Saint Lucia
Ministry of Agriculture, Food Production,
Fisheries, Cooperatives and Rural Development

THE PREPARTORY SURVEY
FOR
THE PROJECT FOR IMPROVEMENT
OF FISHERY EQUIPMENT AND MACHINERY
IN
SAINT LUCIA

August 2014

Japan International Cooperation Agency

System Science Consultants Inc.

RD
JR
14-079

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to System Science Consultants Inc.

The survey team held a series of discussions with the officials concerned of the Government of Saint Lucia, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Saint Lucia for their close cooperation extended to the survey team.

August, 2014

KITANAKA Makoto
Director General,
Rural Development Department
Japan International Cooperation Agency

SUMMARY

1. Background of the Project

(1) Background of the Project Request

Fisheries products have been loved by and a source of protein to people in Saint Lucia. The average annual per capita fish consumption in 2008 ~2009 is about 19 kg. During this period, average annual fish landed volume was 1,776 tons and that of imported fish products was 1,523 tons. Accordingly it can be said that approximately 46 % of the said fish consumption has been supplemented by the imported fish products. It has been an important agenda for the Saint Lucia Government to utilize fisheries resources in the sustainable manner and to reduce the distribution losses by keeping freshness of landed fish.

Over the past 20 years, the Japanese Government has assisted in construction and improvement of major fish landing places with a purpose of improving efficiency of fisheries industry and distribution of landed fish. Currently, approximately 80 % of the country's fish catch land in these fisheries facilities and distributed throughout the country. In recent years, the functions of some of these facilities, cooling equipment/machineries in particular, are not working or deteriorating. It is an urgent problem for the Saint Lucia Government to take care of.

While improving self-sufficiency of fisheries products has been an important agenda for the government, overfishing in coastal water has been criticized. The Saint Lucia Government is under pressure to focus on proper fisheries management for the sake of sustainable utilization of marine resources. In summary, Saint Lucia's current needs in fisheries are to promote development of offshore resources to increase fisheries production and to conduct proper fisheries management for achieving sustainable utilization of marine resources, for which they need appropriate equipment.

In this context, the Saint Lucia Government compiled "The Project for Improvement of Fisheries Equipment and Machinery in Saint Lucia" and requested the grant assistance to Japan.

(2) Summary of the Requested Project

The contents of the grant aid request are summarized as follows:

a) Cooling equipment concerned: Replacement of the cooling equipment necessary for five (5) fisheries center out of ten (10) centers that were constructed by Japanese assistance in the past.
b) Introduction of the equipment for promoting activities of the Department of Fisheries such as a multi-purpose research vessel, refrigerating vehicles, submerged type Fish aggregating device (FAD), etc.

(3) Circumstances on the requested Project

1) Natural Conditions

Saint Lucia, lying between the Caribbean Sea and North Atlantic Ocean, is sublime with warm and moist northeast trade winds. The volcanic country is 42.3 km long and 22.4 km wide, the total area is about 616km^2.

In the tropical oceanic climate, Saint Lucia's temperature does not fluctuate much throughout the year: the mean temperature is 27℃. The dry season is between December and May and the rainy

season is between June and November. In August and September, the peak months of the rainy season, the precipitation of each month reaches to 200～300. During this time, hurricanes often attack the country with its wind velocity sometimes reaching 60m per second. The 10-year annual rainfall average is 1,265mm.

Although the Exclusive Economic Zone (EEZ) extends to 8,000km^2, the area of the continental shelf is rather narrow with only 176km^2. The fish stocks in the continental shelf are estimated to 1,000-2,000 tons (Canadian International Development Agency, 1984). The offshore water is believed to have abundant fish stocks as it is a migratory area of offshore large pelagic.

2) Socio-environmental Considerations

The focus of proposed project is to replace cooling equipment installed in fisheries facilities. The special considerations should be made to the following three areas:

① **Scheduling to avoid excess operational interruptions:**

The cooling equipment in daily use will have to be temporarily shut down for replacement and installation. The work should be scheduled to avoid peak fishing season and alternative ways to refrigerate marine products during the shutdown period should be arranged.

② **Identifying methods to store reusable materials and to dispose waste materials:**

The existing cooling equipment will be dismantled for replacement and installation. All parts will be sorted out by the contractor side and left by the construction site in two piles: one as reusable parts and another as waste materials. The Saint Lucia side is obliged to make decisions on where to store reusable parts and how to dispose the waste, and follow through the decisions.

③ **Ensure practices that maximize recovery and recycling of ozone-depleting substances:**

In this project, the Hydro chlorofluorocarbon (hereinafter referred to HCFC) type refrigerants in old equipment will be replaced. Safe removal of HCFC and filling them in cylinders is essential to avoid releasing them in the air.

3) Global Issues

This Project is to replace old cooling equipment which was previously installed by Japan's grant aid. We will comply with the *Montreal Protocol on Substances that Deplete the Ozone Layer* in selecting an alternative refrigerant for the replaced equipment.

The Protocol is designed to phase-out or to reduce the production and consumption of HCFC (R22 & etc.) as well as HFC (R404a & etc.) to protect the earth's fragile ozone Layer and to slow down global warming. The current international agreement is in the following areas:

*Phase-out of HCFC refrigerants to zero: Year 2020 (2030 for developing countries)

*Freeze the production and consumption of HFC: Undetermined, however, drastic reduction by 2030 (2040 for developing countries) is likely to be agreed.

In this Project, ammonia would be considered as the most realistic refrigerant of all those meets the condition above. However, final decision of refrigerant should be done by the St. Lucia side depending on the age & size of equipment, level of malfunctions and other specific conditions.

Following three options will be examined for their choice:*Convert to ammonia

* Convert to HFC (to avoid ammonia and HCFC refrigerants)

* Keep the current refrigerants (to maintain existing equipment to its mechanical life)

2. Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goal and Project Purpose

The "National Fisheries Plan 2013" describes the vision, strategies and agendas of Saint Lucia's fishery development. The vision is stated as "to promote sustainable fishery by public-private partnership to strengthen profitability and contribute to the nation's food security".

To achieve this vision, seven (7) strategies are set up as follows:

1) Institutional strengthening
2) Strengthening stakeholder input into the decision making process
3) Improving the average income of fish catchers by designed, devised and implemented by DOF
4) Fisheries management (To define, prepare, and implement evergreen integrated Fisheries Management Plan, etc.)
5) Aquaculture
6) On-shore ancillary support (Infrastructural development)
7) Marketing (Improving fish handling, efficient fish distribution, etc.)

Thereby, as a part of measures to achieve the said development strategies, the mid-term purposes of this Project are i) to keep up the function of fish distribution infrastructure of existing fisheries centers and ii) to promote proper fisheries management by providing necessary equipment for achieving sustainable use of fisheries resources.

Since the effect of improvement of distribution function that is the main contents of the Project will be shown within short time period, the target year is set as three years after the Project is completed.

(2) Outline of the Project

This Project focuses on five (5) sites among ten (10) fishery facilities which Japan has assisted in the past 20 years. In order to achieve above Project purposes, large fishery equipment (including the cooling equipment of ice machine, etc.) will be replaced and/or upgraded. Additionally, the Project will also introduce such equipment that might contribute to promoting proper fisheries management for sustainable use of fishery resources.

2-2 Overview of the Survey Results and the Project (Operational Plans/Equipment Plans)

(1) Field Survey and Preparation of the Report

- January 11 to February 23, 2014: Field survey
- May 15 to May 16, 2014: Explanation of the Draft Final Report

(2) Principles of Outline Design

The Project is targeted to the previously procured cooling equipment that needs urgent repairs. The landed fish volume remains almost the same with small fluctuations in the past 10 years. The following principles for equipment improvement will be employed:

－All the cooling equipment that has strong impact on Saint Lucia's fish distribution and needs urgent repairs is targeted.
－New equipment will keep the same capacities and functions of the existing equipment. New equipment will be also installed to the facilities which have shown significant fisheries development.
－The Freon type refrigerant will be converted by natural refrigerant such as Ammonia to observe the Montreal Protocol and to respect the Saint Lucia Government's intentions.
－When ammonia refrigerant is installed, skills and knowledge necessary for every stage of installation, test operation and full operation will be thoroughly transferred to the maintenance staff for safety and sustainable operations.

Saint Lucia has requested equipment for fisheries management since the coastal resources have been stagnated. The new equipment will be selected according to the following principles:

－Equipment to disperse fishing pressure in coastal fishing
－Equipment that induce synergy effect on this Project and the ongoing project, "the Caribbean Fisheries Co-management Project"(CARIFICO), by linking both projects

(3) Outline and Project Design

Based on the Saint Lucia Government's request, field survey and discussions with the representatives of the country, the Grant Aid is focused on improving inefficient distribution of fisheries products and to disperse excessive fishing pressure in coastal waters by:

a) Replace cooling equipment/machineries in 4 locations (Vieux Fort, Dennery, Castries and Anse La Raye) and new introduction of solar panels in Dennery and an ice plant in Gros Islet.
b) Procure vehicles for using activities of Department of Fisheries in 3 locations (Castries, Vieux Fort and Soufriere)
c) Procure submerged FAD in 2 locations (Southern and Western offshores)

The requested solar panels installation in Vieux Fort is not included in the Project because the roof structure is not sturdy enough for installation. A fisheries research vessel is not included either although there is a need for the vessel. One reason is, in accordance with the record submitted to the survey team, that the previously procured vessel (The Chadon) has not been utilized as often as expected. And another is that the team could not find out a fixed operational plan or specifics for using the new vessel.

(4) Design Summary

The following table shows the list of equipment to be procured.

List of Planned Equipment /Machineries

Site and Planned Equipment			Components	Quantity
Vieux Fort				
1-1	Refrigerating system			1 lot
	1-1-1	Ice plant		1 lot
		1-1-1-1	Compressor for Ice machine	2
		1-1-1-2	Ice machine (Plate type, 4ton/day)	2
		1-1-1-3	Evaporative condenser for Ice machine	1
		1-1-1-4	Ice storage, 7200mm(L) x 3600mm(W) x 2400mm(CH) t=100mm	1
		1-1-1-5	Control panel	2
	1-1-2	Cold storage/ Blast freezer		1 lot
		1-1-2-1	Compressor for Cold storage	1
		1-1-2-2	Compressor for Air blast	2
		1-1-2-3	Cooling unit for Cold storage at preparation room	1
		1-1-2-4	Cooling unit for Cold storage	1
		1-1-2-5	Cooling unit for Air blast	2
		1-1-2-6	Evaporative condenser for Cold storage and Blast freezer	1
		1-1-2-7	Control panel for Cold storage and Blast freezer	2
	1-1-3	Ammonium detector・Auto water sprinkler system		1 lot
1-2	5-ton refrigerated van			2 units
*1	Subsidiary works			1 lot
	*1a	Demolition and restoration of wall of facility for Ice machine		1 lot
Dennery				
2-1	Ice plant			1 lot
	2-1-1	Compressor for Ice machine		1
	2-1-2	Ice machine (Plate type, 2ton/day)		1
	2-1-3	Evaporative condenser for Ice machine		1
	2-1-4	Ice storage, 2700mm(L) x 1800mm(W) x 2200mm(CH) t=100mm		1
	2-1-5	Control panel		1
	2-1-6	Ammonium detector and Auto water sprinkler system		1
2-2	Solar power system			1 lot
	2-2-1	Photovoltaic panel and mount		1
	2-2-2	Connection box		4
	2-2-3	Power conditioner		1
	2-2-4	AC connection panel		1
*2	Subsidiary works			1 lot
	*2a	New machine building		1 lot
	*2b	Roof top water-proofing		1 lot
Castries				
3-1	Condenser for Refrigerating system			1 lot
	3-1-1	Evaporative condenser for Freezing storage		1
	3-1-2	Evaporative condenser for Cold storage		1
3-2	Pickup truck			3 units
	3-2-1	Single cabin		1
	3-2-2	Double cabin		2
*3	Subsidiary works			1 lot
	*3a	Foundation for condenser		1 lot
Anse La Raye				
4	Freezing system			1 lot
	4-1	Compressor for Ice machine		1 lot

Gros Islet			
5	Ice plant		1 lot
	5-1	Ice machine (Flake type, 1ton/day)	1
	5-2	Ice storage, 2700mm(L) x 1800mm(W) x 1600mm(CH) t=100mm	1
	5-3	Evaporative condenser	1
	5-4	Compressor for Ice machine	1
	5-5	Control panel	1
	5-6	Ammonium detector and Auto water sprinkler system	1
Dept. of Fisheries (DOF)			
6	Submerged-type FAD		2 lots

*: Subsidiary works

3 Work Period and Cost Estimate

(1) Period

It is anticipated to take 4 months for consultants to prepare the detail design after E/N and G/A signed off. The contractor is verified by the Japanese Government through an official tendering process. Then, contracted contractor starts procurement tasks and consultants start procurement supervision. They need 12 months to complete their tasks.

(2) Cost Estimate

Estimated cost borne by the Government of Saint Lucia is approximately EC$124.0 thousand, for the accomplishment of the Grant-in-aid project by the Government of Japan.

4 Project Implementing Agencies

The responsible government body of the Project is the Ministry of Agriculture, Food Production, Fisheries, Co-operatives and Rural Development (Ministry of Agriculture: MOA), and the implementing agency is the Department of Fisheries (DOF) under MOA. The MOA takes care of Banking Arrangement (B/A), Authorization to Pay (A/P), etc. The DOF is in charge of the operation and management of completed facilities and equipment.

5 Management System

Cooling equipment that engaged to be replaced is restricted to the existing equipment/ machineries.. Therefore, the same operation and maintenance structure will be applied before and after the Project except the case of Gros Islet where a new ice machine is introduced.

The facilities of Vieux Fort, Dennery and Castries are located in the main fish distribution centers in Saint Lucia and operated under the management of the Saint Lucia Fish Marketing Corporation (hereinafter referred to SFMC). Even after replacement of the cooling equipment, the maintenance staff assigned to each facility will engage in maintenance works.

In case of Anse La Rayae, the fishermen cooperative manages the center, and the cooling equipment is operated by an experienced operator hired by the cooperative under technical support by the staff of SFMC.

As for the operation of the newly introduced ammonia type ice machine at Gros Islet, the fishermen cooperative has to hire its operator. The operation needs to have a technical support by the staff of SFMC in a tour system where the main office locates in Castries near to Gros Islet.

The objective cooling equipment to be replaced by the Project has been well maintained. Therefore, it

is anticipated that renovated facilities will be well maintained once the maintenance staff will have proper operation and maintenance training of the ammonia system.

6 Project Evaluation

As explained below, the relevance and the effectiveness of the Project are anticipated to be high.

(1) Relevance

1) Contribution to achieve overall goals of the mid/long term fisheries development plan

In accordance with the CARICOM's development guide, the Government of Saint Lucia has formulated the National Fisheries Plan 2013 with its target year of 2020. Its basic vision is stated as "to promote sustainable fisheries industry by a public-private partnership, to strengthen profitability and to contribute to food security"

The Project aims to improve and maintain the function of fisheries distribution facilities have been provided by Japanese Grant Aid in the past, and to contribute to sustainable use of fisheries resources through promoting proper fisheries management, which serves to achieve the basic vision of the National Plan stated above.

2) Relevance to policies/guideline of assistance by the Government of Japan

In the Assistance Policy to Saint Lucia (April, 2014) by the Government of Japan, the fisheries sector is stated as one of important assistance field (midterm target), and is commented to continue the cooperation for its sustainable development and management of fisheries. In this regards, this Project is relevant to the assistant policy of the Government of Japan, and high in appropriateness since the project aims to improve the fish distribution of Saint Lucia and to promote its fisheries management.

(2) Effectiveness

1) Quantitative Impact

Most cooling equipment targeted in the Project is ready to stop functioning due to salt damages as well as aging deterioration. Therefore, the concrete effect of replacing cooling equipment is the same as prolonging the function of the equipment for another 15 years.

In developing countries, the cooling methodology in fishing/distribution exclusively relies on ice. The effect of replaced the equipment can be evaluated by whether they can supply enough ice or not.

The evaluation objective sites are expected to be either Vieux Fort or Dennery, where the landed fish volume is large and ammonia cooling equipment will be installed.

To quantitatively evaluate whether replaced cooling equipment is operated effectively or not, we have to figure out how much ice is used for monthly landed fish. In general, cooling effectiveness of fresh fish is assessed by ice/fish ratio = 1 as a standard. However, the ice/fish ratio might be under 1 in the project sites because this standard of preserving freshness of fish is not prevalent among fishermen and also the distribution time is relatively short for it is a small country. If it is the case, the baseline at the time of replacement cannot be determined unless actual ice/fish ratio is measured in each site, which unfortunately has to be left in future.

If the ice/fish ratio is actually measured in each site, quantitative measurements can be possible by the following methodologies:

a) Calculate monthly volume of produced ice by monthly cumulative operating hours of the cooling equipment
b) Calculate average monthly ice/fish ratio by monthly landed fish volume
c) Compare the monthly ice/fish ratio with the baseline ratio measured at the time of replacement of the cooling equipment

The following preconditions need to be met for quantitative evaluation of the project effectiveness.
Preconditions：

a) The maintenance staff should record operating hours in the daily log book. The operating hours should be determined by the cumulative operating time meter installed on the cooling equipment. In addition, the total operating hours should be recorded every month.
b) The landed volume recording staff should keep the total volume of landed fish every month.
c) An ice making machine with its capacity of 1 ton/day produces 1 ton of ice during 19.2 operating hours (80 % of 24 hours).

Table 3.1 The Baseline Numbers for Quantitative Evaluation of Refrigerant Effectiveness

Quantitative Effects	Baseline Value (2014)	Target Value (2018) 【3 years after completion】
Ice/fish ratio (Vieux Fort or Dennery)	α	α≦
Registered number of fishermen operating at the point of submerged FAD as their fishing ground	Total 0/Year	Total 500 persons/ year

2) Qualitative Effects

The following are the expected qualitative effects by this Project.

