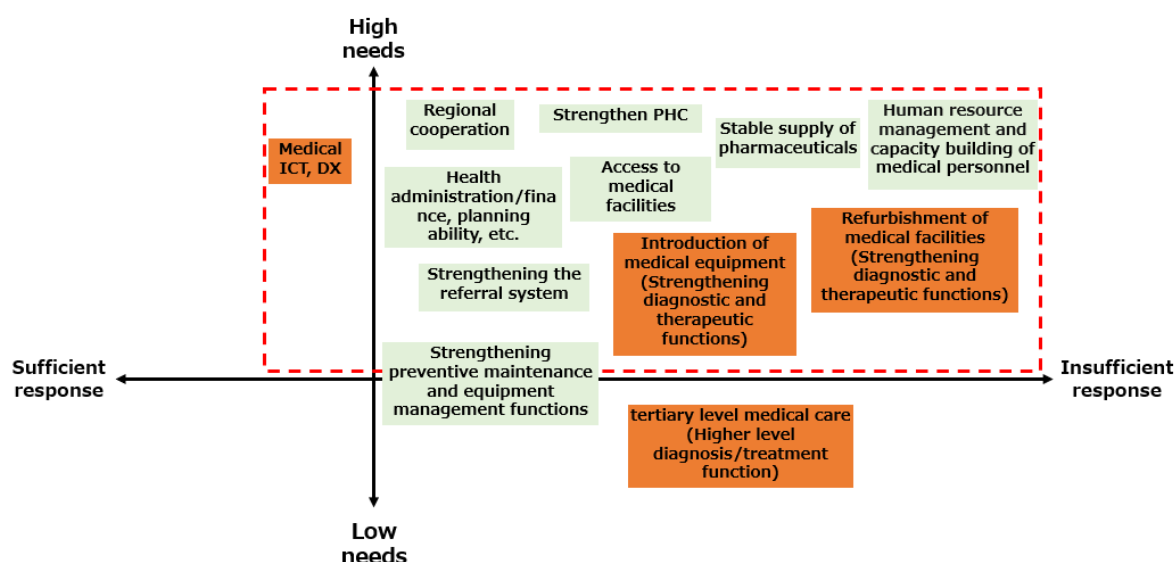
²⁶Developed in 2011 by the National Center for Global Health and Medicine as a tool and analytical framework to comprehensively understand the health human resource development system.

Table 8-18 Criteria for Selection of Programs/Projects to be Worked on by JICA

Selection Criteria	Content
Needs and responses in the healthcare sector in Saint Lucia	As a result of the survey, all the programs/projects considered for implementation have high needs in Saint Lucia. However, sufficient measures have not been taken to meet these demands.
Consistency with the Japanese government's country-by-country development cooperation policy	"Based on the need to respond to infectious diseases such as the COVID-19 and lifestyle-related diseases, JICA will also cooperate in the field of health and medical care as necessary."
Development cooperation with the Organization of Eastern Caribbean States (OECS)	The secretariat is located in Castries, St. Lucia, and through wide-area and regional cooperation through St. Lucia, it is expected that the effects of cooperation will spread to OECS member countries.
Applicable modalities in Saint Lucia	The following modalities are envisioned for Saint Lucia: Regional technical cooperation Dispatch of experts Training in Japan or a third country Japan Overseas Cooperation Volunteers (JOCV)

Source: JICA Study Team

In addition, the priority of cooperation in Saint Lucia is organized as shown below.



Source: JICA Study Team

Figure 8-23 Arrangement of Priorities for Cooperation in the Health Sector in Saint Lucia

In terms of soft component, there is an extremely high need for expansion and capacity building of medical personnel. Although it will be difficult to increase the number of health workers immediately, it is still necessary to increase the number of health workers in the long term, while strengthening the capabilities of existing health workers and effectively utilizing medical resources in the short term. In order to deal with the increasing number of NCDs, it is necessary to strengthen PHC activities, stabilize the supply of medicines, improve access to medical facilities, and strengthen the referral system. It is also necessary to strengthen the health administration and planning capacity of the Ministry of Health in order to respond to increasingly complex and diversified health issues. In Saint Lucia, which has a small population and economic scale and limited medical resources, it is essential to strengthen regional ties with the Eastern Caribbean countries, which have similar geographical conditions and economic scale. Health ICT, which has been relatively introduced, is also required to be further promoted from the viewpoint of efficient use of medical resources.

In terms of hard component, needs were confirmed for the renovation of medical facilities and the provision of medical equipment. Currently, limited medical resources such as deterioration of facilities and shortage of medical equipment and supplies are confirmed. In order to deal with the increasing number of NCDs patients, it is necessary to improve the facilities and equipment of secondary hospitals and PHC facilities (wellness centers) in line with the expansion of health personnel.

b) Cooperation scenario

Based on the results of the field survey and literature research, the organization of cooperation priorities, and the selection criteria for programs/projects, the programs/projects that are expected to be implemented in the healthcare sector in Saint Lucia over the next 10 years are drafted as development scenarios. Table 8-19 shows an overview of the cooperation scenario.

Table 8-19 Cooperation Scenario (Health / Saint Lucia)

Subject	Strategy	Program/Project	Modality
Health	Strengthening of OECS regional cooperation on the theme of countermeasures against NCDs	1-1 Sharing experiences/lessons and strengthening collaboration in the health sector of OECS countries.	Technical cooperation Training in Japan
		1-2 Coordination of medical supplies/health information systems	
		1-3 Effective utilization of human resources and strengthening of capacity through coordination of health human resources	
Saint Lucia	Sharing Japan's remote island experience related health	2-1 Sharing the experience of remote island health in Japan	
		2-2 Sharing and utilization of experiences of medical cooperation in Japan (introduction of systems for cooperation with medical information systems, utilization and sharing of health personnel, etc.)	
		2-3 Medical cooperation through the introduction of technology such as doctor helicopters and drones	

Source: JICA Study Team

Emphasis will be placed on utilizing Japan's remote island medical experience, which is highly similar to the external environment of St. Lucia. In addition, in Saint Lucia, which has a small population and economic scale, it is necessary to consider the health system as a unit of the East Caribbean countries, which have similar geographical conditions and economic scales, rather than Saint Lucia alone. In order to make the most of limited medical resources, programs/projects to strengthen regional cooperation through OECS is recommended.

Next, in order to respond to the increase in NCDs, which is an urgent issue, capacity building related to NCDs countermeasures, especially the prevention of NCDs and strengthening PHC, is desired from the viewpoint of efficiency of medical resources.

c) Details of the cooperation: remote island health and strengthening of OECS regional cooperation (technical cooperation) on the theme of countermeasures against NCDs

Training in Japan on the theme of remote island medicine is recommended. After training in Japan, technical cooperation project or long-term expert dispatch aimed at strengthening regional cooperation in the East Caribbean countries is desirable. In order to make the most of the limited medical resources of St. Lucia, which has a small population and economy, incorporate similar Japan's experience and good examples of medical care on remote islands. In addition, after training in Japan and technical

cooperation projects/long-term expert dispatch, if there is a request from the government of the recipient country, digitization and sharing of patient data, an image transfer system, a doctor helicopter for transporting emergency patients, and an efficient telemedicine infrastructure development for strengthening regional cooperation will be provided. Introduction of drones for transporting medical supplies is also proposed.

The counterpart organization should be OECS in order to promote regional cooperation. Countries in OECS is similar to the environment of small island countries than CARICOM, and it will be possible to collaborate on more specific issues. As a good example, there is already joint procurement of medicines and equipment through OECS, which has realized reductions in the purchase price of medicines and shortened delivery times. Further promote such excellent efforts with the cooperation of JICA will be conducted.

In addition, based on the results of the second field survey, measures against NCDs, which the OECS health unit is focusing on in health care, will be incorporated as a central theme for promoting regional collaboration in the proposed cooperation scenario. Strengthening and improving NCDs prevention, early detection/treatment, management (patient records/data management) will be the central theme of strengthening regional cooperation. Also consider supporting the utilization and creation of OECS's own NCDs-related guidelines.

Table 8-20 Proposed Components of Cooperation Scenario

	Plan	Subject	Content	Remarks
1	Training in Japan on the theme of remote island medical care	OECS and OECS member countries (Ministry of Health)	Training in Japan on the theme of remote island medical experience (*JICA Kyushu has an experience as "Island Area Strengthening Community Health Learned from Lifestyle-Related Disease Countermeasures")	Candidate sites: Nagasaki Prefecture (Goto Islands), Kagoshima Prefecture, Okinawa Prefecture
2	Technical Cooperation Project / Dispatch of Long-Term Experts for Strengthening regional coordination and regional health with the theme of prevention, early detection and treatment of NCDs	OECS and OECS member countries (Ministry of Health)	Promote further medical cooperation with OECS member countries. By sharing pharmaceutical logistics, medical information, and medical personnel to efficiently operate medical resources owned by each country. As collaborative themes, consider prevention, early detection and treatment of NCDs, patient data sharing and management for that purpose, and development and utilization of medical information systems (with a view to sharing health personnel in the future). Support and promote the development of guidelines that match the unique regional characteristics of OECS. Good example: Joint pharmaceutical purchasing system implemented at OECS	With OECS as a counterpart, member countries, mainly Saint Lucia, will benefit
3	Introduction of patient data sharing, image transfer system, doctor helicopter, drone, etc.	OECS and OECS member countries (Ministry of Health)	Supported by grant aid/loan. X-ray images are transferred to other hospitals (including other countries such as Martinique) by the image transfer system. Emergency patients are transported both domestically and internationally by doctor helicopter (transportation to Martinique is possible in about 20 minutes). Drones will also be considered for transporting medical supplies.	Cooperation with the ICT sector, transportation sector, etc. is necessary

Source: JICA Study Team

Consistency with Development Issues / National Policies

In island countries with small populations and economies, resources for related health sector on a national basis are limited. In addition, due to the brain drain of health personnel, human resources are

becoming even scarcer. Under these circumstances, in order to make the most of limited resources, it is necessary to consider the health system in all of East Caribbean countries, which have similar geographical conditions and economic scales, rather than Saint Lucia alone. Programs/projects that aim to use health resources effectively and efficiently by strengthening regional cooperation are consistent with development issues. In Saint Lucia, NCDs have a very high mortality rate of 82% (2016), and diabetes and obesity-related cardiovascular disease accounted for 33%. The theme of countermeasures of NCDs for regional cooperation is consistent with the development issue.

As the national policy, Saint Lucia has set specific strategies in its "Mid-term Development Strategy 2020-2023" to decrease the proportion of diabetics with high fasting blood sugar levels and to decrease the proportion of hypertensive patients. The National Chronic Disease Policy (2017-2025) also states that NCDs prevention will be promoted. Since countermeasures for NCDs are the most important matter in Saint Lucia's health policy, promoting these countermeasures in this cooperation scenario is consistent with the policy.

In the OECS, as an action in the "OECS Growth and Development Strategy (OGDS) Health Agenda 2017-2030", it is clearly stated that focus is on prevention and primary care of NCDs. The content of the cooperation centered on countermeasures against NCDs, especially prevention, is the same as the direction of OECS. In addition, both OECS and Saint Lucia have prioritized prevention of diabetes and hypertension, electronic sharing and storage of patient records, and health promotion among NCDs countermeasures. The activities of the cooperation scenario component are also in line with the policy. Furthermore, since OECS is a regional organization that aims at regional cooperation, strengthening regional cooperation through OECS is consistent from the standpoint of the organization's purpose.

Expected Results

By establishment of a common regional system and framework based on the unique health situation of small island countries, efficient sharing of health resources, and strengthening cooperation in the health sector among the Eastern Caribbean countries, it is expected that these will lead to an increase in the number of examinations for NCDs at health facilities in each country, as well as improvement in the prevention, early detection, and early treatment of NCDs. It is also expected that skills of health personnel will be developed through training and monitoring, such as improvement of diagnostic/testing capabilities, patient management and data management capabilities. In the medium to long term, this is expected to lead to a reduction in mortality from NCDs under the age of 70 (increase in life expectancy).

Significance of Japan's Cooperation

The environment in the East Caribbean countries, including Saint Lucia, which is a small island country, is very similar to the environment of island medical care in Japan, which has many remote islands. Japan, like Saint Lucia and the Eastern Caribbean countries, is also a country prone to natural disasters, and Japan's experience in disaster management for health is one of the types of health cooperation that only Japan can provide.

In addition, Saint Lucia is a small island country with a population of 180,000 and is vulnerable to disasters. Much less do they have the resources in the health sector to provide adequate health and medical services. For tertiary care level treatment, patients are being transferred to neighboring countries. The nominal GDP per capita is US\$9,419 (2021 data from IMF/John Hopkins University),

which is relatively high among developing countries, but considering the vulnerability of small island states, cooperation is highly significant.

Table 8-21 shows the proposed cooperation scenario summarizing the above results.

Table 8-21 Proposed Cooperation Scenario: Strengthening of OECS Regional Cooperation on the Theme of Countermeasures against NCDs and Utilization of Japan's Remote Island Experience in Health Sector

Item	Content	Remarks
Name	Strengthening of OECS Regional Cooperation on the Theme of Countermeasures against NCDs and Utilization of Japan's Remote Island Experience in Health Sector	Measures against NCDs and strengthening of regional cooperation will be carried out at the same time.
Main issue	Although the prevalence of NCDs is increasing, the capacity to provide health services to NCDs patients is insufficient. In particular, there is a quite shortage of health personnel and medicines. In addition, there are issues unique to small island countries, such as limited resources due to small economies and populations, and frequent disasters.	One of the reasons for the shortage of health workers is that many workers go abroad to work in other countries, taking advantage of their native language being English.
Purpose	(1) Strengthening cooperation in the health sector among OECS member countries (2) Strengthening and improving ability to prevent, diagnose and treat NCDs	NCDs measures focus on prevention, early detection and treatment.
Implementing Agency / Counterpart	OECS and Ministry of Health in OECS member countries	Cooperate with each country through the health unit of OECS. A few selected countries, including Saint Lucia and other countries, will be implemented.
Budget	Tens of millions to hundreds of millions of yen	It varies depending on which component (1) to (3) is adopted.
Period	Several months to several years	It is assumed that training in Japan will take several months, and technical cooperation projects will take about three to four years.
Beneficiaries / Beneficiary population	Residents of Saint Lucia and OECS member countries Approximately 180,000 to 625,000 (Saint Lucia population to total population of OECS member countries)	The beneficiary population fluctuates depending on the selection of target countries.
Assumed component	(1) Training in Japan on remote island medical care. (2) Technical cooperation project/long-term expert dispatch for strengthening regional cooperation and regional health on the theme of prevention, early detection and early treatment of NCDs. (3) Introduction of patient data sharing and management, image transfer system, doctor helicopter, drone, etc.	Of the three components, the main scenario is assumed to be (2) a technical cooperation project for strengthening regional cooperation and regional health on the theme of prevention, early detection and early treatment of NCDs, and long-term expert dispatch.
Consistency with policy	In both OECS and Saint Lucia, NCDs measures are priority policies in health sector. OECS is an organization that aims at regional cooperation.	Among NCDs measures, both OECS and Saint Lucia prioritize prevention of diabetes and hypertension, electronic sharing and storage of patient records, and health promotion.
Expected Outcomes / Goals	(1) Cooperation on health between East Caribbean countries will be strengthened. (Efficient sharing of health resources) (2) The number of examinations for NCDs provided at the primary/secondary level will increase. (Prevention of NCDs, improvement of early detection and early treatment) (3) Capacity development for health personnel (improve management, diagnostic/testing capabilities, etc.) (Overall Goal/Outcome) Reduced mortality from NCDs under age 70 (increased life expectancy)	The results of health collaboration will confirm the results of concretely linked systems and experience sharing. (For example, electronic sharing of patient information has made it possible to refer to patient information in any country in the OECS)

Item	Content	Remarks
Japan's strengths and reasons for implementation	The medical environment in Japan, which has many remote islands, is similar to that of the small island nation of Saint Lucia and other East Caribbean countries. Japan, like Saint Lucia and the Eastern Caribbean countries, is also a country prone to natural disasters, and Japan's experience in disaster management for health is a strength of Japan's cooperation.	
Considerations	Saint Lucia has a population of 180,000 and does not have economies of scale. It is a small island country and is vulnerable to disasters. The tertiary health care level responds by transferring patients to neighboring countries, which does not provide adequate health care services. Therefore, although nominal GDP per capita is US\$9,419 (2021, data from IMF/John Hopkins University), which is relatively high among developing countries, it is important to note the vulnerability of small island states.	Points to note in the implementation of cooperation scenario are described below.

Source: JICA Study Team

d) Points to Note in Implementing Cooperation Scenarios

Below are some points to keep in mind for the cooperation scenario.

In East Caribbean countries, cooperation through OECS, which has more similarities in the situation and issues of the countries, is preferable to CARICOM. In addition, the OECS side wishes to resume the suspended project, and although it seems impossible for JICA to resume the suspended project, it is necessary to consider the linkage and effective use of the data and content of the suspended project.

In addition, under COVID-19, telemedicine was used mainly by wealthy people who can use ICT infrastructure and internet. Since this could create a new gap with the poor who cannot use smartphones or internet access, it is important to pay attention to whether the poor can enjoy the service when introducing the above-mentioned telemedicine services. In November 2022, the Osaka General Medical Center was attacked by ransomware and was forced to suspend medical services at the hospital. When handling patient data in medical information systems such as electronic medical records, it is essential to incorporate the perspective of cyber security.

Regarding remote island medical system, the key to effective utilization of medical resources is collaboration and cooperation with the country that corresponds to the main island of Japan (a country with a high level of medical care and with which it is possible to cooperate). It is necessary to determine which country corresponds to Japan's main island, and in the case of St. Lucia, Cuba, which already has strong ties, and Martinique, which has a high level of medical care in neighboring countries, can be considered as candidates.

Finally, the survey confirmed that Saint Lucia has strong medical ties with Cuba. When promoting stronger collaboration with the Eastern Caribbean countries, consider continuing ties with Cuba and transferring technology from Cuba.

The points to note are summarized in the table below.

Table 8-22 Points to Note in Implementation of Cooperation Scenario

Item	Points to Note in Cooperation Scenarios
Cooperation with OECS	Consider the effective use of the contents and information of the suspended project
Health ICT	Are the services accessible to the poor? Is cyber security adequate?
Remote island medical system	It is necessary to establish a country that corresponds to the main island of Japan (a country with a high level of medical care and with which it is possible to cooperate) and deepen cooperation and collaboration. (For St. Lucia, would Cuba or Martinique be candidates)
Collaboration	While deepening cooperation among OECS member countries, also consider the use of cooperation with Cuba, where cooperation in health human resources is already progressing.

Source: JICA Study Team

e) Related Sector

Collaboration and cooperation with the following sectors can be considered.

Table 8-23 Coordination and Cooperation with Other Sectors

No.	Sector	Contents
1	Information and telecommunications sector	Strengthening of OECS regional cooperation "1-2 Cooperation of medical supplies/health information system" and sharing of experience of medical care on remote islands in Japan "2-2 Sharing and utilization of experience of medical cooperation in Japan (Introduction of sharing mechanisms, etc.)", collaboration and cooperation with the ICT sector in telemedicine, such as electronic medical record sharing and image transmission systems, can be considered.
2	Transportation sector	In "2-3 medical cooperation through the introduction of technology such as doctor helicopters and drones," sharing Japan's experience in remote island health, collaboration and cooperation in the introduction of doctor helicopters, drones, etc. with the transportation sector can be considered.
3	Education sector	In "1-3 Effective utilization of human resources and strengthening of capacity through coordination of health human resources" for strengthening regional OECS cooperation, collaboration and cooperation with the education sector in the long-term development of health personnel (higher education, specialized medical education) can be considered.
4	Regional Cooperation/ South-South Cooperation	Strengthening of OECS regional cooperation in "1-1 Sharing experiences/lessons and strengthening cooperation in the health sector of OECS countries", regional cooperation and South-South cooperation can be considered for the promotion of intra-regional cooperation in the East Caribbean countries. Also, consider medical cooperation with Cuba.

Source: JICA study team

8.3.3 Guyana

(1) Overview of Health Care

1) Current Situation and Challenges of Health Sector

Guyana was classified as an upper middle-income country in 2021. The Human Development Report 2021/2022 ranked Guyana 107 on the Human Development Index and 114 on the gender inequality index out of 191 countries. The life expectancy at birth in Guyana (70 years in 2019) is the second lowest in the region. The population is relatively young, and only 7% is aged 65 years or older, although this portion may grow quickly in coming years as the country progresses to the final stage of the demographic transition with lower birth and mortality rates²⁷.

The country is in epidemiological transition. Non-communicable diseases are the major causes of

²⁷ Institute for Health Metrics and Evaluation (IHME). 2019. *Global Burden of Disease Study 2019 (GBD 2019) Data Resources*. <http://ghdx.healthdata.org/gbd-2019>

morbidity and mortality while there is still a significant burden of communicable diseases. Violence and injuries continue to be a major problem in the country with an increasing incidence of domestic violence and road traffic accidents. Violence and injuries are the leading causes of mortality and exact a terrible cost in terms of morbidity, mortality, and disability²⁸.

a) Medium- and Long-term Health Plan by the Ministry of Health

Health Vision 2020

A National Health Strategy for Guyana 2013-2020 was developed with the vision that: “All people of Guyana are among the healthiest in the Caribbean and the Americas”. Its two pillars are Universal Health and Addressing the Social Determinants of Health. The strategy takes into consideration the plans already developed such as the Strategic Plans for the Integrated Prevention and Control of Non-communicable Diseases and the Reduction of Maternal and Neonatal Mortality. The SDG targets identified are all consistent with the priorities and implementation strategies of the Health Vision 2020.

b) Healthcare Service Delivery

The Ministry of Health is mandated through the Public Health Act 2005 to ensure effective policy formulation, regulation, coordination, monitoring and evaluation of the health sector. Service delivery is provided through five levels of care - from health posts to national level facilities. The country is divided into ten administrative regions, managed by Regional Democratic Councils (RDCs) that are legally responsible for the delivery of health services. The Ministry of Health has the mandate in law for the health of the population. However, service delivery is the responsibility of the ten Regional Democratic Councils.

A separate arrangement is in place for the Georgetown Public Hospital Corporation with its own legislation that affords some level of autonomy. There is a growing private sector which functions mainly in the larger centers of population. Several non-governmental organizations are also involved in varying aspects of health. There is no national health insurance but there is a national insurance scheme that provides some health insurance benefits.



Source: Guyana Health System Assessment 2010

Figure 8-24 Referral System in Guyana

²⁸ <https://www.healthdata.org/guyana> (access 13 October 2022)

The health care network includes 199 health posts, 127 health centers, 18 district hospitals, 7 regional hospitals, and 3 national referral hospitals, primary of which is Georgetown Public Hospital Corporation (GPHC)²⁹.

c) Health Facility (Infrastructure)

Guyana has an extensive offer of primary care through its numerous health posts and centers; hospital care is more constrained, with only 1.6 beds per 1,000 persons, lower than the averages in LAC (2.2) and the Caribbean (2.3)¹⁴. A recent nationwide assessment of 330 health facilities showed that many of them require infrastructure rehabilitation, construction and/or upgrade and equipment replacement or provision. Twenty-percent of the buildings have no electricity, and only 60% of buildings receive water continuously during operating hours. In addition, just 20 buildings (6%) receive treated water. Regarding structural, architectural, and operational integrity, 24 of the buildings were judged to require immediate rehabilitation and/or construction. The country's principal national reference hospital, the Georgetown Public Hospital, requires significant infrastructure investments to improve patient flows, alleviate overcrowding (>100% bed occupancy), reduce the risk of cross-contamination, and expand key clinical medicine and surgery as well as support services (imaging, laboratory, logistics and administration). Similarly, at the time of evaluation in 2018/19, the New Amsterdam and Linden Regional Hospitals, strategic for providing services to the country's interior, were deemed to require rehabilitation in multiple service areas within three years²⁹.

In addition, as a result of the remote interview with the PAHO Guyana Office, it is necessary to strengthen the infrastructure centering on nine hospitals (three to be renovated and six to be newly built), and to create a new medical system model that matches the strengthening of the infrastructure. PAHO Guyana Office will promote cooperation with the Ministry of Health of Guyana, focusing on the two above points. The renovation of the above three hospitals is the subject of the project currently underway at IDB.

d) Health Human Resources

Guyana faces severe human resource limitations, with just 0.8 doctors and 1.0 nurses per 1,000 persons, far below the LAC averages of 2.0 and 2.8, respectively¹⁴. Given the concentration of health professionals in the coastal and urban areas, these indices are even worse in the rural interior.

In March 2019, MoH started the first phase of a strategy by conducting a situation analysis with Dalhousie University. The shortage of health personnel in Guyana is a serious situation, and it has been pointed out that the migration of skilled workers particularly doctors and nurses to other countries raised brain drain in the country. In the past, there was a HR department which was funded by a project. However, when the project ended, the ministry could not retain the staff³⁰. As a result of the interview survey, 40% of Guyana's nurses are currently working in other countries. It is necessary to secure health personnel in parallel with strengthening infrastructure to conduct the Package of Essential Health Services.

²⁹ CONDITIONAL CREDIT LINE FOR INVESTMENT PROJECTS AND FIRST OPERATION FOR HEALTH CARE NETWORK STRENGTHENING IN GUYANA (IDB, 2022)

³⁰ <https://www.observatoriorh.org/en/status-situation-2020-country-guyana> (access 13 October 2022)

e) Digital Health

As a result of remote interviews, many development partners are planning to help Guyana for digital health. As of 2022, discussions are underway to formulate a digital health policy led by the Ministry of Health. The digital health promotion envisaged in the project by the IDB (first phase of the project) considers the introduction and sharing of electronic medical record systems and the use of remote imaging and remote eye examination services, etc., with the main objective of reducing the healthcare gap with hinterland areas where access to healthcare is difficult. The promotion of digital health is also recognized as an essential element in advancing a comprehensive approach as a new health system model.

f) Medicine

The Government Analyst-Food and Drugs Department (GA-FDD) is the National Regulatory Authority for food and drugs in Guyana. Legislation guiding the department is old, with the Food and Drug Act coming into force in 1971 and its regulations in 1977. Some of the provisions such as the establishment of a Drug Advisory Committee have not been implemented. The legislation has been reviewed and recommendations were made for updating.

The Essential Medicines List (EML) has been updated in line with the revisions of the Package of Essential Health Services. Several issues exist with respect to the supply and distribution of pharmaceuticals and medical supplies. These include shortages, wastage, and expired drugs. Guyana takes part in the PAHO Revolving Fund for the purchase of vaccines and has recently signed on to the PAHO Regional Revolving Fund for Strategic Public Health Supplies to ensure improved access to safe, quality, and effective essential medicines and supplies. Interventions proposed in the Health Vision 2020 include development of a national pharmaceutical policy in line with the Caribbean Policy; monitoring compliance with the Standard Treatment Guidelines to ensure rational use of drugs and the establishment of a management information system for drugs and medical supplies³¹.

g) Health Finance

Public health expenditures, financed through general taxation, represented 3.7% of GDP in 2018, below the LAC average of 4.1%. Furthermore, expressed in per capita terms, this spending (US\$317 current PPP) is less than half that of the regional average (US\$648 current PPP). Public health expenditure as a share of total government expenditure in 2019 was 10.3%, below the 15% recommended by WHO³².

Guyana has a national public health system that pursues universal coverage free of charge to all Guyanese. Only around 5% of the population use voluntary private health insurance, and out-of-pocket payments comprised an estimated 32% of total health spending in 2019²⁹. A National Health Accounts (NHA) study has been initiated with support from PAHO and WHO. Implementation has been slow due to staffing constraints. An assessment of the health information system identified constraints such as fragmentation and inadequate human and financial resources³¹.

³¹ GUYANA COUNTRY COOPERATION STRATEGY 2016-2020 (PAHO, 2017)

³² World Bank Indicators <https://data.worldbank.org/indicator>

h) Primary Health Care

Universal Health (UH) is one of the two main pillars of the Health Vision 2020 strategy. UH promotes a renewed focus on primary health care (PHC) as the main approach to public health care provision in Guyana. The Ministry of Public Health has developed the Package of Guaranteed Health Services, now called the Package of Essential Health Services, which outlines the facility-based health care services to be made available to the public, free of charge, at each level of the health care system. The package, prepared by the MOH with technical assistance from PAHO, is a critical milestone that will project adequate human resources to be trained and deployed in the ten administrative regions of Guyana.

Health Vision 2020 has indicated that poverty remains particularly marked among Amerindian and rural interior populations, children and young people below 25 years old. Persons living in regions 1, 7, 8, and 9 experience health outcomes below the national average. Factors related to poverty in the rural and hinterland areas include isolation and difficulties with transportation and communication. The health services have implemented many strategies to ensure accessibility and availability of services to the socially excluded or disadvantaged sub-populations. These include the implementation of the Package of Essential Health Services and strengthening the primary health care system³¹.

i) NCDs

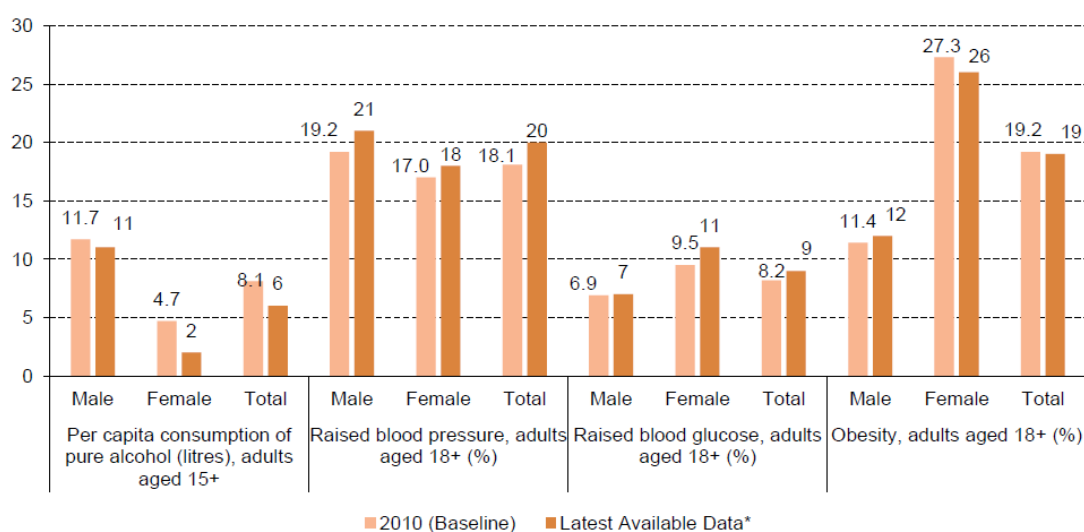
Chronic diseases are major contributors to morbidity and mortality in Guyana but they have not been able to attract much donor support. A review of the leading causes of death over the period 2008-2012 shows the predominance of the chronic diseases with cerebrovascular disease and ischemic heart disease ranking as the two main causes of death with neoplasms third. It is estimated that the prevalence of diabetes is 6.2% of the population over 30 (31,000 persons) while hypertension affects 18% of that same population (52,000 persons). New cases of diabetes and hypertension are estimated annually at 2,000 and 9,000, respectively. It was projected that in 2015, 9% of all deaths (7.2% males and 10.9% females) were due to diabetes. A national multisectoral NCDs Strategy 2013-2020 was developed and launched in 2013³³.

The country is making efforts to also reduce the modifiable risk factors, namely, tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol through the implementation of strategic interventions which include a National Tobacco Legislation, the introduction of a Tobacco Cessation Program and taxation of sugar beverages³³.

There is some sex difference in the risk factors for NCDs in Guyana where males consume more alcohol and have raised blood pressure while more females have raised blood glucose and obesity. Except for the consumption of alcohol, the prevalence of NCD risk factors did not much in Guyana between 2010 and 2016 (see Figure 8-25). In the case of alcohol consumption, there has been a reduction in the prevalence for both sexes with the reduction for women (4.7 to 2.0 liters) relatively greater than for men (11.7 to 11 liters)³⁴.

³³ GUYANA COUNTRY COOPERATION STRATEGY 2016-2020 (PAHO, 2017)

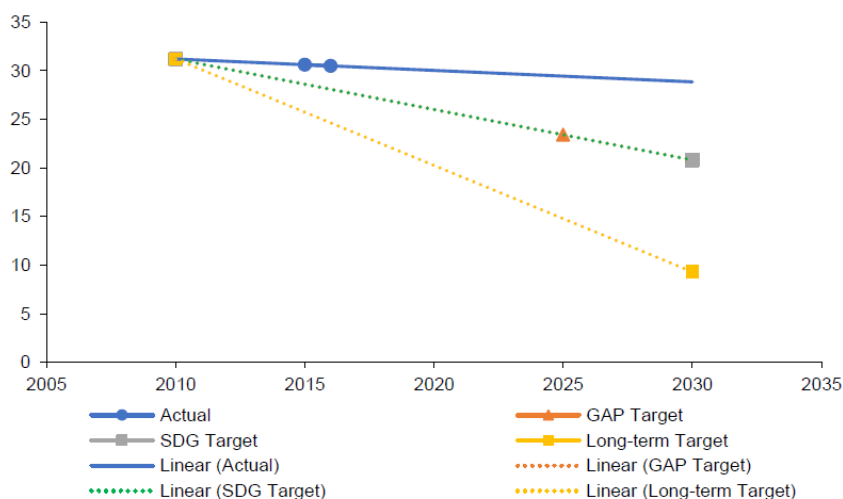
³⁴ Addressing the adverse impacts of non-communicable diseases on the sustainable development of Caribbean countries



Source: Addressing the adverse impacts of non-communicable diseases on the sustainable development of the Caribbean countries

Figure 8-25 Changes in NCD Risk Factors (2010 vs 2016)

As can be seen in Figure 8-26, the premature death rate from NCDs has decreased from 31.2% in 2010 to 30.5% in 2016. This trajectory shows that Guyana’s progress is somewhat flat, and the country is not positioned to achieve the SDG and GAP 2013–2025 targets. A more drastic reduction in mortality will be required to attain these global targets and even more for the country to achieve the long-term objective of 9.3% mortality for NCDs³⁴.



Source: Addressing the adverse impacts of non-communicable diseases on the sustainable development of the Caribbean countries

Figure 8-26 Trends in the Achievement of Global Targets on NCDs, Guyana, Probability of Premature Death from NCDs

j) Maternal and Child Health, Nutrition

Several gains have been made with respect to maternal and child health. There is a very successful immunization program and trained health personnel attending nearly all births. Guyana shows high skilled birth attendance coverage (96% or more). Skilled health personnel supervise nearly all births,

but relatively with high maternal mortality ratio (MMR) (all over 120), probably evidencing quality of care problems. Guyana shows antenatal care coverage above 85% but MMR over 150 deaths per 100 000 live births, which might be linked with quality of care issues³⁵.

The Prevention of Mother-to-Child Transmission (PMTCT) program has reduced the mother-to-child transmission of HIV from 7% in 2003 to less than 2% by the end of 2014. PMTCT interventions are fully integrated into the Maternal and Child Health (MCH) program. However, several challenges exist in the care of pregnant women and newborns such as lack of specialist trained staff at some of the regional and district hospitals to cater for obstetric emergencies, quality of hospital care and delivery, and the need for more family planning services. The Multiple Indicator Cluster Survey (MICS) conducted by UNICEF in 2014 found that the contraceptive prevalence rate was 34.1%.

In Guyana, adolescents face challenges related to comprehensive sexual and reproductive health, mental health, and teen pregnancies, including repeat pregnancies in teenagers and gender-based violence at the community and national levels. The high rate of teenage pregnancy represents 20% - 24% of all pregnant women³⁶.

Nutritional issues significantly affected children under 5. The prevalence of underweight children under 5 was 8.5% for moderate and severe, with 2.2% severe. Stunting prevalence for the same age group was 12% moderate and severe, with 3.4% severe. Wasting prevalence was 6.4% moderate and severe, with 1.7% severe. The overweight prevalence was 5.3%³⁷.

k) Infectious Disease, Other Issues

The number of newly reported HIV/AIDS cases in 2020 was 43 per 100,000³⁸. Tuberculosis is one of the leading causes of death from infectious diseases, with an incidence rate of 79 cases per 100,000 in 2020. The number remains stable³⁹. Continued focus is needed until the number of HIV and tuberculosis cases is steadily reduced.

As to the results of the interviews, Guyana has the second highest suicide rate in the world and that the mental health is particularly important. Suicide is the leading cause of death among young people and there is an urgent need to improve and support their mental health.

2) Investment Projects Based on Conditional Credit Line by the IDB

This proposed sector Conditional Credit Line for Investment Projects (CCLIP) will be allocating US\$160 million for financing through the ordinary capital of the IDB that will finance up to two projects during a period of ten years. The amount of CCLIP is estimated to cover the priority financing needs of the MOH, and the period of execution is necessary to allow for the implementation of complex infrastructure works. The first operation is a specific investment loan in the amount of US\$60 million, with a disbursement period of five years.

³⁵ Health at a Glance: Latin America and the Caribbean 2020 (PAHO, 2020)

³⁶ <https://www.paho.org/en/news/3-6-2022-guyana-takes-action-address-high-rate-teenage-pregnancies-urgent-public-health-issue> (access 18th November 2022)

³⁷ GUYANA COUNTRY COOPERATION STRATEGY 2016-2020 (PAHO, 2017)

³⁸ <https://aidsinfo.unaids.org/> (access 18th November 2022)

³⁹ Global tuberculosis report 2021 (WHO, 2021)

a) “Health Care Network Strengthening in Guyana” Project (First Operation)

The project will target infrastructure improvement and expansion in three priority hospitals, namely: the New Amsterdam Regional Hospital (NARH) (Level 4), Linden Hospital Complex (LHC) (Level 4), and the Georgetown Public Hospital Corporation (GPHC) (Level 5) including the country’s hinterlands, through digital health. The project is expected to improve access, use, and quality of health services in Guyana. The three hospitals benefiting from the project have a catchment population of around 315,000 persons, which is nearly 40% of the entire population.

Table 8-24 Overview of the “Health Care Network Strengthening in Guyana” project (First Operation)

Name	“Health Care Network Strengthening in Guyana” project (First Operation)
Purpose	-To increase the number of consultations and examinations provided at the primary level of care -To increase referrals to district and regional hospitals for consultations, examinations and/or procedures that require a more specialized level of care -To increase access to radiology and ophthalmology services -To ensure the continuous availability of key medicines, inputs, and supplies in health facilities
Scale	US\$60 million
Period	5 years
Target facility, beneficiary population	Georgetown Public Hospital Corporation (GPHC) (Level 5), New Amsterdam Regional Hospital (NARH) (Level 4), Linden Hospital Complex (LHC) (Level 4), About 315,000 people (about 40% of the total population)
Remarks	As a US\$160 million Contingent Credit Line for Investment Projects (CCLIP), it plans to finance up to two projects over ten years. The above is the project contents of the first phase project

Source: JICA study team based on IDB documents

The project has three components:

Component 1 focuses on supporting hospital health services networks (US\$48 million).

Component 2 focuses on strengthening digital health (US\$7.2 million)

Component 3 focuses on promoting health sector management and efficiency (US\$3 million).

The table below shows the contents of each component.

Table 8-25 Components of the Health Care Network Strengthening in Guyana project (First Operation)

Component Items	Contents
1. Supporting hospital health services networks (US\$48 million)	(i) infrastructure rehabilitation and expansion at the New Amsterdam Hospital, Linden Hospital Complex, and the Georgetown Public Hospital Corporation, considering energy and water efficiency and climate change risk reduction features; (ii) purchase of medical equipment and furniture for these and other facilities; (iii) services for architectural and engineering design and construction supervision; and (iv) corrective and preventive maintenance of infrastructure works and medical equipment and improvement of installed maintenance capacity.
2. Strengthening digital health (US\$7.2 million)	(i) digital health governance and sustainability (assessments of preparedness, national strategy and budget, and digital health foundations: core team, architecture, data privacy norms, cybersecurity, interoperability guidelines, electronic health record strategy, telehealth strategy and norms, change management strategy, total cost of ownership); (ii) strengthening and expansion of the current teleradiology and teleophthalmology networks, plus other telemedicine services (tele-therapy, triage), to the country’s hinterland areas, including its socio-cultural adaptations; (iii) telehealth infrastructure and connectivity; (iv) preparedness for the selection and implementation of an electronic health record system; and (v) software maintenance and support. Digital health can reduce the emissions of greenhouse gasses by reducing travel for health care and hardware purchases will follow best practices to reduce Information and Communication Technology emissions.
3. Promoting	(i). human resource quality and availability (allied health professional assessment, including current

Component Items	Contents
health sector management and efficiency (US\$3 million).	supply, gaps, and projected demand; stock-taking of existing training capacity; curricula review and improvement, including socio-cultural dimensions in health; proposal for addressing sector’s Human Resources needs, considering training center that could be financed in second operation); (ii) supply chain management (expansion of warehouse capacity; software and hardware for electronic supply chain management system; training of staff in supply chain management); (iii) pandemic and emergency preparedness (analysis of COVID-19 response, Emergency Operations Center plan, simulation exercises, laboratory equipment and diagnostic tests procurement, and biosafety/biosecurity assessments); and (iv) essential services package for maternal and child health (laboratory and medical equipment, maternal waiting homes, community health committees set-up and training).

Source: JICA study team based on IDB documents

Regarding Component 2, given the success of the MoH telemedicine initiatives and the further potential that these and other digital health interventions show for innovation, this component will ensure financing for the country’s plans for digital transformation in health.

In addition to the three project components described above, the project will also support project administration and program monitoring and evaluation at a cost of US\$1.8 million. These resources will support the MoH in program management and assessment of its effects. It will finance specialized consulting services for project implementation, costs associated with the Project Executing Unit (PEU), and evaluations of project implementation and impact.

b) Background and Reasons for the Selection of Phase 1 Project Facilities, and their Positioning in National Strategies and Plans

As a result of the interviews, it was confirmed that Guyana plans to build six new hospitals and renovate three hospitals, and that the country will continue to strengthen its infrastructure. The renovation of the three hospitals is the subject of the IDB's Phase 1 project. The Georgetown Public Hospital Corporation, New Amsterdam Regional Hospital, and Linden Hospital Complex have been selected as top referral hospitals and regional core hospitals in the first phase of the project. In addition to aging medical facilities, as noted in the health infrastructure section, Georgetown Public Hospital Corporation, New Amsterdam Regional Hospital and Linden Hospital Complex need infrastructure investment to meet wider patient needs such as reducing overcrowding for accommodating more patients and expanding services. The New Amsterdam and Linden Hospitals are in urgent need of renovation to serve the patients in the hinterlands of the country. In addition, the second component of the first phase project - strengthening digital health, is positioned as an important measure for providing medical services to hinterland areas.

From the viewpoint of realizing universal health, which is a priority policy of Guyana, and providing an essential health package, it is important to build a resilient health system, and it is appropriate to strengthen the infrastructure of referral hospitals in the first phase of the project. Projects that are considered desirable for implementation in Phase 2 are described in the section on the recommendation (potential cooperation scenario).

3) Development Partner Trends

a) PAHO/WHO

The Country Cooperation Strategy (CCS) for Guyana is a way to ensure agreement on the priorities

to which PAHO/WHO will direct the majority of its resources³⁷.

The selected strategic priorities are:

1. Strengthening health systems for universal health.
2. Achieving health and well-being throughout the life course.
3. Promoting safe, resilient, healthy environments.
4. Reducing the burden of non-communicable diseases.
5. Reducing the morbidity and mortality due to communicable diseases.

PAHO is also supporting the MOH Guyana to define a service delivery model based on integrated health service delivery networks at the regional level, to update national clinical guidelines that will inform the preparation of treatment pathways, and to estimate the human resources needed for its gradual implementation. PAHO will support the implementation of the package by providing technical cooperation for the adoption of a national laboratory strategy, a referral system, the preparation of regional health profiles and needs, the preparation of annual regional health plans and their costing, as well as the definition of regional integrated networks⁴⁰.

From the remote interview with a representative of the PAHO/WHO Guyana Office, it was noted that, in the case of JICA support for the second phase of the IDB project, the expansion of PHC services for the provision of essential health services (renovation of PHC facilities, provision of equipment, human resource development, strengthening management capacity and technical strengthening of medical personnel) is a high priority and its cooperation is desired.

b) CARPHA / CARICOM

The Caribbean Cooperation in Health, Phase IV (CCH IV) was formulated by CARICOM (CARPHA) as the regional health framework 2016-2025. The CCH provides a framework for CARICOM Member States to address common health and development challenges efficiently and effectively through functional cooperation and joint action. The intention is to build the capacity of member states to improve the conditions for health for all by developing and maintaining cost-effective and efficient health systems⁴¹.

CCH IV emphasizes multisectoral action and regional public goods (RPGs) to address common challenges in areas where a regional approach holds the best potential to add value to national efforts. It further reflects a greater understanding of the need for a whole-of-society approach that harnesses the capacities of a range of stakeholders across sectors and at all levels, to tackle the complex health and development challenges facing the Caribbean countries.

CCH IV will begin to address the health systems improvements required to satisfy the needs of universal health coverage. These will touch the health information systems (HIS); human resources diversity required; and policies on commodities and regulatory systems to enhance quality.

⁴⁰ <https://www.paho.org/en/news/31-3-2022-ministry-health-guyana-and-paho-collaborate-produce-package-essential-health-care> (access 18th Nov. 2022)

⁴¹ Caribbean Cooperation in Health Phase IV (CCH IV) Summary of the Regional Health Framework 2016 – 2025 (CARICOM, 2016)

4) Summary of Challenges in the Health Sector in Guyana

The challenges in Guyana's health sector, which are identified as a result of the survey, are summarized below.

Issue 1: Addressing a wide range of health issues

The challenges of health in Guyana are manifold. Life expectancy is low at 65.7 years⁴² and MMR is 150 per 100,000 live births, second only to Haiti in the Caribbean. The proportion of out-of-pocket for patients is high at 34.8%³². Furthermore, Guyana has the second highest suicide rate in the world, with 40 out of every 100,000 people committing suicide in 2019³². Although the country has a large youth population, there is an urgent need to address the mental health of young people, including youth suicide and unwanted pregnancies. On the other hand, NCDs are also expected to become a major challenge in the future as the population ages, but Guyana's progress in SDGs and other targets in the NCDs are not on track, and the country is currently finding it difficult to achieve its SDGs, GAPs, and other targets. Disparities between coastal and hinterland areas were also noted by the interview with PAHO/WHO. Also, poverty and disparity existed even within Georgetown, where the capital is located. In order to address these far-reaching health challenges, the entire health system needs to be strengthened and a holistic approach implemented.

Issue 2: Fragile health systems, especially health human resources shortages.

Guyana does not have an adequate health service delivery system, and as in other Central American and Caribbean countries, there is a shortage of health human resources due to the problem of brain drain of health personnel. The ageing of medical facilities and equipment and shortages of medicines are also problems. In order to address the various health challenges listed in Issue 1, a resilient health system based on a cross-sectional approach is required rather than longitudinal programs/projects that focus on specific diseases.

(2) Recommendation (Potential Cooperation Scenario in Guyana)

As part of JICA's cooperation with Guyana, JICA is considering co-financing the second phase of the investment project being promoted by the IDB. Although the details of the second phase of the project are also planned by the IDB, the JICA Study Team will propose a desirable cooperation scenario with the co-financing with the IDB based on the areas of high priority and implementation needs in Guyana's health care.

In the first phase of the project, the focus is on strengthening the infrastructure of referral hospitals at the 4th and 5th level (general tertiary level) of the referral system in Guyana. Strengthen health facilities and PHC at the 1st to 3rd level (general primary and secondary levels) in Guyana for the project in the second phase are desirable to realize UHC.

The promotion of PHC is consistent with Guyana's health policy. Specifically, improvement of the quality of maternal and child health at the PHC level, strengthening of the capacity of health personnel to realize the prevention, early detection and early treatment of NCDs, and strengthening of the infrastructure of PHC facilities (provision of medical equipment, etc.) will be provided. It will also

⁴² Global health estimates 2019 (<https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/>, accessed 2 May 2022)

support the expansion of essential health packages, which are emphasized in Guyana's health plan.

With regard to maternal and child health, it is pointed out that although the figures for antenatal care and facility deliveries with skilled birth attendant are high, the quality is not as high. While improving the quality of primary to tertiary maternal and child health care, it is necessary to strengthen the prevention, early detection, and early treatment of NCDs, which are expected to continue to increase in the future.

Furthermore, by effectively utilizing the digital health environment developed in the first phase of the project, the second phase of the project aims to deliver medical services to hinterland areas where medical access is difficult. In addition, improvement of the referral system will be conducted by implementing appropriate referrals to the upper level hospitals whose infrastructure was developed in the first phase of the project. Considering the referral system in the target area, it is desirable that target PHC facilities be located in the same administrative district as the three hospitals in the first phase of the project and the six hospitals to be newly established.

Table 8-26 Potential Cooperation Scenario of Phase 2 Project in co-financing with IDB

Item	Content	Remarks
Name	PHC expansion project in Guyana (Phase 2 project)	Although the primary care level is the focus, strengthening of district hospitals (secondary care level) is also included.
Purpose	<ul style="list-style-type: none"> ➤ Expansion of PHC to realize UHC ➤ Building a resilient health system and strengthening the referral system ➤ Improving the quality of maternal and child health, measures against NCDs (especially prevention of diabetes and hypertension, early detection and early treatment of diseases) 	In the first phase of the project, the focus is on strengthening the infrastructure of referral hospitals at the 4th and 5th levels (general tertiary medical level) of the referral system in Guyana. Aim to strengthen 1 st – 3 rd level (general primary and secondary medical level) medical facilities and PHC for second phase of the project.
Budget	Approximately US\$100 million	The remaining amount of the total budget of Phase 1 and Phase 2. Total budget is US\$160 million, and the budget of the first phase project is US\$60 million.
Period	For 5 years	The duration of first and second phases is 10 years. After the completion of the first phase project, second phase will start.
Target, Beneficiary population	Target: Health posts, health centers, district hospitals and medical workers at Levels 1 to 3 (general 1st to 2nd medical medical) of Guyana medical facilities in the surrounding areas of the 3 target hospitals of the first phase project Beneficiary Population: Approximately 315,000 local residents (approximately 40% of the total population)	There are plans to establish six new hospitals outside of the IDB project target, and there is room for consideration of targeting those areas.
Assumed component	<ul style="list-style-type: none"> ▪ Strengthening the infrastructure of primary/secondary medical facilities (renovation of facilities, provision of medical equipment) (Hereafter referred to as soft component) ▪ Support for expansion of essential health packages ▪ Implementation of training, supportive supervision, and monitoring to strengthen the capacity of health personnel (improvement of the quality of maternal and child health, prevention/early detection/treatment of NCDs, improvement of diagnostic capacity) ▪ Use of well-established digital health (especially in the field of diagnostic imaging and ophthalmology) ▪ Improvement of referral system 	Due to the large scale of budget, about 90% of the funds will be allocated to strengthening infrastructure, and about 10% will be for other soft components. However, it should be noted that the soft component is more important than the price difference. In addition, if the capacity building of the medical staff at the three hospitals, which was strengthened in the first phase of the project, is insufficient, consider including three hospitals for implementing training, supportive supervision, and monitoring for the medical staff.

Item	Content	Remarks
Consistency with the policy	In "Health Vision 2020", the Ministry of Health of Guyana aims for universal health and makes the provision of essential health care by free of charge to all citizens a top policy priority. As a method, PHC strengthening and essential health packages have been introduced, and the PHC expansion/strengthening project is in line with the policy. Furthermore, the cooperation scenario incorporates the advice of the person in charge of the PAHO Guyana office, which works with the Guyana Ministry of Health to formulate policies and plans.	"Health Vision 2030" is still being formulated, but interview surveys have confirmed that there will be no major changes to its direction.
Expected results	(1) The number of examinations and examinations provided at the primary level will increase. (2) Appropriate number of referrals to regional hospitals is carried out. (3) Access to radiology and ophthalmology will be improved through the use of digital health. (Overall Goal) (1) Decrease in mortality due to NCDs under age 70 (increase in life expectancy) (2) Decrease in maternal mortality ratio and infant mortality rate.	In the second phase of the project, by focusing more on the primary level, aims to strengthen the referral system, prevent disease, and realize early detection and early treatment of disease.
Japan's strengths and reasons for cooperation	JICA's cooperation has strengths in "human resource development," and Japan's assistance is highly significant not only for facility renovation and provision of medical equipment, but also for the implementation of soft components after infrastructure strengthening, especially for the development of health personnel.	Although Guyana has become an oil-producing country and GDP growth can be expected, major health indicators such as maternal mortality ratio and infant mortality rate at present are the worst in the Caribbean next to Haiti. JICA's cooperation is also important from a humanitarian point of view.
Considerations	Compared with the first phase project, the second phase project plan emphasizes the soft component more. In addition, since the implementation date will be in the future, it will be necessary to revise the draft content as appropriate, taking into consideration the results of the first phase of the project, changes in the Central America and Caribbean region including Guyana, and international affairs.	In order for the IDB to conduct surveys and plans for the second phase of the project, it is necessary to confirm information with the IDB on the progress and results of the first phase of the project, as well as changes in the health care situation in Guyana.

Source: JICA Study Team

Part 3

Transition to Green Economy

Chapter 9	Energy
Chapter 10	Green Economy (Resilient Economic Development)
Chapter 11	Agriculture and Rural Development
Chapter 12	Fisheries Value Chain Development
Chapter 13	Local Economic and Social Development (Local Branding)
Chapter 14	Climate Change

9. Energy (Electric Power/Decarbonized Society, Energy Saving and Renewable Energy)

9.1 Electric Power Sector

9.1.1 Outline of the Study

A field survey and a remote meeting were conducted, including desk research and interviews with relevant organizations. Issues related to the electric power sector were identified, and development scenarios and JICA cooperation scenarios were formulated.

Table 9-1 shows the scope of work of the electric power sector within the economic infrastructure development sector.

Table 9-1 Scope of Work (Electric Power)

No.	Task	Scope of Works
1	Sector Targets	To present measures that contribute to the direction of carbon neutrality in the energy sector, which has been and will continue to be a major issue, and the possibilities for cooperation (countries and contents of cooperation).
2	Scope Update	Conducting studies on renewable energy and related electric power infrastructure in Jamaica and Guyana with a view to structuring projects in these countries.
3	[Task 2] Desktop Study	Collect indicator data (installed capacity, generated electric power by source, electrification ratio, loss ratio, and frequency of power outage) Identification of projects underway or planned Organization of issues Preparation of questionnaire
4	[Task 3] Field survey	In the first field survey, in Jamaica and Guyana, interviews with electric power authorities, electric power companies, other donors, international organizations, etc., were conducted and field checks were conducted on the aged infrastructure in Guyana. Instead of conducting the second field survey, the JICA Study Team continued to conduct remote surveys targeting Guyana.
5	[Task 8] Recommendation / Finalization of Development and Cooperation Scenarios	Finalize the development and cooperation scenarios based on comments from JICA and relevant organizations.

Source: JICA Study Team

9.1.2 Outline of Electric Power Sector in the Region

(1) Outline of Electric Power Sector in Central America

Table 9-2 shows indicators for the energy and electric power sectors, including primary energy supply (per population and per unit of GDP), energy self-sufficiency, the percentage of electric power derived from renewable energy sources, the percentage derived from fossil fuels, and the percentage of rural electrification. Table 9-3 shows the share of electric power from renewable and other energy sources.

Many countries in the Central American region have energy self-sufficiency rates of 50% or higher. This is because some countries, such as Mexico, are oil-producing countries, while others, such as Costa Rica, Guatemala, Honduras, and El Salvador, are not oil-producing countries, but have high rates of

electric power derived from renewable energy (hydropower, geothermal, solar, and wind), resulting in higher energy self-sufficiency rates.

On the other hand, it should be noted that in some countries further progress in rural electrification is considered necessary, such as Nicaragua and Honduras, where the rural electrification rate is below 90%.

Table 9-2 Indicators of Electric Power Sector in Central America

	Total Energy Supply (TES)(EJ)	TES/pop (GJ/capita)	TES/GDP (MJ/USD)	Overall Energy Self-sufficiency (%)	Source/note	Share of Renewable in Electricity Production (%)	Share of Fossil Fuels in Electricity Production (%)	Source/note	Access to electricity, rural (% of rural population)	Source/note
Belize	0.018	N/A	6.1	45% *3, 2019		93%	7% *3, 2020		96.1% *4, 2020	
Costa Rica	0.22	44	3.6	50% *2		99%	1% *2		99.7% *4, 2020	
El Salvador	0.19	30	7.4	43% *2		71%	29% *2		100.0% *4, 2020	
Guatemala	0.61	37	8.6	66% *2		59%	41% *2		96.6% *4, 2020	
Honduras	0.24	25	9.9	48% *2		53%	47% *2		83.7% *4, 2020	
Mexico	7.34	58	6.4	86% *1		19%	76% *1		97.7% *4, 2020	
Nicaragua	0.17	26	13.0	57% *2		71%	43% *2		72.9% *4, 2020	
Panama	0.21	48	3.2	17% *2		53%	47% *2		90.2% *4, 2020	
Japan	16.71	133	3.3	11% *1		19%	73% *1		100.0% *4, 2020	

Source: *1 IEA Atlas of Energy, 2020
 *2 IEA Atlas of Energy, 2019
 *3 Energy Profile (IRENA)
 *4 <https://data.worldbank.org/indicator/>, World Bank

Table 9-3 Installed Capacity of Renewable Energy in Central America

	Installed Capacity (MW)	Hydro/Marine (MW)	Solar (MW)	Wind (MW)	Bioenergy (MW)	Geothermal (MW)	Total of Renewable (MW)	Non Renewable (MW)	Source/note
Belize	194	55	7		42		103	91	*1, 2020
Costa Rica	3,599	2,332	57	394	80	262	3,124	474	*1, 2020
El Salvador	2,262	573	428		300	204	1,506	757	*1, 2020
Guatemala	4,119	1,577	101	107	1,036	49	2,870	1,249	*1, 2020
Honduras	2,853	838	516	241	221	39	1,855	998	*1, 2020
Mexico	87,969	12,671	5,644	8,128	1,010	906	28,358	59,611	*1, 2020
Nicaragua	1,620	157	16	188	218	153	731	888	*1, 2020
Panama	4,115	1,796	198	270	33		2,296	1,819	*1, 2020
Japan	351,804	28,147	68,665	4,371	1,826	481	103,490	248,314	*1, 2020

Source: *1 Energy Profile (IRENA)

(2) Outline of Electric Power Sector in the Caribbean Region

Table 9-4 shows indicators for the energy and electric power sectors, including primary energy supply (per population and per unit of GDP), energy self-sufficiency, percentage of electric power derived from renewable energy sources, percentage derived from fossil fuels, and the rural electrification rate.

Table 9-5 shows the share of electric power from renewable and other energy sources. The potential for hydropower generation is limited in small island countries in the Caribbean region. The potential for geothermal power generation is a challenge to balance with the size of the country's electric power demand even if a country has a potential for geothermal. Therefore, the main renewable energy is to be photovoltaic solar power. Although the rapid decline in the cost of introducing renewable energy has led to its adoption, the country still relies heavily on imported fossil fuels, wherein the share of renewable energy in the power sector is limited.

Table 9-4 Indicators of Electric Power Sector in the Caribbean Region

	Total Energy Supply (TES)(EJ)	TES/pop (GJ/capita)	TES/GDP (MJ/USD)	Overall Energy Self-sufficiency (%)	Source/note	Share of Renewable in Electricity Production (%)	Share of Fossil Fuels in Electricity Production (%)	Source/note	Access to electricity, rural (% of rural population)	Source/note
Antigua and Barbuda	0.007	N/A	3.5	1% *3, 2019		7%	93% *3, 2020		100.0% *4, 2020	
Bahamas	0.036	N/A	2.5	1% *3, 2019		0%	100% *3, 2020		100.0% *4, 2020	
Barbados	0.016	N/A	3.5	18% *3, 2019		6%	94% *3, 2020		100.0% *4, 2020	
Cuba	0.40	35	4.3	50% *2		4%	96% *2		100.0% *4, 2020	
Dominica	0.003	N/A	3.0	5% *3, 2019		20%	80% *3, 2020		N/A *4, 2020	
Dominican Republic	0.41	38	4.6	11% *2		10%	90% *2		100.0% *4, 2020	
Grenada	0.004	N/A	2.9	8% *3, 2016		2%	98% *3, 2017		N/A *4, 2020	
Guyana	0.041	N/A	4.0	9% *3, 2019		8%	92% *3, 2020		90.9% *4, 2020	
Haiti	0.19	17	21.1	78% *2		19%	81% *2		2.2% *4, 2020	
Jamaica	0.13	44	8.6	7% *2		11%	89% *2		100.0% *4, 2020	
Saint Kitts and Nevis	0.004	N/A	2.6	1% *3, 2019		4%	96% *3, 2020		100.0% *4, 2020	
Saint Lucia	0.008	N/A	2.8	8% *3, 2019		2%	98% *3, 2020		100.0% *4, 2020	
Saint Vincent and the Grenadines	0.003	N/A	2.5	5% *3, 2019		18%	82% *3, 2020		100.0% *4, 2020	
Suriname	0.043	N/A	4.0	94% *3, 2019		52%	48% *3, 2020		96.7% *4, 2020	
Trinidad and Tobago	0.72	514	31.3	201% *2		N/A	100% *2		100.0% *4, 2020	
Japan	16.71	133	3.3	11% *1		19%	73% *1		100.0% *4, 2020	

Source: *1 IEA Atlas of Energy, 2020
 *2 IEA Atlas of Energy, 2019
 *3 Energy Profile (IRENA)
 *4 <https://data.worldbank.org/indicator/>, World Bank

Table 9-5 Installed Capacity of Renewable Energy in the Caribbean Region

	Installed Capacity (MW)	Hydro/Marine (MW)	Solar (MW)	Wind (MW)	Bioenergy (MW)	Geothermal (MW)	Total of Renewable (MW)	Non Renewable (MW)	Source/note
Antigua and Barbuda	99		12	4			16	83	*1, 2020
Bahamas	747		2				2	745	*1, 2018
Barbados	317		50				50	267	*1, 2020
Cuba	6,806	72	163	12	951		1,198	5,610	*1, 2020
Dominica	29	7					7	22	*1, 2020
Dominican Republic	5,375	625	267	370	47		1,310	4,065	*1, 2020
Grenada	58		3				3	54	*1, 2020
Guyana	359	2	8		42		53	306	*1, 2020
Haiti	471	78	3				81	390	*1, 2020
Jamaica	1,340	30	93	99	32		254	1,086	*1, 2020
Saint Kitts and Nevis	71		2	2			4	67	*1, 2020
Saint Lucia	92		4				4	88	*1, 2020
Saint Vincent and the Grenadines	54	6	2				8	46	*1, 2020
Suriname	536	180	9		2		191	345	*1, 2020
Trinidad and Tobago	2,158		3				3	2,155	*1, 2020
Japan	351,804	28,147	68,665	4,371	1,826	481	103,490	248,314	*1, 2020

Source: *1 Energy Profile (IRENA)

9.1.3 Selection of Priority Countries in the Electric Power Sector

Guyana, where commercial oil production has started and economic growth is remarkable, and where the power system is aging, and Jamaica, where a Japanese company has invested in Jamaica Public Service Co. (JPS), an electric power company, are selected as the two priority countries.

9.1.4 Development and Cooperation Scenario in Jamaica

(1) Overview of Electric Power Sector

In Jamaica, the Ministry of Science, Energy, and Technology (MSET) is responsible for the energy and power sector. The Office of Utility Regulation (OUR) is the regulator of the electric power sector.

The Jamaica Public Service Co. (JPS) is responsible for the generation, transmission, and distribution of electric power, with some generation by Independent Power Producers (IPPs). Future power supply development, including renewable energy, will be decided through a bidding process.

According to the JPS Annual Report of 2021, the average generation cost is USD 0.3159/kWh and the system loss is 28%. The high level of non-technical losses is one of the main reasons for the high cost of electricity. Maximum demand is 667 MW (2017), 655 MW (2018), 661 MW (2019), 638 MW (2020), and 631 MW (2021), and maximum demand is stable, although the new coronavirus is expected to have an impact after 2020.

Jamaica, led by MSET, is currently developing a "Second Integrated Resource Plan (IRP)" with a target at the end of 2022. This plan will include electric power demand projections up to 2040, a power supply development plan, and decarbonization initiatives.

In order to achieve such lofty goals as "50% of electric power to be generated from renewable energy sources by 2030," as mandated by the Prime Minister, JPS will be increasingly responsible for ensuring the stability of the power grid. However, recovering these costs will be a major challenge due to the current high cost of electricity.

(2) Development Scenario

1) Development Issues and Strategies

Major players in electric power sector in Jamaica are shown in Table 9-6.

Table 9-6 Major Players in the Electric Power Sector in Jamaica

Field	Player	Note
Generation	JPS, IPPs	New power development project will be determined by bidding.
Transmission	JPS	The responsibility for grid stabilization and power system reinforcement also lies with JPS.
Distribution	JPS	JPS has the exclusive right but also the responsibility.

Source: JICA Study Team

Based on the above, the current challenges and development needs of Jamaica's power sector are as follows:

- In the power generation sector, under the government's high renewable energy adoption target and plan (IRP), power sources are being introduced through competition by the private sector, and further acceleration is needed.
- JPS has a major role and responsibility in the field of power transmission and substation. Although the necessary costs are to be passed on to electricity prices, electricity prices in Jamaica are already high, and it is expected to be difficult, including public opinion, to completely pass on the costs to electricity prices.
- In the electric power distribution sector, electricity theft is a major reason for the high cost of electricity. This is an issue that JPS wants to address urgently.
- It is natural and inevitable that JPS will work to stabilize and strengthen the power grid, which will inevitably occur in the future, and pass on the necessary costs to electricity rates. At the same time, it is necessary to work on other areas, specifically, lowering costs in the power generation sector and addressing urgent issues, such as measures to prevent electricity theft, in order to bring down electricity prices.

Table 9-7 Development Issues and Strategies of Electric Power Sector in Jamaica

Target	Issue	Strategy
Jamaica Electric Power	1. Utilization of renewable energy	Although government announced the goal as 50% electric power to be generated from renewable resources by 2030, it can increase electricity tariff due to the instability of natural resources. appropriate resource mixing and facility management.
	2. Reduction of un-electrified area	Development of electric facilities in un-electrified areas where electricity theft occurs a lot by utilizing renewable energy smart grids without influence of non-technical loss ratio.

Target	Issue	Strategy
	3. Reduction of electricity tariff	Electricity tariff will be decreased by cost reduction of power generation with enhancement of competitiveness in market and countermeasures against electricity theft in densified area and un-electrified area.

Source: JICA Study Team

2) Programs and Projects

The following table shows the programs and projects proposed to be implemented in Jamaica.

Table 9-8 Proposed Programs and Projects in Jamaica

Target	Issues	Programs and Projects	Period
Jamaica Electric Power	1. Utilization of renewable energy	Capacity development for planning and implementation forward mass utilization of renewable resources	Short
		Enforcement of power system	Mid - Long
		Power system stabilization by battery	Mid - Long
	2. Reduction of un-electrified area	Development of smart grid with renewable energy in non-electrified areas	Mid
	3. Reduction of electricity tariff	Revision of electricity policy and price	Short
		Reduction of power generation cost and electricity charges	Short – Long
Countermeasure on electricity theft		Short – Mid	

Source: JICA Study Team

3) Development Scenarios

Based on the above, the following development scenarios are proposed.

- Lowering the cost of electric power generation in the power generation sector needs to be continued by ensuring an environment that is more conducive to private-sector participation and competition.
- In the field of power transmission and substation, grid stabilization and power system reinforcement are major capital investments, and it is difficult to respond rapidly. Part of this investment needs to be funded by lowering the cost of electric power generation and other costs included in electricity rates, such as through progress on measures to prevent electricity theft.
- In general, for variable renewable energy such as solar PV and wind power, the integration cost per unit of installed capacity (the cost of connecting and stabilizing them to the grid) will rise as these sources are introduced. Therefore, it may not necessarily be correct to rely heavily on a battery energy storage system. While paying attention to future trends in storage battery systems, it is also necessary to pay attention to trends in technologies and prices for energy storage other than storage batteries, as well as trends in renewable energy power output forecasting and control techniques. This is in order to optimize power source development and grid operation.
- According to interviews with JPS, power theft occurs in the Red Zone and in un-electrified areas (unreasonable extension of the grid from electrified areas). The former involves significant security issues and considerable difficulties. Therefore, it is appropriate to consider how to deal with the former, starting with the theft of electric power in un-electrified areas. From the JPS side, there is a proposal to disconnect stolen electricity in un-electrified areas from the power grid. This will then reduce electricity rates by reducing electricity theft. The disconnected areas shall then be supplied with electric power from renewable energy sources.

(3) Cooperation Scenario

Table 9-9 shows the prioritized programs and projects in Jamaica.

Table 9-9 Prioritized Programs and Projects in Jamaica

Target	Issues	Programs and Projects	Modality	Priority
Jamaica	Utilization of renewable energy	For system stabilization, storage battery systems, gas-fired power generation, carbon dioxide capture, storage technology, output prediction, and control technology for renewable energy power generation	Public Private Partnership	C
		Development of smart grid with renewable energy in non-electrified areas	Public Private Partnership	C
		Countermeasure on electricity theft	Public Private Partnership	C

Source: JICA Study Team

In Jamaica, the main players in the power sector are JPS, a private company (in which the Jamaican government holds a stake of less than 20%), and IPPs for power generation. Therefore, these are not considered direct targets of ODA, and possible cooperation schemes are considered to be private-public partnership (PPP) schemes. This is the first point to be noted.

Various technical cooperation schemes such as capacity development on planning and implementation for renewable energy or on optimization of electricity price are possible for the public sector. In terms of industrial development in Jamaica and energy sector involvement in the Caribbean region as a whole, technical cooperation to the Jamaican public in the field of energy policy in the future is considered to be one of the promising areas.

The private sector (JPS) has development needs in the areas of: "countering electricity theft," "converting un-electrified areas to smart grids using renewable energy," and "addressing the massive introduction of renewable energy." JPS is 40% owned by a Japanese trading company and could benefit Japanese companies and be a cooperation project for Jamaica's power sector in the renewable energy field. There could be a cooperation project in the renewable energy field for the Jamaican electric power sector.

Table 9-10 shows the proposed projects for cooperation with the private sector.

Table 9-10 Project for PPP in Electric Power Sector in Jamaica

Field	Contents	Expected Impact
Countermeasure against power theft	Identification of the power theft point and countermeasures (disconnection)	Lower electricity tariff by reduction of the non-technical loss ratio
		Possibility to expand the concept to the red zones
Smart grid through renewable energy for non-electrified area (area connected illegally)	Electric power supply by renewable energy	Installation of renewable energy
		Lower electricity tariff by reduction of the non-technical loss ratio (since the grid is isolated from other main grids.)
Preparation for mass-introduction of renewable energy	Enhancement of power system	Countermeasure to accept more renewable energy developed by IPPs
	Power system stabilization by existing technology (BESS and others)	Ditto

Source: JICA Study Team

9.1.5 Development and Cooperation Scenario in Guyana

(1) Overview of Electric Power Sector

In Guyana, the Ministry of Public Works (MoPW) is in charge of the energy and power sector, and the Guyana Energy Agency (GEA), the energy policy implementation agency, is under its jurisdiction.

The Guyana Power and Light Inc. (GPL), which operates electric power in some urban areas, and the Hinterland Electrification Company Inc. (HECI), which operates electrification projects in the hinterland region, are also under the jurisdiction of MoPW.

In some cities such as Linden, electric power is supplied by a separate power utility that generates electric power at a bauxite plant.

The regulatory agency is the Public Utility Commission (PUC).

The electricity tariff for residential use (the portion above 75 kWh/month) is GYD 43.43/kWh (USD 0.22/kWh).

According to the Low Carbon Development Strategy 2030 (LCDS 2030, July 2022), the Government of Guyana's low carbon development strategy, the peak demand for the largest grid, the Demerara Berbice Interconnected System (DBIS), was 135.7 MW in 2021. In contrast, the back-up HFO or diesel power generation facilities are planned at 203 MW through 2022, but coupled with rapid economic growth, there is a short-term shortage of electric power. In response to this situation, a gas-fired power plant (300 MW) using domestically produced natural gas is scheduled to start its operation in 2023 or 2024.

The Government of Guyana's strategy is to decouple economic growth from the use of fossil fuels for electric power by developing low-carbon energy sources (solar, hydro, wind, biomass, and natural gas) to meet the rapidly growing demand and keep greenhouse gas emissions low.

This is being done through a combination of the following: (i) investment in transformational energy infrastructure across the generation and transmission systems; (ii) fiscal incentives and government policies to support the use of renewable energy at the level of households and businesses; and (iii) investments to improve energy efficiency.

The LCDS 2030 also presents a roadmap for the introduction of gas-fired power, large hydro, solar, wind, and biomass in the DBIS by 2040, and small hydro and solar in the distributed grid by 2030.

According to the GPL's development plan "Development and Expansion Program 2022-2026", system losses as of December 2021 were 24.7%, which is still at a high level. Technical losses are attributed to aging or long-distance distribution lines, inefficient transformers, and insufficient reactive power compensation, while nontechnical losses are attributed to unmetered supply, meter failures, streetlights, and electricity theft.

From the above, it is a challenge for Guyana's power sector to make steady progress on its power development plan in accordance with LCDS 2030, while making more recommendations on losses and updating infrastructure.

(2) Development Scenario

1) Development Issues and Strategies

The development needs of Guyana's power sector, given the current challenges, as already articulated in LCDS 2030, are as follows:

- In the field of power generation, power development is needed to address electric power shortages and future economic growth, and LCDS 2030 envisions gas-thermal power from domestic natural gas and solar PV in the short term, and hydropower and more solar PV, wind, and biomass in the medium and long term. This plan is reasonable and realistic. On the other hand, there is no definite plan for meeting medium- and long-term financing needs, and the country is still in the process of considering various possibilities while securing economic growth.
- In the field of power transmission and substation, it will be necessary to repair and strengthen aging existing grids and connect DBIS to distributed grids in each city in order to develop large-scale power sources in the future, including the large-scale introduction of renewable energy.
- In the field of power distribution, there is room for improvement, as some facilities are aging, and technical losses are still high. Furthermore, from the viewpoint of efficient use of energy, it is also necessary to promote the introduction of energy-saving and high-efficiency equipment on the consumer side.
- The rural electrification rate is not at a high level, and further progress in rural electrification through renewable energy and mini grids will be necessary in the future.

Table 9-11 Development Issues and Strategies of Electric Power Sector in Guyana

Target	Issue	Strategy
Electric Power Sector	Development of renewable energy power source, electric network expansion, and planning capability aligned with LCDS 2030	Development of renewable energy power source to respond to power shortages and future economic growth
		Rehabilitation and reinforcement of aging existing transmission and substation facilities, and connection of DBIS with distributed grids in each city
		Renewal of aging power distribution equipment and reduction of losses
		Promotion of rural electrification and improvement of electrification rate
		Improving the planning and operation capabilities and business intelligence of electric power companies to respond to the increase in power demand and system expansion accompanying rapid economic development

Source: JICA Study Team

2) Programs and Projects

Table 9-12 shows proposed programs and projects in Guyana.

Table 9-12 Proposed Programs and Projects in Guyana

Target	Issues	Programs and Projects	Period
Electric Power Sector	Development of renewable energy power source, electric network expansion, and planning capability aligned with LCDS 2030	Technical support for formulation of mid- and long-term plans related to system stabilization and expansion in preparation for the large-scale introduction of renewable energy sources, improvement of operational technology capabilities, and improvement of business intelligence of electric power companies to respond to the increase in power demand accompanying rapid economic development.	Mid-term

		Financial support for development of power resources and related technologies along with power resource development plan of LDS2030	Mid to Long-term
		Financial support for expansion of electric power network for massive introduction of renewable energy power source	Mid to Long-term
		Financial support for rural electrification (mini grid and smart grid)	Mid to Long-term

Source: JICA Study Team

3) Development Scenarios

Based on the above, the following development scenarios are proposed:

- It can be judged that the LCDS 2030 plans to break away from dependence on fossil fuel-derived power sources and promote the development of renewable energy power sources is a realistic and effective strategy. In order to realize this strategy, it is necessary to clarify how to respond to financial needs.
- Financial support is needed for capital investment to solve bottlenecks in Guyana's power system, such as high transmission and distribution losses, low supply reliability, aging equipment, and dispersion of small-scale power grids.
- In order to improve the low electrification rate in rural areas, it is necessary to provide financial assistance for the development of renewable energy power sources, the introduction of power storage systems, solar home systems and the construction of mini-grids in areas where connection to the national DBIS cannot be expected in the early stages.
- In addition to rehabilitation and strengthening the existing power network, which is aging and has a large power loss, and connecting DBIS, which is the backbone power system, with distributed systems in local cities, it is necessary to provide technical assistance for improvement of planning and operation capabilities to respond to the large-scale introduction of renewable energy in the future. Furthermore, technical assistance is also required to improve the business intelligence of electric power companies in order to respond to the increase in power demand that accompanies rapid economic development.

(3) Discussions with the Government of Guyana on Cooperation Scenarios

1) Draft Cooperation Scenario (as of October 2022)

Table 9-13 summarizes the priority programs and projects to be implemented in Guyana. Basically, it is assumed that support for development projects in Guyana's power sector in the future will mainly be provided by the official development assistance (ODA) loans on the premise of co-financing with the Inter-American Development Bank (IDB), rather than grant aid, in consideration of Guyana's economic development.