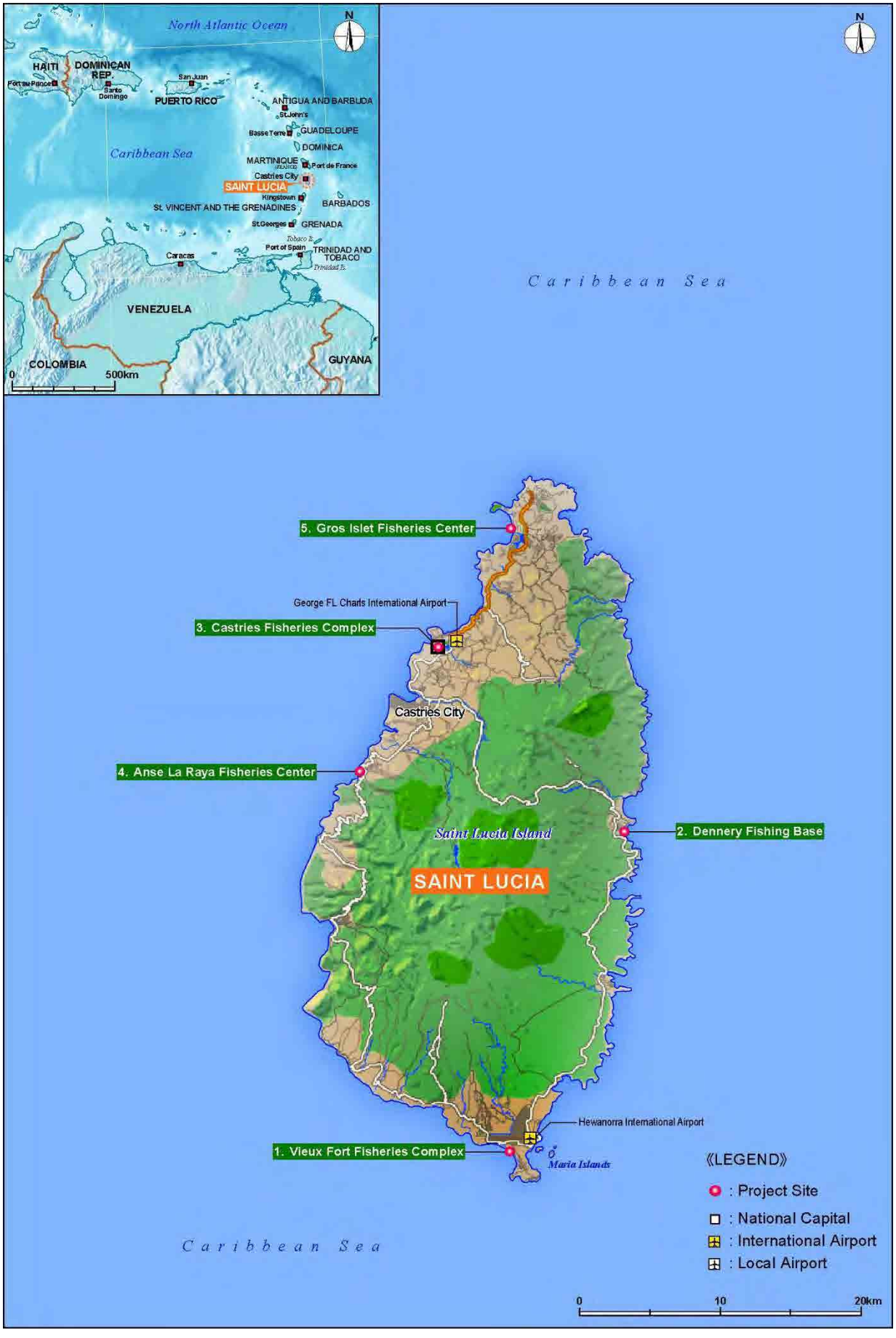
Table 3.2 Qualitative Effects of Equipment by each Site

Objective Project	Project Contents	Project Effect
Construction of Vieux Fort Fisheries Development Center	Replacement of ice plant, cold storage and blast freezer together with conversion to ammonia system. Replacement of 5-ton refrigeration trucks	*Some level of satisfactory with freshness of fish would be maintained by users of the cooling equipment *Ice is utilized continuously (Sales volume of ice)
Construction of Dennery Fisheries Base	Replacement of ice plant and cold storage together with conversion to ammonia system.	

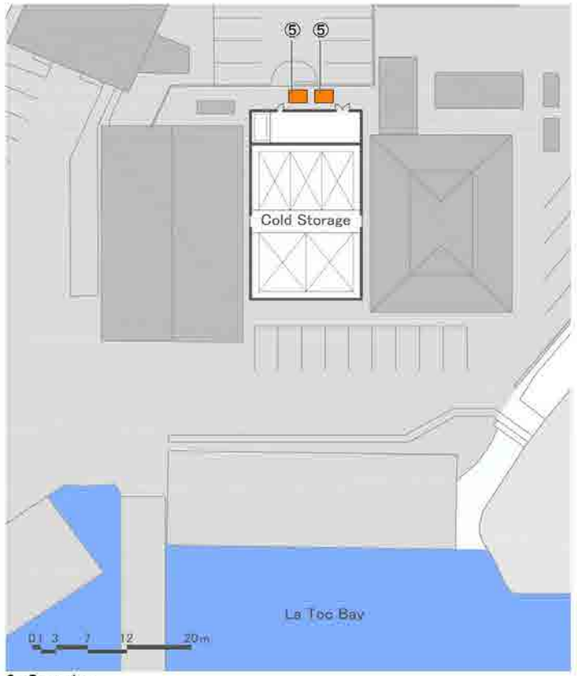
INDEX

Appendices

LOCATION MAP

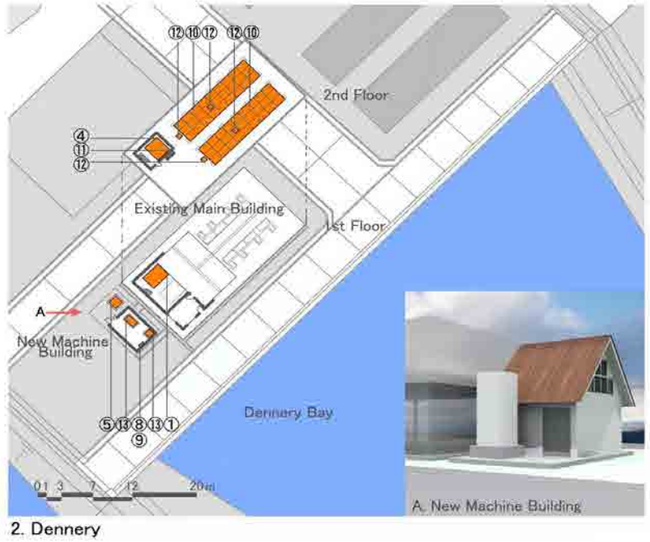


PERSPECTIVE

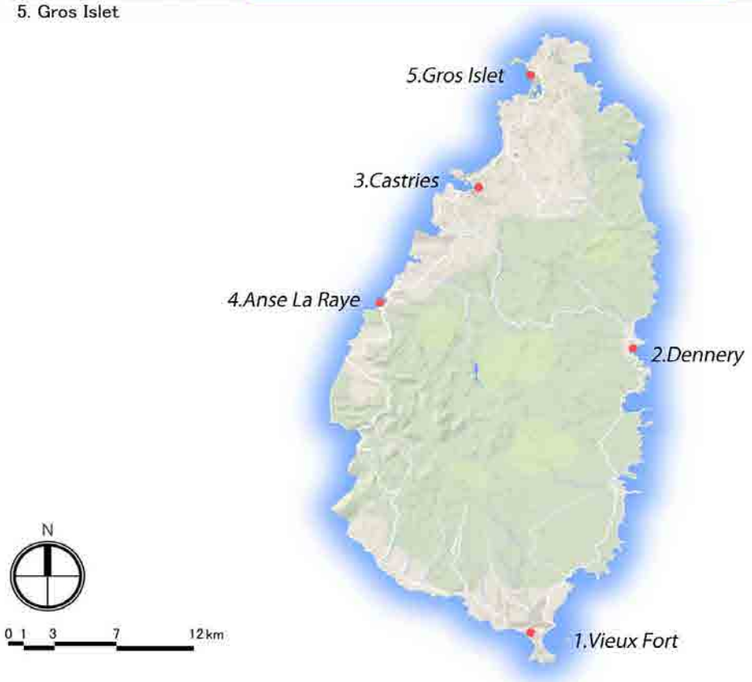


3. Castries

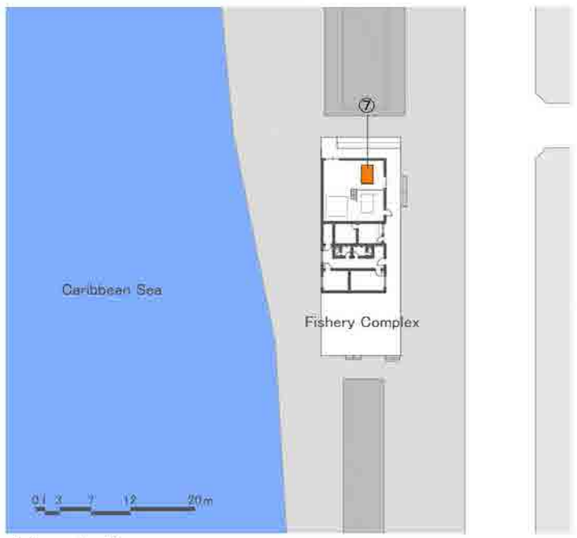
5. Gros Islet



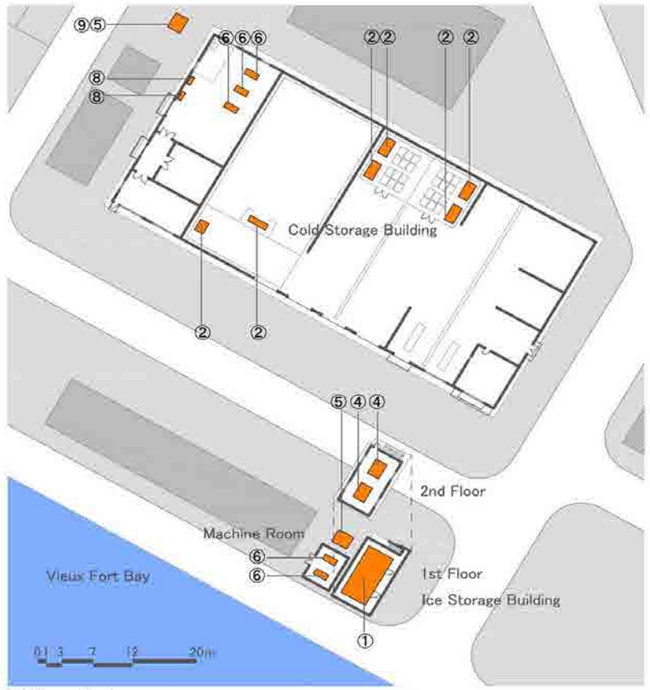
2. Dennery



Saint Lucia Project Site Plan



4. Anse La Raye



1. Viuex Fort

① ICE STORAGE ② COOLING UNIT ③ ICEMAKINGMACHINE FLAKE TYPE ④ ICEMAKINGMACHINE PLATE TYPE ⑤ EVAPORATIVECONDENSER ⑥ COMPRESSOR 1 ⑦ COMPRESSOR 2 ⑧ CONTROL PANEL ⑨ AMMONIUM DETECTOR AND AUTO WATER SPRINKLER SYSTEM ⑩ PHOTOVOLTAIC PANEL ⑪ GRID CONNECTION PANEL ⑫ CONNECTION BOXES ⑬ POWER CONDITIONER

LIST OF FIGURES AND TABLES

[FIGURES]

Chapter 2 Contents of the Project

[TABLES]

Chapter 2 Contents of the Project

Chapter 3 Project Evaluation

ABBREVIATIONS

A/ P	Authorization to Pay
B/A	Banking Arrangement
CARICOM	Caribbean Community
CARIFICO	Caribbean Fisheries Co-Management Project
CIDA	Canada International Development Agency
CFC	Chlorofluorocarbons
CRFM	Caribbean Regional Fisheries Mechanism
DOF	Department of Fishery
EEZ	Exclusive Economic Zone
E/N	Exchange of Notes
FAD	Fish Aggregating Devise
G/A	Grant Agreement
GDP	Gross Domestic Product
HCFC	Hydro Chlorofluorocarbons
HFC	Hydro Fluorocarbons
JICA	Japan International Cooperation Agency
MOA	Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development
MPAs	Marine Protected Areas
SFMC	Saint Lucia Fish Marketing Corporation

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Request for Grant Aid

(1) Background of the Request

Fisheries products have been loved by and a source of protein to people in Saint Lucia. The average annual per capita fish consumption in 2008 ~2009 is about 19 kg. During this period, average annual fish landed volume was 1,776 tons and that of imported fish products was 1,523 tons. Accordingly it can be said that approximately 46 % of the said fish consumption has been supplemented by the imported fish products. It has been an important agenda for Saint Lucia Government to utilize fisheries resources in the sustainable manner and to reduce the distribution losses by keeping freshness of landed fish.

Over the past 20 years, the Japanese Government has assisted in construction and improvement of major fish landing places with a purpose of improving efficiency of fisheries industry and distribution of landed fish. Currently, approximately 80 % of the country's fish catch land in these fisheries facilities and distributed throughout the country. In recent years, the functions of some of these facilities, cooling equipment/machineries in particular, are not working or deteriorating. It is an urgent problem for the Saint Lucia Government to take care of.

While improving self-sufficiency of fisheries products has been an important agenda for the government, overfishing in coastal water has been criticized. The Saint Lucia Government is under pressure to focus on proper fisheries management for the sake of sustainable utilization of marine resources. In summary, Saint Lucia's current needs in fisheries are to promote development of offshore resources to increase fisheries production and to conduct proper fisheries management for achieving sustainable utilization of marine resources, for which they need appropriate equipment.

In this context, the Saint Lucia Government compiled "The Project for Improvement of Fisheries equipment /machineries in Saint Lucia" and requested the grant assistance to Japan.

(2) Summary of the Requested Project

The contents of the grant aid request are summarized as follows:

(a) Cooling equipment concerned: Replacement of the cooling equipment necessary for five (5) fisheries centers out of ten (10) centers that were constructed by Japanese assistance in the past.

(b) Introduction of the equipment for promoting activities of the Department of Fisheries such as a multi-purpose research vessel, refrigerating vehicles, submerged type Fish Aggregating Devise (hereinafter referred to FAD), etc.

1-2 Natural Conditions

Saint Lucia, lying between the Caribbean Sea and North Atlantic Ocean, is sublime with warm and moist northeast trade winds. The volcanic country is 42.3 km long and 22.4 km wide, the total area is about 616 ㎢. While the northern part is relatively flat, the central part is covered with precipitous mountains, and the southern part is an alluvial plain.

In the tropical oceanic climate, Saint Lucia's temperature does not fluctuate much throughout the year: the mean temperature is 27℃. The dry season is between December and May and the rainy season is between June and November. The temperatures drop during the months of December and March and rise between

June and September. The average high temperature is 30.1℃ and the average low is 24.5℃.

In August and September, the peak months of the rainy season, the precipitation of each month reaches to 200～300. During this time, hurricanes often attack the country with its wind velocity sometimes reaching 60m per second. The 10-year annual rainfall average is 1,265mm. There are only 60 days or less in which rain falls more than 10 mm a day. The wind pattern does not fluctuate either except the times of hurricane. It blows from east-northeast and east south-east on 86 % of the year and the average wind speed is 5~7m in average.

Although the Exclusive Economic Zone (EEZ) extends to 8,000km^2, the area of the continental shelf is rather narrow with only 176km^2. The fish stocks in the continental shelf are estimated to 1,000-2,000 tons including demersal fishes, shells, crustacean, etc. (Canadian International Development Agency, 1984). The offshore water is believed to have abundant fish stocks as it is a migratory area of offshore large pelagic such as dorados, tunas, swordfish, Spanish mackerels, etc.

The proposing project will not be impinged by the weather conditions as it is done mostly indoor operations to replace cooling equipment. It is important to note, however, careful planning to avoid potential hurricanes is indispensable for safe installation of solar roof panels in Dennery.

1-3 Socio-environmental Considerations

The focus of proposed project is to replace cooling equipment or to change a compressor previously installed in fisheries facilities. During the work, the special considerations should be made to the following three areas:

1) **Scheduling to avoid excess operational interruptions:**
   The cooling equipment in daily use will have to be temporarily shut down for replacement and installation. The work should be scheduled to avoid peak fishing season and alternative ways to refrigerate fisheries products during the shutdown period should be arranged (for example: utilizing freezing containers).

2) **Identifying methods to store reusable materials and to dispose waste materials:**
   The existing cooling equipment will be dismantled for replacement and installation. All parts will be sorted out by the contractor side and left by the construction site in two piles: one as reusable parts and another as waste materials. The Saint Lucia side is obligated to make decisions on where to store reusable parts and how to dispose the waste, and follow through the decisions.

3) **Ensure practices that maximize recovery and recycling of ozone-depleting substances:**
   In this project, the Hydro chlorofluorocarbon (hereinafter referred to HCFC) type refrigerants in old equipment will be replaced by HCFC substitutes such as Hydro fluorocarbon (hereinafter referred to HFC) or ammonia. Safe removal of HCFC and filling them in cylinders is essential to avoid releasing them in the air.

1-4 Global Issues

This Project is to replace old cooling equipment which was previously installed by Japan's grant aid cooperation. We will comply with the *Montreal Protocol on Substances that Deplete the Ozone Layer* in selecting an alternative refrigerants for the replaced equipment.

The Protocol is designed to phase-out or to reduce the production and consumption of HCFC (R22 & etc.) as well as HFC (R404a & etc.) to protect the earth's fragile ozone Layer and to slow down global warming. The current international agreement is in the following areas:

*Phase-out of HCFC refrigerants to zero: Year 2020 (2030 for developing countries)

*Freeze the production and consumption of HFC: Undetermined, however, drastic reduction by 2030 (2040 for developing countries) is likely to be agreed.

In this Project, ammonia would be considered as the most realistic refrigerant of all those meets the condition above. However, final decision of refrigerant should be done by the St. Lucia side depending on the age & size of equipment, level of malfunctions and other specific conditions. Following three options will be examined for their choice.

*Convert to ammonia

* Convert to HFC (to avoid ammonia and HCFC refrigerants)

* Keep the current refrigerants (to maintain existing equipment to its mechanical life)

Chapter2 Contents of the Project

Chapter2 Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goal and Project Purpose

The "National Fisheries Plan 2013" describes the vision, strategies and agendas of Saint Lucia's fishery development. The vision is stated as "to promote sustainable fishery by public-private partnership to strengthen profitability and contribute to the nation's food security".

To achieve this vision, seven (7) strategies are set up as follows:

1) Institutional strengthening
2) Strengthening stakeholder input into the decision making process
3) Improving the average income of fish catchers by designed, devised and implemented by DOF
4) Fisheries management (To define, prepare, and implement evergreen integrated Fisheries Management Plan, etc.)
5) Aquaculture
6) On-shore ancillary support (Infrastructural development)
7) Marketing (Improving fish handling, efficient fish distribution, etc.)

Thereby, as a part of measures to achieve the said development strategies, the mid-term purposes of this Project are i) to keep up the function of fish distribution infrastructure of existing fisheries centers and ii) to promote proper fisheries management by providing necessary equipment for achieving sustainable use of fisheries resources.

Since the effect of improvement of distribution function that is the main contents of the Project will be shown within short time period, the target year is set as three years after the Project is completed.

(2) Outline of the Project

This Project focuses on five (5) sites among ten (10) fishery facilities which Japan has assisted in the past 20 years. In order to achieve above Project purposes, large fishery equipment (including the cooling equipment of ice machines, etc.) will be replaced and/or upgraded. Additionally, the Project will also introduce such equipment that might contribute to promoting proper fisheries management for sustainable use of fishery resources.

The refrigerant conversion from HCFC to ammonia will be conducted by the Project in accordance with the phase-out year stated in the *Montreal Protocol*. At the sites where ammonia is selected as a refrigerant, training on safe operation and maintenance and other necessary technical transfer will be incorporated in the work plans.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

The Project is targeted to the previously procured cooling equipment which needs urgent repairs. The landed fish volume remains almost the same with small fluctuations in the past 10 years. The following principles for equipment replacement will be employed:

−All equipment that has strong impact on Saint Lucia's fish distribution and needs urgent repairs is targeted.

−New equipment will keep the same capacity and functions of the existing equipment.

−To select refrigerant by reflecting what has been agreed in the Montreal Protocol upon replacing refrigerating equipment/ machinery. The Project plans to adopt ammonia as the refrigerant having less impact on ozone depletion and global warming in case that the recipient country will agree to adopt it after her intention is ascertained.

−To conduct thorough technical transfer to the maintenance staff for the safety and sustainable operation of the refrigerating facilities upon introducing ammonia.

Saint Lucia has requested equipment for fisheries management since the coastal resources have been stagnated. The new equipment will be selected according to the following principles:

−Equipment to disperse fishing pressure in coastal fishing

−Equipment that induces synergy effect on this Project and the ongoing project, "Caribbean Fisheries Co-management Project"(hereinafter referred to CARIFICO), by linking both projects

(2) Design Policy on Installation of Equipment/machinery

1) Policy on natural and environmental conditions

Target sites are the sites where fisheries facilities had been built by the Japanese assistance in the past. Since the survey on natural conditions had been conducted when these facilities were built, it is not conducted under this survey. Natural conditions of target sites are applied referring to the past survey reports. They are shown in Table 2.1.

Table 2.1 Natural and Environmental Conditions of Each Target Site

Items		Vieux Fort	Dennery	Castries	Anse La Raye	Gros Islet
Temperature	℃	29.6~31.5 / 20.1~23.0(Max. Temp./ Min. Temp.)				
Humidity	%	70.1~81.0				
Annual Rainfall	mm	1,265 (by the coast) / 3,420 (inland/ high land)				
Wind direction/ Wind speed	m/s	ENE~ESE / 9.7~13.7				
Seismic force (horizontal seismic force)		0.1 (Caribbean Uniform Building Code: CUbiC)				
Soil property		-	-	-	-	-
Remarks			Surveying and soil exploration are required upon DD			Surveying and soil exploration are required upon DD
Source		· BDR (1997) · Detailed Design (1999)	· BDR (1993) · Completion drawing (1994)	BDR (1994)	BDR (2007)	BDR (1994)

Remarks: BDR: Basic Design Report, reported years are noted in brackets

Saint Lucia is located along the path of hurricane. Extreme rainfall is also expected due to the global warming effect (The main bridge was swept away by 'heavy rains, floods on Caribbean island' in December 2013). The work plan therefore shall well be developed considering such weather conditions.

2) Policy for socio-economic conditions

When the Project carries out its works, especially for replacing the cooling equipment, the existing facilities need to be stopped. In other word, the cooling equipment will not be accessible during the replacement work. As the landed volume of the peak fishing season is larger 5-8 times more than that of the lean fishing season, the replacement work shall be conducted during the lean fishing season. At the same time, by avoiding overlap of work schedules for each site, accessibility to other fisheries facilities shall be insured. Since 40% of the total fish landings are concentrated at the Vieux Fort Fisheries Complex, and its replacement work period is expected to last for long, the Project tries to minimize the burden on its users by providing a temporary freezing container.

3) Policy for procurement/ construction conditions

a) Equipment/ machinery

The main equipment/ machinery of the Project is cooling equipment/ machinery which is to be procured from abroad. As for procurement of a compressor, the Project shall consider procuring the open types that are popular in Japan and are comparatively easier for repairing and maintaining locally instead of semi-closed types that are popular in Europe and the United States and are difficult to be repaired and maintained locally.

Regarding the submerged-type fish FAD, the Project shall procure from Japan since the product with 10 year guarantee is only available in Japan.

b) Subsidiary works

Since subsidiary facilities would be dealt by the local contractors, its equipment/ machineries are basically of those locally available applying conventional construction methods that local contractors are able to handle.

i) Policy for construction methods for subsidiary works

Considering structures of general buildings in the locality, reinforced concrete and concrete block buildings can be constructed conventionally without any trouble. Plastering cement mortar is also a commonly used construction method in the area. Applying reinforced concrete for the subsidiary building with block walls and salinity tolerant colored steel sheet for the roof is considered to be appropriate as a basic specification.

ii) Policy for recruiting local contractors

By observing the sites, it is assessed that there is no problem in technical capacity among local contractors in case of construction works handling reinforced concrete including reinforcing bar arrangement, formwork and concrete placement work. Although some attention on covering depth of concrete on the reinforcements and intervals of reinforcement bar is necessary, local workers are considered to have enough skills for conducting the above-mentioned works.

Local workers, however, are not much experienced with processing skills on complicated heavy steel frame materials except handling light materials. Therefore, the Project will secure either the technical capacity or the supply capacity of labor force not only from the domestic contractors but also from those of the CARICOM (Caribbean Community).

4) Policy for operation and maintenance

The major issue that was faced during operation and maintenance of Japanese cooling equipment installed in the past is difficulty in spare parts procurement. In some cases, spare parts procurement took several months. The Project will, therefore, secure extra spare parts for the core equipment/ machinery made in any countries.

On the other hand, the submerged-type FAD basically does not require maintenance once it is installed. It is considered that there is no big obstacle in procuring spare parts for vehicles such as a cooling truck, etc.

5) Policy for setting up equipment grade

Since the main component of the Project is the replacement of existing large-scale equipment/ machineries assisted by Japan's Grand Aid in the past, therefore, the grade for equipment/ machineries shall be the same with the existing equipment grade.

6) Policy for procurement method and construction period

Considering 3) procurement conditions and 5) equipment grade, the main equipment/ machineries to be procured would basically be made in Japan. The Project will secure spare parts that are locally not available.

Since the landed volume in the peak fishing season (Jan. to Mar.) is 5 to 8 times larger than that of the lean fishing season (May. to Dec.) in Saint Lucia, the construction period shall be designed during the lean fishing season.

2-2-2 Basic Plan (Equipment Plan)

(1) Requested Contents

The Saint Lucia Government requested replacing deteriorating or broken cooling equipment previously built by Japan's Grant Aid and procurement of equipment necessary for efficient distribution and fisheries management.

Requested equipment/ machineries are broadly classified into 4 categories. They are: i) replacing cooling equipment/ machineries; ii) newly introducing cooling equipment/ machineries; iii) newly introducing solar panel; and iv) introducing necessary equipment/ machineries for appropriate fish distribution and/or fisheries management. The list of requested items is shown in Table 2.2.

Table 2.2 List of Requested Equipment/ machineries

Site/ Category			Name of Equipment/ machineries (replaced/ newly introduced)	Quantity
1	**Vieux Fort**			
	1-A	Refrigerating system	ice machine/ cold storage/ blast freezer (refrigerant: ammonia) (Replacement)	1 set
	1-B	Fish distribution	5-ton refrigeration truck (Replacement)	2 vehicles
	1-C	Refrigerating system	Solar panel (newly introduced)	1 set
	1-D	Fisheries management	Research boat (newly introduced)	1 boat
2	**Dennery**			
	2-A	Refrigerating system	Ice machine/ice storage/ cold storage (refrigerant: ammonia) (Replacement)	1 set
	2-B	Refrigerating system	Solar panel (newly introduced)	1 set
3	**Castries**			
	3-A	Refrigerating system	Cooling condenser (Replacement)	1 set
		Fish distribution	Pickup trucks (Replacement)	3 vehicles
4	**Anse La Rayae**			
	4-A	Refrigerating system	Refrigeration compressor (Replacement)	1 set
5	**Gros Islet**			
	5-A	Refrigerating system	Ice machine unit (with an ice storage) (newly introduced)	1 set
6	**Department of Fisheries**			
	6-A	Fisheries management	Submerged-type FAD (newly introduced)	2sets

(2) Plan of Equipment

The following facility equipment has been selected according to the policies above, Saint Lucia's requests and current state of facilities.

1) The whole facilities in Vieux Fort and Dennery will be renewed because of severe deterioration of refrigerant due to salt damage and aging. The new equipment will keep the same operational capacities as existing ones, but the refrigerant will be converted to ammonia. In Vieux Fort, 2 deteriorating cooling vans for distribution will be replaced by new ones with the same superimposed capacities. In Dennery, solar panels will be installed to conserve electricity. No batteries will be installed but installed panels will have a capacity to produce electricity needed during the day.

2) In Castries, only the deteriorating condenser will be updated. The new condenser will have the same operational capacities as existing one. The condensation method will be converted from air-cooling type to water-cooling type to conserve electricity. 3 old pickup trucks for distribution will be replaced with new ones.

3) In Anse La Raye, the broken compressor installed to the ice machine will be replaced. The new compressor will have the same operational capacities as existing one. The electronic controlled oil surface sensor, which caused the problems, will be abolished and changed to an analog type sensor to prevent the same problem.

4) In Gros Islet, an ice-maker with ammonia refrigerant will be installed since demand for ice is increasing in conjunction with the fisheries' steady growth. The operational capacity of the ice-maker will match current landed volume and distribution.

5) Submerged type FAD with long operating life will be installed instead of floating type FAD currently being used by the Department of Fisheries (hereinafter referred to DOF). One each of submerged type FAD will be installed on the side of the Atlantic Ocean and the Caribbean Sea respectively.

The requested solar panels installation in Vieux Fort is not included because the roof structure is not sturdy enough for installation. A fisheries research vessel is not included either although there is a need for the vessel. One reason is, in accordance with the record submitted to the survey team, that the previously procured vessel (The Chadon) has not been utilized as often as expected. And another is that the team could not find out a fixed operational plan or specifics for using the new vessel.

2-2-3 Outline Design Drawing

List of the planned equipment/ machineries and figures of site plan and equipment layout plan are indicated in the following paragraphs (1) and (2).

(1) Planned Equipment/machineries and Quantity

List of planned equipment/machineries is indicated in Table 2.3.

Table 2.3 List of Planned Equipment/ machineries

Site and Planned Equipment			Components	Quantity
Vieux Fort				
1-1	Refrigerating system			1 lot
	1-1-1	Ice plant		1 lot
		1-1-1-1	Compressor for Ice machine	2
		1-1-1-2	Ice machine (Plate type, 4ton/day)	2
		1-1-1-3	Evaporative condenser for Ice machine	1
		1-1-1-4	Ice storage, 7200mm(L) x 3600mm(W) x 2400mm(CH) t=100mm	1
		1-1-1-5	Control panel	2
	1-1-2	Cold storage/ Blast freezer		1 lot
		1-1-2-1	Compressor for Cold storage	1
		1-1-2-2	Compressor for Air blast	2
		1-1-2-3	Cooling unit for Cold storage at preparation room	1
		1-1-2-4	Cooling unit for Cold storage	1
		1-1-2-5	Cooling unit for Air blast	2
		1-1-2-6	Evaporative condenser for Cold storage and Blast freezer	1
		1-1-2-7	Control panel for Cold storage and Blast freezer	2
	1-1-3	Ammonium detector・Auto water sprinkler system		1 lot
1-2	5-ton refrigerated van			2 units
*1	Subsidiary works			1 lot
	*1a	Demolition and restoration of wall of facility for Ice machine		1 lot
Dennery				

2-1	Ice plant		1 lot
	2-1-1	Compressor for Ice machine	1
	2-1-2	Ice machine (Plate type, 2ton/day)	1
	2-1-3	Evaporative condenser for Ice machine	1
	2-1-4	Ice storage, 2700mm(L) x 1800mm(W) x 2200mm(CH) t=100mm	1
	2-1-5	Control panel	1
	2-1-6	Ammonium detector and Auto water sprinkler system	1
2-2	Solar power system		1 lot
	2-2-1	Photovoltaic panel and mount	1
	2-2-2	Connection box	4
	2-2-3	Power conditioner	1
	2-2-4	AC connection panel	1
*2	Subsidiary works		1 lot
	*2a	New machine building	1 lot
	*2b	Roof top water-proofing	1 lot
Castries			
3-1	Condenser for Refrigerating system		1 lot
	3-1-1	Evaporative condenser for Freezing storage	1
	3-1-2	Evaporative condenser for Cold storage	1
3-2	Pickup truck		3 units
	3-2-1	Single cabin	1
	3-2-2	Double cabin	2
*3	Subsidiary works		1 lot
	*3a	Foundation for condenser	1 lot
Anse La Raye			
4	Freezing system		1 lot
	4-1	Compressor for Ice machine	1 lot
Gros Islet			
5	Ice plant		1 lot
	5-1	Ice machine (Flake type, 1ton/day)	1
	5-2	Ice storage, 2700mm(L) x 1800mm(W) x 1600mm(CH) t=100mm	1
	5-3	Evaporative condenser	1
	5-4	Compressor for Ice machine	1
	5-5	Control panel	1
	5-6	Ammonium detector and Auto water sprinkler system	1
Dept. of Fisheries (DOF)			
6	Submerged-type FAD		2 lots

*: Subsidiary works

(2) Site Plan and Equipment Layout Plan

Drawings of the site plan and the equipment layout plan in each Project site (Vieux Fort, Dennery, Castries, Anse la Raye and Gros Isle) are shown in Fig. 2.1 – Fig. 2.9.