Table 9-13 Prioritized Programs and Projects in Guyana (as of October 2022)

Target	Issues	Programs and Projects	Modality
Guyana Power Sector	Development of renewable power resources, expansion of system and planning aligned with LCDS 2030	Technical assistance for improving medium- and long-term planning capacity, improving operational capacity, and improving business intelligence of power companies.	Technical assistance

		Financial support to development of power resources and related technologies along with power resource development plan of LCDS 2030	Technical assistance ODA loan (co-financing with IDB)
		Financial support for expansion of electric power system for massive introduction of renewable energy	Technical assistance ODA loan (co-financing with IDB)
		Technical cooperation and financial support for rural electrification (mini grid and smart grid)	Technical assistance ODA loan (co-financing with IDB)

Source: JICA Study Team

In Guyana, there is a possibility of technical cooperation and financial cooperation to the planning department of the government, as well as technical cooperation and financial cooperation to the power utilities. The power utilities differ from region to region, and some of those that are currently independent as a grid may be connected to the DBIS in the future. In addition, from a technical standpoint, it is reasonable to connect them from the perspective of utilizing the large-scale power sources developed and reducing the fluctuation of renewable energy.

For the public sector, there is the possibility of technical cooperation for formulating concrete plans that are subordinate to the strategic LCDS 2030, and for the formulation of future energy policies, as well as financial cooperation for the development of renewable energy sources and the promotion of energy efficiency and energy conservation.

For electric power utilities, there is a possibility of financial cooperation not only for the development of renewable energy power sources, but also for equipment renewal and reinforcement for system stabilization, loss reduction measures, and improvement of electrification rate. In addition, there is a possibility of technical assistance for capacity building of grid stabilization/reinforcement plan formulation, operation/maintenance management improvement, and business intelligence improvement in anticipation of increase in renewable energy power sources in the future.

2) Results of Discussions with the Government of Guyana

Based on the above, a remote meeting with GEA/GPL was held in December 2022 in order to hear requests from the Guyana side. The list of development projects and technical assistance projects requested by the Guyana side at the meeting is shown in Table 9-14.

- All of the required projects are based on the LCDS 2030 and the GPL's development plan, Development and Expansion Program 2022-2026.
- All projects on the list are basically requests to Japan, not to other donors (IDB conducts wind condition surveys for RE2 wind power generation projects).
- Although projects in each category are not prioritized, the Guyana side hopes to implement the mid-term plan within five years and the long-term plan within six to ten years.

Table 9-14 Requested Development Projects and Technical Assistance (as of December 2022)

No.	Project Name	Mid	Long	Project Objective	C/P	Costs (mil\$) Remarks
1. RE Infrastructure: Generation (Solar, Wind, Hydro, Biomass)						
RE1	Residential solar roof top programme (5 MW in total)	X		Solar PV	GEA&GPL	8, Scalable
RE2	Wind Farm No. 1 (10 MW) Corentyne (Fyrish, Port Mourant to Whim; Leeds to Number 63)		X	Wind P/S	GEA&GPL	Collaborate-IDB
RE3	Hinterland Electrification Program (Solar PV for Off-grid/Rural Electrification for Hinterland and riverine communities, 19 MW in total)	X		Solar PV	GEA	108, Scalable
2. TD Infrastructure : Transmission and Distribution						
TD1	The Infrastructure Development Programme Phase II (Garden of Eden SS to Kuru Kururu SS (New SS) with New 69 kV Transmission Line etc..)	X		Strengthen reliability, power quality, reduce technical losses and increase access to electricity.	GPL	16.59
TD2	Construction of New 69 kV Transmission Lines L16 & L16 P	X		Strengthen reliability and reduce technical losses	GPL	3.53
TD3	Construction of new Hydronic 69/13.8 kV SS, Edinburgh SS expansion, New 69 kV TL and 4x13.8 kV Feeders (coming out of Hydronic SS)	X		Strengthen reliability, power quality, reduce technical losses and increase access to electricity.	GPL	9.53
TD4	Construction of new Enmore/Victoria 69/13.8 kV SS, Good Hope SS & Columbia SS expansion, New 69 kV TL (L17P & L18P), 4x13.8 kV Feeders (coming out of Enmore/Victoria SS)	X		Strengthen reliability, power quality, reduce technical losses and increase access to electricity.	GPL	15.54
TD5	Construction of thirteen (13) 13.8 kV Priority Feeders	X		Strengthen reliability, power quality, reduce technical losses and increase access to electricity.	GPL	3.13
3. EE: Energy Efficient Infrastructure: Energy Efficiency & Others						
EE1	Installation of 5,000 solar powered streetlights across Guyana	X		Energy Efficiency and Social Security	GEA	4, Scalable
EE2	Charging Infrastructure to support Electric Mobility for Government Entities	X		Energy Efficiency Solar PV	GEA	
EE3	Appliance Replacement Programme (Refrigerators and AC units)	X		Energy Efficiency	GEA&GPL	Scalable IUS of GPL, Two Step Loan
4. TA Technical Assistance (Capacity Development, Training)						
TA1	Training for Planning, development and operation of modern power systems, and Technical Loss reduction	X		Planning, O&M	GPL	
TA2	The systems operation training for Business Intelligence, HRIS, Computerized Maintenance Management, GIS, SCADA, PLEXOS and PSS Suite.	X		O&M management	GPL	

Source: GEA/GPL

The following is an overview of the requested development projects and technical assistance projects that were interviewed at the remote meetings.

a) RE: Renewable Energy Development Projects

RE1. Residential Solar Roof Top Programme (Mid-term Plan, GEA/GPL)

- PV panels (and power conditioners) are to be installed on the roofs of ordinary households, and electric power generated during the daytime can be used free of charge by consumers where the PV panels are installed. Surplus power is sent to the grid, but cannot be sold.
- A battery storage system is not to be installed.
- The installed capacity per project depends on the roof area, but it is assumed to be about 4 to 8 kW/house.
- Estimated installation cost for a 4 kW system is approximately USD 5,000. The requested amount is USD 8 million, but it can be adjusted according to the budget and project scale.

RE2. Wind Farm No. 1 (10 MW) Corentyne (Fyrish, Port Mourant to Whim; Leeds to Number 63) (Long-term Plan, GEA/GPL)

- A project to construct wind farms with a total capacity of 10 MW in the Fyrish, Port Mourant to Whim and Leeds to Number 63 areas, along the East Berbice-Corentyne Coast in Eastern Guyana.
- The total capacity is about 10 MW, but the details of the system configuration, including the unit capacity of a wind turbine and battery system, will depend on the results of future FS. Assumed project costs also depend on the results of the FS.
- A wind survey at one site was conducted over 15 months with IDB assistance. However, the wind condition observation equipment has been stolen four times, and satisfactory data has not been obtained.
- GEA/GPL wants to start with the FS including wind condition survey at an additional point.

RE3. Hinterland Electrification Program (Solar PV for Off-grid/Rural Electrification for Hinterland and Riverine Communities) (Mid-term Plan, GEA)

- This is an off-grid rural electrification project to electrify non-electrified villages in Hinterland, except for coastal areas, through mini-grid.
- Basically, system configuration is PV + BESS + mini-grid, and introduction of diesel power generators is not considered
- The capacity of PV and BESS will be determined according to the demand in the electrification target area, but this request is for a system with a total power generation capacity of 19 MW that can electrify about 21,000 households (60 to 70 villages), and the total project cost is estimated to be USD 108. However, it is scalable, such as narrowing down the target according to the budget scale.
- GEA/GPL estimates that 83 MW (USD 313 million) is required to finally achieve 100% electrification.

b) TD: Transmission, Substation, and Distribution Facilities Projects

TD1. The Infrastructure Development Programme Phase II (Mid-term Plan, GPL)

- This is a complex project of power transmission, substation and distribution line construction aimed at improving supply reliability of DBIS, reducing transmission loss, and improving electrification rate.
- Main scope
 - New Kuru Kururu 69/13.8 kV Substation, 70 MVA TR
 - Garden of Eden Substation Expansion
 - New 69 kV Transmission Lines, 17.23 km, Double-circuit
 - New 3x13.8 kV Feeders Coming Out of Kuru Kururu Substation, 21 km in total
- GEA/GPL submitted a request for grant aid for this project in January 2022.

TD2. Construction of the New 69 kV Transmission Line L16 & L16 P (Mid-term Plan, GPL)

- This is a project to construct a new 69 kV transmission line and expand a substation for the purpose of improving the supply reliability of DBIS and reducing transmission loss.
- Main scope
 - New 69 kV transmission lines L16 & L16P (New Sophia SS to Good Hope SS), 12.5 km, double circuit
 - Good Hope Substation expansion

TD3. Construction of the New Hydronie 69/13.8 kV Substation & New Transmission Line L8 (Mid-term Plan, GPL)

- This is a complex project of power transmission, substation and distribution line construction aimed at improving supply reliability of DBIS, reducing transmission loss and improving electrification rate.
- Main scope
 - New Hydronie 69/13.8 kV Substation, 50 MVA TR
 - Edinburgh Substation Expansion
 - New 69 kV Transmission Line L8 (Edinburgh SS to Hydronie SS), 16 km, Single-circuit
 - New 4x13.8 kV Feeders Coming Out of Hydronie Substation, 20 km in Total

TD4. Construction of the New Enmore/Victoria 69/13.8 kV Substation & New Transmission Lines L17P & L18P (Mid-term Plan, GPL)

- This is a complex project of power transmission, substation and distribution line construction aimed at improving supply reliability of DBIS, reducing transmission loss and improving electrification rate.
- Main scope
 - New Enmore/Victoria 69/13.8 kV Substation, 50 MVA TR
 - Good Hope Substation Expansion
 - Columbia Substation Expansion
 - New 69 kV Transmission Lines L17P (Good Hope to Enmore/Victoria) & L18P

(Enmore/Victoria to Columbia) 27.5 km in Total, Single-circuit

- New 4x13.8 kV Feeders Coming Out of Enmore/Victoria Substation, 24 km in Total

TD5. Construction of Thirteen (13) 13.8 kV Priority Feeders (Mid-term Plan, GPL)

- This is a new 13.8 kV distribution feeders construction project aimed at improving the supply reliability of DBIS, reducing distribution loss, and improving the electrification rate.
- Main scope
 1. Columbia Substation - 2 feeders, 16 km in total
 2. Good Hope Substation - 1 feeder, 6 km
 3. No. 53 Substation - 1 feeder, 3 km
 4. Vreed-en-Hoop Substation- 1 feeder, 3 km
 5. DP3 Power Plant - 1 feeder, 3 km
 6. GOE Substation - 2 feeders, 6 km in total
 7. Canfield Substation - 3 feeders, 12 km in total
 8. Edinburgh Substation - 1 feeder, 2 km
 9. Old Sophia Substation - 1 feeder, 4 km

c) EE: Energy Efficiency, Energy Saving, etc.

EE1. Installation of 5,000 Solar Powered Streetlights Across Guyana (Mid-term Plan, GEA)

- This is a project to install 5,000 20 W LED streetlights with solar panel storage on major roads throughout Guyana for the purpose of energy saving and crime prevention.
- Approximately USD 800 per LED streetlight, totaling USD 4 million (adjustable according to budget size).

EE2. Charging Infrastructure to Support Electric Mobility for Government Entities (Mid-term, GEA)

- This is a project to install EV charging stations with PV panels on the premises of government facilities.
- According to GEA, the cost and installation location are undecided (adjustable according to the budget scale).
- For reference, according to GEA, there are currently six charging stations and about 120 EVs in Guyana.

EE3. Appliance Replacement Programme (Refrigerators and AC units) (Mid-term Plan, GEA/GPL)

- This is a project to provide funds (subsidies) to general households and commercial facilities nationwide to replace their refrigerators and air conditioners with more efficient ones for the purpose of saving energy.
- According to GEA, a two-step loan is assumed and can be adjusted according to the budget scale.

d) TA: Technical Assistance

TA1. Training for planning, development and operation of modern power systems, and technical loss reduction (Mid-term Plan, GPL)

- This is a technical assistance project aimed at improving the capability to plan and operate the introduction of GPL's renewable energy power sources, reactive power compensators, EMS, etc., in order to improve the supply reliability of the DBIS system and reduce power loss.

TA2. The systems operation training for business intelligence, HRIS, computerized maintenance management, GIS, SCADA, PLEXOS and PSS Suite. (Mid-term Plan, GPL)

- This is a technical assistance project that collects and analyzes huge amounts of business data accumulated in GPL information systems, etc., visualizes the results, and supports the construction of business intelligence that is used in business and management decision-making.
- This TA project includes training and provision of equipment such as human resource development system (HRIS), asset management system, geographic information system (GIS), system control and monitoring system (SCADA), power market simulation tool (PLEXOS), system analysis tool (PSS), etc.

(4) Updated Cooperation Scenario

1) Simple Evaluation of the Requested Projects (Loan Target Projects)

Table 9-15 simply evaluates how each of the development projects among the abovementioned requested projects contributes to the elimination of the bottlenecks in Guyana's electric power sector. Since technical cooperation (TA) projects cannot be evaluated in the same way as development projects, they will be evaluated separately.

As evaluation criteria, in addition to the five items, i.e., (1) renewable energy power source development, (2) supply reliability improvement, (3) loss reduction/aging measures, (4) electrification rate improvement, (5) energy efficiency / energy saving and (6) project urgency were applied.

The evaluation method is based on a three-grade evaluation of "◎: Significantly contributes to eliminating bottlenecks," "○: Contributes to some extent in eliminating bottlenecks," and "△: Does not contribute much to eliminating bottlenecks," each with 3 points, 2 points, and 1 point, respectively.

Table 9-15 Simple Evaluation of Requested Projects

No.	Projects	Renewable energy development	Supply reliability	loss reduction/ Aging measures	Electrification rate	Energy efficiency/ Energy saving	Urgency	score
RE1	Solar roof top	◎	△	△	◎	◎	△	12
RE2	Wind Farm No. 1	◎	△	△	○	○	△	10
RE3	Hinterland Electrification	◎	△	○	◎	○	○	12
TD1	Infrastructure Dev. P-II	△	◎	◎	○	○	◎	14
TD2	New 69 kV TL (L16 & L16 P)	△	◎	◎	△	○	○	12
TD3	New Hydronic SS & TL	△	◎	◎	○	○	○	13
TD4	New Enmore/Victoria SS & TL	△	◎	◎	○	○	○	13
TD5	13 nos. 13.8 kV Priority Feeders	△	◎	◎	◎	○	△	13
EE1	Solar powered streetlights	○	△	○	△	◎	△	10
EE2	Charging Infrastructure for EV	○	△	△	△	◎	△	9
EE3	Appliance Replacement Programme	△	△	◎	△	◎	△	10

Source: JICA Study Team

From the evaluation results in the table above, TD1: Infrastructure Development Program Phase II has the highest score of 14 points, followed by TD3, TD4, and TD5 with the same score of 13 points. Since TD2 does not include a distribution scope, it is evaluated as having a low degree of contribution to improving the electrification rate, and is given 12 points.

All of these projects are complex projects involving power transmission, substation, and distribution line aimed at improving DBIS supply reliability, reducing losses, and improving the electrification rate. However, the amount requested for TD1, for example, is USD 16.59 million, which seems to be rather small in terms of the scale of the project, assuming co-financing with IDB.

Assuming that the amounts requested for similar projects from TD1 to TD5 are summed up, the total amount will be USD 48.32million, this seems suitable for co-financing with IDB.

2) Technical Assistance Projects

Regarding technical assistance projects (TA), two requests have been made: (1) improvement of GPL's planning and management capabilities, and (2) improvement of GPL's business intelligence. According to the interview with GPL, there is no priority between the two, but it is considered that the former should be prioritized in order to improve supply reliability and reduce loss, which are the bottlenecks in the Guyana power sector mentioned above.

It is conceivable that contents of technical assistance include (1) dispatch of experts for power system planning and operational capacity improvement, (2) provision of materials and equipment for training (software, simulators, etc.), and (3) training in Japan or a third country, with a period of two to three years.

3) Updated Cooperation Scenario

Table 9-16 shows the updated cooperation scenario.

Table 9-16 Updated Cooperation Scenario

Target	Issues	Programs and Projects	Modality	Priority
Guyana Power Sector	Development of renewable power resources, expansion of system and planning aligned with LCDS 2030	TA1. Training for planning, development and <u>operation of modern power systems, and technical loss reduction</u> Technical assistance for improving medium- and long-term planning capacity in the power sector and <u>improving system operation capacity</u>	Technical Assistance	B
		<u>TD1. The Infrastructure Development Programme Phase II</u> Financial cooperation for power system expansion aimed at improving supply reliability, reducing losses, and improving the electrification rate	ODA loan (co-financing with IDB)	B

Source: JICA Study Team

Although Guyana's electric power sector faces a variety of challenges, such as aging facilities, electricity losses, and the need to meet rapidly increasing power demand, the country is rapidly working to improve these issues using economic growth as a springboard, such as proceeding with the commencement of operation of gas-fired power generation using domestically produced natural gas.

The power development roadmap of LCDS 2030 is a realistic one, and it would be extremely significant if Japan could cooperate in some way to further realize it. When considering Japan's cooperation, attention should be paid to the timeline assumed by the Guyana side and the progress of the actual plan.

It would be beneficial for Japan to provide technical assistance in the planning section first, and at the same time, to express its cooperation in specific initiatives in which Japan may cooperate, in building a cooperative relationship between Guyana and Japan in the future. On the other hand, due to rapid economic growth, the situation is changing rapidly, and timely cooperation is required.

It would be desirable for Japan to establish a presence in the planning part of Guyana's power sector, and then expand its cooperation to various projects such as renewable power development, grid renewal/strengthening, and rural electrification.

9.2 Green Economy (Decarbonized Society, Energy Efficiency, and Renewable Energy)

9.2.1 Outline of the Study

From May to November 2022, desk research, interviews (SICA), and field research (Guatemala, Costa Rica, Guyana, and Jamaica) were conducted to determine policies for creating development and cooperation scenarios for the decarbonized society, energy efficiency and renewable energy sectors. The study scope, updated based on previous studies, is shown in the table below.

Table 9-17 Survey Scope by Sector (Decarbonized Society, Energy Efficiency, and Renewable Energy)

No.	Task	Survey Scope
1	Sector Targets	In order to create measures and development scenarios that contribute to a decarbonized society, energy conservation and renewable energy, further support needs will be investigated and shall consider support measures in the Central American region based on the information from the preliminary study. In the Caribbean region, support measures and development scenarios will be considered based on further information gathering and issue identification.
2	Scope Update	Based on the previous phase of the survey, investigation for renewable energy needs, hydrogen potential, and energy saving needs such as LED lighting projects will be conducted, and future development/cooperation scenarios, including the possibility of wide-area cooperation in SICA, will be considered.
3	【Task 2】	In Central America, information will be collected in Costa Rica, Guatemala, and Dominican Republic, mainly through a survey to be conducted by a local expert, where interviews will be conducted at the JICA office (branch office) and SICA. In the Caribbean region, information gathering surveys by a local expert will be conducted, in accordance with the power sector, on the Ministry of Energy and other relevant organizations in Guyana and Jamaica and by the Caribbean Community (CARICOM).
4	【Task 3】	Based on the information obtained in Task 2 by SICA (UCE) and others, the JICA Survey Team shall visit Costa Rica and Guatemala to conduct interviews and surveys. A field survey will not be conducted in the Dominican Republic due to the absence of the counterpart (CP) agency for energy efficiency projects. In the Caribbean region, interviews will be conducted with relevant organizations in Jamaica and Guyana.
5	【Task4-6】	Although pilot projects in the green economy sector is not expected, advise on the selection, planning, and implementation of pilot projects in security (Honduras), environment (Belize), and agriculture and fisheries, as well as tourism and investment promotion will be made.
6	【Task 8】	Finalize development scenarios and cooperation scenarios based on the results of the survey analysis and opinions/requests from JICA offices, regional organizations, and development partners.

Source: JICA Study Team

9.2.2 Overview of the Decarbonized Society, Energy Conservation, and Renewable Energy Sectors in the Region

(1) Global Trends on Decarbonized Society

The Paris Agreement, which aims to pursue efforts to limit the global average temperature increase to 1.5°C, well below 2°C compared to pre-industrial times, was passed at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, and most recently, at COP26 in 2021, the goal is to limit temperature increase to 1.5°C. According to UNEP, emission reductions consistent with the 1.5°C trajectory (a target set to mitigate environmental impacts) would require global emissions to be reduced by almost 8% per year. While the transition to zero carbon in the transportation sector is considered essential, the global economy is still in the process of

recovering from the effects of COVID-19, with most policies prioritizing the recovery of the health and environmental sectors, and the energy crisis following Russia's invasion of Ukraine, started in February 2022, casting a shadow over this momentum. The situation is uncertain in the short term due to such factors as the decision by Germany to temporarily increase the operation of coal-fired power generation, which emits large amounts of carbon dioxide (CO₂), and the strong emphasis on energy conservation by Europe, which has led global measures to date, as a response to the energy crisis, and other factors such as retrogression and delay.

(2) Main Issues on Decarbonized Society

The main problem on a decarbonized society is rising global temperatures which is followed by the dependence on carbon-derived resources (coal, diesel, gas, etc.) in the energy matrix of most countries, especially major gas emitting countries like the United States and China. This is further fueled by the fact that the main means of transportation is gasoline and gas (NGVs and LPG).

Various relevant agencies agree that transportation changes that use alternatives as energy sources (those that significantly reduce greenhouse gas emissions) should be encouraged, the main proposal being electric vehicles. Although the technology remains to be expensive, it is slowly becoming more widespread in production and use. Another mode of transportation that has received a high degree of attention is maritime transportation, in which most of the transportation of goods (raw materials, intermediate products, and finished goods) takes place by sea. For this reason, the use of carbon-free alternative fuels has been proposed.

The energy sector accounts for almost three-quarters of greenhouse gas emissions today, and replacing pollutants such as coal, oil, and gas power generation with renewable energy such as solar and wind reduces carbon dioxide. The use of renewable energy resources (RER) technologies such as solar, hydro, and wind power in energy generation is being promoted as they can dramatically reduce emissions, but the use of these technologies is limited by the countries where they are applied. There are regional disparities in the introduction status, depending on the conditions and efficiency of the system.

(3) Overview of the Decarbonized Society, Energy Conservation, and Renewable Energy Sectors in Central America

Regional development policies for the Central American region are formulated and implemented mainly by the relevant organizations of the SICA which are Ambiente y Desarrollo (CCAD), Energy Ministers Council Secretariat (Unidad de Coordinación Energética: UCE), Central American Economic Integration Secretariat (Secretaría de Integración Económica Centroamericana: SIECA), etc.

As the secretariat of the Council of Energy Ministers of SICA member countries, UCE gathers the strategies and plans of each country, summarizes the priorities of each country as a regional vision (Central America vision), and has a mission to provide support to the entire SICA region. Recognizing that energy efficient economic development is an important step on the road to sustainability, all SICA member countries should promote energy efficiency programs and promote energy efficiency within ministries in charge of the energy sector. Specialized units and staff are designated.

In November 2007, the Central American Sustainable Energy Strategy 2020 (EESCA) was announced as a sustainable energy policy. Its purpose is to "consolidate Central America's energy supply in terms

of quality, quantity and source, as required to ensure sustainable development, taking into account social justice, economic growth, governance and environmental compatibility, and in accordance with international environmental commitments, from the viewpoint of the diversity of the population.” The EESCA was updated in 2020 as "EESCA 2030" with the following main objectives:

- Universalization of electricity
- Universalization of modern fuels (cooking with clean stoves)
- Greater participation in renewable energies
- Increased production of electricity
- Promoting the use of non-traditional energy sources such as geothermal, solar, wind, and biomass
- Promoting energy efficiency and energy conservation

Based on EESCA, the UCE has established working groups on the energy sector (hydrocarbons, bioenergy, energy efficiency, fuel standards, planning for 2024, etc.) and is formulating projects. The action plan contained in the EESCA strategy aims to improve efficiency by at least 5%, making the switch to cleaner energy in residential, commercial, industrial, and public lighting sectors. Guatemala, Costa Rica, and the Dominican Republic will also conduct research on offshore energy sources and plan to discuss aviation fuels in the future.

Aiming for the sustainable development of the region, the main mission of CCAD is to promote regional integration in the field of environmental policy. It has established the Central American Alliance for Sustainable Development (ALIES) with the aim of building it. With the exception of the Dominican Republic, most countries in Central America have a high rate of renewable energy introduction (Table 9-18 below).

Table 9-18 Renewable Energy Share of Electricity Production, Central America

PROD (%GWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Belize	87.2	90.4	90.1	87.1	86.5	86.7	79.7	60.2	92.7
Costa Rica	91.8	88.3	89.8	99.0	98.2	99.7	98.6	99.2	99.8
Dominican Republic	11.7	12.6	9.5	7.6	11.2	15.3	14.0	12.1	14.6
El Salvador	60.4	60.4	60.3	58.5	59.0	74.9	77.9	71.2	84.6
Guatemala	66.5	67.5	68.3	61.0	62.0	70.8	70.7	69.4	77.9
Honduras	44.7	41.5	40.9	45.5	49.6	56.5	59.8	52.2	53.4
Nicaragua	42.9	52.4	54.3	50.1	52.4	55.9	58.9	56.8	69.9
Panama	62.9	57.9	55.8	65.3	66.6	72.4	78.4	53.0	75.9

Source: IRENA, Renewable Energy Statistics 2022

The proportion of renewable energy sources varies from country to country, with a high proportion of hydroelectricity in each country, but solar power generation is more prevalent in El Salvador, Honduras, and the Dominican Republic; wind power generation in the Dominican Republic, Nicaragua, Honduras, Costa Rica, and Panama; biomass power generation in Belize, Guatemala, Nicaragua, and El Salvador; and a reasonable amount of geothermal power generation in Nicaragua, El Salvador, and Costa Rica (Table 9-19 below).

Table 9-19 Component of Renewable Energy, Central America

Capacity	Hydro	Solar	Wind	Bio	Geo.
Belize	53%	7%	0%	41%	0%
Costa Rica	75%	2%	13%	3%	8%
Dominican Republic	48%	20%	28%	4%	0%
El Salvador	38%	28%	0%	20%	14%
Guatemala	55%	4%	4%	36%	2%
Honduras	45%	28%	13%	12%	2%
Nicaragua	21%	2%	25%	30%	21%
Panama	78%	9%	12%	1%	0%

Source: IRENA, Renewable Energy Statistics 2022

(4) Overview of the Decarbonized Society, Energy Conservation, and Renewable Energy Sectors in the Caribbean Region

Regional development policies in the Caribbean region are formulated and implemented mainly by the relevant agencies of the Caribbean Community (CARICOM), including the Caribbean Center for Renewable Energy and Energy Efficiency (CCREEE), CARICOM Energy, and the Caribbean Community Climate Change Center (CCCCC).

CCREEE's mission is to promote renewable energy and energy efficiency investments, markets, and industries in the Caribbean by promoting access to modern, affordable, and reliable energy services and energy security which reduces negative externalities to the energy system. It aims to improve mitigation of environmental impacts (such as local pollution and GHG emissions). CCREEE has seven strategic priority programs in the Caribbean¹ (Table below)

Table 9-20 CCREEE's Caribbean Regional Strategic Program

No.	Objective	Outline
1	Knowledge Management and Transfer	Knowledge base, data exchange, and local capacity building to deliver goods and services to local sustainable energy markets
2	Access to Energy	Improved access to reliable, affordable, clean, and sustainable electricity services and cooking solutions
3	Sustainable Industry and Business	Cleaner labor practices reduce energy intensity and resource consumption, and are socially and environmentally responsible
4	Sustainable Transportation	Reduce the environmental impact of transportation, increase energy efficiency, and reduce CO2 emissions
5	Financing and Project Support	Address financial constraints and financing capacity/knowledge challenges affecting the development of sustainable energy projects
6	Climate Resilience	Helping the Caribbean Community (CARICOM) countries become more resilient to climate change
7	Sustainable Building	Increasing energy and resource efficiency and transforming the building sector to be sustainable, environmentally friendly, and climate resilient

Source: JICA Study Team on CCREEE Strategic Plan 2019-2023

CARICOM Energy was established in 2008 as an energy unit under the CARICOM Secretariat and is responsible for strategic management of energy issues in the CARICOM region, with implementation coordinated by CCREEE. In 2015, the Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS) was established with the aim of providing CARICOM Member States with strategies for their transition to sustainable energy, focusing on renewable energy, energy efficiency, and greenhouse gas

¹ CCREEE (2020) https://www.ccreee.org/wp-content/uploads/2020/06/strategic_plan_one_pager_final.pdf

emissions A framework of short-term (20% by 2017), medium-term (28% by 2022) and long-term (47% by 2027) targets has been set.

A trend in the Caribbean is to switch to sustainable transportation, and to seek funding for associated energy efficiency projects. According to CCREEE, the Caribbean is in transition to a sustainable, efficient, and effective transport sector where future transport services will be driven by electrification, enhanced connectivity through increased digitization, changing transport demand, and the ability to manage it. CCREEE has created the "CARICOM Regional Electric Vehicle Strategy (REVS) Framework" as a framework for achieving these goals².

The introduction of renewable energy in the Caribbean is limited compared to the Central American region, with the exception of Belize, which also belongs to both regions (as stated in table below). Many countries have few mountainous areas and scarce water resources, making it difficult to develop hydroelectric power generation. The shrinking production of sugarcane and the increasing demand for electricity due to economic development have forced the region to rely on thermal and diesel power generation using fossil fuels. In the previous section of the study, it was pointed out that although there were temporary disruptions due to logistical disruptions during COVID-19, there was no impact of disruption of fossil fuel imports, but from the perspective of stable energy supply, excessive reliance on imported fossil fuels is undesirable and measures to become carbon neutral (NC) are necessary.

Table 9-21 Renewable energy share of electricity production, Caribbean Region

PROD (%GWh)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Antigua Barb	0.1	0.2	0.2	1.6	1.6	1.7	2.7	5.8	7.1
Bahamas	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Barbados	0.3	0.4	1.0	1.3	2.1	3.0	3.0	3.8	5.6
Belize	87.2	90.4	90.1	87.1	86.5	86.7	79.7	60.2	92.7
Cuba	3.8	5.0	4.4	4.4	4.4	3.9	3.7	4.0	4.5
Dominica	27.0	37.0	30.6	23.5	33.1	32.5	37.7	22.3	20.4
Grenada	0.4	0.5	0.6	0.8	1.2	1.5	1.5	1.6	2.0
Haiti	20.2	13.5	8.9	8.3	6.8	12.3	19.2	19.2	19.2
Jamaica	6.9	6.5	7.1	6.9	8.4	10.2	11.4	13.0	13.5
St Kitts Nevis	3.6	3.9	4.7	4.5	4.7	3.7	3.6	3.5	3.7
St Lucia	0.0	0.0	0.0	0.3	0.3	0.3	0.8	0.8	1.6
St Vincent Grenadines	17.3	16.2	8.6	12.1	10.9	14.1	16.6	17.6	17.6
Trinidad Tobago	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Guyana	7.1	8.3	7.7	6.3	7.5	7.5	7.5	7.8	7.8
Suriname	55.1	54.1	35.2	29.2	43.8	51.8	56.4	51.6	51.6

Source: IRENA, Renewable Energy Statistics 2022

(5) Selection of Priority Countries

Based on the level of progress in the transition to renewable energy in each country, the potential for cooperation in the areas of energy conservation and renewable energy, and the selection of priority countries in the economic infrastructure (electricity) sector, Costa Rica, Guatemala, and the Dominican

² CARICOM & CCREEE (2020) https://www.ccreee.org/wp-content/uploads/2020/06/regional_electric_vehicle_strategy_revs_framework.pdf

Republic were selected from Central America and the Caribbean region (Guyana and Jamaica) as the priority countries in the areas of decarbonization and energy conservation and renewable energy.

9.2.3 Overview of the Decarbonized Society, Energy Efficiency, and Renewable Energy Sector in Costa Rica

(1) Trends in Costa Rica

The Costa Rica field study was conducted from August 18 to August 24, 2022. The institutions involved for visits and hearings in energy were the Secretaría de Planificación del Subsector Energía, Ministro de Ambiente y Energía (MINAE-SEPSE, Energy Subsector Planning Secretariat of the Ministry of Environment and Energy), the Dirección de Cambio Climático, Ministro de Ambiente y Energía (MINAE-DCC, Department of Climate Change, Ministry of Environment and Energy), Secretaría Ejecutiva de Planificación Sectorial Agropecuaria, Ministerio de Agricultura y Ganadería (MAG-SEPSA, Sectoral Planning Secretariat of the Ministry of Agriculture and Livestock), and Refinadora Costarricense de Petróleo (RECOPE: Costa Rican Petroleum Refining Corporation).

Costa Rica announced its National Decarbonization Plan on February 24, 2019, declaring its commitment to a more modern, green, and emission-free economy. The long-term goal is to achieve net zero emissions. It identifies the public policy packages and actions that must be implemented today to reach the targets by 2050. The action is divided into three main stages:

- a) Initial phase (2018-2022): Administrative considerations,
- b) Variable Phase (2023-2030): Revision of Plans to Achieve Goals;
- c) Deployment stage (2031-2050): Actual implementation of the plan³.

Emissions by 2050 and is based on ten key axes and eight cross-cutting strategies (see below).

Costa Rica has now completed 61% of the targets set for the period of 2018-2022 in the National Decarbonization Plan El Plan Nacional de Descarbonización (PdD), with another 22% in progress and scheduled for completion during 2022, and 17% in default are classified as at risk. Thus, 83% of the targets are expected to be achieved by the end of 2022 (as displayed in the figure below).



Source: Gobierno de Costa Rica (2022) <https://dev.cambioclimatico.go.cr/wp-content/uploads/2022/02/Reporte-final-de-Descarbonizacion-Preview.pdf>

Figure 9-1 Achievement of the National Decarbonization Plan (PdD)

³ Gobierno de Costa Rica (2019) Pag.10 <https://cambioclimatico.go.cr/wp-content/uploads/2019/11/PLAN-NACIONAL-DESCARBONIZACION.pdf>

The figure below shows the global progress of the target and the status of each axis of the PdD⁴, which indicates that decarbonization of the transportation sector is an issue.



Source: Gobierno de Costa Rica (2022)

Figure 9-2 Progress on the National Decarbonization Plan (PdD) Targets by Axis

Costa Rica's CO₂ emissions (kt) trends (2015-2019) are shown in Figure 9-3, which displays a decreasing trend after 2018⁵.



Source: World Bank

Figure 9-3 CO₂ Emissions (kt) for Costa Rica (2015-2019)

⁴ Gobierno de Costa Rica (2022) Pag. 17 <https://dev.cambioclimatico.go.cr/wp-content/uploads/2022/02/Reporte-final-de-Descarbonizacion-Preview.pdf>

⁵ Banco Mundial <https://datos.bancomundial.org/indicador/EN.ATM.CO2E.KT?contextual=default&end=2019&locations=CR&start=2015&view=chart>

1) Strategies and Plans in Costa Rica

Due in part to COVID-19, oil consumption in 2020 was -19% of the previous year's consumption, electricity consumption was -3%, and overall energy consumption was -12%. In terms of the composition of energy consumption in 2021, oil-derived: 65.2%, electricity: 22.3%, biomass: 9.6%, and others: 2.9%. Costa Rica has achieved almost 100% conversion to renewable energy for electricity, but most of the energy other than electricity is derived from fossil fuels. To achieve carbon neutrality, the country has developed a National Decarbonization Plan (National Decarbonization Plan 2018-2050), which sets ten key axes and eight cross-cutting strategies in its long-term goal (as displayed in the table below).

Table 9-22 Key Axes of the National Decarbonization Plan

Key Axis	
1.	Development of mobility systems based on safe, efficient, and renewable public transportation and active and shareable mobility systems.
2.	Zero-emission light vehicles, powered by renewable energy sources that are not dependent on fossil resources.
3.	Promotion of freight transportation employing modalities, technologies, and energy sources until zero emissions or the lowest possible emissions are achieved.
4.	Integration of a national electricity system with the capacity, flexibility, intelligence, and resilience necessary to supply and manage renewable energy at competitive costs.
5.	Development of buildings for different uses (commercial, residential, and institutional) under high efficiency standards and low emission processes.
6.	Modernization of the industrial sector through the application of efficient, sustainable, low, and zero-emission electrical processes and technologies.
7.	Development of an integrated waste management system with maximum efficiency and low greenhouse gas emissions based on separation, reuse, reevaluation, and final disposal.
8.	Promotion of highly efficient agriculture, forestry, and fisheries systems that enable low-carbon exports and local production for local consumption.
9.	Establish an environmentally competitive livestock production model based on production efficiency and greenhouse gas reduction.
10.	Establishment of management models for rural, urban, and coastal areas that protect biodiversity, increase, and maintain forest cover, and promote ecosystem services based on nature-based solutions.

Source: JICA Study Team based on the National Decarbonization Plan.

Table 9-23 Cross-cutting Strategies of the National Decarbonization Plan

Cross-cutting Strategies	
1.	Comprehensive Reforms for New Institutions for the 200 th Anniversary
2.	Green Tax Reform
3.	Financing Strategies for Transformation and Investment Promotion
4.	Digitalization and Knowledge-based Economy Strategy
5.	"Just transition" Labor Strategy
6.	Inclusion of Human Rights and Promotion of Gender Equality
7.	Transparency Strategies, Indicators, and Open Data
8.	Strategies in Education and Culture Fossil Fuel Independent Costa Rica Bicentennial

Source: National Decarbonization Plan

The major issue in the renewable energy sector in Costa Rica is the transportation sector, which accounts for 42% of greenhouse gas emissions. Maintenance and transition to electric vehicles are being considered. In addition, the National Energy Plan (PNE) 2015-2030 also aims for energy conservation, GHG reduction, electrification of public transportation, etc. The 7th edition of PNE 2015-2030 was formulated in 2019, setting seven planning axes for electrification and efficiency improvement in the transport sector (Table below).

Table 9-24 PNE's Seven Planning Axes

Policy Directions for Electricity	
Axis 1	Energy Efficiency
Axis 2	Distributed Generation
Axis 3	Electricity Matrix
Axis 4	Sustainability of Electricity Development
Policy Directions for Transport and Fuels	
Axis 5	Environmentally Friendly Vehicles
Axis 6	Sustainable Public Transportation
Axis 7	Pathways to Clean Fuels

Source: JICA Study Team based on interviews with MINAE-SEPSE

Regarding renewable energy, the PNE also mentions the development of wind, solar, biofuels, geothermal, etc. The formulation of a strategy for hydrogen energy was delayed due to the change of government, but the National Strategy on Green Hydrogen was announced in November 2022. The government has identified wind, biomass, solar, and geothermal as potential sources of renewable energy supply, and in its goal to become carbon neutral, it has positioned biomass fuels such as ethanol in the short term, vehicle efficiency and electrification in the medium term, and hydrogen energy in the long term. There are many projects in solar power, the largest being a solar park with a contract with a power trader, but many are small-scale projects that fall into the self-consumption category.

The National Bioenergy Plan has not been revised since its development in 2008, but what was initially a biodiesel and ethanol-centered study needs to be revised due to the short-term emphasis on biofuels in the energy matrix. There are initiatives for sugarcane, palm oil, ethanol, cattle manure, microbial research, etc., but the interest is not very high as the introduction cost is relatively high and most of the biofuels are mainly for processing biomass derived from agricultural and industrial processes. The same is true for SAF fuel, for which plans and legal frameworks need to be developed and inter-ministerial cooperation, especially between the Ministry of Environment and the Ministry of Agriculture, is essential.

2) Movement Toward Decarbonization of the Transport Sector

The number of EV vehicles is increasing, albeit slowly. As shown in table below, the cumulative number of electric vehicles in Costa Rica through July 2022 is consistently increasing (as displayed in the table and figure below) and public institutions such as ministries, local governments, and universities also purchase about a quarter of the total⁶.

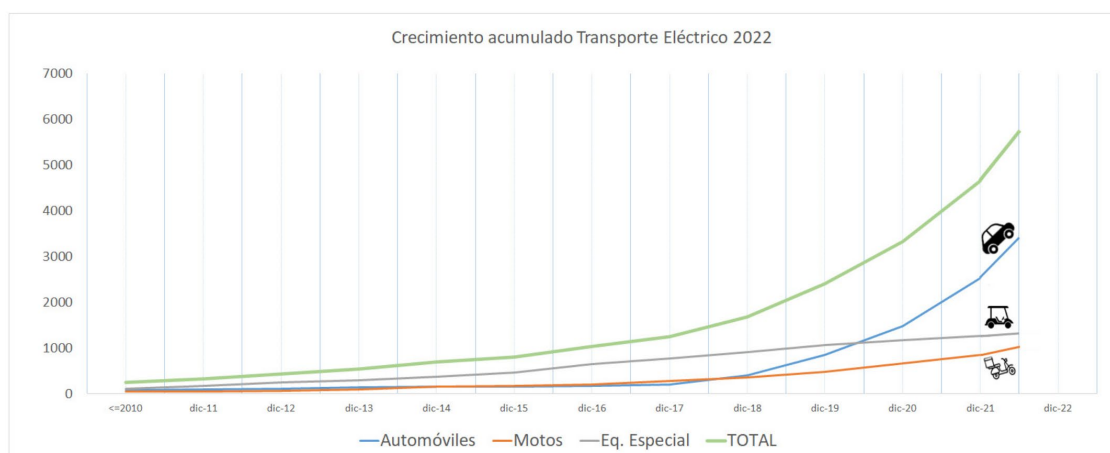
⁶ In 2021 results, 254 of the 1045 new units added were public institutions (<https://energia.minae.go.cr/?p=5634>)

Table 9-25 Cumulative Number of Electric Vehicles in Costa Rica through July 2022

ACUMULADO DE VEHÍCULOS ELÉCTRICOS				
TIPO	Automóviles	Motos	Eq. Especial	TOTAL
<=2010	86	43	118	247
2011	102	48	169	319
2012	114	65	249	428
2013	146	98	294	538
2014	159	153	380	692
2015	163	179	469	811
2016	175	204	656	1,035
2017	200	287	771	1,258
2018	398	365	918	1,681
2019	857	486	1070	2,413
2020	1484	670	1170	3,324
2021	2529	858	1271	4,658
2022	3412	1007	1311	5,730

Vehicle type: Automóvil: motor vehicles with license plates; Motos: motorcycles with license plates, motorized bicycles; Equipo Especial: golf carts, quad bikes, forklifts, work carts (all with plates).

Source: Taken from the National Land Numerical Data.



Source: MINAE website (<https://energia.minae.go.cr/?p=5634>)

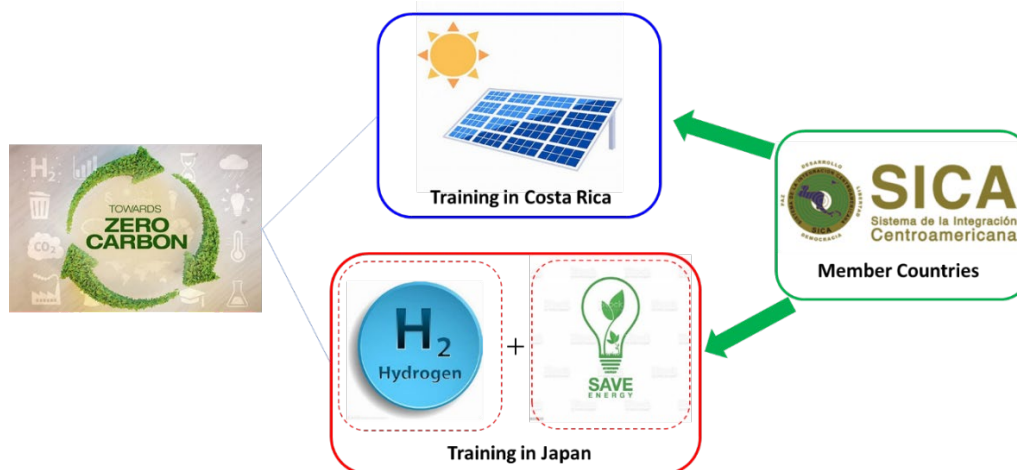
Figure 9-4 Number of Electric Vehicles in Costa Rica

EV stations are being deployed by Instituto Costarricense de Electricidad (ICE) and stations can be found on the streets of tourist and commercial areas, but the number of stations is minimal. As for hydrogen, MINAE is to make a roadmap for hydrogen fuel, but there is only one hydrogen station in the country (in Liberia) and it is not widely used.

3) Activities of SICA

Assistance to neighboring countries in renewable energy technologies and geothermal power generation technologies is being considered within the framework of SICA, mainly by ICE in cooperation with Germany: SICA and JICA are planning a cooperation program on "Environment and Climate Change" in the "Regional SICA - JICA 2021 - 2025" (Plan de acción para la cooperación (SICA) Project Planning Working Paper). The program includes triangular cooperation (see figure

below) to assist Costa Rica in supporting third countries by combining Japan's knowledge of renewable energy and hydrogen energy technologies and case studies with training in Costa Rica, which has made great strides in renewable energy.



Source: JICA Study Team

Figure 9-5 Re-Energy and Energy Conservation Training Plan (Triangular Cooperation)

Regarding hydrogen, a "Hydrogen Alliance" is being launched in 2019 within the framework of the IDB Labo Project. The alliance is initially being promoted by several private stakeholders interested in promoting Costa Rica's hydrogen ecosystem as a sustainable energy alternative and in addition to IDB Labo. The members include the Costa Rica-US Cooperation Foundation (CRUSA), the Costa Rican Hydrogen Association (ACH2), ICE, and RECOPE, as well as private companies such as SIEMENS and Toyota. The objective is to introduce Costa Rica as a model for hydrogen economy and clean energy in developing countries, and to expand and deploy a transportation ecosystem based on these clean, renewable, and economically independent technologies. The IDB Labo and Japanese companies can contribute to the project with Japan's knowledge of this technology.

4) Activities of JICA

JICA is conducting a study on Costa Rica as a target country for the "Information Collection and Verification Study on Development Needs and Potential for the Introduction of Hydrogen Technology and Value Chain in Latin America" in the form of a regional value chain and renewable energy utilization type study. There is a high level of interest in hydrogen energy development and although the "Draft Law for the Promotion and Implementation of a Green Hydrogen Economy" was prepared in 2021, deliberations were repeatedly delayed due to a change of government, but it was announced in November 2022 that deliberations would resume in February 2023. The report "Information Collection and Verification Study on Development Needs and Potential for the Introduction of Hydrogen Technology and Value Chain in the Latin American Region" lists the possible cooperation proposals that Japan could provide. Training in Japan based on their local technical standards for hydrogen, infrastructure development planning study for international value chains, hydrogen station development planning study for regional value chains, hydrogen mobility introduction project, and decarbonization project in the industrial sector.

Regarding vehicle electrification, according to the Ministry of Environment's Department of Climate Change (MINAE-DCC), the plan is to increase the market size from USD 50 million today to USD 250 million by 2026 (introduction of electric vehicles), with the following related plans:

- Expansion of EV vehicle charging stations to businesses and households
- Increase demand by charging at dawn (night time) when electricity rates are low and consumption is low.
- Since the household power supply system is designed to be reduced from 220 V to 110 V, rapid recharging will be realized by recharging while 220 V is still available.
- Development of recharging facilities and high-quality batteries necessary for the widespread use of EVs

In addition to the manufacturers' published values for the distance that EV vehicles can travel on a single charge, there is a great need for cooperation in the development of batteries for EVs, including the ability to provide figures (driving range) for Costa Rica based on local road conditions.

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Goal and Strategies

Costa Rica has already achieved an almost 100% renewable energy conversion rate for electricity, but from the perspective of the energy mix, the country plans to further diversify its energy sources. In terms of energy consumption, 65% of the energy consumed in Costa Rica is derived from petroleum, and the country plans to expand the use of energy derived from renewable energy sources and increase the efficiency of energy consumption. The decarbonization plan calls for the introduction of biomass fuels in the short term and the promotion of vehicle efficiency and electrification in the medium term. This should be done while also placing hydrogen in the long term and considering the need for hydrogen research from a long-term perspective even though there is currently little experience with hydrogen. In light of this situation, and taking into consideration SICA's sustainable energy strategy for the Central American region, the challenges for the sector are summarized as follows (See Table 9-26).

Table 9-26 Issues of Costa Rica's Decarbonized Society, Energy Conservation, and Renewable Energy Sector

Issues	Outline of the Issues
1. Diversification of energy sources, promotion of renewable energy generation	In the electric power sector, the shift to renewable energy sources has been largely realized, but diversification of energy sources from the perspective of energy mix needs to be promoted. The development of biomass and geothermal power generation should be put into practice and a national green hydrogen strategy for hydrogen energy should be realized.
2. Promote energy efficiency and decarbonization of the transportation sector	The transportation sector, which has high emissions, needs to be decarbonized to eliminate fossil fuels from private fleets and to decarbonize freight transportation. There is also a need to promote EV stations and use of storage batteries to promote EVs.
3. Promote energy use efficiency and energy conservation measures	There is a need to reduce energy consumption by improving efficiency in the industrial and residential (construction) sectors, which are high emitters. Technical assistance is needed for neighboring countries with their own advanced technologies related to renewable energy in order to contribute to the decarbonization of the entire Central American region.

Source: JICA Study Team

The table below summarizes the development strategy and its summary for the above issues.

Table 9-27 Overview of Strategies for a Decarbonized Society, Energy Efficiency, and Renewable Energy Sector in Costa Rica

Subjects	Issues	Strategy Overview
Green Economy (decarbonized society, energy saving, renewable energy)	Diversification of energy sources, promotion of power generation from renewable energy sources	Promote development of biomass, solar, and geothermal energy in order to diversify the renewable energy mix that relies on hydroelectric power generation. For hydrogen, implement human resource development and institutional design as a matter that should be addressed immediately from a long-term perspective.
	Increase energy efficiency and decarbonize the transportation sector (shift to use of EVs, etc.)	Aiming to achieve zero emissions in the transportation sector, which is a major source of greenhouse gas emissions, the project aims to reduce the carbon footprint of fuels used in automobiles and freight transport, to promote EV vehicles, and to revitalize the railroad sector (freight vehicles and urban railroads). Since EV vehicles are still expensive and there is no subsidy system, and it will take time to replace them with EV vehicles in countries with a large number of used vehicles, the introduction of biofuels such as ethanol will be promoted. In order to achieve zero emissions, there is a need to increase the number of EV stations and promote the use of storage batteries.
	Promote energy use efficiency and energy conservation measures	Reducing energy consumption is a priority strategy. It is important to promote the use of LED lighting in public buildings and on public roads, and the upgrading and electrification of industrial and household appliances. SICA and JICA will contribute to the decarbonization of the Central American region by being at the forefront of renewable energy and by assisting neighboring countries in their renewable energy conversion efforts as a member of the OECD. SICA and JICA are planning "Environment and Climate Change" and "Promotion of South-South and Triangular Cooperation" as cooperation programs in the "SICA - JICA 2021 - 2025" project planning working paper. A separate proposal, a project for training in renewable energy, energy conservation, and hydrogen energy in Japan and Costa Rica as a project to be undertaken in the wider region, shall be made for this project.

Source: JICA Study Team

b) Programs and Projects

The following table summarizes the programs/projects that should be implemented in Costa Rica based on the above strategies. In the area of geothermal power development, two geothermal power plant construction projects are currently underway through JICA's grant aid. In addition, a similar project for "technical and financial support for the promotion of LED lighting in public buildings and streets" is scheduled to be implemented in the Dominican Republic with co-financing from the IDB and JICA. There is also a similar need in Costa Rica. Regarding hydrogen, the IDB and GIZ have been actively supporting the Hydrogen Alliance, and implementing several projects. In addition, the Japanese Ministry of Economy, Trade and Industry (METI), Ministry of the Environment (MOE), NEDO, JBIC, and others are implementing JCM project investigation projects.

Table 9-28 Proposed Programs and Projects

Subjects	Strategy	Program/Project	Implementing Agency
Green Economy (decarbonized society, energy saving, and renewable)	Diversification of energy sources and promotion of power generation from renewable energy sources	Biomass Energy Development	MAG/MINAE
		Support for geothermal power development	MINAE/ICE
		Support for formulation of hydrogen energy system and development of human resources	MINAE
	Increase energy	Promotion of low emission vehicles	MOPT

Subjects	Strategy	Program/Project	Implementing Agency
energy)	efficiency and decarbonize the transportation sector (shift to use of EVs, etc.)	Revitalization of the railroad sector	MOPT
	Diversification of energy sources and promotion of power generation from renewable energy sources	Technical and financial support for promotion of LED lighting in public buildings and public roads	MOPT/MINAE
		Promote higher performance and electrification of industrial and residential electrical equipment	MEIC
		Renewable energy, energy conservation, and hydrogen energy training for SICA member countries	MEIC/MINAE

Source: JICA Study Team

2) Cooperation Scenario

In order to select the cooperation scenario for JICA to work on, the criteria listed in the table below were established.

Table 9-29 Cooperation Scenario Selection Criteria (Costa Rica)

Selection Criteria	Contents
(1) Consistency with the Japanese government's country-specific development cooperation policies	The Japanese government has stated that Costa Rica's development cooperation policy (priority areas) is to promote the development of clean energy and the introduction of environmentally friendly transportation systems such as electric vehicles, and as a country with advanced technology and knowledge in these areas, Japan will actively promote and deploy cooperation.
(2) Consistency with JICA's global agenda	JICA will work on the development of an environment to promote the introduction of renewable energy and energy conservation (the "New Renewable Energy Introduction Promotion" cluster and the "Energy Conservation Promotion" cluster), utilizing private-sector funds for the low-carbonization of energy use.
(3) Effective utilization of the results of past projects implemented by JICA	It is necessary to effectively utilize the results and lessons learned from JICA's previous projects in Costa Rica.

Source: JICA Study Team

Based on the above selection criteria, the highest priority programs/projects were selected as shown in the table below. The transportation sector is not discussed in this chapter, as the study and recommendations are provided in the Economic Infrastructure Development (Transportation, Traffic, and Ports) chapter of this report.

Table 9-30 Proposed Programs and Projects

Strategy	Programs/Projects	Modality
1. Promotion of power generation from own resources and renewable energy sources	Support for formulation of hydrogen energy strategy and human resource development	Technical cooperation / Training in Japan
2. Promote energy use efficiency and energy conservation measures	Renewable energy, energy conservation, and hydrogen energy training for SICA member countries	Triangular cooperation/ Issue-specific training (country-specific training, third-country training)

Source: JICA Study Team

a) Technical Cooperation Project on Support for Formulation of Hydrogen Energy System and Human Resources Development

The "Draft Law for the Promotion and Implementation of the Green Hydrogen Economy" was prepared in 2021 and deliberations were delayed again and again due to the change of government, but in November 2022, it was announced that deliberations would resume in February 2023. Support is needed for the realization of the items in each phase (1. establishment of infrastructure, 2. market development and expansion, and 3. monitoring and realization) of the "National Strategy for Green Hydrogen," especially the enactment of relevant laws and incentives, market research, possible support for the realization of attracting foreign companies, and human resource development related to hydrogen development and hydrogen handling. The project will implement country-specific training / training in Japan.

Table 9-31 Outline of Technical Cooperation Project on Support for Formulation of Hydrogen Energy System and Human Resources Development

Item	Contents
Project name	Technical Cooperation Project on Support for Formulation of Hydrogen Energy System and Human Resources Development
Priority	Priority Project (A)
Target Country	Costa Rica
Basic Strategy	Promotion of power generation using the country's own resources and renewable energy sources
Modality	Country-specific training / Training in Japan
Project Site	Costa Rica
Cooperation Period	January 2024 - December 2025 (24 months)
Name of Partner Country	MINAE
Name of partner country and other related organizations	RECOPE, ICE
Project Objectives	Safety standards for hydrogen and related regulations for handling and production will be developed. Impediments to the approval of hydrogen strategies and policies will be identified. Related human resource development will be developed.
Outcome	<ol style="list-style-type: none"> 1) Impediments to approval of hydrogen strategies and policies will be identified. 2) Hydrogen strategies and policies are approved based on the identified impediments. 3) Technical standards for hydrogen will be organized and analyzed. 4) Human resource development related to hydrogen development and handling

Source: JICA Study Team

b) Training on Renewable Energy, Energy Conservation, and Hydrogen Energy for SICA Member Countries

As mentioned above, the training on renewable energy and energy efficiency and conservation for SICA member countries will contribute to Costa Rica's position as an advanced renewable energy country to support neighboring countries. It will also benefit Central American countries' implementation of decarbonization plans based on Japan's long-accumulated knowledge of energy efficiency and conservation and technologies related to the development and operation of hydrogen energy. In addition, the establishment and strengthening of a network for information sharing within the SICA region is also significant as a cooperative program toward carbon neutrality in the region. This issue is described separately in Section 9.2.8 as a project to be undertaken on an area-wide basis.

Table 9-32 Training on Renewable Energy, Energy Conservation, and Hydrogen Energy for SICA Member Countries

Item	Contents
Project name	Training on Renewable Energy, Energy Conservation, and Hydrogen Energy for SICA Member Countries
Priority	Priority Project (A)
Target Country	SICA Member Countries
Basic Strategy	Promotion of training in renewable energy, energy conservation, and hydrogen energy in Costa Rica and Japan
Modality	Subject-specific training/country-specific training, third-country training
Project Site	SICA Member Countries /Costa Rica and Japan
Cooperation Period	August 2023 - July 2026 (36 months)
Name of Partner Country	SICA/UCE, MEIC, and MINAE
Name of partner country and other related organizations	Ministries in charge of each country
Project Objectives	Capacity building and networking in the renewable energy and energy saving sectors and hydrogen energy will be strengthened.
Outcome	<ol style="list-style-type: none"> 1) Technologies related to energy conservation, renewable energy, and hydrogen energy will be introduced. 2) Human resources for hydrogen energy will be developed. 3) Costa Rica's renewable energy initiatives and experiences will be shared within the SICA region. 4) SICA UCE network in the field of renewable energy will be established.

Source: JICA Study Team

9.2.4 Overview of the Decarbonized Society, Energy Efficiency and Renewable Energy Sector in Guatemala

(1) Trends in Guatemala

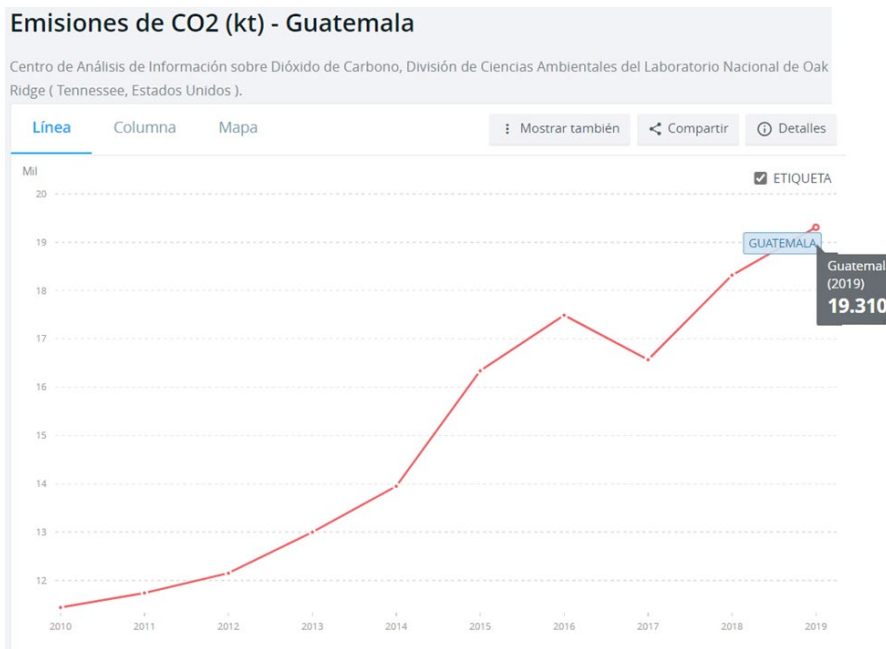
The field survey in Guatemala was conducted from August 24 to August 31, 2022. The following three ministries were selected for visits and interviews: the Ministerio de Agricultura, Ganadería y Alimentación (MAGA, Ministry of Agriculture, Livestock and Food), Ministerio de Ambiente y Recursos Naturales (MARN, Ministry of Environment and Natural Resources), and Ministerio de Energía y Minas (MEM, Ministry of Energy and Mining) as institutions related to energy.

Guatemala submitted a Nationally Determined Contribution (CDN) to the UNFCCC in 2015, which was approved by the National Climate Change Council. The strategy promotes the construction of individual, sectoral, and national tools within the framework of a national plan, oriented towards low emission development, strengthening the economy, increasing efficiency, improving small and medium-scale production and large-scale profitability, and promoting access to international markets and new sources of financing and funding mechanisms.⁷

This CDN plans to achieve an 11% reduction in total emissions by 2030 through its own means and, with the support of the international community, a 22% reduction relative to the emissions transition based on a constant growth rate from 1990 to 2005. According to World Bank data, Guatemala's CO₂ emissions (kt) have not stopped rising since 2010 even though a slight decrease in 2017 was recorded (see figure below).⁸

⁷ Gobierno de la República de Guatemala - USAID. Estrategia Nacional de Desarrollo con Bajas Emisiones de Gases de Efecto Invernadero Pag. 12 https://pdf.usaid.gov/pdf_docs/PA00X395.pdf

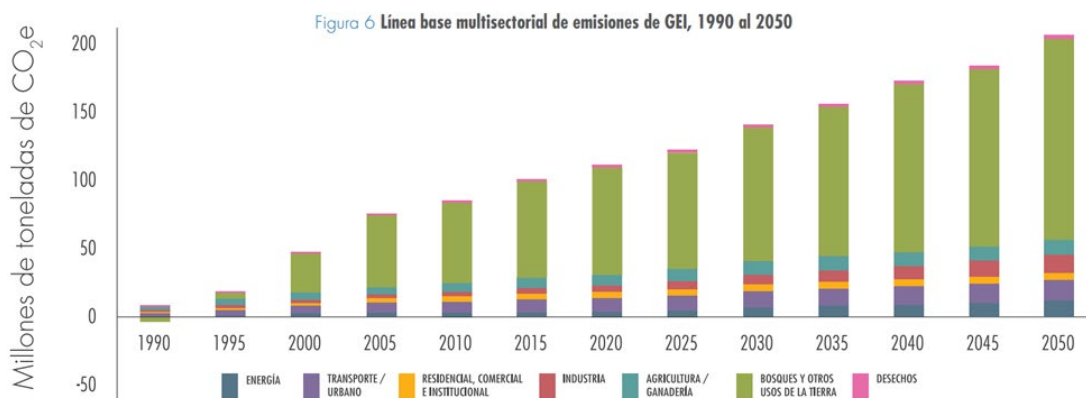
⁸ Emisiones de CO₂ (kt) – Guatemala. Banco Mundial (2022)



Source: World Bank

Figure 9-6 CO2 emissions (kt) in Guatemala (2015-2019)

The figure below shows the baseline and projected GHG emissions by sector for Guatemala from 1990 to 2050. The baseline was developed using the GHG estimation methodology proposed by the Intergovernmental Panel on Climate Change (IPCC) and projections to 2050 are based on business as usual (BAU), with population growth and gross domestic product (GDP) growth as the main drivers of GHG growth. The baseline shows that forestry and other land use sectors are the largest emitters in the country due to deforestation and land use change. Deforestation not only increases emissions through the release of carbon stored in trees and other biomass, but also implies a loss of capacity to absorb carbon from the atmosphere.



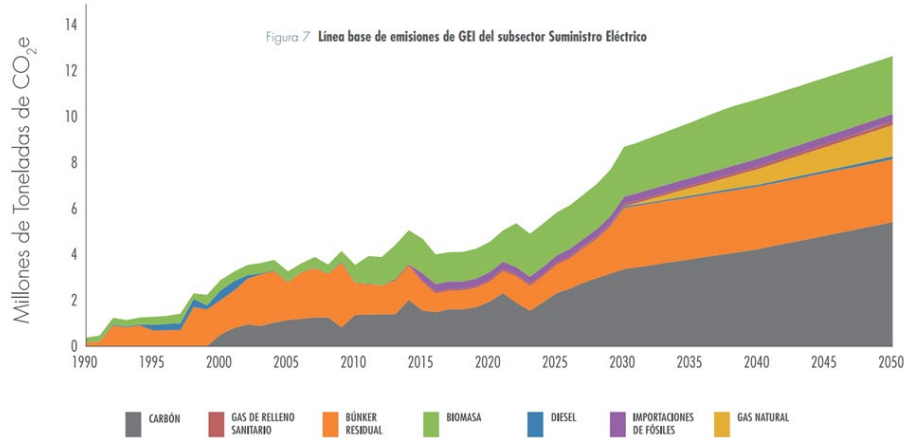
Source: Estrategia Nacional de Desarrollo con Bajas Emisiones de Gases de Efecto Invernadero

Figure 9-7 Baseline Trend of GHG Emissions by Sector (1990-2050)

The figure below also shows the baseline trend of greenhouse gas emissions in the electricity subsector

<https://datos.bancomundial.org/indicador/EN.ATM.CO2E.KT?contextual=default&end=2019&locations=GT&start=2010&view=chart>

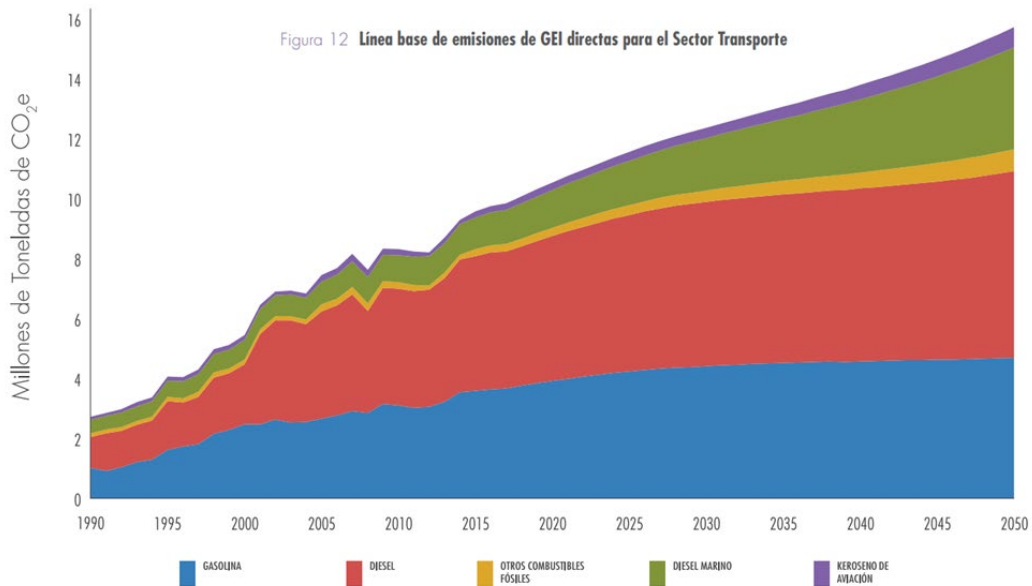
(1990-2050), with coal, bunker, diesel, and biomass being used for power generation, and natural gas is projected to be used after 2030. All of these fuels, with the exception of biomass, emit carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).



Source: Estrategia Nacional de Desarrollo con Bajas Emisiones de Gases de Efecto Invernadero

Figure 9-8 Reference Trends in Greenhouse Gas Emissions in the Electricity Supply Subsector (1990-2050)

The figure below shows the baseline trend of GHG emissions in the transportation sector (1990-2050). The GHG emissions are fuels used in cars, buses, trucks, ships, and aviation, and it is clear that carbon-derived fuels will not decrease easily in the future. Gasoline, diesel, liquefied petroleum gas (LPG), and paraffin are used, while carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are produced during combustion.

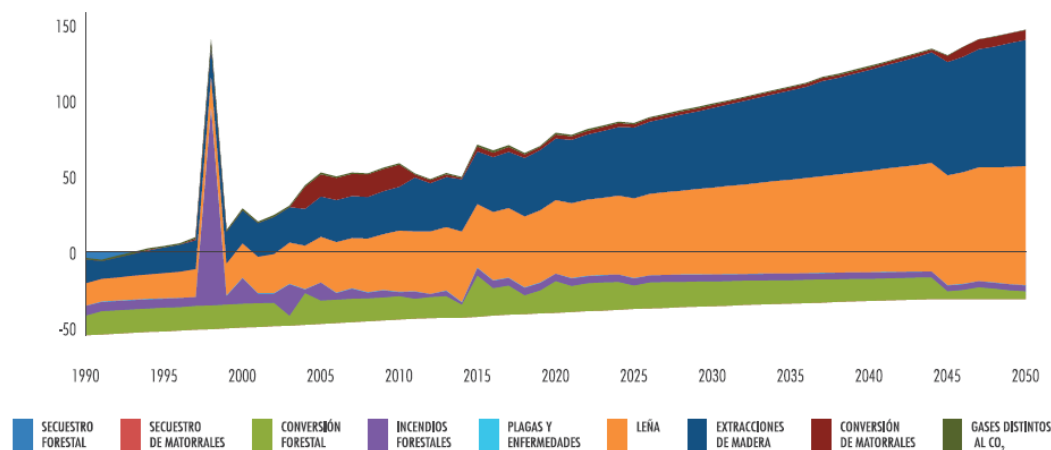


Source: Estrategia Nacional de Desarrollo con Bajas Emisiones de Gases de Efecto Invernadero

Figure 9-9 Reference Trends in Greenhouse Gas Emissions from the Transportation Sector (1990-2050)

The figure below shows the transition of GHG emissions in the largest emitting sector, "Deforestation

and land use change", which arises from deforestation, firewood collection, and land use change, requiring reduction of deforestation and firewood collection. All of these situations require immediate action.



Source: Estrategia Nacional de Desarrollo con Bajas Emisiones de Gases de Efecto Invernadero

Figure 9-10 Baseline GHG Emissions from Forest and Other Land Use Sectors

1) Strategies and Plans in Guatemala

With its CDN submission, Guatemala expressed its commitment to promote low-emission sustainable development and reduce threats related to climate change, a commitment that is also included in the Sustainable Development Goals SDG. Guatemala's population, GDP, and Gross National Income (GNI) are projected to increase continuously through 2050, and the current emissions of six tons of CO₂e per inhabitant are projected to increase to eight tons of CO₂e per inhabitant in 2050. To achieve the goals outlined in the Guatemala CDN, five sectors have been identified as priority sectors for reducing GHG emissions: energy, forest USCUS, agriculture, waste, and industrial processes.⁹

Table 9-33 Five Priority Sectors for GHG Emissions Reduction

Energy	
	<ul style="list-style-type: none"> • Energy policy of the Ministry of Energy and Mines 2012-2023 • Law on incentives for the development of renewable energy projects (Decree 52-2003) • Technical Standards for the Connection, Operation, Control, and Commercialization of Renewable Distributed Generation • National Energy Plan as stipulated in Article 18 of the Framework Law on Climate Change (Decree 7-2013) • Objective of 80% of electricity generation to come from renewable sources by 2030
LULUCF Forest¹⁰	
	<ul style="list-style-type: none"> • Implementation of the "Strategy to Reduce Emissions from Avoided Deforestation and Forest Degradation - REDD+" • Implementation of REDD+ Projects • Implementation of the climate change agenda of public authorities related to compliance with Article 20 of the Framework Act on Climate Change. Implementation of the Climate Change Agenda of Public Authorities related to Compliance with Article 20 of the Framework Act on Climate Change, mainly the Implementation of the Biodiversity and Climate Change Strategy • Strengthening of the National Forest Fire Prevention and Control System (SIPECIF) • Continued implementation and compliance with Forest Management Policy Instruments. Of particular importance are the new Law on the Promotion of the Establishment, Restoration, Management, Production, and Protection of Guatemalan Forests (PROBOSQUE, Decree 02-2015), the Forestry Incentives Program (PINFOR), the Forestry Incentives Program for Small Landowners with Forestry or Agroforestry

⁹ Acuerdo de París Simplificado – Versión para Guatemala (SGP Guatemala) (2019). Pag. 18 [https://sgp.undp.org/all-documents/country-documents/1055-simplified-paris-agreement-\(popular-version-for-guatemala\)/file.html](https://sgp.undp.org/all-documents/country-documents/1055-simplified-paris-agreement-(popular-version-for-guatemala)/file.html)

¹⁰ Bosques USCUS : Uso de Suelo, Cambio de Uso de Suelo y Silvicultura

	Occupations (PINPEP), the National Forest Landscape Restoration Strategy with a target of 1.2 million ha, Forest Link Strategy Industries and Markets and the National Strategy to Combat Illegal Logging, which has a target of 1.2 million ha.
Agriculture	
	<ul style="list-style-type: none"> • The existence of an agricultural policy to strengthen the National Rural Extension System (SNER), among other programs related to the action plan for the implementation of the National Comprehensive Rural Development Policy • Development of an annual organizational management plan relevant to the agricultural sector, according to sub-watersheds • Implementation of irrigation policies with an integrated approach to water resources
Waste	
	<ul style="list-style-type: none"> • Implementation of Wastewater Regulations - Government Agreement 236-2006 • Solid Waste Policy is still being developed by the Ministry of Environment and Natural Resources
Industrial process	
	<ul style="list-style-type: none"> • Development and coordination for private sector involvement through actions based on cleaner production policies implemented as a tool for competitiveness and environmental management • Development by MARN of incentive programs to motivate voluntary activities aimed at reducing or absorbing GHG emissions in accordance with Article 19 of the Framework Act on Climate Change

Source: JICA Study Team based on Acuerdo de Paris Simplificado Version Popular para Guatemala.

The National Energy Plan 2017-2032 proposes three strategic axes: 1) use of renewable resources, 2) efficiency and energy conservation, and 3) reduction of greenhouse gas emissions, with targets set for the year 2020, 2027, and 2032 for the rate of renewable energy, and the diversification of the energy matrix, the collection and actions such as diversification of the energy matrix, collection, and reduction of firewood consumption, energy and electricity conservation in public lighting, conversion to electric and LPG vehicles, and energy conservation and efficient energy use in the residential and industrial sectors.

The National Energy Efficiency Policy 2019-2050 has been updated to 2022-2050, which calls for the promotion of EVs and bioenergy, and is also developing a law that will reduce taxes on the import of EVs and related goods. In addition, Acuerdo Ministerial 180-2022 states that green hydrogen will be recognized as a priority sector in terms of the energy matrix, in accordance with the provisions of Article 4 of the Law on Incentives for the Development of Renewable Energy Projects..

The Guatemalan electricity sector is facing a low electrification rate in the northern part of the country (according to the census conducted in 2020, 119,060 households live without electricity), and it is necessary to continue promoting the installation of Micro Hydro Generation and other measures. Regarding fuels, Guatemala plans to actively and cautiously promote the use of gasoline mixed with ethanol, referring to the case of Costa Rica, where the use of gasoline mixed with ethanol has been suspended due to opposition from the citizens of Costa Rica. Biomass energy, which accounts for 36% of the total renewable energy, has so far been implemented mainly by sugar manufacturing companies and private companies using cattle manure, and the government plans to be actively involved in this area in the future.

The status of the energy matrix for renewable energy is 71.85% (in 2022), which is slightly below the 2027 target of 80% in the National Energy Plan 2017-2032. The demand has recovered to pre-COVID-19 levels in 2022. The demand patterns are changing due to the establishment of remote work and the plan is to promote the installation of solar panels on homes to encourage a system of self-sufficiency in the supply of electricity.

With regard to hydrogen energy, in August 2022, Government Agreement 180-2022, which provides for the promotion of incentives for green hydrogen projects, entered into force, recognizing "green

hydrogen" as a renewable energy resource and including it in Article 4 of the Law on Incentives for the Development of Renewable Energy Projects. The new agreement also includes "green hydrogen" as a renewable energy resource in Article 4 of the Law on Incentives for Development of Renewable Energy Projects. This means that new green hydrogen projects will be exempted from import duties, including value-added tax (VAT), fees for the import of machinery and equipment, consular tax, and exemption from income tax and IEMA payments for 10 years, similar to the incentives already established for solar, wind, hydroelectric, and geothermal. Comisión the Nacional de Energía Eléctrica (National Electric Energy Commission, CNEE) states that this will promote the development of more robust energy from renewable sources, not only for domestic use, but also for future export, thus establishing a strong position in renewable energy. The CNEE will develop a strong position in renewable energies.

2) Major Decarbonization Projects by the Government

The city of Guatemala is planning to introduce 75 EV buses to TransMetro and a feasibility study has been conducted by the city government. Guatemala City plans to negotiate with a wide range of parties, including international organizations, for funding. The Ministry of Environment (Ministerio de Ambiente y Recursos Naturales: MARN) is currently implementing the Tuk Tuk Project in San Juan Comarapa, using electric tricycles (made in China) to collect waste and transport residents to schools and other places. The project has been well received by the community and is being considered for implementation (cooperation) in other areas of the city and even in other prefectures. Currently, they are considering adding four electric recharging stations in the city and procuring Tuk Tuk vehicles (currently 9 vehicles). However, since Tuk Tuk vehicles are simple to make (current vehicles are made in China), they are considering manufacturing them in Guatemala in the future (outsourcing to private companies).

MARN is promoting energy conservation through the Discover MARN project, a project by SICA (CCAD) to install solar panels on government buildings and replace them with LED lights.

In some areas of Guatemala City (areas that are considered relatively safe), electric kickboard sharing using a smartphone app is being piloted. The development of recharging facilities is one of the challenges for EV diffusion. In Japan, a business using a membership car-sharing system using a smartphone app, along with a membership system for EV recharging, has been widely developed, and there is potential for technical cooperation based on this kind of knowledge. However, in implementing the project in Guatemala, it is necessary to consider issues related to security and the companies that will implement the project. The ongoing projects in Costa Rica¹¹ can be used as reference.

3) Major Decarbonization Projects by International Partners

Other major projects implemented by international partners to date are listed in the table below.

Table 9-34 Major Projects Implemented with International Partners

<p>Euro-Solar Program: Energía renovable para el desarrollo rural y comunitario</p> <p>EU: grant aid, overall budget USD 5.6 million (78% EU, 22% CP) In addition to installation of solar equipment, includes training for residents and technical assistance in the areas of education, health, and technology</p>

¹¹ Zipcar, a global car sharing company from the U.S., operates in Alajuela and Heredia, Costa Rica. <https://www.zipcar.com/>

<p>Promoting Production Activities through the Use of Clean Energy in the Northern Villages of the Republic of Guatemala</p> <p>JICA: Grant aid with an overall budget of USD 11 million (CP USD 1 million) The project aims to construct a small-scale hydroelectric power plant in an un-electrified poor area in Alta Verapaz in the northern part of the country, and to provide technical assistance to promote production activities using electricity, such as processing of local products including coffee, cardamom, and woodwork.</p>
<p>Support for Environmental and Social Work to Develop Renewable Sources Energy</p> <p>IDB: Technical Cooperation, overall budget USD 630,000 (CP USD 130,000) Strategic assessment of environmental and social aspects of hydropower projects, support for policy formulation, support for geographic information systems, dissemination, and strategic communication.</p>
<p>Biofuels Action Plan</p> <p>IDB: Technical cooperation, overall budget USD 510,000 (CP USD 102,000) Action plan for biofuels: support for implementation of national programs as an alternative in energy matrix diversification, reduction of external dependence on fuel supply, environmental sustainability, increased demand for agricultural products, and rural job creation</p>
<p>Consumo Eficiente de Leña en América Central</p> <p>ECLAC/GTZ Aimed at discussing the efficient consumption of firewood in Central America and proposals for public policies to promote the sustainable production of firewood and the use of improved wood stoves in rural Guatemala</p>

Source: JICA Study Team based on the Ministerio de Energía y Minas de Guatemala (MEM) website

The objective of the IDB Group's country strategy for the period 2021-2024 is to reverse Guatemala's social degradation exacerbated by the pandemic and to contribute to stronger economic growth based on inclusion and environmental sustainability criteria. To support this goal, the IDB group proposes three priority areas to be addressed through dialogue, programming, and portfolios. These are (i) institutional strengthening, (ii) improving the delivery of basic services to the most vulnerable populations, and (iii) promoting the private sector for stronger, more inclusive, and sustainable growth. Cross-cutting themes are gender and diversity, digital transformation, and climate change and natural disasters. The table below shows the IDB's projects in the energy sector since 2000 where eight of the 22 projects are related to rural electrification, followed by four related to energy efficiency. The number of projects related to solar power, biofuels, and geothermal energy is also high. In addition, five projects are related to renewable energies such as solar power, biofuels, and geothermal power generation.

Table 9-35 IDB Projects in the Energy Sector

Project Title	Sectors and Themes	Project Type	Project Total (USD)	Approval Date
Efficient Use of Firewood and Alternative Fuels in Indigenous and Rural Communities in Guatemala	Energy	Investment Grants	10,053,600	Jun-2021
Efficient Use of Firewood and Alternative Fuels in Indigenous and Rural Communities in Guatemala	Energy	Technical Cooperation	2,926,400	Jun-2021
Infrastructure for the Rural Electrification Program of Guatemala	Energy	Loan Operation	120,000,000	Dec-2020
Preparation of the Program for Rural Electrification Infrastructure in Guatemala	Energy	Technical Cooperation	200,000	Jul-2020
Technical Proposal for the Efficient Use of Fuelwood and Alternative Fuels in Indigenous and Rural Communities in Guatemala	Energy	Technical Cooperation	420,000	Dec-2016
Institutional Strengthening for the management of hydrocarbon resources	Energy	Technical Cooperation	280,000	Dec-2015
Multiphase Rural Electrification Program Phase II	Energy	Loan Operation	55,000,000	Dec-2014

Project Title	Sectors and Themes	Project Type	Project Total (USD)	Approval Date
Capacity Building of the Ministry of Energy and Mines to support the mitigation	Energy	Technical Cooperation	250,000	Dec-2014
BASICSERV - Qestsol Pay-as-you-go Solar Power for the BoP in Guatemala	Energy	Technical Cooperation	262,920	Jan-2014
Rural Electrification Master Plan of Guatemala	Energy	Technical Cooperation	500,000	Feb-2009
Multiphase Rural Electrification Program - Phase I	Energy	Loan Operation	55,000,000	Oct-2008
Energy Efficiency Integral Plan	Energy	Technical Cooperation	600,000	Oct-2008
Support for Environmental and Social Work to Develop Renewable Sources Energy	Energy	Technical Cooperation	500,000	Sep-2008
Biofuels Action Plan	Energy	Technical Cooperation	408,000	Dec-2007
Feasibility Studies to Support Small Hydropower Plants	Energy	Technical Cooperation	400,000	Mar-2007
Energy for Poverty Reduction in Rural Areas	Energy	Technical Cooperation	110,000	Nov-2005
Strengthening the National Electricity Commission	Energy	Technical Cooperation	500,000	Oct-2004
Electric Interconnection between Guatemala and Mexico	Energy	Loan Operation	37,500,000	Aug-2003
Exploitation Geothermal Resources for Electricity Generation Projects	Energy	Technical Cooperation	350,000	Dec-2002
Capital Expenditures Electricity Distribution	Energy	Loan Operation	25,000,000	Dec-2002
Expenditures Rural Electricity Distribution.	Energy	Technical Cooperation	750,000	Jan-2001
Improving Rural Life Quality	Energy	Technical Cooperation	87,719	Jan-2000

Source: <https://www.iadb.org/en/projects-search?country=GU§or=EN&status=&query=>

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

In electricity, Guatemala has a renewable energy conversion rate of 71% as of 2022, but the National Energy Plan 2017-2032 targets 80% by 2027. In addition, Guatemala's CO2 emissions have continued to rise since 2010, making it important to take measures to achieve the CDN's total emission reduction plan. As a plan to further diversify energy sources in terms of the energy mix, in addition to bioenergy, geothermal power and hydrogen energy, energy storage technology (Tecnología de almacenamiento) is also a priority¹². The power sector is also a key challenge for the country. In addition, the plan also includes the promotion of the electrification of areas with no electricity, which is a challenge for the power sector, and the installation of EV vehicles and EV stations, as well as the promotion of the use of hydrogen energy (production and stations) for the purpose of energy efficiency. In light of this

¹² Based on interview with MEM, Dirección General de Energía, August 29, 2022.

situation and taking into consideration SICA's sustainable energy strategy for the Central American region, the issues for the sector are summarized in the table below.

Table 9-36 Issues for Guatemala's Decarbonized, Energy-efficient, and Renewable Energy Sector

Issues	Outline of the Issues
1. Diversification of energy sources, promotion of power generation from renewable energy sources	Diversification of energy sources by improving the energy mix should be promoted to achieve CDN. Bioenergy, geothermal power, and hydrogen energy development must be put into action, and an institutional strategy and human resource development plan for hydrogen energy has not been established.
2. Reduction of greenhouse gas emissions/energy efficiency and decarbonization of the transportation sector	Promote fossil fuel-free private vehicles and decarbonization of freight transportation, which is necessary to promote zero-emissions in the high-emission transportation sector. Promote EV stations and improve storage battery-related technologies to promote EVs.
3. Promote energy use efficiency and energy conservation measures	Reduce energy consumption by improving efficiency in the industrial and residential (construction) sectors

Source: JICA Study Team

The table below summarizes the development strategy and its summary for the above issues.

Table 9-37 Overview of Strategies for a Decarbonized Society, Energy Efficiency and Renewable Energy Sector in Guatemala

Subjects	Issues	Strategy Overview
Green Economy (decarbonized society, energy saving, and renewable energy)	Diversification of energy sources, promotion of power generation from renewable energy sources	To diversify its renewable energy mix, the country will promote the development of biomass energy, geothermal power, and hydrogen energy. Regarding hydrogen energy, the government agreement (Acuerdo Gubernativo 180-2022) that stipulates the promotion of incentives for green hydrogen projects came into effect in August 2022, and it is clear that development will be promoted with the same incentives as other renewable energies.
	Reduction of greenhouse gas emissions/energy efficiency and decarbonization of the transportation sector	In order to decarbonize the transportation sector, which is a major emitter of CO2 emissions, development of bioenergy, such as the use of ethanol-blended gasoline, will be further promoted. In the area of vehicle EVs, promote projects such as the introduction of EV buses in Guatemala City and electric tricycles in communities. With support from development partners for the expansion of EV stations and the use of storage batteries, both of which are challenges for EVs, with the aim of achieving zero emissions.
	Promote energy use efficiency and energy conservation measures	Guatemala has identified five priority sectors for reducing GHG emissions: energy, forest USCUS, agriculture, waste, and industrial processes, and has identified energy conservation and efficient energy use in the residential and industrial sectors as priority strategies. The promotion of LED lighting in public buildings and public roads and the promotion of higher performance and electrification of industrial and household appliances will continue to be promoted.

Source: JICA Study Team

b) Programs and Projects

Based on the three issues listed in the table above, the following table summarizes the programs/projects that should be implemented in Guatemala.

Table 9-38 Programs and Projects Proposed

Subject	Strategy	Program/Project	Implementing Agency
Guatemala Decarbonized Society, Energy Saving,	Diversification of energy sources, promotion of power generation from renewable energy	Biomass Energy Development	MAGA/MEM
		Support for geothermal power development	MEM/INDE
		Support for formulation of hydrogen energy system and development of human resources	MEM
		Research on hydrogen energy potential, etc.	MEM

Renewable Energy	sources		
	Reduction of greenhouse gas emissions/energy efficiency and decarbonization of the transportation sector	Promotion of low emission vehicles and expansion of EV stations	CIV/MINECO
		Technical assistance for manufacturing EV tricycles (Tuk Tuk)	MINECO
		Technical assistance for emergency power supply by EVs and fuel cell vehicles and their use in non-electrified areas	MINECO/MEM
		Promotion of ethanol production and mixed fuel (10%)	MEM/CIV
	Promote energy use efficiency and energy conservation measures	Technical and financial support for promotion of LED lighting in public buildings and public roads	MEM/CIV
Promotion of electrification in industry and homes		MINECO	

Source: JICA Study Team

2) Cooperation Scenario

In order to select programs/projects for JICA to work on, the criteria listed in the table below were established.

Table 9-39 Program/Project Selection Criteria (Guatemala)

Selection Criteria	Content
(1) Consistency with the Government of Japan's Country Development Cooperation Policy	The Government of Japan's development cooperation policy (priority areas) for Guatemala is to "provide assistance in the areas of environmental conservation and disaster prevention, including raising environmental awareness, reducing disaster risks, and responding to disasters" and "promote cooperation with Guatemala through the Central American Integration Agency (SICA) in order to support Central American integration.
(2) Consistency with JICA's global agenda	JICA will work on the development of an environment for the introduction of renewable energy and promotion of energy conservation (a "New Renewable Energy Introduction Promotion" cluster and an "Energy Conservation Promotion" cluster) using private-sector funds for the low-carbonization of energy use.
(3) Effective utilization of the results of past projects implemented by JICA	It is necessary to make effective use of the results and lessons learned from JICA's previous projects in Guatemala.

Source: JICA Study Team

Based on this selection criteria, the highest priority programs/projects were selected as shown in Table below.

Table 9-40 Proposed Programs and Projects

Strategy	Programs/Projects	Modality
1. Promote power generation from own resources and renewable energy sources	Study on information collection and confirmation on hydrogen energy development	Study
2. Promotion of energy use efficiency and conservation measures	Technical and financial support for the promotion of LED lighting in public buildings and public roads	Yen Loan

Source: JICA Study Team

a) Study on Information Collection and Confirmation on Hydrogen Energy Development

Table 9-41 Overview of the Study on Information Collection and Confirmation on Hydrogen Energy Development

Item	Contents
Project name	Study on information collection and confirmation on hydrogen energy development
Priority	Possible Project (C)
Target Country	Guatemala
Basic Strategy	Clarify the use of hydrogen as a renewable energy source, the potential for development, the legal system that needs to be developed, and human resource development needs.

Item	Contents
Project Site	Guatemala
Cooperation Period	January 2024 - December 2025 (24 months)
Name of Partner Country	MEM
Name of partner country and other related organizations	MARN
Project Objectives	The possibilities and issues related to hydrogen development will be clarified.
Outcome	<ol style="list-style-type: none"> 1) Potential utilization of hydrogen, including its production, will be analyzed. 2) Infrastructure needs for hydrogen distribution will be identified. 3) Clarification of hydrogen utilization methods and legal systems to be developed. 4) The status of human resource development and development needs related to hydrogen will be clarified.

Source: JICA Study Team

Regarding hydrogen energy projects, as of August 2022, no strategy or legislation has been established for hydrogen, but in August 2022, Government Agreement 180-2022, which stipulates the promotion of incentives for green hydrogen projects, entered into force, recognizing "green hydrogen" as a renewable energy resource and it provides incentives for the development of renewable energy projects. In Guatemala, there are many issues in the energy sector, such as the development of un-electrified areas and the need to diversify the energy mix, which is heavily weighted toward hydroelectric and thermal power generation, but a strategy for hydrogen has not yet been established. As a first step, by collecting information and conducting a study on the potential for hydrogen development, it will be possible to examine how hydrogen can be used, and to help clarify the potential for production, distribution, infrastructure development needs, and human resource development needs.

b) Promote Energy Use Efficiency and Energy Conservation Measures

Energy efficiency projects are also in high demand in Guatemala, as the Integrated Energy Efficiency Plan proposes to increase the percentage of LED lighting fixtures in public lighting from 18% to 65% in order to reduce national energy consumption for public lighting¹³, as well as to promote the use of more energy-efficient equipment and systems in the consumption sector, and the Minister of MEM (Ministry of Energy) has expressed a request to switch to LED lighting for not only street lighting but also for public building lighting. The promotion of energy efficiency and energy conservation is a common need in all countries in the region, as is included in the objectives of EESCA, and switching to LED lighting is considered to be a significant and steady step because it will continuously contribute to reducing power consumption.

Table 9-42 Technical and Financial Support for Promotion of LED Lighting in Public Buildings and Public Roads

Item	Contents
Project Name	Technical and Financial Support Project to Promote LED Lighting in Public Buildings and Public Streets
Priority	Possible Project (C)
Target Country	Guatemala
Basic Strategy	Promotion of energy use efficiency and conservation measures
Project Site	All areas in Guatemala
Cooperation Period	August 2024 – July 2026 (24 months)
Name of Partner Country	MINECO
Name of partner country and other related	MEM, CIV

¹³ Plan Nacional de Energía 2017-2032, 8.2.2 Acción 2. Eficiencia y Ahorro Energético en el Alumbrado Público

Item	Contents
organizations	
Project Objectives	Promoting energy conservation through the conversion of existing streetlights and electric lights on public roads and public buildings nationwide to LED and the installation of new LED streetlights
Outcome	<ol style="list-style-type: none"> 1) Reduction of electricity consumption of the streetlights and electric lights in question 2) Fossil fuel consumption from power generation will be reduced. 3) Improvement in the ability of related institutions to implement energy conservation policies.

Source: JICA Study Team

9.2.5 Overview of the Decarbonized Society, Energy Efficiency and Renewable Energy Sector in the Dominican Republic

(1) Trends in Dominican Republic

For the Dominican Republic, information was collected through desk research instead of field surveys, mainly Ministerio de Energía y Minas (MEM), Ministerio de Medio Ambiente y Recursos Naturales (MIMARENA), Ministerio de Agricultura (MAG), Comisión Nacional de Energía (CNE), Ministerio de Turismo (MITUR), and international organizations were surveyed. In addition, through a separate introduction from the JICA Dominican Republic office, an online meeting with the energy expert of the IDB Dominican Republic office was made.

The MEM's role is to formulate and manage policies for sustainable development of the energy sector and metal and non-metal mining industries, with jurisdiction over the power, renewable energy, nuclear, natural gas, and mining energy sub-sectors and the national energy system. There are departments for energy, energy conservation, nuclear energy, energy security and infrastructure, mining, and hydrocarbons. Renewable energy and agriculture-related energy are handled by the Department of Energy. The Energy Conservation Bureau is responsible for policy development and management of energy conservation and energy efficiency, as well as the development and implementation of necessary regulations, technologies, and programs/projects.

MIMARENA has jurisdiction over the environment, ecosystems, and natural resources and their services in order to achieve sustainable development, protect natural heritage, and guarantee society's right to a healthy environment, biodiversity, international cooperation, coastal and marine, environmental management, forest resources, soil and water quality, and national environmental protection.

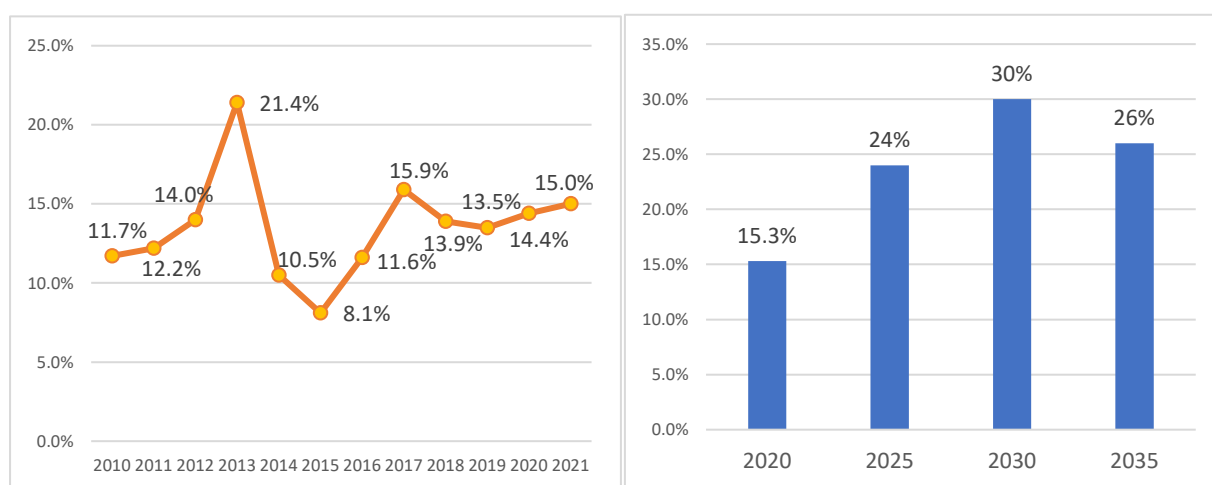
The MAG is the agency responsible for the agricultural sector, which is not only affected by climate change, but also accounts for 14% of global greenhouse gas emissions and has the potential to play an important role in the solution by reducing emissions through mitigation measures and in synergy with adaptation measures. The MAG has developed the National Strategy for Adaptation to Climate Change in the Agricultural Sector 2014-2020.

The CNE is a council under the coordination and administrative supervision of the MEM, with jurisdiction over the administration of laws and regulations and the development of indicative plans for the energy sector; jurisdiction over power generation, transmission, and distribution projects, and biofuel concessions; subsidies for the promotion of renewable energy; and promotion of investments under the National Energy Plan.

The Superintendencia de Electricidad (SIE), as the Electricity Supervisory Authority, monitors and

supervises the compliance of the Dominican Republic's electricity subsector with the laws, regulations, and technical regulations applicable to the subsector in relation to the development of generation, transmission, and distribution activities, and is also in charge of setting tariff and toll rates.

The share of renewable energy in electricity generation in the Dominican Republic from 2010 to 2021 and the forecast for the same share until 2035 are shown in the figure below. Renewable energy in the Dominican Republic increased its share of the electricity generation matrix by approximately 3% between 2010 and 2021. As seen in the figure, this growth is highly volatile, due to the instability of total energy demand and hydropower generation. The forecast to 2035 is based on the scenario of the National Energy Plan 2022-2036 (PEN), which estimates a decline from 15.3% in 2020 to 24% in 2025, to 30% in 2030, and to 26% in 2035.



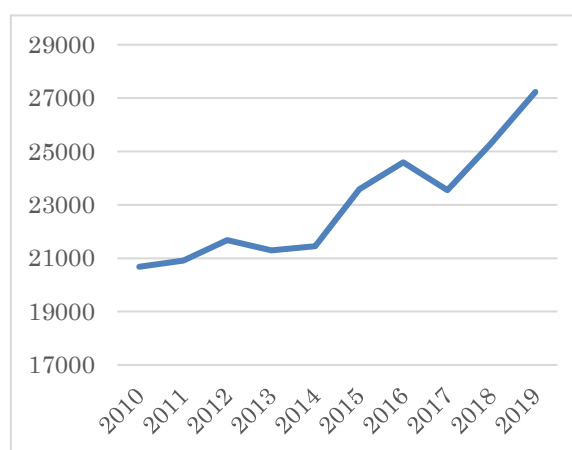
Source: Perfil de las Energías Renovables en República Dominicana, RELAC

Figure 9-11 Percentage of Renewable Energy in Power Generation and Prospects for Renewable Energy in Power Generation in the Dominican Republic

The Dominican Republic's CO₂ emissions (kt) have continued to increase since 2010 (see figure below)¹⁴ and the analysis of the National Energy Plan (PEN) also predicts that electricity generation will also increase toward 2035 due to the energy demand associated with the Dominican Republic's high economic growth rate (see table below).

¹⁴ Emisiones de CO₂ (kt) – República Dominicana. Banco Mundial (2022). <https://datos.bancomundial.org/indicador/EN.ATM.CO2E.KT?contextual=default&end=2019&locations=DO&start=2015&view=chart>

According to PEN 2022-2036, the Electricity Sector's Incentives Act for the Development of Renewable Energy Sources stipulates a 25% renewable energy rate by 2025, so estimates for emission reductions in the electricity sector also follow. As can be seen in the table below, the direct emission factor from power generation is expected to decrease from 0.756 tCO₂eq/MWh in 2019 (base year) to 0.53 tCO₂eq/MWh in 2035, resulting in reduced annual emissions from the electricity sector by almost 30%, reducing 4.7 million tons of CO₂ per year by 2030 and 7.3 million tons of CO₂ by 2035, compared to the base scenario where the emission factor remains constant.



Source: World Bank

Figure 9-12 CO2 Emissions (kt) in the Dominican Republic

Table 9-43 CO2-equivalent emissions reduced under PEN's Scenario 3A

Año	Generación Electricidad (GWh)	Factor de Emisiones Base 2019 (tCO ₂ eq/MWh)	Factor Modificado (tCO ₂ eq/MWh)	Emisiones Evitadas (tCO ₂ eq)	% Reducción emiones vs base 2019
2025	21,829	0.756	0.70	1,222,424	7.4%
2030	26,632	0.756	0.58	4,687,232	23.3%
2035	32,117	0.756	0.53	7,258,442	29.9%

Source: RELAC, Perfil de Las Renovables en República Dominicana

1) Strategy and Planning in the Dominican Republic

The Dominican Republic needs to double its annual decarbonization rate to achieve the goal of zero carbon emissions by 2050 committed to at COP25¹⁵. Between 1990 and 2010, the Dominican Republic achieved an average annual decarbonization of -2.4%, but not quite the average needed to achieve carbon neutrality (NC) by 2050. The MEM and CNE recognize the need to promote energy efficiency and energy conservation and are considering the development of an energy efficiency law to further promote energy conservation. In addition to reducing electricity demand and reducing the risk of power outages through conservation and efficiency programs, it is expected to involve sectors other than electricity, such as buildings, industry, land use, and water resource management, and be designed to reduce energy demand for infrastructure and building air conditioning.

The CDN includes 42 mitigation measures, the most important of which will be implemented in the transportation sector, which accounts for more than one-third of GHG emissions. Specifically, the CDN plans to fully transition to electric and hybrid express bus systems in Santo Domingo, Santiago de los Caballeros, and other major cities, revamp cab fleets, and develop alternative public transportation

¹⁵ ECLAC

systems such as bicycle paths and extended subway lines in the capital¹⁶.

As noted above, the Dominican Republic decarbonized at an average annual rate of -2.4% from 1990 to 2010, roughly half of the target needed to achieve zero carbon emissions by 2050, and will need to double its emission reduction rate to reach the goal. Meanwhile, electricity demand continues to grow at 7% per year, but the power sector is in short supply, and many buildings must be equipped with their own generators. For this reason, the government has set a goal of reducing carbon emissions by 25% from 2010 to 2030. In addition, to promote energy efficiency, the MEM submitted an Energy Efficiency Law to the National Assembly last year in order to change the current situation where there is no legislation on energy efficiency. The National Energy Efficiency Plan 2010 is expected to be revised after this law is passed.

In the PEN 2022-2036 scenario, the two renewable energy sources with the largest growth are solar PV and wind power, indicating their importance in the diversification of the energy matrix.

The Dominican Republic's current main energy sources are coal and fossil fuels, and the country's decarbonization performance has been below target, despite high electricity demand growth associated with steady economic growth. In May 2022, the Ministry of Energy, in cooperation with GIZ, compiled the report "Analysis of the Prospects for Green Hydrogen in the Dominican Republic". In the first phase, the Minister of MEM will develop a regulatory framework for hydrogen, which currently does not exist in the country, and will study incentives and funding sources for private investors.

In the report "Information Collection and Verification Study on the Development Needs and Potential for the Introduction of Hydrogen Technology and Value Chain in the Latin American and Caribbean Region" (March 2022), JICA grouped hydrogen in the LAC region according to the stage of construction and potential of the hydrogen value chain. Among the four categories of "export-oriented," "regional value chain," "renewable energy utilization," and "economic transition," the current situation in the Dominican Republic is close to the regional value chain type, and the following information (shown below) was provided to Jamaica, a country surveyed in the same group and a neighbor of the Dominican Republic, as a need for reference in future cooperation projects.

- Development of a hydrogen strategy and support for the development of a hydrogen plan for the Integrated Resource Resilience Plan;
- Study of infrastructure development plan for hydrogen implementation;
- Carbon neutrality study; and
- Project to develop hydrogen human resources in Jamaica.

2) Development Partner Support Status and Areas of Focus

Currently, GIZ is implementing the "Energy Transformation Project - Promoting Renewable Energy to Combat Climate Change in the Dominican Republic" project with 17 partners consisting of public institutions, private companies, and academic organizations in the energy and climate sectors, with MEM as CP agency (2017-2023). The objective of this project is to support the climate and energy

¹⁶ NDC Partnership (2020) "NDC-RD 2020": The Dominican Republic's Widely Embraced Climate Plan <https://ndcpartnership.org/news/%E2%80%9Cndc-rd-2020%E2%80%9D-dominican-republic%E2%80%99s-widely-embraced-climate-plan>

sector in the Dominican Republic to develop actions aimed at a low-carbon economy through the promotion of renewable energy, with the following five main objectives:

- 1) Improve the regulatory framework of the energy sector to encourage greater investment in renewable energy;
- 2) Support the development of new financing instruments for renewable energy in national banks;
- 3) Expand the capacity of relevant public institutions and private companies in the energy sector to develop greenhouse gas inventories, and define and prioritize their mitigation potential;
- 4) Deepen capacities on the topic of renewable energy integration in the national electricity system; and
- 5) Support the development of pilot projects to increase the public's understanding of renewable energy deployment.

a) IDB's Activities

The IDB's country strategy for the Dominican Republic for the period 2021-2024 is to assist the country to restore a strong economic growth pace consistent with inclusive, resilient, and sustainable development. To this end, the IDB Group has identified three key areas of focus: (i) improving public management and fiscal institutional structures, (ii) sustainable and inclusive productive revitalization, and (iii) strengthening human capital. Specifically, it will address gender diversification, climate change adaptation, digitalization, organizational capacity strengthening, and rule of law with emphasis on transparency in a cross-cutting manner. These areas are essentially a continuation of the previous country strategies, but with greater emphasis on considerations for productivity growth, inclusiveness, and institutional strengthening where four of the 21 projects currently under implementation are in the energy sector, the largest number by sector, along with transportation, social investment, and state renovation.

The table below shows the IDB's projects in the energy sector since 2010 where nine out of 23 projects are related to sustainability or efficiency, followed by six projects related to the reduction of electric losses.

Table 9-44 Energy Sector Projects by IDB

Project Title	Sectors and Themes	Project Type	Project Total (USD)	Approval Date
Power Sector Sustainability and Efficiency Program III	Energy	Loan Operation	250,000,000	Oct, 2021
Support for Third Stage of the Electricity Sector Sustainability and Efficiency Program	Energy	Technical Cooperation	300,000	Sep, 2021
Private Participation in the Electricity Distribution Companies (EDEs) in Dominican Republic	Energy	Technical Cooperation	250,000	Jul, 2021
Supporting the implementation of the Dominican Republic's energy efficiency program	Energy	Technical Cooperation	465,000	Jun, 2021
Institutional Strengthening within the Framework of the Program for the Sustainability and Efficiency of the Electric Sector II	Energy	Technical Cooperation	200,000	Oct, 2020
Implementation of the Energy Efficiency (EE) Program of the Dominican Republic	Energy	Loan Operation	39,000,000	Dec, 2019
Support Evaluation of Projects to Reduce Losses and Strengthening the Governance of the Electricity Sector	Energy	Technical Cooperation	400,000	May, 2019
Program to Expand Electricity Networks and Reduce Technical Losses in Distribution Systems	Energy	Loan Operation	155,000,000	Dec, 2018

Network Expansion Program and the Reduction of Electric Losses in Distribution	Energy	Technical Cooperation	325,000	Nov, 2018
Power Sector Sustainability and Efficiency Program II	Energy	Loan Operation	400,000,000	Nov, 2018
CANEF Dominican Republic Phase I: Integral Support to the Extractive Sector	Energy	Technical Cooperation	400,000	Oct, 2017
Institutional strengthening of the Ministry of Mines and Energy (MEM)	Energy	Technical Cooperation	300,000	Feb, 2017
Estudio Regulatorio para la Optimización del Mercado Eléctrico	Energy	Technical Cooperation	600,000	Jul, 2016
Support for the identification of potential solutions for rural energy supply DR Best practices in the management of a public utilities company	Energy	Technical Cooperation	400,000	Dec, 2015
	Energy	Technical Cooperation	15,036	Nov, 2015
Support Modernization Program Distribution Network Loss Reduction	Energy	Technical Cooperation	400,000	Jul, 2014
Support Modernization Program and Distribution Network Loss Reduction	Energy	Technical Cooperation	400,000	Jul, 2014
Support for the Distribution Network Improvement and Electricity Losses Reductio	Energy	Loan Operation	78,000,000	Jun, 2014
Best Practices in the Management of a Public Utilities Company	Energy	Technical Cooperation	18,450	Jul, 2013
Support to the Design and Execution of the Power Sector Sustainability Program	Energy	Technical Cooperation	310,000	Dec, 2012
Power Sector Sustainability and Efficiency Program	Energy	Loan Operation	200,000,000	Nov, 2011
Support to Renewable Energy and Bioenergy Programs	Energy	Technical Cooperation	750,000	Sep, 2011
Energy Efficiency analysis in Dominican Republic	Energy	Technical Cooperation	300,000	Jun, 2010

Source : IDB website

b) Other Development Partners' Activities

Other major projects in the energy sector are listed in the table below.

Table 9-45 Major Projects by Other Development Partners (Dominican Republic)

Project Title	Year	Partner
National Adaptation Plan	2019	UNEP
National Plan for Adaptation to Climate Change 2015-2030	2015	USAID
Greater Santo Domingo Sustainable Urban Mobility Plan	2021	EU, IDB
Central American Dry Corridor and the Arid Zone of the Dominican Republic	2021	GCF, BCIE, UNEP, FAO
The Country Partnership Framework (MAP) FY 22-26	2022	World Bank
Habilitar el camino para el desarrollo de ciudades y territorios prósperos	2022	World Bank
Proyecto Transición Energética : Fomento de Energías Renovables para Implementar los Objetivos Climáticos en la República Dominicana	2017	GIZ
Technical Assistance Program for Sustainable Energy in the Caribbean (TAPSEC)	2017	GIZ
Análisis Prospectivo de Hidrógeno Verde en la República Dominicana	2022	GIZ

Source: JICA Study Team

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

In the Dominican Republic, the electricity sector is currently at 15% renewable rate as of 2020, with

the goal of 25% renewable energy by 2025. Reflecting the steady economic growth, CO2 emissions have been increasing almost consistently, although it decreased slightly in 2017. It is planned to address this by reducing electricity demand through conservation and efficiency programs, and by developing distributed systems that include renewable energy sources. In terms of diversification of the energy matrix, wind and solar power generation are considered important and preparations have begun to develop a roadmap that includes the development of green hydrogen¹⁷. In light of this situation, and taking into consideration SICA's sustainable energy strategy for the Central American region, the issues for the sector are summarized in the table below.

Table 9-46 Issues for the Dominican Republic's Decarbonized, Energy-efficient, and Renewable Energy Sector

Issues	Outline of the Issues
1. Diversification of energy sources, increasing the share of renewable energy in power generation	Need to promote diversification of energy sources by improving the energy mix to achieve CDN. Promote development of renewable energy sources (solar and wind power) toward zero emissions. No development strategy has been formulated for hydrogen energy.
2. Energy efficiency and decarbonization of the transport sector	Need to shift express buses to electric/hybrid systems, renew cab fleet, improve public transportation, and decarbonize freight transportation in order to achieve zero emissions in the high emission transportation sector. Need to promote EV stations to promote EVs.
3. Promotion of energy use efficiency and conservation measures	Reduction of energy consumption through efficiency improvements in the industrial and residential sectors

Source: JICA Study Team

The table below summarizes the development strategy and its summary for the issues above.

Table 9-47 Overview of Strategies for a Decarbonized Society, Energy Efficiency and Renewable Energy Sector in the Dominican Republic

Subjects	Issues	Strategy Overview
Green Economy (decarbonized society, energy saving, and renewable energy)	Diversification of energy sources, increase of renewable energy conversion rate in power generation	To achieve the goal of 25% of electricity from renewable energy sources by 2025, develop wind power and solar power generation to diversify the energy matrix. Advance actions needed based on the roadmap being prepared to utilize hydrogen energy as part of the energy matrix ¹⁸ .
	Reduction of greenhouse gas emissions / energy efficiency and decarbonization of the transportation sector	Prioritizing the implementation of mitigation measures in the transport sector, which accounts for more than one-third of GHG emissions; firstly to promote measures from sectors such as public transportation and taxis, as well as the decarbonization of freight transport.
	Promote energy use efficiency and energy conservation measures	In decarbonizing the high emission industrial sector, reducing energy consumption is a priority strategy, and further promote the use of LED lighting in public buildings and on public streets, as well as the upgrading and electrification of industrial and household appliances (promote energy conservation in air conditioning equipment, refrigerators, etc.).

Source: JICA Study Team

b) Programs and Projects

Based on the above issues, the following table summarizes the programs/projects that should be implemented in the Dominican Republic.

¹⁷ Information from MEM, Direccion de Energía Convencional.

¹⁸ In the report "Analysis of the Prospects for Green Hydrogen in the Dominican Republic," MEM outlines three phases in which the study of hydrogen utilization will proceed, and in the first phase, a regulatory framework for hydrogen will be developed and incentives and funding sources to promote investment will be considered.

Table 9-48 Programs and Projects Proposed

Subject	Strategy	Program/Project	Implementing Agency
Dominican Republic Decarbonized Society, Energy Saving, Renewable Energy	Diversification of energy sources, promotion of electricity generation from renewable energy sources	Wind and solar power development	MEM
		Support for formulation of regulations and framework for hydrogen energy	MEM/MEPyD
	Increase energy efficiency and decarbonize the transportation sector	Promotion of low emission vehicles and expansion of EV stations	MOPC/
	Promote energy use efficiency and energy conservation measures	Technical and financial support for promotion of LED lighting and HVAC (Heating, Ventilation, and Air Conditioning) equipment in public buildings and public roads	CDEEE Successor Agency

Source: JICA Study Team

2) Cooperation Scenario

The criteria listed in the table below were established to select cooperation scenario for JICA to work on.

Table 9-49 Cooperation Scenario Selection Criteria (Dominican Republic)

Selection Criteria	Content
(1) Consistency with the Government of Japan's Country Development Cooperation Policy	The Japanese government's development cooperation policy (priority areas) for the Dominican Republic is to consider supporting the introduction and promotion of renewable energy and energy conservation in order to break away from dependence on imported fossil fuels, which has contributed to greenhouse gas emissions and the trade deficit.
(2) Consistency with JICA's global agenda	JICA is committed in creating an environment for the introduction of renewable energy and promotion of energy efficiency and conservation (the "New Renewable Energy Introduction Promotion" cluster and the "Energy Efficiency and Conservation Promotion" cluster) using private-sector funds for the low-carbon and decarbonization of energy use.
(3) Effective utilization of the results of past projects implemented by JICA	It is necessary to effectively utilize the results and lessons learned from JICA's previous projects in the Dominican Republic.

Source: JICA Study Team

Based on these selection criteria, the highest priority programs/projects were selected as shown in the table below.

Table 9-50 Proposed Programs and Projects

Strategy	Programs/Projects	Modality
1. Promote energy use efficiency and energy conservation measures	Technical and financial support for the promotion of LED lighting in public buildings and public roads and of and of HVAC (Heating, Ventilation, and Air Conditioning) equipment in public buildings.	Yen loan

Source: JICA Study Team

With regard to hydrogen energy, the MEM is considering the potential role of hydrogen in the decarbonization of the country and the development of a regulatory framework for hydrogen use, among other issues for early action. The Dominican Republic, on the other hand, has a number of priorities, including meeting the electricity demand associated with its steady economic growth, and developing and improving its electricity transmission and distribution network from the perspectives of energy

conservation, climate change countermeasures, and disaster prevention. Considering this situation, support for the introduction of hydrogen energy is not included in the cooperation scenario because it is considered to be a medium- to long-term project. However, the report "Analysis of the Prospects for Green Hydrogen in the Dominican Republic" suggests that "Japan's decarbonization program can be a useful reference given the similar situation of low energy self-sufficiency and dependence on fuel imports," and it is desirable to provide support based on Japan's experience to the extent possible. If the "training on energy efficiency and conservation, renewable energy, and hydrogen energy for SICA member countries" proposed in Section 9.2.8, "Projects to be undertaken on a wide scale (collaboration with SICA)," is implemented, the participation of the Dominican Republic should also be considered.

a) Promote Energy Use Efficiency and Energy Conservation Measures

Table 9-51 Technical and Financial Support for Promotion of LED Lighting in Public Buildings and Public Roads and of Air Conditioning Equipment in Public Building

Item	Contents
Project name	Technical and Financial Assistance Project to Promote the Use of LED Lighting in Public Buildings and Public Roads and of HVAC Equipment in Public Buildings
Priority	Possible Project (C)
Target Country	Dominican Republic
Basic Strategy	Promotion of energy use efficiency and conservation measures
Project Site	All areas in Dominican Republic
Cooperation Period	August 2024 - July 2026 (24 months)
Name of Partner Country	CDEEE Successor Agency
Name of partner country and other related organizations	MEPyD, MEM
Project Objectives	Promotion of energy conservation through the conversion of existing streetlights and electric lights on public roads nationwide to LED, the installation of new LED streetlights and improvement of the efficiency of HVAC systems in public buildings
Outcome	<ol style="list-style-type: none"> 1) Reduction of electricity consumption of public infrastructure 2) Fossil fuel consumption by power generation will be reduced. 3) Improvement in the ability of related organizations to implement energy conservation policies.

Source: JICA Study Team

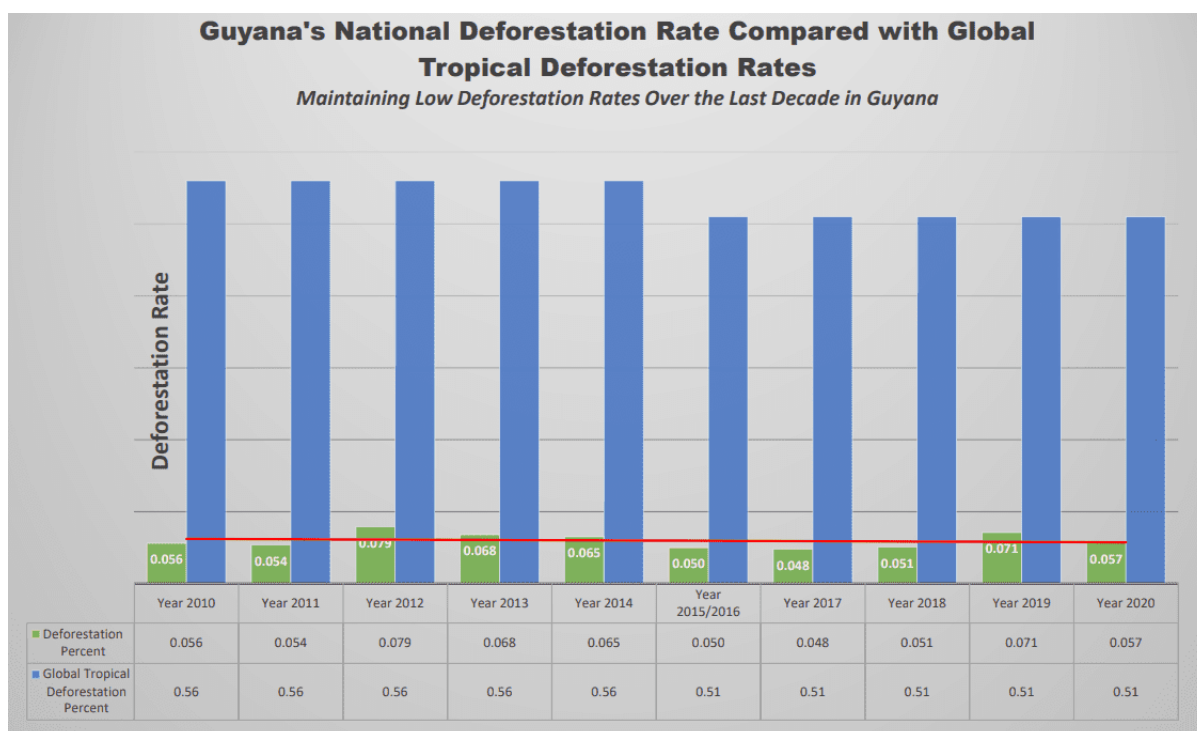
JICA has conducted the "Dominican Republic Energy Efficiency and Conservation Sector Information Collection and Verification Study" in 2014 to verify the feasibility of specific cost-effective energy efficiency and conservation measures (policy part) that utilize Japan's energy efficiency and conservation technologies. This energy efficiency project has already been signed as a co-financing LA with the IDB and will be implemented pending the early confirmation of the successor agency to the CDEEE. The implementation of this project will be of great help and significance to other countries in the region, as the promotion of energy efficiency and energy conservation is a common need in all countries in the region, and it is included in the objectives of EESCA. In addition, although the project's preliminary evaluation list targets streetlights on public roads nationwide, there is also a high need for LED lighting and more efficient HVAC (Heating, Ventilation, and Air Conditioning) equipment in public buildings, which consume large amounts of energy, and it would be desirable to consider expanding the scope of this project.

9.2.6 Overview of the Decarbonized Society, Energy Efficiency, and Renewable Energy Sector in Guyana

(1) Trends in Guyana

The field survey of Guyana was conducted from August 13 to August 18, 2022. The City Council of Georgetown, Alero Oil & Gas Inc., Guyana Energy Agency (GEA), and CARICOM Secretariat, were selected as the sites to be visited as they are institutions related to energy.

Guyana is experiencing an investment success with the start of oil production in 2020, but at the same time, the introduction of renewable energy and energy conservation are proceeding steadily based on the Low Carbon Development Strategy (LCDS) 2030. The results-based management framework within the LCDS 2030 investment plan has been formed based on the priorities of the NDC and will reflect updates to Guyana's NDC as it is revised¹⁹.



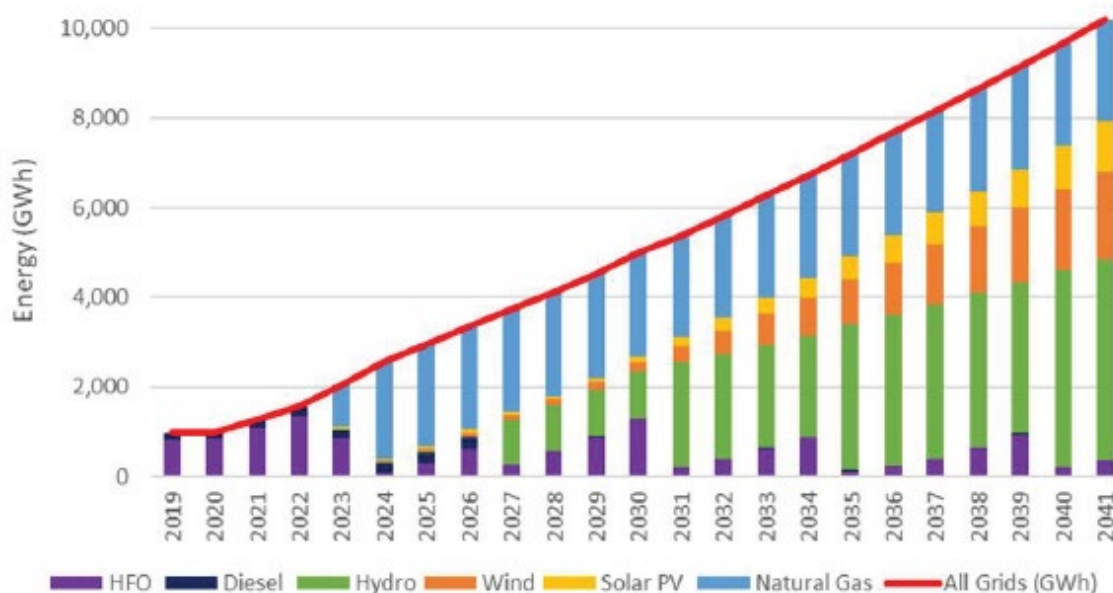
Source: Oil Now (2022) <https://oilnow.gy/news/forests-the-key-to-guyanas-low-carbon-development-strategy/>

Figure 9-13 Guyana's Domestic Deforestation Rate

Guyana has the second highest forest cover in the world at 99.5%, while the deforestation rate is lower than the world's tropical deforestation rate, which means that 19.5 billion tons of carbon dioxide equivalent (a measure of greenhouse gas emissions) can be stored. On the other hand, Guyana relies on imported fossil fuels for 97% of its fuel needs, and if the current electricity supply mix continues, consumer costs will not drop significantly, while greenhouse gas emissions will triple by 2027. The government therefore plans to reduce the use of fossil fuels by developing low-carbon energy resources (solar, hydro, wind, biomass, and natural gas) to meet the rapidly growing demand and keep greenhouse

¹⁹ Low Carbon Development Strategy Government of Guyana (2022). Pag.2 <https://lcds.gov.gy/conclusion-implementing-lcds-2030/>

gas emissions low.



Source : LCDS 2030

Figure 9-14 Guyana's energy mix by 2041

Guyana, where 90% of the population lives in low-lying coastal areas, is at risk of sea level rise and coastal flooding. The rate of sea level rise in Guyana exceeds 10 mm per year, which is higher than the global average of 2-4 mm per year. There is a real-time flood forecasting program established by the Caribbean Community (CARICOM)/Japan International Friendship Fund and implemented by the Caribbean Institute for Meteorology and Hydrology (CIMH)²⁰. Guyana currently relies on imported petroleum-based fuels as its primary energy source, but the energy sector is undergoing a major transition, with a renewed commitment in the "Green National Development Strategy" to develop its own renewable energy resources and pursue 100% renewable energy in power generation.

1) Strategy and Planning in Guyana

a) LCDS 2030:²¹

The following three phases are planned to achieve diversification of the energy mix, as mentioned above:

Table 9-52 Phases of Greenhouse Gas Emission Reductions under LCDS 2030

From 2022 to 2027	Responding to increased electricity demand primarily through a combination of natural gas and hydroelectric generation, as well as the installation of solar power generation equipment with storage batteries in rural areas.
From 2027 to 2032	Further growth in electricity demand will be met by expanding wind and solar power generation and by supplying Guyana's second hydroelectric power plant, which is expected to be operational (location to be identified by 2025).
After 2032: From 2032 onward	Sufficient advances in battery storage technology will allow solar and wind power plants to contribute to further downward pressure on electricity prices and provide for new capacity growth.

Source: Study team based on LCDS 2030

²⁰ USAID (2021). Pag.5 www.climatelinks.org/sites/default/files/asset/document/2021-09/Guyana.May_.2021.Final_.pdf

²¹ Low Carbon Development Strategy Government of Guyana (2022). Pag.10 <https://lcds.gov.gy/lclds-chapter-1/>

b) Vision 2040²²

Green National Development Strategy: Vision 2040 is Guyana's national development policy (20 years) and describes the vision and principles that will guide the "Green Agenda," with the following three key areas:

- Manage natural resource wealth
- Support economic resilience; and
- Develop human resources and strengthen organizations

2) Development Partner Support Status and Priority Areas

a) Guyana Utility Scale Solar Power (GUYSOL) Program²³:

GUYSOL is an IDB-approved grant of up to USD 83.3 million, funded by the Norwegian Development Cooperation Agency, which will build eight solar projects totaling 33 MWp and associated 34-MWh energy storage systems in three regions of the country. The eight projects, including 10 MWp in the Berbice area, 8 MWp in the Essequibe grid, and a project with a minimum of 12 MWh of storage batteries, will support a substantial transition to power generation based on renewable energy sources, with no CO₂ emissions and reduced generation costs.

b) Guyana Energy Agency (GEA)²⁴

While oil production has started and investment is booming, at the same time, the introduction of renewable energy and energy conservation is also proceeding steadily based on the LCDS. Although they are actively pursuing a wide range of energy mix, the planned ratio is still insufficient, and there are high expectations for support from international partners.

Table 9-53 Renewable Energy Projects Planned and Under Implementation

Project	Funding Source
Installation of solar panels on public buildings	CARICOM
Replacement of lighting in public buildings and schools with LED (increase from 20,000 to 50,000)	Undetermined
Solar Farm (1MW) in Region 9	EXIM Bank of India
Wind Mapping Project for Solar Energy	Unknown
Monitoring of wind power, installation of wind power generation facilities along the coast	Unknown
Installation of EV stations (6 locations nationwide)	Undetermined
Incentives (tax exemption) for Bio Energy	Undetermined
Solar Migrants Project (Community Development in 28 communities)	Undetermined

Source: JICA Study team

3) Georgetown City Council, Deputy Mayor²⁵

The City of Georgetown is within 15 km in all directions, but has the following project needs:

²² Government of Guyana. Pag.10 <https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/GSDS2040.pdf>

²³ IDB (2022) <https://www.iadb.org/es/noticias/guyana-impulsara-el-uso-de-fuentes-de-energia-renovable-con-apoyo-del-bid-y-noruega>

²⁴ Based on meeting at meeting room of GEA CEO on 16th August 2022

²⁵ Based on meeting at meeting room of Deputy Mayor on 15th August 2022

Table 9-54 Renewable Energy Projects Planned in Georgetown

Project	Source of funds
Energy conservation in public buildings and lighting on city streets	Undetermined
Potential study on renewable energy (pilot)	Undetermined
Clean City project by converting city hall cars and public buses to EVs	Undetermined

Source: JICA Study team

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issues and Strategies

Guyana's renewable energy conversion rate in electricity is 8% as of 2019 and relies on imported petroleum-based fuels as its primary energy source. However, it has made a commitment in its Green National Energy Strategy to develop its own renewable energy resources and pursue 100% renewable energy in power generation. Guyana began producing and exporting oil in 2019 and is in an investment success with a GDP growth rate of 43.48% in 2020, but the LCDS 2030 calls for investments in clean energy and stimulate low carbon growth for revenues from carbon markets to be invested, along with other national resources, primarily in: 1) national low-carbon priorities and 2) community-developed Village Sustainability Plans (VSPs). Taking into account the CCREEE Strategic Plan and the CARICOM Regional Electric Vehicle Strategy (REVS), the sector issues are summarized in the table below.

Table 9-55 Issues for Guyana's Decarbonized, Energy-efficient, and Renewable Energy Sector

Issue	Issue Overview
1. Diversification of energy sources, promotion of renewable energy generation	Need to promote diversification of energy sources by improving the energy mix and promote development of hydroelectric, solar, wind, and biomass power generation.
2. Promote energy efficiency and decarbonization of the transportation sector	Promotion of GHG emission reduction (conversion of public vehicles to EVs and promotion of EV stations to promote EVs)
3. Promote energy use efficiency and energy conservation measures	Reduction of energy consumption by improving lighting efficiency in the industrial sector and on public roads

Source: JICA Study Team

The table below summarizes the development strategy and its summary for the issues above.

Table 9-56 Overview of Strategies for a Decarbonized Society, Energy Efficiency and Renewable Energy Sector in Guyana

Subjects	Issues	Strategy Overview
Guyana Green Economy (decarbonized society, energy saving, renewable energy)	Diversification of energy sources, promotion of electricity generation from renewable energy sources	The government has committed to 100% renewable energy in power generation in its Green National Development Strategy and plans to build solar, wind, and hydroelectric power plants. LCDS 2030's strategy is to invest revenues from the carbon market (oil) in low-carbon priorities.
	Increase energy efficiency and decarbonize the transportation sector	GEA owns one EV vehicle for testing and plans to convert its public fleet to EVs and build six EV stations nationwide, of which there is currently one.
	Promote energy use efficiency and energy conservation measures	Promotion of LED lighting in public buildings and schools.

Source: JICA Study Team

b) Programs and Projects

Based on the three issues shown in the table above, the programs/projects listed in the table below are proposed.

Table 9-57 Programs and Projects Proposed

Subject	Strategy	Program/Project	Implementing Agency
Guyana Decarbonized Society, Energy Saving, Renewable Energy	Diversification of energy sources, promotion of electricity generation from renewable energy sources	Biomass and bioenergy development	NRE, GEA
		Support for wind mapping and installation of equipment for wind power generation	NRE, GEA
	Reduction of greenhouse gas emissions/Increase energy efficiency and decarbonize the transportation sector	Promotion of low emission vehicles and expansion of EV stations	NRE, GEA
	Promote energy use efficiency and energy conservation measures	Technical and financial support for promotion of LED lighting in public buildings and public roads and improvement of the efficiency of industrial and residential electrical equipment	NRE, GEA

Source: JICA Study Team

Although Guyana is experiencing investment success due to the start of oil production, the introduction of renewable energy and energy conservation is proceeding steadily in accordance with the LCDS. The renewable energy rate has increased slightly to 7.8% in 2020 from 7.1% in 2012, and bioenergy accounts for 87% of the total energy sources (in 2020), while solar power generation has increased from 1% to 13% during this period²⁶. LCDS plans to introduce natural gas (thermal) and solar power in the short term, and hydropower, wind power, and biomass in the medium to long term. In December 2022, a remote meeting with GEA/GPL by the study team expert in the energy sector presented a request from the Guyanese side, which included the introduction of solar panels, wind farms, LED lighting for public roads, more efficient refrigerators and air conditioners for household and industrial use, and installation of EV stations. The development needs are confirmed and projects are evaluated in the energy sector. Considering the above, this sector will not take up this scenario as a cooperation scenario.

9.2.7 Overview of the Decarbonized Society, Energy Efficiency, and Renewable Energy Sector in Jamaica

(1) Trends in Jamaica

The field survey in Jamaica was conducted from August 31 to September 5, 2022. The Jamaica Public Services Company (JPS), the Embassy of Japan in Jamaica, and the Ministry of Science, Energy and Technology (MSET) were selected as the sites to be visited and interviewed as institutions related to energy.

Jamaica does not produce fossil fuel resources, and as of 2020, the renewable energy rate for electricity is limited to 14%, which means that the country is still dependent on imported fossil fuels for most of its energy needs. This has resulted in high electricity prices, ranking Jamaica in the top six in the world for residential use and ninth for industrial use in 2021²⁷. To address this current situation, the

²⁶ Statistical data are from IRENA Renewable Energy Statistics 2020

²⁷ https://www.globalpetrolprices.com/Jamaica/electricity_prices/

government is to promote energy conservation and renewable energy to reduce fossil fuel imports.

In its NDC submitted in June 2020, Jamaica's target for reducing emissions relative to Business as Usual (BAU) by 2030 is to achieve a 25.4% reduction relative to BAU emissions in 2030 without international support (unconditional) and a 28.5% reduction with conditions if international support is provided. The target is to achieve a 28.5% reduction with international support (see figure below).²⁸

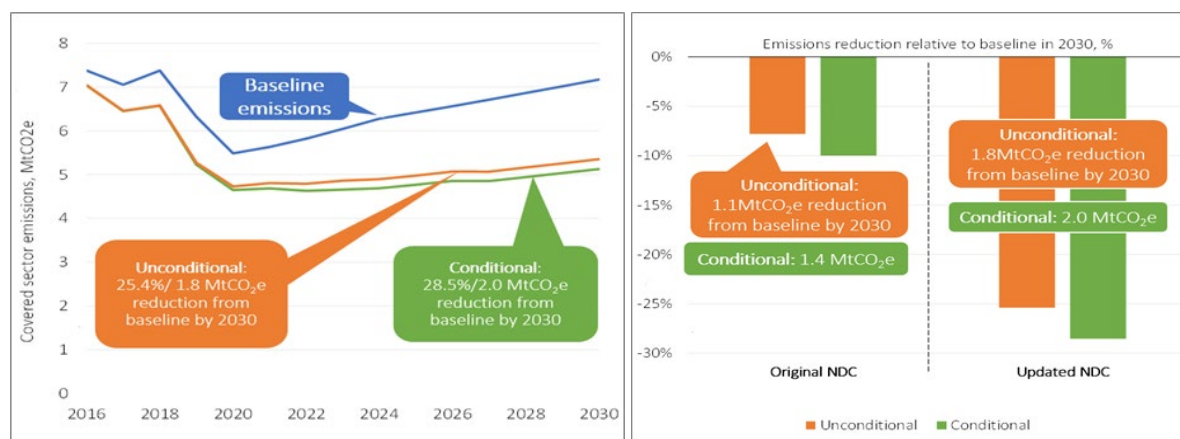


Figure 9-15 Emission Reduction Targets for Jamaica's NDCs

1) Issues and Strategies in Jamaica

The National Development Plan Vision 2030 Jamaica envisions achieving developed country status by 2030, based on the vision that "Jamaica will be the place of choice to live, work, raise a family, and do business. The Jamaica National Energy Policy (2009-2030) calls for energy diversification by moving away from imported energy, increasing the share of renewable energy in the energy mix to 11% by 2012, 12.5% by 2015, and 20% by 2030. Other goals include efficient energy use, replacement with high-performance infrastructure, and development of a legal framework for the energy sector.

The Integrated Resource Plan (IRP), enacted in 2018, calls for renewable energy to account for 31% of electricity generation capacity by 2030 and 49% by 2037. The share of solar power generation will be 37% of the total power generation capacity in 2037.

No national policy or target has been established for hydrogen (green hydrogen). If there is a surplus of electricity derived from renewable energy sources, it would be appropriate to turn it into electricity supply, and Jamaica is in a position to serve as a distribution hub from South America and other regions with hydrogen production potential. Therefore, at this point in time, it is appropriate to orient the site toward being a hub for transshipment and importation for domestic use in Jamaica, as well as a supply base for the Caribbean region, rather than for hydrogen production.

2) Development Partner Support Status and Areas of Focus

a) IDB's Activities

The IDB Group Country Strategy (CS) 2022-2026 will support the government's development goals of "faster inclusive growth and sustainable debt reduction"; the CS will support post-pandemic recovery

²⁸ NDC Partnership. <https://ndcpartnership.org/news/grounded-and-credible-jamaica-banks-greener-future-2020-ndc>

that is socially inclusive, sustainable, and driven by the private sector under two strategic areas: (i) revitalizing the productive sector for sustainable growth and (ii) addressing social gaps. In addition, the cross-cutting themes of gender and diversity, climate change and environmental sustainability, and institutional capacity and rule of law are rationalized into each strategic area. The table below shows the IDB's energy sector projects since 2000, with the largest number of projects on Efficiency (9 out of 15), followed by Renewable Energy (3 out of 15).

Table 9-58 IDB Projects in the Energy Sector (Jamaica)

Project Title	Sectors and Themes	Project Type	Project Total (USD)	Approval Date
Implementation and Technical Support for the Energy Sector in Jamaica	Energy	Technical Cooperation	400,000	Aug, 2022
Supporting the Recovery of the Energy Sector in Jamaica from the COVID-19 Pandemic	Energy	Technical Cooperation	200,000	Aug, 2020
Building a Sustainable Electric Mobility Ecosystem for Inclusion and Access	Energy	Technical Cooperation	995,000	Nov, 2019
Sustainable Transport and Renewable Energy-Powered Electromobility Support to Jamaica	Energy	Technical Cooperation	500,000	Oct, 2019
EcoMicro - COK Sodality Green Finance for Renewable Energy and Energy Efficiency for MSMEs and Low-Income Households	Energy	Technical Cooperation	350,000	Sep, 2018
Institutional Support and Capacity Building for The Petroleum Corporation of Jamaica	Energy	Technical Cooperation	230,000	Dec, 2017
Energy Management and Efficiency Programme	Energy	Investment Grants	10,000,000	Oct, 2017
Energy Management and Efficiency Programme	Energy	Loan Operation	15,000,000	Dec, 2016
Support to Energy Management and Efficiency Program	Energy	Technical Cooperation	340,000	Jul, 2016
ECOMICRO2 - Access Financial Services: Green microfinance for clean and efficient energy	Energy	Technical Cooperation	284,000	Jul, 2015
Energy Efficiency and Conservation Programme	Energy	Loan Operation	20,000,000	Nov, 2011
Support to Promote Energy Efficiency, Energy Conservation and Sustainable Energy	Energy	Technical Cooperation	593,000	Dec, 2009
Wind and Solar Development Program	Energy	Investment Grants	750,000	Sep, 2009
Energy Efficiency and Conservation Technical Assistance	Energy	Technical Cooperation	350,000	Jun, 2009
Establishment of an Energy Efficiency Fund	Energy	Technical Cooperation	45,000	May, 2004

Source: <https://www.iadb.org/en/projects-search?country=JA§or=EN&status=&query=>

b) Other Development Partners' Activities

Other major projects in the energy sector are listed in the table below.

Table 9-59 Major Energy Sector Projects by Other Development Partners

Project Title	Year	Partner
Commonwealth Ocean and Natural Resources Program	2015-2019	CFTC
Energy Management and Efficiency Program	2018-2023	European Union
Energy Management and Efficiency Program	2017-2022	Japan
Technical Cooperation to Promote Energy Efficiency in the Caribbean REGIONAL (USD 2.7 Million)	2019-2021	Japan
Deployment of Renewable Energy and Improvement of Energy Efficiency in Public Sector (GEF 5)	2016-2021	UNDP
Promoting Energy Efficiency and Renewable Energy in Buildings in Jamaica (LGGE)	2013-2019	UNDP

Source: Planning Institute of Jamaica

c) JICA's Activities

The Energy Management and Efficiency Program aims to reduce fuel consumption by improving the efficiency of lighting in public buildings such as government buildings and hospitals, upgrading air conditioning systems, and installing traffic control equipment. The project is being conducted in cooperation with the IDB and the EIB (European Investment Bank). For energy conservation in the transportation sector, the IDB projects Building a Sustainable Electric Mobility Ecosystem for Inclusion and Access, Sustainable Transport and Renewable Energy-Powered Electromobility Support to Jamaica, which supports the introduction of EV vehicles and EV stations.

JICA has surveyed Jamaica as a target country in the "Information Collection and Verification Study on Development Needs and Potential for the Introduction of Hydrogen Technology and Value Chain in the Latin American Region" for the regional value chain type and renewable energy utilization type studies. Although there is interest in hydrogen, there is currently no hydrogen policy in place. First of all, there is a need to strengthen the capacity and formulate policies related to hydrogen. Jamaica has a certain level of renewable energy potential and is interested in hydrogen production in the country, including the use of offshore wind power, etc. However, the current renewable energy rate is low, and it is first necessary to increase the renewable energy rate in order to promote hydrogen production. Jamaica has an important regional hub, the Port of Kingston, and in order for the port to maintain its current status as an important international port in the era of decarbonization, it is imperative for it to be converted into a carbon neutral port. This should be considered together with the possibility of accommodating ships that use ammonia and hydrogen as fuel. The analysis identifies the following cooperation needs:

- Development of a hydrogen strategy
- Support the development of a hydrogen plan for the Integrated Resource Resilience Plan (IRRP)
- Study of infrastructure development plans for hydrogen deployment
- Study of carbon neutral ports
- Hydrogen human resource development project in Jamaica.

(2) Development and Cooperation Scenario

a) Development issues and strategies

Regarding electricity, Jamaica is dependent on imported petroleum-based fuels as its main energy source, with a renewable energy conversion rate of 14% as of 2020. But in the National Energy Strategy 2009-2030, Jamaica has set a target of 20% renewable energy share in the energy mix by 2020. The Integrated Resource Plan (2018) has set ambitious targets of 31% renewable energy in electricity generation by 2030 and 49% by 2037. The integrated resource plan emphasizes a 37% share of solar power in 2037, and mentions the need to invest in energy storage systems and smart grids.

Due in part to its dependence on fossil fuel imports for majority of its energy needs, and in part to the fact that electricity prices are among the highest in the world, the Jamaican government is actively promoting the introduction of renewable energy sources, as well as energy efficiency, increasing their share of electricity generation from 6.9% in 2012 to 13.5% in 2020 (Table 9-5). Looking at the

breakdown of renewable energy, the major growth is in solar power, which has not increased in terms of share, but is significant in terms of total capacity, with wind and solar being the main sources of power generation (See Table 9-60 below).

Table 9-60 Component of Renewable Energy, Jamaica

Capacity	Hydro	Solar	Wind	Bio	Geo.	Total
2012	24%	2%	41%	33%	0%	100%
2020	12%	37%	39%	13%	0%	100%

Source: IRENA, Renewable Energy Statistics 2022

IRENA also evaluates the renewable energy potential of each country, and Jamaica's assessment indicates that there is potential for development in solar, wind, and biomass power generation.

Based on this situation, and taking into consideration the CCREEE Strategic Plan and the CARICOM Regional Electric Vehicle Strategy (REVS), the challenges for the sector are summarized in the table below.

Table 9-61 Issues for Jamaica's Decarbonized, Energy-efficient, and Renewable Energy Sector

Issue	Issue Overview
1. Diversification of energy sources, promotion of renewable energy generation	Diversification of energy sources through energy mix improvement should be promoted to achieve CDN, and development of solar, wind, and biomass power generation should be promoted. Institutional strategy for hydrogen energy has not been established and human resource development plan has not been formulated.
2. Promote energy efficiency and decarbonization of the transportation sector	Promotion of GHG emission reduction (conversion of vehicles to EVs and promotion of EV stations)
3. Promote energy use efficiency and energy conservation measures	Reduction of energy consumption through efficiency improvements of various equipment in the industrial and residential sectors

Source: JICA Study Team

The table below summarizes the development strategy and its summary for the above issues.

Table 9-62 Overview of Strategies for a Decarbonized Society, Energy Efficiency and Renewable Energy Sector in Jamaica

Subjects	Issues	Strategy Overview
Jamaica Green Economy (decarbonized society, energy saving, renewable energy)	Diversification of energy sources, promotion of electricity generation from renewable energy sources	In its Integrated Resource Plan (IRP), the government has pledged to increase renewable energy in power generation to 31% by 2030 and 49% by 2037, with particular emphasis on solar power, but wind power is also a major player. Regarding hydrogen, interest in its domestic use is high, but the government has not yet announced its policy, and the legal system needs to be clarified.
	Increase energy efficiency and decarbonize the transportation sector	Promotion of low emission vehicles and expansion of EV stations.
	Promote energy use efficiency and energy conservation measures	Reduction of energy consumption by improving efficiency in the industrial and residential sectors as a countermeasure to the high price of electricity, which ranks 9 th in the world for industrial use and 6 th in the world for residential use.

Source: JICA Study Team

b) Programs and Projects

Based on the strategies listed in the table above, the programs/projects listed in Table below are

proposed.

Table 9-63 Programs and Projects

Subject	Strategy	Program/Project	Implementing Agency
Jamaica Decarbonized Society, Energy Saving, Renewable Energy	Diversification of energy sources, promotion of electricity generation from renewable energy sources	Development of wind power, solar power, and bioenergy	MSET/MIIC
		Support for development of hydrogen energy strategy	MSET/JPS
	Increase energy efficiency and decarbonize the transportation sector	Promotion of lower vehicle emissions and expansion of EV stations	MSET/MTM
	Promote energy use efficiency and energy conservation measures	Technical and financial support for promotion of LED lighting in public buildings and public roads	MSET/MIIC

Source: JICA Study Team

2) Cooperation Scenario

The criteria listed in the table below were established to select cooperation scenario for JICA to work on.

Table 9-64 Cooperation Scenario for Selection Criteria (Jamaica)

Selection Criteria	Content
(1) Consistency with the Government of Japan's Country Development Cooperation Policy	The Government of Japan's development cooperation policy (priority areas) for Jamaica is to "provide assistance to promote energy conservation and conversion to renewable energy in order to reduce greenhouse gas emissions.
(2) Consistency with JICA's global agenda	JICA is committed to creating an environment for the introduction of renewable energy and promotion of energy conservation (the "New Renewable Energy Introduction Promotion" cluster and the "Energy Conservation Promotion" cluster) by utilizing private-sector funds for the low-carbon use of energy.
(3) Effective utilization of the results of past projects implemented by JICA	It is necessary to make effective use of the results and lessons learned from JICA's previous projects in Jamaica.

Source: JICA Study Team

Based on these selection criteria, the highest priority programs/projects were selected as shown in the table below.

Table 9-65 Proposed Programs and Projects

Strategy	Programs/Projects	Modality
1. Diversification of energy sources, promotion of renewable energy generation	Support for development of hydrogen energy strategy	Country-specific training

Source: JICA Study Team

a) Developing A Strategy for the Use of Hydrogen Energy in Renewable Energy Policy

Although the Government of Jamaica is interested in hydrogen, there is currently no hydrogen policy in place. Thus, the first step is to strengthen its hydrogen capacity and develop a hydrogen strategy.

The Government of Jamaica has been steadily developing renewable energy sources, as evidenced by the Prime Minister's directive to increase the percentage of renewable energy sources to 50% of the

country's electricity generation by 2030, although the current renewable energy rate is low and the government needs to first increase the rate in order to promote hydrogen production. On the other hand, Jamaica has the Port of Kingston, which is a regional hub port, and it is reported that Jamaica has the potential to become a regional hydrogen distribution center by accommodating ships that utilize ammonia and hydrogen as fuel, and the MSET has expressed interest in the possibility of hydrogen development. Jamaica's interest has been confirmed, and although the development of renewable energy is progressing, support for the formulation of a hydrogen strategy may be considered, due to the fact that the renewable energy rate is still low at around 13.5% and the priorities of the electricity sector.

To address the issue of promoting energy use efficiency and energy conservation, JICA has already implemented the Energy Management and Efficiency Program in cooperation with the IDB and the EIB, which aims to reduce fuel consumption by improving the efficiency of lighting and air conditioning systems in public buildings such as government buildings and hospitals. For energy efficiency and decarbonization issues in the transport sector, the IDB is already implementing the Building a Sustainable Electric Mobility Ecosystem for Inclusion and Access, Sustainable Transport and Renewable Energy-Powered Electromobility Support to Jamaica, which supports the introduction of EV vehicles and EV stations. Therefore, it is not included in the cooperation scenario.

Table 9-66 Outline of the Hydrogen Energy Strategy Development Support Project

Item	Contents
Project name	Support for development of hydrogen energy strategy
Priority	Possible Project (C)
Target Country	Jamaica
Basic Strategy	Developing a strategy for the use of hydrogen energy in renewable energy policy
Project Site	Jamaica
Cooperation Period	January 2024 - December 2024 (12 months)
Name of Partner Country	MSET
Name of partner country and other related organizations	JPS, MIIC
Project Objectives	A development strategy for hydrogen will be developed. Related human resources will be developed.
Outcome	<ol style="list-style-type: none"> 1) Study the use of hydrogen in the power, transportation, and industrial sectors. 2) Establish a roadmap for hydrogen energy. 3) Human resource development related to hydrogen development and handling will be made.

Source: JICA Study Team

9.2.8 Recommended Projects On A Broad Basis (In Collaboration With SICA)

The energy policies of countries in the region are generally in line with EESCA 2030, and issues such as diversification of the energy matrix (expansion of the introduction of renewable energy), energy efficiency and decarbonization of the transportation sector, and promotion of energy conservation measures are common issues in the Central American region. SICA is considering a regional cooperation program in the field of environment and climate change under the Plan de acción para la cooperación regional SICA - JICA 2021 - 2025, which includes the "Renewable Energy and Energy Efficiency Training Program for SICA Member Countries" under a regional training scheme. It is important to continue collaboration and information sharing with UCE, the agency in charge of the energy sector in SICA, to consider support for these issues.

In addition, interest in hydrogen energy is growing rapidly in many countries in the region, and several

countries have announced plans to conduct hydrogen utilization studies in 2022. Despite the interest in hydrogen, many countries have yet to develop their hydrogen strategy such as related legal systems and human resources, and it would be effective to include this training in the "Renewable Energy and Energy Conservation Training Program for SICA Member Countries" mentioned above. In this case, it would be effective to share within the region the know-how accumulated through the soft and hard cooperation projects that JICA has implemented in the region to date. Projects such as the scheme in which Costa Rica, a world leader in renewable energy, shares its experience and know-how, while Japan shares its technologies and measures in energy conservation and hydrogen energy.

Table 9-67 Programs/Projects in Collaboration with SICA

Item	Contents
Project name	Training on Renewable Energy, Energy Saving and Hydrogen Energy for SICA Member Countries
Priority	Priority Project (A)
Target Country	SICA Member Countries
Basic Strategy	Training on Renewable Energy, Energy Conservation and Hydrogen Energy in Japan and Costa Rica
Modality	Subject-specific training/country-specific training, third-country training
Project Site	SICA member countries/Costa Rica and Japan
Cooperation Period	August 2023 - July 2026 (36 months)
Name of Partner Country	SICA/CCAD/UCE, MEIC/MINAE
Name of partner country and other related organizations	Ministries in charge in each country (Ministry of Energy, etc.)
Project Objectives	Capacity building and networking in the renewable energy and energy saving sectors, as well as in hydrogen energy, will be strengthened.
Outcome	<ol style="list-style-type: none"> 1) Japanese technologies related to renewable energy, energy saving, and hydrogen energy will be introduced. 2) Human resources for hydrogen energy will be developed. 3) Costa Rica's renewable energy initiatives and experiences will be shared within the SICA region. 4) SICA UCE network in the field of renewable energy will be established.

Source: JICA Study Team

10. Green Economy (Resilient Economic Development)

10.1 Outline of the Study

In the previous study, social and economic policies, the private sector, agriculture sector and tourism were examined in relation to the resilient economic development sector. In the area of social and economic policy, while there have been some successes in the Central America and Caribbean region over the years in diversifying its industrial structure¹, the region has yet to make major changes in its industrial structure, and the lack of domestic employment remains a regional issue. In light of this, the study recommended that the Central American and Caribbean region should continue to address the major issues of diversifying the industrial structure as it's linked to immigration and family remittances. In the private sector, the study examined support for micro, small and medium-sized enterprises (MSME) and made recommendations for supporting innovation for industrial upgrading. While in the tourism sector, recommendations were made for promoting MSME and digitalization, and minimizing tourism leakages. This study will be conducted to gather information on MSME promotion, startups, and ecosystem (energy environment) promotion that contribute to the green economy to identify issues and create scenarios for development and cooperation.

(1) Updated Survey Scope by Sector

Table 10-1 Survey Scope by Sector (Resilient Economic Development)

No.	Task	Subsector	Scope
1	Sector Targets		Data for resilient economic development (include tourism), information on MSME promotion, startups, and ecosystem promotion that contribute to a green economy will be collected to identify issues and create scenarios for development and cooperation. For tourism, specific project proposals and support schemes will be considered by taking the previous research one step further.
2	Scope Update		In the Central American region, the scope includes research contributing to the green economy as part of industrial promotion (promotion of MSME, startups, and ecosystems). In the Caribbean region, a desk study of all target countries will be conducted to select priority countries. In the tourism area, further needs assessment will be conducted in the Dominican Republic, following the previous phase of the study.
3	【Task 2】		The selection of priority countries will be made through interviews and information gathering surveys with the MSME Promotion Agency, Investment Promotion Agency, Ministry of Economy, Ministry of Export, Ministry of Tourism, SICA, Centro Regional de Promocion de la MIPYME (CENPROMYPE), La Secretaría de Integración Económica Centroamericana (SIECA Economic Institute, Secretaría de Integración Turística Centroamericana(SITCA), Caribbean Development Bank(CDB), Caribbean Tourism Organization(CTO), and other regional organizations, as well as think tanks such as La Agencia Costarricense de Promoción de Inversiones (CINDE) in Costa Rica.
4	【Task 3】		Visit relevant organizations in the priority countries selected in Task 2 and conduct hearing surveys. Issues and measures regarding MSME promotion and ecosystem promotion will be investigated, and the direction of development scenarios will be discussed.
5	【Task 4-6】		Although it is not expected to implement pilot projects in the green economy sector, appropriate advice on the selection, planning and implementation of pilot projects in security (Honduras), environment (Barbados), and agriculture and fisheries, from the perspective of tourism, investment promotion, etc., shall be made.
6	【Task 8】		Finalize development scenarios and cooperation scenarios based on the results of the survey analysis and opinions/requests from JICA offices, regional organizations, and development partners.