1) Vieux Fort

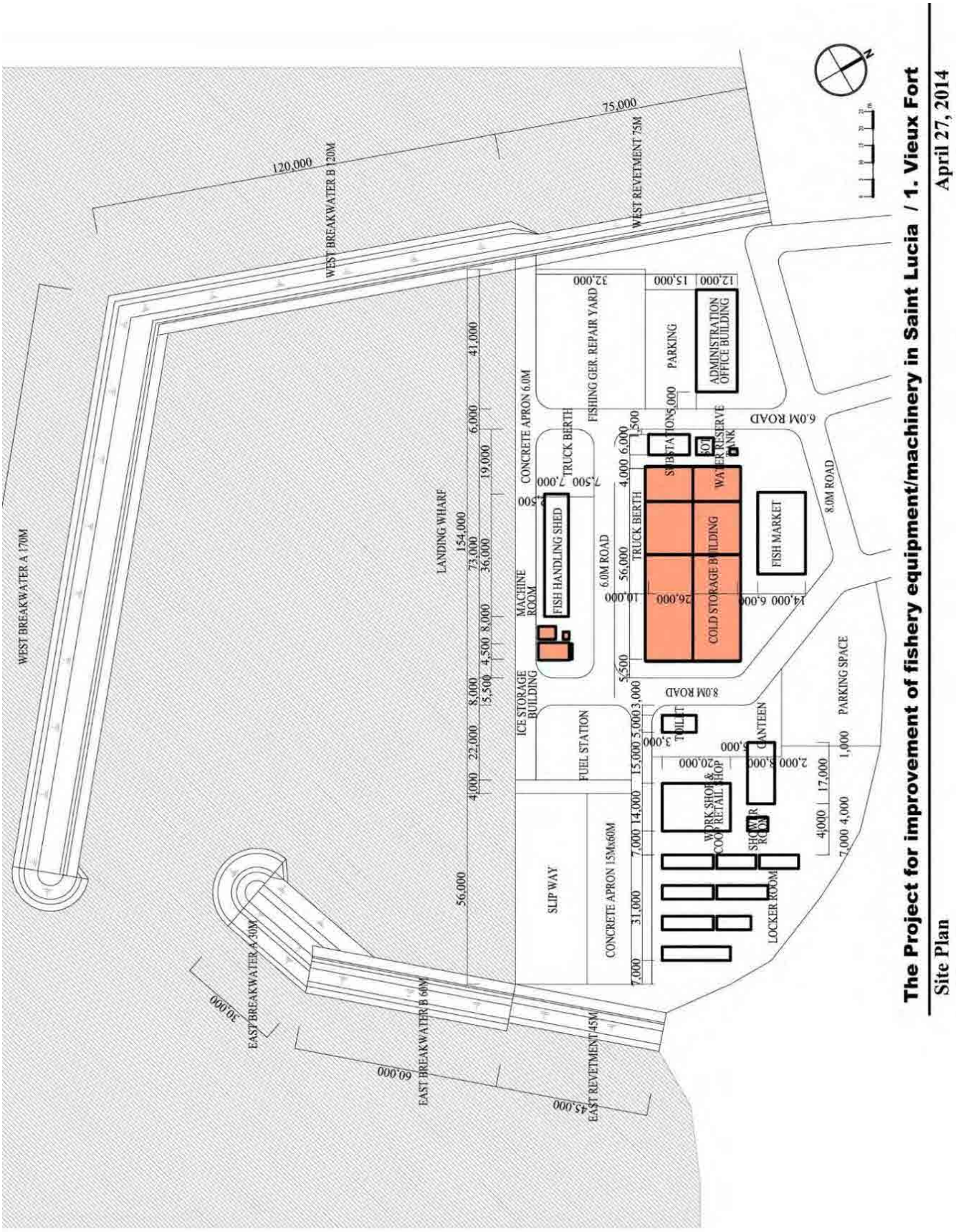
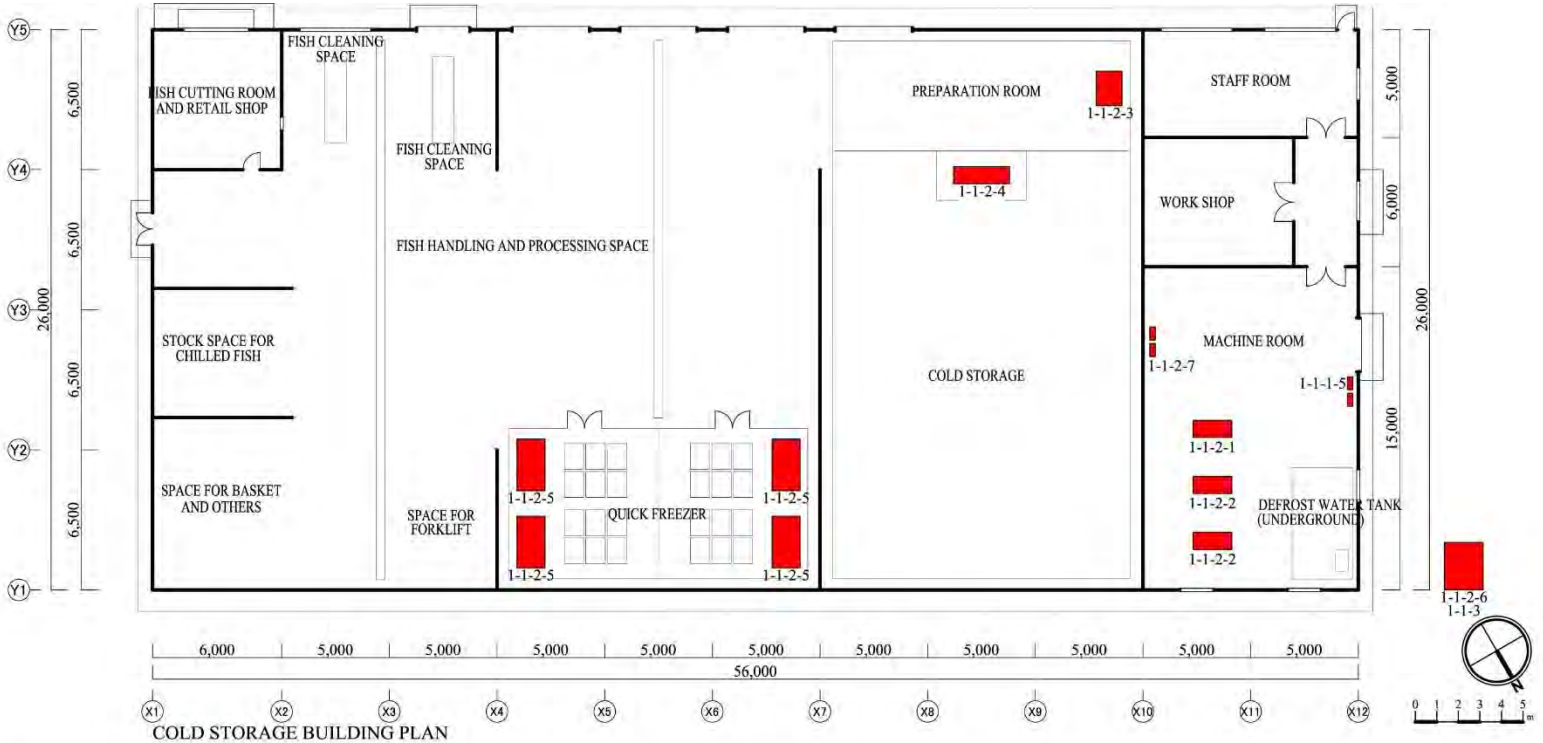


Fig. 2.1 Site Plan of Vieux Fort



Code	Equipment	Qty
1-1-1-1	Compressor for Ice machine	2
1-1-1-2	Ice machine (Plate type, 4ton/day)	2
1-1-1-3	Evaporative condenser for Ice machine	1
1-1-1-4	Ice storage, 7,200mm(L) x 3,600mm(W) x 2,400mm(CH)	1
1-1-1-5	Control panel	2

Code	Equipment	Qty
1-1-2-1	Compressor for Cold storage	1
1-1-2-2	Compressor for Air blast	2
1-1-2-3	Cooling unit for Cold storage at preparation room	1
1-1-2-4	Cooling unit for Cold storage	1
1-1-2-5	Cooling unit for Air blast	2
1-1-2-6	Evaporative condenser for Cold storage/ Blast freezer	1
1-1-2-7	Control panel for Cold storage/ Blast freezer	2
1-1-3	Ammonium detector and Auto water sprinkler system	1 lot

The Project for improvement of fishery equipment/machinery in Saint Lucia / 1. Vieux Fort

Layout Plan for Equipment/ machinerary

Fig. 2.2 Layout Plan for Equipment /machinery in Vieux Fort

2) Dennery

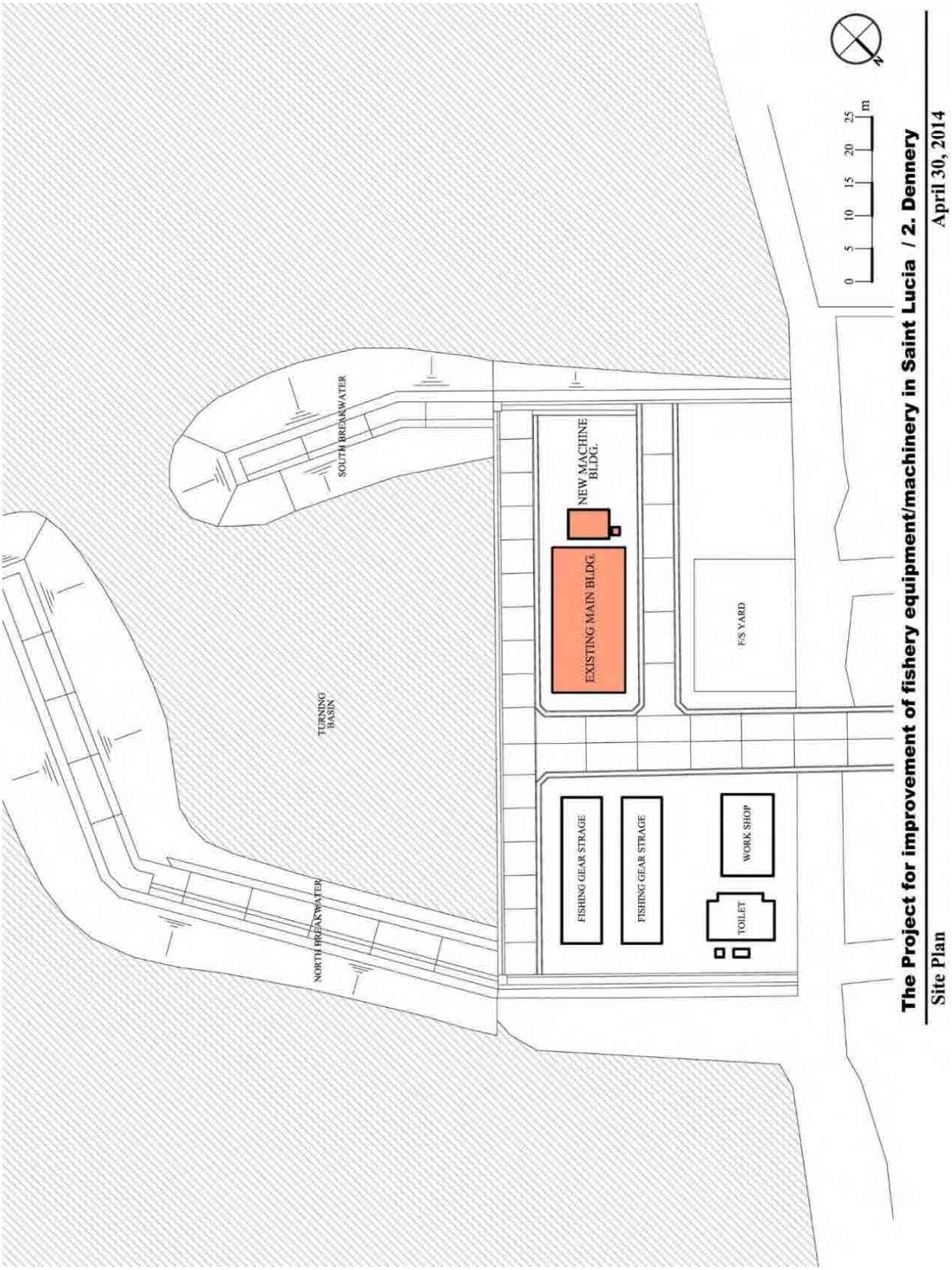
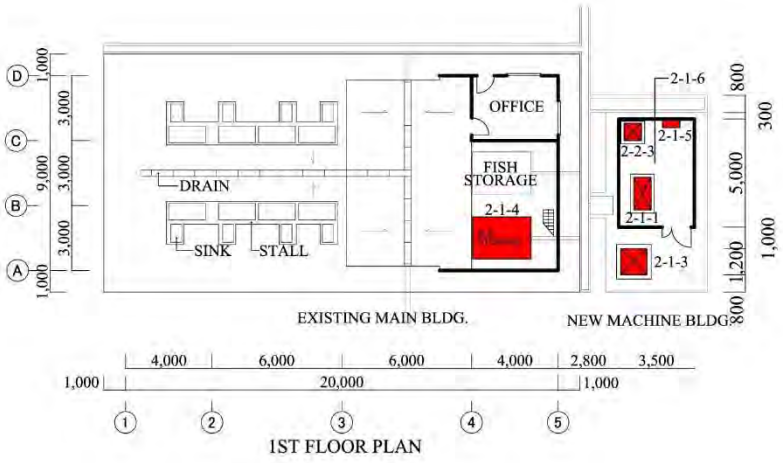
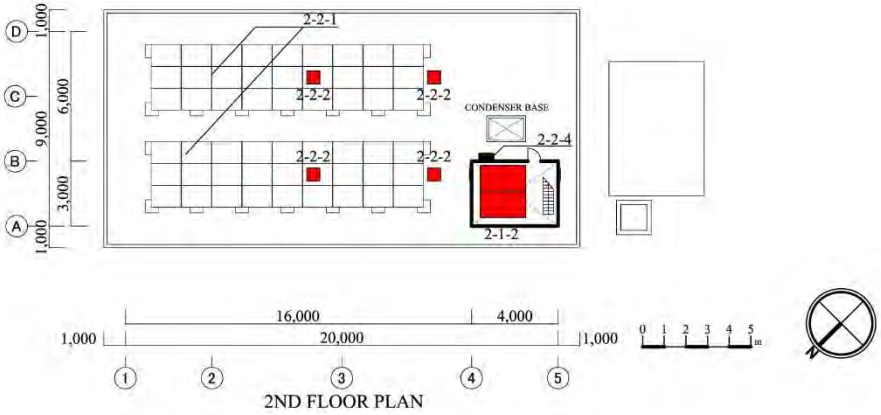


Fig. 2.3 Site Plan of Dennery





Code	Equipment	Qty
2-1-1	Compressor for Ice machine	1
2-1-2	Ice machine (Plate type, 2ton/day)	1
2-1-3	Evaporative condenser for Ice machine	1
2-1-4	Ice storage, 2,700mm(L) x 1,800mm(W) x 2,200mm(CH)	1
2-1-5	Control panel	1
2-1-6	Ammonium detector and Auto water sprinkler system	1
2-2-1	Photovoltaic panel and mount	1
2-2-2	Connection Boxes	4
2-2-3	Power conditioner	1
2-2-4	AC connection panel	1

Fig.2.4 Layout Plan for Equipment /machinery in Dennery

3) Castries

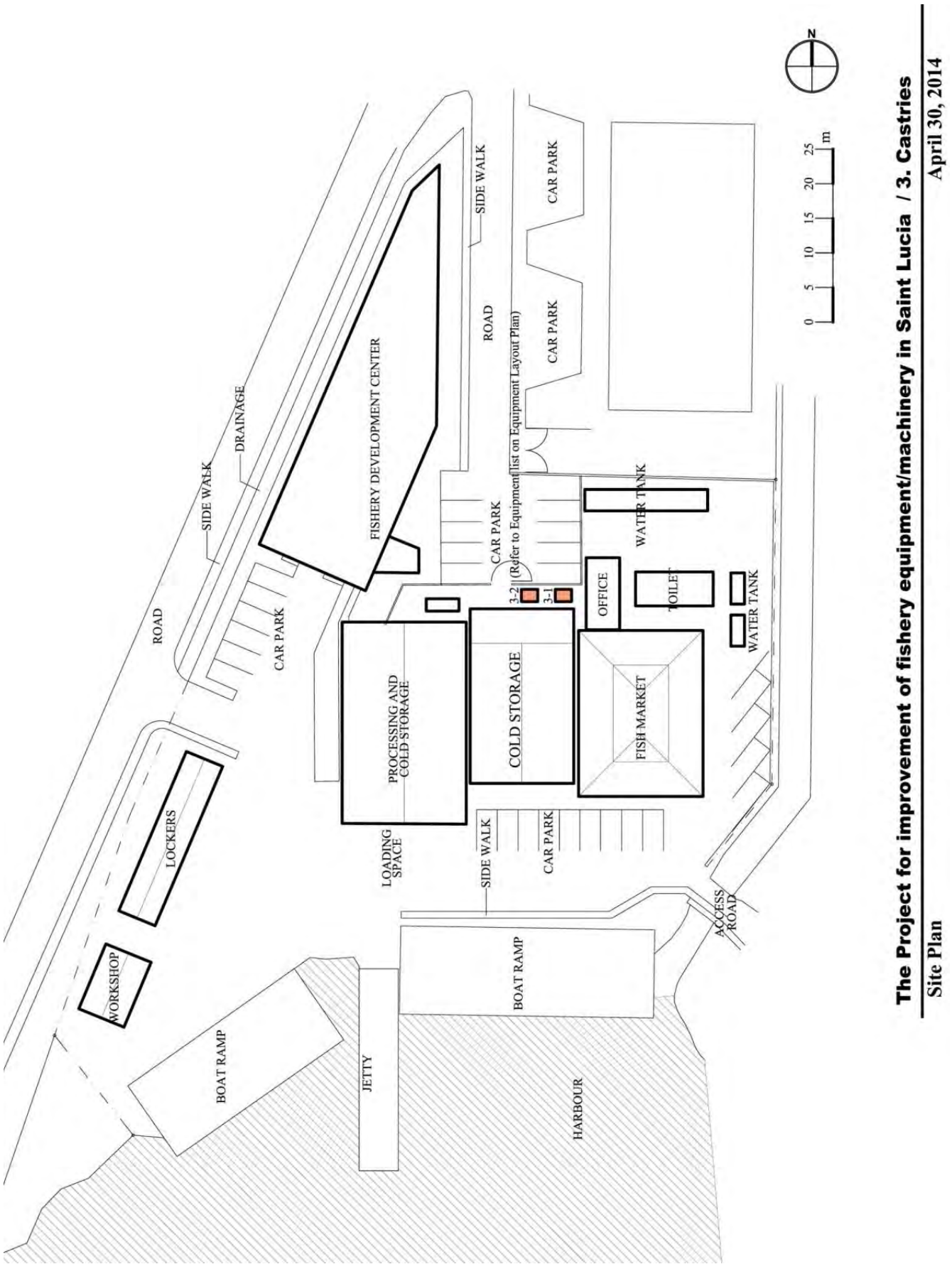


Fig. 2.5 Site Plan of Castries

Code	Equipment	Qty
3-1-1	Evaporative condenser for Freezing storage	1
3-1-2	Evaporative condenser for Cold storage	1