Source: JICA Study Team

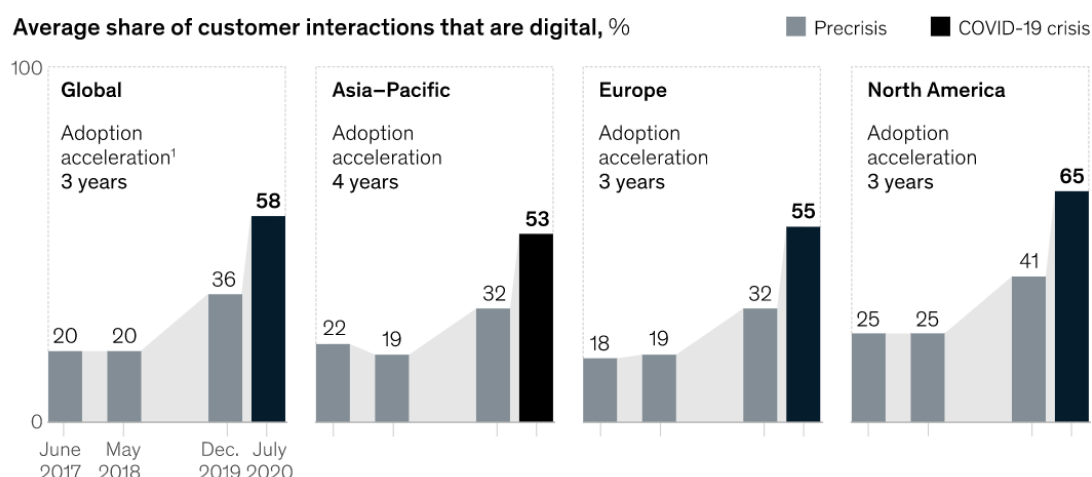
¹ Success in attracting the automotive industry in Mexico, the IT industry in Costa Rica, and the automotive parts industry such as harnesses, etc. (El Salvador, Nicaragua, etc.), etc.

10.2 Overview of the Resilient Economic Development Sector in the Region

(1) Global Trends on the Economic Development Sector

The IMF revised downward its forecast for 2023 by 0.2% from its previous forecast (July) in its World Economic Outlook released in October 2022, with global economic growth rates of 3.2% in 2022 and 2.7% in 2023. The slowdown in 2023 will be broad-based, with about one-third of the global economy projected to experience negative growth. The United Nations has designated June 27 as MSME Day, and the crisis is that MSME, which account for 90% of the world's businesses, 60-70% of employment, and 50% of GDP, have been severely affected by the COVID-19 pandemic, climate change, and conflicts such as the war in Ukraine². United Nations Industrial Development Organization (UNIDO) has identified three trends in industrial recovery from the pandemic: 1) digitization and automation of production processes, 2) changes in trade and global value chains due to the rise of China, and 3) greening production processes for a decarbonized economy³. McKinsey notes that during the pandemic, consumers rapidly migrated to online channels, companies and industries adapted (Figure below), and developed these products and services on average seven years faster⁴.

The COVID-19 crisis has accelerated the digitization of customer interactions by several years.



¹Years ahead of the average rate of adoption from 2017 to 2019.

Source: McKinsey & Company

Figure 10-1 Consumers' Use of Digital Channels

(2) Overview of Central America and the Caribbean Region

According to the IMF, the Latin America and Caribbean (LAC) region's economy is expected to grow by 3.5% in 2022 after growing by 6.9% in 2021, a percentage point upward revision to the April 2022 World Economic Outlook forecast due to strong economic conditions in the first half of 2022⁵. The

² <https://www.un.org/en/observances/micro-small-medium-businesses-day>

³ United Nations Industrial Development Organization, 2021. Industrial Development Report 2022. The Future of Industrialization in a Post-Pandemic World. Overview. Vienna. P. 18-19.

⁴ McKinsey & Company (2020) <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever>

⁵ Regional Economic Outlook Western Hemisphere, IMF, 2022.10

revised growth rate of 4.7% for Central America is higher than the growth rate for LAC as a whole, although it decreased by 0.1%. The Caribbean region's growth rate increased by 0.5% to 5.2%, which is also higher than the overall LAC growth rate⁶.

However, a slowdown is expected in most countries in the second half of 2022 and into 2023, with private consumption and investment, which contributed significantly to growth in 2021-22, expected to weaken, and public consumption and exports expected to return to their pre-pandemic growth rates (Table below).

Table 10-2 Economic Growth Projections for Central America and the Caribbean

Western Hemisphere: Real GDP Growth	Year-over-year percent change					
			Projections		Difference from April 2022 WEO	
	2020	2021	2022	2023	2022	2023
United States	-3.4	5.7	1.6	1.0	-2.1	-1.3
Canada	-5.2	4.5	3.3	1.5	-0.6	-1.3
Latin America and the Caribbean	-7.0	6.9	3.5	1.7	1.0	-0.8
South America	-6.6	7.3	3.6	1.6	1.3	-0.5
CAPDR	-7.1	11.0	4.7	3.6	-0.1	-0.4
Caribbean						
Tourism Dependent (11 countries)	-14.7	7.8	5.2	3.6	0.5	-0.3
Other (4 countries)	1.3	3.4	16.7	9.3	2.8	-2.7
Of which: Commodity Exporters	4.0	6.1	24.6	12.8	4.4	-3.6
Mexico	-8.1	4.8	2.1	1.2	0.1	-1.3

CAPDR = Central America, Panama, and the Dominican Republic

Caribbean Tourism Dependent: Ariguaná and Barbuda, Aruba, Bahamas, Barbados, Belize, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines

Caribbean Other: Guyana, Haiti, Suriname, Trinidad and Tobago

Caribbean Commodity Exporters: Guyana, Suriname, Trinidad and Tobago

Sources: IMF, Regional Economic Outlook, Western Hemisphere, 2022.10

One of the problems faced by MSME in LAC countries identified by COVID-19 is that they don't have access to long-term loans or equity investment (financial access) as large companies do, and they rarely raise funds in overseas markets. In terms of market access, MSME often have little experience in the export business, which means that the cost of complying with regulations and taxes is often high, and they often have little or no budget for research and development or human resource development.

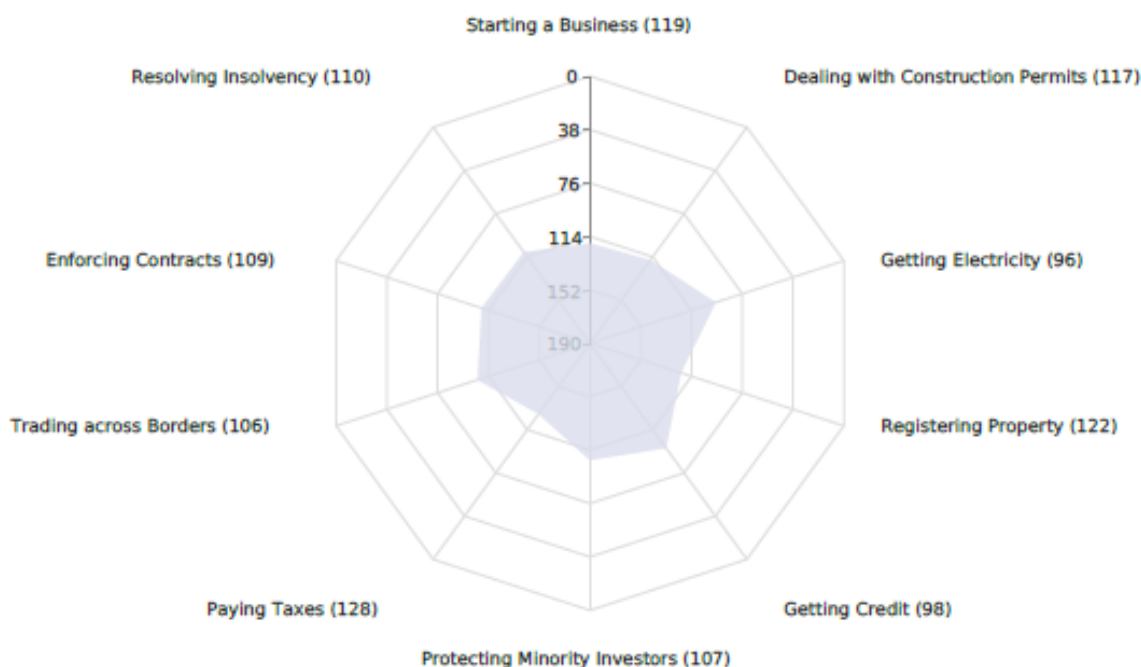
The significant reduction in financial support during the recovery phase is also evident, with measures aimed at increasing MSME liquidity through debt, grants, and deferred repayment instruments reportedly carrying less weight in the recovery package (4.5% of total loans) than crisis measures (43.2%), and more generous public support is desired⁷.

The World Bank's Doing Business report is a comprehensive comparison and ranking of the business environment in countries and regions around the world and is an indicator of the investment and business environment. The 2020 edition, which was discontinued after 2020, ranked LAC 116th (with a score of 59.1), which is below the average of 190 countries surveyed, and the following issues were

⁶ BID (2003) <https://www.iadb.org/es/noticias/hojas-informativas/2003-01-08/pymes-y-microempresa%2C2592.html>

⁷ OECD. Financing SMEs and Entrepreneurs 2022 : An OECD Scoreboard. <https://www.oecd-ilibrary.org/sites/e9073a0f-en/index.html?itemId=/content/publication/e9073a0f-en>

identified: it takes longer than average to pay taxes, starting a business is more expensive and involves more procedures than average, and there are many areas that need improvement, such as asset registration. (Figure below).



Source: Doing Business 2020 Region Profile Latin America & Caribbean

Figure 10-2 Ranking of LAC Countries by Doing Business Topic

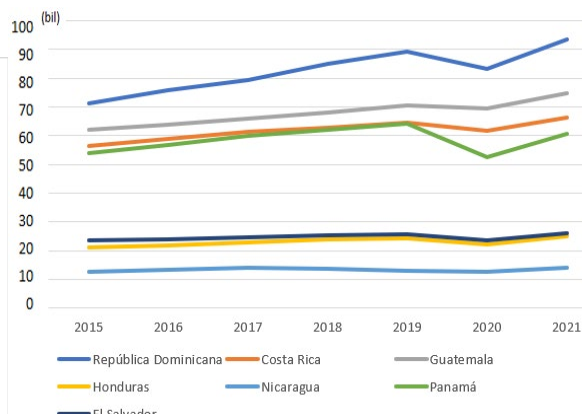
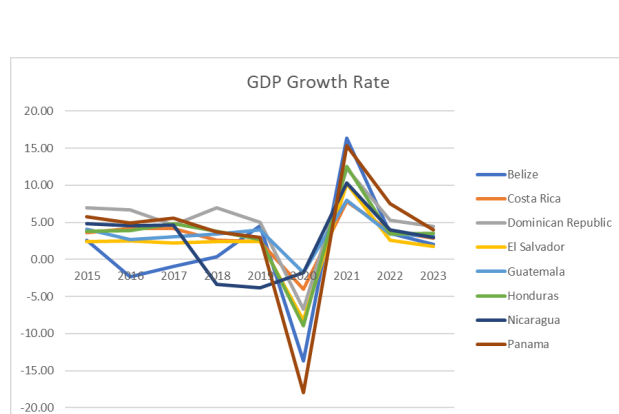
10.2.1 Overview of the Resilient Economic Development Sector in the Central American Region

(1) Trends in Central America

Central American countries experienced a significant economic slowdown in 2020 due to COVID-19 (see Figure below). Among the seven Central American countries, Panama and the Dominican Republic recorded relatively large negative growth in terms of GDP decline. The Dominican Republic, the largest economy in Central America, and Panama showed one of the best recoveries despite the significant impact of 2020, and their economic growth rates showed one of the highest recoveries in the region in 2021-2022. They are expected to continue to grow at high rates in 2023, with one of the highest growth forecasts in Central America⁸. The country's economic situation and solid economic and fiscal management are highly rated by rating agencies⁹.

⁸ 12.26% (2021), 5.25% (2022), 4.49% (2023), World Economic Outlook 2022, IMF

⁹ Standard & Poor's raised its credit rating on Dominican Republic to BB- from BB- (20th Dec 2022, <https://dominican.news/money/standard-poors-upgrades-dominican-republics-credit-rating/>)



Note: GDP 2001-2021 (US\$ at constant 2010 prices)

Source: World Bank

Source: WEO 2022 en LAC

Figure 10-3 GDP Growth Rates of Central American Countries

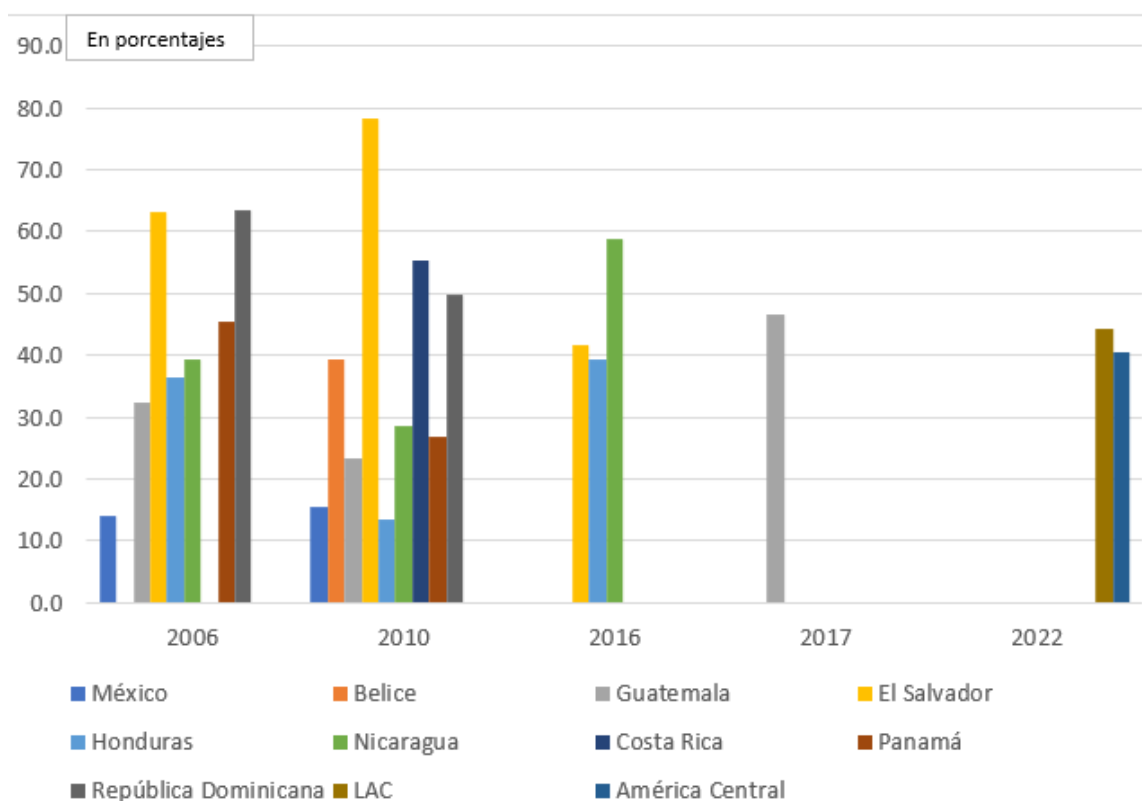
Figure 10-4 GDP Trends in Central American Countries

ECLAC commented on the challenges facing MSME in Central America and the Caribbean: "Although MSME account for 99% of the industrial structure and generate the majority of employment, their productivity is extremely low compared to larger firms. To improve this situation, it is necessary to establish production chains composed of firms of different sizes, mainly MSME, in order to eliminate economic heterogeneity, create jobs, and increase wages," emphasizing the need to support MSME¹⁰.

The Instituto Centroamericano de Administración Pública (ICAP), an agency of SICA, noted that the pandemic highlighted the high informality of MSME and limited availability of financing, and the need to improve such access. ICAP suggests that in some countries, even with the widespread use of electronic payment platforms, the main means of payment is cash. With this, it is necessary to develop tools tailored to the conditions and characteristics of each country, such as access technological platforms, connectivity, and access facilities¹¹. The report also points out that when administrations change in the region, in many cases the activities, policies, and programs that were previously in place are suspended or reversed, and that MSME and entrepreneurs are greatly affected by this, and that this vexing problem is hindering the spread of new policies.

¹⁰ <https://www.cepal.org/en/subtopics/micro-small-and-medium-sized-enterprises-MSME#>

¹¹ La Transformación digital, innovación en las MIPYMES de America Latina



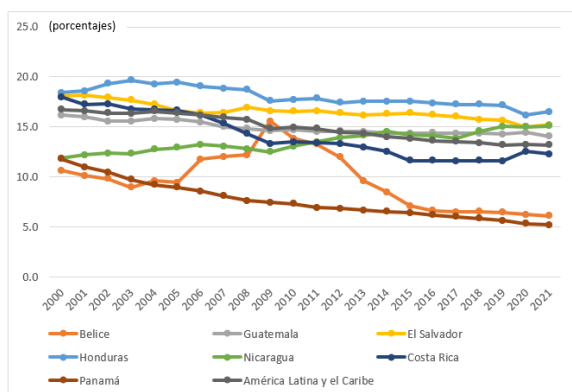
Source: Agenda 2030 en LAC

Figure 10-5 Percentage of MSME Received Financing

Improving MSME financing is also a goal of SDG 9.3, but LAC's 2022 performance is only 44.2% for the region as a whole and 40.4% for the Central America region. Within the Central American region, there are disparities among countries (as shown in the figure above). The lack of sufficient statistics is also a problem but improving access to finance is ongoing.

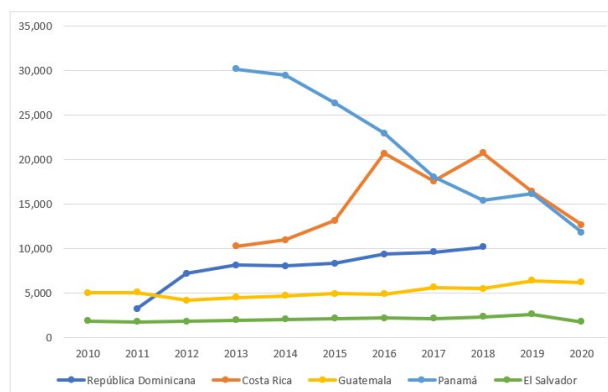
While the previous phase of the study also pointed out the need to develop diversified and competitive industries as a challenge for industrial structure, the Agenda 2030¹² for Central America and the Caribbean shows the statistics for value added products in the manufacturing sector, SDG Global Indicator 9.2, as a percentage of GDP for Central American countries (SDG 9.2.1), and shows a declining trend since 2000 in all countries except Nicaragua.

¹² La Agenda 2030 en América Latina y el Caribe



Source: Agenda 2030 en LAC

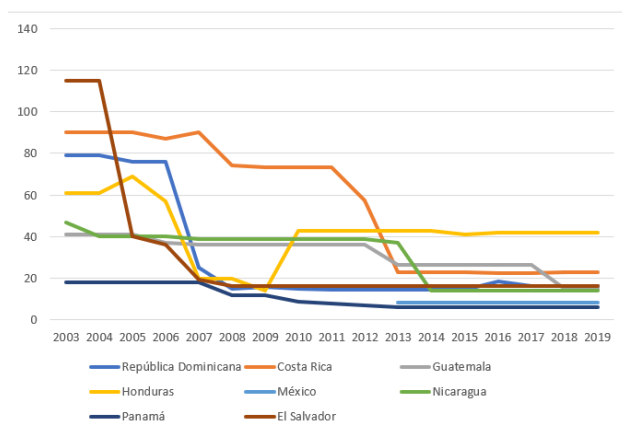
Figure 10-6 Value Added as a Percentage of GDP (Manufacturing)



Source: World Bank

Figure 10-7 New Companies Registered

In terms of start-ups, the number of new companies in Central America by the World Bank (see figure above), which had been flat before the pandemic, has been decreasing due to the pandemic. The number of days required to start a business in each country (Figure below) is more than 20 days in Honduras and Costa Rica. In the Doing Business 2020 ranking of countries in the region, Mexico (60th) is followed by Costa Rica (74th), Panama (86th), and Nicaragua is ranked 142nd, the bottom of the list. LAC as a whole is ranked 116th as mentioned above, which is below the average of all 190 countries surveyed. Table below shows the ranking of Central American countries in Doing Business 2020.



Source : World Bank

Figure 10-8 Number of days required to start a business

Table 10-3 Rank in Doing Business in Central American Countries

Rank	Economy	DB score
60	Mexico	72.4
74	Costa Rica	69.2
86	Panama	66.6
91	El Salvador	65.3
96	Guatemala	62.6
115	Dominican Republic	60.0
153	Honduras	56.3
142	Nicaragua	54.3

Source: JICA Study Team based on Doing Business

For startups, StartupBlink, with the help of about 100 local partners¹³ around the world, in collaboration with Crunchbase, UNAIDS, and others, publishes the Global Startup Ecosystem Index ranking (top 100 by country, top 1000 by city) every year. The Index ranks countries based on the sum of their scores in three areas: Quantity Score, Quality Score, and Business Environment Score. The main scoring factors in each area are shown in the table below.

¹³ Europe 56, Middle East 5, Asia-Pacific 35, Africa 16, North America 18, South America 13, <https://www.startupblink.com/startupecosystemreport>

Table 10-4 Examples of Elements of Each Sub-score

Quantity Score	Quality Score	Business Environment Score
• Number of Startups	• Branches of multinational companies	• Internet speed
• Number of Coworking Spaces	• Total private sector investment	• Internet freedom
• Number of Accelerators	• Number of employees per startup	• R&D investment
• Number of Startup related Meetups	• Global startup events	• Level of English proficiency

Source: Global Startup Ecosystem Report 2022

According to the 2022 Global Startup Ecosystem Index, the number of LAC countries in the top 100 decreased by two from the previous year to 11, of which the Dominican Republic, which had been in the top 100 until 2021, dropped out of the top 100 in the Central America and Caribbean region, where this study was conducted. In the region, only Costa Rica, Panama, and Jamaica remain in the top 100. The number of LAC cities in the top 1,000 cities dropped to 60 from 82 the previous year, and 33 of the 60 cities in the top 1,000 dropped in rank. On the other hand, the number of cities in the top 300 increased to 18 from 17 a year ago, indicating that overall, the top cities made progress while the bottom cities fell back. Countries that did not make the Top 100 include Santo Domingo (Dominican Republic), Guatemala City (Guatemala), and San Salvador (El Salvador), which are either in the Top 1000 or are candidates for the Top 1000.

Thus, the startup environment in Central America and the Caribbean is not a situation that has earned a good reputation. According to the Doing Business 2020 profile data for the LAC region, the LAC region has the worst business environment in 12 of the 19 indicators. The LAC Region also had the lowest results for startups in three of the four indicators: procedures, number of days required for procedures, and cost of procedures. In terms of startups, the LAC region has the lowest results in 3 out of 4 indicators (procedural items, number of days required for procedures, and cost of procedures), and also needs improvement in access to funds and procedures required for real estate registration and obtaining permits.

Table 10-5 Business Environment by Region

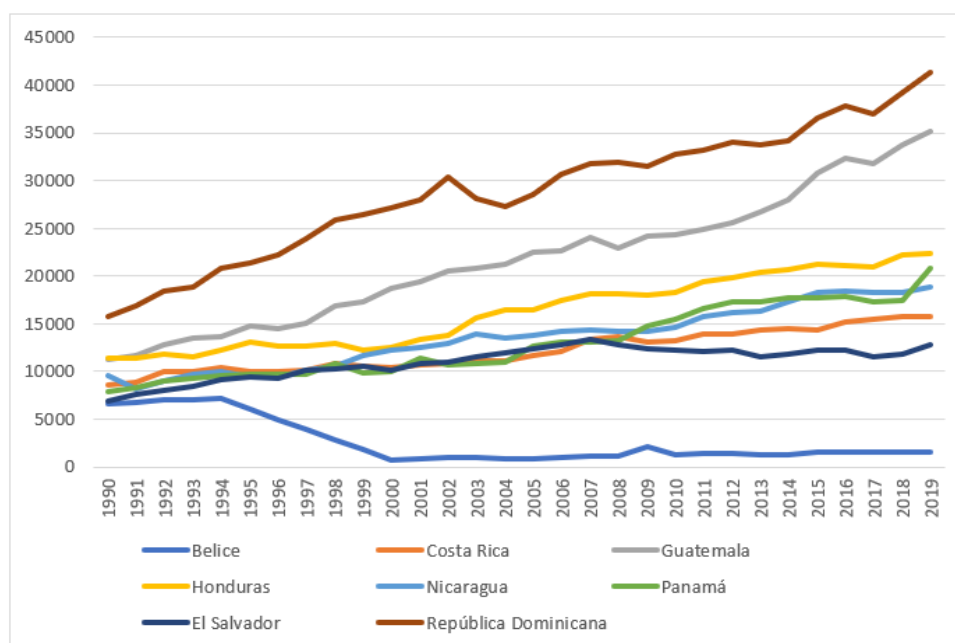
	LAC	South Asia	East Asia & Pacific	EU
Starting a Business				
Procedure (number)	8.1	7.1	6.5	5.3
Time (days)	28.8	14.5	25.6	11.9
Cost (% of income/capita)	31.4	8.3	17.4	3.1
Paid-in min. capital (% of income/capita)	0.4	0.2	3.5	8.1
Dealing with Construction Permits				
Procedure (number)	15.5	14.6	14.8	13.7
Time (days)	191.2	149.7	132.3	176.5
Cost (% of warehouse)	3.6	12.5	3.2	1.9
Getting Electricity				
Procedure (number)	5.5	5.5	4.2	4.6
Time (days)	66.8	86.1	63.2	91.4
Cost (% of income/capita)	407.2	952.6	594.6	111.6
Registering Property				
Procedure (number)	7.4	6.9	5.5	5.1

Time (days)	63.7	107.8	71.9	27.1
Cost (% of property)	5.9	7.0	4.5	4.8
Getting Credit				
Ease of getting credit	52			
Strength of Legal Right	5.3	5.5	7.1	5.7
Paying Tax				
Payments (number/year)	28.2	26.7	20.6	10.3
Time (hour/year)	317.1	273.5	173.0	171.5
Total Tax (% of profit)	47.0	43.9	33.6	39.7
Trading Across Borders				
Time to Export (hours)	55.3	53.4	57.5	8.1
Cost to Export (USD)	516.3	310.6	381.1	86.8

Color cell: Most negative results among the 4 indicators

Source: Doing Business LAC 2020

As for the eco-system (energy environment), the introduction of renewable energy is progressing in Central America, and most countries have achieved a renewable energy rate of over 50%, led by Costa Rica, where almost 100% of electricity generation is provided by renewable energy. On the other hand, most energy consumption is derived from fossil fuels, and each country is considering strategies to decarbonize and become carbon neutral. The table below shows the trend of CO₂ emissions in Central American countries from 1990 through 2019. With the exception of Belize, almost all countries are showing an increasing trend, indicating the need for further promotion of national decarbonization plans (PNdD).



Source: World Bank

Figure 10-9 Total Greenhouse Gas Emissions 1990-2019 (kt of CO₂ equivalent)

Centro Regional de Promocion de la MIPYME (CENPROMYPE) is composed of eight SICA member countries and the regional development bank, Banco Centroamericano de Integracion Economica

(BCIE) It is an organization that promotes MSME and entrepreneurial development¹⁴ and has developed the "Regional Policy for the Modernization and Transformation of MSME in the SICA Countries" (Política Regional de Modernización y Transformación para las Mipymes en los países del SICA) based on the industrial policies of its member countries. The latter was done in a participatory process that began in 2018 and approved in 2022, making compliance mandatory for the eight SICA member countries. In an interview with CENPROMYPE¹⁵, it was noted that they place importance on establishing a regional brand and are promoting the "Sello de Origen" (certification of origin). Since 2010, they have been implementing the "MSME REGIONAL AGENDA" to strengthen the competitiveness of MSMEs and contribute to the "Sustainable Development Goals". It is organized around six axes, namely Business Development Support, Financial Environment Improvement, Entrepreneurship Support, Competitiveness Enhancement, Women Entrepreneurs Support, and Technology Innovation (See Figure below). It is currently working with the Secretaría de Integración Turística Centroamericana (SITCA) to develop a joint plan to work with eight Central American countries.



EJES PRIORIZADOS POR LA AGENDA REGIONAL MIPYME



Source : CENPROMYPE Website

Figure 10-10 MSME Regional Agenda

The project is also considering developing a region-wide value chain with ECLAC, e.g., if Costa Rica is good at producing cocoa and Panama is good at marketing, the frame could be that production is done in Costa Rica and marketing is left to Panama. Funding comes from membership fees from the eight SICA member countries, but 80% of the project implementation comes from international partners and 10% from large private companies willing to fund MSME suppliers. In a model called Angel Venture, the strategy is for small farmers to grow their products and sell them to large corporations such as Wal-Mart and Super Selectos, securing the supply chain for their mutual benefit. In addition to this,

¹⁴ CENPROMYPE en breve

¹⁵ Based on interviews at the CENPROYPE conference room on August 10, 2022.

CENPROMYPE has also established an investment fund, which works on a grant and matching grants model (50% for large companies and 50% for other small and micro companies).

The joint working agenda with SITCA is developing a roadmap for matching the expertise of CENPROMYPE (MSME promotion) and SITCA (tourism sector) (this roadmap will be published after approval by member ministries of tourism, but as of December 2022, it has not been approved). Under the ECADERT (Central American Strategy for Territorial Rural Development), Costa Rica and Panama have recently held meetings on rural tourism. SIECA has a trade platform, but mainly for large companies, CENPROMYPE has requested them to allow MSME to participate in the platform as well as large companies.

These issues and points to be improved for MSME in Central America are summarized in the table below in reference to the issues and improvement measures in the ICAP report, etc., and in relation to the JICA Global Agenda (4. Private Sector Development) [Five approaches and tactics for "Entrepreneur and Enterprise Development" and "Investment Promotion and Industrial Promotion"].

Table 10-6 MSME Issues and Improvements

MSME Issues	Improvements	Global Agenda
Management and Operational Structure of MSME	Improving the administrative and financial capacity of MSME	Access to Finance Strengthening Corporate Competitiveness
Integration of the production chains in Central America	Creation of opportunities and capacities, linkages with technical centers of regional cooperation in different sectors, emphasis on agro-industry, integration of related value chains	Enhancement of Linkage
Programs aimed at promoting new technologies	Internship programs (agreements with universities in Central America and abroad) to attract professionals	Strengthening Corporate Competitiveness
Business development, innovation, and competitiveness	Technical capacity building with emphasis on improving productivity, reducing production costs, mass production, and using new technologies to create high value-added products	Strengthening Corporate Competitiveness Promotion of Innovation
Development of specialized technical assistance centers (Industry 4.0, promotion of Kaizen)	Development of a regulatory framework, sectoral policies, and promotion of a digital ecosystem for the development of the digital technology services industry	Industrial Policy and Business Environment Promotion of Innovation

Source: JICA Study Team based on Cuadernos Centroamericanos del ICAP No. 38.

(2) Tourism Sector

The tourism sector was the sector most affected by COVID-19, with the World Travel & Tourism Council (WTTC) estimating tourism losses of USD 4.9 trillion (-50.4%) and 62 million jobs lost in 2020¹⁶. It showed a significant recovery in 2021, with tourism's share of GDP increasing by 0.8% to 6.1% in 2021, after declining by 5.0% year-on-year in 2020, creating 18.2 million jobs. WTTC forecasts an annual growth rate of 5.8% for tourism as a share of GDP from 2022 to 2030, but the recovery in 2021 was less than expected. MSME share of the sector is 80% and is dominated by women, young workers, and minorities, pointing to the need for a quick recovery. Looking at the Central American region, the recovery of tourism as a share of GDP in 2021 was 26.5%, a recovery rate higher than the global average of 21.7% (Table below).

¹⁶ Travel & Tourism Economic Impact 2022, WTTC, August 2022

Table 10-7 GDP Contribution of Tourism in the Central American Region

	Total Contribution of Travel & Tourism to GDP									Total Contribution of Travel & Tourism to Employment						
	USD MN						Share			Jobs (000)				Share		
	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	
Guatemala	4,743.6	2,284.1	-51.8%	3,295.8	44.3%	5.8%	2.8%	3.8%	405.6	342.4	-15.6%	386.0	12.7%	6.0%	5.1%	5.6%
El Salvador	3,229.9	1,618.1	-49.9%	2,595.3	60.4%	11.7%	6.4%	9.3%	334.8	268.1	-19.9%	294.4	9.8%	12.9%	10.6%	11.3%
Honduras	3,114.3	1,691.7	-45.7%	2,349.4	38.9%	11.0%	6.6%	8.2%	473.5	392.1	-17.2%	422.4	7.7%	10.9%	9.2%	9.6%
Nicaragua	1,158.6	936.7	-19.2%	886.6	-5.4%	8.9%	7.4%	6.4%	274.1	264.8	-3.4%	266.5	0.6%	9.5%	9.1%	8.9%
Costa Rica	6,714.5	3,002.2	-55.3%	3,851.9	28.3%	10.8%	5.0%	6.0%	238.8	168.4	-29.5%	200.5	19.1%	11.0%	8.7%	9.8%
Panama	10,363.7	3,627.8	-65.0%	5,313.5	46.5%	15.6%	6.7%	8.7%	331.5	223.6	-32.5%	257.6	15.2%	16.6%	13.7%	14.2%
Belize	777.9	402.2	-48.3%	449.9	11.9%	37.6%	22.6%	23.4%	67.0	49.9	-25.5%	54.1	8.6%	40.0%	34.3%	32.2%
Dominican Republic	14,390.5	6,444.1	-55.2%	11,111.3	72.4%	15.9%	7.6%	11.8%	800.3	605.7	-24.3%	759.6	25.4%	17.2%	13.8%	16.7%

Source: Travel & Tourism Economic Impact 2022, WTTC

SITCA was created in 1965 as a permanent organization of Consejo Centroamericano de Turismo (CCT), the Regional Tourism Council under SICA, and operates as a tourism bureau. It also coordinates the implementation of the Strategic Plan for the Development of Sustainable Tourism in Central America, manages international cooperation, follows up on ministerial agreements, and disseminates and communicates information on tourism activities in Central America¹⁷.

The Strategic Plan for Sustainable Tourism Development 2021-2025 (PEDTS), approved by the eight member countries, defines four strategic areas and 34 products (actions), with an implementation plan through 2025 (Please see table below).

Table 10-8 Strategic Areas of Plan Estratégico de Desarrollo Turístico Sostenible (PEDTS) 2021-2025

Strategic Area 1:	Integration and Tourism Policy
Strategic Area 2:	Promotion and Marketing
Strategic Area 3:	Quality and Competitiveness
Strategic Area 4:	Public-private Organization, Coordination, and Collaboration Enhancement

Source: PEDTS Región del SICA 2021-2025

In Strategic Area 3, "Quality and Competitiveness," the project is promoting El Sistema Integrado Centroamericano de Calidad y Sostenibilidad Turística (SICCS), an integrated tourism quality and competitiveness certification system for MSME entrepreneurs, with the aim of building a strong tourism MSME, a pressing issue for the sector, and will be rolled out in all SICA regions, following Nicaragua and Honduras¹⁸.

In collaboration with ECLAC, an online tool, "Digital Maturity Self-Assessment and Toolbox for Tourism MSME" (www.sitca.info) was launched on November 11, 2021 and is available free of charge to all micro and small entrepreneurs involved in the tourism industry in the SICA region. It is also available to hotels, restaurants, and tour operators, tourist transportation rental companies, and other related businesses where it can be used as a professional training resource. Other efforts to strengthen tourism-related MSME include the operation of a capacity-building platform called CEFESTUR, which is an Emerging Specialized Tourism Training Courses in collaboration with CENPROMYPE and can be used as a training opportunity for MSME business owners.

The issues facing the tourism sector in the Central American region were analyzed and categorized in

¹⁷ SICA Website

¹⁸ The objective is to improve quality and competitiveness in five categories: 1) accommodations, 2) restaurants, 3) tour operators, 4) transportation and car rental, and 5) thematic activities.

the previous phase of the study, and the parts categorized as "promotion of micro, small, and medium enterprises" and "promotion of digitalization," which are closely related to MSME promotion, are shown in the table below. Regarding digitalization, some progress has also been made in web-based marketing and mobile banking, which were shown in the previous section of the survey as examples of enhanced capabilities in the use of digital tools.

Table 10-9 Measures to Overcome Vulnerabilities in the Tourism Sector in the Central American Region as Indicated in the Previous Phase of the Study

Vulnerabilities revealed in COVID-19	Draft measures to overcome
- Outbreak of cash-strapped MSMEs - Slow response of MSMEs to digital and online payments - Increasing number of illegal traders putting pressure on the business of legitimate traders - Delays in responding to new needs and markets for With/Post COVID (e.g., intra-regional tourism, responsible tourism, diaspora markets, etc.)	Promotion of MSME Improve access to financial services, including the development of financial products that meet the needs of MSME in the tourism sector Strengthening the fair market competition environment Strengthening the capacity of With/Post COVID to respond to new needs and markets
Slow response to digitalization, including digital payments and digital marketing	Promotion of digitalization Strengthening the capacity of MSME in digital payments and digital marketing Subsidies to promote digitization and tax incentives to encourage investment in digitization Integration of digitization promotion into tourism promotion policies

Source: previous study report

(3) Policies on MSME in Central America

ICAP has proposed a regional policy for the modernization and transformation of MSME in Central America¹⁹, which is summarized in the table below.

Table 10-10 Regional Policies for MSME Modernization and Transformation in Central America

Strategic Objectives	<ul style="list-style-type: none"> ➤ Integrate MSME in the region and transform them into key actors of sustainable development and social equality ➤ Create an MSME sector that improves productivity and competitiveness through innovation and the use of technological and scientific knowledge that is legitimate, competitive, and geared to international markets. ➤ Develop MSME organizations into organized, capacity-building, and profitable organizations with the ability to expand nationally, regionally, and internationally.
Strategy	1. Ecosystem strengthening and institutional clarification <ul style="list-style-type: none"> ○ Management of data, information, and knowledge ○ Clarification of institutional arrangements for support to MSME ○ Adaptation, simplification and improvement of the regulatory framework
	2. Human Resource Development and Institutional Improvement <ul style="list-style-type: none"> ○ Strengthening the skills and capacities of entrepreneurs ○ Strengthening the organization of MSM
	3. Support Center <ul style="list-style-type: none"> ○ MSME Support Center ○ Promote and strengthen public-private partnerships ○ Access to national, regional, and international markets ○ Regional value chains

¹⁹ La Transformación digital, innovación en las MIPYMES. Pag.23
https://www.celiem.org/_files/ugd/3d73d3_44d9f6e1508744c59345f419c0c10f5c.pdf

	4. Improve access to finance
	<ul style="list-style-type: none"> ○ Development of new financial products ○ Deregulation of financial regulations ○ Financial education (training) for MSME
	5. DX/Innovation, Quality Improvement
	<ul style="list-style-type: none"> ○ Promote innovation in production processes ○ Quality management ○ Digital Transformation of MSME

Source: Cuadernos Centroamericanos del ICAP No.38

10.2.2 Overview of the Resilient Economic Development Sector in the Caribbean Region

(1) Overview

GDP growth rates in the Caribbean countries averaged 2.6% in 2018 and 1.8% in 2019, maintaining a slightly slower but positive growth rate. In 2020, however, the restriction of human traffic due to COVID-19 was a major blow to the economies of the Caribbean region, where tourism is the main industry. Real 2020 GDP growth averaged -9.9% in 2020, with negative growth in all countries except Guyana, where oil production has started (see table below). St. Lucia (-24.3%), Bahamas (-23.8%), Antigua and Barbuda (-20.2%), Dominica (-16.6%), and Suriname (-15.9%) experienced significant negative growth exceeding -15%. Although many countries showed recovery after 2021 due to the revival of tourism, the October 2022 forecast has been revised downward in most countries, as in the Central America region, compared to the April 2022 forecast, due to high inflation rates and the effects of international conflicts around the world.

Table 10-11 Real GDP Growth Rates for Each Country (2018-2022)

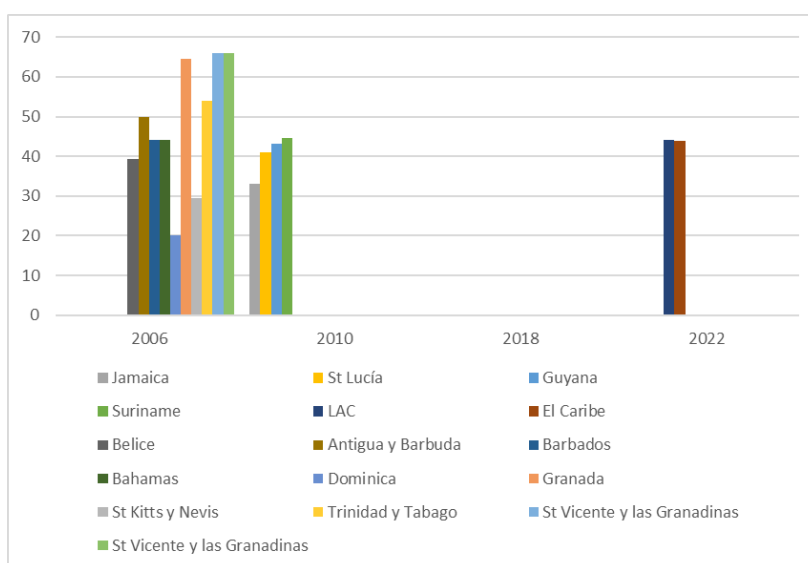
Country	Real GDP Growth Rate (%)				
	2018	2019	2020	2021	2022
Antigua and Barbuda	6.9	4.8	▲20.2	5.2	6.0
Bahamas	1.8	1.9	▲23.8	13.7	8.0
Barbados	▲0.6	▲1.3	▲13.7	0.7	10.5
Belize	0.3	4.5	▲13.6	16.3	3.5
Dominica	3.5	5.5	▲16.6	4.8	6.0
Grenada	4.4	0.7	▲13.7	5.6	3.6
Guyana	4.4	5.4	43.5	23.7	57.7
Haiti	1.7	▲1.7	▲3.3	▲1.7	▲1.2
Jamaica	1.8	1.0	▲10.0	4.6	2.8
Saint Kitts and Nevis	2.7	4.8	▲14.0	▲3.6	9.8
Saint Lucia	2.9	▲0.6	▲24.3	12.2	9.0
Saint Vincent and the Grenadines	3.1	0.4	▲5.3	0.5	5.0
Suriname	4.9	1.1	▲15.9	▲3.5	1.3
Trinidad and Tobago	▲0.7	▲0.2	▲7.4	▲0.7	4.0

Source: World Economic Outlook October 2022, IMF

Many countries used to be agricultural countries, centering on the sugar industry, which has been a traditional industry since the British era. However, along with the promotion of tourism, the ratio of agriculture to GDP has declined in many countries and is now less than 10%. Apart from oil-producing countries, the main industries are real estate and construction related to tourism, accommodation, and food services such as hotel and restaurant management, and financial services such as offshore finance.

CARICOM has sectoral organizations such as the Caribbean Agricultural Development Institute (CARDI), Caribbean Tourism Organization (CTO), Caribbean Regional Fisheries Mechanism (CRFM),

as well as development finance institutions such as the Caribbean Development Bank (CDB), the CARICOM Development Fund (CDF), the export promotion agency Caribbean Export and Investment Agency (Carib-Export), and the CARICOM Private Sector Organization (CPSO). These provide support to businesses but there is no organization dedicated to the promotion of small and medium-sized enterprises²⁰. The industrial structure of each country in this region is heavily dependent on tourism, and the fact that there are no notable industries other than agriculture seems to have had an impact, thus the establishment of an MSME promotion organization corresponding to CENPROMYPE in Central America should be considered in cooperation with the University of West Indies (UWI), which also plays a role as a regional think tank.



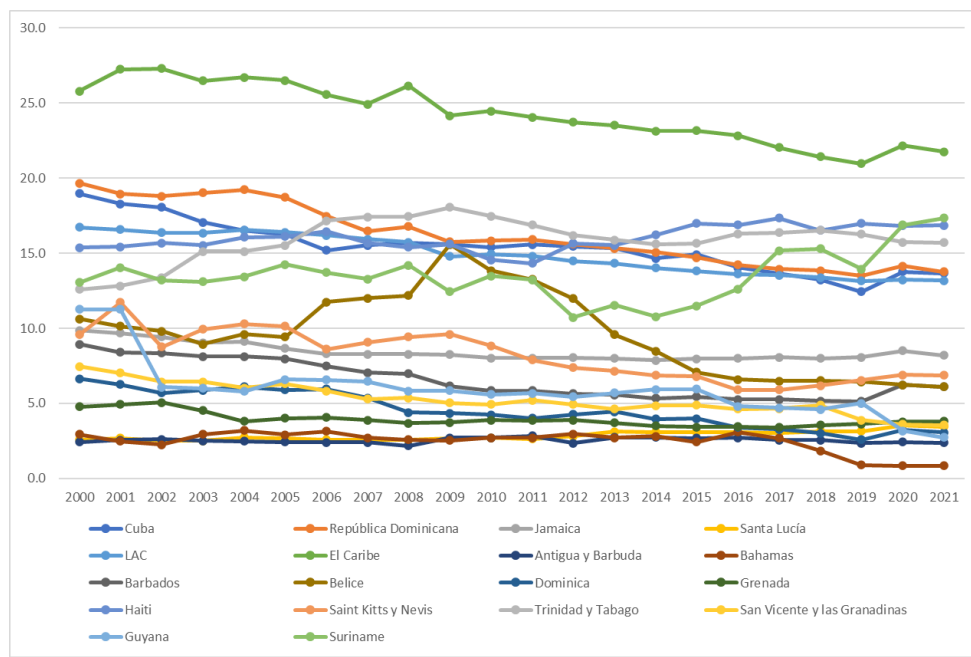
Source: 2030 Agenda in Latin America and the Caribbean, ECLAC-UN

Figure 10-11 Proportion of Small Industries That Have Obtained a Loan or Line of Credit

Improving MSME financing is also a goal of SDG 9.3, but LAC's 2022 performance is only 44.2% for the region as a whole and 44.0% for the Caribbean region, similar to the Central American region. Within the Caribbean region, many countries have less than 50%, although there are disparities by country, and as in the Central America region, improving access to finance is an issue (as shown in the table below, the statistics are not fully developed).

While diversification and finding competitive industries were pointed out in the previous phase of the study as an issue to the industrial structure, the Agenda 2030 for Central America and the Caribbean sets the goal of increasing value added in the manufacturing sector in SDG Global Indicator 9.2. As shown in the figure below, the share of value added as a percentage of GDP (SDG 9.2.1) in the Caribbean region countries has generally remained flat or declined since 2000.

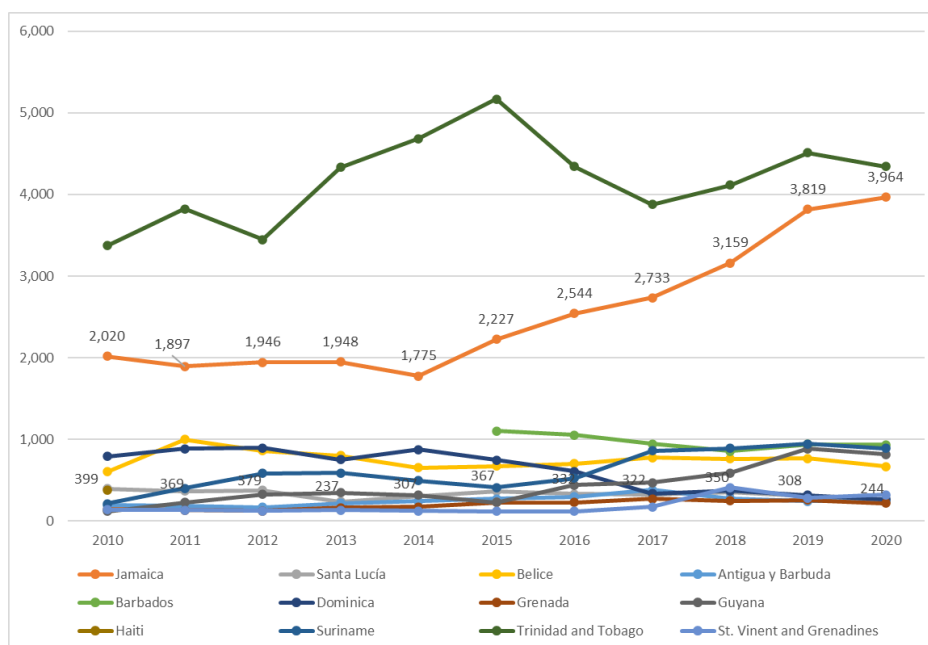
²⁰ The CARICOM Competition Commission (CCC) is somewhat different, as its main focus is on strengthening the CARICOM organization itself rather than entrepreneurship within the region.



Source: Los ODS en América Latina y el Caribe, La Agenda 2030 en América Latina y el Caribe

Figure 10-12 Value Added of the Manufacturing Sector as a Proportion of GDP (Caribbean)

The number of new start-ups in the Caribbean region increased slightly in 2020 due to the pandemic, although Jamaica had shown an increase even before the pandemic (Figure below). The number of new start-ups in other countries has remained almost flat since 2010, indicating the need to improve the start-up environment.



Source: World Bank

Figure 10-13 New Companies Registered (Excluding Mexico)

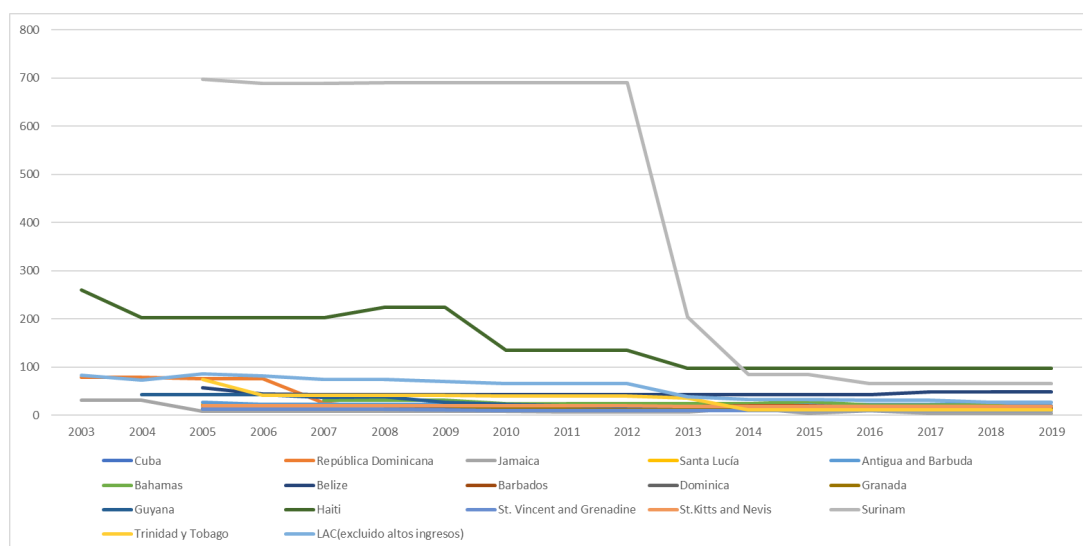
The table below shows the same figures for the number of new startups, and while there were

disparities in the number of new startups in each country before the pandemic, with increases, leveling off, and declines, the majority of countries are experiencing a decline in 2020 due to the pandemic. While some countries, such as Antigua and Barbuda, Jamaica, and St. Vincent, are increasing, more than 70% of the countries whose statistics are available are decreasing in the number of new cases, indicating the need to further improve the entrepreneurial environment to support recovery from the pandemic.

Table 10-12 New Companies Registered (number) (Caribbean)

Country Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Antigua and Barbuda	193	187	168	217	246	271	296	380	280	242	255
Bahamas, The											
Belize	604	1,000	863	801	655	675	701	777	763	769	671
Barbados						1,105	1,056	945	859	939	934
Cuba											
Dominica	792	884	898	755	874	748	609	339	371	319	268
Grenada	147	136	123	164	175	228	228	273	247	257	217
Guyana	119	229	327	348	316	227	440	469	589	885	819
Haiti	383										
Jamaica	2,020	1,897	1,946	1,948	1,775	2,227	2,544	2,733	3,159	3,819	3,964
St. Kitts and Nevis											
St. Lucia	399	369	379	237	307	367	332	322	350	308	244
Suriname	214	400	583	592	495	412	523	860	890	946	892
Trinidad and Tobago	3,372	3,825	3,446	4,334	4,682	5,165	4,341	3,877	4,115	4,511	4,344
St. Vincent and the Grenadines	139	134	127	133	125	119	118	175	414	284	323

Source: World Bank



Source: World Bank

Figure 10-14 Time Needed to Start a Business 2003-2019 (days) - Caribbean

As for the number of days required to start a business in each country, as of 2019, Jamaica is the only country where it takes less than 10 days to start a business, while there are still countries where it takes close to 100 days (see figure below). Suriname has made a significant improvement since 2013, from 690 days to almost 100 days, and Haiti has also made improvements between 2010 and 2013 (details are unknown).

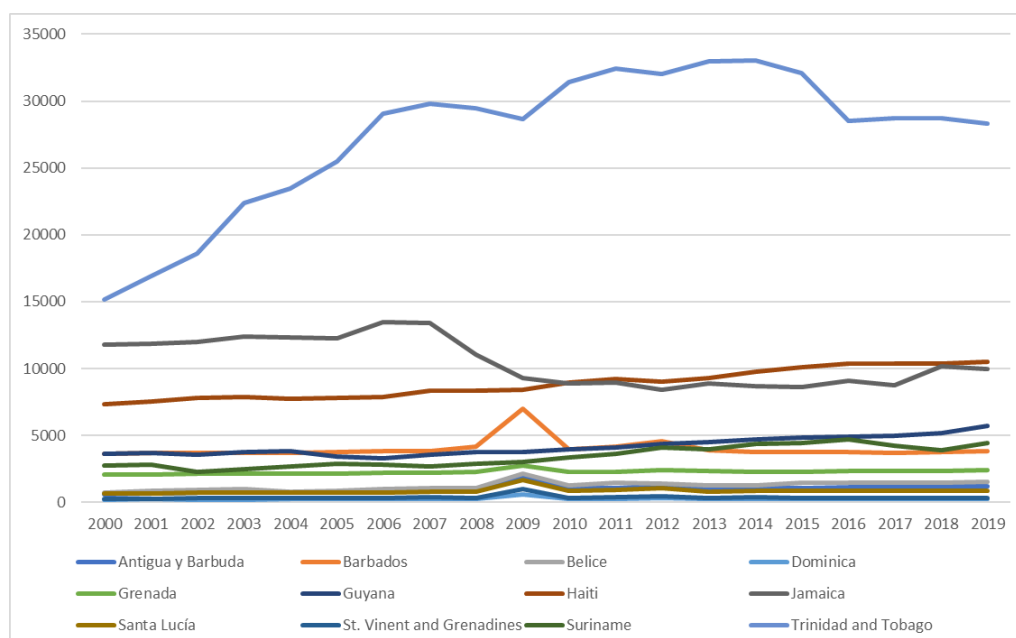
The ranking of the Caribbean countries' business environment in the Doing Business 2020 edition is shown in the table below, with Jamaica in the highest ranking at 71, followed by St. Lucia at 93. Many countries are ranked between 100 and 140, slightly below the average of the 190 countries surveyed.

Table 10-13 Caribbean Countries Rank in Doing Business

Rank	Economy	DB score	Rank	Economy	DB score
71	Jamaica	69.7	150	St. Vincent Grenadines	57.1
93	St. Lucia	63.7	154	Guyana	55.5
105	Trinidad Tobago	61.5	155	Belize	55.5
111	Dominica	60.5	159	St. Kits and Nevis	54.6
115	Antigua Barbuda	60.3	162	Suriname	47.5
119	Bahamas	59.9	179	Haiti	40.7
128	Barbados	57.9			

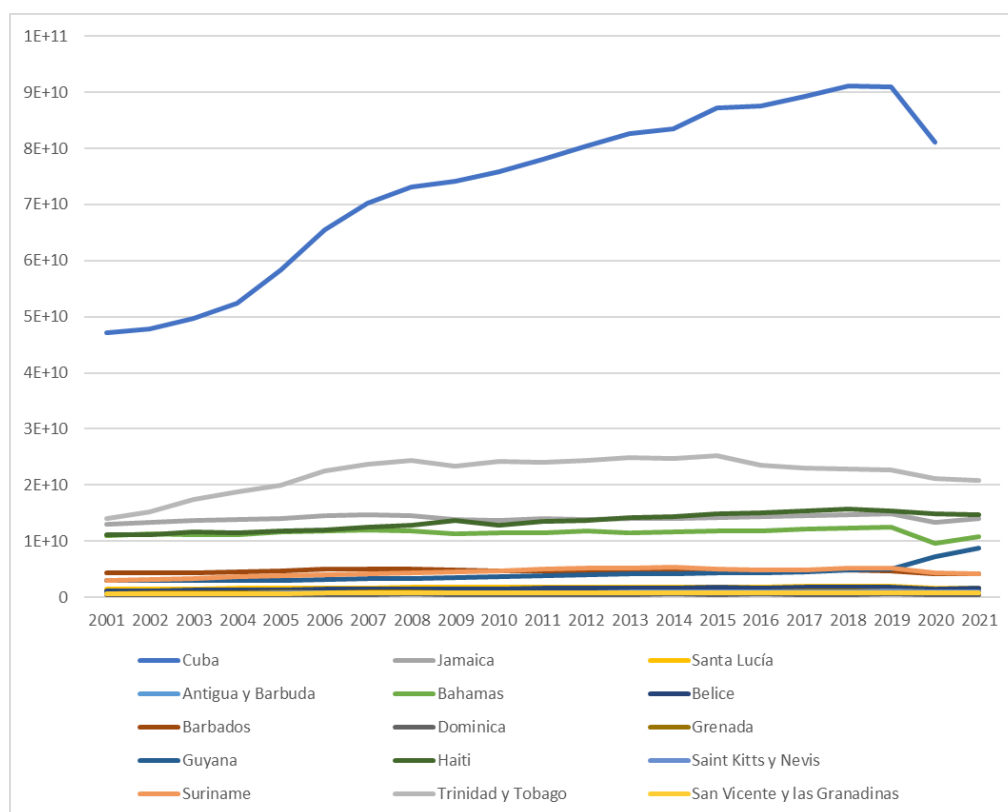
Source: Doing Business 2020

In terms of energy environment, the introduction of power generation from renewable energy sources is limited in the Caribbean region. Compared to Central American countries, where hydropower development has progressed due to the characteristics of mountainous regions, the Caribbean region, with its small land area and flat land, is not suitable for large-scale development from the standpoint of development costs. Although biomass, solar, and wind power generation are being developed, the region is still dependent on thermal power generation using fossil fuels due to increasing electricity demand and shrinking sugarcane production. Energy consumption is mostly derived from fossil fuels, and although each country is considering strategies to decarbonize and become carbon neutral, as shown in Figure 10-14 CO2 emissions in the Caribbean by 2019, with the exception of Trinidad and Tobago, an oil-producing country, almost all countries have seen their economic growth rates (Figure 10-15) far below the current rate.



Source: World Bank

Figure 10-15 Total Greenhouse Gas Emissions 1990-2019 (kt of CO2 equivalent)



Source: World Bank

Figure 10-16 Caribbean GDP 2001-2021 (USD at constant 2010 prices)

Organizations involved in the promotion of MSME and entrepreneurship in the Caribbean region include CDB, CDF, Carib Export, Caribbean Chamber of Commerce (CARICHAM), and Caribbean Association of Investment Promotion Agencies (CAIPA). Private sector development (PSD) in the CDB is based on the recognition that it is essential for sustainable economic growth and poverty reduction. PSD has the following three strategies for private sector development:

- 1) Creation of an investment and business environment
- 2) Expansion of infrastructure for inclusive economic and human capital development
- 3) Promotion of MSME development in the private sector.

In terms of supporting MSME, the Private Sector Development Policy and Strategy prioritizes improving access to finance, human resource development, and trade facilitation. Specifically, MSME support is provided in the areas of tourism, agriculture, manufacturing, construction, mining, and entrepreneurship, particularly in the agricultural sector through the Youth Agri Entrepreneurship Project (YAEP), which provides training in technology and skills.

CARICHAM provides MSME with tools such as the CARICHAM Guide to Completing the Business Continuity Plan and the CARICHAM Business Continuity Plan Template as part of its efforts to enhance the resilience of MSME.

The Caribbean Export, the Secretariat of CAIPA, emphasizes the promotion of industries other than tourism, particularly the development of small and medium-sized private enterprises. Agro-processing accounted for the largest share (25%) and is followed by manufacturing (23%).

These issues and areas for improvement for MSME in the Caribbean region are summarized, with reference to the issues in the CDB's private sector development policy and their relationship to the JICA Global Agenda (4. Private Sector Development) [Five Approaches and Approaches to "Entrepreneur and Enterprise Development" and "Investment Promotion and Industrial Development"] as described in the table below.

Table 10-14 Private Sector (MSME) Development Issues and Improvements

Issues of MSME	Approaches of the JICA Global Agenda
Legislation for Business Environment and Competitiveness <ul style="list-style-type: none"> Real Estate Ownership Starting a Business Collateral registration 	Industrial Policy and Business Environment (Policy Aspects)
Development of Financial Infrastructure <ul style="list-style-type: none"> Improvement of legal system Accelerate loan settlement Improving and diversifying access to finance	Access to finance (financial aspects)
Promote public-private partnerships (PPP)	Linkage Enhancement (Market Access)
Expand infrastructure for economic and human capital development <ul style="list-style-type: none"> Renewable energy, energy conservation Transportation Climate change measures Education 	Strengthening Corporate Competitiveness (Management and Technology)
Expansion of financing for MSME by financial institutions Promote innovation and entrepreneurship	Innovation Promotion

Source: Prepared by the JICA Study Team based on Private Sector Development Policy and Strategy, CDB

(2) Tourism Sector

The tourism sector is said to be the sector most affected by COVID-19, with the World Travel & Tourism Council (WTTC) estimating that tourism losses in 2020 will be US\$4.9 trillion (-50.4%) and 62 million jobs lost. The WTTC forecasts an annual growth rate of 5.8% for tourism as a share of GDP from 2022 to 2030, but the recovery in 2021 was less than expected. Recovery was at a lower level than expected. The MSME share of the sector is 80% and is dominated by women, young workers, and minorities, pointing to the need for a quick recovery.

In Central America, the recovery of tourism as a share of GDP in 2021 was 36.6% in the Caribbean region, a recovery higher than the global average of 21.7% (see table below)

Table 10-15 GDP Contribution of Tourism in the Caribbean Region

	Total Contribution of Travel & Tourism to GDP						Total Contribution of Travel & Tourism to Employment									
	USD MN			Share			Jobs (000)			Share						
	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021				
Antigua and Barbuda	1,446.7	690.3	-52.3%	836.5	21.2%	83.3%	49.7%	61.0%	32.7	25.7	-21.4%	28.4	10.5%	87.7%	76.5%	83.8%
Bahamas	5,822.4	1,741.3	-70.1%	3,288.6	88.9%	42.5%	15.2%	28.1%	101.8	53.5	-47.5%	70.3	31.5%	49.3%	34.4%	43.1%
Barbados	1,625.5	767.5	-52.8%	685.2	-10.7%	29.5%	16.9%	14.4%	46.6	30.1	-35.4%	32.2	7.1%	37.4%	26.7%	28.0%
Belize	777.9	402.2	-48.3%	449.9	11.9%	37.6%	22.6%	23.4%	67.0	49.9	-25.5%	54.1	8.6%	40.0%	34.3%	32.2%
Dominica	155.6	53.5	-65.6%	45.4	-15.1%	26.8%	11.4%	9.6%	10.4	7.6	-26.9%	8.2	7.5%	29.6%	26.9%	26.8%
Grenada	543.8	216.0	-60.3%	158.9	-26.4%	43.6%	19.9%	14.2%	25.2	14.2	-31.9%	17.4	1.6%	44.4%	32.8%	33.0%
Guyana	220.5	176.2	-20.1%	214.7	21.9%	4.1%	2.4%	2.6%	16.2	14.2	-12.8%	15.3	8.1%	6.1%	5.3%	5.7%
Haiti	1,081.6	495.1	-54.2%	523.9	5.8%	9.9%	5.0%	5.2%	444.2	299.3	-32.4%	315.7	5.5%	9.9%	7.3%	7.6%
Jamaica	4,594.3	2,001.1	-56.4%	2,725.0	36.2%	29.1%	14.1%	18.6%	371.8	268.5	-27.8%	303.3	12.9%	29.9%	21.9%	23.6%
St. Kitts and Nevis	486.7	181.0	-62.8%	92.4	-49.0%	43.6%	20.1%	10.2%	12.5	9.4	-24.8%	10.3	9.9%	52.4%	47.4%	52.8%
St. Lucia	1,359.5	475.2	-65.0%	915.2	92.6%	59.8%	27.1%	48.6%	64.5	44.9	-30.4%	53.4	18.9%	80.1%	58.2%	69.0%
St. Vincent and the Grenadines	337.0	125.9	-62.6%	100.3	-20.4%	40.5%	16.6%	13.5%	18.7	13.9	-25.6%	15.6	12.2%	42.6%	32.6%	37.2%
Suriname	90.2	35.7	-60.4%	41.3	15.5%	2.3%	1.1%	1.3%	4.6	3.3	-29.4%	3.4	4.8%	2.3%	1.9%	1.9%
Trinidad and Tobago	1,990.3	1,118.4	-43.8%	1,323.3	18.3%	7.9%	4.8%	5.5%	51.8	39.6	-23.7%	44.1	11.5%	8.5%	6.7%	7.3%

Source: Travel & Tourism Economic Impact 2022, WTTC

With regard to tourism, the Caribbean Tourism Organization (CTO), as a CARICOM tourism organization with membership from 24 countries and the private sector in the region, is providing services and information necessary for the development of sustainable tourism for the economic and social benefit of the people. The CTO has analyzed the challenges of tourism in the region before and after the pandemic as shown in the table below.

Table 10-16 Caribbean Tourism Sector Issues Analysis (CTO)

	Issues from before the pandemic	Vulnerabilities (issues) exposed by the pandemic
Legal system		
	Access to MSME financial services Legal and regulatory framework for payments outside the banking system Size of market difficult for fintech firms to enter	Cashflow of MSME Delayed support for digital and online payments
Human resources side		
	High rate of informal employment Gender gap in digitalization Shortage of highly skilled human resources due to brain drain Population aging	Worsening poverty levels due to lack of social security coverage Delay in digitalization due to high ratio of female managers and employees Delay in digitization of business and value-added tourism products
Marketing and Promotion		
	Cruise tourism, dependence on foreign all-inclusive resorts Tourism leakage, limited benefit to local economy Exclusion of local MSME from tourism value chain	Slow response to new needs (long-term remote workers, diaspora, experiential tourism, responsible tourism, community-based tourism, adventure tourism, etc.)
Tourism Risk Management		
	Inadequate risk management for damage to the tourism industry caused by hurricanes and other natural disasters	Delayed or inadequate response to tourism crises caused by infectious diseases

Source: Prepared by the study team based on interviews with CTO.

The CTO advocates community-based tourism (CBT) as a regional tourism development strategy, aiming to support entrepreneurship and community development while providing tourists with unique experiences and products. The main objectives of CTO's CBT program are to:

- Contribute to the diversification and strengthening of regional tourism products in order to meet diversifying market demands.
- Provide meaningful engagement opportunities for tourists and host communities; and
- Enhance tourism participation and benefits for local communities and ensure equitable access to tourism markets for rural and local communities.

The Caribbean Community-Based Tourism Network (CCBTN) was formally established in mid-2021 with the aim of providing a platform to support the continued development of CBT in the Caribbean region, with the following strategies:

- 1) Identify tourism management policy needs and good practices to advance the recovery process. At the same time, provide training to enhance skills in collecting, analyzing, and reporting tourism-related data.
- 2) As a high-level think tank, it will support the strategic planning process by establishing a network between regional tourism destinations and markets, connecting members with experts, regional and international partners.
- 3) Promote collaboration between the CTO and the Caribbean Hotel and Tourism Association

- (CHTA) to link the health programs of Caribbean Public Health Agency (CARPHA) with tourism.
- 4) Provide technical assistance and capacity building to promote the digitalization of the tourism sector, the marketing and packaging of tourism products and experiences together with regional marketing.
 - 5) Develop a fund or mechanism to provide the necessary resources to rehabilitate the tourism sector (including MSME) and support entrepreneurship, and partner with organizations such as Caribbean Export.
 - 6) Conduct training to promote the CTO's Caribbean Sustainable Tourism Policy and Development Framework, a roadmap to guide rehabilitation efforts.
 - 7) Support for product development initiatives such as the Regional Heritage Trails Program and community-based tourism development related to experience, packaging, and multi-destination tourism.

In the previous phase of the study, the vulnerabilities that became apparent due to COVID-19, and how to overcome them were analyzed and organized. The contents generally cover the strategies of the CTO's CBT program. The table below shows the issues of the tourism sector in the Caribbean region, which are categorized into “promotion of micro, small and medium enterprises” and “promotion of digitalization,” which are closely related to the promotion of MSME. As for digitalization, as mentioned above, the development of products and services is progressing rapidly²¹, and in some countries, digitalization is beginning to be implemented.

Table 10-17 Measures to Overcome the Vulnerabilities of the Tourism Sector in the Caribbean Region Indicated in the Previous Phase of the Study

Vulnerabilities revealed in COVID-19	Draft measures to overcome
<ul style="list-style-type: none"> • Occurrence of micro, small and medium-sized enterprises facing financial difficulties • Delayed response to digital and online payments by MSME • Pressure on legal businesses due to increase in illegal businesses • Delayed response to new needs and markets for with/post COVID (responsible tourism within the region, diaspora market, etc.) 	Promotion of micro, small and medium enterprises <ul style="list-style-type: none"> • Improve access to financial services, including the development of financial products that meet the needs of small and micro enterprises in the tourism sector • Strengthening the fair market competition environment • Strengthening the capacity of with/post COVID to respond to new needs and markets
Delayed response to digitalization, such as digital payments and digital marketing	Promotion of digitalization <ul style="list-style-type: none"> • Establish legal framework for digital payments • Provide incentives to fintech companies • Strengthening the capacity of small and medium-sized enterprises (MSME) in digital payments and digital marketing • Subsidies to promote digitalization and tax incentives to encourage investment in digitalization • Integration of digitization promotion into tourism promotion policies

Source: From preliminary study

The table below summarizes the issues related to industrial promotion of MSME in the Central American and Caribbean regions that we have investigated so far.

²¹ 10.2 (1) Global Trends in the Industrial Development Sector

Table 10-18 Issues in Industrial Development (Including Tourism) in Central America and the Caribbean

Policy	Industrial Policy	Development of regulatory framework, sectoral policies, legal framework for digital payments, and legal framework for real estate (registration, collateral)
	Business Environment	Improvement of the entrepreneurial environment, provision of incentives, subsidies, tax incentives, and seed capital
Financial Aspects	Access to Finance	Improve MSME administrative and financial capacity Improvement and diversification of access to finance, including faster loan settlement, real estate collateral and guarantees (including Fintech) Development of financial products that meet the needs of finance-related capabilities and MSME
Market Access	Linkage Enhancement	Linkage with technical centers of regional cooperation and integration of relevant value chains Public-private partnership (PPP) promotion, formalization, and development of suppliers and MSME Access to international markets, networking of entrepreneurs Establishing a network between regional tourism destinations and market markets
Management and Technology	Strengthening Corporate Competitiveness	Improve productivity, reduce production costs, expand production, add value, and increase capacity to acquire new technologies Promotion of manufacturing: promotion of MSME handicraft activities Capacity building of MSME for digital payments and digital marketing Training to improve skills in tourism data collection, analysis, and reporting
Promoting Innovation		Technical capacity building to increase productivity, reduce production costs, expand production, and utilize new technologies to create high value-added products Digital innovation to improve MSME access to finance Entrepreneurship Promotion Centers to provide pre-entrepreneurial and student entrepreneurs with entrepreneurial know-how tools

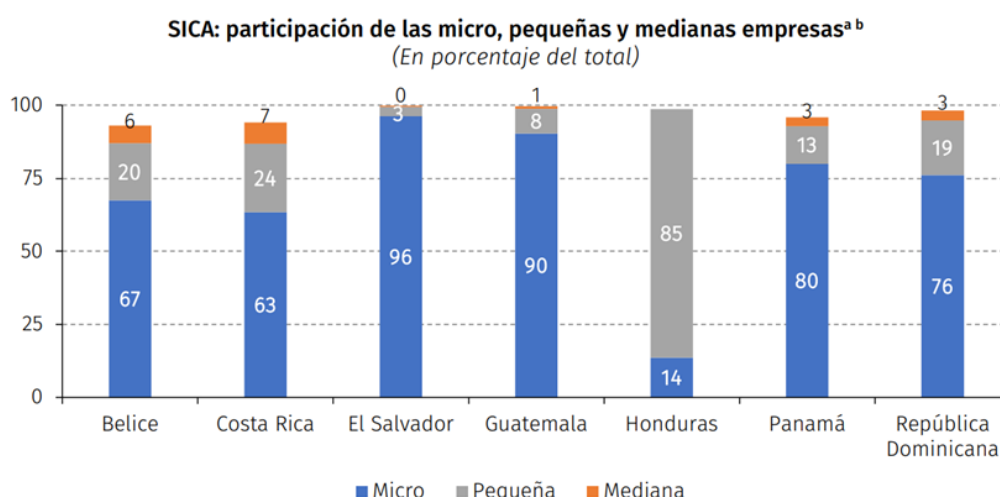
Source: Prepared by the study team

10.3 Overview and Development/Cooperation Scenarios in Priority Countries and Areas

The Dominican Republic was selected as a priority country in the field of resilient economic development in consultation with JICA based on SICA's strategy for the Central American region for the promotion of small and medium-sized enterprises and tourism development, as well as the results of the survey conducted in priority countries in the previous survey.

The share of MSMEs in SICA member countries is shown in the figure below²², the share of MSME in El Salvador and Guatemala is more than 90% and the ratio of micro enterprises in almost all countries except Honduras is about 70% or more. In case of the Dominican Republic, the figure is 76%.

²² CEPAL (2021) Pag. 20 https://repositorio.cepal.org/bitstream/handle/11362/46801/1/S2100249_es.pdf



Fuente: Elaboración propia, sobre la base de Directorios o Registros de Establecimientos Económicos y Empresas de cada país: Belice (2016), Costa Rica (2019), El Salvador (2012), Guatemala (2017), Honduras (2015), Panamá (2009) y la República Dominicana (2019).

^a Elaborado sobre la base de información disponible en los Directorios o Registros de Establecimientos Económicos y Empresas, y bajo la definición de mipyme de cada país.

^b En Honduras las empresas se clasifican como micro (13,6%) y pequeñas y medianas (85,1%).

Source: CEPAL 2021

Figure 10-17 Participation of MSME (% of total) in Central America

10.3.1 Overview of the Resilient Industrial Development Sector in the Dominican Republic

(1) Overview of the Sector

The Dominican Republic has the eighth largest economy in Latin America and the largest in the Caribbean and Central American region, with the highest GDP growth rate in the region and is expected to continue growing in 2023 (see table below).

Table 10-19 Dominican Republic GDP Growth Rate

2021	2022				2023			
	IMF	World Bank	ECLAC	Consensus Forecast	IMF	World Bank	ECLAC	Consensus Forecast
11.8	5.5	5	5.3	5	5	5.3	4.5	

Source: IMF WEO (2022.04), World Bank (2022.06), ECLAC (2022.08), Consensus Forecast (2022.08)

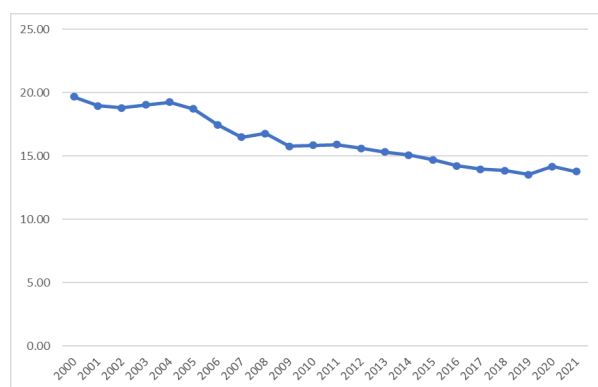
1) Overview of MSME

There are approximately 1.5 million MSMEs in the Dominican Republic, representing 98% of the total number of firms, 54.4% of total employment, and 38.6% of GDP. Of the total number of MSME, 50.98% are fixed establishments, 26.78% are mobile establishments, 21.70% are in the agricultural sector, and 0.55% are in the fisheries and mining sector. In addition, 51.3% of microenterprises are owned by women. Moreover, more than 83.3% of MSME are located in urban areas and 16.7% in rural areas. 46.7% of MSME are in the commercial sector, 38.4% in the service sector, and 14.9% in the industrial sector, mainly in warehouses and grocery stores, beauty salons and barber stores, textiles and

footwear, restaurants, bars, canteens, personal effects, and household²³. Regarding MSME, the definition in Central American countries is mainly based on the number of employees and sales, but there is no unified standard for defining MSME in each country.

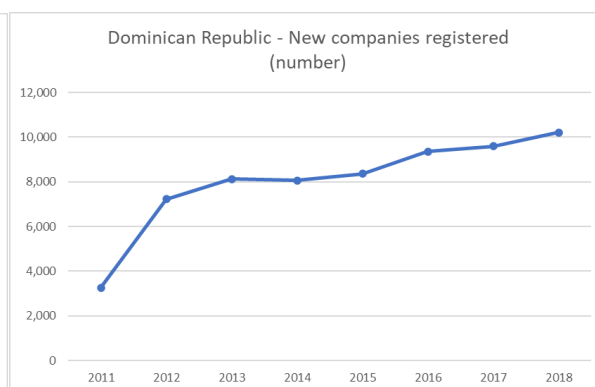
CENPROMYPE classifies enterprises by the number of employees, according to which the Dominican Republic's enterprises are composed of 72.73% with less than 10 employees, 20.66% with 11 to 50 employees, 2.92% with 51 to 100 employees, and 3.68% with 101 or more employees²⁴. In terms of employment classification by occupation, commerce is the largest employer category at nearly 40% for microenterprises. While in manufacturing and others are all less than 10%, but for small enterprises, commerce accounts for over 30% and manufacturing for over 10%. For medium enterprises, commerce accounts are below 25% and manufacturing just under 20%. The share of self-employment is 42.6%.

As mentioned above, diversification and competitiveness have been identified as issues for the industrial structure of Central American and Caribbean countries, and Agenda 2030 also sets the goal of increasing value added in the manufacturing sector, but the share of value added in the Dominican Republic's GDP (SDG 9.2.1), as in Central American and the Caribbean countries, has been declining since 2000 (Figure below).



Source: Agenda 2030 en LAC

Figure 10-18 Value Added as % of GDP (Manufacturing)



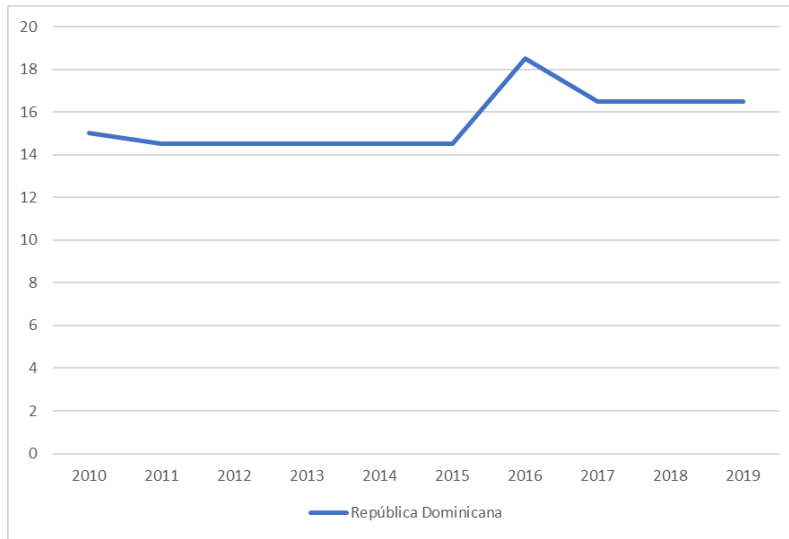
Source: World Bank

Figure 10-19 Number of New Start-ups (Dominican Republic)

As shown in the figure above, the Dominican Republic is one of the few countries in the region that has shown an increase in the number of new start-ups since before the pandemic. But the number of days required to start a business has not improved since 2011, remaining at 16.5 days in 2019, which is the average for Central American countries (see figure below). Further improvement of the entrepreneurial environment is required to keep pace with economic growth.

²³ Situación Económica y de Mercado de las MIPYMES en República Dominicana por la Crisis del COVID-19, UNDP, MICM, Observatorio MIPYMES

²⁴ MiPYMES en América Latina, CEPAL, 28 December, 2020



Source : World Bank

Figure 10-20 Time Needed to Start a Business (in Days) – Dominican Republic



Source: Doing Business 2020

Figure 10-21 Dominican Republic Doing Business Ranking by Topic (Itemized)

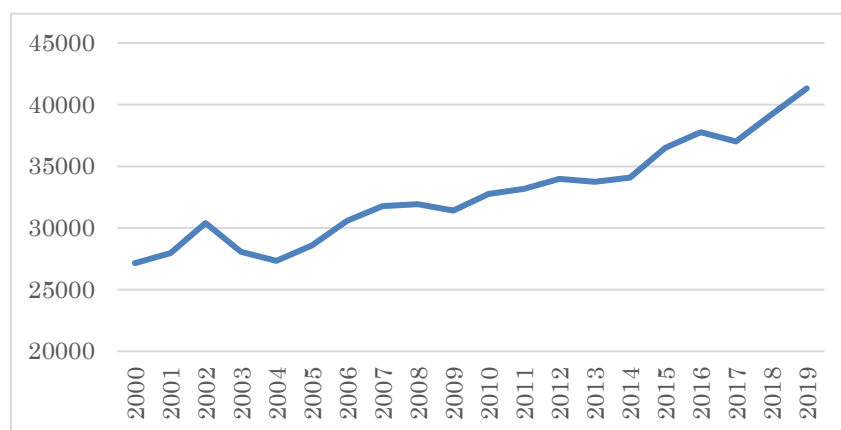
The Dominican Republic's ranking in the 2020 edition of Doing Business is 115th as shown in the table below, which is the lowest in Central America after Nicaragua and Honduras. The ranking results by topic are shown in the following chart, and in general, the Dominican Republic has issues with legal and regulatory vulnerabilities (Protecting Minority Investors, Paying Taxes, Enforcing Contracts Resolving Insolvency), access to finance, and access to electricity. The country is ranked 112th in the Starting Business category.

Table 10-20 Dominican Republic Doing Business Ranking by Topic

Topics	Rank	Score	Topics	Rank	Score
Starting a Business	112	85.4	Protecting Minority Investors	143	34.0
Dealing with Construction Permits	80	70.7	Paying Taxes	150	57.4
Getting Electricity	116	68.0	Trading across Borders	66	83.5
Registering Property	74	67.2	Enforcing Contracts	133	50.6
Getting Credit	119	45.0	Resolving Insolvency	124	38.0
			Total	115	60.0

Source: Doing Business 2020

In terms of ecosystems related to energy environment, Central America is making progress in introducing renewable energy, with most countries achieving renewable energy rates above 50%, led by Costa Rica, where almost 100% of electricity generation is provided by renewable energy. While the Caribbean region has seen limited introduction of electricity generation from renewable energy sources. The Dominican Republic's renewable energy adoption rate is 10% of electricity generation (2019 IEA values), a level similar to that of Jamaica at 11% and close to the trend for Caribbean countries (see figure below). The breakdown of renewable energy is hydroelectric, wind, and solar power.



Source : World Bank

Figure 10-22 Total Greenhouse Gas Emissions in Dominican Republic (kt of CO2 equivalent)

MSME promotion is under the jurisdiction of the Ministry of Commerce, Industry, and Small and Medium Enterprises of the Dominican Republic (MICM), which established the MSME Promotion and Support Program (El programa de Promoción y Apoyo a la Micro, Pequeña y Mediana Empresa: PROMIPYME) under its umbrella (1997). PROMIPYME contributes to the improvement of productivity and job creation through training and technical assistance, in addition to the formulation of MSME support measures and financial assistance, and promotes the formation of production chains and supports entrepreneurship. Currently, it is promoting the certification system Sello Hecho en República Dominicana (Certification Made in the Dominican Republic) with the aim of branding, strengthening competitiveness, and differentiating products made in the Dominican Republic²⁵. This is considered to be similar to the certification of origin (Sello de Origen) that the aforementioned CENPROMYPE is promoting in Central America. Based on these MSME support measures, MSME issues are summarized in the table below as development issues in line with the JICA Global Agenda

²⁵ MICM <https://industriasrd.micm.gob.do/sello-hecho-rd/>

(4. Private Sector Development) [Five Approaches to Entrepreneurship and Enterprise Development, Investment Promotion, and Industry Promotion].

Table 10-21 Issues for MSME in the Dominican Republic

MSME Issues	Contents
Industrial Policy and Business Environment (Policy Aspects)	
• The Challenge of Becoming an Entrepreneurial City	Provide training on entrepreneurial methodologies, dispatch experts, and provide seed capital in cities to create new businesses and grow and promote existing businesses
Access to Finance (Financial Aspects)	
• Strengthening Financial Inclusion	Design public policies, financial education, and development of financial services to promote MSME bank utilization and improve access to financing
Strengthening Linkages (Market Access Aspects)	
• Strengthening Alliances	Promote collaboration to enhance the competitiveness of companies Strengthen human and social capital; improve organization, management, and decision-making systems
• Formalization and development of suppliers	Coordinate, facilitate, improve, and follow up on MSME formalization process Facilitate access to international markets Strengthening entrepreneurship
• Entrepreneurial Networking	Institutional support to expand the national entrepreneurial network and support the creation of enterprises
Strengthening Corporate Competitiveness (Management and Technology)	
• Promotion of manufacturing	Coordination to promote handicraft activities of MSME in the country
• Strengthening competitiveness	Develop models and strategies to enhance MSME competitiveness
Promoting Innovation	
• Digital Economy Promotion	Develop and implement public policies to improve use and access to information and communication technologies (ICT), increase MSME competitiveness, and expand employment
• EMPRETEC Center ²⁶	Provide MSME entrepreneurs, owners, pre-entrepreneurs, and students with tools for successful entrepreneurship

Source: Prepared by the study team based on Centro de Información MIPYME, SICE, etc.

2) Tourism Sector

The tourism sector in the Dominican Republic estimates a decrease of 4.04 million visitors (-62.7%), tourism losses of USD 7.94 billion (-55.2%), and employment losses of 194,000 (-24.3%) in 2020, affected by COVID-19. 2021 shows a significant recovery, with a 107.6% increase in tourists²⁷. In 2021, the region showed a significant recovery, with a 107.6% increase in tourists, a 72.4% increase in tourism as a percentage of GDP, a 74.7% increase in foreign tourism spending, and a 25.4% increase in employment (Table below), showing a recovery above the average for the region. While countries around the world are competing to attract post-COVID tourism, Central American and Caribbean countries are performing well in terms of the number of tourists compared to 2019, with the Dominican Republic in particular topping the list as the only country to show positive growth (+5%) compared to 2019²⁸.

According to the Ministry of Tourism (MITUR), tourists from the United States, Canada, Russia, and France stay an average of 9 nights, and the hotel occupancy rate for the month of November 2021 reached 73% compared to 68% in 2019. However, according to MITUR, the country's tourism sector does not show a comparative advantage over similar Caribbean countries, and there is a scattered lack

²⁶ EMPRETEC is a flagship capacity-building programme of UNCTAD for the promotion of entrepreneurship and micro, small and medium sized enterprises (MSME) to facilitate sustainable development and inclusive growth

²⁷ UNWTO website (number of visitors), Travel & Tourism Economic Impact 2022, WTTC, August 2022

²⁸ Most Visited Destinations report 2022, <https://forwardkeys.com/the-most-visited-destinations-2022-report-wtm/#download-1>

of specialization in the tourism sector due to its heavy reliance on large-scale resort development, which requires more innovative, sustainable, and diversified development²⁹.

Table 10-22 Overview of the Dominican Republic Tourism Sector

	2019	2020		2021	
Arrivals of non-resident tourists at national borders (000)	6,446.0	2,405.3	-62.7%	4,994.3	107.6%
Total Contribution of Travel & Tourism to GDP (US\$ NM)	14,390.5	6,444.1	-55.2%	11,111.3	72.4%
Total Contribution of Travel & Tourism to GDP (share)	15.9%	7.6%		11.8%	
Total Contribution of Travel & Tourism to Employment(job 000)	800.3	605.7	-24.3%	759.6	25.4%
Total Contribution of Travel & Tourism to Employment(share)	17.2%	13.8%		16.7%	
Visitor Spend (International) (US\$ MN)	7,966.5	2,973.4	-62.7%	5,194.8	74.7%
Visitor Spend (Domestic) (US\$ MN)	2,902.3	1,258.4	-56.6%	2,590.8	105.9%

Source: Prepared by the JICA Survey Team based on statistics from WTTC, UNWTO

MITUR's Plan Estratégico Institucional (PEI) 2021-2024 describes three strategic axes that define the objectives, strategic outcomes, and set of indicators and targets that MITUR intends to achieve over the next four years (see table below).

Table 10-23 Tourism Strategy Axis by PEI

Strategic Axis	Objectives
Promotion, development and promotion of sustainable tourism	Promote, develop and advance the tourism industry to increase its competitiveness, diversity and sustainability to an international level
Planning and effective regulation of the management of tourism destinations	Ensure competitiveness and sustainability through proper management and maintenance of tourist destinations through integration/cooperation of the public and private sectors.
Organizational strengthening	Guarantee the effectiveness of the activities and services developed by the Ministry of Tourism through quality control

Source: PEI 2021-2024

In addition, MITUR has a Roadmap for a Low Carbon and Resources Efficient Hotel Sector in the Dominican Republic, which sets goals for decarbonization, food loss reduction, plastic product reduction, and sustainability certification for all-inclusive hotels.

Regarding the analysis of vulnerabilities and measures to address them by COVID-19 in the tourism sector, the Dominican Republic was selected as one of the focus countries in the previous phase of the study, and issues and vulnerabilities in the areas of legal system, human resources, marketing and promotion, and tourism risk management were examined, with measures to overcome them in the areas of 1) Promotion of small and micro enterprises, 2) Promotion of Digitalization, 3) Tourism Crisis Management, 4) Promotion of Intra-regional Cooperation (Central America), and 5) Minimization of Tourism Leakage (Caribbean) (Table 10-18).

The following table summarizes the list of projects in the private sector, MSME, and tourism sectors by the Inter-American Development Bank (IDB), which is providing active support in the region as a trend of major development partners. In the field of MSME promotion, there are many fields such as organizational strengthening, productivity improvement, support for female entrepreneurs, financial access, and support for sustainable tourism.

²⁹ UMWTO (2022). Tourism Investment Guide - Dominican Republic. P.44-45. <https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2022-01/guias-de-inversion-republica-dominicana.pdf>

Table 10-24 IDB Projects in the Field of Industrial Development

Project Title	Sectors & Themes	Project Type	Project Total (US\$)	Approval Date
Strengthening the institutional and regulatory environment to enable competitiveness and business development	Private Firms & SME Development	Technical Cooperation	150,000	NA
Acceleration of the Dominican Republic's Venture Capital Ecosystem	Private Firms & SME Development	Investment Grants	750,000	Sep, 2022
Acceleration of the Dominican Republic's Venture Capital Ecosystem	Private Firms & SME Development	Technical Cooperation	250,000	Sep, 2022
Support to the Formalization and Productivity Improvement Program II	Private Firms & SME Development	Technical Cooperation	500,000	Aug, 2018
Formalization and Productivity Improvement Program II	Private Firms & SME Development	Loan Operation	300,000,000	Nov, 2017
MERCOFACT: An Innovative Platform for Trading Small Business Invoices	Private Firms & SME Development	Loan Operation	350,000	Nov, 2017
Urban and commercial revitalization: the case of Colonial City - Santo Domingo	Private Firms & SME Development	Technical Cooperation	850,000	Nov, 2015
Design of Mechanisms to Support SME. Exchange of Experiences.	Private Firms & SME Development	Technical Cooperation	15,646	Oct, 2014
Microfranchising for Women Entrepreneurs	Private Firms & SME Development	Technical Cooperation	400,000	May, 2014
Business Development & Competitiveness in the Province of San Juan	Private Firms & SME Development	Loan Operation	35,000,000	Dec, 2013
Inclusion of SME in the Sustainable Tourism Value Chain in Miches	Private Firms & SME Development	Technical Cooperation	833,856	Sep, 2012
PROMOTION OF SAVINGS AND CREDIT AMONG REMITTANCE RECIPIENTS IN THE DOMINICAN REP	Private Firms & SME Development	Technical Cooperation	386,301	Oct, 2011
Extension of financial services to small enterprises	Private Firms & SME Development	Technical Cooperation	280,000	Nov, 2010
Program to Support Competitiveness Policy II	Private Firms & SME Development	Loan Operation	110,000,000	Oct, 2010
Innovation and Remanufacturing Program in the Plastics and Construction Sectors	Industry	Technical Cooperation	1,179,650	Dec, 2017
Competitiveness and Sustainability Studies for the Destination of Santo Domingo	Sustainable Tourism	Technical Cooperation	200,000	Aug, 2021
Green Fins Hub - Digital scaling for Coral Reef Protection Within a Sustainable Marine Tourism	Sustainable Tourism	Technical Cooperation	328,000	Dec, 2020
Circular Economy Model for Organic Waste in Tourist Zones	Sustainable Tourism	Technical Cooperation	258,356	Nov, 2020
CORAL GARDENING TO ENHANCE TOURISM, SUPPORT CORAL REEF CONSERVATION,	Sustainable Tourism	Technical Cooperation	539,835	Dec, 2011
Tourism Development Program - Colonial City of Santo Domingo	Sustainable Tourism	Loan Operation	30,000,000	Oct, 2011
Support for Preparation of National Tourism Program-Santo Domingo Colonial Zone	Sustainable Tourism	Technical Cooperation	287,998	Jan, 2011

Source: Prepared by the JICA Study Team based on data from the IDB website.

JICA's cooperation in the tourism sector in the Dominican Republic is shown in the table below. Problems in the tourism sector in the Dominican Republic are that it is limited to large resorts and does

not necessarily benefit the local community, and that tourism resources are not being developed appropriately. In the National Development Plan 2030, one of the four pillars of development is "an innovative economy based on sustainable growth and an environmentally friendly production system", and the growth of the tourism industry is touted.

The "National Ecotourism Development Plan Study" (2007-2010) was carried out with the goal of developing ecotourism at the national level with the aim of contributing to the diversification of tourism, the protection of natural resources, and the improvement of the quality of life of communities. In the "project to create a prosperous tourist area through public-private cooperation" (2009-2013, hereinafter referred to as the preceding project), stakeholders from the public and private sectors collaborated to establish a unit network for improving regional power, and created guidelines as an implementation manual for approaches and examples of tourism promotion. The public and private sectors are working together to build a base for promoting tourism by making the most of local characteristics.

Regarding the expansion of the tourism promotion model of the preceding project implementation prefecture to other prefectures and further marketing and promotion, in order to promote community-based tourism (CBT) in the northern 14 prefectures, "The Project for Strengthening Mechanisms for Tourism Development" (2016-2021) was implemented. After the COVID-19 epidemic that occurred during the project implementation period, the number of inbound tourists decreased significantly, and sales of folk crafts for inbound tourists stagnated. However, domestic travel for adventure tours increased, and in the weekend before COVID-19, in some cases, the number of visitors increased. The use of online tools by local groups has become more active, and new spots that were not known until now have been developed through posting on SNS, etc., and the number of visitors, mainly young people, also increased.

Table 10-25 Tourism Sector Studies and Projects Conducted by JICA in the Past

Country/Region	Survey/Project	Year	Type of Cooperation
Dominican Republic	Strengthening Mechanisms for Sustainable Community-Based Tourism Development in the Northern Region Project	2016-2021	Technical Cooperation
Dominican Republic	Project to develop a prosperous tourism region through public-private cooperation	2009-2013	Technical Cooperation
Dominican Republic	National Ecotourism Development Plan Study	2007-2010	Technical Cooperation

Source: JICA website

In addition, USAID is supporting the creation of industrial clusters of local peers to improve ecotourism and the quality of local products, to collaborate in the procurement, sales, and marketing, and to provide equipment and technology. USAID also provides support in the form of equipment and technical assistance.

In addition to the relevant departments of the Ministry of Tourism, many central ministries and the private sector are involved in the promotion of CBT, and it is important to establish a coordination mechanism for them. The lessons learned from this project pointed out to the Ministry of Tourism not having a coordination function and that it is necessary to take a flexible approach, such as changing the policy to achieve specific results through cooperation between two ministries for each specific theme.

Community tourism is a common need in Central American and Caribbean countries, and SITCA, which is responsible for coordinating the implementation of a strategic plan for sustainable tourism

development in Central America and disseminating information on tourism activities, has shown great interest. The above series of projects by the Dominican Republic have been highly evaluated by international organizations and are expected not only to be expanded to other regions of the country, but also to be effectively utilized within the Central American region, and have been recognized by the Webinar Regional - Turismo Comunitario Sostenible Intercambio de The project has been shared with SICA countries in the form of the Webinar Regional - Turismo Comunitario Sostenible Intercambio de buenas prácticas³⁰, and is expected to contribute to the improvement of the tourism sector in the entire Central American region as an area-wide project.

(2) Development and Cooperation Scenario

1) Development Scenario

a) Development Issue and Strategy

As mentioned above, in the Dominican Republic, the MSME Promotion and Support Program PROMIPYME under the Ministry of Commerce, Industry, and Small and Medium Enterprises (MICM), which oversees MSME promotion, has measures to support MSME efficiency, modernization, and competitiveness enhancement, while the tourism sector was identified as a priority country in the previous study. The results of the tourism sector survey conducted as a focus country in the previous phase of the study are used to develop a development scenario. Based on this information and the strategies compiled by CENPROMYPE and SITCA for MSME promotion and tourism development in the Central American region based on the development strategies of each country, the table below summarizes the challenges in the Dominican Republic's industrial promotion sector (including tourism).

Table 10-26 Issues of the Dominican Republic's Resilient Economic Development (Including Tourism) Sector

Policy	Industrial Policy	Effects of legal system improvements such as digitization, regulatory framework for real estate (registration, collateral), etc. will permeate MSMEs
	Business Environment	Creation of an entrepreneurial environment that includes incentive grants, subsidies, tax breaks, and provision of seed capital
Financial Aspects	Access to Finance	Improve MSME administrative and financial capacity Improvement and diversification of financial procedures, such as speeding up loan settlement, collateral, and guarantees (including Fintech) Insufficient knowledge of MSME on financial matters, financial products that meet MSME' needs have not been developed
	Linkage Enhancement	Linkages with technology centers of regional cooperation, related value chains are not integrated Formalization of suppliers and MSME, access to international markets, networking of entrepreneurs Absence of networks connecting regional tourism destinations and market markets
Management and Technology	Strengthening Corporate Competitiveness	Lack of capacity to improve productivity, reduce production costs, expand production, add higher value, and acquire new technologies Promotion of manufacturing: stagnation of handicraft activities of MSME Lack of MSME capacity for digital payments and digital marketing in the tourism sector Training opportunities to improve skills in tourism data collection, analysis, and reporting
	Promoting Innovation	Digital Innovation for Improving MSME Access to Finance Productivity through digital marketing Entrepreneurship promotion center to provide entrepreneurial know-how tools to pre-entrepreneurs and students

³⁰ Conducted by SITCA, SG-SICA, JICA at ZOOM in cooperation with MITUR, INFOTEP, MEPyD, Dominican Republic, 20 jul 2022,

b) Strategies for Development Issues

- Strategies for Industrial Policy and Business Environment

The Doing Business results also show that the number of days for start-up is slow, and the development of the business environment should be promoted. Address issues such as the lack of progress in collateral procedures due to inadequate real estate registration, and improve the legal system for digitization of business start-up procedures and finance, etc.

- Access to Finance

In the area of access to finance, the banks are expected to improve the obstacles identified in the previous study, such as the inability of MSME to borrow due to a mismatch between their financing needs and the bank lending system, improve their financial knowledge and equipment, develop mobile applications that can be used without a bank account, and develop financial products that meet MSME's needs.

- Enhancement of corporate competitiveness

Promote the improvement of competitiveness and productivity by enhancing quality and value-added products. Promote the diffusion of certification systems in Japan as one of the ways to achieve this goal. In order to promote the certification system, it is important to prepare training programs to improve the level and increase the number of extension agents, as well as incentive programs for those who receive the certification system. It will be efficient to proceed with these measures in conjunction with regional branding strategies.

- Strengthen linkages

Promote backup through support centers, such as networking with the informal sector and women entrepreneurs. In the tourism sector, promote the development of a network linking information on tourism assets and markets.

The Center for Promotion of Entrepreneurship will provide know-how and tools to women, students, and other entrepreneurs (especially the use of and collaboration with private services that are already prevalent around the world) in preparation for starting their own businesses. The table below outlines the strategies.

Table 10-27 Overview of Strategies for Industrial Promotion (Including Tourism) in the Dominican Republic

Subject	Strategy	Strategy Overview
Green Economy (Resilient economic development (including tourism))	Developing relevant legal systems as a prerequisite for the business environment	In order to strengthen the productivity and competitiveness of MSME, which account for 99% of the industrial structure, it is important to have the relevant legal systems in place as a prerequisite for improving the business environment. The project will promote the development of legal systems to improve the time and days required to start a business, as well as the development and improvement of real estate registration procedures and other legal systems that have become obstacles for MSME to develop their businesses.
	Support MSME in improving access to finance, capacity building on financial products and transactions, and financial	MSME have little access to long-term loans, securities markets, or overseas markets, and their access to finance is limited. This is a situation that needs to be addressed along with institutional improvements, financial education for MSME, and the development of financial services that meet their needs.

knowledge in business management	
Strengthening MSME by supporting MSME to improve their competitiveness and productivity	In an effort to improve competitiveness and productivity, promoting the Sello Hecho en República Dominicana certification system is underway, which aims to improve quality and added value. In promoting the certification system, the company is pursuing a broad strategy that includes the development of human resources to support certification and the provision of financing incentives for companies that receive certification. In addition to improving quality and technical capabilities, promotion as a regional brand is also important, and a branding strategy in conjunction with the "Marca País" national image strategy by the government is being promoted.
Support for improving economic independence and employment opportunities and conditions for the informal sector, women entrepreneurs, and other vulnerable groups	MSME include many in the informal sector, and in rural areas, many of the projects are led by women. Rural women still face significant obstacles in terms of education and labor policies, and it is important to support their economic independence, and strategies such as entrepreneurship workshops by the EMPRETEC Center and the roadmap to support rural women's economic independence by SITCA and COMMCA will be useful. Strategies utilizing the SITCA and COMMCA Roadmap for Supporting Rural Women's Economic Independence will also be useful.
Support for promotion of digital and innovation to improve access to finance, etc.	Regarding innovations such as digitalization, not only business processes but also financial access, institutional and marketing aspects need to be addressed. At the same time, MSME need to be supported in developing their capacity to respond to new technologies.

Source: Prepared by the JICA Study Team

2) Programs and Projects

The table below shows examples of similar JICA projects that can serve as a reference for the outline of strategies presented in the previous section 1) Organizing Development Issues.

Table 10-28 Examples of Similar Projects

Strategy Overview	Similar Project
Business development support <ul style="list-style-type: none"> Strengthening management and operation of MSME Strengthen cooperation with government, academia, and related companies Promotion of manufacturing 	<ul style="list-style-type: none"> KAIZEN support for companies in the field of business management in Tanzania India Support Project for Fostering Management Executives in the Manufacturing Industry for Comprehensive Growth Improvement of Management and Operation of Belau National Hospital in Palau Indonesia: A project to expand industry-government-academia collaboration through the promotion of open innovation at the Gadjah Mada University Field Research Center "
Improvement of financial environment <ul style="list-style-type: none"> Improvement of management of MSME, use of banks, and access to financing Education and capacity building for improving financial access Support for product design to improve financial access 	<ul style="list-style-type: none"> Survey for information collection and confirmation related to construction of credit risk information database for improvement of access to MSME in Myanmar Information collection survey for improvement of access to corporate finance in Tanzania Information collection survey for improving access to corporate finance in Kenya African Region Information Collection and Verification Survey for Examining Methods for Improving Access to Corporate Finance"
Strengthen productivity and competitiveness <ul style="list-style-type: none"> Incorporation of added value Promotion of continuous improvement process for productivity improvement Support formalization of MSME Strategy and tool design (including digitization) to enhance the competitiveness of MSME Regional collaboration, regional cooperation, integration of production value chains (Central America: agriculture, Caribbean: fisheries) 	<ul style="list-style-type: none"> Cameroon Comprehensive promotion of MSME through promotion of quality and productivity improvement (kaizen) Information collection survey on MSME promotion in Peru North America/Central and South America Region Project Research "Impact Analysis of Quality and Productivity Improvement Projects for MSME" Saudi Arabia: Information collection and confirmation survey related to MSME promotion support Mongolia MSME Development and Environmental Conservation Two-Step Loan Project Europe Strengthening the mentor system for MSME in the Western Balkans region Survey for information collection and confirmation related to MSME promotion in Turkey

Strategy Overview	Similar Project
<ul style="list-style-type: none"> • Tourism crisis management, minimization of tourism leakage 	<ul style="list-style-type: none"> • Information collection and confirmation survey on support for overseas expansion of MSME in the agricultural sector in Vietnam and future direction of cooperation in the agricultural sector
<p>Entrepreneurship promotion</p> <ul style="list-style-type: none"> • Environmental improvement for entrepreneurship, development and growth • Development and support of local policy tools to promote women entrepreneurs 	<ul style="list-style-type: none"> • Information collection/confirmation survey on startup company collaboration in Latin America/Caribbean region • Information collection and confirmation survey on public-private fund collaboration for fostering entrepreneurs and MSME worldwide • India information collection and confirmation survey on startup innovation ecosystem and Japan-India cooperation strengthening measures • Information collection and confirmation survey on supporting female entrepreneurs through improving access to digital services in the African region • Additional research work related to Ethiopia's Loan Aid Project "Support for Women Entrepreneurs"
<p>Supporting innovation and technology development</p> <ul style="list-style-type: none"> • Policies to strengthen the ability to generate innovation and new technologies • Promotion of digitization 	<ul style="list-style-type: none"> • Information collection and confirmation survey for ICT/digital industry and startup promotion in Mongolia • Project for Strengthening Digital Technology and Data Utilization Capacity of the Government of Bhutan • Technical education and dissemination promotion project by Digital Manufacturing Workshop (Fab Lab) in Bhutan • Rwanda ICT Innovation Ecosystem Strengthening Project

Source: Repaired by Study team

The table below summarizes the programs/projects proposed in the Dominican Republic on the five issues listed in Table 10-29 as a reference.

Table 10-29 Programs/Projects Proposed in the Dominican Republic

Subject	Issues	Program/Project
Green Economy (Resilient economic development)	1. Industrial policy and improvement of the business environment	Survey on business environment improvement
		Investigation of legal systems to promote the development of the business environment
		Industrial promotion project
	2. Improvement of financial access	Survey on Improving Financial Access for MSME
		Education, capacity building and financial support for improving financial access
		Product design for improving financial access (support for new technologies such as DX)
		Development of legal system related to improvement of MSME financial environment, such as payment and incentive
	3. Enhancing corporate competitiveness	Local industry promotion information gathering survey for creating added value
		Promotion of MSME to improve quality and productivity (promotion of authentication systems)
		Developing strategies and designing tools to enhance corporate competitiveness
		Regional collaboration, regional cooperation, production value chain integration (agriculture and fisheries)
		Support for promotion of community tourism for sustainable tourism development
		Ongoing efforts for tourism crisis management plan
	4. Linkage strengthening	Creating an environment for entrepreneurship, development and growth
		Economic independence support for women in rural areas
		Developing and supporting local policy instruments to promote women entrepreneurs
	5. Promoting innovation	Support for capacity building related to innovation and new technology development
Strengthening capabilities related to digital payments and digital marketing		
Investment incentives and tax abatement to promote digitalization		

Source: Repaired by Study team

3) Cooperation Scenario

In order to select the programs/projects that JICA should work on, the criteria shown in the table below

have been set.

Table 10-30 Dominican Republic Program/Project Selection Criteria

Selection Criteria	Content
(1) Consistency with the Japanese government's country development cooperation policy	The Japanese government has established the Dominican Republic's development cooperation policy (priority areas) as follows: "(1) Sustainable economic development: In order to achieve sustainable economic development, it is essential to strengthen the competitiveness of domestic industries. Emphasize productivity improvement of MSME and support human resource development efforts. In the field of tourism, utilize local resources, support the promotion of the tourism industry, including areas around resorts, and revitalize the local economy.." In addition, "As one of the main resort areas in the Caribbean region, about 7.3 million foreign tourists visited in 2017, and it is an important source of income for the country. It is confined to resort hotels and does not necessarily benefit the surrounding local economies." On top of that, the priority area (medium goal) is to utilize local resources, support the promotion of the tourism industry, including areas around resorts, and revitalize the local economy.
(2) Consistency with JICA's global agenda	JICA has set the following goals as the growth of private companies is the source of sustainable economic growth; (1) Foster competitive entrepreneurs and entrepreneurs. (2) Entrepreneurship support for business innovation creation. (3) Improving the external environment for growth of private companies and improving access to finance and markets
(3) Effective utilization of results of past projects implemented by JICA	It is necessary to make effective use of the outcomes and lessons learned from JICA's past projects in the Dominican Republic.

Source: JICA Study Team

SICA and JICA are also planning "Sustainable Tourism Development," "Support for Women's Economic Independence," and "Agricultural and Rural Development" as cooperation programs in the "SICA Project Planning Working Paper" (Plan de acción para la cooperación regional SICA - JICA 2021 - 2025). Development". It includes capacity building and networking support projects for tourism sector MSME, promoting the introduction of JICA approaches and tools that promote rural socio-economic revitalization, and supporting agricultural and rural development through the dissemination and utilization of the Japanese brand concept at the SICA regional level.

In the area of sustainable tourism development, as mentioned above, SITCA and JICA have begun sharing the experiences and results of the "Strengthening Mechanisms for Sustainable Community-Based Tourism Development in the Northern Region" project (2016-2021) within the Central American region. The various manuals developed through this project will be useful in promoting CBT development in other countries in the region. As an area-wide project, it is expected to contribute to the improvement of the tourism sector in the entire Central American region.

In addition, interviews with SITCA have requested the dispatch of wide-area experts to the tourism sector, and in the area of supporting women's economic independence, an expert has dispatched to COMMCA, which is the agency that manages PRIEG, and the promotion of women's entrepreneurship is an option from the perspective through COMMCA. Therefore, it is necessary to consider including the implementation of tourism sector and MSME support in the Dominican Republic in the regional cooperation with SICA as C/P.

Using this information as a reference, and also checking consistency with the JICA Global Agenda, the programs/projects with high priority that JICA should address are selected and shown in the table below.

Table 10-31 Proposed Cooperation Scenario in Dominican Republic (Draft)

Strategy	Programs/Projects	Modalities
1. Area-wide cooperation 2. Strengthening corporate competitiveness	Support for micro, small and medium enterprises in the tourism sector (support for sustainable tourism development in the region)	Subject-specific training (complementary training in a third country)/training in a third country, dispatch of experts

Source: JICA Study Team

A summary of the above programs/projects is as follows

a) Projects to be Undertaken in the Broader Region (in Collaboration with SICA)

The issues of MSMEs in the Dominican Republic, such as improving competitiveness and productivity, supporting entrepreneurs, improving quality, and developing tourism utilizing local resources, are common issues for the entire Central American region. SICA is considering addressing these regional issues on an area-wide basis, and is considering the "Promotion of Intra-regional Cooperation for Sustainable Tourism Development" as a project under the cooperation program "Support for Community Tourism Promotion for Sustainable Tourism Development (Wide-area)" in the "SICA-JICA Regional Cooperation Action Plan 2021-2025". Promotion of Regional Cooperation for Sustainable Tourism Development" in the "SICA-JICA Regional Cooperation Action Plan 2021-2025" cooperation program.

A series of CBT projects have been conducted in the Dominican Republic to develop a sustainable tourism industry, including the "National Ecotourism Development Plan Study," the "Public-Private Cooperation Project to Create a Prosperous Tourism Region," and the "Strengthening the Mechanism for Sustainable Community-Based Tourism Development in the Northern Region. The experiences, findings, and lessons learned from these projects can be applied to other regions in the country, and can also be shared with other countries in the region through technical cooperation.

In order to improve the quality and productivity of agricultural products to a level where tourism can become a marketing target for local industries, the certification systems implemented by CENPROYPE and SITCA should be utilized to guarantee quality and increase added value.

The Dominican Republic's experience in cooperating with and supporting the development of CBT know-how within the Central American region will be useful for the Dominican Republic's tourism sector when it expands to other regions of the country.

In addition, many MSMEs in rural areas are run by women, and supporting women's economic independence is important for "sustainable tourism development. From this perspective, there is a possibility that COMMCA, which is under the jurisdiction of PRIEG, may participate in the implementation of the project.

Table 10-32 Programs/Projects in Collaboration with SICA

Item	Contents
Project name	Tourism Sector MSME Support Project
Priority	Priority Project (A)
Target Country	SICA Member Countries
Modality	Subject-specific training (complementary training in a third country)/training in a third country, dispatch of wide-area advisors
Basic Strategy	Promoting intra-regional cooperation for sustainable tourism development
Project Site	SICA member countries
Cooperation Period	August 2023 - July 2026 (36 months)

Name of Partner Country	SICA/SITCA/CEMPROMYPE/ COMMCA (SICA) MITUR/INFOTEP/MICM/PROMYPYME (Dominican Republic)
Name of partner country and other related organizations	Ministries in charge of each country (Ministry of Tourism, etc.)
Project Objectives	Intra-regional collaboration for sustainable tourism development will be promoted, and MSME capacity building and networking will be strengthened.
Outcome	<ol style="list-style-type: none"> 1) The actual situation and needs of MSME in the tourism sector will be identified. 2) The current status of CBT and local resources in each country will be analyzed. 3) Capacity building and networking of MSME in the tourism sector will be strengthened. 4) A common SICA framework for certification, PR, etc. will be established. 5) The experience and know-how on CBT accumulated in the Dominican Republic will be shared with SICA member countries. 6) Central America will be promoted as a single tourism destination.

Source: Revised by JICA Study Team

10.3.2 Overview of the Resilient Industrial Development Sector in Jamaica

(1) Overview of the Sector

1) National Policy for Industry Development in Jamaica

In the National Development Plan: Vision 2030 (2009), the Government of Jamaica aims to become "Jamaica, the place of choice to live, work, raise families, and do business". The plan shows Jamaica's economic development strategy as to grow to become a logistics hub for the Central America and the Caribbean region utilizing its geographical strategic advantage. In addition, in order to promote industrial development and investment, the Ministry of Industry, Investment and Commerce has identified priority policies in the Strategic Planning Framework (2022) as 1) to develop internationally competitive business environment, 2) to maximize opportunities for export, 3) to implement a National Investment Framework, 4) to implement the Agribusiness Strategy, 5) to enhance the business environment for growth and development of the MSME sector., 6) to strengthen the resilience of manufacturing and service sector, 7) to enhance Consumer empowerment and Competitiveness, and 8) To strengthen the capacity of Ministry and entities.

2) Issues for Inverness SEZ Project

Under these policies, the Jamaica Special Economic Zones Authority (JSEZA), which was established in 2016, requested JICA to conduct an initial study for development of the Inverness SEZ (3,607 ha) near Kingston, which is a priority project. Then, JICA conducted "Jamaica Inverness Smart City Special Economic Zone Development Preliminary Study Report (February 2022)"

The initial study identified seven issues for launching project for the Inverness SEZ as follows.

a) Confirmation of potential investment from Japanese company

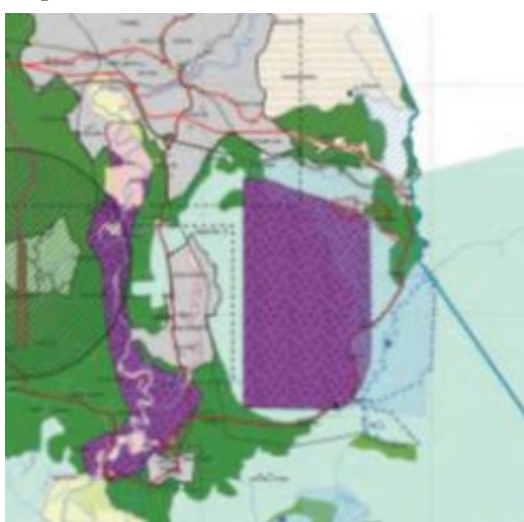
In proposing cooperation by Japanese government, an involvement of Japanese private sectors such as developers, operators, and tenants who will potentially expand to the SEZ and Jamaican market must be confirmed. Currently, there are only 16 Japanese companies located in Jamaica. The initial study indicated that high consumer index, high labor costs, and public order safety may be barriers for developing new industrial park with Japanese companies in the SEZ in the short term.

This study conducted an interview with Japanese company located in Jamaica. While high interest in the SEZ project by the Japanese company was confirmed, the company is still in the very initial stage

for a participation. Acceleration of initiatives to enhance attractiveness of industrial business in Jamaica and the SEZ, and to increase awareness of Japanese companies shall be required.

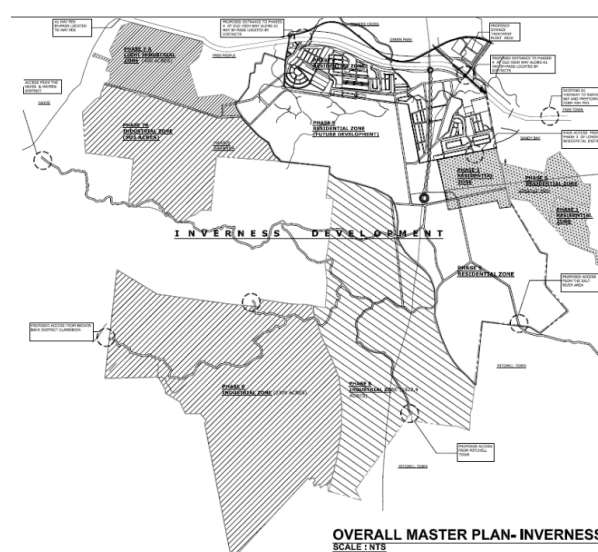
b) Enhancement of Consistency with Land Use Plans and Cooperation With Local Governments

Clarendon Parish designates the SEZ site as quarry and such as other new residential land and agricultural land in a zoning plan of the Development Order (2017) as shown in Figure 10-22. On the other hand, National Housing Trust designates it as mixed land use which consist of industrial, residential, commercial in the Inverness SEZ Master Plan as shown in Figure 10-23. These two plans are not consistent, therefore, an amendment of the Development Order may be required for the SEZ development.



Source: Town and Country Planning (Clarendon Parish) Development Order (2017)

Figure 10-23 Development Order of Clarendon Parish



Source: NHT

Figure 10-24 Overall Master Plan of Inverness SEZ

c) Promotion of collaborative projects with the National Housing Trust (NHT)

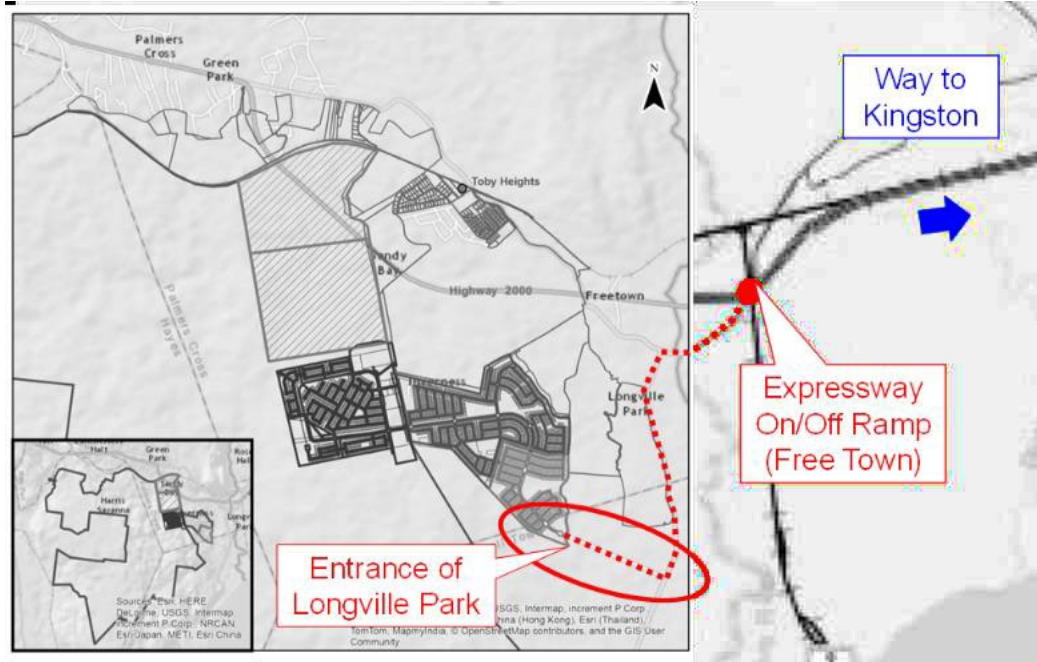
While JSEZA has indicated that the SEZ project will be implemented in partnership with private sector, NHT has acquired the lands of the SEZ and a development plan for the site as mentioned above. Therefore, smooth coordination and consistent implementation policy of the SEZ development project by establishment of a long-term cooperative framework between JSEZA and NHT is required.

As of February 2022, JSEZA and NHT were in the process of finalizing MOU for cooperation and coordination.

d) Development of Surrounding Infrastructures

Highway 2000 (T1), the access road to the SEZ, crosses the northern part of the SEZ project area. Currently there is one ramp for access to the Phase 1 area as shown in Figure 10-24. Securing multiple access to this highway via ramps with sufficient traffic capacity is an essential factor for operation of the SEZ. In order to secure the connection (specifically, a construction of new ramps), it is necessary to

coordinate closely with agencies in charge of traffic planning/management, highway and access road management and operation, and to confirm the certainty of land acquisition and construction financing. In addition, depending on the access design, the land use plan and development phasing plan of the SEZ may also need to be adjusted.



Source: NHT

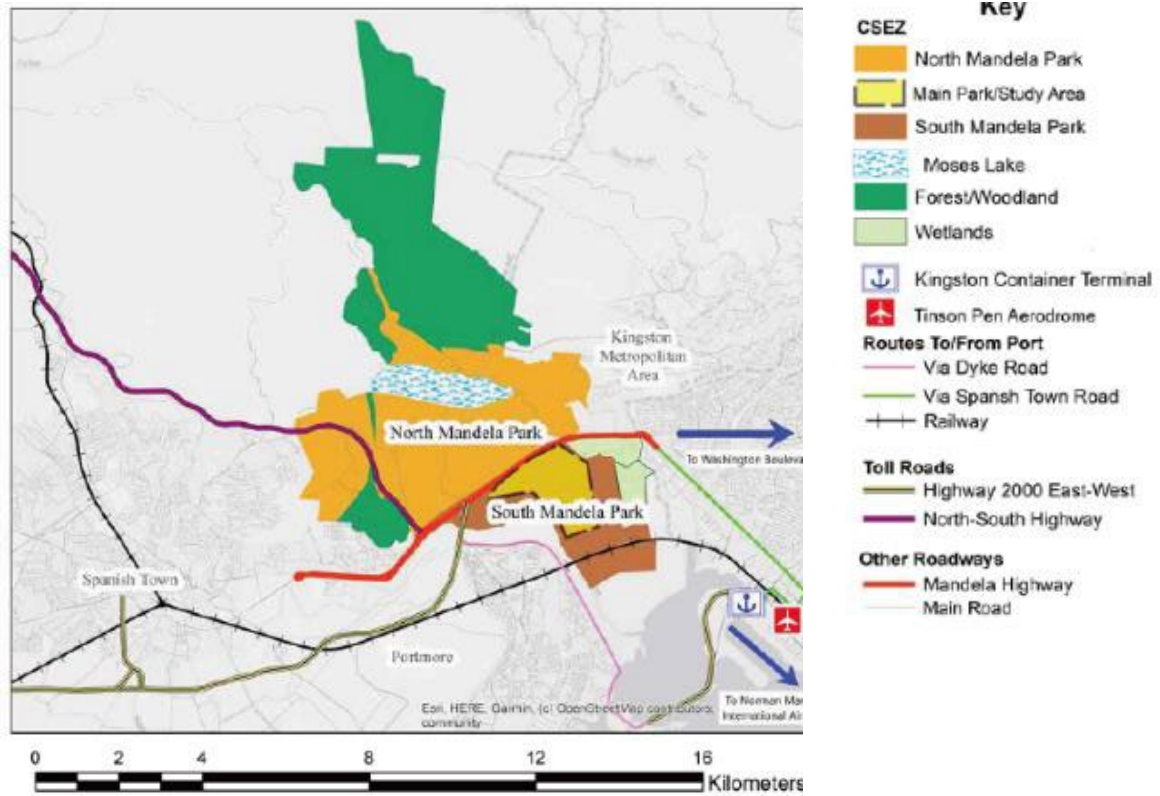
Figure 10-25 Layout of Existing Access Road to Inverness SEZ

For electricity, there may be little need to develop additional power plant for the SEZ development, and no critical issues to launch the SEZ project. On the other hand, dependence on fossil fuels and expensive price of electricity may be caused by electricity theft might be barriers for attracting companies interested in ESG investment, advanced industries and manufacturing plants in order to enhance smart city development and heavy industrial function as a proposed development direction for the SEZ.

e) Differentiation from Caymanas SEZ

JSEZA is also promoting Caymanas SEZ project as a priority project which will be developed similarly to Inverness SEZ. A feasibility study was prepared with World Bank support in 2015, and a master plan was approved in 2020. Caymanas SEZ is located between Kingston and Spanish Town where is nearby high population density area. Then, planned land use of Caymanas SEZ is majorly for industrial (Figure 10-25) and a goal of the development is to create a cluster of light industry and logistics by attracting businesses such as agricultural processing, pharmaceuticals, automotive and logistics. In order to secure involvement of Japanese companies to Inverness SEZ, differentiation of Inverness SEZ from Caymanas SEZ, which will be located at the same time and in the same region, is also important not to disperse investment.

For strengthening the complementary relationship and reducing competition among SEZs, JSEZA is preparing for a national SEZ strategy. As of January 2023, it is under preparation.



Source: Caymanas SEZ Investor Brief

Figure 10-26 Land Use and Transportation Plan of Caymanas SEZ

f) Environmental and Social Considerations

Area for Inverness SEZ is designated as a bight protected area under the Natural Resources Conservation Act, as a habitat for rare and endangered plants and animals. Also a part of the bight is registered as the Wise Use of Wetlands of Ramsar. On the other hand, it is not designated as a protected area under the IUCN. So it is a protected area where is possible used in a sustainable method. However, it is necessary to fulfill JICA's policy on environmental and social considerations when implementing JICA's cooperation. As the development of the SEZ is likely to be categorized as A which has significant adverse impacts on the environment and society, sufficient measures for environmental and social considerations are essential from the early planning stage.

For these reasons, JSEZA will commence environmental consideration process since March 2023. It is necessary to continue to closely monitor the activities of the Government of Jamaica with regard to environmental and social considerations.

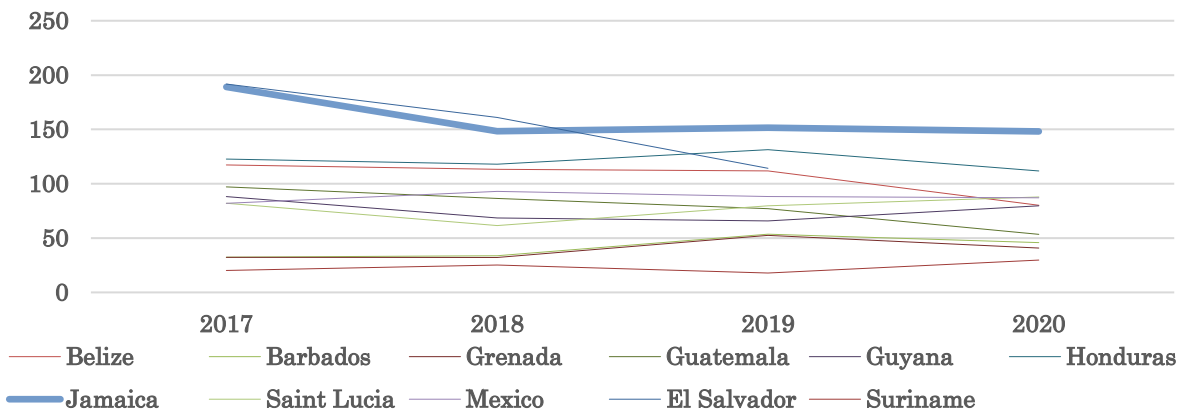


Source: Jamaica Inverness Smart City Special Economic Zone Development Preliminary Study Report

Figure 10-27 Location of Protected Area and Inverness SEZ

g) Improvement of Public Order (Security)

Although Jamaica has a low risk of terrorism, it has a high homicide rate which is the highest in the world according to UN statistics as shown in Figure 10-27. The security situation is a concern for foreign companies including Japanese. Enhancement of security is an important initiative for inviting private investment.



Source: JICA Study Team by data from UNODC

Figure 10-28 Homicide rate of Countries in Central Americas and Caribbean Region (per 100,000 population)

(2) Development and Cooperation Scenario

1) Development Scenario

In order to commence the Inverness SEZ project, it is essential to address the seven issues mentioned above. In addition, initiatives to accelerate industry development and investment in Jamaica are also

important for attracting foreign companies including Japanese. Table 10-33 shows the actions for promoting the SEZ project.

Table 10-33 Development Scenario for Industry Development in Jamaica

	Issues	Assumed status to be reached	Activities
Inverness SEZ	1. Confirmation of potential investment from Japanese company	Several companies have been identified that are interested in participation to Inverness SEZ development such as developers, operators or tenants	1-1. Implementation of seminars for Japanese companies' invitation 1-2. Improvement of the SEZ's exemption
	2. Enhancement of Consistency with Land Use Plans and Cooperation With Local Governments	The various plans designated on the SEZ site have been organized without inconsistencies, and obtaining development approvals without delay is ready	2-1 Amendment of Development Order of Clarendon Parish 2-2 Adjustment of Inverness SEZ master plan
	3. Promotion of collaborative projects with NHT	A cooperation system between NHT and JSEZA has been established. Also, a possibility of jointly working among NHT and Japanese private companies has been confirmed	3-1 Exchange of MOU between JSEZA and NHT for a cooperation 3-2 Improvement of housing policy and implementation capacity 3-3 Possibility study for PPP scheme in partnership with NHT
	4. Development of Surrounding Infrastructures	Project for access road development has been decided. Also, completion of the construction has been scheduled.	4-1 Development of ramps with Highway (T1) 4-2 Adjustment of Inverness SEZ plan aligned with ramps development 4-3 Development of renewable energy plant and distribution system 4-4 Development of smart grid system for electricity distribution
	5. Differentiation from Caymanas SEZ	Strategy for strengthening complementary relationship and minimize competitive relationship between Inverness and Caymanas SEZs has been established.	5-1 Formulation of national SEZ master plan 5-2 Formulation of SEZ master plan around Kingston 5-3 Formulation of Inverness SEZ strategy for smartification
	6. Environmental and Social Considerations	Measures for environmental and social considerations has been conducted properly	6-1 Implementation of SEA 6-2 Implementation of EIA
	7. Improvement of Public Order (Security)	Security has been improved	7-1 Enforcement of community policing
	8. Inverness SEZ Development	Achievement on above seven issues have been confirmed	8-1 Revision of Inverness SEZ master plan 8-2 Feasibility study and design 8-3 Construction 8-4 Operation and management
	9. Other measures for industrial development and investment promotion	industrial development has been encouraged and investment environment has been improved	9-1 Improvement of port facilities around Kingston 9-2 Tourism development through regional branding with local community

Source: JICA Study Team

2) Cooperation Scenario

As mentioned above, Inverness SEZ development project will be commenced after a confirmation of achievement in all seven issues. Each of the seven issues is a significant project which requires sufficient discussion and coordination. Therefore, implementation of the SEZ development project can only be a medium-term or long-term project.

This study proposes priority projects, which shall be commenced in short-term and shall contribute to promote industrial development and investment in Jamaica, the Technical Assistance Project on Local

Branding related to the development scenario 9-2 (also described in Chapter 13: Regional Branding). This proposal is consistent with the priority policies identified in the Strategic Planning Framework of the Ministry of Industry, Investment and Commerce: 2) to maximize opportunities for export, 4) to implement the Agribusiness Strategy, 5) to enhance the business environment for growth and development of the MSME sector., 6) to strengthen the resilience of manufacturing and service sector, and 8) to strengthen the capacity of Ministries.

Details of the technical assistant project are described in Chapter 13: Local Branding.

a) Outline of Technical Assistance Project (abstract of Chapter 13)

From the perspective of local branding, by increasing the connectivity between tourism and local industries such as agriculture, implementing outer and inner branding, and improving organization and business capacity, the project will solve the problem of tourism leakage and increase the ripple effect of tourism on local industries.

Table 10-34 Outline of Technical Assistance Project on Local Branding

Item	Content
Name	Technical Assistance on Enhancement of Local Branding and Agricultural Value Chain
Priority	Priority Project (A)
Country	Jamaica
Strategy	Resilient and Inclusive Tourism Development
Site	Whole of the nation
Modality	Dispatchment of Experts
Period	April 2024 -Mar 2027 (36 months)
Counterpart	Ministry of Agriculture and Fisheries, RADA (ALEX)
Other related organizations	Tourism Linkage Network, Ministry of Tourism, TPDCo, Ministry of Local Government and Rural Development, Ministry of Industry, Investment and Commerce, SRC, Moneague college
Project goal	Tourism linkage is enhanced by local economy development with local branding
Output and Activities	<ol style="list-style-type: none"> 1. To establish national policy for local branding <ol style="list-style-type: none"> 1-1 To analyze product value chain 1-2 To develop national vision and strategy 1-3 To identify role of stakeholders 2. To enhance organizational system to promote local branding under the national policy <ol style="list-style-type: none"> 2-1 To develop platform with cross sections in national level 2-2 To develop Certification system for local branding 2-3 To develop impact assessment system for local branding 3. To establish support system on local business by local community <ol style="list-style-type: none"> 3-1 To organize local actors for product development 3-2 To identify /rediscover local resources by local people through event (Onpaku) 3-3 To support to formulate local business plan by local people 3-4 To conduct promotion activities at major domestic touristic sites (antenna shops, booths, fairs) 4. Output4: To share experiences of Jamaica <ol style="list-style-type: none"> 4-1 To develop domestic platform to share initiatives 4-2 To share experiences in Jamaica with countries in Central America and the Caribbean region

Source: JICA Study Team

b) Implementation Structure

The proposed technical assistance project consists of a top-down approach (Outcome 1: policy, and Outcome 2: organizational structure) and a bottom-up approach (Outcome 3: community business, and Outcome 4: information sharing). Then, it requires to establish an implementation structure involving various organizations.

The table below shows drafted input from each government

Table 10-35 Outline of Input in Technical Assistance Project on Local Branding

Output	Activities	Jamaican responsible organization	Input from Japan
1 To establish national policy for local branding	1-1 To analyze product value chain 1-2 To develop national vision and strategy 1-3 To identify role of stakeholders	MoAF MoT MIIC MoLGRD	
2 To enhance organizational system to promote local branding under the national policy	2-1 To develop platform with cross sections in national level 2-2 To develop Certification system for local branding 2-3 To develop impact assessment system for local branding	TLN • TPDCo ALEX • RADA	Tourism and Industry Development Advisor
3 To establish support system on local business by local community	3-1 To organize local actors for product development 3-2 To identify /rediscover local resources by local people through event (Onpaku) 3-3 To support to formulate local business plan by local people 3-4 To conduct promotion activities at major domestic touristic sites (antenna shops, booths, fairs)	ALEX • RADA	Community Business Advisor
4 To share experiences of Jamaica	4-1 To develop domestic platform to share initiatives 4-2 To share experiences in Jamaica with countries in Central America and the Caribbean region	ALEX • RADA TLN	

Source: JICA Study Team

11. Agriculture and Rural Development

11.1 Agricultural Value Chain

11.1.1 Outline of the Study

(1) Survey Scope

The work shown in Table 11-1 was conducted through desktop research, interviews, and field survey in Nicaragua and Cuba to formulate a development scenario and future JICA cooperation scenarios for improving the agricultural value chain.

Table 11-1 Survey Scope by Sector (Agricultural Value Chain Development)

No.	Item	Scope
1	Sector Targets	<ul style="list-style-type: none"> - To identify the challenges in the value chain of export products and livestock products - To formulate a development scenario and JICA's future cooperation scenario based on the identified challenges
2	Scope Update	Updating and agreement on the scope through the discussion with JICA.
3	[Task 2]	<p><Collection and analysis of basic information about the agriculture sector in the target countries></p> <ul style="list-style-type: none"> - Agricultural development strategy and its plan - Organization chart and budget plans of relevant organizations - Report on an ongoing project implemented by the government and development partners - Statistical data on production and foreign trade of export and livestock products <p><Selection of target products for a value chain survey></p> <p>Selection of target products for a value chain survey based on basic information</p> <p><Online interview with relevant governmental organizations></p> <p>Collection of the following information through online interviews with relevant governmental organizations:</p> <ul style="list-style-type: none"> - Production and production system of the target products - Challenges of the value chain of the target products <p><Online interview with development partners></p> <p>Collection of the following information through online interviews with development partners:</p> <ul style="list-style-type: none"> - Contents and components of ongoing projects - Lessons learned and challenges of the ongoing projects <p><Preparation of a value chain survey></p> <p>Preparation of questionnaires and briefing about the survey to national staff</p>
4	[Task 3]	<p><Field survey (1): Value chain survey></p> <p>Identification of challenges in the value chain of the target products (survey item: roles of the value chain actors, value structure of the value chain actors, and challenges in the value chain)</p> <p><Field survey (1): Preparation of a draft development scenario and JICA's future cooperation scenario></p> <p>Preparation of a draft development scenario and JICA's future cooperation scenario based on the value chain survey</p> <p><Field survey (2): Explanation and modification of the scenario></p> <p>Explanation of the scenario to relevant governmental organizations and JICA, and modification of the scenario based on their feedback</p>
5	[Task 5]	Technical advice for preparing a plan of pilot projects
6	[Task 6]	Technical advice for implementing pilot projects
7	[Task 8]	<p><Finalization of the scenario></p> <p>Finalization of the scenario based on the feedback from relevant governmental organizations and JICA</p>

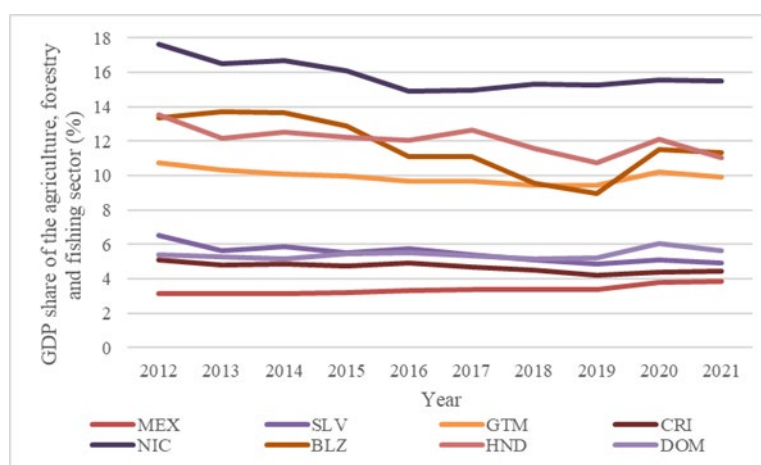
Source: JICA Study Team

11.1.2 Overview of Agricultural Value Chain in the Region

(1) Outline of Agricultural Value Chain in Central America

1) General Situation

Central America, including Mexico, is a vast region characterized by a wealth of natural resources, including freshwater resources and high-quality soil for agricultural production. Although much of the region share the same language and cultural heritage, the structure and scale of the agriculture sector vary significantly from country to country. The contribution of the agriculture, forestry, and fishing sector to Latin America and the Caribbean’s total Gross Domestic Product (GDP) stands at 6.9%, while the GDP share of the sector accounts for more than or around 10% in Belize, Guatemala, Honduras, and Nicaragua¹. As shown in Figure 11-1, these countries have maintained the GDP share of the sector for ten years from 2012 with a slight decrease, which reveals that the sector is still essential for these countries’ economies.



Remarks: MEX: Mexico, SLV: El Salvador, GTM: Guatemala, CRI: Costa Rica, NIC: Nicaragua, BLZ: Belize, HND: Honduras, DOM: Dominican Republic

Source: JICA Study Team based on the World Bank data (2021)

Figure 11-1 GDP Share of the Agriculture, Forestry, and Fishing Sector in Central America from 2012 to 2021

Agriculture is an important source of employment in Central America, including Mexico, with 15.5% of the region’s labor force engaged in agricultural activities. Agriculture’s contribution to overall employment is incredibly high in countries like Guatemala, Honduras, and Nicaragua, where the percentage of the labor force employed in agriculture rises to almost one-third². These countries are characterized by the prevalence of smallholder producers engaged in labor-intensive crops like coffee, fruits, and vegetables³. According to the Food and Agriculture Organization (FAO), smallholder producers in Central America account for 50% of total agricultural production and 70% of all food consumed in the region, revealing that they play an essential role in agriculture.

¹ World Bank Data (2021)

² Calculated based on World Bank Data (2019)

³ Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean (IDB Lab, February 2021)

Agricultural exports from Central America contribute a large percentage to the region's economy. The United States (US) is the leading destination country, accounting for nearly 50% of the region's exports. Central America's main agricultural export products are coffee, bananas, sugar, fruits, and palm oil. These products contribute significantly to the region's GDP; coffee, bananas, and sugar exports accounted for an average of 22% of Central American GDP in 2016⁴.

A seminar called "Feeding the World" was held on 28th November 2022 by the Wilson Center of a US think tank and the Inter-American Institute for Cooperation on Agriculture (IICA). In the seminar, the ministers of agriculture of four Latin American countries, namely: Argentina, Colombia, Honduras, and Trinidad and Tobago, requested development partners to expand the financing system for small-scale producers since increasing fertilizer prices due to the situation in the Russia-Ukraine war and other factors have had a negative impact on agricultural production. The expansion of the financing system is expected to increase producers' resilience and contribute to reducing food prices. The seminar also pointed out the importance of promoting the production and adoption of organic fertilizers instead of relying on chemical fertilizers.

2) Policy and Program of SICA Related to the Agricultural Value Chain

The Executive Secretariat of the Central American Agricultural Council (SE-CAC) under SICA has formulated the Agricultural Policy of the SICA Region (2019-2030) in order to promote a sustainable agriculture sector that is climate-adapted, inclusive, and competitive. As shown in Table 11-2, measures have been taken under the five strategic areas: i) Promotion of competitiveness and agribusiness, ii) Climate-adapted sustainable agriculture, iii) Innovation and technological development, iv) Agricultural health and food safety, and v) Effective institutional development.

Table 11-2 Outline of Agricultural Policy of the SICA Region (2019-2030)

Strategic Area	Measures
i) Promotion of competitiveness and agribusiness	<ul style="list-style-type: none"> - Promotion of business development in the agriculture sector, through the management of producers' knowledge and the generation of added value to increase the region's competitiveness - Securement of the correct application of rules and regulations based on technical and scientific principles of international trade
ii) Climate-adapted sustainable agriculture	<ul style="list-style-type: none"> - Promotion of risk management and adaptation of agriculture to climate variability and change - Natural resource management in sustainable agricultural landscapes
iii) Innovation and technological development	<ul style="list-style-type: none"> - Articulate regional research, development, and innovation schemes
iv) Agricultural health and food safety	<ul style="list-style-type: none"> - Modernization of regional technical standards and regulations - Implementation of regional systems for surveillance, early warning, and control of pests and diseases
v) Effective institutional development	<ul style="list-style-type: none"> - Effective development of national public policies in the framework of SICA regional policies - Articulation of regional projects in the framework of SE-CAC

Source: JICA Study Team based on Política Agropecuaria de la Región SICA 2019-2030

The SE-CAC has also formulated a work plan every year based on the policy. In the work plan 2022, SE-CAC has designated coffee, cacao, and dairy as the prioritized products in the strategic area of promoting competitiveness and agribusiness. The activities shown in Table 11-3 are planned for 2022 to promote the competitiveness and agribusiness of these products.

⁴ Política Agropecuaria de la Región SICA 2019-2030 (CAC)

Table 11-3 Work Plan of CAC Related to the Prioritized Products

Prioritized Product	Activity
Coffee	<ul style="list-style-type: none"> - Follow-up of the coffee project based on the Regional Strategic Plan for Coffee Farming in Mesoamerica and the Caribbean with a view to its implementation - Identification of regional challenges on coffee with the coffee institutes of the region
Cacao	<ul style="list-style-type: none"> - Formulation of plans and projects for implementing the Regional Cacao Strategy (2022-2030) approved in 2021. - Support of the cacao sector to promote the improvement of the response capacities of families and cacao farms to the effects caused by vulnerability to climate variability and change
Dairy	<ul style="list-style-type: none"> - Update of the Regional Dairy Sector Strengthening Plan addressing competitiveness issues - Analysis of the impact of the dairy sector in the face of trade liberalization

Source: JICA Study Team based on the Work Plan 2022 (SE-CAC)

(2) Outline of Agricultural Value Chain in the Caribbean Region

The agriculture sector has strategic importance in the Caribbean region. Although the average contribution of the agriculture, forestry, and fishing sector to the total GDP in the Caribbean region, including Cuba, is around 6.8%, Dominica, Guyana, and Haiti have been highly dependent on the sector with a share of 15.2%, 16.9%, and 20.4%, respectively. Agriculture is also an important source of employment in Cuba, Guyana, Haiti, and Jamaica, with 17.4%, 15.4%, 29.0%, and 15.2%, respectively, of the country's labor force engaged in agricultural activities⁵. The sector has provided jobs, rural incomes, export earnings, and quality food to local consumers in these countries.

Dominica and Haiti have made subsistence agriculture among the above countries with a high GDP share or employment rate in the sector. Meanwhile, Cuba, Guyana, and Jamaica have exported the agricultural products shown in Table 11-4.

Table 11-4 Export Amount of Agricultural Products in Cuba, Guyana, and Jamaica

Country	Leading Agricultural Export Products ^{*1}
Cuba	Sugar, cigars, honey, tobacco, coffee (green beans)
Guyana	Rice, sugar, coconut
Jamaica	Coffee (green beans), fruits, vegetables, sugar

Note*1: Agricultural products with an export amount of more than USD 5 million in 2021

Source: JICA Study Team based on FAOSTAT

(3) Target Country of Survey

JICA has conducted the Data Collection Survey on Food Value Chain Strengthening and Agricultural Finance in Central America and the Caribbean Region, targeting five countries in Central America (Mexico, Guatemala, El Salvador, Honduras, and Panama) and one country in the Caribbean Region (Dominican Republic). Taking into account the i) importance of the agriculture sector in the economy, ii) potential of exporting agricultural products, and iii) avoidance of the duplication of the contents of other surveys of JICA, Nicaragua and Cuba were selected as target countries from Central America and the Caribbean Region, respectively, for the agricultural value chain survey through the discussion with JICA. Since the purpose of the data collection survey is to formulate a yen loan project, the countries that currently have difficulty implementing a yen loan project were selected. Therefore, in the survey,

⁵ World Bank Data (2019)

the JICA Study Team formulated a development scenario and proposed JICA's cooperation scenario utilizing modalities other than yen loan.

Target products of the survey (hereinafter referred to as “the target products”) were also selected through the discussion with JICA, as shown in Table 11-5.

Table 11-5 Target Products for the Agricultural Value Chain Survey

Target Country	Target Product
Nicaragua	Coffee, Cacao, Pitaya or Pitaya, Bovine Meat
Cuba	Coffee, Cacao, Mango, Guava

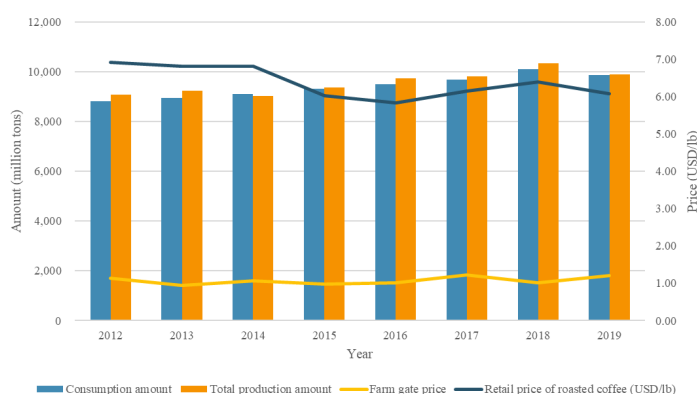
Source: JICA Study Team

In Sub-chapter 11.3.1(1)4), the statistical data of not only Nicaragua but also Guatemala and Honduras, in which the GDP share of the agriculture sector accounts for more than or around 10%, were reviewed for comparison.

(4) International Market Trend of the Target Products

1) Coffee

Coffee consumption is led by Europe, followed by countries in the Asia-Oceania region in second place, and North America in third place⁶. Figure 11-2 shows the world consumption amount, production amount, farm gate price, and retail price of roasted coffee from 2012 to 2019. During this period, coffee demand grew 12%, from 8,818 million tons to 9,871 million tons. Like demand, the production amount increased from 9,071 million tons to 9,903 million tons, representing an increase of 9%.



Source: JICA Study Team based on the statistical data of International Coffee Organization

Figure 11-2 World Coffee Demand, Supply and Prices from 2012 to 2019

On the price side, there is a generally increasing but volatile trend. The gap between retail and grower prices remains wide but has tended to narrow down from USD 5.78 per pound in 2012 to USD 4.87 per pound in 2019. This narrowing of the gap is mainly due to the improvement in farm gate prices.

Table 11-6 shows the import amount of green coffee beans in major importing countries from 2017 to 2021. The table also reveals that Switzerland, Russia, and Korea have increased the import amount of green coffee beans, although the European Union (EU) and the US are still large importers of green coffee beans accounting for 60% of the total amount in 2021.

⁶ Statistical data of the International Coffee Organization (ICO)

Table 11-6 Import Amount of Green Coffee Beans from 2017 to 2021

Country	Import Amount (ton)					Increasing Rate from 2017 to 2021 (%)
	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021	
European Union	2,670,600	2,753,400	2,667,600	2,632,500	2,700,000	1.1
United States	1,467,000	1,629,000	1,434,000	1,460,100	1,500,000	2.2
Japan	390,000	442,200	393,000	391,200	408,000	4.6
Switzerland	165,000	168,600	181,800	207,000	201,000	21.8
Canada	182,100	188,100	170,100	171,600	171,000	-6.1
Russia	171,600	184,200	190,800	203,400	198,000	15.4
South Korea	144,000	148,800	159,600	158,100	162,000	12.5
United Kingdom	173,400	190,500	158,400	136,200	123,000	-29.1
Algeria	136,200	138,000	120,000	132,000	123,000	-9.7
Other	1,095,780	1,181,760	1,099,680	1,174,320	1,149,360	4.9

Source: JICA Study Team based on Coffee: World Markets and Trade (USDA, June 2022)

Table 11-6 shows the consumption amount of coffee in importing countries from 2017 to 2021. The table reveals that Switzerland, Canada, South Korea, the Philippines, and China have increased their consumption amount, although the EU and US are still large consumers accounting for 64% of the total amount in 2021. It is also noted that the Philippines and China are the largest importers and consumers of soluble coffee.

Table 11-7 Consumption Amount of Coffee from 2017 to 2021

Country	Consumption Amount (ton)					Increasing Rate from 2017 to 2021 (%)
	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021	
European Union	2,523,900	2,525,520	2,415,840	2,478,360	2,532,000	0.3
United States	1,533,420	1,629,720	1,562,940	1,556,220	1,584,660	3.3
Japan	493,860	473,820	456,600	441,240	465,000	-5.8
Switzerland	91,500	87,600	88,200	94,800	96,000	4.9
Canada	285,000	293,100	289,800	299,700	301,500	5.8
Russia	267,900	296,700	277,500	249,900	243,000	-9.3
South Korea	158,700	166,200	178,800	179,700	183,000	15.3
United Kingdom	227,100	239,700	232,800	174,000	204,600	-9.9
Algeria	138,000	140,400	122,400	134,400	125,400	-9.1
Philippines	393,000	367,500	367,200	396,300	421,500	6.6
China	174,000	180,000	216,000	252,000	252,000	3.9

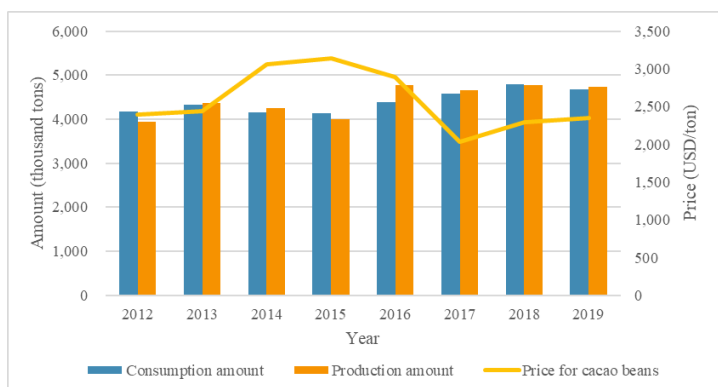
Source: JICA Study Team based on Coffee: World Markets and Trade (USDA, June 2022)

The Institutional Institute for Sustainable Development reported that the sector is projected to grow by increasing demand from producing countries and emerging economies that have not traditionally been among the major coffee importers, such as Brazil, Indonesia, and China, as well as the expansion of retail options and coffee-based products⁷.

⁷ Global Market Report: Coffee (Institutional Institute for Sustainable Development, 2019)

2) Cacao

Cacao consumption is led by Europe and North America⁸. Figure 11-3 shows the world consumption amount, production amount, and international cacao market price from 2012 to 2019. Cacao demand grew 12% during this period, from 4,180 thousand tons to 4,671 thousand tons. Like demand, the production amount increased from 3,943 thousand tons to 4,728 thousand tons, representing an increase of 20%. However, the market price of cacao beans has not been stable, and it has volatility.