Fig. 2.6 Layout Plan for Equipment /machinery in Castries

4) Anse La Raye

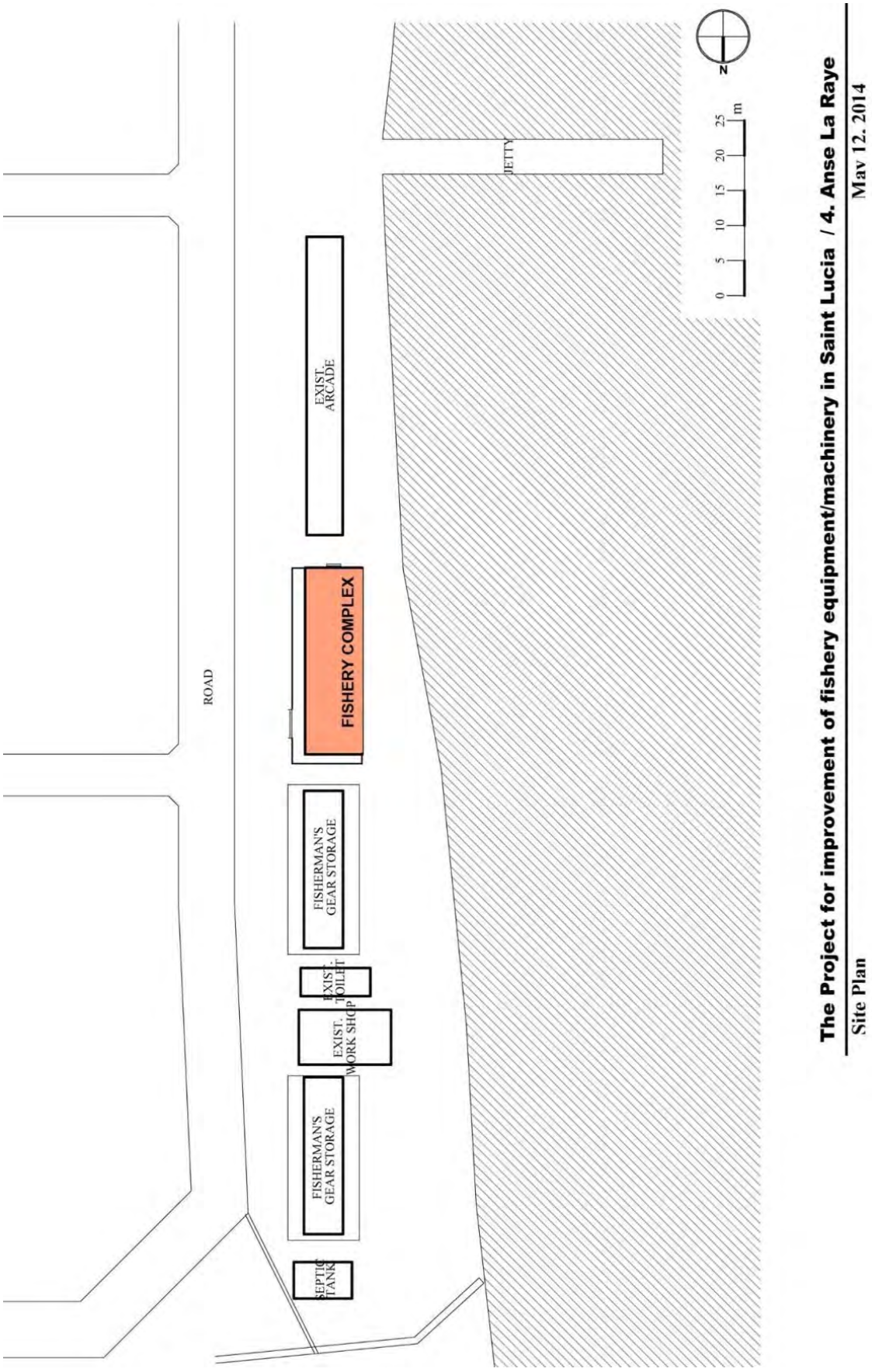


Fig. 2.7 Site Plan of Anse La Raye

Code	Equipment	Qty
4-1	Compressor for Ice machine	1 lot

Fig. 2.8 Layout Plan for Equipment /machinery in Anse La Raye

5) Gros Islet

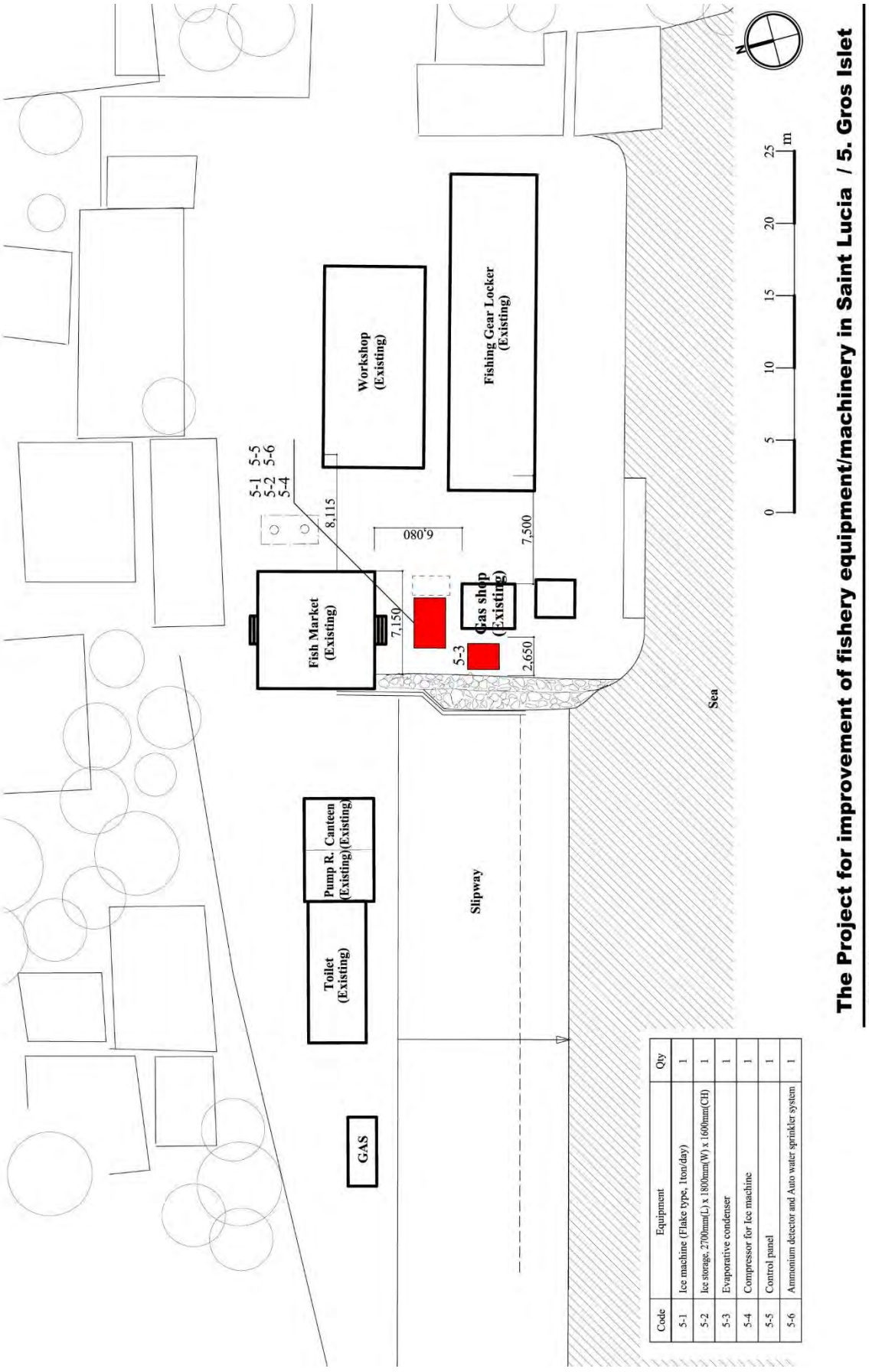


Fig. 2.9 Site Plan/Layout Plan for Equipment/machinery in Gros Islet

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project is to be carried out under the Japan's Grand Aid Scheme. For the smooth implementation of the Project, it is important that opinions to be well exchanged among the implementation agency of the recipient country, the Japanese consultant and a contracted company for procurement and installation of equipment/ machinery.

(1) Basic Policy in Implementing the Works

The Project implementation requires the cabinet approval by the Government of Japan after being reviewed by relevant organizations/personnel in Japan. Following the approval, an Exchange of Notes (E/N) is signed by the two governments. The Project is then to be implemented in line with the following criteria.

1) The Project is funded by taxes of Japanese citizen, and will be implemented in line with the Grand Aid Scheme as stipulated under the budgetary system of Japan.

2) The Government of Saint Lucia will enter into contract with a Japanese consultant to which will be delegated the tasks of supporting tendering procedure and implementing construction/procurement supervision based on the results of the preparatory survey for the Project.

3) Under the above described cooperation from the consultant, the Government of Saint Lucia will select a Japanese contractor (trading firm or manufacturer) by open tendering. A contract is signed with this entity for comprehensive procurement and installation of equipment/ machineries under the Project.

(2) Basic Policy for Procurement

1) Suitable sites for temporary storage of procured equipment/ machineries are to be secured either in warehouse or on premises of target facilities in order to avoid theft and accidents during their installation works.

2) Unpacking and transport of equipment/ machineries is to be done by local workers. Engineers from the manufacturer are to be dispatched for assembly and installation of equipment/ machineries. A managerial engineer is also dispatched from Japan for directing the overall work schedule.

3) Since a number of subsidiary facilities works requires high-level management, an engineer for construction management is dispatched from Japan.

(3) Implementing Agency of the Recipient Country

The responsible agency of the Project in Saint Lucian side is the Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development (hereinafter referred to MOA) and an implementing agency for operation and maintenance is the DOF under the MOA.

2-2-4-2 Implementation Conditions

(1) Equipment/ machineries

Acquiring correct handling as well as operation and maintenance methods of introduced equipment/ machineries by users at seven sites (5 sites for replacing cooling equipment, 2 sites for introducing submerged-type FAD) is important for their appropriate operation and sustainable development of fisheries in Saint Lucia. Therefore, the Project shall prepare users' manuals for major equipment/ machineries and provide advises and training for their operation and maintenance by dispatching experts.

(2) Subsidiary Works

The interviews with local construction companies reveal that there are a limited number of contractors as well as skilled technicians especially carpenters, reinforcing bar placers, and masons. The number of employees of each contractor is also limited to 15 to 20. Subsidiary works of the Project are relatively small scale such that to renovate existing facilities and conducting additional construction of small scale buildings for machineries. However, in order to keep minimum quality standards as a Grand Aid project, the works are expected to be undertaken by a contractor who has experiences as a subcontractor in past Grand Aid projects.

Contractors that are able to conduct works of the Project in Saint Lucia and CARICOM are shown below.

Table 2.4 Name of Contractors

St. Lucia	CARICOM
・Renee's Construction Co. Ltd. ・Jamecob's Quality Construction Ltd. ・Metro Construction Ltd.	・DEVCON (TCI) Ltd. (Antigua)

2-2-4-3 Scope of Works

Respective tasks borne by the Japanese and Saint Lucian sides are to be clearly demarcated to ensure smooth Project coordination and implementation. The demarcation of the works is shown in Table 2.5.

Table 2.5 Major Undertakings for Both Governments

	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To explain and reach an agreement with facility users regarding inaccessibility to the facilities during construction works		●
2	To clear unnecessary materials within the target sites		●
3	To conduct installation works	●	
4	To fill refrigerant that to be discarded into cylinders upon removing existing equipment	●	
5	To remove and store cylinders with refrigerant that to be discarded		●
6	To remove and store dismantled existing equipment outside of the target sites		●
7	To enter into a B/A with a Japanese bank		
	1) To execute A/P		●
	2) To pay commission		●
8	To ensure unloading and custom clearance at port of embarkation		
	1) To transport the products from Japan to the recipient country via marine/ air	●	
	2) To process tax exemption and custom clearance of the products for disembarkation		●
	3) To conduct inland transportation from the port of disembarkation to the Project sites	●	
9	To exempt internal taxes and other taxes over materials/ equipment procured by contracted constructors at Saint Lucia as well as payment for services		●
10	To exempt customs duties, internal taxes, value-added tax and other fiscal levies which will be imposed to necessary duties of Japanese nationals		●
11	To accord Japanese nationals for their entry into the recipient country and stay therein for the performance of their work		●
12	To maintain and use properly and effectively the equipment provided under the Project		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

B/A: Banking Arrangement; A/P: Authorization to Pay

2-2-4-4 Consultant Supervision

(1) Detail Design and Tasks of Tendering Process

The Project begins after the official Exchange of Notes (E/N) is signed between the Japanese and the Saint Lucia Governments and the Grant Agreement (GA) is signed by JICA and the Saint Lucia Government. The following tasks are executed after a contract is signed between the Saint Lucia's responsible agency (MOA) and Japanese consultant.

1) Detail Design

The consultant conducts following tasks shown below:

・Preparation of tender documents (technical specifications, design documents)

・Provision of technical information

2) Selection of Contractors

After the tender documents are completed, the responsible agency (MOA) starts a selection process of Japanese contractors by general competitive tendering. The consultants provide assistance during the process. The steps are:

・Tender announcement →Tender evaluation →Contract negotiation

After the contractor selection, the consultant works closely with the responsible agency (MOA) and the implementation agency (DOF) to enforce smooth process of tax exemption procedure and budgeting by agencies concerned.

On the other hand, the consultant carefully examines procurement and installation documents submitted by the selected contractor. The contents to be included in the procurement and installation documents are listed in the Table 2.6 below.

Table 2.6 List of Drawings & Documents for Procurement and Installation Works

Manufacture drawings, Catalogs, Installation plan, Construction drawings, Work schedules, Organization chart for procurement and installation work, Temporary work plan, Quality control plan, Procurement plan, Safety control plan, Environment management plan

(2) Plan of Construction/Installation Supervision

The replacement of cooling equipment is strongly related with handlings of subsidiary facilities/equipment. Also, work items of subsidiary facility are quite different at each site. Therefore, an experienced architectural engineer will be dispatched for a short period to provide support and supervision for quality control and in deciding whether new and existing equipment are compatible to each other.

This engineer will also serve for the same tasks in the projects concurrently implemented in the neighboring countries (Saint Vincent and the Grenadines, and Grenada). The engineer will provide information about conditions of the foundation work such as a condenser, construction of a new machinery building and equipment facilities, and workability and capabilities of local contractors in other 2 countries for comparison.

(3) Plan of Procurement Supervision

As the Project has to be implemented during the lean fishing season and the replacement of the cooling equipment extends to 5 sites, the installation works will be going simultaneously in multiple sites. In addition, instructions for operation and maintenance of ammonia equipment are necessary at every stage of the process. Therefore, the consultants will stay in the country to supervise from the time of equipment arrival to the completion of installation.

During the installation, this consultant will hold regular meetings with the contractors to review discuss and instruct about the progress, quality, appearances and safety management. The consultants will prepare and submit monthly reports on the progress from the installation work to the completion to the Saint Lucia's implementing agency as well as to JICA.

2-2-4-5 Quality Control Plan

Items, contents and methods of management, quality standards, measurement frequency and organizing methods of its results for the quality of materials used in the Project, are to be referred to the particular specifications (tender documents, drawing, question and answer, etc.). However, since CUBiC, ASTM, AWWA and BS are commonly used in the recipient country, these standards are also to be considered.

Quality control of the subsidiary works is conducted based on the Japanese Architectural Standard Specification 5 (Architectural Institute of Japan), the Architectural Common Specification (the Ministry of Land, Infrastructure, Transport and Tourism, Japan), the Architectural Management Guideline (the Ministry of Land, Infrastructure, Transport and Tourism, Japan), and Japanese Industrial Standards.

Points of consideration in order to ensure proper quality of equipment/ machineries procured by the supplier are as follows:

1) The consultant will inspect main equipment items prior to ex-factory shipment. Also, the consultant will be responsible for confirming a temporary storage site for equipment prior to deployment, which will prevent degradation of equipment (in containers) due to effects of rain, sun, etc.

2) Regarding subsidiary facilities, the consultant shall ensure the submission of monthly working reports and take notice for avoiding inconsistency with design specifications.

2-2-4-6 Procurement Plan

(1) Equipment/ machineries

Since the major equipment/ machineries including cooling equipment, solar panel, and sub-merged FAD under the Project are of Japanese standards, following points are taken into consideration upon their maintenance.

1) Refrigerant in some objective facilities of the Project will be converted from R22 to Ammonia. The operation and maintenance method of the ammonia system has much difference in some points from that of Freon type refrigerants. Therefore, it would be the best way for local maintenance staff to receive the technical training from the stage of equipment installation spending sufficient time, directly from Japanese engineers who are familiar with installing the ammonia system.

2) It is assumed to be necessary to procure equipment/ machineries which have been introduced in tropical areas in the past as they are to be used in the severe environment with severe natural conditions and poor infrastructure of the Caribbean area.

3) Closed or half closed types are currently a mainstream for small-scale freezers and others. So that the Project plans to use half-closed types for small-scale equipment while select open types when available.

4) As for an electric controlling system, the computer control is not to be used as it cannot be repaired locally. The system that can be repaired locally is to be applied.

(2) Subsidiary Facilities

Since the subsidiary works in this Project are in small scale, a site-mixing method is taken for concreting works. Concrete blocks are produced in Saint Lucia. Though reinforcing bars and steel beams are basically imported, materials for constructing small to medium-scaled buildings are locally available. The most of residences use deformed tiles as roofing materials while neither folded-plates using tight-frame with strength nor salinity tolerant materials exists. The usage of caulking necessary for water-proofing construction is not seen at all.

The Project basically plans to use local materials. However, the Japanese products or the products from third countries are to be considered for the materials for water-proofing works.

2-2-4-7 Operation Guidance Plan

The most sensible technical transfer in this Project is operation techniques of the ammonia typed equipment. This includes not only daily operation skills but also skills for periodical overhaul of the equipment. Therefore, the soft component (technical assistance) program of the Project which does not engage in actual assembly and installation works is not good enough. One needs to participate in assembly and installation of equipment as the engineer experienced in actual operational experiences (an engineer from the manufacturer) provides the guidance on operation and indication of points for consideration (the most important work for the maintenance of ammonia typed equipment is a removal of “drain”. This procedure will be trained in the timing of 2-3 weeks after the actual operation begins when oil leaked from a compressor mixed with ammonia accumulates inside the piping system as “drain”). Through such technical transfer which one can have firsthand knowledge of an actual assembly and points of consideration from equipment installation, risks that ammonia refrigerant inherent are to be completely removed.

As to conclude, the Project, therefore, does not plan its soft component.

Technical training for maintenance staff includes guidance by engineers from the manufacturer at each stage of: assembly and installation; test operation; and actual operation. The training policies are described below:

- 2-3 maintenance staff will be trained at each site.
- Training will be conducted at stages: assembly and installation; test operation; and actual operation.
- An entire training period will be for 3 months. Justification for the training period is explained in the Reference 2.

2-2-4-8 Soft Component (Technical Assistance) Plan

As noted in 2-2-4-7, the Project does not plan the soft component.

2-2-4-9 Implementation Schedule

If the Project proceeds to implementation under Japan's Grant Aid scheme, it will be carried out through following steps after signing of the E/N between the two Governments: (1) consultant agreement; (2) detail designing, tender document preparation and approval; (3) tendering and contracting with a supplier for equipment procurement; and (4) procuring equipment and its subsidiary works.

(1) Consultant Agreement

A Japanese consultant will enter into contract with the responsible agency, MOA, to carry out the detail design and supervision of the Project. This agreement is subject to verification by the Government of Japan.

(2) Tender Document Preparation and Approval

After the consultant agreement is verified, the consultant conducts the detail designing based on the Preparatory Survey Report, and prepares tender documents. As for the equipment specifications drafted during the outline design stage, these are reviewed in terms of any changes within Saint Lucia that would affect the Project, as well as confirming whether the originally envisioned equipment items are still being manufactured, necessary legislative applications, etc. Specifications are to accordingly be modified if necessary.

After tender documents have been drafted, these are to be presented and explained to the MOA for its approval.

(3) Tendering and Contracting

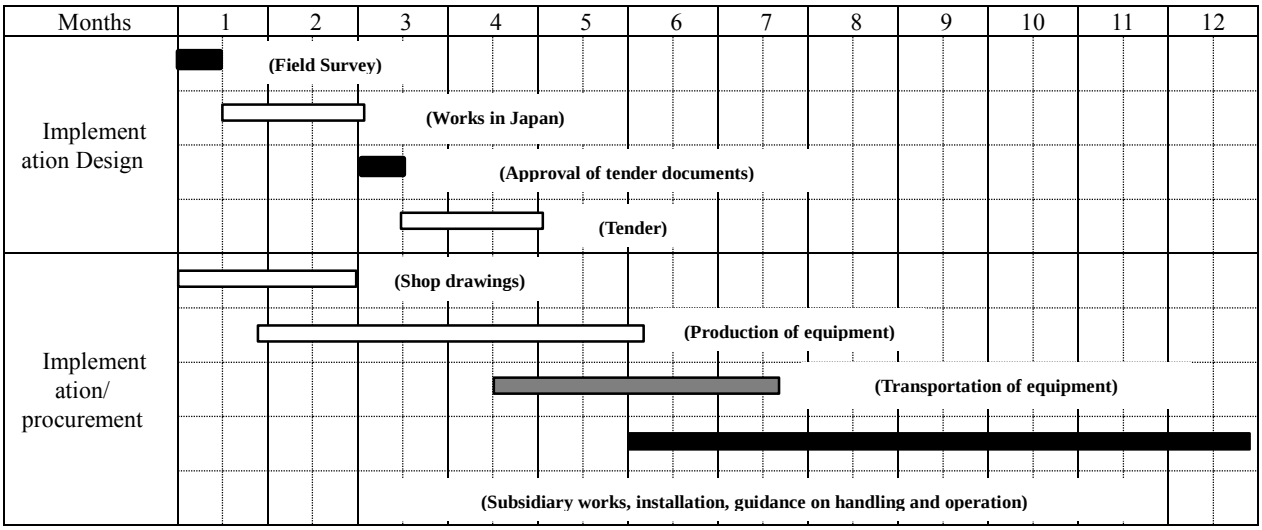
After approval of tender documents, parties interested in tendering are to be invited within Japan by means of tender notice in a generally circulated newspaper. Interested parties are briefed on the Project and provided with the requisite tender documents. After issuing tender documents, a 45 day period is allocated to interested parties for estimating the cost of equipment procurement. Interested parties are then assembled for open tendering on the Project participated by officials concerned. The tendering process entails an examination of technical documentation submitted by tenderers. Only those tenderers that pass this technical review are eligible for tendering amount evaluation. The lowest tenderer is subsequently nominated for contract negotiation.

If negotiation goes smoothly, the MOA enters into a contract with the nominated contractor for procurement of equipment under the Project.

(4) Procurement of Equipment

It is anticipated to take 4 months for consultants to prepare the detail design after E/N and G/A signed off. The contractor is verified by the Japanese Government through an official tendering process. Then, contracted contractor starts procurement tasks and consultants start procurement supervision. They need 12 months to complete their tasks.(see Table 2.7 below).

Table 2.7 Project Implementation Schedule



2-3 Obligations of the Recipient Country

The demarcation between the Japanese and Saint Lucian sides under the Project is as described in Section 2-2-4-3. Specifically, obligations of the Government of Saint Lucia are shown below.

1) To explain and reach an agreement with facility users regarding inaccessibility to existing cooling equipment during replacement works

For replacing refrigeration equipment/ machineries, works of removal of existing equipment and installation of new equipment will occur. In order to conduct these works, the entire cooling equipment needs to be stopped its operation during the work period. As a consequence, facility users are unable to access to the cooling equipment. The implementing agency, the DOF, needs to explain to facility users regarding this point before the work begins, come up with an alternative measure, and reach to a consensus on stopping the operation of the facility.

2) To clear unnecessary materials within the target sites

Unnecessary materials are to be removed as requested through discussion with concerned parties before the work for equipment installation begins.

3) To remove and store cylinders with wasted refrigerant

Along replacing the cooling equipment, the removal of existing equipment will be conducted. When the work is undertaken, the refrigerant within the existing equipment needs to be removed. The wasted refrigerant will be injected into cylinders by the contractor (supplier). The DOF shall consult and agree with agencies concerning the environment on the method and place for storing the cylinders and remove them accordingly.

4) To remove and store dismantled existing equipment outside of the target sites

Existing cooling equipment, pipes, bulbs and other dismantled materials that are to be removed during the installation work are sorted and stored in an open space near the site by the contractor. They include materials which can still be used. The DOF, therefore, moves and stores these materials in an appropriate place after deciding measures to be taken.

5) To enter into a B/A with a Japanese bank

After the signing of the E/N between the Government of Japan and the Government of Saint Lucia, the Government of Saint Lucia needs to enter into a Banking Arrangement (B/A) with a Japanese bank that includes opening a bank account.

6) To execute A/P and pay commission

The Government of Saint Lucia will have to pay an A/P notification commission as well as a payment commission to the bank with which it has entered into a B/A.

7) To process tax exemption and custom clearance of the products for disembarkation

The smooth procedure for custom clearance and internal transport of the equipment procured under the Grand Aid is necessary.

8) To exempt internal taxes and other taxes over materials/ equipment procured by the contracted contractor in Saint Lucia as well as payment for services

9) To exempt customs duties, internal taxes, value-added tax and other fiscal levies which will be imposed to necessary duties of Japanese nationals

The Government of Saint Lucia will exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in Saint Lucia with respect to the supply of the products and services under the verified contracts on the Project.

10) To accord Japanese nationals for their entry into the recipient country and stay therein for the performance of their work

The Government of Saint Lucia needs to provide necessary measures for Japanese nationals to enter into and stay in the county in order for them to accomplish their services stipulated in the verified contracts on the Project.

11) **To maintain and use properly and effectively the equipment provided under the Project**

It is necessary that the Government of Saint Lucia allocates the necessary personnel and operational and maintenance budget to ensure the effective utilization and upkeep of the equipment procured under the Japan's Grant Aid.

12) To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment

2-4 Project Operation Plan

(1) Personnel Plan

Replacing equipment/ machineries by the Project does accompany neither new allocation of personnel nor staff recruitment. However, it is essential for current maintenance staff to undergo a series of technical training starting from the stage of equipment installation as the work requires converting from current refrigerant to ammonia.

(2) Operation and Maintenance Plan

The cooling equipment that the Project engages is restricted to existing equipment/ machineries which to be replaced. Therefore, the same operation and maintenance structure will be applied before and after the Project except the case of Gros Islet where a new ice machine is introduced.

The facilities of Vieux Fort, Dennery and Castries are located in the main fish distribution centers in Saint Lucia and operated under the management of the Saint Lucia Fish Marketing Corporation (hereinafter referred to SFMC). Even after replacement of the cooling equipment, the maintenance staff assigned to each facility will engage in maintenance works.

In case of Anse La Rayae, the fishermen cooperative manages the center, and the cooling equipment is operated by an experienced operator hired by the cooperative under technical support by the staff of SFMC.

As for the operation of the newly introduced ammonia type ice machine at Gros Islet, the fishermen cooperative has to hire its operator since it is anticipated the cooperative will have the operation profit even though it hires the operator (see 3-5-2 “Operation and Maintenance Cost”). The operation needs to have a technical support by the staff of SFMC in a tour system where the main office locates in Castries near to Gros Islet.

The objective cooling equipment to be replaced by the Project has been well maintained. Therefore, it is anticipated that renovated facilities will be well maintained once the maintenance staff will have proper operation and maintenance training of the ammonia system.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

Estimated cost borne by the Government of Saint Lucia is approximately EC$124.0 thousand, for the accomplishment of the Grant-in-aid project by the Government of Japan.

The Breakdown of the cost is shown in Table 2.8.

(1) Costs borne by the Saint Lucian side

Estimated cost borne by the Saint Lucian side: EC$124.0 thousand (JPY approx. 4.77 million)

Table 2.8 The Breakdown of the Project Cost borne by the Government of St. Lucia

Items	Costs		Remarks
	EC$	JPY ('000)	
Removal and storage of cylinders filled with waist refrigerant, dismantled existing equipment/materials to the outside	80,000	3,079	DOF will take budgetary steps
Commissions of B/A and A/P	43,967	1,692	MOA will take budgetary steps
Total	123,967	4,771	

Remarks: EC$= JPY38.4830

(2) Estimate conditions

- Time of calculation: An average of 3 months from January 1 to March 31, 2014
- Exchange rate: US$ = JPY103.45
  US$ = EC$ 2.6882
  EC$ = JPY38.4830
- Implementation period: One fiscal year. The periods required for detailed design and construction are shown in the working schedule.
- Other: The Project is to be implemented under the Japan's Grant Aid scheme.

2-5-2 Operation and Maintenance Cost

The Project mainly targets replacing degraded equipment/ machineries out of the cooling equipment that has been installed in the past. In other words, there will be no extra cost generated for its operation and maintenance after replacing the equipment/ machineries.

On the other hand, a newly introduced ammonia-typed ice machine will be introduced to the Gros Islet Fisheries Center currently operated by the fishermen cooperative which accounts the operational surplus of approximately EC$110 thousands for the fiscal year of 2013. An operation plan for introduction of an ice machine is shown in the Table 2.9 below:

Table 2.9 Operation and Maintenance Cost of Ice making Machine at Gros Islet

(1)Planned sales amount of ice (designed ice production capacity: 1ton/day)	
Planned price of ice : EC$ 0.2/lb	Case example: SFMC (for traders) EC$ 0.6/lb Retail price in Gros Islet city EC$ 0.4/lb Soufriere Village (for fishers) EC$ 0.2/lb = EC$0.44/kg
Planned daily sales of ice ・For fishing operation: 250kg/day ・For storing over nights: 250kg/day Planned daily sales of ice	 ・250kg/day x EC$0.44/kg = EC$110/day ・250kg/day x EC$0.44/kg = EC$110/day Total EC$110/day + EC$110/day = EC$220/day
(1) Operation and maintenance cost for ice making (planned ice production = 500kg/day)	
・Electricity consumption	7.66kw/hr x 9hr/day=68.94kw/day
・Electricity cost	EC$ 1.05/kw
・Production cost	68.94 kw/day x EC$ 1.05/kw = EC$72.39/day
・Labor cost (operator fee)	EC$100/day
Total of OM cost for ice making	Total: EC$72.39/day + EC$100/day = EC$172.39/day
(2) Planned Profit by ice making at Gros Islet: (Daily sales of ice)-(OM cost) = EC$220/day - EC$172.39/day = EC$47.61/day	

The operation of an ice machine at Gros Islet accounts surplus of approximately EC$47.61/day which is expected surplus of EC$14,850/year (JPY approx.540 thousand annually). This is equivalent to approximately 10% of the operational profit of this cooperative.

On the other hand, the cooling equipment at Dennery is able to reduce its electricity cost during daytime (7.5 hr/day) by 100% through the introduction of solar panel. However, its conditioner is required to be replaced in 10 years that costs approximately EC$31,460/ set. Its annual replacement cost is EC$3,146/year. This cost is estimated at approximately 3.2% of the annual ice sales amount of EC$97,600 (150 tons/year) in Dennery. Accordingly, it can be said the annual average replacement cost for the conditioner could be deposited annually from ice sales activities in Dennery.

There will be not operation and maintenance costs for submerged-type FAD once they are installed.

Regarding above, it is not necessary for the DOF, the implementing agency, to allocate new budget in order to implement this Project.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

The following matters are the preconditions to implement the Project:

(a) Permission from the relevant environmental agencies with regards to the methodologies and locations to store cylinders filled with waste refrigerant.

(b) Taking measures for smooth executions of custom clearance and tax exemptions which are stipulated for the project implementation by the Japan's Grant Aid.

3-2 Necessary Inputs by Recipient Country

(1) Socio-environmental Approach

Current used refrigerants will be removed from the cooling equipment and collected in cylinders by the Japanese contractor during the installation works. The cylinders are to be transferred to and disposed at the final location by the Saint Lucia side. It is essential for the DOF and relevant environmental agencies to discuss and agree on the disposal methodologies as well as the locations in advance. Even after the Project is completed, the DOF should conduct periodical inspection on storage conditions of these cylinders.

(2) Conversion of Refrigerant and Technical Training for the Maintenance Staff

To comply with the phase-out year specified in the *Montreal Protocol*, current used refrigerant (HCFC; R22) will be converted to ammonia refrigerants or HFC (R404a) in this Project. It is critical for the Japanese engineers to provide timely technical training at every stage of equipment installation, test runs, and the start of actual operation. Even after the completion of the Project, thorough technical training should be conducted by the DOF in the case that a new maintenance staff is recruited in future.

(3) Collaboration of CARIFICO in Introducing Submerged Type FAD

The "CARIFICO" project aims to develop appropriate resources management by public-private partnership approach and share the fruit among the Caribbean region. Through this project, it is anticipated the fishing rules necessary for fisheries co-management between public and private sectors such as permission on fishing operation around FAD, might be established based on agreement of fishermen.

The introduction of submerged type FAD is expected to contribute to promote proper fisheries management around fishing ground of this FAD applied by the fishing rules developed by the CARIFICO project through public and private partnership.

(4) Measures to Natural Conditions

a) Seawater splashes

The splashes of seawater reach to the property of the Dennery Fisheries Center when the Atlantic Ocean is rough, which easily poses the problems of metallic as well as electrical corrosion. Regular maintenance work, such as washing and/or painting equipment, is necessary for corrosion control.

b) Hurricanes

Saint Lucia is prone to hurricanes with a maximum wind speed of 60 meters a second. The solar panels planned to be installed on the roof top of the Dennery's main building should be inspected after each hurricane and identify strategies and actions to take to prevent possible damages before the next hurricanes.

c) Seasonal variation of fish landings

Saint Lucia's seasonal fish landings differ considerably. The total fish landing in the peak season reach 5 to 8 times of the landings in the lean season. The maintenance of the cooling equipment should be scheduled in the lean season and it should be performed to prevent any problems in the following peak season.

3-3 Important Assumptions

(1) Influence of Global Climate Change

The main content of the Project is to replace the existing cooling equipment. In this aspect, influences of global climate change might be an important assumption to generate or sustain the Project effect. Because the global climate change may create the change of the sea current movement which induces the change of the route of migratory fishes and might have much decrease of fish catch during the fishing season. In this result, the utilization rate and/or pattern of the fish distribution facilities might be affected.

Further, the project facilities may get damages by a hurricane with extraordinary wind velocity that might be caused by the global climate change.

3-4 Project Evaluation

As explained below, the relevance and the effectiveness of the Project are anticipated to be high.

3-4-1 Relevance

(1) Contribution to achieve overall goals of the mid/long term fisheries development plan

In accordance with the CARICOM's development guide, the Government of Saint Lucia has formulated the National Fisheries Plan 2013 with its target year of 2020. Its basic vision is stated as "to promote sustainable fisheries industry by a public-private partnership, to strengthen profitability and to contribute to food security"

The Project aims to improve and maintain the function of fisheries distribution facilities have been provided by Japanese Grant Aid in the past, and to contribute to sustainable use of fisheries resources through promoting proper fisheries management, which serves to achieve the basic vision of the National Plan stated above.

(2) Relevance to policies/guideline of assistance by the Government of Japan

In the Assistance Policy to Saint Lucia (April, 2014) by the Government of Japan, the fisheries sector is stated as one of important assistance fields (midterm target), and is commented to continue the cooperation for its sustainable development and management of fisheries. In this regard, this Project is relevant to the assistant policy of the Government of Japan, and high in appropriateness since the project aims to improve the fish distribution of Saint Lucia and to promote its fisheries management.

3-4-2 Effectiveness

(1) Quantitative Impact

Most cooling equipment targeted in the Project is ready to stop functioning due to salt damages as well as aging deterioration. Therefore, the concrete effect of replacing cooling equipment is the same as prolonging the function of the equipment for another 15 years.

In developing countries, the cooling methodology in fishing/distribution exclusively relies on ice. The effect of replaced cooling equipment can be evaluated by whether they can supply enough ice or not.

The evaluation objective sites are expected to be either Vieux Fort or Dennery, where the landed fish volume is large and ammonia cooling equipment will be installed.

To quantitatively evaluate whether replaced cooling equipment is operated effectively or not, we have to figure out how much ice is used for monthly landed fish. In general, cooling effectiveness of fresh fish is assessed by ice/fish ratio = 1 as a standard. However, the ice/fish ratio might be under 1 in the project sites because this standard of preserving freshness of fish is not prevalent among fishermen and also the distribution time is relatively short for it is a small country. If it is the case, the baseline at the time of replacement cannot be determined unless actual ice/fish ratio is measured in each site, which unfortunately has to be left in future.