Source: JICA Study Team based on the statistical data of International Cocoa Organization

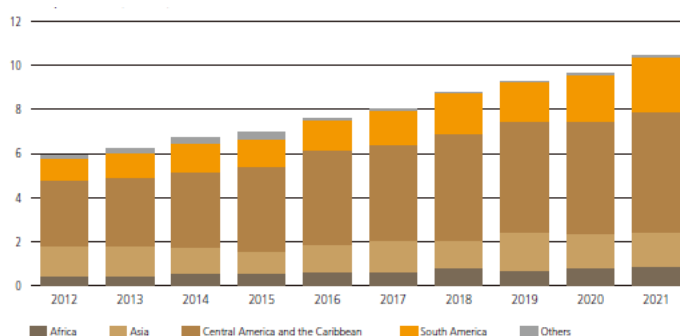
Figure 11-3 World Cacao Demand, Supply and Prices from 2012 to 2019

The cacao sector is projected to grow, driven primarily by its extensive appeal, popularity, and wide use in the food and beverage industry. Increased demand for chocolate with perceived health benefits and more exotic flavors is expected in Western Europe and North America⁹.

3) Tropical Fruits¹⁰

Since a market overview on pitaya is not available, this sub-chapter summarizes the international trend in mango, mangosteen, and guava.

As shown in Figure 11-4, the volume of world trade of major tropical fruits in 2021 rose to a record of USD 10.5 billion, increasing approximately 8% from 2020. As for mango, mangosteen, and guava, the export amount was 2.3 million tons in 2021, with an increase of 3% from 2020, which reveals that the market for these products has still expanded.



Source: Major Tropical Fruits: Preliminary results 2021 (FAO 2021)

Figure 11-4 Global Aggregate Export Volumes of Major Tropical Fruits

The US and EU remained the two leading global importers, at estimated import shares of 26% and 19%, respectively. Both markets have higher consumer demand for mangoes, particularly organic types, in line with a generally higher awareness of the assumed health benefits of these fruits.

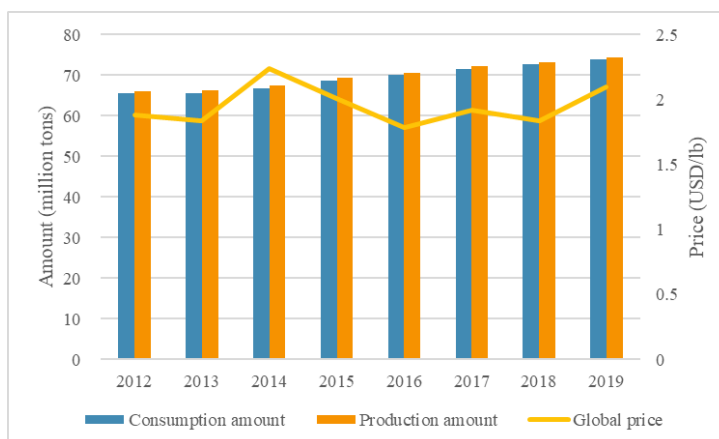
⁸ Statistical Data of the International Cocoa Organization

⁹ Global Market Report: Cocoa (Institutional Institute for Sustainable Development, 2019)

¹⁰ Major Tropical Fruits: Preliminary results 2021 (FAO 2021)

4) Bovine Meat

Bovine meat consumption is led by the US, China, and the EU. Figure 11-5 shows the world consumption amount, production amount, and global market price from 2012 to 2019. Bovine meat demand grew 13% during this period, from 65 million tons to 73 million tons, due to the increase in world population, although global per capita bovine meat consumption has not increased (around 6.4 kg/capita/year). Like demand, the production amount increased from 66 million tons to 74 thousand tons, representing an increase of 12%. The global market price has a trend towards increasing, although it has volatility.



Source: JICA Study Team based on the statistical data of OECD data, FAO STAT and IMF

Figure 11-5 World Bovine Meat Demand, Supply and Prices from 2012 to 2019

Organization for Economic Co-operation and Development (OECD) and FAO projected that global per capita beef consumption will fall by 5% by 2030, while beef production is projected to increase rapidly to 75 million tons by 2030 due to population growth in sub-Saharan Africa.¹¹ Asia and the Pacific is the only region where per capita beef consumption is projected to increase over the period from 2021 to 2030. However, most countries with high beef per capita consumption will see their level of beef consumption decline in favor of poultry meat¹².

11.2 Agriculture Digital Transformation (DX)

11.2.1 Survey Summary

In this Study, the introduction of DX in Central America and the Caribbean was investigated by understanding the challenges of applying digital technology in the region from various publicly available information and by conducting a case study of the Guatemalan agricultural DX to look into the applicability of the introduction of DX. Furthermore, Guatemala was selected as the target country for the study to investigate the possibility of selecting and applying effective digital technologies for agricultural development.

11.2.2 Overview of Agricultural DX in Central America and the Caribbean

In Central America and the Caribbean, agriculture is an employment-contributing industry, especially in rural areas, where 54.6% of the labor force is engaged in agricultural production. The region's agriculture accounts for 17.3% of the world's total agricultural exports, making it an important global food source.^{13,14}

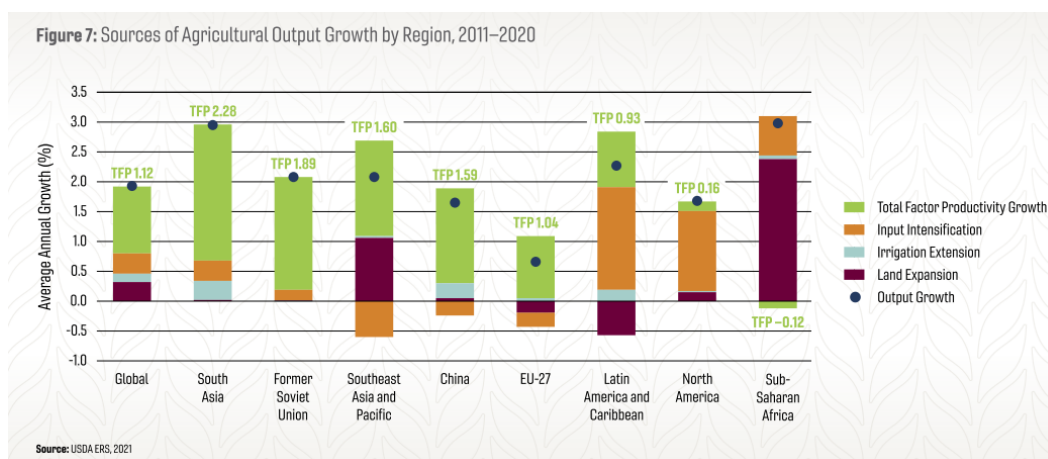
¹¹ OECD-FAO Agricultural Outlook 2021-2030 (OECD/FAO 2021)

¹² OECD-FAO Agricultural Outlook 2021-2030 (OECD/FAO 2021)

¹³ IICA 2019

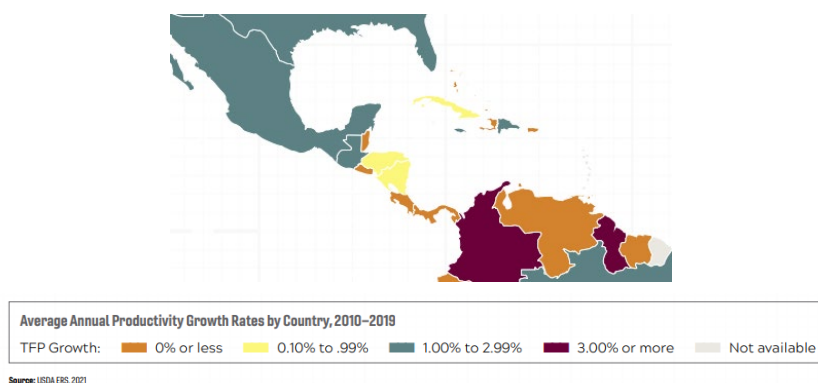
¹⁴ FAO 2020

However, the agricultural sector in the region does not have the highest productivity levels in the world, and according to the Global Agricultural Productivity (GAP) report, the growth rate of Total Factor Productivity (TFP) averaged 0.93% per year (2011-2020), which is below the global level of 1.12%. The global target for the GAP indicator is calculated to be 1.73% per year and there are concerns that the productivity gap is widening such that it is becoming increasingly difficult to eliminate the gap. In addition to delays in developing financial inclusion, the country is also vulnerable to changes in external factors such as climate change and the global epidemic of COVID-19.¹⁵



Source: CALS 2021

Figure 11-6 Growth Indicators for Agricultural Products by Region



Source: CALS 2021

Figure 11-7 Annual Agricultural Productivity Growth Indicators

(1) Agricultural DX Implementation Challenges in the Region

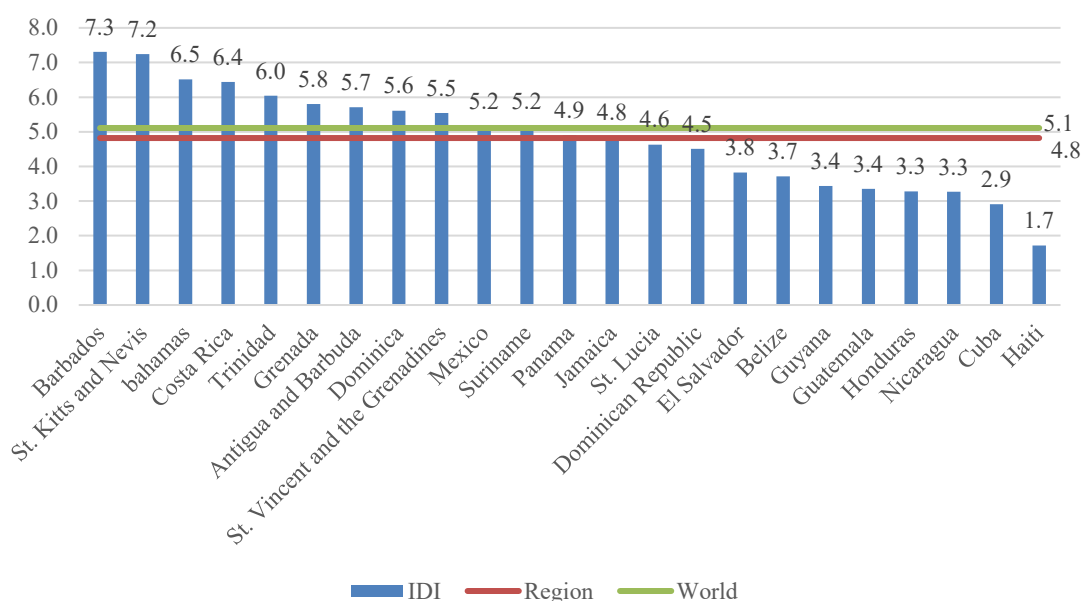
Crop production, which is a source of income for agricultural producers, depends on the inputs required for production and external factors such as climate. In order to improve productivity, it is necessary to accurately identify and analyze these factors to improve the efficiency of agricultural production. Digital services for agriculture using digital technology, which are beginning to be adopted in Latin America and the Caribbean, are expected not only to transform the current food system by

¹⁵ CALS 2021, Global Agricultural Productivity Report: <https://globalagriculturalproductivity.org/wp-content/uploads/2021/10/2021-GAP-Report.pdf>

increasing productivity, cost efficiency, transparency, and mobility, but also to promote rural communities by improving producers' livelihoods and strengthening resilience to climate change. The project is expected to have a transformative effect on sustainable agriculture by optimizing resource use, reducing waste, adapting to climate change, and reducing environmental impacts. Against this backdrop, agricultural stakeholders in Latin America and the Caribbean have begun to adopt agricultural digital services on both the supply and demand sides of the agricultural value chain, as they increasingly recognize that such services can improve productivity, income, and climate change adaptability. However, the following issues need to be addressed in order for digital services to be widely adopted in the region.

1) ICT Implementation in the Region

The ICT Development Index (IDI) by the International Telecommunication Union (ITU) is a standardized measure of the state of ICT worldwide. From 2018 onwards, it will be defined by 14 indicators with additional information on the performance of countries and the relative performance of countries at different levels of development. Figure 11-3 shows IDI figures for countries in Latin America and the Caribbean. In the region, Costa Rica has the highest score at 6.4 followed by Colombia and Mexico. The regional average of 4.8 is slightly lower than the global average of 5.1, but not by much.¹⁶



Source: CALS 2021

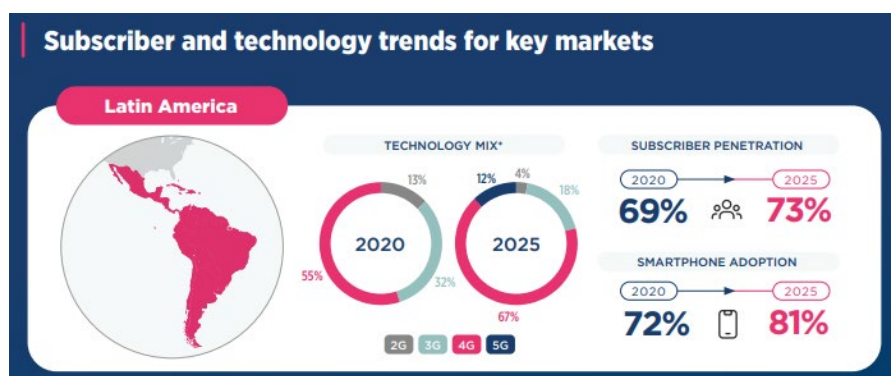
Figure 11-8 ICT Development Index

2) ICT Services Related to Agriculture

Smartphones are becoming increasingly popular in this region and digital services are available through the mobile internet. Mobile-based advisory services, primarily used for production management, are capable of providing information on efficient farming operations and typically provide market prices, weather forecasts, and other information necessary for agricultural production. Rural

¹⁶ ITU 2017, ITU <https://www.itu.int/net4/ITU-D/idi/2017/index.html>

users, who generally have challenges with internet connectivity, are often limited to voice channels such as interactive voice response (IVR), outside line voice call (OBD), and helplines, as well as text-based messaging. In many cases, they are stuck with the services provided. On the other hand, the potential for ICT application in agriculture is growing in the region, as the use of subscription services and smartphones is expected to reach 73% and 81%, respectively, in 2025.



Source: GSMA, 2021

Figure 11-9 Use of Digital Services in the Region

3) Digital Financial Services in Agriculture

Financial services are essential as a means to increase productivity, raise incomes, and build resilience to climate change. The financial needs of producers are diverse. For example, producers' financing needs range from short-term financing to purchase production inputs such as climate-resilient seeds and fertilizers to long-term financing for sustainable farming, such as irrigation systems, crop storage and processing equipment that can be used to regulate production.

As for agricultural financial services, the introduction of digital financial services (DFS) in the agricultural sector using mobile money has begun. These services are expected to help improve productivity as payments for crops, transaction data, and other information are recorded as digital information (creating a digital footprint). Various other data will be generated by the mobile-based digital farming tools, such as producer and field records collected during registration, which, when combined, are expected to promote producers' economic independence and be used by financial institutions to assess their creditworthiness. Data on agricultural production activities will lead to creditworthiness assessments by financial institutions, enabling the previously inaccessible segments of the population and those paying high interest rates to access appropriate financial services. Such financial inclusion is expected to establish an economic base for producers; enable planned agricultural production; and promote economic development and self-reliance.

Digital tools have also spurred the development of innovative products such as credit scoring algorithms, crowdfunding platforms, and digital agri-wallets through data-sharing partnerships with FSPs (loan service providers). With these, smallholder producers can access a variety of sources to access financing. However, in addition to knowledge gaps, smallholder producers do not have the necessary collateral or financial history to access formal financial services such as credit, loans, savings, and insurance. Also, producers are currently under-utilizing the financial services.

4) Market Access

Many smallholder producers in the Latin American region operate in informal value chains with inadequate access to markets and buyers.¹⁷ In the absence of strong value chains, organized buyers, transportation and storage infrastructure, and formal financing mechanisms, intermediaries often function as buyers for producers and providers of short-term informal financing. However, access to formal markets would reduce producers' dependence on intermediaries and allow them to sell their produce at more competitive prices.

The introduction of agricultural e-commerce platforms is expected to enable producers in informal value chains to bypass informal intermediaries and access formal markets. The introduction is also expected to result in saving time and costs related to the distribution of goods, which will broaden buyers' options and lead to increased profits for producers.¹⁸

(2) Digital Agriculture in Central America and the Caribbean

1) Outlook

Digital agriculture is an emerging field of rural and agricultural development that is evolving in tandem with advances in information and communication technology. Information and communication technologies in the agricultural sector can be classified into the following typologies¹⁹:

Table 11-8 Typology of Information and Communication Technologies in Agriculture

Basic Communication	Radio, television, telephone, or anything that opens up opportunities to access and exchange information
Production control	Used to increase productivity of agricultural holdings and small and medium enterprises in the agricultural industry
Marketing and Finance	Aimed at improving market access, financial services, and value chain integration
Public Services	Aimed at improving public service delivery for agriculture and agro-industry

Source: FAO-ITU

In general, agricultural value chains are constructed among the parties involved to provide a specific commodity from the production chain to the end consumer to increase competitive advantage and added value. The sustainable value chain model developed by the company consists of the following four basic links²⁰:

- i) Production
- ii) Aggregation and grouping
- iii) Processing and deformation
- iv) Marketing/Distribution

Digital technologies provide solutions to optimize the various links in the value chain and their use requires a well-developed digital ecosystem. The incorporation of digital technologies into agricultural and agro-industrial value chains, especially those involving small producers and rural microenterprises, requires ensuring the following minimum conditions: 1) low connectivity costs, 2) affordable devices

¹⁷ Zimmerer, K.S., de Haan, S., 2020 Informal food chains and agrobiodiversity need strengthening-not weakening-to address food security amidst the COVID-19 crisis in South America: <https://link.springer.com/article/10.1007/s12571-020-01088-x>

¹⁸ <https://www.gsma.com/mobilefordevelopment/resources/e-commerce-in-agriculture-new-business-models-for-smallholders-inclusion-into-the-formal-economy/>

¹⁹ FAO/ITU-2016, E-Agriculture Strategy Guide: <https://www.fao.org/3/i5564e/i5564e.pdf>

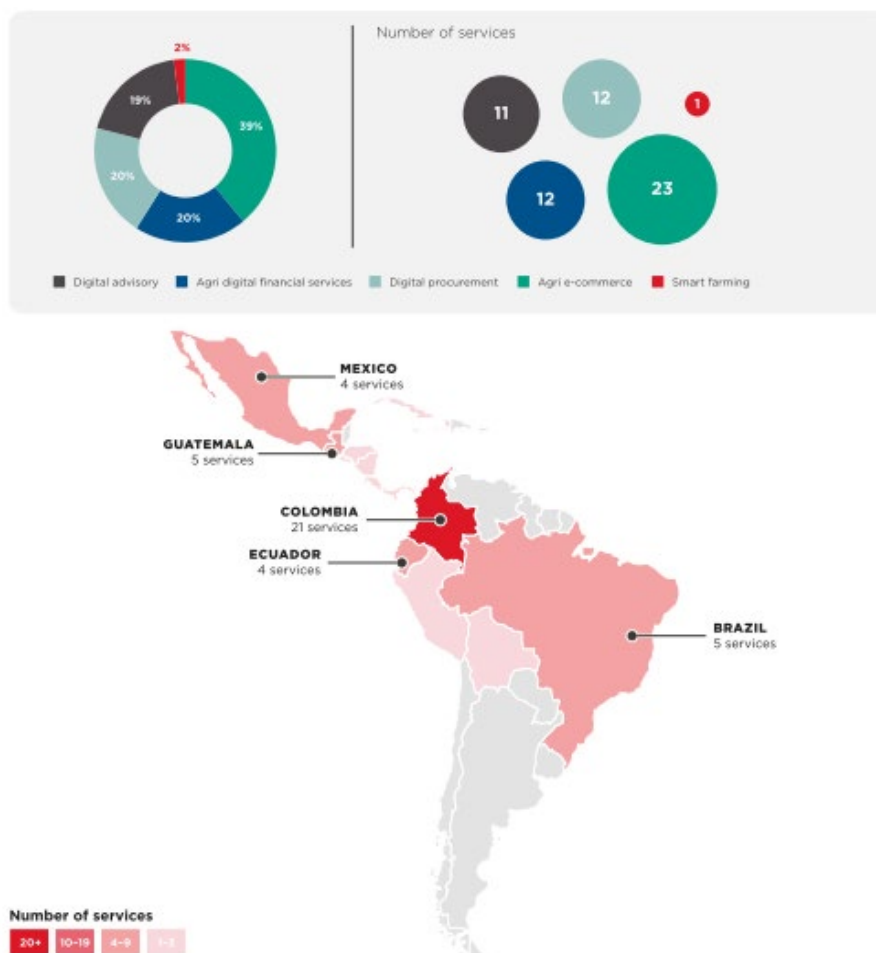
²⁰ FAO-2015, Desarrollo de cadenas de valor alimentarias sostenibles: <https://www.fao.org/3/i3953s/i3953s.pdf>

tailored to their needs, 3) information storage and exchange, 4) innovative business models and partnerships, and 5) public access to information related to production and marketing, including the use of social networks Table 11-9 shows examples of digital agriculture use cases and services in the region according to the FAO typology. Figure 11-10 also shows the number of digital services in the region, of which Colombia has widespread use of the service.²¹

Table 11-9 Examples of Digital Agriculture Use Cases and Services in Latin America

Type	Use Case	Examples of Services
Basic Communication	Digital Advisory	Advisory services, weather forecasting, disease and pest management, quality control, and record keeping
Production control	Smart agriculture	Material and equipment sharing, equipment monitoring, and production control
Marketing and Finance	Digital Financial Services	Credit loans, capital infusion, credit scoring, crowdfunding, insurance, digital wallets, etc.
	E-commerce	Collection, payment, shipping, etc.
Public Services	E-Procurement	Digital records (payment and traceability)

Source: JICA Study Team



Source: GSMA2021

Figure 11-10 Number of Agricultural Digital Services in the Region (as of January 2020)

²¹ World Bank-2017, Digitizing Value Chain Finance for Smallholder Farmers; <https://documents1.worldbank.org/curated/ar/685021505111787704/pdf/119216-BRI-PUBLIC-Focus-Note-Digitizing-Value-Chain-Finance-Apr-2017.pdf>

2) Case Study on Digital Technologies in the Agricultural Supply Chain

Various solutions for digital agriculture have the potential to transform the agricultural sector in the LAC region, including closing the knowledge gap on production, increasing financial inclusion, and improving market access.

By enabling access to a variety of services, markets, and assets, digital solutions are expected to provide opportunities to increase productivity and income for smallholder producers. This section presents examples of the use of digital services in the region for each of the five digital agriculture use cases shown in Table 11-10.

Table 11-10 Use Cases and Examples

Use Case	Case
Digital Advisory	Agromensajes SMS-MAGAP), Extensio, Coffee Cloud
Smart agriculture	Procagica
Digital Financial Services	EthicHub
E-commerce	Mercadito
E-Procurement	Olam.

Source: JICA Study Team

a) Digital Advisory Services

Mobile network coverage and connectivity are the most important factors in achieving digital advisory services for production management and support. Early services were accessible via feature phones, but many of the more recent tools are predicated on the use of smart devices.

Most of the advisory tools available in the region are free to smallholder producers. They are primarily led by governments and NGOs which are not designed with revenue generation in mind. The typical service costs only a few dollars per producer.

Smallholder producers in Latin America have little willingness to pay for agricultural advisory services and most of the region's models to date have been delivered through subsidized models. On the other hand, some agri-tech companies are pursuing cooperative payment models or freemium models. In some cases, agri-tech companies are also pursuing hybrid business models, adding insight sales and advertising as complementary revenue streams.²²



Source: CNP Web Site

Figure 11-11 Service Image

²² IDB/GSMA -2021, Landscaping the agritech ecosystem for smallholder farmers in Latin America and the Caribbean: <https://publications.iadb.org/publications/english/document/Landscaping-the-Agritech-Ecosystem-for-Smallholder-Farmers-in-Latin-America-and-the-Caribbean.pdf>

Agromensajes (Costa Rica), SMS-MAGAP (Trinidad and Tobago)

The Inter-American Institute for Agricultural Cooperation (IICA) works closely with the Inter-American Market Information Organization (MIOA) and the USDA Foreign Service (USDA) to launch the region's earliest agricultural VAS services. Costa Rica had launched Agromensajes in cooperation with the National Production Commission (CNP), the Comprehensive Agricultural Marketing Program (PIMA), and Costa Rica Electricity Corporation (ICE). Also, an NGO in Trinidad and Tobago had launched SMS-MAGAP.

Agromensajes is an initiative to facilitate timely communication among various stakeholders in the national agrifood chain and this effort is part of the "Agri-Food Sector and Rural Development Policy 2010-2021," which provides crop-specific prices for agricultural commodities. It will eventually facilitate the use of information and communication technology (ICT) for the dissemination of other types of content needed for rural and agricultural development in the country.

If one wishes to receive agricultural product price information, he/she can send an SMS to code 2476 to enter and submit the name of the product he/she is interested in, and use the information requested.

Extensio (Mexico)

Extensio in Mexico provides services to the government and research institutions (Mexican Secretariat of Agriculture and Rural Development, CIMMYT), agribusinesses (Grupo Modelo, Bavaria, Agrana Fruit), and NGOs (Alternare) for their producer support projects. Extensio provides digital extension services to producers by charging government agencies and others an annual fee of USD 7 to USD 20 per producer. Extensio customers can communicate with producers in remote locations and access data collected from the field. Meanwhile, producers will receive satellite-based smart advisories, including forecasts on pest management, best practices, and weather, as well as opportunities to enter certain agricultural commodity markets.

Coffee Cloud (Guatemala, Honduras, El Salvador, and Costa Rica)

Guatemala's *Anacafé* announced its cloud service offering in 2019 with "*Mejor Suelo, Mejor Café*" (better soil, better coffee). The service is a digital tool that allows coffee producers to access soil test results via the smartphone app. After sending a soil sample to a designated laboratory for testing and analysis and paying a small fee, producers receive a report with a QR code that provides a report on the soil condition and access to suggestions for effective use of fertilizer and irrigation to improve yields and reduce costs.

In addition, to combat coffee bean rust (Roya), Coffee Cloud can test crop disease incidence and severity in the field without the use of the internet according to methods approved by the local Ministry of Agriculture and receive recommendations for disease control based on the level of rust incidence, extent of spread, and current climate conditions.²³

²³ DAI-2019, Coffee Cloud: El proyecto digital para los caficultores de Centroamérica: <https://dai-global-digital.com/coffee-cloud-el-proyecto-digital-para-los-caficultores-de-centroamerica.html>

b) Smart Farming

Smart agriculture is the use of sensors, drones, satellites, and other farm assets to generate data about specific crops, animals, or agricultural activities to support farming activities, and uses connectivity among Internet of Things (IoT)-enabled devices to optimize production processes and growing conditions while minimizing costs and resource conservation.

The tools used in smart agriculture are among the tools that have emerged in the digital agriculture ecosystem, but their adoption has been stalled due to the high costs associated with deploying sensors and the state of IoT networks in rural areas.

The expansion of smart farming applications in rural areas relies on the availability of low power wide area (LPWA) networks and LPWA networks support devices that require low power consumption, long range, and low cost, which are critical for the success in the agricultural sector.

In this region, IoT is widely used in large-scale intensive agriculture but the adoption of smart farming solutions for smallholder producers has been slow, with most of them being small pilots and not yet commercialized.

Procagica (Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, and Dominican Republic)

Microsoft, Lantern Technologies and the IICA have developed an IoT-based device that allows growers to monitor agro-climatic variables that facilitate decision-making to manage farms and improve yields. The device will be a prototype climate station designed with the latest IoT technology with sensors that record real-time data on soil moisture, humidity, temperature, rainfall, sunshine, dew, wind speed, and wind direction. The information collected by the sensors will be stored in a cloud provided by Microsoft which producers will be able to access and create alerts and notifications about specific variables and send them to mobile devices or email.²⁴

The climate stations will be used locally through the Central American Coffee Rust Integrated Management Program (PROCAGICA), implemented by IICA and funded by the European Union. It has been incorporated into a program to provide technical assistance to coffee producers in Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and the Dominican Republic to address the problem of coffee rust from a productive, social, and commercial perspective.²⁵

²⁴ Procomer 2020, Costa Rica and Industry 4.0: <https://www.gatewaytocostarica.com/wp-content/uploads/2020/07/WP.Costa-Rica-and-Industry-4.0.pdf>

²⁵ IICA 2019 MICROSOFT LANTERN TECHNOLOGIES Y EL IICA CREAN DISPOSITIVO IOT PARA QUE PRODUCTORES MONITOREEN VARIABLES AGROCLIMATICAS



Source: Project website

Figure 11-12 IoT Climate Station

c) Digital Agricultural Financial Services (DFS)

Digital financial services (DFS) are a variety of financial services accessed and provided through digital channels, such as payments, credit, savings, remittances, and insurance, and also include mobile financial services (MFS), which use cell phones to access financial services and conduct financial transactions. It also includes non-transactional services such as mobile money transfers for mobile payments and access to financial information.

Furthermore, insurance services and other services are becoming more widespread, but the lack of understanding and awareness of insurance among small producers is a barrier to service development.

EthicHub (Mexico, Honduras and Brazil)²⁶

EthicHub is a crowdfunding business model that "creates wealth for all parties involved," a crowdfunding platform that connects individual investors from around the world with smallholder producers without bank accounts. Through this platform, individual users can invest as little as €20 in an agricultural project of their choice and receive a 15% return. This allows micro-lenders to earn a return on their investment while participating in social impact projects.

EthicHub launched the project in 2018 with 40 producers in two communities in Chiapas, Mexico's main coffee-producing state, and the platform now includes more than 120 families and has provided loans to producers in Las Delicias, Chespal, and Chanjalé. It has provided nearly USD 150,000 in loans to producers in communities such as San Rafael, Guatimoc, and La Boquilla.

d) Agricultural Electronic Commerce Services (Agri-e-commerce)

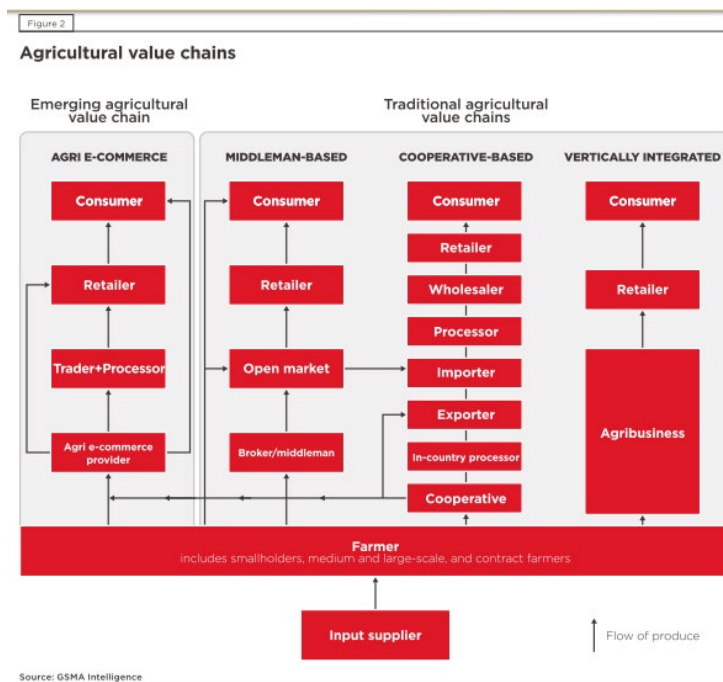
Most agri-e-commerce platforms in the region use a markup (a margin added to the price paid to the producer's supplier) business model.

Agri-e-commerce companies buy produce directly from small producers, which they then mark up and sell to business and home consumers, and many have collection and processing facilities to receive, process, and package the produce from smallholder producers. In addition, some companies, such as

²⁶ EthicHub, proyecto Blockchain que conecta inversores minoristas con más de 120 agricultores de café en México: <https://agroempresario.com/publicacion/25153/ethichub-proyecto-blockchain-que-conecta-inversores-minoristas-con-mas-de-120-agricultores-de-cafe-en-mexico/>

Agromóvil (Colombia), even handle logistics. Also, SiembraViva (Colombia) is piloting a digital procurement tool to help producers achieve and maintain certification standards.

In the agricultural value chain, traditional sales channels are broadly classified into middlemen, producer associations, and direct sales by agribusinesses (e.g., export of agricultural products for processing) (Figure 11-13), but GSMA research indicates that agri-e-commerce businesses will have a large market in the future in sales channels through producer associations and middlemen. The GSMA, which consists of mobile telecommunications carriers, survey suggests that there will be a large market for the transformation of business models through producers' associations and intermediaries.²⁷



Source: GSMA 2019

Figure 11-13 Map of Restructuring the Agricultural Value Chain through the Introduction of Agri-e-commerce

Mercadito (Panama)

The service by Mercadito was launched in 2016 by EtyaLab as a minimal viable product with assistance (USD 40,000 seed capital) from the National Secretariat for Science, Technology and Innovation (Senacyt). One can register and use the service by entering basic information such as name, farm location, and whether the buyer is a wholesaler or retailer. It serves as a platform with basic functions such as product inventory management but also incorporates delivery services. Buyers of the products are guaranteed to place fruits and vegetables in their online shopping cart (USD 16 or more) and have them delivered from Merca Panama (a state-owned fruit and vegetable market) for USD 5.²⁸

²⁷ GSMA-2019, E-commerce in agriculture: new business models for smallholders' inclusion into the formal economy: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/05/E-commerce_in_agriculture_new_business_models_for_smallholders_inclusion_into_the_formal_economy.pdf

²⁸ CF-2019, Mercadito quiere ser el Amazon de los productores agrícolas: <https://elcapitalfinanciero.com/mercadito-quiere-ser-el-amazon-de-los-productores-agricolas/>

The system, which began in 2018, has over 4,000 downloads and about 200 active users, mainly housewives who request on weekends and has realized cost savings of up to 20% with this system that eliminates intermediate margins from field to table.

e) E-Procurement

Digital procurement tools have been widely adopted in the region, from large global exporters to small cooperatives. Digital records management with built-in traceability is the most prevalent use case for digital procurement. This is partly because the United States and the European Union, which are major importers of agricultural products, have tightened food import regulations in recent years, making traceability a priority for agribusinesses that export crops to these markets.

Many of the digital procurement tools in the region are proprietary tools developed in-house. Much of this is not about generating revenue, but more as an operational cost required to meet the traceability standards demanded by international buyers.

Olam (Mexico, Guatemala, Honduras, and Nicaragua)

Olam International is building and using a digital procurement tool for value chain's last mile to capture producer information, manage producer payments, and streamline traceability and sustainability efforts. The tools are broadly divided into a platform called Digital Origination, a producer database, and a traceability system. An overview is shown in Table 11-11.

Table 11-11 Detailed Tool developed by Olam and its Outline

Detailed Tool	Outline
Digital Origination	A platform based on a direct purchase model by producers, bringing transparency to the agricultural supply chain purchased without intermediaries or speculators.
Olam Producer Information System (OFIS)	A database of small-scale producers that will allow tracking of all "first mile" data, including GPS data point records of fields and social infrastructure, historical management of training activities, financing, input distribution, crop purchases, etc. This will create a comprehensive and detailed model that will help producers plan their development according to their needs and obtain more accurate data on sustainability, social justice, and other business indicators.
Olam Traceability	Point of purchase (POP) digital solutions installed at supplier and cooperative facilities will provide first mile traceability to producers and help expand traceability programs with customers.

Source: JICA Study Team

11.3 Overview and Development and JICA's Cooperation Scenarios in Target Country

11.3.1 Nicaragua (Agricultural Value Chain)

(1) Overview of Agricultural Value Chain

1) Agricultural Development Strategy and Policy

a) National Development Plan

The Government of Nicaragua has formulated the National Plan for the Fight Against Poverty and for Human Development 2022-2026 as a national development plan, presenting the 12 essential policies to reduce poverty and inequality, as shown in Table 11-12.

Table 11-12 Outline of the National Plan for the Fight Against Poverty and for Human Development (2022-2026)

Policy	Major Program
1. Macroeconomic stability	<ul style="list-style-type: none"> - Implementation of i) monetary and financial policy, ii) fiscal policy, and iii) public spending policy - Promotion and facilitation of more domestic and foreign direct investments in priority areas
2. Strengthening of the primary conditions for development	<ul style="list-style-type: none"> - Securement of safety and peace - Development of resilient infrastructures - Increase of the availability of safe drinking water and sanitation
3. Development of human resources for national development	<ul style="list-style-type: none"> - Promotion of more inclusive, equitable, and quality early childhood, primary, and secondary education - Strengthening of technical and technological education - Strengthening of research and innovation in priority areas - Promotion of the knowledge and use of digitization
4. Consolidation of public goods and services for social well-being	<ul style="list-style-type: none"> - Development of health infrastructure, networks, and services - Consolidation of social security
5. Deepening of gender equality and empowerment of all women and girls	<ul style="list-style-type: none"> - Implementation of a gender policy to promote the participation of women in the development of a fairer society
6. Youth-centered development	<ul style="list-style-type: none"> - Formulation and implementation of a youth policy to promote youth-centered development
7. Improvement of production in the agriculture sector	<ul style="list-style-type: none"> - Securement of sufficient food production for food security and improved nutrition - Strengthening of production in the potential and emerging areas - Promotion of finance for production fields - Development and dissemination of technologies - Strengthening of the agricultural surveillance system - Promotion of public-private partnerships to develop medium- and large-scale agro-industry - Promotion of creation of associations and cooperatives - Promotion of digitalization in the agriculture sector
8. Development of the creative, family, and entrepreneurial economy	<ul style="list-style-type: none"> - Technical and financial support for entrepreneurial initiatives - Encouragement of the creation of new domestic companies - Fostering of the expansion of small- and medium-sized businesses and enterprises - Promotion of creative and innovative forms of tourism
9. Boost of local and international trade and markets	<ul style="list-style-type: none"> - Promotion of new trade agreements - Promotion of e-business and business digitalization
10. Development of inclusive, healthy, creative, safe, resilient, and sustainable cities	<ul style="list-style-type: none"> - Promotion of the formulation of resilient land-use plans and urban development plans - Promotion of local economic development programs and projects
11. Measures to mitigate the impacts of climate variability and climate change	<ul style="list-style-type: none"> - Sustainable management of forests, prevention of desertification and land degradation, and securement of biodiversity - Formulation and implementation of environmental and natural resource protection policies - Promotion of environmental education and value formation in the face of climate change
12. Development of human and socio-economy of the Caribbean coast	<ul style="list-style-type: none"> - Strengthening of socio-economic welfare - Promotion of the rural and urban household economy

Source: JICA Study Team based on National Plan for the Fight against Poverty and Human Development 2022-2026

b) Agricultural Development Plan

The National System of Production, Consumption and Commerce (SNPCC)²⁹ has formulated the yearly National Plan for Production, Consumption, and Trade as an agricultural development plan based on the national development plan. As shown in Table 11-13, the National Plan for Production, Consumption, and Trade 2021/22 has indicated activities to be undertaken under the eight policies.

²⁹ The SNPCC, composed of several governmental organizations, is a platform for developing strategies and monitoring their implementation in the agriculture, forestry, and fisheries sector.

Table 11-13 Outline of the National Plan for Production, Consumption, and Trade 2021/22

Policy	Objective	Major Activity
1. Productivity policy	<ul style="list-style-type: none"> - To improve productivity and yields - To guarantee a nutritious and healthy diet 	<ul style="list-style-type: none"> - Development of technical capacities with producers - Delivery of technological packages to producers - Financial support to strengthen the capacities of small and medium-sized livestock producers
2. Research and productive innovation policy	<ul style="list-style-type: none"> - To generate agricultural biotechnologies and agricultural practices for sustainable production systems 	<ul style="list-style-type: none"> - Generation of new varieties, technologies, and agricultural practices - Provision of training for creative entrepreneurs and micro-, small- and medium-sized enterprises in the use of Information and Communication Technologies (ICTs)
3. Food security policy	<ul style="list-style-type: none"> - To guarantee the right of all Nicaraguan families to have sufficient, safe, and nutritious food available at fair prices 	<ul style="list-style-type: none"> - Establishment of diversified vegetable gardens - Promotion of creation of cooperatives
4. Forestry policy	<ul style="list-style-type: none"> - To promote the protection and conservation of forest resources 	<ul style="list-style-type: none"> - Establishment of forest plantations and agroforestry systems - Monitoring of natural forest
5. Commercial policy	<ul style="list-style-type: none"> - To promote a domestic market - To diversify the agro-export destination 	<ul style="list-style-type: none"> - Promotion of the Central American economic integration process - Provision of training with entrepreneurs with export potential - Strengthening of exporting small and medium-sized enterprises (SMEs)
6. Financing and investment policy	<ul style="list-style-type: none"> - To manage external financial resources to finance public and socio-productive investment programs 	<ul style="list-style-type: none"> - Implementation of the microcredit programme for small businesses
7. Agro-industrialization policy	<ul style="list-style-type: none"> - To increase the value addition of agricultural production 	<ul style="list-style-type: none"> - Provision of training with producers for value addition - Development of new innovation processes for agricultural production transformation methods
8. Security policy	<ul style="list-style-type: none"> - To strengthen the surveillance and patrolling system 	<ul style="list-style-type: none"> - Execution of surveillance and patrolling plans

Source: JICA Study Team based on the National Plan for Production, Consumption, and Trade 2021/22

c) Strategy of Promotion of Production of the Target Products

The Government of Nicaragua has identified the following products as target products with the most significant socio-productive impacts to allocate technical-financial and human resources intensively.

- Essential products in the socio-economy of Nicaragua: cattle, dairy, coffee, pork meat, and beans
- Products to be promoted: cacao, fruits, rice, and vegetables
- Emerging products: breeding poultry; eggs and chicken, fisheries and aquaculture, and honey

As mentioned above, all the target products selected in the study have been identified as strategic products. Table 11-14 presents the strategies for the target products.

Table 11-14 Outline of the Strategy of Promotion for Production of the Target Products

Product	Approach	Major Activity
Coffee	Development of new technologies and strengthening of the existing technologies	<ul style="list-style-type: none"> - Strengthening of the capacities of producers - Provision of training to producers in the management of coffee farms with an agro-ecological approach
	Breeding for adaptation of coffee farming to climate	<ul style="list-style-type: none"> - Establishment of a center for scientific-technological development for the generation of varieties

Product	Approach	Major Activity
	variability	<ul style="list-style-type: none"> - Expansion of existing coffee varieties for adaptation and validation in the agro-climatic conditions
	Promotion of the renovation of coffee plantations	<ul style="list-style-type: none"> - Development of a program to renovate and rehabilitate plantations - Promotion of the establishment of efficient pruning systems - Promotion of micro-grafting
	Improvement of post-harvest, value addition, and coffee processing	<ul style="list-style-type: none"> - Support of small- and medium-sized producers with the application of technological innovations - Strengthening of the capacities of producers and entrepreneurs for processing and adding value to coffee production - Promotion of new enterprises in roasting, milling, and packaging - Promotion of brand design - Promotion of the certification of coffee farms
	Boost of marketing and commercialization	<ul style="list-style-type: none"> - Organization of the annual coffee cup of excellence competition - Sharing of the market price utilizing ICTs and mobile applications - Generation of a national map of cup profiles
	Promotion of environmentally sustainable coffee production	<ul style="list-style-type: none"> - Encouragement of producers to use a Pest and Disease Prevention and Management Program (SATCAFE) - Strengthening of the technical capacities of producers on phytosanitary control measures
	Cacao	Improvement of the quality of cacao value addition and transformation processes
	Promotion of the commercialization of fine cacao	<ul style="list-style-type: none"> - Development of municipal and regional fairs and festivals of cacao products and by-products - Development of meetings and business rounds between producers' organizations and processors
	Increase of the productivity of fine Nicaraguan cacao	<ul style="list-style-type: none"> - Facilitation of the access of producers to clones of high genetic quality - Development and introduction of new technologies to producers to facilitate the management, increase productivity
	Promotion of the generation of small cacao enterprises	<ul style="list-style-type: none"> - Promotion of entrepreneurship for the generation and innovation of equipment to improve the harvesting and post-harvesting processes - Strengthening and encouragement of new ventures
Fruits (including pitaya)	Genetic improvement	<ul style="list-style-type: none"> - Generation of new fruit varieties resistant to pests, diseases, and climate variability
	Productivity improvement	<ul style="list-style-type: none"> - Promotion of new planting management systems - Development of a map of potential areas for the production of fruit crops - Promotion of water harvesting works and efficient irrigation systems
	Improvement of fruit processing	<ul style="list-style-type: none"> - Strengthening of the capacities of small family businesses in the transformation and value-adding processes - Promotion of the implementation of good manufacturing practices - Creation of cooperatives, associations, and enterprises for the production and processing of fruits
	Improvement of quality and safety	<ul style="list-style-type: none"> - Strengthening of pest and disease monitoring - Capacity building of fruit producers on control pests and diseases
	Access to new and better markets	<ul style="list-style-type: none"> - Development of national and regional spaces for the promotion and marketing of fruits - Encouragement of the use of digital technologies for marketing and promotion
	Promotion of national fruit consumption	<ul style="list-style-type: none"> - Development of recipe books for the production of fruit-based drinks, food, and preserves
	Bovine meat and dairy	Genetic improvement
	Strengthening of traceability and safety	<ul style="list-style-type: none"> - Development of municipal meetings with producers on the implementation of the bovine traceability system - Development of a mobile application with health information

Product	Approach	Major Activity
		on diseases
	Improvement of the capacity of producers and technicians	<ul style="list-style-type: none"> - Provision of training on farm management to producers - Development and presentation of livestock booklets for producers - Organization of workshops to share good animal husbandry
	Sustainable livestock production	<ul style="list-style-type: none"> - Capacity building of producers on techniques and methods for the conservation of pasture
	Promotion of access to new markets	<ul style="list-style-type: none"> - Provision of training to innovative producers on adding value to meat, milk, and dairy products

Source: JICA Study Team based on the i) National Strategy for the Development of Nicaraguan Coffee Production, ii) National Strategy for the Development of Nicaraguan Cacao Production, iii) National Strategy for the Development of Fruit Production, and iv) National Strategy for the Development of Cattle Production.

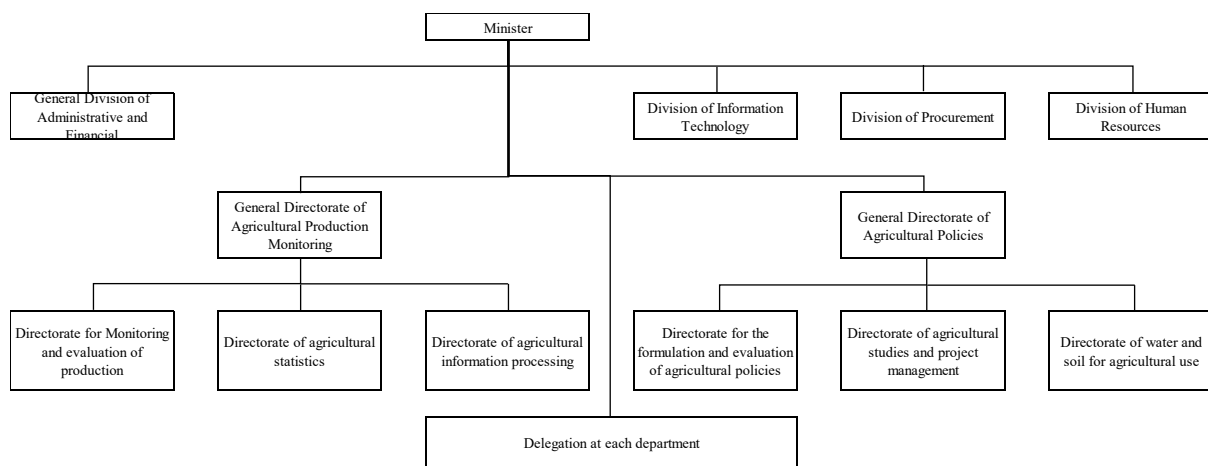
The above table reveals that the Government of Nicaragua has promoted i) building the capacity of the stakeholders, ii) improving the quantity and quality, iii) promoting value addition and commercialization, and iv) developing a sustainable production system for the target products.

2) Organizations of the Agriculture Sector

Various governmental organizations, as follows, are concerned with producing and exporting the target products in Nicaragua:

a) Ministry of Agriculture (MAG)

The MAG is mainly responsible for i) formulation of policies, plans, and strategies for agricultural development and ii) monitoring and follow-up of national agricultural production. As shown in Figure 11-14, two general directorates and four management divisions have been established under the minister. At the department level, a delegation is in charge of monitoring and follow-up of agricultural production.

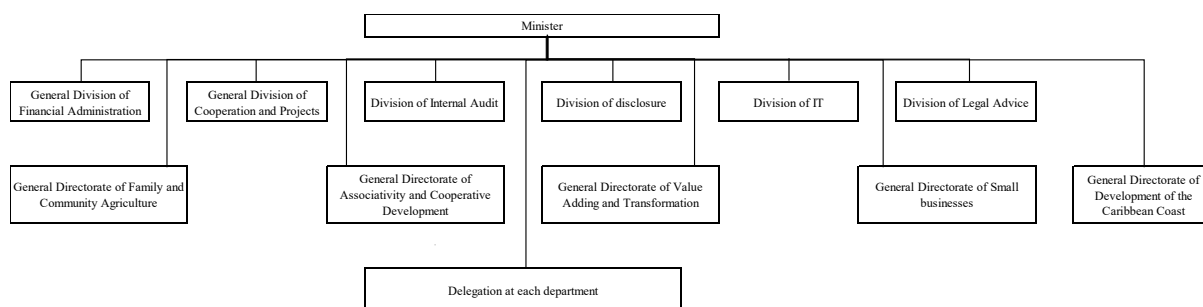


Source: JICA Study Team based on the organization chart of MAG

Figure 11-14 Organizational Chart of MAG

b) Ministry of Family, Community, Cooperative and Associative Economy (MEFCCA)

The MEFCCA is the implementing ministry of policies, plans, and strategies to promote the capacities of the families, communities, cooperatives, and associations. Figure 11-15 presents the organizational chart of MEFCCA. Under the minister, five general directorates and six divisions have been established. Each delegation has assigned at least one technician to support rural activities at the department level.



Source: JICA Study Team based on the organization chart of MEFCCA

Figure 11-15 Organizational Chart of MEFCCA

Table 11-15 presents the roles of each general directorate of MEFCCA.

Table 11-15 Roles of General Directorates of MEFCCA

General Directorate	Role
General Directorate of Family and Community Agriculture	Promotion of diversified food systems that improve the availability of food with techniques and sustainable technologies Strengthening of livestock practices to improve productive and reproductive rates
General Directorate of Associativity and Cooperative Development	Promotion of legalization and registration of cooperatives Promotion of different associative forms and provision of cooperative strengthening processes.
General Directorate of Value Adding and Transformation	Development and strengthening of capacities of the products of the family economy Promotion of improving processes with quality and safety for the transformation
General Directorate of Small Businesses	Promotion and strengthening of the development of business creation by SMEs and entrepreneurs
General Directorate of Development of the Caribbean Coast	Coordination of activities with regional governments Promotion of production activities on the Caribbean Coast

Source: JICA Study Team based on the website of MEFCCA (<https://www.economiafamiliar.gob.ni/websitemefcca-mvc/>)

c) Ministry of Development, Industry, and Commerce (MIFIC)

The MIFIC is mainly responsible for i) formulating policies, plans, strategies, and regulations that regulate and dynamize national and international trade and ii) developing the industrialization process and promoting exports. Under the minister, six general directorates and three divisions have been established. Among the general directorates, the General Directorate for the Development and Promotion of Exports has formulated strategies and policies to encourage and promote exports in coordination with the public and private sectors.

d) Institute for Agricultural Technology (INTA)

The INTA is responsible for i) implementing scientific research and promoting technological innovation and ii) developing and implementing strategies for disseminating agricultural technologies. INTA has 14 technology development centers in Nicaragua, among which the following centers are in charge of research for the target products:

- Coffee: Two centers in the departments of Matagalpa and Nueva Segovia
- Cacao: One center in the South Caribbean Coast Autonomous Region
- Fruits (including pitaya): One center in the department of Masaya

e) Institute of Protection and Agricultural Health (IPSA)

The IPSA is responsible for planning, regulating, and coordinating activities for phytosanitary protection and safety of agricultural, fishing, and forestry production and commercial exchange. It has nationwide coverage, with a physical presence in all the departments.

f) Secretariat of Investment and Export Promotion

The Secretariat of Investment and Export Promotion was established under Law 1134 on 28th October 2022. The secretariat replaces the functions of the Investment and Export Promotion Agency (ProNicaragua). The objective of the secretariat is to attract private investment, promoting foreign trade and domestic exports of goods and services. The major functions are i) to formulate the national investment and export promotion strategy, ii) to evaluate the annual results of the national investment and export promotion strategy, iii) to coordinate with the public and private sectors, and iv) to coordinate with the micro and medium-sized enterprise sectors to develop export chains.

g) Association of Producers and Exporters of Nicaragua (APEN)

APEN is a business organization founded in 1991 to provide services to its members comprising exporters, importers, and international trade service providers. The primary services are:

- Training on export procedures and logistics,
- Market research and analysis,
- Organization of trade fairs and business rounds, and
- Provision of loans.

3) Implementation of Projects by Development Partners

a) Projects Implemented by JICA

JICA has implemented several surveys and projects in the agriculture sector for the last decade in Nicaragua, as shown in Table 11-16.

Table 11-16 Outline of the Surveys and Projects Implemented by JICA

Survey or Project	Outline
Dispatch of Agricultural Development Advisor	(1) Purpose of the dispatch: To strengthen the food value chain (2) Expected outputs: <ul style="list-style-type: none"> - Challenges in the value chain of the target products are identified. - An action plan is formulated to achieve the identified challenges through industry-academia-government collaboration. - The action plan is implemented through industry-academia-government collaboration. - Lessons learned through the implementation of the action plan are extracted and shared. (3) Dispatched period: March 2020 to March 2021
Feasibility Study for Cacao Value Addition and Value Chain Development	(1) Purpose of the study: To formulate the ODA project's plan and business plan for developing the cacao value chain using the proposed technologies of the Japanese company. (2) Expected outputs: <ul style="list-style-type: none"> - It is identified how the proposed technologies contribute to challenges for the cacao value chain development. - The feasibility of the proposed technologies is confirmed.

Survey or Project	Outline
	<ul style="list-style-type: none"> - The ODA project's plan and business plan are formulated. (3) Survey period: March 2019 to March 2020
Vocational Training Improvement Project in the Agricultural and Livestock Sector	<ul style="list-style-type: none"> (1) Purpose of the project: Trainers of the National Technological Institute (INATEC) can give lectures on agricultural techniques in their classes. (2) Expected outputs: <ul style="list-style-type: none"> - Training materials are developed by INATEC. - INATEC trainers can acquire agricultural techniques for lectures. Implementing agency: INATEC (3) Project period: September 2013 to September 2018

Source: JICA Study Team

Among the implemented projects and surveys by JICA, the dispatch of the agricultural development advisor is similar to this survey's purpose. Therefore, the report on the dispatch was reviewed in the study, and the following lessons were extracted.

- Importance of learning by doing: It is crucial for MAG to learn the method by making a value chain survey, analyzing the result, and preparing the action plan by themselves.
- The necessity of formulating an action plan at the national level: MAG is expected to prepare an action plan at the national level in collaboration with the university and private sectors to strengthen the food value chain and promote export.

b) Projects Implemented by Other Development Partners

The International Fund for Agricultural Development (IFAD) and Mennonite Economic Development Associates (MEDA) implemented projects related to the target products, as shown in Table 11-17.

Table 11-17 Outline of the Projects by Development Partners

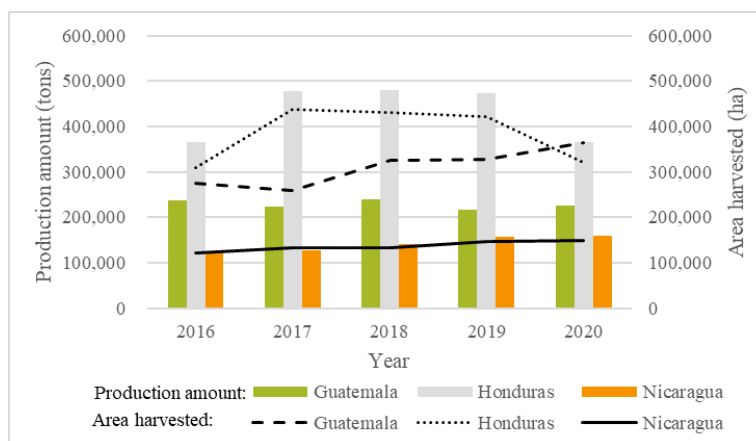
Project	Outline
Adapting to Markets and Climate Change Project (NICADAPTA)	<ul style="list-style-type: none"> (1) Purpose of the project: To help improve rural families' quality of life by increasing their participation in the value generated by the coffee and cacao chains. (2) Expected outputs: <ul style="list-style-type: none"> - The competitiveness of producer cooperatives and their members is improved. - Producer organizations and institutions are strengthened. - Effective and efficient project implementation is achieved, and the capacity to monitor and evaluate actions is strengthened. (3) Project period: 2013 to 2020 (4) Development partner: IFAD
Project on Moving Towards Inclusive Prosperity in Nicaragua's Agri-Food and Export Sectors (TECHNOLINKS+)	<ul style="list-style-type: none"> (1) Purpose of the project: To accelerate small producers' and agri-food processors' use of more productive technologies. (2) Expected outputs: <ul style="list-style-type: none"> - The agricultural productivity, profitability, and adoption of technologies by women- and men-producers are increased. - The agricultural output, profitability, and use of agriculture and food processing technologies by distributors and food processors are increased. - Agriculture and food processing technologies effectively by public and private partner institutions are promoted. (3) Project period: 2016 to 2023 (4) Development partner: MEDA

Source: JICA Study Team based on Adaptation to Changing Markets and Climate Change Impacts Project Final Report (IFAD 2021) and the

The lessons learned from the projects by IFAD and MEDA are as follows:

- Combination of individual and group extension (NICADAPTA): Combining individual and group extension is essential to achieve attitudinal changes among producers.

- Needs-based training (NICADAPTA): Needs-based training can enable producers to improve their knowledge continuously and innovatively.
- Promotion of participation of women (NICADAPTA): It is vital to promote the participation of women to empower them and increase their income.
- Strengthening of agribusiness initiative (TECHNOLINKS+): It is practical and impactful to support organizations that have the willingness to strengthen their business.
- Organization of cooperatives or associations (TECHNOLINKS+): It should be promoted to organize cooperatives and associations to develop their technical and business skills.



Source: JICA Study Team based on FAOSTAT

Figure 11-16 Production Amount and Area Harvested of Green Coffee Beans in Guatemala, Honduras, and Nicaragua

4) Outline of Production and Export of the Target Products

a) Coffee

Production

Coffee plays a fundamental role in the livelihood of many rural households in Nicaragua. According to MAG, around 90% of the total coffee producers (37,780 producers) are small-scale producers of less than 20 *manzanas*, with 50% of the cultivated coffee area. Coffee occupies the third place in the cultivated area (11%), after maize and beans.

Although the production amount and harvested area in Nicaragua have slightly increased, these are still lower than in Guatemala and Honduras, as shown in Figure 11-16. More than 80% of the total production amount has been concentrated in the northern region (mainly Matagalpa and Jinotega departments), with high annual rainfall (1,100 to 1,300 mm) and an altitude of more than 800 m from the sea level.

Nicaragua has produced both Arabica and Robusta coffees. Arabica is produced in the northern region, while Robusta is mainly produced in the lowlands of the Caribbean coast. According to the Nicaraguan Coffee Exporters Association (EXCAN), Robusta coffee produced in Nicaragua is sold at a premium category, under which the Government of Nicaragua has promoted cultivating Robusta coffee to improve their incomes by diversifying the cropping system.

The cooperatives have played an essential role in collecting and exporting parchments from small-scale producers. Around 20% of the producers have organized cooperatives. As shown in Table 11-18, about 333 cooperatives in total have been established as of July 2022.

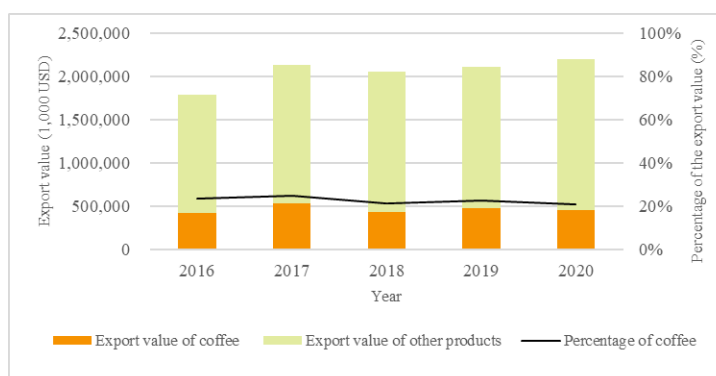
Table 11-18 Number of the Coffee Cooperatives

Department	No. of Coffee Cooperatives
Boaco	17
Carazo	7
Chinandega	2
Estelí	19
Jinotega	84
León	3
Madriz	32
Managua	7
Masaya	5
Matagalpa	96
North Caribbean Coast Autonomous Region	11
Nueva Segovia	25
Río San Juan	9
South Caribbean Coast Autonomous Region	16
Total	333

Source: Prepared by the JICA Study Team based on the collected information from MEFCCA

Export

Coffee is one of the country's most important agricultural export products. As shown in Figure 11-17, the coffee export value has constantly accounted for around 20% of the total agricultural export products since 2016. The major export destinations in the Year 2021³⁰ are the US (46%), Belgium (14%), and Germany (7%), which reveals that Nicaragua has highly relied on the US market for coffee export. Guatemala has also been dependent on the US market (40%), while Honduras has diversified markets such as the US (28%), Germany (23%), and Belgium (10%).

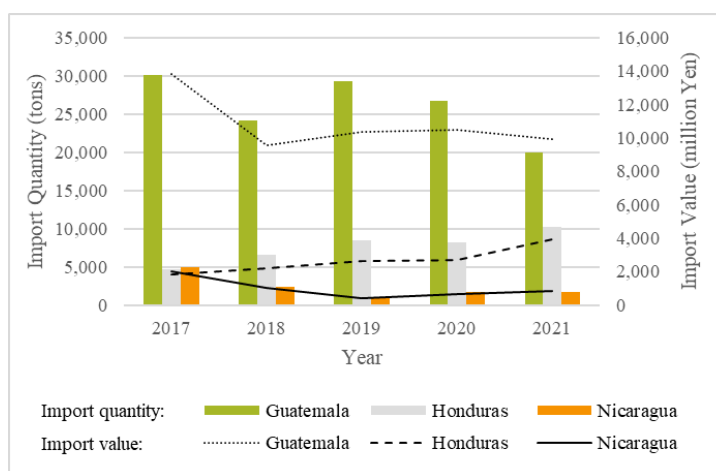


Source: JICA Study Team based on FAOSTAT

Figure 11-17 Export Value and Percentage of Coffee

In addition to the cooperatives, private companies (Mercon, Ecom, and Olam) have exported packed green coffee beans after collecting with the support of an extensive network of intermediaries from the field to a large city. MIFIC reported that the exporting companies have exported under the name of their brand, not a brand of origin in which parchment coffee is produced.

Japan has imported around 400,000 tons of green coffee beans since 2017. Among the total imported quantity, the share of beans produced in Guatemala, Honduras, and Nicaragua accounts for around 10%³¹. The import situation of green coffee beans to Japan from Guatemala, Honduras, and Nicaragua is shown in Figure 11-18. Nicaragua's export quantity and value to Japan are the lowest among these three countries.



Source: JICA Study Team based on Trade Statistics of Japan

Figure 11-18 Import Quantity and Value of Green Coffee Beans of Japan from Guatemala, Honduras, and Nicaragua

In an interview with a Japanese importing company of green coffee beans, it reported that the market is interested in Nicaraguan coffee since it is of high-quality in terms of flavor and taste. The company also pointed out that the following are the criteria to make trading.

³⁰ Trade Map

³¹ Calculated based on Trade Statistics of Japan

- A marketing officer of an exporter or a cooperative can explain its field situation and share requirements from the company to its producers;
- An exporter or a cooperative can provide more than 40 tons (around two containers) of green coffee beans per year constantly; and
- An exporter, a cooperative, or a producer can advertise their production and processing situation with photos to consumers through various Social Networking Service (SNS) media (e.g., Twitter, Instagram, Facebook) since high-end consumers are willing to reach this information to enjoy roasted coffee.

Table 11-19 presents the list of coffee farms which has exported green beans to Japan. Most coffee farms exporting to Japan are located in Nueva Segovia.

Table 11-19 List of Coffee Farms Exporting Green Coffee Beans to Japan

Coffee Farm	Department
Peralta	Nueva Segovia
Buenos Aires	Nueva Segovia
El Suyatal	Nueva Segovia
La Laguna	Nueva Segovia
Ojo de Agua	Nueva Segovia
Los Congos	Nueva Segovia
Limoncillo	Matagalpa
El Suspiro	Matagalpa
Santa Ana	Jinotega
Los Altiplanos	Jinotega
Monte Cristo	Madriz

Source: JICA Study Team

Private Association of the Coffee Sector

The National Commission for the Transformation and Development of Coffee Growing (CONATRADEC) was created in 2013 under the Law for the Transformation and Development of Coffee Growing. The functions of CONATRADEC are as follows:

- To approve and modify the National Program for the Transformation and Development of Coffee Growing (PNTDC);
- To approve the PNTDC's regulations, credit procedures, and financing scheme; and
- To participate in the regional and international organizations that provide cooperation and assistance in the coffee sector.

According to MIFIC, for 2022, each coffee producer contributes to CONATRADEC, applying USD 2.00 and USD 1.00 for each quintal of green grains of exported Arabica and Robusta coffee, respectively. Using the contributions, CONATRADEC has done the following activities:

- Organization of departmental and national fairs: "Expo Café," National Cup of Excellence, Electronic Auctions,
- Construction of coffee laboratories and procurement of necessary equipment for the laboratories,
- Provision of technical training to producers in the production management and wet processing of coffee, and

- Provision of technical training programs in cupping and barista.

In addition to the above activities, CONATRADEC, in collaboration with MIFIC, has made regional branding of coffee based on the production area and given the certification of coffee with a cupping score of more than 82 points evaluated by Q Graders approved by CONATRADEC. Under the certification system, four brands, namely: Dipilito, Cuspire, Wiwili Jinotega, and Ometepe, have already been established, and the certified coffee has been exported with a specific seal.

Nicaraguan Coffee Exporters Association (EXCAN), consisting of 10 private companies and large-scale cooperatives, is a Nicaraguan association with 40 years of operation, hosting the leading coffee export organizations in the country. EXCAN members currently account for 70% of the country's export volume.

b) Cacao

Production

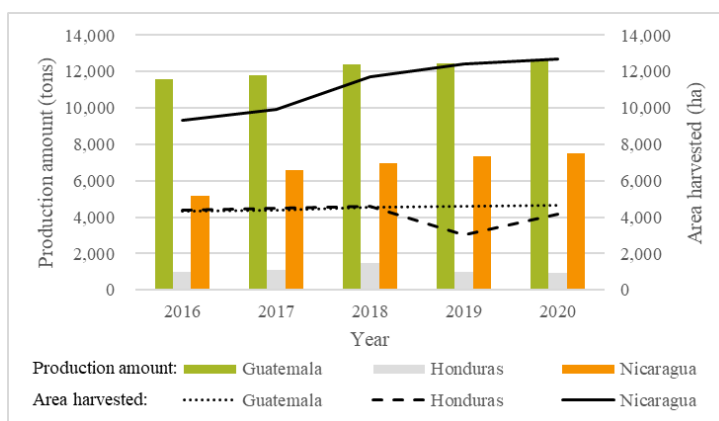
Like coffee, cacao production has also relied on small-scale producers. MAG reported that 65% of the total cacao producers (12,563 producers) are small-scale producers with a cultivated area of less than 2 ha. As shown in Figure 11-19, the production amount and harvested area of cacao have increased in Nicaragua. Since Guatemala has produced fermented cacao from Nicaraguan washed (unfermented) cacao, the production amount is the highest among the three countries even though the cultivated area is smaller than Nicaragua. Most cacao has been produced in the Northern and Caribbean regions.

The cooperatives have played an essential role in collecting washed cacao from small-scale producers and exporting fermented cacao. As shown in Table 11-20, 30 cooperatives in total have been established as of July 2022. Around 40% to 50% of the producers have organized cooperatives.

Table 11-20 Number of the Cacao Cooperatives

Department	No. of Cacao Cooperatives
Boaco	1
Jinotega	1
Madriz	1
Matagalpa	4
North Caribbean Coast Autonomous Region	14
Río San Juan	5
Rivas	1
South Caribbean Coast Autonomous Region	3

Source: JICA Study Team based on the collected information from MEFCCA



Source: JICA Study Team based on FAOSTAT

Figure 11-19 Production Amount and Area Harvested of Cacao in Guatemala, Honduras, and Nicaragua

Export

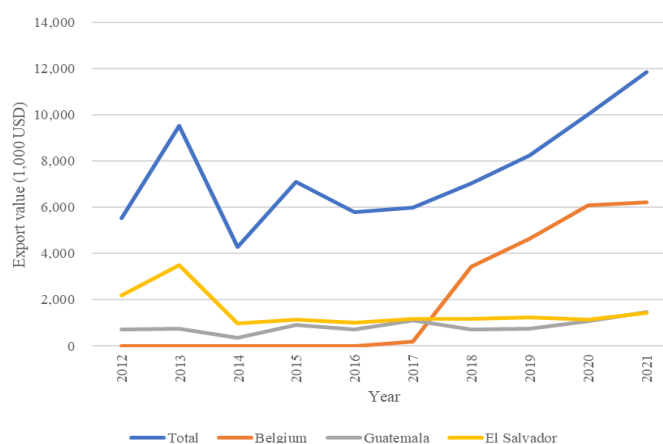
Since Nicaragua has won several international cacao of excellence and international chocolate award prizes, the international market has been interested in the quality of fine cacao. As shown in Figure 11-20, the export amount has increased rapidly since 2017. The leading export destination of fermented cacao is Belgium, although the washed (unfermented) cacao has also been exported to Guatemala and El Salvador.

Ritter Sport, a German private company producing cacao products, has been the dominant private sector actor for the past two decades, topping the list of exporters of cacao. Ritter Sport is mainly responsible for the high-quality fermented cacao sector, supporting numerous cooperatives to implement infrastructure and fermentation protocols for cacao over the years. Over the past ten years, Ingemann, a Danish private company, and several cooperatives have emerged and begun exporting cacao themselves.

Japan has imported around 35,000 to 50,000 tons of cacao beans since 2017, of which 75% has been imported from Ghana³². The Japanese import situation of cacao beans from Guatemala, Honduras, and Nicaragua are shown in Figure 11-21. Nicaragua has exported to Japan mainly through INGEMAN or cooperatives.

In an interview with a Japanese bean-to-bar chocolate company, it reported that the market has been interested in Nicaraguan cacao since it is high-quality in terms of flavor and taste. Although Nicaraguan cacao's price is double that of Ghana's, it is worth paying to make premium bean-to-bar chocolate. The company also pointed out that the following are the criteria to make direct trade with cooperatives.

- Producers are organized well to share feedback on the quality, and
- Cooperatives have an officer who knows trading procedures well.



Source: JICA Study Team based on Trade Map

Figure 11-20 Export Value and Major Export Destination of Cacao

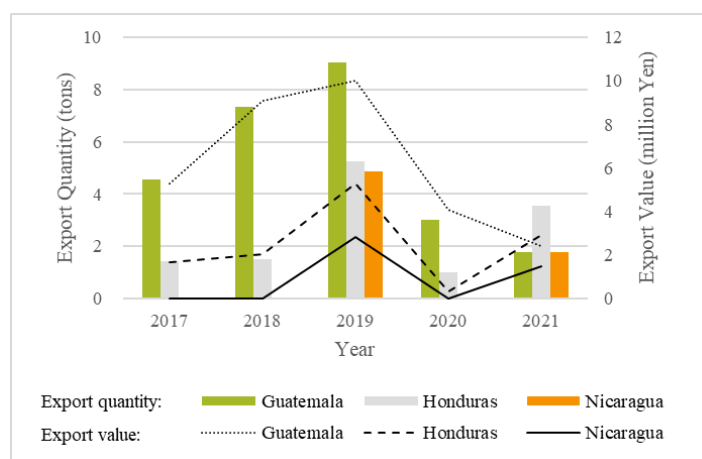


Figure 11-21 Import Quantity and Value of Cacao Beans of Japan from Guatemala, Honduras and Nicaragua

³² Calculated based on Trade Statistics of Japan

c) Pitaya

Production

Pitaya is an emerging product in Nicaragua, and producers and private companies have invested in expanding production and export, respectively. Although there has not been available official data, according to MIFIC, pitaya cultivation in Nicaragua is estimated in 1,500 *manzanas*, with 641 producers, mainly in the department of Masaya. The average production of pitaya is around 12 tons of fresh fruit per *manzana*.

Apart from the edible use of pitaya, BASA Nicaragua, a processing and exporting company of pitaya, has developed and commercialized i) dyes from pitaya peel and ii) pitaya seed oil for the cosmetic purpose. The main difficulty in marketing is the limited number of customers for these new products.

Export

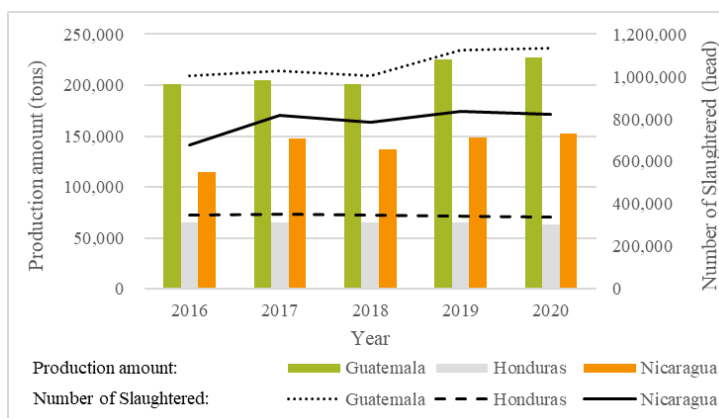
Produced pitaya has two distribution channels in Nicaragua: the national and international markets. Fresh pitaya has been sold at the national markets for beverages, while fresh pulp, dehydrated pulp, and fresh pitaya have been exported. The US and EU countries are leading export destinations. In addition, the United States Department of Agriculture has recognized Nicaragua as a country free of fruit flies in pitaya plantations, which allows Nicaragua to export fresh fruit to that market. It is noted that since Japan has designated Nicaragua as an outbreak country for the Mediterranean fruit fly, imports of fresh fruit are not permitted.

d) Bovine Meat

Production

Cattle farming is the most important activity in the livestock sector. As shown in Figure 11-22, an average of 800,000 heads of cattle have been slaughtered since 2017, with a production amount of around 150,000 tons. Most of the cattle are produced in the Central and Caribbean regions.

According to CANICARNE, livestock cattle in 2021 is around 6.2 million, which are distributed among 146,000 farms, of which 85% to 90% are managed by small and medium-sized producers with farm areas from 7 ha to 70 ha. Most of these have applied the dual-purpose production system producing cows and calves. More than 95% of the milk and beef produced in Nicaragua comes from this system, which involves raising the male calf and selling it to



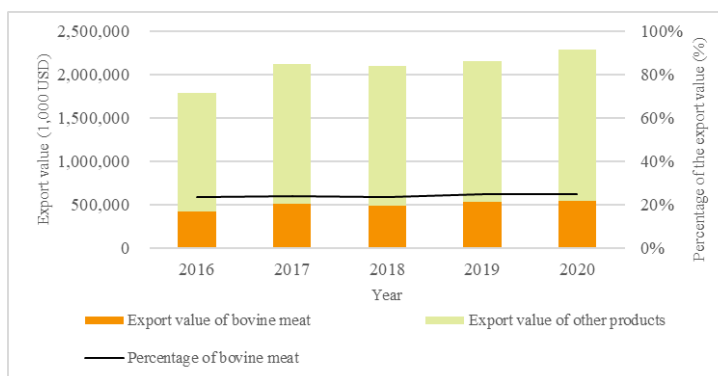
Source: JICA Study Team based on FAOSTAT

Figure 11-22 Production Amount and Producing Cattles/Slaughtered in Guatemala, Honduras, and Nicaragua

intermediaries or steer producers after weaning³³. The steer producers buy 100 kg of weaned calves to fatten them to around 400 kg. These are then sold to meat-packing plants.

Export

Bovine meat is one of the country's most important agricultural export products. As shown in Figure 11-23, the bovine meat export value has accounted for constantly around 20% of the total agricultural export products since 2016. The major export destinations in 2021³⁴ are Mexico (33%), El Salvador (32%), and the US (27%). In addition, Nicaragua is a country declared by the World Organization for Animal Health as free of Foot and Mouth Disease without vaccination.



Source: JICA Study Team based on FAOSTAT

Figure 11-23 Export Value and Percentage of Bovine Meat

The major markets in Asia are Japan, Taiwan, Hong Kong, and Thailand, although the import quantity is smaller compared to the above-mentioned countries. Japan imported tongue and offal from Nicaragua with an import value of USD 28,000 in 2021. Nicaragua has negotiated with China to start exporting. After evaluating whether the processing facilities meet their standards around January 2023, Nicaragua confirmed that they can start exporting their products to China.

Nicaragua has 7 slaughterhouses that process beef certified for export. All of the bovine meat for export has been processed in these plants.

Private Association of the Bovine Meat Sector

Nicaraguan Chamber of Beef Exporting Plants (CANICARNE) is a non-profit association made up of four slaughterhouses (San Martín, Novaterra, Nuevo Carnic, Macesa) that export beef products. Major activities by CANICARNE to strengthen livestock farming are as follows:

- Promotion of the protection of the environment, with particular objectives towards the implementation of silvopastoral practices and buffer forest plantations, non-production, and non-acquisition of livestock from protected areas,
- Implementation of a pilot project to strengthen the bovine traceability system, with a monthly traceability goal of 2,000 cattle
- Scientific research activities on the environment and climate change

³³ Dual-purpose milk and beef value chain development in Nicaragua: Past trends, current status and likely future directions (May 2014, CGIAR)

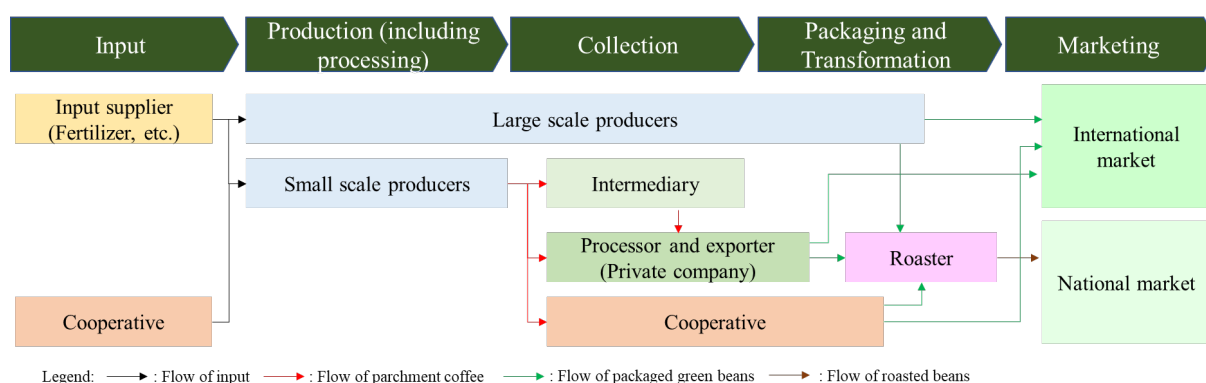
³⁴ Trade Map

5) Value Chain of the Target Products

a) Coffee Sub-sector

General Value Chain Structure

The coffee value chain is composed of five chains: i) input, ii) production (including processing), iii) collection, iv) packaging and transformation, and v) marketing, as shown in Figure 11-24.



Source: JICA Study Team based on the interview results and Coffee and Cacao Market System in the Americas (May 2020, Bioversity International and CIAT)

Figure 11-24 General Coffee Value Chain in Nicaragua

Small-scale producers, who are dominant in Nicaragua, have three sales channels of green grains after harvesting and processing coffee cherries: i) local intermediaries, ii) private exporting companies, and iii) cooperatives. After procuring green grains from the producers, intermediaries sell them to private companies, which pack them for sale in the international and national markets. Table 11-21 shows each chain's stakeholders and current situation.

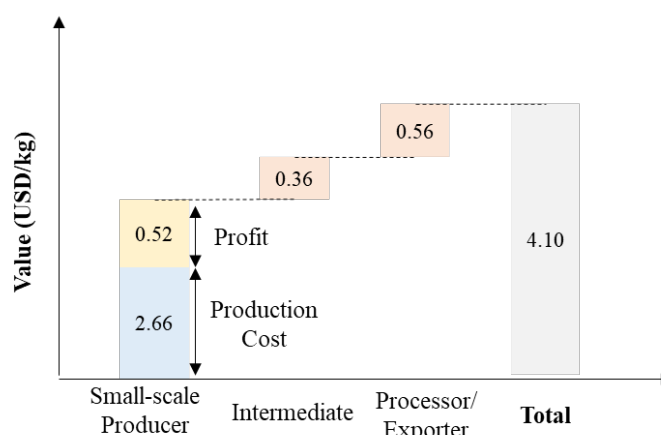
Table 11-21 Stakeholders and Current Situation of Each Coffee Chain in Nicaragua

Value Chain	Stakeholder	Current Situation
Input (Seed and Seedling)	<ul style="list-style-type: none"> - INTA - Private company - Cooperative - Producer 	<ul style="list-style-type: none"> - INTA has a germplasm bank with 22 varieties of coffee. - Some private companies have a laboratory to produce seedlings sold to producers. - Most small-scale producers have used seeds from their own farms or their cooperatives.
Input (Fertilizer and Organic Materials)	<ul style="list-style-type: none"> - Private company - Cooperative - Producer 	<ul style="list-style-type: none"> - Most small-scale producers do not apply chemical fertilizer. - Most small-scale producers make organic materials by themselves or procure these from private companies or cooperatives.
Input (Finance)	<ul style="list-style-type: none"> - Private companies - Cooperatives 	<ul style="list-style-type: none"> - Most small-scale producers cannot access production loans from banks due to high-interest rates (around 12% per year). - Private companies and cooperatives give small-scale producers short-term loans for harvesting. - The cost of chemical fertilizers has increased.
Production	<ul style="list-style-type: none"> - Producers 	<ul style="list-style-type: none"> - Some small-scale producers have already received Rainforest Alliance and/or Organic Certification. - Small-scale producers do not record their farming practices and their costs. - SAT-Café (digital tool) has already been developed to monitor seven coffee pests. Producers can understand the pest situation. - The cost of casual labor during harvesting has increased due to the limited number of laborers. - Some small-scale producers do not apply recommended pruning and

Value Chain	Stakeholder	Current Situation
		renovation techniques, resulting in low yield. - Mainly wet processing is applied, but there are experiences such as honey and anaerobic processing. - Producers who are not members of cooperatives have limited access to market information.
Collection	- Intermediary - Private company - Cooperative - Producer	- Some small-scale producers sell green beans to intermediaries to get cash immediately, even though they have a contract with a private company or cooperative. - When producers sell to their cooperatives, it is common for the producers to arrange the means of transportation by themselves.
Packaging and Transformation	- Private company - Cooperative	- Private companies and cooperatives pack green beans based on the demands of their customers.
Marketing	- Private company - Cooperative	- Private companies and cooperatives enter into a contract with customers yearly to export green beans before starting the harvesting season. - There are advances and efforts to create denominations of origin coffee to boost the coffee positioning in the international market.

Source: JICA Study Team

Figure 11-25 presents the example of the value structure of each stakeholder, from a small-scale producer to an exporter, based on collected information through interviews with small-scale producers and EXCAN. A producer takes USD 2.66 per kg for production and gets a profit of 0.52 USD/kg. The average Free On Board (FOB) price is USD 4.10 per kg, which would be dynamized based on the international market price and quality. The figure also reveals that a producer generates around 80% of the total value, and there is a possibility to increase their value if a direct trade with an exporter is made.

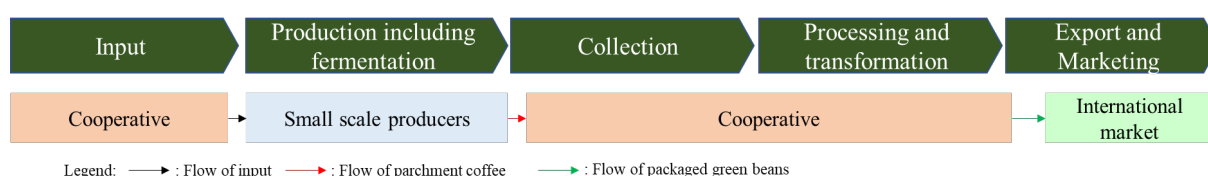


Source: JICA Study Team

Figure 11-25 Value Structure of Coffee

Good Value Chain Practice (CIPAE RL)

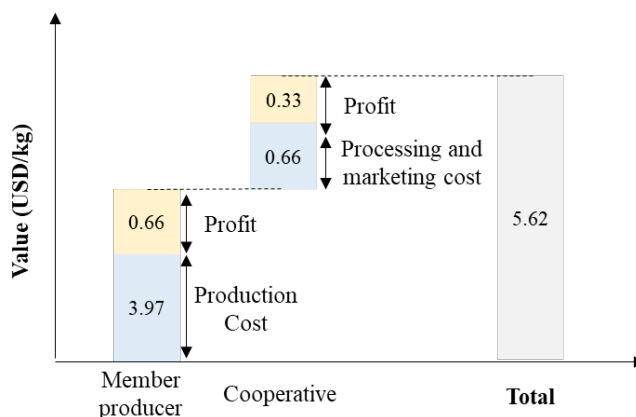
CIPAE RL, in which 58 small-scale producers have registered, have made direct sales with their customers in the international market, as shown in Figure 11-26. The cooperative has covered services from input to marketing.



Source: JICA Study Team

Figure 11-26 Good Value Chain System of CIPAE RL

Figure 11-27 shows the value structure of CIPAE RL. Compared to the value-added structure shown in Figure 11-25, member producers can get better profit, and the cooperatives can reach a better market with a higher FOB price. The production cost of cooperative members is higher than that of small-scale producers as shown in Figure 11-25 since the renovation period of coffee trees is shorter than that for the small-scale producers (Cooperative members: around seven years; Small-scale producers: around ten years).



Source: JICA Study Team

Figure 11-27 Value Structure of CIPAE RL

Good practices of the value chain system of the cooperatives are as follows:

- The cooperative has given a production loan of USD 50,000 per member;
- It has a marketing board, which has negotiated with importing companies before starting the harvesting season.
- The member producers can decide whether they can sell green grains individually or collectively.
- It introduced a processing machine by getting a loan from a bank.
- It has sold all the green grains collected from the members around August (before the next harvesting season).



Photo: JICA Study Team

Figure 11-28 Processing Machine Installed by the Cooperative



Photo: JICA Study Team

Figure 11-29 Packaged Green Grains in the Cooperative's Storage

Although the number of small-scale producers registering in cooperatives is limited, several producers have improved their income through registering in cooperatives like CIPAERL, which have made direct sales with their customers in the international market.

SWOT Analysis of the Coffee Sector

The Strengths, Weaknesses, Opportunities, and Threats (SWOT) for the coffee sub-sector are summarized in Figure 11-30 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The Government (SNPCC) has already formulated the strategy for the promotion of coffee production and implemented it. ◆ INTA has already developed the manual on coffee production. ◆ 333 coffee cooperatives have been established. ◆ Some producers have already received the certification of Rainforest Alliance and organic. ◆ Some producers have improved their profitability by participating in a cooperative. ◆ Regional cupping and barista laboratories have been established. ◆ SAT-Café (digital tool) has already been developed to monitor seven (7) coffee pests. ◆ Genetic banks and specialized centers for the study of coffee varieties are available. ◆ Robusta coffee exported by Nicaragua is sold as a premium category. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Producers are difficult to access a loan with low interest. ◆ Some producers have not yet been organized well. ◆ Some producers have not recorded their farming practices. ◆ Some producers have not applied recommended techniques. ◆ It is common that coffee is exported under an exporting company's name, not the producers' name, when they sell to an intermediary or exporting company. ◆ The cost of casual labor during the harvesting season has increased due to the limited number of laborers. ◆ The export destination has been highly dependent on the United States of America.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Coffee consumption amount in the international market has increased. ◆ The demand for quality coffee by Nicaraguan people has increased. ◆ Every year, a cup of excellence is organized to show coffee quality to importers. ◆ Small and medium-sized producers can apply for tax exemptions for the purchase of inputs and machinery. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The coffee sector is vulnerable to climate change. ◆ The price of the international market has not been stable. ◆ The input cost, such as chemical fertilizer, has increased.

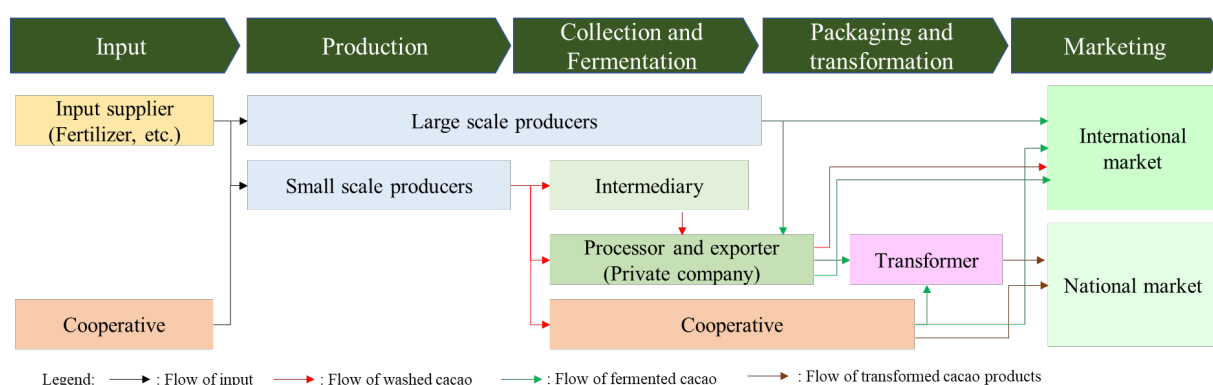
Source: JICA Study Team

Figure 11-30 SWOT Analysis Result of the Coffee Sub-sector of Nicaragua

b) Cacao Sub-sector

General Value Chain Structure

The cacao value chain is composed of five chains: i) input, ii) production, iii) collection and fermentation, iv) packaging and transformation, and v) marketing, as shown in Figure 11-31.



Source: JICA Study Team based on the interview results and Coffee and Cacao Market System in the Americas (May 2020, Bioversity International and CIAT)

Figure 11-31 General Cacao Value Chain in Nicaragua

Small-scale producers, dominant in Nicaragua, have three sales channels for washed cacaos after harvesting: i) intermediaries, ii) private companies, and iii) cooperatives. After procuring washed cacaos

from the producers, intermediaries sell them to private companies, which pack them in international and national markets. Table 11-22 shows each chain's stakeholder and current situation.

Table 11-22 Stakeholders and Current Situation of Each Cacao Chain in Nicaragua

Value Chain	Stakeholder	Current Situation
Input (Seed and Seedling)	<ul style="list-style-type: none"> - INTA - Private company - Cooperative 	<ul style="list-style-type: none"> - INTA has a germplasm bank. - Private companies such as Ritter Sport have provided genetic materials to producers with technical assistance. - Some cooperatives select and reproduce genetic materials. - There have not been any certified seed producers. - There is a national regulation for seed production and commercialization.
Input (Fertilizer and organic materials)	<ul style="list-style-type: none"> - Private company - Cooperative - Producer 	<ul style="list-style-type: none"> - Most small-scale producers do not apply chemical fertilizer. - Most small-scale producers make organic materials by themselves or procure them from private companies or cooperatives.
Input (Finance)	<ul style="list-style-type: none"> - Private companies - Cooperatives 	<ul style="list-style-type: none"> - Most small-scale producers cannot access production loans from banks due to high-interest rates (around 12% per year). - Private companies and cooperatives give small-scale producers short-term loans for harvesting.
Production	<ul style="list-style-type: none"> - Producers 	<ul style="list-style-type: none"> - Some small-scale producers have already received Rainforest Alliance and/or Organic Certification. - Small-scale producers do not record their farming practices and their costs. - SAT-Cacao (digital tool) has already been developed to monitor three cacao pests. - The cost of casual labor during harvesting has increased due to the limited number of laborers. - Some small-scale producers do not apply recommended pruning and shade regulation, resulting in low yield. - Producers who are not members of cooperatives have limited access to market information.
Collection and Fermentation	<ul style="list-style-type: none"> - Intermediary - Private company - Cooperative - Producer 	<ul style="list-style-type: none"> - Some small-scale producers sell washed cacaos to intermediaries to get cash immediately, even though they have a contract with a private company or cooperative. - Private companies and cooperatives arrange the means of transportation to collect pulp cacaos from producers.
Packaging and Transformation	<ul style="list-style-type: none"> - Private company - Cooperative 	<ul style="list-style-type: none"> - Private companies and cooperatives pack fermented cacaos based on the demands of their customers. - The high cost of imported packaging has limited competitive cacao production. - The local commercialization of processed cacao is basically as powders for traditional beverages.
Marketing	<ul style="list-style-type: none"> - Private company - Cooperative 	<ul style="list-style-type: none"> - Private companies and cooperatives contract with customers yearly to export fermented cacaos before starting the harvesting season.

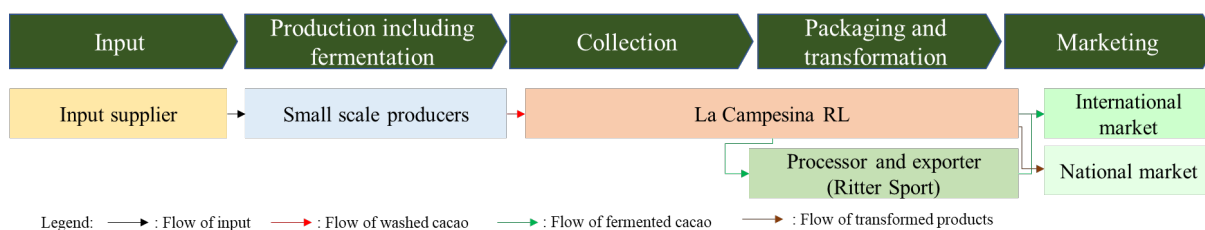
Source: JICA Study Team

The limited reliable information makes it challenging to analyze the cacao sub-sector value structure with a start from a small-scale producer. The EU and Agricultural Research Centre for International Development reported that fine cacao exported by large exporters with Rain Forest Alliance at USD 2,600 to 2,800 per ton, and gourmet cacao destined for niche markets ranged at USD 3,600 to 4,500 per ton. The price of unfermented cacao paid by intermediaries is estimated at around 80% of the reference price on the New York market³⁵.

Good Value Chain Practice (La Campesina RL)

La Campesina RL, where 262 small-scale producers have registered, has made direct sales with their customers in the international market, as shown in Figure 11-32. The cooperative has covered from input to marketing, including the transformation of cacao with their facilities.

³⁵ Análisis de la cadena de valor de cacao en Nicaragua (July 2022, EU and Agricultural Research Centre for International Development)



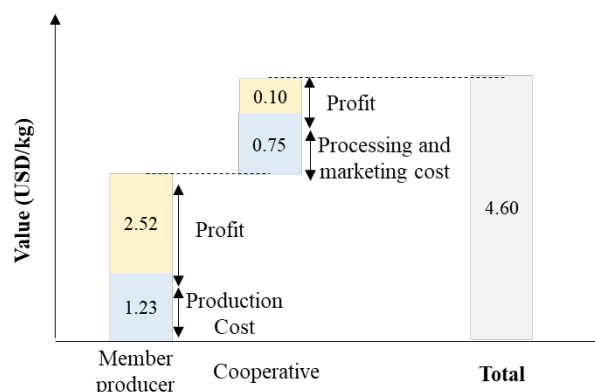
Source: JICA Study Team

Figure 11-32 Good Value Chain System of La Campesina RL

Figure 11-33 shows the value structure of La Campesina RL. Since the FOB price of cacao beans of the cooperative is USD 4.60 per kg with Rain Forest Alliance (equivalent to USD 4,600 per ton), it is suggested that the cooperative reach niche markets.

Good practices of the value chain system of the cooperatives are as follows:

- The cooperative has employed and trained young people technically and professionally for the processing and transformation processes.
- It has diversified its sale destination, not only Ritter Sport but also importers from Belgium and France.
- It has genetic mapping in farms and a fine cacao germplasm bank.



Source: JICA Study Team

Figure 11-33 Value Structure of La Campesina RL



Photo: JICA Study Team



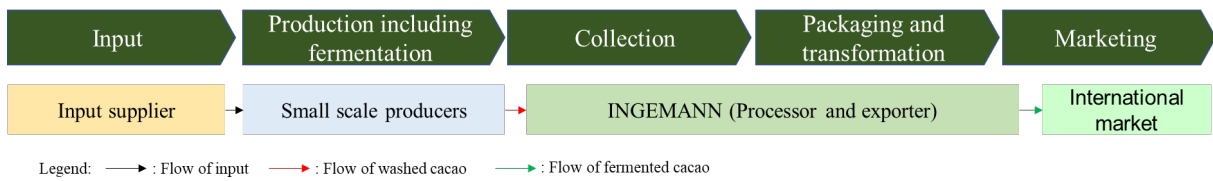
Photo: JICA Study Team

Figure 11-34 Fermentation Facility of Cacao

Figure 11-35 Packed Cacao for Export

Good Value Chain Practice (INGEMANN)

INGEMANN is a Danish private company involved in the processing and exporting of cacao. The company has i) procured washed cacaos from small-scale producers based on quality, ii) fermented cacaos by their own method, and iii) exported fermented cacaos to the international market, as shown in Figure 11-36.



Source: JICA Study Team

Figure 11-36 Good Value Chain System of INGEMANN

Good practices of the value chain system of the company are as follows:

- The company has paid the amount to get a certification of Rainforest Alliance and/or Organic instead of producers selling washed cacao to the company.
- It has collected high-quality washed cacao from producers at a premium price and sold it to importers from the EU and US after fermenting.
- It has provided the IT tool (Agroclimatica) for smooth producers' decision-making on farming practices.



Photo: JICA Study Team



Photo: JICA Study Team

Figure 11-37 Sorting Machine of Organic Cacao

Figure 11-38 Drying Facility of Cacao

SWOT Analysis Result

The cacao sector's SWOT is summarized in Figure 11-39 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The Government (SNPCC) has already formulated the strategy for the promotion of cacao production and implemented it. ◆ INTA has already developed the manual on coffee production. ◆ 30 cacao cooperatives have been established. ◆ Some producers have already received the certification of Rainforest Alliance and organic. ◆ Some producers have improved their profitability by participating in a cooperative. ◆ 150 cocoa clones in Germplasm Banks or Clonal Gardens are available. ◆ SAT-Cacao (digital tool) has already been developed to monitor three (3) cacao pests. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Producers are difficult to access a loan with low interest. ◆ Some producers have not yet been organized well. ◆ Some producers have not recorded their farming practices. ◆ Some producers have not applied recommended techniques. ◆ There are no certified cocoa seed producers. ◆ Washed cacao is exported in Central American countries (Guatemala and El Salvador) without any processing, including fermentation. ◆ There is no national plan for monitoring the presence of cadmium in cocoa.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Cacao consumption amount in the international market has increased. ◆ The international market has an interest in the quality of fine cacao since Nicaragua won several international cacao of excellence. ◆ Small and medium scale producers can apply for tax exemptions for purchases of inputs and machinery. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The cacao sector is vulnerable to climate change. ◆ The price of the international market has not been stable. ◆ The input cost, such as chemical fertilizer, has increased.

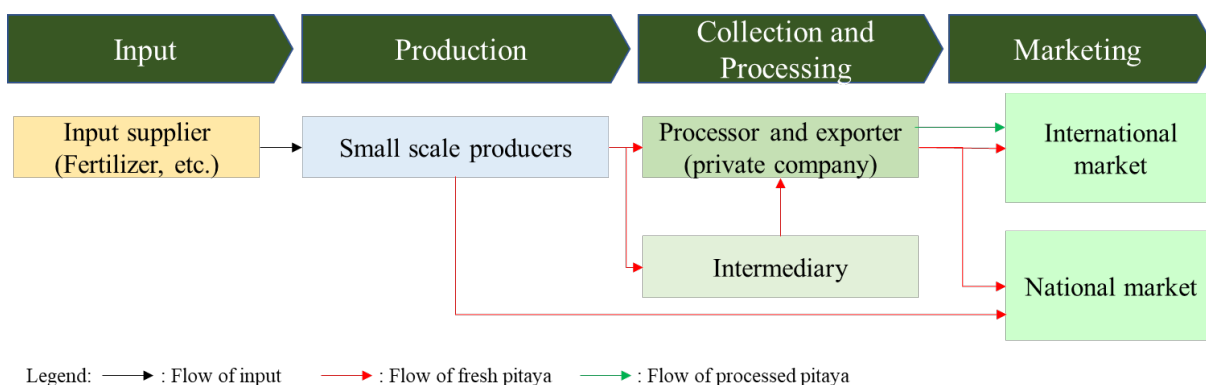
Source: JICA Study Team

Figure 11-39 SWOT Analysis Result of the Cacao Sub-sector of Nicaragua

c) Pitaya Sub-sector

General Value Chain Structure

The pitaya value chain is composed of four chains: i) input, ii) production, iii) collection and processing, and iv) marketing, as shown in Figure 11-40.



Source: JICA Study Team

Figure 11-40 General Pitaya Value Chain in Nicaragua

Small-scale producers have sold harvested pitaya to the international market through the four processing and exporting companies authorized by IPSA. Table 11-23 shows each chain's stakeholder and current situation.

Table 11-23 Stakeholders and Current Situation of Each Pitaya Chain in Nicaragua

Value Chain	Stakeholder	Current Situation
Input (Seed and Seedling)	- INTA - Producer	- INTA has a germplasm bank. - Producers produce seedlings by themselves.
Input (Fertilizer and organic materials)	- Private company - Producer	- Most small-scale producers do not apply chemical fertilizer. - Most small-scale producers produce organic materials by themselves or procure from private companies.

Value Chain	Stakeholder	Current Situation
Input (Finance)	<ul style="list-style-type: none"> - Private companies - Producer 	<ul style="list-style-type: none"> - Most small-scale producers can not access production loans from banks due to high-interest rates (around 12% per year). - Some private companies give small-scale producers a production loan.
Production	<ul style="list-style-type: none"> - Producers 	<ul style="list-style-type: none"> - Some small-scale producers have already received Organic Certification through private companies' support. - Small-scale producers do not record their farming practices and their costs. - Some small-scale producers do not apply recommended agricultural practices such as plant distance for a higher density, planting of high-yield varieties, plant support systems or trellis, and proper pruning, resulting in low yields. - Producers have few opportunities to receive technical guidance on production. - Producers who do not have contracts with private companies have limited access to market information. - The farm gate price of fresh pitaya is around 0.70 USD/kg.
Collection and Processing	<ul style="list-style-type: none"> - Intermediary - Private company - Producer 	<ul style="list-style-type: none"> - Some small-scale producers sell fresh pitayas to intermediaries to get cash immediately, even though they have a contract with a private company or cooperative.
Marketing	<ul style="list-style-type: none"> - Private company 	<ul style="list-style-type: none"> - Private companies contract with customers yearly to export processed pitayas before starting the harvesting season. - The export amount of fresh pitaya is small due to difficulties in keeping them fresh. - Fresh pitaya pulp processed in Nicaragua is used for juice and shakes in export destination countries. - The sales price of pitaya at the national market is around 2.24 USD/kg.

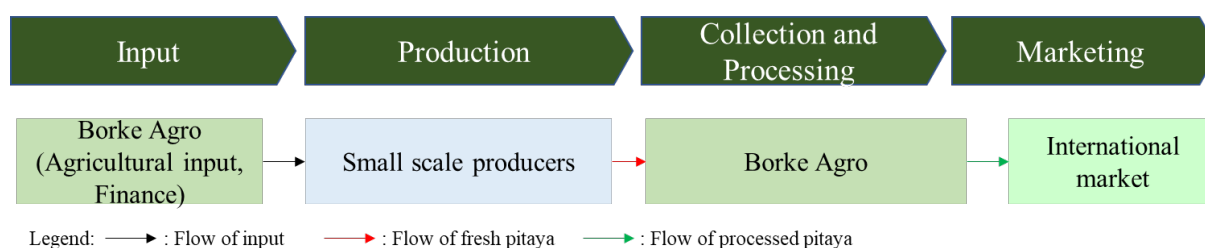
Source: JICA Study Team

For a value structure of the pitaya sub-sector, it is difficult to analyze due to the following reasons.

- An interviewed producer has not recorded any production costs; and
- An interviewed processing and exporting company did not disclose its data since it is confidential.

Good Value Chain Practice (Burke Agro)

Among the four companies authorized to export fresh and processed pitayas by IPSA, Burke Agro company has procured fresh pitayas from around a thousand small-scale producers in the department



of Masaya. The value chain system is shown in Figure 11-41.

Source: JICA Study Team

Figure 11-41 Good Value Chain System of Burke Agro

Good practices of the value chain system of the company are as follows:

- The company has made a contract on sales of harvested pitayas with small-scale producers.
- It has paid the amount to get a Certification of Organic instead of producers selling fresh pitayas to the company.

- It has paid the amount to producers through bank transfer within one week after collecting pitayas.
- It has assigned a technical assistant who has covered around 80 producers to give technical advice to the producers.



Photo: JICA Study Team

Figure 11-42 Pitaya Farm of Producer Making the Contract with Burke Agro



Photo: JICA Study Team

Figure 11-43 Collection Point of Pitayas

d) SWOT Analysis Result

The pitaya sector's SWOT is summarized in Figure 11-44 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The Government (SNPCC) has already formulated the strategy for the promotion of fruits production and implemented it. ◆ Phytosanitary standards and surveillance have been implemented in compliance with international agreements. ◆ There is a national germplasm bank of 10 varieties of pitahaya, of which 3 have ideal characteristics for export. ◆ Plots of 255 ha of pitahaya are approved and certified for export. ◆ Four (4) export processing plants are approved and certified. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Producers are difficult to access a loan with low interest. ◆ Some producers have not yet been organized well. ◆ Some producers have not recorded their farming practices. ◆ Some producers have not applied recommended techniques. ◆ Pitahaya products developed for non-food purposes have not attracted customers.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Export amount of tropical fruits in the international market has increased. ◆ The international market has an interest in the positive effects of pitahaya. ◆ The increase of production areas in non-traditional zones. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The pitahaya sector is vulnerable to climate change. ◆ The input cost, such as chemical fertilizer, has increased.

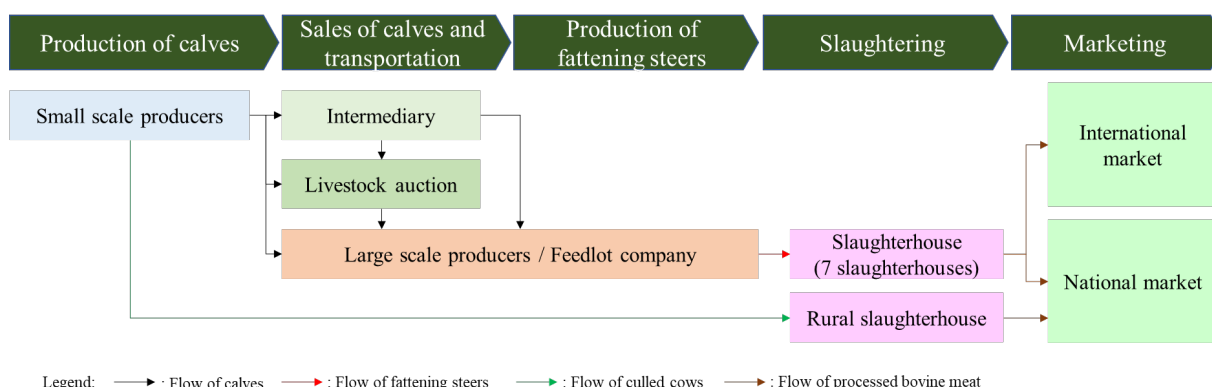
Source: JICA Study Team

Figure 11-44 SWOT Analysis Result of the Pitaya Sub-sector of Nicaragua

e) Bovine Meat Sub-sector

General Value Chain Structure

The bovine meat value chain is composed of five chains: i) production of calves, ii) sales of calves and transportation, iii) production of fattening steers, iv) slaughtering, and iv) marketing, as shown in Figure 11-45.



Source: JICA Study Team based on the interview results and dDual-purpose milk and beef value chain development in Nicaragua: Past trends, current status and likely future directions (May 2014, CGIAR)

Figure 11-45 General Bovine Meat Value Chain in Nicaragua

As mentioned in Sub-chapter 8.6.4 (4), small-scale producers have applied the dual-purpose production system. The producers sell calves to large-scale producers or feedlot companies to produce fattening steers. And then, the authorized slaughterhouses slaughter the steers for export. Table 11-24 shows each chain's stakeholder and current situation.

Table 11-24 Stakeholders and Current Situation of Each Bovine Meat Chain in Nicaragua

Value Chain	Stakeholder	Current Situation
Production of calves	– Small-scale producers	<ul style="list-style-type: none"> – Most small-scale producers apply the dual-purpose production system in producing cows and calves. – Calves are produced under grazing conditions. – Small-scale producers have to register their calves in the national traceability system. – Most small-scale producers cannot access production loans from the banks due to high-interest rates (around 12% per year). – Small-scale producers do not record their farming practices and costs. – Most small-scale producers sell their weaned calves at 12 months of age. – The improved grass varieties' seeds depend mainly on imports from countries such as Brazil. – There are available technologies for reproduction, such as artificial insemination, embryo transplant, and also races diverse options to breed at farms. – Small-scale producers have few opportunities to receive technical guidance on production. – Most small-scale producers have not been able to identify market needs and produce calves. – IPSA has a national surveillance plan for 14 diseases produced by different pathogens or pathogen complexes.
Sales of calves and transportation	<ul style="list-style-type: none"> – Intermediary – Livestock auction – Large-scale producer / Feedlot company 	<ul style="list-style-type: none"> – Intermediaries play an important role in transporting calves to livestock auctions since most small-scale producers cannot arrange the means of transportation. – The farm gate price of calves from is around 2.18 USD/kg. – The price of live stock auctions tends to be low after June. – Large-scale producers or feedlot companies have to register procured calves in the national traceability system. – It is difficult to find a calf with young age (under 3 years old) and high weight (400 to 500 kg). – Four auction companies for calves and steer commercialization are important for market dynamization.
Production of fattening steers	– Large-scale producer / Feedlot	<ul style="list-style-type: none"> – The fattening speed is late since it is difficult to access compound feeds.

Value Chain	Stakeholder	Current Situation
	company	
Slaughtering	- Slaughterhouse	- All beef for export have been processed in the seven slaughterhouses authorized by IPSA. - The bovine meat processed in these slaughterhouses for the domestic market is sold to supermarkets, hotels, and restaurants.
Marketing	- Private Company	- The private companies export beef meat.

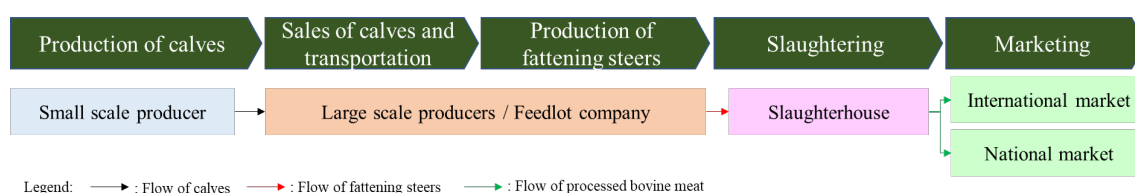
Source: JICA Study Team

For a value structure of the bovine meat sub-sector, it is not easy to analyze due to the following reasons.

- An interviewed producer has not recorded any production costs; and
- An interviewed processing and exporting company did not disclose its data since it is confidential.

Good Value Chain Practice (Individual Producer)

An interviewed small-scale producer has sold his calves directly to the feedlot company (SuKarne) and received feedback to improve the production of calves. The value chain system is shown in Figure 11-46.



Source: JICA Study Team

Figure 11-46 Good Value Chain System of the Producer

Good practices of the value chain system of the producer are as follows:

- The producer has applied artificial insemination, crossbreeding of dairy, and beef breeds with dairy traits.
- He has also applied suckling calf management practices to promote early development and weight gain.



Photo: JICA Study Team



Photo: JICA Study Team

Figure 11-47 Calves Production under Grazing Conditions

Figure 11-48 Facility for Artificial Insemination

SWOT Analysis Result

The bovine meat sector's SWOT is summarized in Figure 11-49 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The Government (SNPCC) has already formulated the strategy for the promotion of cattle production and implemented it. ◆ Seven (7) cattle slaughterhouses have been certified for export to Central America, the United States, Europe, and Asia. ◆ National Bovine Traceability System has been established to secure the traceability of cattle from their origin until they reach the consumer. ◆ Genetic improvement centers and a network of health monitoring laboratories have been established. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Producers are difficult to access a loan with low interest. ◆ Some producers have not yet been organized well. ◆ Some producers have not recorded their farming practices. ◆ Some producers have not applied recommended techniques. ◆ The double production system of milk and calves have resulted in lower performance and value of the steer for sale and lower quality of the meat.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ The demand in the international market has increased. ◆ The ICT tool to control and manage cattle production has been developed and utilized in other countries. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The bovine meat sector is vulnerable to climate change. ◆ Input cost has increased. ◆ The procurement of improved grasses have highly depends on imports. ◆ Pasture lands have been replaced with other non-traditional crops (oil palm, robusta coffee, bananas, etc.).

Source: JICA Study Team

Figure 11-49 SWOT Analysis Result of the Bovine Meat Sub-sector of Nicaragua

6) Challenges of the Value Chain

Based on Sub-chapter 11.3.1(1)5), the value chain challenges for the target products in Nicaragua are summarized in Table 11-25.

Table 11-25 Challenges of the Value Chain for the Target Products in Nicaragua

Value Chain	Target Product	Challenges
Each Chain of the Value Chain		
Input	All products	- Establishment of a financial system with low-interest rate accessible for small-scale producers
Production	All products	- Application of recommended cultivation techniques for improving yield - Promotion of record-keeping of farming practices by producers for reviewing/improving the practices - Addressing climate change
	Bovine meat	- Production of calves based on market needs
Collection and Processing	All products	- Compliance with a contract with private companies or cooperatives by producers
	Coffee, Cacao	- Establishment of necessary facilities for processing, sorting, and packaging based on market needs
Marketing	All products	- Sharing of market needs from downstream stakeholders to upstream stakeholders of the value chain - Continuous market research, including requirements and quality standards of markets - Promotion of direct trade between cooperatives or producers and buyers
Elements Supporting the Value Chain		
Policy and Planning	All products	- Formulation of a national strategy for promoting the export of each product
Production Base (Infrastructure and Organization)	All products	- Development of rural logistic infrastructures for efficient transportation - Development of a power grid system to promote regional agri-industry - Improvement of business skills of cooperatives
	Pitaya	- Promotion of producers' organization
Technical Support	Pitaya, Bovine meat	- Strengthening of technical guidance by the governmental organizations taking into account export promotion

Source: JICA Study Team

Since the target products' market price easily fluctuates due to the production situation in major producing countries, it is essential to minimize the impact of the price fluctuation and build a value chain that can sustainably generate profits for the actors. Therefore, the actors should continuously try to reduce costs or improve the value (selling price). Although the challenges for improving the value chain are broad, as shown in Table 11-25, the prioritized challenges are as follows based on three reasons:

Prioritized challenges

- Application of recommended cultivation techniques and promotion of record-keeping of farming practices by producers to reduce the cost
- Promotion of direct trade between cooperatives or producers and buyers and improvement of business skills of cooperatives to improve the value

Reasons

- The number of stakeholders in the production chain is the biggest, and the generated value is also the largest in the value chain.
- Improvement in raw materials' quantity and quality positively impacts the process and distribution chains.
- Some cooperatives have improved the final value (export price) by improving the quantity and quality.

(2) Development Scenario

1) Development Goal and Strategy

The agriculture sector is one of the priority sectors in Nicaragua, and it is also expected to play an essential role in supporting economic growth sustainably into the future. The Government of Nicaragua has made much effort to strengthen production and develop the agro-industry under the national plan for the fight against poverty and human development. In addition, the Government has formulated the promotion strategy of the strategic products and has mainly addressed i) capacity building of value chain actors, ii) improvement of production quantity and quality, iii) promotion of value addition and iv) establishment of a sustainable production system.

Under this situation, the development goal and the purpose are set as follows:

Development Goal: Sustainable development of the agricultural value chain for the fight against poverty and human development.

Purpose: To strengthen the production of export products and promote agro-industry as the engine of economic growth.

The four development strategies to achieve the above goal and achieve the challenges of the value chain shown in Table 11-25 are presented in Table 11-26.

Table 11-26 Development Strategy in Nicaragua

Target	Strategy	Value Chain*1	Outline of Strategy
Agricultural value chain development, Nicaragua	1. Development of basic infrastructure and human resources	Production Base, Technical Support	Basic infrastructure, such as agricultural roads, is weak, and the production of the target products depends on individual small-scale producers, resulting in inefficient production for export. In addition, technical guidance to pitaya and bovine meat from the government is limited. Under this strategy, basic infrastructure and human resources to support the development of the agriculture sector should be strengthened. This strategy contributes to implementing the other three strategies smoothly.
	2. Improvement of the quantity and quality of export products	Input, Production, Collection and Processing, Marketing	For accessing the international market, it is essential to ensure stable production of high-quality products and smooth distribution of products through close communication among value chain actors. However, due to the insufficient application of recommended techniques by producers and coordination among the actors, the supply is still low compared with the demand, and production is not based on market needs. Under this strategy, the quantity and quality of the products should be improved in order to meet the market demand.
	3. Diversification of export destinations and promotion of national consumption	Marketing, Policy and Planning	The export destination depends on specific countries. It is crucial to find new markets continuously, to improve income and quality. In addition, increasing national consumption is also necessary. Under this strategy, the export destination should be diversified, and national consumption should also be promoted.
	4. Development of a resilient production system	Production	The target products are vulnerable to climate change and international market prices. The challenge is to build resilient production systems to minimize the impact of external factors. Under this strategy, a resilient production system should be developed.

Note *1: The value chain shows the chains shown in Table 11-25.

Source: JICA Study Team

2) Programs/Projects

Based on the four strategies, it is proposed that the Government of Nicaragua shall implement the 12 programs/projects shown in Table 11-27 for the next ten years.

Table 11-27 Development Program/Project for the Next Ten Years in Nicaragua

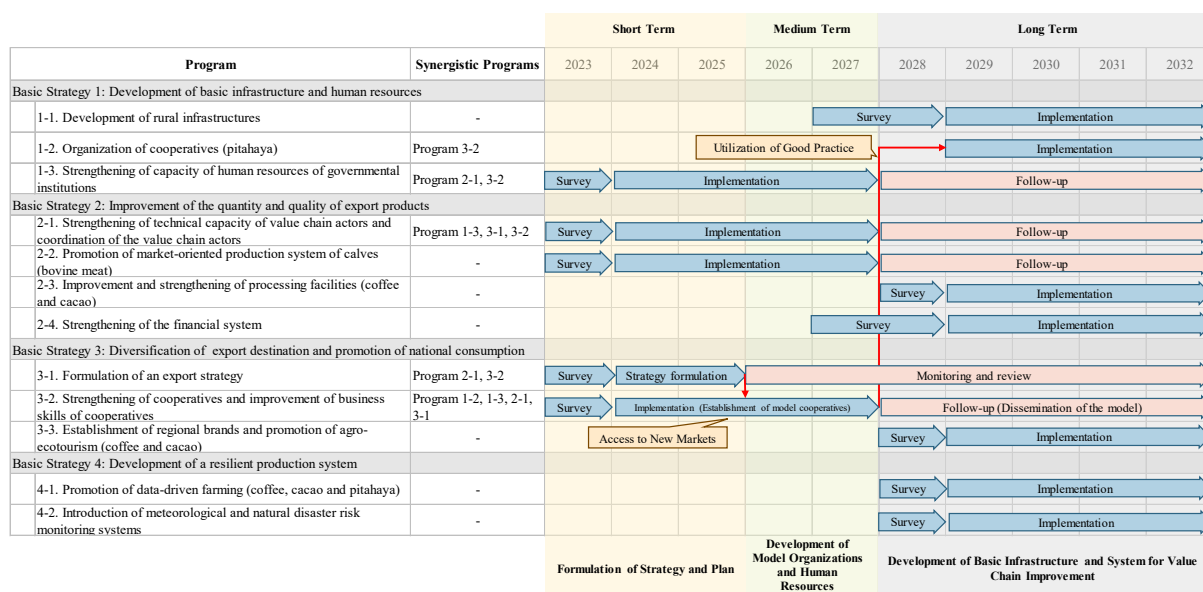
Target	Strategy	Program/Project	Term*1	
Agricultural value chain development, Nicaragua	1. Development of basic infrastructure and human resources	1-1 Development of rural infrastructures	Long term	
		1-2 Organization of cooperatives (for pitaya)	Long term	
		1-3 Strengthening of capacity of human resources of governmental institutions	Medium term	
	2. Improvement of the quantity and quality of export products	2.1 Strengthening of technical capacity of value chain actors and coordination of the value chain actors	2-1 Strengthening of technical capacity of value chain actors and coordination of the value chain actors	Medium term
			2-2 Promotion of market-oriented production system of calves (for bovine meat)	Long term
			2-3 Improvement and strengthening of processing facilities (coffee and cacao)	Long term
			2-4 Strengthening of the financial system	Long term
	3. Diversification of export destinations and promotion of national consumption	3.1 Formulation of an export strategy	3-1 Formulation of an export strategy	Short term
			3-2 Strengthening of cooperatives and improvement of business skills of cooperatives	Medium term
			3-3 Establishment of regional brands and promotion of agro-ecotourism	Long term
	4. Development of a	4-1 Promotion of data-driven farming (for coffee,	Long term	

Target	Strategy	Program/Project	Term*1
	resilient production system	cacao, and pitaya)	
		4-2 Introduction of meteorological and natural disaster risk monitoring systems	Long term

Note*1: Short term: 2023 to 2025, Medium term: 2023 to 2027, Long term: 2023 to 2032

Source: JICA Study Team

A roadmap of the programs/projects is proposed, as shown in Figure 11-50, taking into account their synergistic.



Source: JICA Study Team

Figure 11-50 Roadmap for Agricultural Value Chain Development in Nicaragua

It is proposed that the programs/projects related to strategy formulation and human resource/organizational development, which can be implemented with relatively small inputs, shall be implemented in short to medium term to develop model organizations and human resources. In the long term, it is essential to implement the programs/projects that require more inputs, such as infrastructure development and strengthening of the financial system, to establish a system to improve the value chain by the developed models sustainably.

(3) JICA's Cooperation Scenario

Prioritized programs/projects are selected based on the criteria presented in Table 11-28.

Table 11-28 Selection Criteria of Prioritized Program/Project in Nicaragua

Criteria	Contents
(1) Consistency with the development strategy of the Government of Japan	The Government of Japan has contributed to establishing a stable economy and developing industries in urban and rural areas.
(2) Consistency with JICA's global agenda	JICA has promoted developing an inclusive food value chain and market-oriented agriculture to improve the small-scale producers' income and stimulate the rural economy.
(3) An applicable modality in Nicaragua	It is difficult to apply for loan and grant aid projects in short and medium terms in Nicaragua.
(4) Effective utilization of outputs of the previous projects implemented by JICA	The outputs through the previous projects in Nicaragua implemented by JICA should be utilized effectively.

Source: JICA Study Team

Based on the criteria, the prioritized projects/programs are selected, as shown in Table 11-29.

Table 11-29 Prioritized Programs/Projects in Nicaragua

Strategy	Program/Project	Modality	Term	Implementation Agency
1. Development of basic infrastructure and human resources	1-1 Strengthening of capacity of human resources of governmental institutions	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries 	Medium term	MAG, MEFCCA
2. Improvement of the quantity and quality of export products	2-1 Strengthening of technical capacity of value chain actors and coordination of the value chain actors	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries 	Medium term	MEFCCA
3. Diversification of export destination and promotion of national consumption	3-2 Strengthening of cooperatives and improvement of business skills of cooperatives	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries - JOCV 	Medium term	MEFCCA
4. Development of a resilient production system	4-1 Promotion of data-driven farming (for coffee, cacao, and pitaya)	<ul style="list-style-type: none"> - Technical cooperation - Public-private partnership 	Long term	MAG, MEFCCA

Source: JICA Study Team

Based on JICA's global agenda and assets, it is expected to focus its support on the programs/projects related to Strategy 3. In the short term, it is crucial to support the development of export strategies to diversify export destinations. In the medium term, support is needed to strengthen the production and marketing capacity of value chain actors and agricultural cooperatives, as well as the capacity of government officers to support them in improving the production and quality of export products and facilitating access to new markets. In the long term, JICA is expected to provide support by introducing innovative technologies to build a resilient production system and promote data-driven agriculture through utilizing outputs of agricultural digital transformation in neighboring countries.

Table 11-30 shows proposed projects in the short and medium term based on the synergetic effects of the programs/projects presented in Figure 11-50 and Table 11-29.

Table 11-30 Proposed Projects for Agricultural Value Chain Development in Nicaragua

Project	Outline
Project for Strengthening of the Value Chain of Export Products (Program 1-1, 2-1, 3-2) Priority: Priority Project (A)	<p>(1) Purpose The export volume of target products (coffee and cacao) by agricultural cooperatives is increased.</p> <p>(2) Expected Output</p> <ul style="list-style-type: none"> - Problems related to the export of agricultural products by agricultural cooperatives are identified. - The capacity of government officers to support agricultural cooperatives is improved. - Business plans for export promotion by agricultural cooperatives (including plans for accessing new markets) are developed. - Production and business skills of producers in the cooperatives are improved. - An action plan for strengthening export is formulated. <p>(3) Activity</p> <ul style="list-style-type: none"> - To select target agricultural cooperatives and identify issues for export expansion - To provide training of trainers on production techniques and business skills to government officers - To support agricultural cooperatives in developing business plans and matching them with new markets

Project	Outline
	<ul style="list-style-type: none"> - To support the government officers in providing instructions on production techniques and business skills (matching with new markets, market search, and promotion of the products) to producers of agricultural cooperatives - To support MEFCCA in formulating an action plan for strengthening export (4) Implementation Agency MEFCCA (5) Collaboration Agency MAG, MIFIC, INTA, Secretariat of Investment and Export Promotion (6) Input from the Japanese Side <ul style="list-style-type: none"> 1) Dispatch of experts <ul style="list-style-type: none"> - Team Leader / Agriculture Value Chain - Marketing - Producers' Organization - Cultivation Technique 2) Necessary equipment 3) Provision of counterpart training (training in Japan and/or third countries) 4) Operation cost (7) Input from the Nicaraguan Side <ul style="list-style-type: none"> 1) Assignment of counterpart personnel 2) Project office space 3) Operation cost (8) Project Implementation Period From 2023 to 2027 (five years)

Source: JICA Study Team

As shown in the above table, it is proposed to implement one project in short to medium term. The target sector of the project is coffee and cacao, in which producers have been well organized compared to the other target products. It is expected to support agricultural cooperatives to strengthen their business skills, such as matching with new markets and promoting the products for the markets based on the developed strategy, in addition to strengthening the production techniques of producers. The following points should be noted for the implementation:

- The study conducted a value chain survey for four products through interviews with limited actors. It is essential to implement the project with two phases, namely the planning phase and implementing phase, to collect supplement information for identifying specific challenges of the target cooperatives.
- The private sector plays an essential role in strengthening exports of target products, and the public sector is expected to support exports led by the private sector through institutional development, human resource development, and the provision of the necessary information. Based on the above roles of each sector, it is vital for the project to encourage dialogue and collaboration between the public and private sectors and to use private sector-related organizations effectively.

11.3.2 Cuba (Agricultural Value Chain)

(1) Overview

1) Agricultural Development Strategy and Policy

a) National Development Plan

The 7th Communist Party Congress, organized in April 2016, approved the National Plan for Economic and Social Development (PNDES). Table 11-31 shows the outline of PNDES.

Table 11-31 Outline of PNDES

Strategic Axes	<ul style="list-style-type: none"> - An effective, efficient, and socially inclusive socialist government - Productive transformation and international insertion - Infrastructure - Human potential, science, technology, and innovation - Natural resources and the environment - Human development, equity, and social justice
Prioritized Sector	<ul style="list-style-type: none"> - Tourism - Biotechnology and pharmaceutical industry - Electrical energy industry - Food production - Professional services

Source: JICA Study Team based on PNDES

In addition, the 8th Communist Party Congress has also approved the updated Guidelines of the Economic and Social Policy (2021-2026) as a direction for developing each economic sector, including the agriculture sector. This policy comprises 201 guidelines in total, in which economic development is accelerated by expansion and diversification of exports and investment promotion.

b) Agricultural Development Plan and Related Decree

The Cuban government has implemented reforms to i) increase production, ii) substitute food imports, and iii) expand and develop renewable energy since 2007. Table 11-32 shows the significant policies and decrees related to the agriculture sector reform.

Table 11-32 Major Policies and Decrees Related to the Reform of the Agriculture Sector

Decree 365/2018 and 354/2018	<ul style="list-style-type: none"> - To develop finance for agricultural cooperatives. - To enable small-scale producers to make a deal with input suppliers and service providers.
Resolution 559/2019 (Ministry of Agriculture): Rules for the direct marketing of agricultural products	<ul style="list-style-type: none"> - To authorize the direct marketing between hotels and agricultural cooperatives or small producers without processing.
Economic revitalization policy (June 2020)	<ul style="list-style-type: none"> - Promotion of local production for local consumption at a municipality level. - Promotion of export and strengthening of the production chain. - Strengthening of mini-industries to improve food self-sufficiency. - Promotion of foreign direct investment in specific agricultural product. - Promotion of agro-industry.
COVID-19 Economic policy (October 2020)	<ul style="list-style-type: none"> - Permission for processing and sales of agricultural products at a municipality level. - Permission of export to obtain foreign currency.
Decree 35/2021: Marketing of agricultural products	<ul style="list-style-type: none"> - To make the marketing of agricultural products for different destinations more flexible. - To support the commercialization of agricultural products with a value chain approach. - To introduce incentives for the production, collection, and marketing of

	<p>agricultural products.</p> <ul style="list-style-type: none"> - To increase the added value of the agricultural products on the use of a branding system and units of measurement, the variety of packaging and qualities in compliance with standards. - To maintain a weekly update and disclosure of prices.
63 Measures (2021)	<ul style="list-style-type: none"> - To decide the price of agricultural products freely. - To improve access to the Freely Convertible Currency (MLC) market and the tourism sector. - To strengthen value-added activities by small-scale producers and cooperatives.
Guidelines of the Economic and Social Policy (2021-2026)	<ul style="list-style-type: none"> - To fully implement the policy for the commercialization of agricultural products, paying special attention to the contracting process and its compliance. - To promote a comprehensive policy to encourage the incorporation and stability of the labor force in the countryside, especially young people and women. - To sustainably increase the export of agricultural goods and services of traditional products, coffee, honey, tobacco, charcoal, natural and industrially processed fruits, and vegetables. The income generated contributes to financing the country's integral agricultural development and creates economic incentives for those who produce them.

Source: JICA Study Team based on the Study on Human Resource Development Needs for Economic Reform in Cuba

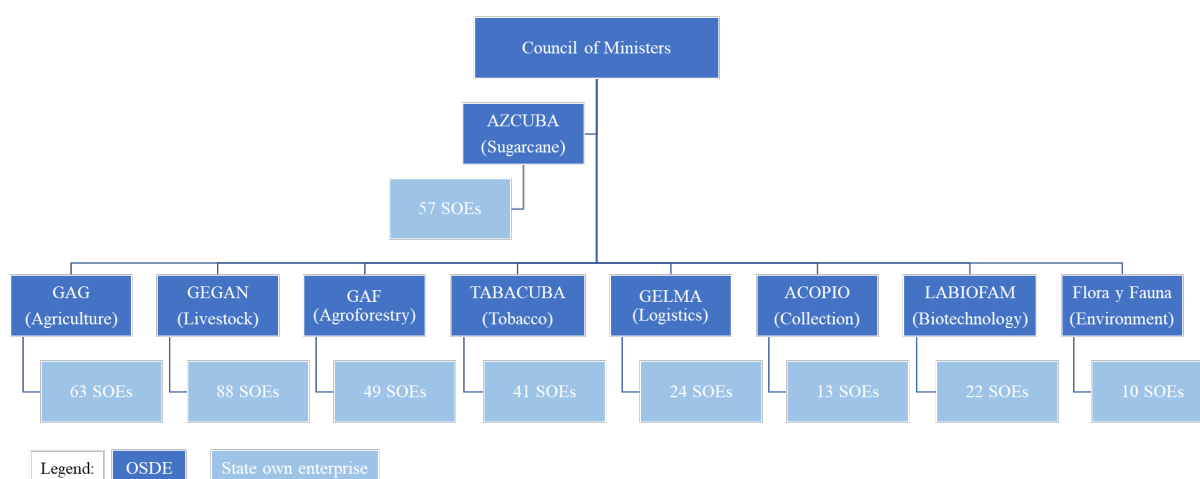
The above table reveals that the Government of Cuba has i) promoted and diversified exports of agricultural products and ii) promoted liberalization of the distribution of agricultural products.

2) Organizations of the Agriculture Sector

Various governmental organizations and Senior Management Organization (OSDE) are concerned with producing and exporting the target products in Cuba as follows:

a) Ministry of Agriculture (MINAG)

MINAG is responsible for proposing, directing, executing, and controlling the policies on land use and tenure and agricultural and forestry production. MINAG has nine national OSDEs in total, which



manage and supervise their State Own Enterprises (SOEs), as shown in Figure 11-51.

Source: JICA Study Team based on the interview result and Final Report on the Study on Human Resource Development Needs for Economic Reform in Cuba

Figure 11-51 OSDEs and Number of State Enterprises under MINAG

Among the nine OSDES, the Agroforestry Business Group (GAF) is in charge of supervising and guiding the production of coffee and cacao, and the Agricultural Business Group (GAG) is in charge of supervising and guiding the production of tropical fruits.

b) Ministry of Food Industry (MINAL)

MINAL is responsible for i) processing agricultural products and ii) managing the regulation and quality of processed products, including the ones processed by mini-industries managed under the SOEs of MINAG. Among the three OSDEs under MINAL, Grupo Empresarial de la Industria Agroalimentaria, which has 37 SOEs, has processed coffee and tropical fruits, and Grupo Empresarial de la Industria Alimentaria has processed cacao.

c) Ministry of Domestic Trade (MINCIN)

MINCIN is responsible for proposing, directing, executing, and controlling the policies, rules, regulations, and procedures in the domestic market, including the distribution of a monthly basic basket for the Cuban people. Roasted coffee, one of the basket products for people older than 7 years old, is distributed to 12,500 bodegas by MINCIN.

d) Ministry of Foreign Trade and Investment Foreign Investment (MINCEX)

MINCEX is responsible for proposing, directing, executing, and controlling the policies in matters of foreign trade, foreign investment, and international economic collaboration. CUBAEXPORT, one of the SOEs under MINCEX has exported coffee and cacao among the target products.

e) Agroforestry Business Group (GAF)

GAF, one of the OSDEs of MINAG, is in charge of supervising and guiding the production of agroforestry products, such as coffee, cacao, honey, coconut, and charcoal. GAF has 49 affiliated SOEs and 2 research institutions. Among the SOEs, 24 SOEs and 14 SOEs have produced and processed coffee and cacao, respectively. Most of the SOEs have exported coffee and cacao through CUBAEXPORT, while the three SOEs, namely, Asdrúbal López, Rolando Ayub, and Baracoa Coconut and Cocoa; and two SOEs, i.e., Asdrúbal López and Baracoa Coconut and Cocoa have received a license from MINCEX to export coffee and cacao, respectively. These SOEs can make direct sales to their customers and get foreign currency by exporting their products under their brand names.

GAF and SOEs under GAF has also assigned 831 technicians in the agroforestry production areas. These technicians have provided technical advice to agricultural cooperatives.

f) Agricultural Business Group (GAG)

GAG, one of the OSDEs of MINAG, is in charge of supervising and guiding the production of major agricultural products, including tropical fruits. GAG has affiliated with 63 SOEs and 7 research institutions, including the Tropical Fruit Growing Research Institute (IIFT), which is in charge of researching tropical fruits. Among the SOEs, the two national SOEs and five regional SOEs presented in Table 11-33 have already received a license from MINCEX to export tropical fruits.

Table 11-33 List of SOEs Exporting Tropical Fruits

Name of SOE	Covered Area	Major Export Products
Frutas Selectas	Nationwide	Fresh tropical fruits
Cítricos Caribe*1	Nationwide	Fresh tropical fruits
Cítricos Ceiba	Artemisa Province	Puree of tropical fruits
Victoria de Girón	Matanzas Province	Puree of tropical fruits
Complejo Sur del Jíbaro	Sancti Spiritus Province	Not available
Ceballos	Ciego de Avila Province	Puree, juice and jam of tropical fruits
Tropical Contramaestre	Santiago de Cuba Province	Puree and juice of tropical fruits

Note*1: This SOE has been exported as an import/export SOE under MINAG before the start of import/export license approval for SOEs.

Source: JICA Study Team based on the Website (<https://www.procuba.cu/>) of ProCuba

A GAG official reports that GAG has encouraged these SOEs to strengthen their capacities to cover the value chain from input procurement to exporting, including technical assistance to producers in order to promote export.

g) Agricultural Cooperatives

Agricultural cooperatives have played a significant role in producing agricultural products in Cuba. The four forms of cooperative presented in Table 11-34 have been established under Decree 305/2012.

Table 11-34 Forms of Agricultural Cooperatives

Form	Outline of the Form
Basic Cooperative Production Unit (UBPC)	The cooperative produces agricultural products in state-owned farms. Producers of the cooperative are former SOE members.
Agricultural Production Cooperative (CPA)	The cooperative comprises small-scale producers. The member producers produce agricultural products collectively.
Credit and Services Cooperative (CCS)	The cooperative provides credit and technical services to the member small-scale producers. The producers produce agricultural products in their own farms.

Source: JICA Study Team based on the interview result and Final Report on the Study on Human Resource Development Needs for Economic Reform in Cuba

In addition to the agricultural cooperatives, non-state individual producers who are not cooperative members have produced agricultural products.

3) Implementation of Projects by Development Partners

a) Projects Implemented by JICA

JICA has mainly supported the rice sector for the last decade in Cuba, as shown in Table 11-35.

Table 11-35 Outline of the Surveys and Projects Implemented by JICA

Survey or Project	Outline
Project on Improvement of Agricultural Extension System for Grain Production	<ol style="list-style-type: none"> (1) Purpose of the project: To strengthen the extension system of cereal crop. (2) Expected outputs: <ul style="list-style-type: none"> - The capacities of extension officers and model producers for the management and implementation of extension activities are strengthened. - Tools and materials for extension activities are developed. - The human resource development system of extension activities is verified. (3) Implementing agency: Grain Research Institute (4) Project period: January 2017 to January 2022
Project for Extension and Diffusion of Technologies for Certified Rice Seed Production in the Central Zone of Cuba	<ol style="list-style-type: none"> (1) Purpose of the project: To increase the certified seed amount produced by the model producers in the Central Zone of Cuba. (2) Expected outputs:

Survey or Project	Outline
	<ul style="list-style-type: none"> - The quantity and quality of certified seeds are improved. - Extension activities of rice cultivation are strengthened. - Production techniques of the model producers are improved. - Technical knowledge on the supervision of certified seeds is improved. <p>(3) Implementing agency: Grain Research Institute (4) Project period: January 2017 to January 2022</p>

Source: JICA Study Team

Among the projects implemented by JICA, the report on the Project on Improvement of Agricultural Extension System for Grain Production was reviewed, and the following lessons were extracted.

- Technical Dissemination to collaborative producers: The Project assigned collaborative producers and disseminated techniques to them. This approach functioned well and contributed to building their capacities.
- Close collaboration with counterpart officers: The direct close collaboration among counterpart officers and dispatched experts contributed to improving the initiative of the counterpart agency.
- Involvement of top organization and topsider: It is necessary to involve the top organization and topsider from the beginning of a project and get their commitment to the project for promoting institutionalization.
- Appropriate approach based on the social convention: It is essential to apply an appropriate approach taking into account the unique social convention of Cuba.

b) Projects Implemented by Other Development Partners

The IFAD and the United Nations Development Programme (UNDP) implemented projects related to the target products, as shown in Table 11-36.

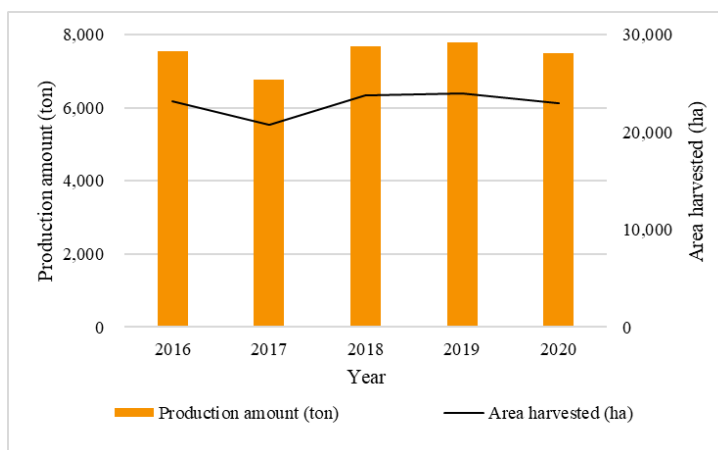
Table 11-36 Outline of the Projects by Development Partners

Project	Outline
Agroforestry Cooperative Development Project (PRODECAFE)	<p>(1) Purpose of the project: To increase the production and sales of agroforestry cooperatives' products and reduce their vulnerability to climatic and economic impacts.</p> <p>(2) Expected outputs:</p> <ul style="list-style-type: none"> - Agroforestry cooperatives increase their production and productivity in a sustainable manner. - Service providers improve agroforestry producer support services, including training, technical assistance, and input provision. <p>(3) Project period: 2019 to 2027 (4) Development partner: IFAD</p>
Agro-frutales Project	<p>(1) Purpose of the project: To improve the performance and management of the mango, guava, and papaya value chains.</p> <p>(2) Expected outputs:</p> <ul style="list-style-type: none"> - The value chain of the target products is analyzed. - Problems and challenges of the value chain are identified. - Action plans to achieve the challenges are planned and implemented. <p>(3) Project period: 2017 to 2022 (4) Development partner: UNDP</p>

Source: Prepared by the JICA Study Team based on the interview results

The interview with IFAD revealed that PRODECAFE has not yet accumulated the lessons learned since it has just started its activities. Therefore, the lessons learned from the Agro-frutales Project by UNDP are summarized as follows:

- Formulation of a regional strategy: It is essential to formulate a regional strategy for tropical fruit development, considering each region's situation and uniqueness.
- Close collaboration between state sectors and non-state cooperatives: The close collaboration between the SOE and the non-state cooperative enables to strengthen not only the production chain but also the overall value chain of tropical fruits.
- Management of integrated fruit tree farms: The management of integrated fruit tree farms, featuring diverse reproductive cycles, increases area use and stabilizes the economic incomes of producers, as well as the resilience to the effects of climate change.



Source: JICA Study Team based on FAOSTAT

Figure 11-52 Production Amount and Area Harvested of Green Coffee Beans in Cuba

4) Production of the Target Products

a) Coffee

Production

Coffee is one of the strategic products in terms of export and national consumption in Cuba. Although the coffee production amount and the harvested area have been constant, as shown in Figure 11-52, they have decreased significantly compared with the 1950s, with a production amount of 60,000 tons and a harvested area of 167,000 ha. The significant depression has been caused mainly by decreased coffee producers producing Arabica coffee in the production areas (Granma, Santiago de Cuba, Guantánamo, Cienfuegos, Santi Spiritus, and Villa Clara provinces) due to the migration from the mountain areas to urban areas. Moreover, limited access to agricultural inputs is also attributed to reduced unit yields.

The Government of Cuba has promoted producing Robusta coffee in the lowlands to meet national consumption. According to MINAG and GAF, Robusta coffee production doubled Arabica's in 2021.

GAF reported that there were 952 coffee-producing cooperatives (UEBs, CPAs, CCSs) comprising 20,800 producers.

Export

Arabica coffee is one of the crucial agricultural export products in Cuba. As shown in Figure 11-53, the coffee export value and amount have slightly increased. The major export destinations were Belgium (26%), Germany (23%), and Japan (19%) in 2018³⁶, which reveals that Cuba has highly relied on these markets for coffee export. Meanwhile, Cuba is importing Robusta coffee to meet national consumption, although the amount and value have decreased since 2017. The leading import destination was Brazil and Vietnam in 2018.

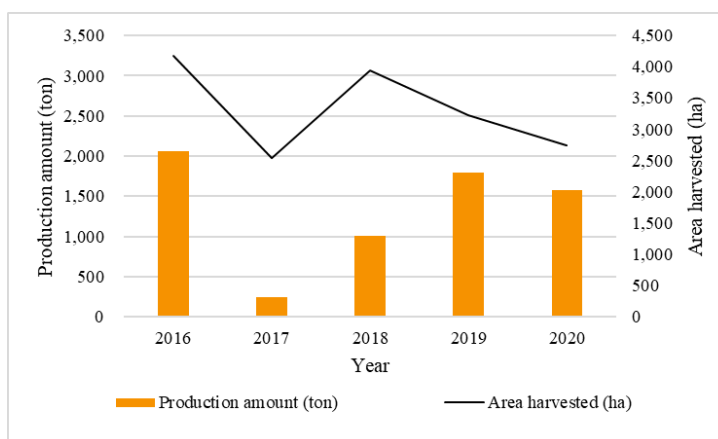
One of the most popular brands of Arabica coffee in Cuba is Christal Mountain, most of which have been produced in the Essambrey Mountains and exported to Japan. In Cuba, green coffee beans have been evaluated based on their screen size, and Christal Mountain has more than 18 (7.2 mm) of the screen size.

Japan has imported around 100 to 170 tons of green coffee beans since 2017. In 2021, Japan also imported 0.4 tons of roasted coffee.

b) Cacao

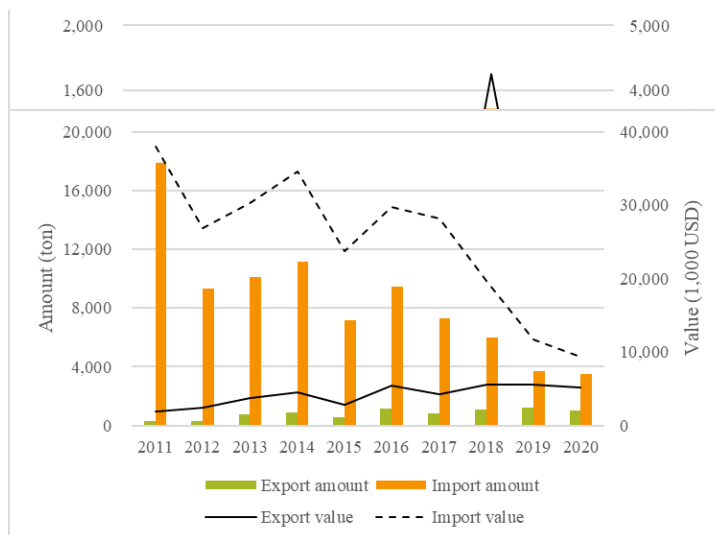
Production

Cacao is one of the strategic products in terms of export in Cuba. As shown in Figure 11-55, cacao production amount and harvested areas were around 1,500 tons and 2,500 ha, respectively, in 2020. According to GAF, the production amount and harvested area have decreased since 1967, with a production amount of 2,240 tons and harvested area of 8,640 ha. The significant depression has been caused mainly by decreased cacao producers in the Eastern regions (Granma, Santiago de Cuba, Guantánamo, Cienfuegos, Santi Spiritus, and Villa Clara provinces) due to the migration from mountain areas to urban areas. Around 90% of the total production amount of cacao



Source: JICA Study Team based on FAOSTAT

Figure 11-55 Production Amount and Area Harvested of Cacao in Cuba



Source: JICA Study Team based on FAOSTAT

Figure 11-53 Export/Import Amount and Value of Green Coffee Beans

36 Trade Map

has been produced in the province of Guantánamo.

Export

As shown in Figure 11-54, the cacao export value and amount have been small compared with other cacao-producing countries. The major export destinations were Belgium and Netherlands in 2018³⁷. GAF reported that only 100 tons out of 750 tons of the total production amount were exported in the Year 2021/22 due to shipment difficulties and quality problems.

Cacao beans are classified into four categories, namely: Fine aroma, Type A, Type B, and Type C, among which the top two categories can be exported. The remaining ones can be distributed to the SOE under MINAL for transformation.

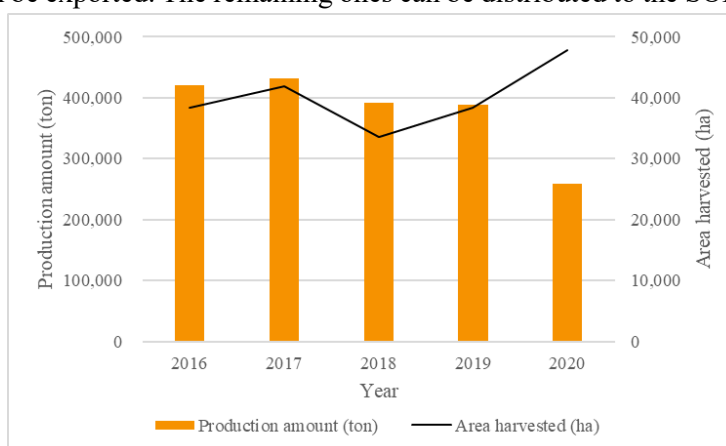
Although CubaExport exported fermented cacaos after procuring from SOEs under GAF, SOEs, Baracoa Coconut Enterprise and Asdrúbal López under GAF have now received the license to export and have currently started exporting the goods.

c) Tropical Fruits

Production

Tropical fruits, especially mango and guava, are strategic products in terms of export and national consumption in Cuba. Although the harvested area has increased since 2018, the production amount has not increased, mainly due to difficulties accessing agricultural inputs (See Figure 11-56). Tropical fruits have been produced nationwide in Cuba.

IIFT, a research institution under GAG, established the Movement of Fruit Tree Cooperatives in 2010 to boost fruit production in the cooperative sector. Although there were only 100 cooperatives to produce tropical fruits in the beginning, the figure amounted to 353 as of August 2022.



Source: JICA Study Team based on FAOSTAT

Figure 11-56 Production Amount and Area Harvested of Mango and Guava in Cuba



Source: JICA Study Team based on FAOSTAT

Figure 11-57 Export Amount and Value of Mango and Guava

³⁷ Trade Map

Export

Figure 11-57 shows the export amount and value of mango, mangosteen, and guava in Cuba. Since 2018, the export amount and value have an increasing trend. The leading export destinations are France, Spain, and the Netherlands³⁸.

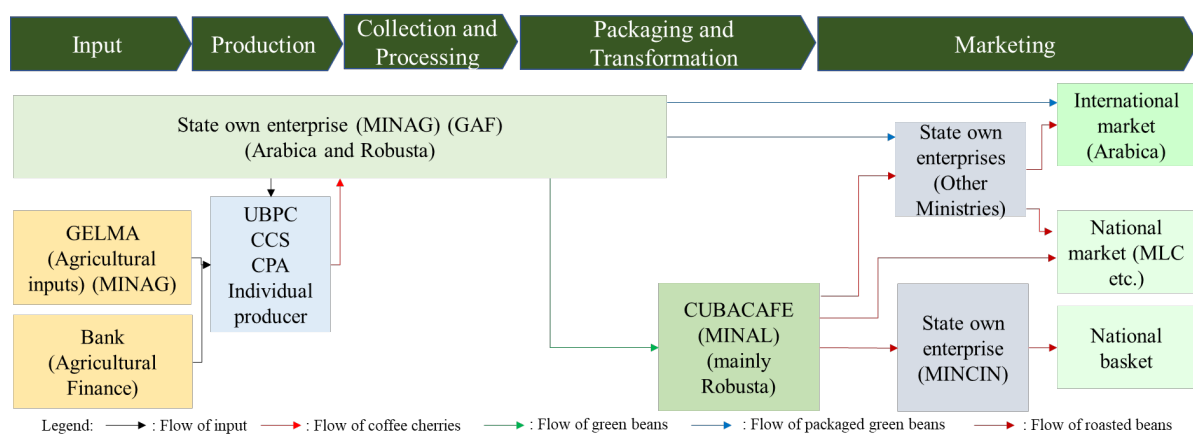
Although some of the SOEs have exported fresh fruits, it has been common to export the pulp of fruits processed by their own facilities.

5) Value Chain of the Target Products

a) Coffee Sub-sector

General Value Chain Structure

The coffee value chain is composed of five chains: i) input, ii) production, iii) collection and processing, iv) packaging and transformation, and v) marketing, as shown in Figure 11-58.



Source: JICA Study Team

Figure 11-58 General Coffee Value Chain in Cuba

Agricultural cooperatives (UBPC, CCS, CPA) and individual producers produce coffee cherries and sell them to the SOEs under GAF in which the cooperatives make the contract. As for Arabica coffee, the SOEs export by themselves or through the SOEs under other ministries. The SOE (CUBACAFE), under MINAL has roasted Arabica coffee procuring green beans from the SOEs of GAF, blended coffee imported from neighboring countries, and exported or sold to the tourism sector under the brand name of Guantanamera, Serrano, Turquino, El Arriero.

On the other hand, as for Robusta, CUBACAFE under MINAL roast and distribute these to the national market, such as the MLC market and national basket, through the SOEs under other ministries. Table 11-37 shows each chain's stakeholder and current situation.