If the ice/fish ratio is actually measured in each site, quantitative measurements can be possible by the following methodologies (See Table 3.1):

a) Calculate monthly volume of produced ice by monthly cumulative operating hours of the cooling equipment
b) Calculate average monthly ice/fish ratio by monthly landed fish volume
c) Compare the monthly ice/fish ratio with the baseline ratio measured at the time of replacement of the cooling equipment

The following preconditions need to be met for quantitative evaluation of the project effectiveness.
Preconditions：

a) The maintenance staff should record operating hours in the daily log book. The operating hours should be determined by the cumulative operating time meter installed on the cooling equipment. In addition, the total operating hours should be recorded every month.
b) The landed volume recording staff should keep the total volume of landed fish every month.
c) An ice making machine with its capacity of 1 ton/day produces 1 ton of ice during 19.2 operating hours (80 % of 24 hours).

Table 3.1 The Baseline Numbers for Quantitative Evaluation of Refrigerant Effectiveness

Quantitative Effects	Baseline Value (2014)	Target Value (2018) 【3 years after completion】
Ice/fish ratio (Vieux Fort or Dennery)	α	α≦
Registered number of fishermen operating at the point of submerged FAD as their fishing ground	Total 0/Year	Total 500 persons/ year

(2) Qualitative Effects

The following are the expected qualitative effects by this Project.

Table 3.2 Qualitative Effects of Equipment/ machinery at each Project site

Objective Project	Project Contents	Project Effect
Construction of Vieux Fort Fisheries Complex Center	Replacement of ice plant, cold storage and blast freezer together with conversion to ammonia system. Replacement of 5-ton refrigeration trucks	*Some level of satisfactory with freshness of fish would be maintained by users of the cooling equipment *Ice is utilized continuously (Sales volume of ice)
Construction of Dennery Fisheries Center	Replacement of ice plant and cold storage together with conversion to ammonia system.	

[Appendices]

Appendices 1. Member List of the Survey Team

(1) Field Survey for the Outline Design

	Title	Name	Affiliation
1	Team Leader (1st period)	Mr. Kenichi Kato	Director, Field Crop Based Farming Group, Rural Development Department, JICA
2	Team Leader (2nd Period)	Mr. Takashi Nishimura	Advisor to Field Crop Based Farming Group, Rural Development Department, JICA
3	Project Manager Operation and Maintenance Management Planning I	Dr. Tamotsu Tomiyama	System Science Consultants Inc.
4	Operation and Maintenance Management II	Mr. Takashi Morimoto	Individual Consultant
5	Equipment Designing I	Mr. Masakazu Ishii	Icons Inc.
6	Equipment Designing II	Mr. Masaji Yoshioka	Individual Consultant
7	Facility Planning / Environment & Social Consideration I	Mr. Hirotaka Koizumi	System Science Consultants Inc.
8	Facility Planning / Environment & Social Consideration II	Mr. Kentaro Nishiyama	System Science Consultants Inc.
9	Equipment Procuring Planning / Cost Estimation I	Mr. Michio Tsuji	System Science Consultants Inc.
10	Construction Procurement/ Cost Estimation II	Mr. Akihiro Hayahara	System Science Consultants Inc.

(2) Explanation on the Draft Final Report

	Title	Name	Organization
1	Team Leader	Mr. Yoshihisa Masanaga	Deputy Director, Field Crop Based Farming Group, Rural Development Department, JICA
2	Project Manager Operation and Maintenance Management Planning I	Dr. Tamotsu Tomiyama	System Science Consultants Inc.
3	Equipment Designing I	Mr. Masakazu Ishii	Icons Inc.

Appendices 2. Study Schedule

(1) Field Survey for the Outline Design

(2) Explanation on the Draft Final Report

Date	Day of the week	**Mr. Y. Masanaga** Team Leader	**Mr. T. Tomiyama** PM/Operation & Maintenance Management Planning I	**Mr. M. Ishii** Equipment Designing I
13th, May	Tue	NRT → NY/JFK		
14th, May	Wed	NY/JFK → Antigua → St.L / HN		
15th, May	Thu	Official Meeting (St.L)		
16th, May	Fri	Exchange of Minutes (St.L)		
17th, May	Sat	St.L / HN → GND		
18th, May	Sun	Preparation of Minutes		
19th, May	Mon	-		
20th, May	Tue			
21st, May	Wed			
22nd, May	Thu			
23rd, May	Fri			
24th, May	Sat	GND → NY/JFK		
25th, May	Sun	NY/JFK →		
26th, May	Mon	→ NRT		

Remarks: St. L: Saint Lucia, GND: Granada, St. V: Saint Vincent and the Grenadines

Appendices 3. List of Parties Concerned in the Recipient Country

Ministry of Agriculture, Food Production, Fisheries, Co-operatives and Rural Development		
Name	Title	Organization
Hon. Moses Jr. Baptista	Minister	Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development (MOA)
Mr. Rufus George	Chief Fisheries Officer	Department of Fisheries (DOF)
Mr. Seon Dunchan Ferrari	Fisheries Officer	
Mr. Thomas Nelson		
Mr. Daniel Medar		
Ms. Flavia Florence	Data-collector	
Mr. Hardin Jr. Pierre	Fisheries Extension Officer	DOF, Vieux Fort
Ms. Rita Harrison		DOF, Soufriere
Ms. Petronila Polus		DOF, Gros Islet
Mr. Vaughn A. Charle	General Manager	SFMC
Mr. Jerson Badal	Senior Manager	
Mr. Lambert Vitalis	Plant Manage	SFMC, Vieux Fort
Mr. Rigie Maxwell		SFMC, Dennery
Anse La Raye Fisheries and Consumers Coop.		
Mr. Gregory Deterville	Secretary	
Gros Islet Fisheries and Consumers Coop.		
Ms. Joana Alice	Board of Director	
M. Ema Michoud	Manager	
Ministry of Physical Development, Housing and Urban Renewal		
Ms. Karen Augustin	Chief Physical Planning Officer	Development Control Authority
Ministry of Sustainable Development, Energy, Science & Technology		
Ms. Crispin d Auvergne	Chief Officer	Sustainable Development and Environment Division
Mr. Dunley Auguste	General Manager	Solid Waste management Authority

Embassy of Japan in Trinidad and Tobago		
His Excellency Yoshimasa Tezuka	Ambassador	
Mr. Takeshi Koga	Second Secretary	

Japan International Cooperation Agency (JICA)		
Ms. Akiko Oda	Chief Representative	JICA Dominican Republic Office
Mr. Naotaka Yamaguchi	Sub-Director	
Mr. Nariaki Mikuni	JICA Expert	CARIFICO PROJECT
Mr. Mitsuhiro Ishida		

Appendices 4. Minutes of Discussions

(1) Minute of Discussions on the Survey I

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
FOR
THE PROJECT FOR IMPROVEMENT OF FISHERY EQUIPMENT/MACHINERY
IN
SAINT LUCIA

The Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to conduct a Preparatory Survey for "the Project for Improvement of Fishery Equipment/ Machinery in Saint Lucia" (hereinafter referred to as "the Project") and sent the survey team (hereinafter referred to as "the Team") to Saint Lucia, headed by Mr. Takashi Nishimura, Advisor, Rural Development Department, JICA. The Team is scheduled to stay in the country from 15th of January to 12th of February, 2014.

The Team held a series of discussions with officials concerned of the Government of Saint Lucia (hereinafter referred to as "GOSL") and conducted field surveys at the study area. As a result of the discussions and the field surveys, both parties confirmed the main items described in the attached sheets.

Castries, 11th of February, 2014

Mr. Takashi Nishimura
Leader,
Preparatory Survey Team,
Japan International Cooperation Agency

Hon. Moses Jn. Baptiste
Minister for Agriculture, Food Production,
Fisheries, Cooperatives and Rural Development
Saint Lucia

ATTACHMENT

1. Title of the Project

Both sides confirmed that the title of the Project was "the Project for Improvement of Fishery Equipment/ Machinery in Saint Lucia".

2. Objective of the Project

Both sides defined the objective of the Project as to improve fishery product distribution and fisheries management, by upgrading and replacing of equipment/machinery and its accompanying facilities that were previously installed by Japan's Grant Aid, as well as, by installing new equipment/machinery responding to new needs on fisheries management.

3. Responsible and Implementing Agency

The responsible agency shall be the Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development.

The implementing agency shall be the Department of Fisheries under the Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development.

The organization chart of the Department of Fisheries is shown in Annex-1.

4. Project site

The Project site is shown in Annex- 2.

5. Items requested by the Government of Saint Lucia

After discussion, both sides confirmed the items requested by the Saint Lucian side. They are listed in Annex-3.

6. Japan's Grant Aid Scheme

The Saint Lucian side understood the Japan's Grant Aid Scheme explained by the Team as described in the Annex 4 and shall take the necessary measures as specified in the Annex 5 for smooth implementation of the Project.

7. Further schedule of the Study

(1) Based on the survey results, JICA will prepare the draft report including the outline design of the Project and dispatch a mission in order to explain its contents tentatively scheduled in May, 2014.

(2) Once both sides agree in principle on the contents of the report, JICA will finalize the report and send it to the Saint Lucian side by the end of August, 2014.

8. Environmental and social considerations

In order to ensure that appropriate environmental and social considerations are to be made for the Project, the Saint Lucian side agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in addition to the national environmental laws and regulations in Saint Lucia.

It was affirmed that the Department of Fisheries would take charge of conducting the Environmental Impact Assessment and obtain an environmental permission from the Saint Lucian authorities concerned before the implementation of the Project.

9. Other important issues

(1) Official request letter for Grant Aid from Japan

The Saint Lucian side agreed that the GOSL should submit "Application Form for Grant Aid from Japan" to the Government of Japan (hereinafter referred to as "GOJ") through diplomatic channel as soon as possible after this meeting. The list of items requested as Annex-3 should be attached to the application form.

(2) Decision of the final items of the Project

The Saint Lucian side understood the followings:

a. After this survey, JICA would prepare the outline design and estimate costs of the Project through further studies in Japan.
b. The GOJ would scrutinize the outline design and costs, taking the Japanese side's budget into consideration.
c. Through these processes, the Japanese side would decide the final items of the Project.
d. Therefore, all items listed in Annex-3 might not be assured to be the final items.

(3) Disposal of equipment/machinery/facilities

The Saint Lucian side agreed that if it is necessary to dispose for implementation of the Project any fishery equipment/machinery/facility installed by the previous Japan's Grant Aid, the GOSL should inform the GOJ through the diplomatic channel based on the Exchange of Notes (E/N) before disposing it.

(4) Explanation to stakeholders

The Saint Lucian side agreed that the GOSL should explain to the stakeholders concerned the equipment/machinery/facilities that would be disposed for the Project before starting the Project, and to ensure that they could obtain substitutes.

(5) Undertakings to be taken by GOSL

The St. Lucian side understood that the GOSL should take necessary measures by its own expenses if existing equipment/machinery/facilities should be disposed and/or enough space should be assured for implementation of the Project.

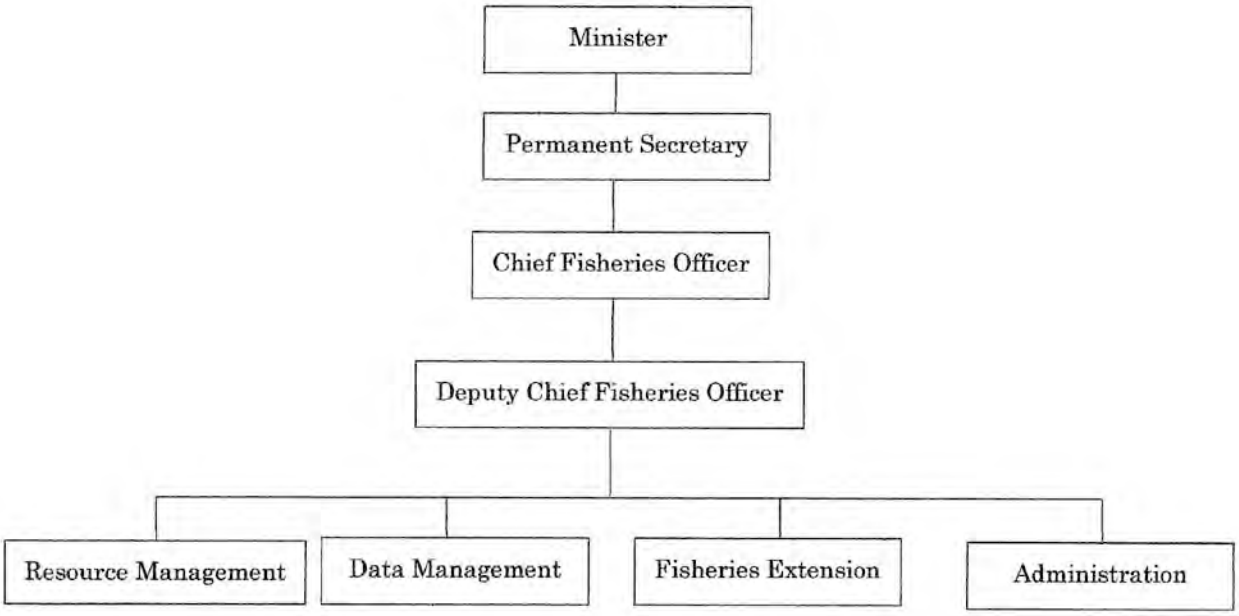
However, both sides agreed that they would explain to their own Government the appropriateness that installation of new equipment/machinery/facilities and disposal of existing equipment/machinery/facilities should be implemented as a work in the Project, if installation and disposal is inseparably related to each other.

END

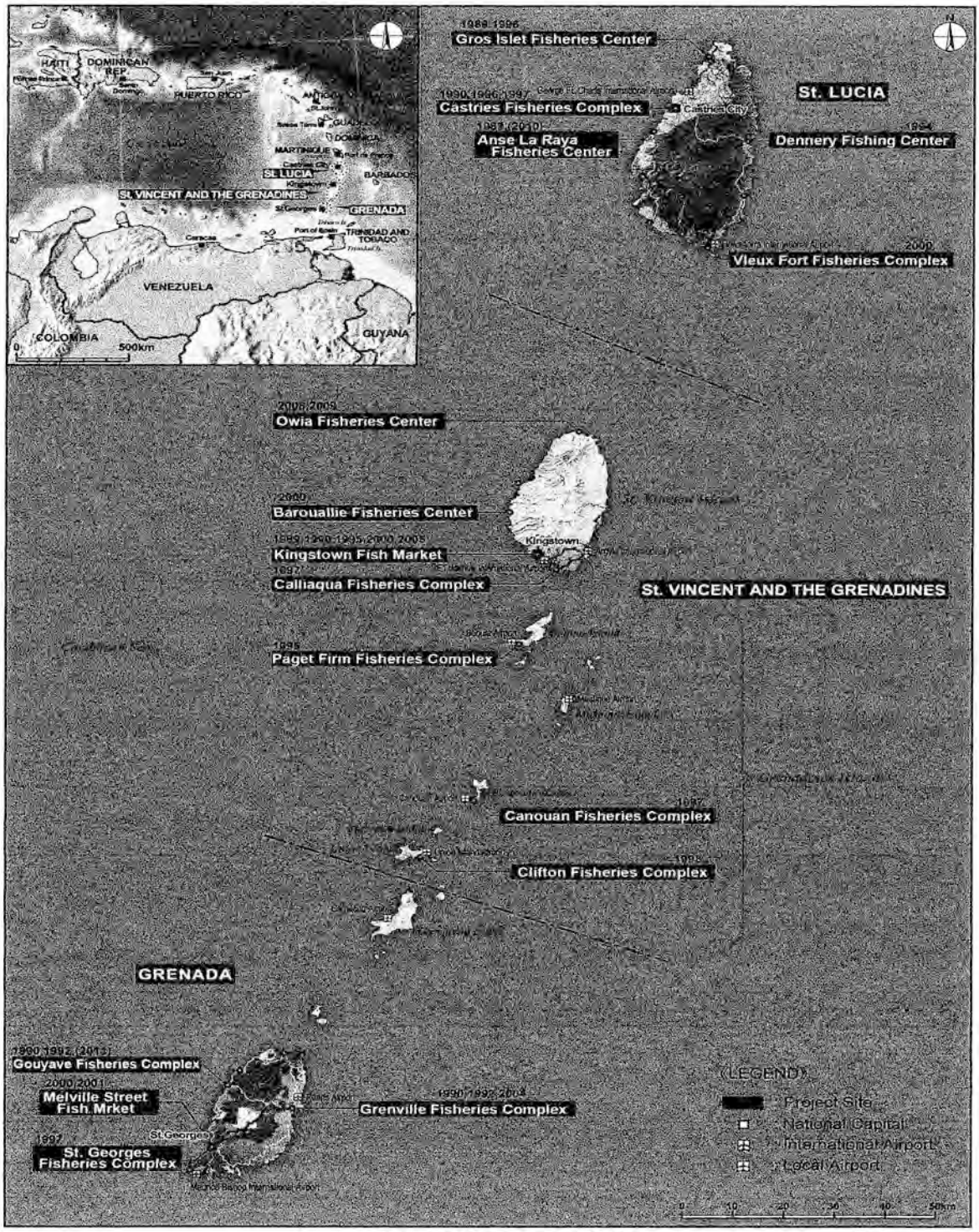
Annex 1 Organization charts
Annex 2 Location of the Project site
Annex 3 List of items requested by the Government of St. Lucia
Annex 4 Japan's grant aid scheme
Annex 5 Major undertakings to be taken by each Government

Annex-1 Organization Chart

Department of Fisheries
Ministry of Agriculture, Food Production, Fisheries, Cooperatives and Rural Development