Table 11-37 Stakeholders and Current Situation of Each Chain of Coffee in Cuba

Value Chain	Stakeholder	Current Situation
Input (Seed and Seedling)	– Agro-Forestry Research Institute (INAF) under	– Basic and certified seeds are produced in two Basic Scientific and Technical Units (UCTB): i) Jibacoa for Central Cuba, and ii) Tercer Frente for Eastern Cuba under

³⁸ Trade Map

Value Chain	Stakeholder	Current Situation
	<ul style="list-style-type: none"> - GAF - SOEs under GAF 	<ul style="list-style-type: none"> - GAF. - 100% of basic and certified seeds for coffee production are guaranteed. - Twenty-six (26) tons of coffee seeds (17 tons of Arabica variety, 9 tons of Robusta variety) were produced for the current harvest in 2021. - The SOEs under GAF make vegetative propagation.
Input (Fertilizer and Organic Materials)	<ul style="list-style-type: none"> - SOEs under GAF - SOEs under GELMA 	<ul style="list-style-type: none"> - Most producers do not apply chemical fertilizers. - Most producers make organic materials by themselves or procure these from SOEs under GAF. - When producers need agricultural chemicals, they procure them from the SOEs under GELMA, which has 24 SOEs and 229 dealers nationwide to sell them.
Input (Finance)	<ul style="list-style-type: none"> - Bank - SOEs under GAF - Producer 	<ul style="list-style-type: none"> - The financial source of most producers is self-financing. - Although some SOEs under GAF provide financial support to cooperatives, most SOEs have no capacity to do.
Production	<ul style="list-style-type: none"> - SOEs under GAF - UBPC - CCS - CPA - Individual producer 	<ul style="list-style-type: none"> - Although some producers supported by PRODECAFE have received organic certification, it is not common to get it. - Some producers do not record their production costs properly and are dependent on SOEs' technical support for their farming. - Some producers do not apply proper pruning and renovation techniques, resulting in low yields. - CCS and CPA transport harvested cherries to a collection point designated by the SOE under GAF. - The government determines the ceiling price of coffee cherries, which is CUP 21.28/kg for Arabica and CUP 21.03 /kg for Robusta.
Collection and processing	<ul style="list-style-type: none"> - SOEs under GAF 	<ul style="list-style-type: none"> - There are two types of processing facilities: small-scale and medium-scale. Small-scale facilities near the production areas collect coffee cherries from agricultural cooperatives for processing and drying. On the other hand, medium-scale facilities collect dried beans from small-scale facilities to sort and package them. - The SOEs assign technicians at collection points to evaluate the quality of harvested coffee cherries. They decide the price of the cherries based on their size and quality. - The SOEs transport harvested coffee cherries from the collection point to processing facilities less than 24 hours after collection. - The SOEs apply wet processing.
Packaging and transformation	<ul style="list-style-type: none"> - SOEs under GAF - SOEs under MINAL 	<ul style="list-style-type: none"> - After screening, the SOEs under GAF pack the processed green beans of Arabica and Robusta separately. - The SOEs under MINAL roast green beans of Robusta and Arabica.
Marketing	<ul style="list-style-type: none"> - SOEs under GAF - SOEs under other ministries 	<ul style="list-style-type: none"> - The SOEs under GAF and other ministries export the packed green beans of Arabica. - SOEs such as the Public Corporation Group for Trade and Foreign Currency Markets (CIMEX), which is under the Ministry of Revolutionary and Military Affairs, are responsible for marketing roasted coffee of both Arabica and Robusta in the MLC market. - The SOE under MINAL has the license to export roasted coffee. - Coffee roasted by the SOE under MINAL is also distributed by MINCIN to 12,500 distribution centers nationwide. - A joint venture between GAF and a private Italian company has mixed Arabica and Robusta coffee and has marketed it in the tourism sector.

Source: JICA Study Team

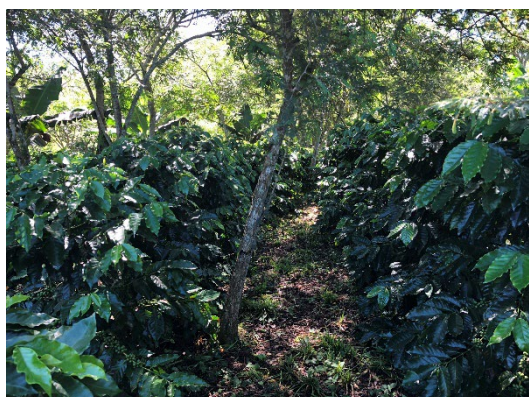


Photo: JICA Study Team

Figure 11-59 Seed Production Farm Managed by the Certified Producer



Photo: JICA Study Team

Figure 11-60 Screening Facilities for Green Beans Managed by the SOE

SWOT Analysis Result

The coffee sub-sector's SWOT is summarized in Figure 11-61 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The role of each actor has been identified. ◆ One (1) research institution have been established, and research has been implemented based on demands. ◆ The seed production system of Arabica and Robusta has been established. ◆ Some producers have received certification in organic farming. ◆ Asdrúbal López, under GAF has covered from producing coffee cherries to exporting green grains. ◆ GAF has 831 technicians for agro-forestry production. ◆ The enterprises have developed and managed processing facilities well. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Unit yield has decreased due to limited access to agricultural inputs. ◆ Producers are difficult to access a production loan and agricultural inputs. ◆ Some producers have not recorded their farming practices. ◆ Migration from the production area of Arabica coffee has been severe. ◆ Some processing facilities have been developed far from the production area of Arabica coffee. ◆ The production amount has not met the processing amount. ◆ Processing facilities and rural infrastructures have deteriorated. ◆ The farm gate prices of Arabica and Robusta do not have a big difference: 21.28 CUP/kg for Arabica and 21.03 CUP/kg for Robusta.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Coffee consumption amount in the international market has increased. ◆ The international market has a great demand for Cuban high-class Arabica coffee. ◆ The national market, including the tourism sector, also has a great demand for Cuban coffee. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The coffee sector is vulnerable to climate change. ◆ The price of the international market has not been stable. ◆ Input prices have increased. ◆ The export destination has highly relied on Japan and Italy.

Source: JICA Study Team

Figure 11-61 SWOT Analysis Result of the Coffee Sector of Cuba

b) Cacao Sub-sector

General Value Chain Structure

The cacao value chain is composed of five chains: i) input, ii) production, iii) collection and processing, iv) packaging and transformation, and v) marketing, as shown in Figure 11-62.

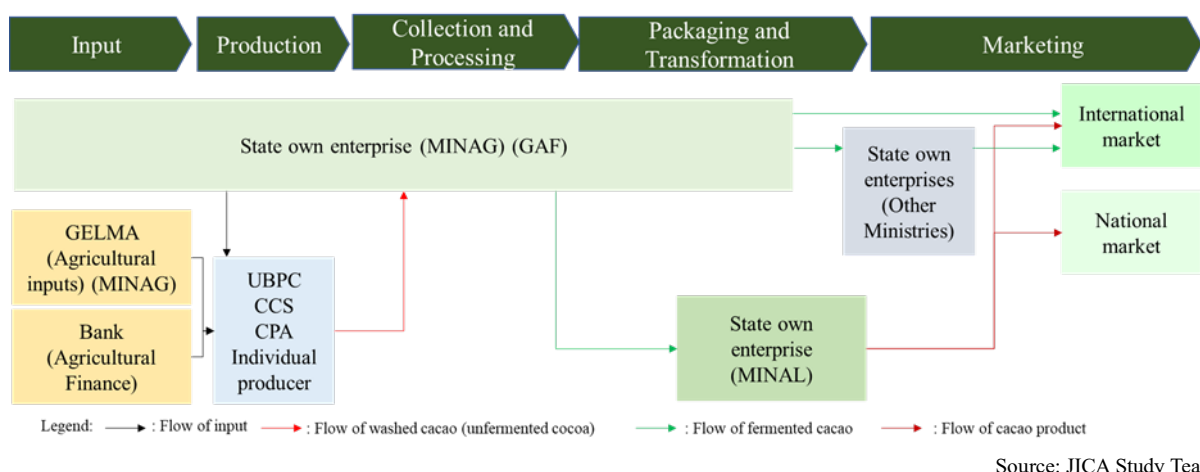


Figure 11-62 General Cacao Value Chain in Cuba

Agricultural cooperatives (UBPC, CCS, CPA) and individual producers produce washed cacao and sell them to the SOEs under GAF in which the cooperatives make the contract. The SOEs ferment procured cacao and sell some of them to the international market by themselves or SOEs under other ministries. The remaining cacao is sold to the national and international markets after the transformation by the SOEs under MINAL. Table 11-38 shows each chain's stakeholder and current situation.

Table 11-38 Stakeholders and Current Situation of Each Chain of Cacao in Cuba

Value Chain	Stakeholder	Current Situation
Input (Seed and seedling)	<ul style="list-style-type: none"> - Agro-forestry Research Institute (INAF) under GAF - SOEs under GAF 	<ul style="list-style-type: none"> - Basic and certified seeds are produced in one UCTB in Baracoa under GAF. - 100% of basic and certified seeds for cacao production are guaranteed.
Input (Fertilizer and agricultural chemicals)	<ul style="list-style-type: none"> - SOEs under GAF - SOEs under GELMA 	<ul style="list-style-type: none"> - Most producers do not apply chemical fertilizers. - Most producers make organic materials by themselves or procure these from SOEs under GAF. - When producers need agricultural chemicals, they procure them from the SOEs under GELMA, which has 24 SOEs and 229 dealers nationwide to sell them.
Input (Finance)	<ul style="list-style-type: none"> - Bank - SOEs under GAF - Producer 	<ul style="list-style-type: none"> - The financial source of most producers is self-financing. - Some SOEs under GAF provide financial support to cooperatives.
Production	<ul style="list-style-type: none"> - SOEs under GAF - UBPC - CCS - CPA - Individual producer 	<ul style="list-style-type: none"> - Although some producers supported by PRODECAFE have received organic certification, it is not common to receive it. - Some producers do not record their production costs properly and are dependent on SOEs' technical support for their farming. - Some producers do not apply proper pruning techniques, resulting in low yields. - CCS and CPA transport harvested cacao to a collection point designated by the SOE, which makes a contract. - The sales price of washed cacao beans from producers to the SOEs under GAF is CUP 17.28/kg.
Collection and processing	<ul style="list-style-type: none"> - SOEs under GAF 	<ul style="list-style-type: none"> - The SOEs assign technicians at collection points to evaluate the quality of harvested cacao. - The SOEs transport harvested cacao from the collection point to processing facilities. - The SOEs ferment the procured cacao.
Packaging and transformation	<ul style="list-style-type: none"> - SOEs under GAF - SOEs under MINAL 	<ul style="list-style-type: none"> - The sales price of fermented cacao beans from the SOEs under GAF to the SOEs under MINAL is CUP 1,216/kg. GAF made an agreement with MINAL, under which the SOEs under MINAL pay MLC 1,500/quintal in addition

Value Chain	Stakeholder	Current Situation
		to the above sales price. Among MLC 1,500, MLC 8 is paid to producers. – The SOEs under GAF pack the fermented cacao. Some of the packaged cacao is sold to SOE under MINAL and CubaExport. – The SOEs under MINAL transform the cacao procured from the SOEs under GAF.
Marketing	– SOEs under GAF – SOEs under other ministries	– The SOEs under GAF and other ministries export the packed cacao. – The sales price of fine aroma is USD 3,000 to USD 3,200 per ton, while it is USD 2,300 per ton for Type A. – The cacao products transformed by the SOEs under MINAL are sold in the international and MLC markets.

Source: JICA Study Team

SWOT Analysis Result

The cacao sub-sector's SWOT is summarized in Figure 11-63 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ The role of each actor has been identified. ◆ Two (2) research institutions have been established, and research has been implemented based on demands. ◆ The seed production system has been established. ◆ Some state enterprises under GAF have covered from producing washed cocoa to exporting fermented cocoa. ◆ GAF has 831 technicians for agro-forestry production. ◆ The enterprises have developed and managed processing facilities well. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Unit yield has decreased due to limited access to agricultural inputs. ◆ Producers are difficult to access a production loan and agricultural inputs. ◆ Some producers have not recorded their farming practices. ◆ Most producers have not been interested in the certification of organic farming. ◆ Migration from the production area has been severe. ◆ The production amount has not met the processing amount. ◆ Processing facilities and rural infrastructures have deteriorated.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Cocoa consumption amount in the international market has increased. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The cocoa sector is vulnerable to climate change. ◆ The price of the international market has not been stable. ◆ Input prices have increased.

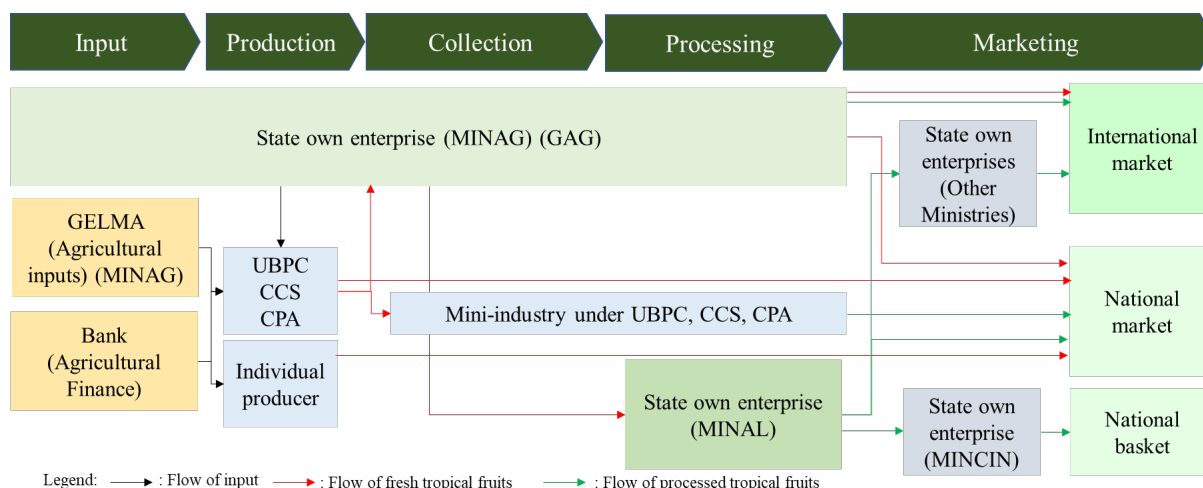
Source: JICA Study Team

Figure 11-63 SWOT Analysis Result of the Cacao Sector in Cuba

c) Tropical Fruits Sub-sector

General Value Chain Structure

The tropical fruits value chain is composed of five chains: i) input, ii) production, iii) collection, iv) processing, and v) marketing, as shown in Figure 11-64.



Source: JICA Study Team

Figure 11-64 General Tropical Fruits Value Chain in Cuba

Agricultural cooperatives (UBPC, CCS, CPA) and individual producers produce tropical fruits and sell them to the SOEs with which the cooperatives makes the contract. The SOEs sells fresh and processed fruits to international and national markets. Some CCS and CPA develop mini-industries to process harvested fruits to decrease post-harvest losses. As shown in the above figure, there are many stakeholders in the value chain, and some of them have the same roles and activities. Table 11-39 shows each chain's stakeholder and current situation.

Table 11-39 Stakeholders and Current Situation of Each Chain of Tropical Fruits in Cuba

Value Chain	Stakeholder	Current Situation
Input (Seed and Seedling)	<ul style="list-style-type: none"> - IIFT under GAG - SOEs under GAG 	<ul style="list-style-type: none"> - The UCTB in Alquizar under GAG has a germplasm bank of fruit trees. - The UCTB and agricultural cooperatives produce seedlings.
Input (Fertilizer and Agricultural Chemicals)	<ul style="list-style-type: none"> - SOEs under GAG - SOEs under GELMA 	<ul style="list-style-type: none"> - Most producers do not apply chemical fertilizers. - Most producers make organic materials by themselves or procure these from SOEs under GAG. - When producers need agricultural chemicals, they procure them from the SOEs under GELMA, which has 24 SOEs and 229 dealers nationwide to sell them.
Input (Finance)	<ul style="list-style-type: none"> - Bank - SOEs under GAG - Producer 	<ul style="list-style-type: none"> - The financial source of most producers is self-financing. - The agricultural development bank established in September 2021 gives producers loans with a low-interest rate (Production loan: 1.5% per year, Investment loan: 2% per year) to those who produce rice, banana, cassava, guava, and pork. The producers should cover 50% of the interest, while the insurance can cover the remaining amount. - Although some SOEs under GAG provide financial support to cooperatives, most SOEs have no capacity to do so.
Production	<ul style="list-style-type: none"> - SOEs under GAG - UBPC - CCS - CPA - Producer 	<ul style="list-style-type: none"> - Few producers receive the certification of Good Agriculture Practice (GAP) and organic. - Some producers do not record their production costs properly and depend on SOEs' technical support for their farming. - Some producers do not apply proper cultivation techniques, resulting in low yields. - The SOEs under GAG has a technical management team

Value Chain	Stakeholder	Current Situation
		<ul style="list-style-type: none"> to support agricultural cooperatives technically, in which it makes a contract. Producers are required to make an efficient production plan for several fruits since the harvesting peak concentrates on a specific period.
Collection	<ul style="list-style-type: none"> SOEs under GAG Mini-industries under CCS and CPA 	<ul style="list-style-type: none"> The SOEs under GAG collect fresh fruits from the agricultural cooperatives, which make the contract before starting production based on the guideline developed by IIFT. The sales price of the cooperatives is fixed in the contract. Mini-industries managed by CCS and CPA procure fresh fruits from member producers.
Processing	<ul style="list-style-type: none"> SOEs under GAG Mini-industries under CCS and CPA SOEs under MINAL 	<ul style="list-style-type: none"> The SOEs under GAG have developed large-scale processing facilities. Mini-industries develop small-scale processing facilities to process fresh fruits to avoid post-harvest losses. The major processed products are pulp and jam, although the varieties are limited. It is challenging to secure containers for the packaging of processed products. SOEs under MINAL procure fresh fruit from SOEs under GAG for processing. Operating hours of processing facilities are low due to electricity shortage.
Marketing	<ul style="list-style-type: none"> SOEs under GAG SOEs under other ministries CCS CPA 	<ul style="list-style-type: none"> The SOEs under GAG mainly export fresh and processed fruits. The SOE under MINAL procures fresh fruits from producers and cooperatives directly without ACIPIO (the SOE under MINAG) for processing. It also exports sliced mangoes through another SOE under MINAL. SOEs under ACOPIO, which have licenses to import and export, procure fresh fruits and export them. SOEs such as CIMEX procure processed fruits from the SOE under MINAL and sell them in the MLC market. Processed fruits (e.g., fruit potage for children) processed at SOEs under MINAL are sent to distribution centers by MINCIN. CCS and CPA sell fresh and processed fruits that are not sold to the SOEs in the national market.

Source: JICA Study Team



Photo: JICA Study Team



Photo: JICA Study Team

Figure 11-65 Mango Trees Managed by the Agricultural Cooperative in Artemisa Province

Figure 11-66 Mini-industry Managed by CCS

Case Study of Ceballos (SOE under GAG)

The JICA Study Team interviewed with Ceballos and made a field visit to collect good practices and challenges. Ceballos is an SOE under GAG, and its outline is presented in Table 11-40.

Table 11-40 Outline of Ceballos

General Information	<ul style="list-style-type: none"> - Ceballos was created on 15th December 1976. - The mission of Ceballos is to increase productivity and crop yields by using innovative technologies to obtain sustainable competitive products to satisfy the growing market. - There are four directions (Foreign Trade, Production Management, Accounting Management, and Human Capital Management) and nine UEBs under Ceballos. - There are 4,546 workers (1,215 women) in total. - Ceballos provides services for three municipalities. 																		
Production Situation	<ul style="list-style-type: none"> - The total planted area of Ceballos is 11,850 ha in total, including the planted area of UBPC, CCS, CPA, and individual producers making the contract with Ceballos, among which 8,830 ha is used for fruit production. - The following table shows the planted area of UEB and cooperatives which make contracts with Ceballos. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Crop</th> <th style="text-align: center;">Planted Area (ha)</th> </tr> </thead> <tbody> <tr> <td>Mango</td> <td style="text-align: right;">3,035</td> </tr> <tr> <td>Guava</td> <td style="text-align: right;">925</td> </tr> <tr> <td>Orange</td> <td style="text-align: right;">560</td> </tr> <tr> <td>Grapefruits</td> <td style="text-align: right;">90</td> </tr> <tr> <td>Lemon</td> <td style="text-align: right;">50</td> </tr> <tr> <td>Papaya</td> <td style="text-align: right;">120</td> </tr> <tr> <td>Pineapple</td> <td style="text-align: right;">154</td> </tr> <tr> <td>Chile Habanero</td> <td style="text-align: right;">7</td> </tr> </tbody> </table>	Crop	Planted Area (ha)	Mango	3,035	Guava	925	Orange	560	Grapefruits	90	Lemon	50	Papaya	120	Pineapple	154	Chile Habanero	7
Crop	Planted Area (ha)																		
Mango	3,035																		
Guava	925																		
Orange	560																		
Grapefruits	90																		
Lemon	50																		
Papaya	120																		
Pineapple	154																		
Chile Habanero	7																		
Processing Situation	<ul style="list-style-type: none"> - Ceballos has 16 mini-industries in total. - The annual processing capacity is 1,000 tons for pineapple, 3,000 tons for guava, and 5,000 tons for tomato per year. 																		
Marketing Situation	<ul style="list-style-type: none"> - Ceballos makes a contract with the cooperatives to decide the sales amount and price before harvesting, taking into account the market situation. - The export amount is decided based on the following items. <ul style="list-style-type: none"> ➤ Municipality supply plan (Ceballos is responsible for producing the municipality supply plan), ➤ The demand in the tourism sector, and ➤ The demand in the international market - The export share of fresh fruit and other products represents only 10% of production. 																		

Source: JICA Study Team

Good practices of the value chain by Ceballos are summarized in Table 11-41.

Table 11-41 Good Practice of Ceballos in the Value Chain

Value Chain	Good Practice
Input Supply	<ul style="list-style-type: none"> - Seedlings and grafted trees are produced and are provided not only to cooperatives that make contracts with the enterprise but also to production farms of other regions. - Financial support for inputs to cooperatives and individual producers is provided.
Production	<ul style="list-style-type: none"> - Technicians have been assigned to support producers and monitor their production. - Proper techniques have been applied.
Collection and Processing	<ul style="list-style-type: none"> - Several processed products have been produced. - Processing (sorting) criteria of fresh products have been visualized, which enables workers to understand it more easily. - Processing facilities have been operated well based on production area (no duplication of processing facilities). - The quality of processed products has been maintained by giving technical support to the mini-industries of the cooperatives which made a contract with Ceballos.
Marketing	<ul style="list-style-type: none"> - Diversified products have been marketed. - The requirement from the customer has been shared with producers. - Market research has been conducted continuously. - The Ceballos brand has been established by providing high-quality product in the market.

Source: JICA Study Team

The following are identified challenges to improve the value chain at the region and their business.

- Selection of strategic products and development of their varied processed products with consideration of strengths and resources of Ceballos;
- Formulation of a regional strategy for the improvement of the value chain of the strategic products;
- Close coordination of regional value chain actors of even enterprises under other ministries; and
- Formulation of an efficient business plan, including technical and management training plan with cooperatives and producers, with resources of Ceballos.



Photo: JICA Study Team

Figure 11-67 Production of Seedlings of Guava



Photo: JICA Study Team

Figure 11-68 Production of Habanero



Photo: JICA Study Team

Figure 11-69 Visualized Criteria of Sorting of Pineapples



Photo: JICA Study Team

Figure 11-70 Mini-industry managed by Ceballos

SWOT Analysis Result

The tropical fruits sub-sector's SWOT is summarized in Figure 11-71 based on those mentioned above.

<p style="text-align: center;">Strength</p> <ul style="list-style-type: none"> ◆ Research and technical support systems have been established, and several types of research have been implemented based on demands. ◆ The seed production system has been established. ◆ Seven (7) enterprises under GAG have received the license to import agricultural inputs and export their products. ◆ The enterprises have developed and managed processing facilities well. ◆ Mini-industries have been established to avoid post-harvest losses. 	<p style="text-align: center;">Weakness</p> <ul style="list-style-type: none"> ◆ Unit yield has decreased due to limited access to agricultural inputs. ◆ Producers are difficult to access a production loan and agricultural inputs. ◆ Some producers have not recorded their farming practices. ◆ Coordination of the value chain actors has been insufficient and some value chain actors conduct the same activities. ◆ The production amount has not met the processing amount. ◆ The variety of processed products has been limited. ◆ It has not been easy to secure raw materials for processed product packaging. ◆ Processing facilities and rural infrastructures have deteriorated.
<p style="text-align: center;">Opportunity</p> <ul style="list-style-type: none"> ◆ Export amount of tropical fruits in the international market has increased. 	<p style="text-align: center;">Threat</p> <ul style="list-style-type: none"> ◆ The tropical fruits sector is vulnerable to climate change. ◆ Input prices have increased.

Source: JICA Study Team

Figure 11-71 SWOT Analysis Result of the Tropical Fruits Sector of Cuba

6) Challenges of the Value Chain

Based on Sub-chapter 11.3.2, the value chain challenges for the target products in Cuba are summarized in Table 11-42.

Table 11-42 Challenges of the Value Chain for the Target Products in Cuba

Value Chain	Target Product	Challenges
Each Chain of the Value Chain		
Input	All products	<ul style="list-style-type: none"> - Improvement of accessibility to agricultural inputs such as chemical fertilizers, agrochemicals, agricultural equipment and tools, and agricultural machinery - Establishment of a financial system with a low-interest accessible for small-scale producers
Production	All products	<ul style="list-style-type: none"> - Review of production cost by producers themselves for improving farming practices - Promotion of receiving international certifications based on market needs - Addressing climate change
	Coffee, Cacao	<ul style="list-style-type: none"> - Establishment of a system of giving an incentive to producers to maintain the number of producers
Collection and Processing	All products	<ul style="list-style-type: none"> - Renewal of processing facilities
	Tropical fruits	<ul style="list-style-type: none"> - Development of new processed products for differentiation
Marketing	All products	<ul style="list-style-type: none"> - Sharing of market needs from downstream stakeholders to upstream stakeholders of the value chain - Diversification of export destinations
	Coffee, Cacao	<ul style="list-style-type: none"> - Strengthening of promotion of coffee and cacao in the tourism sector
Elements Supporting the Value Chain		
Policy and Planning	All products	<ul style="list-style-type: none"> - Formulation of a national strategy for promoting the export of each product
	Coffee, Cacao	<ul style="list-style-type: none"> - Formulation of a strategy for expansion of production amount
	Tropical fruits	<ul style="list-style-type: none"> - Identification of roles of value chain stakeholders and formulation of a regional strategy for improving the value chain
Production Base	All products	<ul style="list-style-type: none"> - Development of rural infrastructures to reduce transportation and processing costs - Strengthening of business skills of SOEs and cooperatives
	Tropical fruits	<ul style="list-style-type: none"> - Development of the cold chain to reduce post-harvest losses
Technical Support	All products	<ul style="list-style-type: none"> - Strengthening of technical guidance to producers and cooperatives

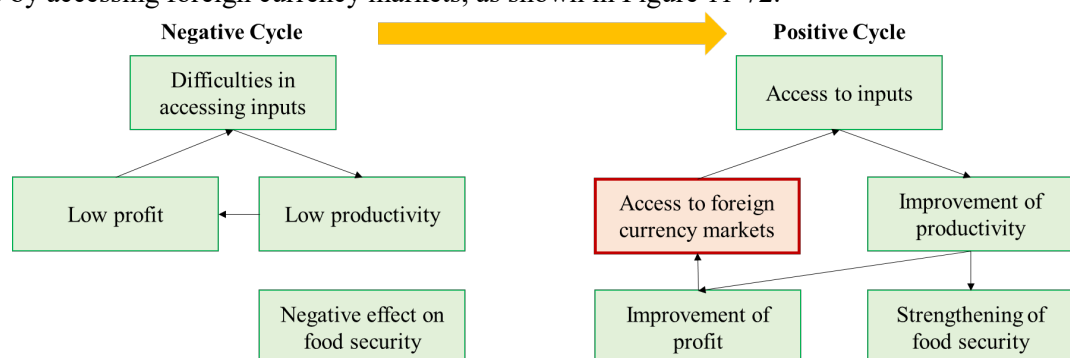
Source: JICA Study Team

Since Cuba has promoted economic liberalization from a planned economy, SOEs and cooperatives have the ability to produce and sell through their initiatives. Therefore, it is essential to promote their independent development to build a sustainable value chain. From this viewpoint, the prioritized challenges are i) formulation of a regional strategy for improving the value chain and ii) strengthening of business skills of SOEs and cooperatives.

(2) Development Scenario

1) Development Goal and Strategy

Agriculture is a strategic sector in Cuba and is also expected to play an important role in sustaining economic growth sustainably into the future. The Government of Cuba has strengthened the production system based on the self-sufficiency plan of the municipalities in terms of food security. At the same time, the government has also improved access to foreign currency markets by promoting agricultural exports and liberalizing the distribution of agricultural products. However, Cuba has faced low productivity resulting from limited access to agricultural inputs due to a shortage of foreign currency. For the sector's sustainable development, it is necessary to transform a negative cycle into a positive cycle by accessing foreign currency markets, as shown in Figure 11-72.



Source: JICA Study Team

Figure 11-72 Development Direction of the Agriculture Sector of Cuba

Under this situation, the development goal and the purpose are set as follows:

Development Goal: Development of a sustainable and attractive agriculture sector for the acquisition of foreign currency.

Purpose: To strengthen the production of export products as the engine of economic growth.

The four development strategies to achieve the above goal and achieve the challenges of the value chain shown in Table 11-42 are presented in Table 11-43.

Table 11-43 Development Strategy in Cuba

Target	Strategy	Value Chain	Outline of Strategy
Agricultural value chain development, Cuba	1. Development of basic infrastructure and human resources	Production Base, Technical Support	Basic infrastructure, such as agricultural roads, is weak, and technical guidance for producers by SOEs and government organizations is limited. Under this strategy, basic infrastructure and human resources to support the development of the agriculture sector should be strengthened. This strategy contributes to implementing the other three strategies smoothly.

Target	Strategy	Value Chain	Outline of Strategy
	2. Strengthening of production of export products	Input, Production, Collection and Processing	It is essential to stabilize the production of high-quality products to access the international market. However, the production amount has decreased due to limited access to inputs and a reduced number of producers. Under this strategy, the production system for export products should be strengthened.
	3. Promotion of access to the foreign currency market	Marketing, Policy and Planning	In order to transform the agricultural production system into a positive cycle, it is essential to obtain foreign currency and procure necessary materials from international markets. However, access to foreign currency markets is limited due to insufficient coordination among value chain actors in addition to weak production systems. Under this strategy, access to the foreign currency market should be promoted.
	4. Development of a resilient production system	Production	The target products are vulnerable to climate change and international market prices. The challenge is to build resilient production systems to minimize the impact of external factors. Under this strategy, a resilient production system should be developed.

Note *1: The value chain shows the chains shown in Table 11-42.

Source: JICA Study Team

2) Programs/Projects

Based on the four strategies, it is proposed that the 10 programs/projects shown in Table 11-44 be implemented for the next ten years.

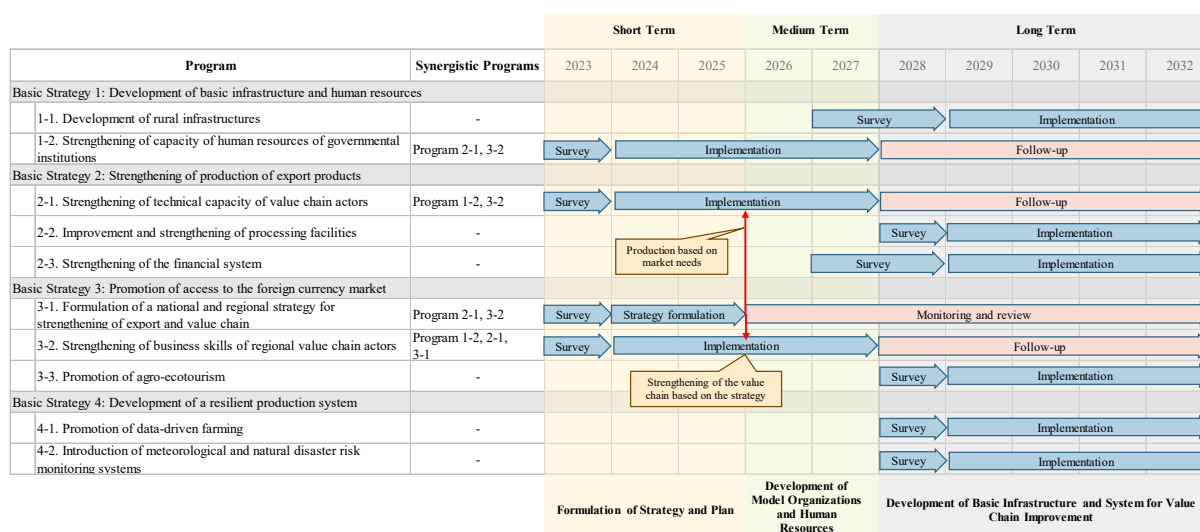
Table 11-44 Development Program/Project in Cuba for the Next Ten Years

Target	Strategy	Program/Project	Term*1
Agricultural value chain development, Cuba	1. Development of basic infrastructure and human resources	1-1 Development of rural infrastructures	Long term
		1-2 Strengthening of capacity of human resources of governmental institutions	Medium term
	2. Strengthening of production of export products	2-1 Strengthening of technical capacity of value chain actors	Medium term
		2-2 Improvement and strengthening of processing facilities	Long term
		2-3 Strengthening of the financial system	Long term
	3. Promotion of access to the foreign currency market	3-1 Formulation of a national export strategy	Short term
		3-2 Strengthening of business skills of regional value chain actors	Medium term
		3-3 Promotion of agro-ecotourism	Long term
	4. Development of a resilient production system	4-1 Promotion of data-driven farming	Long term
		4-2 Introduction of meteorological and natural disaster risk monitoring systems	Long term

Note*1: Short term: 2023 to 2025, Medium term: 2023 to 2027, Long term: 2023 to 2032

Source: JICA Study Team

A roadmap of the programs/projects is proposed, as shown in Figure 11-73, taking into account their synergistic.



Source: JICA Study Team

Figure 11-73 Roadmap for Agricultural Value Chain Development in Cuba

In Cuba, as in Nicaragua, it is proposed that the programs/projects related to strategy formulation and human resource/organizational development, which can be implemented with relatively small inputs, shall be implemented in the short to medium term. In the long term, it is essential to implement the programs/projects that require more inputs, such as infrastructure development and strengthening of the financial system, and to establish a system to improve the value chain sustainably by the developed models.

3) JICA's Cooperation Scenario

Prioritized programs/projects are selected based on the criteria presented in Table 11-45.

Table 11-45 Selection Criteria of Prioritized Program/Project in Cuba

Criteria	Contents
(1) Consistency with the development strategy of the Government of Japan	The Government of Japan has contributed to Cuba's sustainable development by supporting rice production and various crops to improve productivity.
(2) Consistency with the JICA's global agenda	JICA has promoted developing an inclusive food value chain and market-oriented agriculture to improve the small-scale producers' income and stimulate the rural economy.
(3) An applicable modality in Cuba	It is difficult to apply for loan and grant aid projects in short and medium terms in Cuba.
(4) Effective utilization of the outputs of the previous projects implemented by JICA	The outputs through the previous projects in Cuba implemented by JICA should be utilized effectively.

Source: JICA Study Team

Based on the criteria, the prioritized projects/programs are selected, as shown in Table 11-46.

Table 11-46 Prioritized Programs/Projects in Cuba

Strategy	Program/Project	Modality	Term	Implementation Agency
1. Development of basic infrastructure and human resources	1-2 Strengthening of capacity of human resources of governmental institutions	- Technical cooperation - Training in Japan or third countries	Medium term	MINAG, GAF, GAG

Strategy	Program/Project	Modality	Term	Implementation Agency
2. Strengthening of production of export products	2-1 Strengthening of technical capacity of value chain actors	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries 	Medium term	MINAG, GAF, GAG
3. Promotion of access to the foreign currency market	3-1 Formulation of a national export strategy	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries 	Short term	MINAG, GAF, GAG
	3-2 Strengthening of business skills of regional value chain actors	<ul style="list-style-type: none"> - Technical cooperation - Training in Japan or third countries 	Medium term	MINAG, GAF, GAG
4. Development of a resilient production system	4-1 Promotion of data-driven farming	<ul style="list-style-type: none"> - Technical cooperation - Public-private partnership 	Long term	MINAG, GAF, GAG

Source: JICA Study Team

Based on JICA's global agenda and its assets, it is expected that the agency focuses its support on the programs/projects related to Strategy 3. In the short term, it is crucial to support the development of export strategies to access foreign currency markets. In the medium term, support is needed to strengthen the production capacity of value chain actors and business skills by the initiative of SOEs under MINAG, as well as the capacity of government officers to improve the production of export products and access the foreign currency market. In the long term, JICA is expected to support introducing innovative technologies to build a resilient production system and promote data-driven agriculture through utilizing outputs of agricultural DX in neighboring countries.

Table 11-47 shows proposed projects in the short and medium term based on the synergetic effects of the programs/projects presented in Figure 11-73 and Table 11-46.

Table 11-47 Proposed Project for Agricultural Value Chain Development in Cuba

Project	Outline
Project for Strengthening of Agribusiness (Program 1-2, 2-1, 3-2) Priority: Priority Project (A)	<p>(1) Purpose Access to the foreign market of value chain actors is improved.</p> <p>(2) Expected Output</p> <ul style="list-style-type: none"> - Strategies are developed to strengthen regional exports and the value chain. - The business skill of value chain actors is strengthened. - An action plan to strengthen the regional value chain is formulated. <p>(3) Activity</p> <ul style="list-style-type: none"> - To support developing strategies to strengthen regional exports and the value chain - To support value chain actors in identifying challenges for strengthening their business skills and developing action plans, including plans for diversifying processed products - To support value chain actors in strengthening business skills - To support MINAG in preparing an action plan to strengthen the regional value chain <p>(4) Implementation Agency MINAG, GAG, GAF</p> <p>(5) Collaboration Agency State-owned enterprises under GAG and GAF</p> <p>(6) Input from the Japanese Side</p> <ol style="list-style-type: none"> 1) Dispatch of experts <ul style="list-style-type: none"> - Team Leader / Agriculture Value Chain - Marketing - Business Operation - Cultivation 2) Necessary equipment 3) Provision of counterpart training (training in Japan and/or third countries)

Project	Outline
	4) Operation cost (9) Input from the Cuban Side 1) Assignment of counterpart personnel 2) Project office space 3) Operation cost (10) Project Implementation Period From 2023 to 2027 (five years)

Source: JICA Study Team

As indicated in the above table, it is proposed to implement one project in the short to medium term. With the objective of facilitating access to the foreign currency markets, the project supports identifying and clarifying the roles of regional value chain actors and developing a strategy. Subsequently, based on the developed strategy, the project strengthens the business skills and production systems of value chain actors, including developing a variety of processed products based on market needs. It also assists MINAG in developing an action plan to disseminate the project's outputs to strengthen the regional value chain. The following points should be noted for the implementation:

- Not only SOEs under MINAG, but also those under MINAL have received the license of import/export, have procured raw materials, and exported them. In addition, some agricultural cooperatives in the region have similar processed products. Therefore, it is essential for the project to review these activities of value chain actors and formulate a strategy to avoid the duplication of the actors and strengthen the relationship of the value chain actors.
- It is important to use training in Japan and third countries effectively in the project to promote a change in awareness of the importance of fostering regional specialty products and developing a variety of products from one product. This mindset change enables value chain actors to develop local special products and new processed products that require less input, are based on the self-sufficiency plan, and promote further independence of the actors.

11.3.3 Guatemala (Agriculture Digital Transformation)

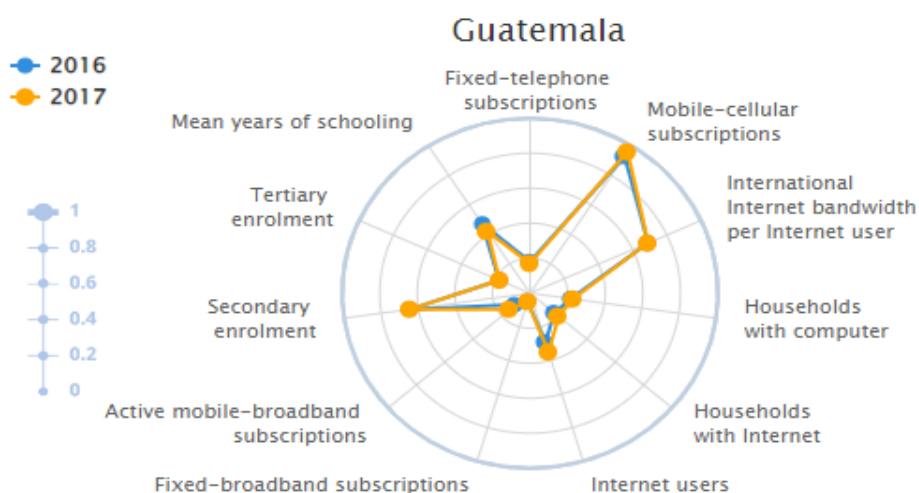
(1) Overview of Agriculture Digital Transformation

1) Potential Use of Digital Technology

a) ICT Usage Environment

In order to understand the current status of digital agriculture in Guatemala, we surveyed the ICT environment and user usage in the country as a reference.

In the 2017 IDI published by the ITU, shown in Figure 11-8. Guatemala has an index of 3.4, well below the regional average, and ranking 31/35 in the region and 125/176 in the world. Analyzing each of the 11 indicators in the IDI 2017 (Figure 11-74), the index on cell phone use is 0.93. While it can be confirmed that cell phones are widely used, the indicator for the use of broadband for data communication via mobile communication is low at 0.14, indicating that cell phones are mainly used for voice communication. Fixed broadband usage was also low at 0.05.



Source: ITU (2017)

Figure 11-74 ICT Development Index for Guatemala

b) Access to ICT in Agricultural Households

According to the latest census, the most popular ICT devices in households are cell phones (82%) and televisions (70.5%). However, the disparity in access to these technologies between agricultural and nonagricultural households is as high as for other ICTs, ranging from 15 to 30 percentage points. The percentage of households with internet access was 17.3%, compared to 3% among agricultural households. The percentage of households with at least one personal computer was 21.3%, while the figure for agricultural households was 5.3% (Table 11-48).³⁹

³⁹ INE 2018

Table 11-48 ICT Devices Prevalent in Agricultural and Non-agricultural Households

Equipamiento TIC	Nacional	Agropecuario	No agropecuario
Radio	65,3	55,0	70,0
Televisor	70,5	48,5	80,4
Computadora	21,3	5,3	28,4
Internet	17,3	3,0	23,6
Celular	82,0	68,6	88,0

Fuente: elaboración propia con datos del XII Censo de Población 2018 (INE, 2018).

Source: ITU (2017)

c) Digital Literacy in the Agricultural Sector

Guatemala has one of the highest digital illiteracy rates among Central American countries; approximately 18.5% of the population over the age of seven, or one in five, is digitally illiterate. Although the statistics do not reveal it, it is assumed that the percentage of digital illiterates would be even worse if we focus on rural agricultural workers and indigenous peoples.

On the other hand, in the use of cell phones, the most widespread ICT in the country, 51% of illiterate people also use cell phones and half of them have access to ICT technology. Among the digitally illiterate people who use cell phones, a lower percentage use computers and the Internet. (Table 11-49).

Table 11-49 Percentage of Illiterate People using ICT Tools (%)

ICT Tools	Literate Person	Illiterate Person
Portable terminal	86.7	51.1
Computer	31.3	0.5
Internet	44.9	2.6

Source: INE, 2018

d) Mobile Coverage and 5G Technology

Guatemala was the first country in Central America to launch 5G services through the country's main telecom operators, Tigo (Millicom) and Claro (America Móvil). However, its coverage is still in the development stage with limited areas of use, such as in Guatemala City, the capital of Guatemala (Figure 11-75). The main cities and main routes in the whole country are almost covered by the cellular network but the mountainous areas away from the cities and routes are not covered. Starlink, which provides satellite internet access, is also not providing service.⁴⁰

⁴⁰ ITU-2021, Digital Development Dashboard Guatemala: <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

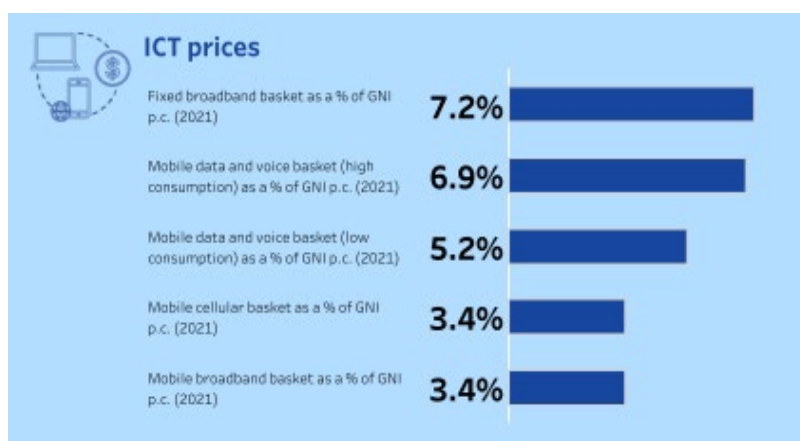


Source: NPER Web Site

Figure 11-75 Mobile Coverage

e) Broadband Service Pricing

The UN Sustainable Broadband Commission has set a target price for broadband services of less than 2% of the GNI per capita per month. The ITU reports that broadband prices in Guatemala in 2021 are 7.2% fixed broadband and 3.4% mobile broadband per capita GNI monthly, with high price barriers for users.^{41,42}



Source: ITU (2021)

Figure 11-76 Rates for Access to 3G/4G Networks in Guatemala

2) Main Initiatives Related to ICT and Agriculture in Guatemala

a) Policy and Plan

Table 11-50 shows the results of the survey on Guatemala's national policies and plans for ICT and agriculture. Although no guiding documents have been identified to promote digital agriculture in Guatemala, several projects shown in Table 11-51 are being implemented by the public and private

⁴¹ ITU-2021, The affordability of ICT services 2021: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2021/ITU_A4AI_Price_Brief_2021.pdf

⁴² ITU-2021, Digital Development Dashboard Guatemala: <https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx>

sectors as well as international organizations and NGOs to promote the use of digital technology in the agricultural sector.

Table 11-50 Summary of Policies and Plans Related to ICT and Agriculture

Policies and Plans	Summary
National Development Policy "K'atun, Nuestra Guatemala 2032". ⁴³	Strategic guidelines for state institutions are developed according to long-term national development interests and priorities.
Digital Nation Agenda 2017 ⁴⁴	It provides equipment and systematic solutions in five lines of action defined in the National Development Policy, thereby covering various measures to reduce the digital divide that exists in the country.
National Plan for Agriculture and Livestock Production: ⁴⁵	It includes a agricultural plan of national character for the period of 2016-2020, formulated to create, promote, and strengthen infrastructure and projects that will allow agricultural and livestock workers to easily market their produce.
National Plan for Innovation and Development ⁴⁶	It sets forth the vision of the Office of the President from 2020 to 2024 and is formulated with the goal of the government to reduce the vulnerability of the population and their livelihoods to the risk of disasters and catastrophes, especially through coordinated actions with local governments and communities.

Source: JICA Study team

Table 11-51 Projects to Promote Digital Agriculture

Project	Summary
ChispaRutal.gt	FAO, together with MAGA, Ministry of Labor and Welfare (MINTRAB), and Ministry of Economy (MINECO), developed a platform that provides specialized services for business capacity strengthening and development for rural entrepreneurs. ⁴⁷
APP MAGA	Ministry of Agriculture and Pastoral Food (MAGA) developed the platform in cooperation with Taiwan. Prices of agricultural, livestock, and fishery products under the supervision of MAGA are monitored and this information is accessible to agricultural workers in the country.
SIGIE	MAGA, in collaboration with the EU, launched the System for Import and Export Management (SIGIE) to improve the efficiency of application, authorization, and licensure procedures. With this system, applications for and issuance of plant and animal quarantine permits, import permits, and export certificates can now be processed electronically. ⁴⁸
SINAT-GT	MAGA is developing SINAT-GT, a platform for traceability of livestock products (beef cattle and poultry). ⁴⁹
Digitagro	Developed as part of the support provided by the World Bank's Agriculture and Food Global Practice to the Guatemalan agricultural sector during the pandemic to improve access to school feeding programs for small-scale agricultural entrepreneurs. ⁵⁰

Source: JICA Study team

b) Status of Digital Technology Adoption in the Agricultural Value Chain

In Guatemala, COVID-19 has accelerated the use of various digital technologies in the agricultural sector. In particular, given that one of the largest growth sectors in COVID-19 is food-related industries, the increase in productivity through digitalization is a major innovation opportunity for the agricultural sector, especially for export crops such as cocoa and coffee, where cell phone for agriculture applications, among others, are being introduced. Table 11-52 is a list of representative efforts:

⁴³ https://sital.iiep.unesco.org/sites/default/files/sit_accion_files/sital_guatemala_0755.pdf

⁴⁴ <http://a4ai.org/wp-content/uploads/2017/11/PRESENTACIoN-Raul-Solares-SUT-NACIoN-DIGITAL-22-11.207.pdf>

⁴⁵ [https://www.maga.gob.gt/download/granplanagro\(2\).pdf](https://www.maga.gob.gt/download/granplanagro(2).pdf)

⁴⁶ https://vamosguatemala.com/wp-content/uploads/2019/03/Alejandro_Giammattei_Plan_Nacional_de_Innovacion_y_Desarrollo.pdf

⁴⁷ <https://www.chisparural.gt/>

⁴⁸ <https://sigie.maga.gob.gt/>

⁴⁹ https://visar.maga.gob.gt/?page_id=14074

⁵⁰ World Bank-2018, DIGITAGRO - Invertir en Tecnología Digital para Aumentar el Acceso al Mercado de las Mujeres Agroempresarias en Guatemala:<https://documentos.bancomundial.org/es/publication/documents-reports/documentdetail/099658107212218638/idu0ed8f13cd06373042d00973b06788b30b98a8>

Table 11-52 Typical Digital Technology Applications

Case	Summary
Cacao Móvil	An advisory tool developed by Lutheran World Relief. In addition to tutorials, the company offers cost management tools, flavor maps, and crop calendar functions under the new AG Móvil brand. Also available in El Salvador, Nicaragua, Honduras, Ecuador, and Peru.
Coffee Cloud	ANACAFÉ and ICAFÉ developed an alert service for coffee pest, disease management, and weather. Available in El Salvador, Honduras, and Costa Rica in addition to Guatemala.
Café Chajulense	A product developed by Farmforce that is oriented towards the digitization of authentication and traceability records. The main target is coffee cooperatives.

Source: JICA Study Team

In addition, Table 11-53 shows the digital tools used in the Guatemalan agricultural sector that were identified during this study.

Table 11-53 Digital Tools Used in Guatemala's Agricultural Sector

Classification	Name	Development & Operation	Category
Provision of information on market prices of agricultural products, weather information (alerts), cultivation management, etc.	MAGA	MAGA	Digital Advisory
	SIMEVI	MAG/JICA	Digital Advisory
	Agrapp	Agrapp	Digital Advisory
	Cultila	Smartdici	Digital Advisory
	Tappedia	TAP/FAO	Digital Advisory
	Biofort,	IICA	Digital Advisory
	TECA	FAO	Digital Advisory
	Agriperfiles	IICA	Digital Advisory
	Yara Farm Weather	YARA	Digital Advisory
	Cacao Móvil	Lutheran World Relief	Digital Advisory
	Precios de café	Anacafé	Digital Advisory
	Producer Training	Rainforest Alliance	Digital Advisory
	Coffee Cloud	Anacafé	Digital Advisory
Procagica	IICA	SmartFarming	
Provision of agricultural management support from both production and management perspectives	SofOS Smart Agroindustria	SoFOS	Digital Advisory
	SI3	MAGA	Procedural Platforms
	Agritask	Agritask	Digital Advisory
	Farm Force	Syngenta	Digital Advisory
	InstaCrops	InstaCrops	SmartFarming
	AgritecGEO	Disagro	SmartFarming
	YARA CheckIT	YARA	Digital Advisory
	Mejor suelo, Mejor café	Anacafé	Digital Advisory
Platform for inter-organizational cooperation promoted by MAGA, MINTRAB and MINECO	Chispa Rural GT	FAO/IICA/MAGA	Digital Advisory
Platform designed to support import/export transactions	SIGIE	MAGA	Procedural Platforms
	VUDI	MAGA	Procedural Platforms
	VUPE	AGEXPORT	Digital Advisory
	Asociación Chajulense	FARMFORCE	Digital procurement
	Digital Origination	Olam International	Digital procurement
	OFIS	Olam International	Digital procurement
	Olam Traceability	Olam International	Digital procurement
	Digitagro	World Bank/MINECO	Agri e-Commerce
Initiatives to promote financial inclusion of small producers	AgroLAC	IDB	DFS
	Plataforma Safe	Hivos NGO	DFS
	IFAD	IFAD	TBD
	Tigo Money	Millicom	DFS
	Akisi	Pronet	DFS

Source: JICA Study Team

3) Major Issues on the Adoption of Digital Agriculture in Guatemala

The results of an online survey conducted by the Guatemalan government to develop a digital agenda for the agriculture and agro-industry sector summarized the main issues perceived by primary producers and micro, small, and medium-sized enterprises (MSMEs) in the agro-industry sector. It is noted that the questionnaire targeted agricultural producers and agro-industrial MSME entrepreneurs, as well as key stakeholders in the government, academic, information technology, and financial services sectors.⁵¹

The major issues to agricultural activities that producers report is the transportation of agricultural products, followed by the lack of employment opportunities, food shortages, and climatic conditions, as presented in Figure 11-77.

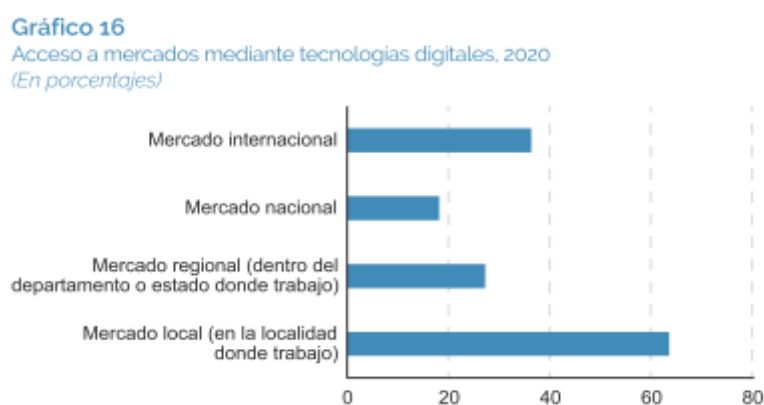


Fuente: cuestionario a productores.

Source: ECLAC, 2020

Figure 11-77 Major Issues in Agricultural Production Activities

In addition, about 63% of producers indicated that they use social networks to access local markets to sell their produce in order to promote their production activities (Figure 11-78).



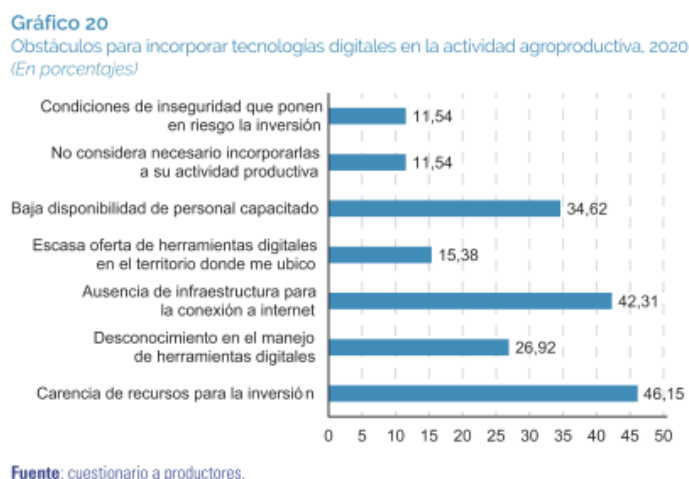
Fuente: cuestionario a productores.

Source: ECLAC, 2020

Figure 11-78 Accessing the Market Digitally

⁵¹ ECLAC-2021, Análisis de las políticas públicas e iniciativas privadas que apoyan el uso de las tecnologías digitales en las mipymes agrícolas y agroindustriales en Guatemala: https://repositorio.cepal.org/bitstream/handle/11362/46947/1/S2100260_es.pdf

It is noted that no research was conducted on production or distribution, including drone use, precision agriculture, automation, GPS-based machine navigation, and blockchain utilization. However, the results show that more than half of the users recognize the importance of ICT for the management and competitiveness of producers and businesses. At the same time, the challenges in the use of ICT reported by the producers were identified as a lack of resources to invest in ICT (46.1%), followed by a lack of infrastructure for internet access (42.3%). In the area of capacity building, 17% cited lack of knowledge about the use of digital technology as another constraint.



Source: ECLAC,2020

Figure 11-79 Issues in ICT Utilization

4) Summary of Issues and Hypotheses

The survey revealed that Guatemalan agricultural producers are still in the developmental stage of ICT use, and although cell phone ownership is high due to high prices, service coverage, and digital literacy, most of them use cell phones only for voice communication, and the percentage of those using broadband services remains low. The study also confirmed that it is difficult to promote digital agriculture through private sector efforts alone, as there are significant cost barriers to smart agriculture that incorporates high-tech technologies such as IoT technology. On the other hand, agricultural producers have the advantage that they tend to be members of cooperatives and other production organizations. Targeting such cooperatives with high agricultural productivity, rather than individual producers, whose large number of households makes it difficult to respond to individual needs, will effectively promote the spread of digital agriculture. In particular, the introduction of a comprehensive platform to ease the cost burden on producers and intermediaries for the distribution of agricultural products will enable the creation of a database for agricultural product transaction information (quantity and value), as well as the issuance of electronic receipts and other previously unregulated informal market access to the formal market. This will lead to improved incentives for producers.

Providing information widely to producers affected by climate change, which has become an issue in recent years, would also be effective. According to the UNFCCC Second Country Report, smallholder producers in Guatemala are the most vulnerable to climate change, losing an average of 55% of their production due to droughts and floods. Therefore, there is also a need to support the provision of

inexpensive and accessible information aimed at minimizing damage from natural disasters and increasing resilience to climate change through access to meteorological satellite data and accurate data analysis.⁵²

In addition to advisory technologies that use digital technologies to ensure appropriate use of natural resources and mitigate the impacts of climate change, it is also important to stimulate financial markets in building sustainable food value chains. Access to short-term funds for procurement of inputs essential for agricultural production and long-term funds for various infrastructure development is an important factor in providing producers with the financial stability they need to become more resilient to climate change. For this purpose, it is important to utilize digital technology and to use data on producers' production status and social and economic activities. The construction of creditworthiness based on data on producers' production status and social and economic activities is effective.

While taking the above situation into consideration, the JICA Study Team is targeting agricultural cooperatives and small- and medium-sized agricultural enterprises to develop climate resilience. The following digital technologies are considered to be effective for building climate resilient food value chain.

Table 11-54 Hypotheses on the Applicability of Digital Technology

Intended users of digital services	Stakeholders on agricultural value chain (e.g., agricultural associations, small and medium agricultural enterprises, transporters, financial institutions, sellers, and consumers)
Hypotheses about the services to be provided	It is effective to provide broadband services to producer groups, etc., and to introduce easy-to-use communication services that will enable future IoT infrastructure and field management, etc.
	Advisory services for producers, such as obtaining information on appropriate crop and harvesting seasons based on weather information and various data in light of weather fluctuations, would be effective. Also, shipping support services that enable stockpiling and shipping based on market conditions are also effective.
	It is effective to create an agri e-commerce infrastructure that will enable various organizations to enter the formal market by acquiring sales channels for sellers and building a foundation for cooperation with the transporter network (securing transport vehicles, matching deliveries, etc.).
	Digital agriculture insurance promotion and crowdfunding from government and private sources, as well as digital agriculture financial services that facilitate long- and short-term financing would be effective.

Source: JICA Study Team

(2) Discussions with the Government of Guatemala

1) Meetings and Discussions

Discussions were held with the MAGA of Guatemala to discuss the digitalization of the agricultural value chain in Guatemala. During the exchange of opinions, in addition to introducing JICA's efforts in agricultural DX, a request has been made for a summary of MAGA's needs and other information for the planning of a future cooperation menu.

⁵² MARN- 2016, Segunda Comunicación Nacional sobre Cambio Climático Guatemala: <https://unfccc.int/sites/default/files/resource/gtmnc2.pdf>.

Table 11-55 Participants in the Discussion Meeting (November 24, 2022, Online Meeting, JICA Office)

Name	Department (MAGA)	Position
Henry Stuardo Ortiz	Difropoco/MAGA	Director
Fernando de León	Difropoco	Field Technician
Humberto Tejada	Difropoco	Field Technician
Other staff	MAGA	-
Ichizuru Ishimoto	JST	Team Leader
Michinori Yoshino	JST	Team Member
Kazushi Endo	JST	Team Member
Manuel Garcia R.	JST/Monitec	Coordinator

Source: JICA Study Team

Table 11-56 Participants in the Discussion Meeting (November 25, 2022, Interviews, MAGA Conference Room)

Name	Department (MAGA)	Position
Henry Stuardo Ortiz	Difropoco	Director
Nidia Escobar	Direpro	Director
Sabrina Posadas	DDA (Dir. De Desarrollo Agrícola)	In charge of Planning
Ignacio Donis Melgar	Diprodu.	Project Technician
Sara Garcia	DDA (Basin Areas)	Professional
Estuardo Dubon	DDA (Horticulture)	Planning
Alex Sarael Montenegro	DDA (Difruta)	Manager
Humberto Tejada	Difropoco	Field Technician
Ichizuru Ishimoto	JST	Team Leader
Manuel Garcia R.	JST/Monitec	Coordinator

Source: JICA Study Team

Propuesta de Modelo Agropecuario para la Transformación Digital

La digitalización de la cadena de valor alimentaria puede contribuir a mejorar los ingresos de los agricultores y el proyecto piloto dará el primer paso hacia esta visión del futuro.



Source: MAGA

Figure 11-80 Organization and Role of MAGA

2) Proposed project from MAGA

Three projects were proposed by MAGA to promote agricultural DX. The projects are outlined below.

Table 11-57 MAGA Proposed Project (1): Information Platform for Accessing Agricultural Markets Information Platform

Objectives	Implementation of a digital platform that collects, processes, and provides producers with market information that provides them with knowledge of national, regional, and international market conditions to assist them in making decisions to plan the production of agricultural, livestock, and fishery products.
Stakeholders	Producer associations (250), MAGA, and related associations (coordinate logistics and execution and monitoring of agricultural production)
Target Area	Whole country of Guatemala
Component	<ol style="list-style-type: none"> 1. Project planning (funding, schedule, structure, etc.) 2. IT Consulting 3. Acquisition of computer equipment, software, licenses, etc. 4. Training plan development <ol style="list-style-type: none"> a) Technical assistance on the use of information platforms b) Afforestation, production, and commercialization of agricultural, livestock, and fishery products at the national level c) Regional, national, and international marketing of the country's agricultural and livestock products and outputs
Expected Outputs	<ul style="list-style-type: none"> - [Social] To raise awareness about the use of new technologies for agricultural production, thereby eradicating hunger and poverty and improving the quality of life in the community. - [Economic] Through the implementation of the project by the community, the project will generate employment and income throughout the year, stimulating the economy of the community and the municipality. - [Workforce] Create direct employment for communities that lack education, training, and access to stable jobs. - [Culture] Provide opportunities to share knowledge about environmental conservation, respect people's customs and traditions, and create a climate of unity and cooperation among residents. - [Environment] It promotes the conservation of natural resources and contributes to improving ecosystems, reducing the use of pesticides, controlling production, and minimizing water consumption through irrigation systems.

Source: MAGA

Table 11-58 MAGA Proposed Project (2): Implementation of Production Support (Smart Agriculture) and Advisory System

Objectives	Application of digital or precision agriculture technology to agricultural development in the village of El Ovejero, El Progreso, Jutiapa, and in the influential Quetzaltenango of FUTAGRU. Precision agriculture models provide information on farmland, land, and climate, in addition to tools such as sensors, drones, and satellite imagery to provide data that experts can use to assist growers in decision-making.
Stakeholders	Engineers, extension agents, and producers of the General Directorate of Agricultural Development
Target Areat	El Ovejero, El Progreso, Jutiapa (50 ha of new land to be developed) Quetzaltenango (vegetable production on existing farmland)
Component	<ol style="list-style-type: none"> 1. Stakeholder training 2. Mapping 3. Digital technology design and implementation 4. Equipment procurement (weather observation equipment and drones) 5. Irrigation facilities (irrigation tunnels) development 6. Crop management planning 7. Various training programs (e.g., productivity indexing, cost and financial analysis, etc.)
Expected Outputs	<ul style="list-style-type: none"> - Application of precision technology in the production of basic grains, vegetables, and fruit trees within the project's sphere of influence - Horizontal development of pilot projects - Strengthening of digital technology capacities of fruit, vegetable, and basic grain producers within the project's sphere of influence - Improvement of the competitiveness of producer organizations by increasing productivity of basic grains, vegetables, and fruit trees - Marketing support that secures the market

Source: MAGA

Table 11-59 MAGA Proposed Project (3): Disaster Preparedness Insurance for Small Producers

Objectives	Increase resilience to catastrophic climate change that threatens business activities and reduces productivity.
Stakeholders	Agricultural sector workers, insurance providers, and citizens of El Progreso
Target Areat	El Progreso, Jutiapa
Component	1. Remotely monitorable technology platform development 2. Maintenance, evaluation and analysis of insurance applications
Expected Outputs	- Stabilization of the economy and enhancement of its competitiveness - Contribution to food safety

Source: MAGA

3) Seminars for the Introduction of Agricultural DX

In the Central American region, small producers play an important role and a limited number of extension agents must provide technical guidance to these producers. Therefore, there is a need to implement tools that will enable a limited number of extension workers to provide a wide range of technical guidance. In light of this situation, an online seminar was held to introduce CropScope, a farm management application developed by a Japanese company (NEC), to government officials in Mexico and Guatemala, as shown in the table below.

Table 11-60 Summary of CropScope Introduction Seminar

Item	Target Country	
	Mexico	Guatemala
Date	December 6, 2022	December 5, 2022
Method	Online meeting tool (Zoom)	
Participant	National Institute of Agro-Forestry (INIFAP), JICA, NEC, JICA Study Team	Strengthening production organization and marketing (DIFOPROCO), JICA, NEC, JICA Study Team
Program	Program	Responsible
	Opening address	JICA survey team
	CropScope Overview Introduction	NEC
	Introduction of major crops in the target countries	INIFAP/DIFOPROCO
	Introduction to CropScope Features	NEC
	Exchange of opinions	All participants
Closing address	JICA survey team	

Source: JICA Study Team

Table 11-61 Participants in the CropScope Introductory Seminar

No.	Name	Organiation	Position
1	Ing. Henry Stuardo Ortiz Paiz	Jefe Comercio y Mercadeo	DIFOPROCO Central
2	Ing. José Gerardo Méndez G.	Jefe Organización	DIFOPROCO Central
3	Ing. Fernando de León	Profesional de Campo	Quetzaltenango, San Marcos, Quiché, Sololá y Totonicapán
4	Ing. Humberto Tejada	Profesional de Campo	Nacional
5	Ing. Lester Muñoz	Profesional de Campo	Guatemala y Escuintla
6	Ing. Douglas Galicia	Profesional de Campo	Huehuetenango
7	Lic. Víctor Hugo Alvarado	Técnico de Campo	Alta y Baja Verapaz
8	Licda. Lisbeth Ruiz	Técnico de Campo	Oriente El Progreso
9	Señor Frody Gómez	Técnico de Campo	El Progreso y Jalapa
10	Señor José Medardo	Técnico de Campo	Oriente Santa Rosa
11	Lic. Fredy Caal	Técnico de Campo	Oriente Jutiapa
12	Señor German Muy	Técnico de Campo	Sololá
13	Dayana Bal	Técnico de Campo	Sacatepéquez
14	Señor Samuel Lorenzo	Productor	ASODICC
15	Señora Rosario Sacuj	Administradora	Coop San Miguel Las Canoas
16	Ing. Armando Hernández	Gerente.	ANAPDE
17	David Roquel	Técnico de Campo	Chimaltenango

No.	Name	Organiation	Position
18	Armando Morales	Técnico Agrícola	ANAPDERCH
19	Julio Castro	Técnico Agrícola	Nacional
20	Irma Esperanza Balsells	Profesional de Campo	Nacional

Source: JICA Study Team

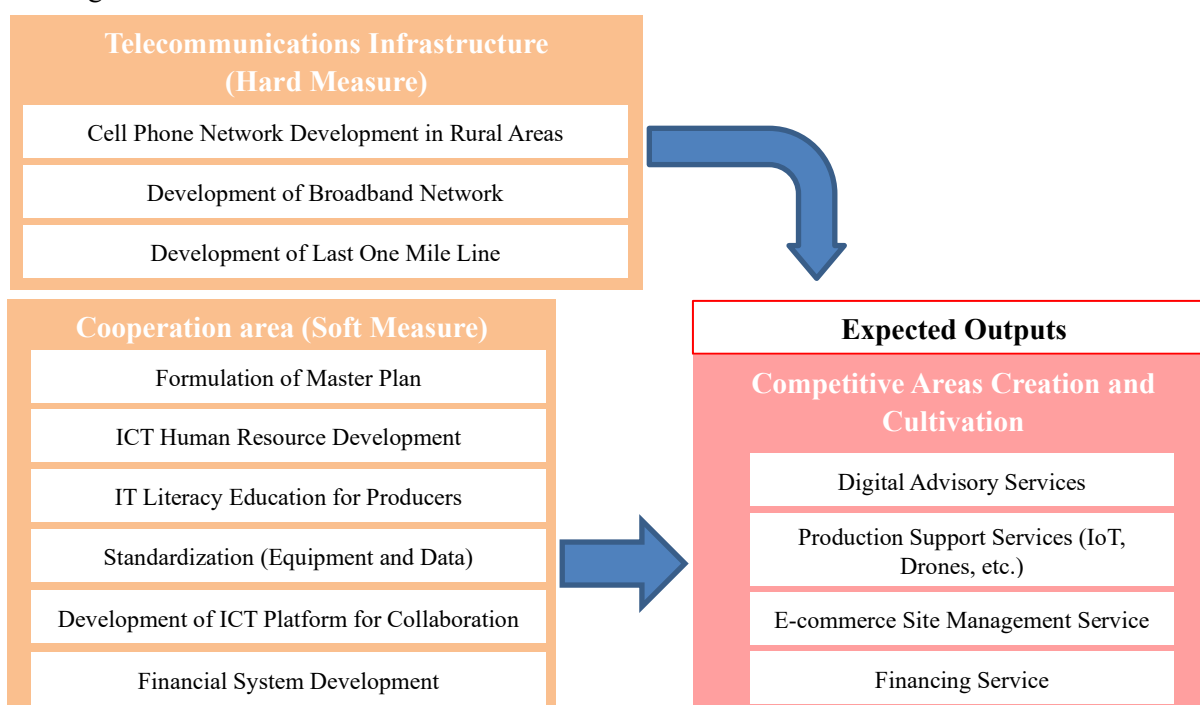
(3) Development and Cooperation Scenarios for Information and Communication (DX)

Based on Guatemala's current challenges and cooperation needs, development scenarios and proposed cooperation scenarios are organized as follows:

1) Development Scenario

As indicated in the previous section, in addition to the organization of producers in the country of Guatemala, in recent years, the use of digital services, such as the use of advisory services for coffee and other export crops, has been increasing. On the other hand, communication infrastructure, such as mobile communication networks, is weak and needs to be improved in order to provide services. It is also necessary to develop a platform that will lead to the visualization of informal transactions on agricultural value chain.

In order to develop various services related to agriculture in Guatemala in the future, it is necessary for the government to develop a communications infrastructure, such as high-capacity communications for the last mile to production organizations and low-power radio for IoT devices, while building a collaborative infrastructure for human resource development and data distribution as a cooperative area and a competitive area. The creation and fostering of private-sector services and the utilization of existing services are considered essential.



Source: JICA Study Team

Figure 11-81 Development Scenario

In order to materialize DX promotion in Guatemala's agricultural sector, it is essential to develop hardware, such as information and communication infrastructure, in addition to software development, such as human resource development, education, and introduction of various services. However, the development of telecommunications networks by the government and private telecommunications companies cannot be done in a short period of time. Currently, cell phone services are mainly provided along major routes connecting cities and towns in Guatemala, but rural areas are not covered by 4G and 5G lines that enable high-capacity communications.

Therefore, a realistic approach to promoting agricultural DX production support is to start with urban and suburban areas where large-capacity communications can be easily secured, and then expand to rural areas in stages. In parallel with the development of the communication network, it is also important to create a master plan for the introduction and dissemination of agricultural DX and to promote DX in a systematic manner. In particular, the establishment of a collaborative infrastructure system, which is a collaborative area between industry, government, and academia, standardization of data and collaborative protocols, and support systems in the short term are expected to activate various private sector services. In order to create a virtuous cycle of such infrastructure development and service creation by the private sector, it is recommended that DX in agriculture will be promoted by utilizing pilot projects that employ existing start-ups, and by creating many good examples. Based on the above, the programs/projects are proposed, as presented in Table 11-62.

Table 11-62 Implementation Schedule of Proposed Program/Project

Program/Project	Short term			Medium-term			Long term
	2023	2024	2025	2026	2027	2028	After 2029
Development of communication infrastructure (hard measure)							
- Cell Phone Network Development in Rural Area	Expansion from urban to rural areas						
- Development of Last One Mile Line							
- Development of Broadband Network							
Development of cooperative areas (soft measure)							
- Creation of a master plan for introduction and dissemination	Creation of various private services in competitive areas						
- ICT human resource development (service provider side)							
- IT literacy education for producers							
- Development of ICT Platform for Collaboration (information system)							
- Standardization of equipment and data (data, protocols, etc.)							
- Financial System Design							
- Pilot project (including start-up support, etc.)							

Source: JICA Study Team

2) Proposed Cooperation Scenario

Based on the above development scenario, it is proposed that the projects shown in Table 11-63 be implemented by JICA.

Table 11-63 Proposed Projects for Agricultural Digital Transformation in Guatemala

Item	Contents
1. Project to improve administrative management capacity for agricultural DX adoption and dissemination	
Priority	Possible Project (C)
Modality	Technical Cooperation
Objective	Necessary measures and actions are identified and the capacity of MAGA government officials in agricultural DX is improved through the formulation of a master plan.
Expected Outputs	1) Strategies and plans are developed to promote agricultural DX. 2) Hardware requirements (information and communication networks) available to the agricultural sector, and development policies are formulated. 3) Hardware requirements, including human resources and institutions, and action plans for the digitalization of the agricultural sector are developed.
Implementation Agency	MAGA
Cooperation Agency	Ministerio de Comunicaciones, Infraestructura y Vivienda (MCIV)
Target Area	Whole area of Guatemala
Implementation Period	2023 to 2025
2. Project to improve administrative management capacity for agricultural DX adoption and dissemination	
Priority	Possible Project (C)
Modality	Technical Cooperation
Objective	In parallel with the preparation of the master plan, various existing services from industry, government, and academia will be piloted, including advisory services for production support, smart agriculture, digital financial services, e-commerce, and e-procurement systems. In addition, a support system for DX introduction and dissemination will be established, including a start-up support fund and support loans for producers to introduce DX.
Expected Outputs	1) ICT human resources are trained to develop and operate digital services related to agriculture. 2) IT literacy of producers is improved. 3) A common collaborative infrastructure that can be utilized by stakeholders in agriculture is developed to improve the sophistication and efficiency of agricultural value chain. 4) Standardization of equipment and data used (including deployed linkage protocols) is promote data science and data utilization related to agriculture. 5) The economic foundation of stakeholders in agriculture is strengthened through the design of a financial system.
Implementation Agency	MAGA
Cooperation Agency	Ministerio de Comunicaciones, Infraestructura y Vivienda (MCIV)
Target Area	All of Guatemala
Implementation Period	2023 to 2027

Source: JICA Study team

11.4 Possibility of JICA's Cooperation in CARICOM

Although CARICOM is not included in the scope, the cooperation needs in CARICOM were identified through the discussion with the JICA Study Team and are presented in this section.

In CARICOM countries, the supply chain disruption caused by COVID-19 has resulted in food insecurity issues, and as of February 2022, around 2.8 million people were food insecure⁵³. Under these circumstances, the major challenge in CARICOM countries is to strengthen food security by enhancing agricultural production. In the discussion between CARICOM and the JICA Study Team, the need for

⁵³ Caribbean COVID-19 Food Security & Livelihoods Impact Survey (CARICOM, Caribbean Disaster Emergency Management Agency (CDEMA), World Food Program (WFP), February 2022)

cooperation on a study aimed at formulating a master plan to respond to the challenge was identified. The outline of the proposed study is shown in Table 11-64.

Table 11-64 Outline of the Study on Information Collection for Strengthening Food Security in CARICOM

Item	Contents
Priority	Priority Project (A)
Cooperation Modality	Dispatch of an advisor
Purpose of the Study	A master plan is formulated to strengthen food security in CARICOM countries.
Expected Output of the Study	<ol style="list-style-type: none"> 1) Necessary production amount of major agricultural products is identified to meet the demand of CARICOM countries. 2) Major challenges are identified to strengthen the production of major agricultural products. 3) Actions to address the challenge are proposed. 4) The long-term strategy and action plan to strengthen food security are formulated.
Target Country	CARICOM countries
Implementation Period	2023 to 2024 (12 months)

Source: JICA Study Team

For the implementation, it is necessary to take into account the outputs and lessons learned from the Project on Enhancement of the Efficiency of Production-Distribution Supply Chain of Fruit and Vegetable Sector (see Table 13-4) in Saint Lucia with the objective of promoting import substitution and local production for local consumption.