ANNEX 2 Location of Project Sites



MAP OF PROJECT SITE

Annex-3 List of Items Requested by the Government of St. Lucia

2014/2/7

No.	Project Site	Name of Previously Executed Project (Completion Year)		Candidate Component of the Project	Quantity	Discussion Results of thw Field Survey (Preparatory Survey for Improvement of Fishery Equipment /Machinery in the Caribbean Region)	Executing Agency
1-1	Vieux Fort	The Project for Construction of VieuxFort Complex	2001	To replace existing refrigeration system (including ice machine, cold storage and blast freezer) using freon origin refrigerant to those of the ammonia system	1 set	This center is the core of the fisheries marketing sytem in St. Lucia. Its refrigeration facilities are in the time of replacement because of their mechanical life span. In their replacement , changing to the ammonia type refrigeration system was requested. The space of this facilities is wide and suitable for the technical transfer to plural number of trainees at a time.	FMC
1-2				To replace existing two 5-ton refrigeration trucks to new ones for frozen fish transport	2 vehicles	Out of existing two trucks, one is heavily broken caused by accident and the remaining is in the time of replacement because of its mechanical life span. These trucks have been used for frozen fish transport not only to the capital Castries but also to other consumption markets.	
1-3				To install solar panel (Less than approx. 500m2 and approx. 50kw, excluding battery) on to the roof of the processing factory (Approx. 500m2)	1 set	The electric cost is heavily burdened to the center's operation. To reduce this burden, installation of solar panel has been requested.	
1-4	Dennery	Project for the Construction of Fish Landing-base	1994	To replace existing ice machine (2 ton/day) attached with an ice storage and cold storege using freon origin refrigerant to those of the ammonia sytem	1 set	This landing base is only the one facing to the atlantic ocean provided by Japanese assistance and is the main supply base of large size fishes to Vieux Fort. Its refrigeration facilities such as ice machine, etc. are still functioning but are apparantly over their mechanical life span. They should be replaced. In their replacement , introductionof the ammonia system has been requested.	
1-5				To install solar panel (less than Approx. 200m2 and approx. 20 kw excluding battery)	1 set	The electric cost is heavily burdened to the center's operation. To reduce this burden, installation of solar panel together with taking measures to rain water leakage of the main building 's roof, has been requested.	
1-6	Soufriere / Choiseul / Castries	The Project for Improvement of Coastal Fisheries Development	2003	To replace existing air cooling condenser to that of water cooling type	1site only	To replace existing air cooling condenser of Castries heavily deteriorated to that of the water cooling type. Others could be used for further 4-5years. They should be replaced when they reach their life span together with existing refrigeration machines at a time. Spareparts of existing compressor to be burdened to FMC.	
1-7	Anse La Rayae	The Project for Improvement of Fishery Infrastructure in Anse La Raye	2010	To replace existing refrigeration compressor	1 set	Existing facilities are still new, only three years from commencement of its operation. However, activities of the center have completely stopped caused only by malfunction of the refrigeration compressor (lock of its cylinder). Inquiring of the cause of locking and replacement of the compressor have been requested. It was clarified the malfuction of electronic censor of compressor's oil level was the cause. Existing refrigeration facilities could be revitalized by replaceing a new compressor provided with an analog type oil level censor.	DOF
1-8	Gros Islet	The Fisheries Development Project (Phase 3)	1996	To install a new ice machine	1set	The center is provided with a small landing wharf and a market hall, constructed 18years ago. In the early time of its commencement, fishing ground was near to the site and fishing was operated only by wooden canoes. By and by, the size of fishing boat has been enlarged and the fishing ground has expanded. At present, average daily landing is approx.500 lb of lobster and bottom fishes. Most boats return to the site in the evening time. A small ice plant has been requested to secure stable and sufficient supply of ice for cooling their catch until next morning. The site is adjacent to the Capital Castries and has strong advantages for marketing their catches.	DOF
2	South and West coast of St. Lucia	Not categorized into past projects (On-going technical cooperation project)		Submerged-type fish aggregating device (FAD) for 1,500m depth including FRP+ABS float unit, resin+wire coated rope, anchor chain, anchor, radar reflector, and beacon light	2 sets	Sub-merged type FAD which enable to avoid from damages by vessels navigation or lost caused by bad weather, has been requested for experiment. It will be used for the effect assessment to the local fishing activities.	DOF
3	Vieux Fort	Project for Construction of the Fisheries Development Center	1996	To replace existing "Chadon (17 years old)"to a new fisheries research boat with approx. 14m length, a cabin enough for 6 persons on board for 3 to 4 days operation, intending to 1) diamondback squid test fishing, 2) survey, deployment and monitoring of FADs equipped with 1-ton crane and submerged camera, and 3) mapping of fishing ground using multi-beam echo-sounder (range up to 3,000m)	1boat	At present, DOF has one staff of captain cum engineer. He has been operating "Chadon"donated by Japanese assitance, more or less 60 times during the year of 2007 to 2013 for test catching, deployment of FAD, training of young fishermen, etc. The hull of the boat is seriously getting deteriorated, and its maintenance cost has reached significantly high. A new research boats has been requested. By using a new boat , test fishing of plural days of operation could be conducted more frequently.	DOF
4	Castries / Vieux Fort / Soufriere	The Fisheries Development Project (Phase 3)	1996	To replace existing pickup trucks (4wd, 2cab x 2 and 1cab x1)	3 vehicles	At present, this type of pickup truck is stationed each in three main DOF branches, and is taking activities of public information and extention of DOF and transportation services of materials to fishing villages. Each vehicles has been engaging for more or less 17 years and getting deteriorated. Replacement of these three vehicles has been requested because of their maintenance cost is higher than the vehicles	

Remarks: DOF,Department of Fisheries, FMC, Fish Marketing Corporation

ANNEX-4 Japan's Grant Aid

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

・Preparatory Survey
  - The Survey conducted by JICA

・Appraisal &Approval
  -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation
  -The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")
  -Agreement concluded between JICA and a recipient country

・Implementation
  -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the

Project.

- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the

Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as shown in ANNEX-5.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

ANNEX-5 Major Undertakings to be taken by Each Governments

Major undertakings to be taken by both Governments are shown in the table below.

NO.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct a parking lot (or parking lots)	(●)	●
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the building	●	
7	To provide facilities with electricity, water, sewage system and other incidental facilities		
	1) Electricity		
	a. Wireing the site		●
	b. Drop wiring and internal wiring within the site	●	
	c. Installation of main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Sewage		
	a. City drainage main (for storm sewer and others to the site)		●
	b. Drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution flame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	●
10	To accord Japanese nationals, whose services may be required in connection with the supply of the products and the services under the verified contract, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
12	To properly and effectively maintain and operate the facilities contracted and equipment provided under the Grant		●
13	To bear all the expenses, other than those to be covered by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to pay)

(2) Minutes of Discussions on the Survey II (Explanation of Draft Report)

MINUTES OF DISCUSSIONS
ON
THE PREPARATORY SURVEY
FOR
THE PROJECT FOR IMPROVEMENT OF FISHERY EQUIPMENT/MACHINERY
IN
SAINT LUCIA
(EXPLANATION OF DRAFT REPORT)

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team on "the Project for Improvement of Fishery Equipment/ Machinery in Saint Lucia" (hereinafter referred to as "the Project"). Based on the results of the survey, JICA prepared the draft report of the Project.

In order to explain and to discuss with the authorities concerned to the Government of Saint Lucia (hereinafter referred to as "GOSL") about the components of the draft report, JICA sent a Preparatory Survey Team (hereinafter referred to as "the Team") to Saint Lucia from 14th to 16th of May, 2014 headed by Mr. Yoshihisa MASANAGA, Deputy Director, Rural Development Department, JICA.

As a result of the discussions, both sides confirmed the main items described in the attached sheets.

Castries, 16th of May, 2014

Mr. Yoshihisa MASANAGA
Leader,
Preparatory Survey Team,
Japan International Cooperation Agency

Mr. Rufus George
Chief Fisheries Officer,
Department of Fisheries,
Minister for Agriculture, Food Production,
Fisheries, Cooperatives and Rural Development
Saint Lucia

ATTACHMENT

1. Components of the draft report

The Saint Lucian side agreed and accepted the components of the draft report explained by the Team including obligations of the recipient country which are mentioned in the Chapter three (3) of the draft report. It is understood that further request of change in the Project components shall not be considered; however, the components of the Project are still subject to change depending upon the result of the tender for contractor.

2. Japan's Grant Aid Scheme

The Saint Lucian side reconfirmed its understanding of the Japan's grant aid scheme and major undertakings of each Government as described in the Annex 4 and 5 of the Minutes of Discussions signed on 11th February, 2014.

3. Further schedule of the survey

JICA will complete the final report in accordance with the confirmed items and send it to the Saint Lucian side by the end of August, 2014.

4. Estimated cost of the Project to be borne by Japan's Grant Aid

4-1. Estimated cost of the Project

The Team provided the estimated cost of the Project as described in the Annex 1.

4-2. Confidentiality

The Saint Lucian side affirmed that the estimated cost of the Project, together with other information related to the Project such as facility design drawings and specifications of equipment, shall not be released to any outside parties before conclusion of all the contract(s) for the Project since they are confidential information that is concerned with the tender.

5. Environment and Social Considerations

In order to ensure that appropriate environmental and social considerations are to be made for the Project, the Saint Lucian side agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in addition to the national environmental laws and regulations of GOSL.

6. Other Relevant Issues

6-1. Timely fulfilment of obligations of the recipient country

It was assured that GOSL shall take necessary measures to fulfil those obligations listed below with due observation of respective time limit.

(1) Disposal of equipment/machinery/facilities

The Saint Lucian side agreed that if it is necessary to dispose for implementation of the Project any fishery equipment/machinery installed by the previous Japan's Grant Aid, the GOSL should inform the GOJ through the diplomatic channel based on the Exchange of Notes (E/N) before disposing it.

(2) Explanation to stakeholders

The Saint Lucian side agreed that the GOSL would explain to the stakeholders concerned the equipment/machinery/facilities that would be disposed for the Project before starting the Project, and to ensure that they could obtain substitutes.

6-2. Proper operation and maintenance of renovated facilities by the Project

It was reconfirmed that the Saint Lucian side assume overall responsibilities for the proper operation and maintenance of the Project facilities and duly undertake the following measures.

(1) The Saint Lucian side assured that the same operation and maintenance system is to be applied before and after the Project. In case of Anse La Rayae, the Fishermen's Co-operative manages the center. The Department of Fisheries will instruct the cooperative to hire an experienced engineer for the refrigeration facilities with technical support by the staff of the Fish Marketing Corporation.

(2) The Saint Lucian side will arrange all the existing maintenance staff both of the Department of Fisheries and the Fish Marketing Corporation to attend the operation and maintenance training of the ammonia type refrigerating facilities by Japanese engineers from the manufacturer at each stage of equipment installation, test operation and full operation by the Project.

ANNEX

Annex 1 Estimated Project Cost to be borne by Japan's Grant Aid

CONFIDENTIAL

5. Appendices 5

App.5-1 Service Life of Refrigeration Facilities

Type of Component	Service life maintained in Japan, etc.<1 (Years)			Service life maintained under sever conditions such as Caribbean. Area, etc.<2 (Years)				Measurements to elongate life span
	Usual <3	Good <4	Bad	Usual <5	Good <6	Bad	Good after proper installation <7	
Plate type ice machine	12	15	10	10	12	7	15	To maintain pipes for water showering(periodical washing by anti-silica detergent)
Flake type ice machine	15	20	10	12	15	7	20	Blade adjustment, speed reducer's oil exchange
Open type compressor	15	20	10	12	15	7	20	Periodical oil exchange and overhaul
Semi-closed type compressor	10	12	7	10	12	7	12	Periodical oil exchange and testing of insulation resistance
Air cooling condenser	12	15	5	10	12	3	15	Proper selection of material, usage of copper fin and exterior coating by SUS, periodical inspection
Water cooling compressor	12	15	7	10	12	5	15	Proper selection of material, usage of exterior coating and pump by SUS, periodical inspection
Other equipment	20	20	10	15	20	10	20	Periodical inspection and touching up
Indoor electric control panel	15	2	10	10	12	7	20	Proper selection of setting sit, periodical testing of insulation resistance
Outdoor electric panel	10	15	7	7	10	5	15	Proper selection of material, exterior coating by SUS, periodical inspection
Motors	10	15	7	7	10	5	15	Application of AVR to keep constant voltage, periodical testing of insulation resistance
Three phase transformer	15	20	10	10	15	7	20	Periodical testing of insulation resistance, touching up
Piping for refrigerant and water	12	15	10	10	12	7	15	Periodical inspection and touching up
Prefabricated panel	15	20	10	12	15	7	20	Proper selection of material, interior and exterior coating by SUS

Remarks<1: Located far from the coast and the site with sufficient infrastructure
<2: Located heavily influenced sea condition and the site without sufficient infrastructure
<3: Maintained by trained maintenance staff
<4: Periodical maintenance by the manufacturer
<5: Maintenance works currently conducted in the Caribbean area
<6: Maintenance works by trained maintenance staff according to the operation manual
<7: Provided with proper material and installation and maintained by trained maintenance staff

App.5- 2 Specialists' View on Appropriate Period for Maintenance Staff's Training on Ammonia Refrigerating Facilities

(1) Basic Precautions for Handling Each Refrigerant

Refrigerant	Ammonia	R404a	R22	Remarks
Ozone depletion coefficient	0	0	0.055	-
Global warming coefficient	0	3920	1810	Assumed CO2 as 1
Poison designation	Poison	non	Non	-
Bad smell	Stink	non	Non	-
Flammability	Ignition point 651℃	Not flammable	Not flammable	-
Boiling point	-33℃	-40.8℃	-49℃	-

(2) Important point of maintenance

Refrigerant		Ammonia	R-404a	R22
1	Preparation for working	Prepare ammonia gas mask	Nothing special	Same as on the left
2	Ventilation and safety apparatus	To keep sufficient ventilation and to take mind the evacuation route in the case of ammonia leakage.	Not to neglect ventilation to avoid accident caused by lack of oxygen since this gas has no small.	Same as on the left
		Put on goggles and gloves	Same as on the left	Same as on the left
3	Valve operation	To close a high receiver liquid valve.	Same as on the left	Same as on the left
		Confirm if the refrigerant has been recovered from the repaired portion.	Same as on the left	Same as on the left
4	Working position	To take a windward position from a working point.	Same as on the left	Same as on the left
5	Procedure of releasing a valve	To start taking off a bolt positioning far from the body.	Same as on the left	Same as on the left
		To confirm not remaining any ammonia by releasing slightly the bolt/screwed type tightener	Same as on the left	Same as on the left
6	Procedure after removing a valve	To purge the air from the repaired portion by a vacuum pomp.	Same as on the left	Same as on the left
7	Leakage check	To check ammonia leakage from the repaired portion by ammonia test paper.	To check gas leakage from repaired portion by a gas sensor	Same as on the left
8	Valve operation after repair working	To open the valve gradually positioned opposite side from a high pressure liquid receiver	Same as on the left	Same as on the left
9	Checking operating condition	To check temperature and pressure of the system.	Same as on the left	Same as on the left

[Comments on Handling and Management of Different Refrigerants]

a) As described in the Table above, the maintenance methodologies of ammonia refrigerant are almost the same as other refrigerants. The handling precautions specifically needed for ammonia is to wear an "ammonia mask" in case of leakage.

b) Ammonia refrigerants are easy to detect even very small leakages. However, fluorocarbon refrigerants can be dangerous when used in a closed space as they are odor-free. The fluorocarbon refrigerants cannot be considered as an easy-to-maintain refrigerant as they require leakage detection regularly.

c) R-404a, a mixed refrigerant, is also a difficult one to handle. When there is a leakage, the mixture ratio of remained content is altered. The residue should be removed and the whole refrigerant ends up needing to be replaced.

(3) Strategies for Foreseeable Accidents and the Prevention

<table>
<tr><th>Refrigerant</th><th>Ammonia</th><th>R404a</th><th>R22</th></tr>
<tr><td colspan="4">1) SERIOUS ACCIDENT
This accident happens specialized in the ammonia liquid pump system. This system is not applied to the Project.</td></tr>
<tr><td>Low temp. liquid blockade accident</td><td>Almost all the death accident by an ammonia system are caused by those of the low temp. ammonia liquid blockade. Once happened, it usually results in an serious accident.</td><td colspan="2">The low temp. liquid blockade by R-404a or/an R22 does not result in a death accident, but still a serious accident.</td></tr>
<tr><td>Cause of the accident</td><td colspan="3">The accident happens in the pipe portion between the discharge check valve of the refrigerant liquid pump and the electric magnetic valve. When the low temperature liquid refrigerant is fully confined in this pipe, the inner pressure is quickly increased, and then large volume of liquid refrigerant spouts caused by destruction of valves, etc.</td></tr>
<tr><td>Prevention of the accident</td><td colspan="3">A relief valve is installed onto the pipe
between the discharge check valve of the refrigerant liquid pump and electric magnetic valve, and the spout pipe of this relief valve is connected to the low receiver.</td></tr>
<tr><td colspan="4">2) ANOTHER TYPE OF ACCIDENT
More than 90% of accidents of refrigeration for equipment/machineries are caused by refrigerant leakages;</td></tr>
<tr><td>Causes of refrigerant leakage accident</td><td colspan="3">18%-miss-operation and/or check error; 12%-poor flange clamping;
12%-damages of mechanical sealing; 10%-imperfect of valve ground sealing;
9%-Poor installation management; 9% poor management of idle facilities;
7%-damaged by earthquake; 7%-damaged by deterioration;
5% -exterior corrosion of pipes; 10%-and others</td></tr>
<tr><td>Prevention of the accident</td><td colspan="3">Implementation of routine maintenance works enables to prevent refrigerant leakage accident.
Followings are to be:
1) To provide operation/instruction manual, equipment list, checklist on important operations and operation record.
2) To educate maintenance staff on the machine operation and preservation to take proper and quick actions once an accident is happened.
3) To check items of foreseeable dangers before starting operation.</td></tr>
</table>

(4) Ammonia specific maintenance

[Drain Removal]

When the mixture of ammonia gas and the leaked compressor oil discharged from the compressor remains in the low-pressure side of ice machines, ice-making function declines. When the same problem occurs in freezers, it does not drop or takes longer to drop to the specified temperature. Either way, the cooling capacity will be compromised. The scheduled drain removal, therefore, is the essential maintenance for refrigeration systems to function properly.

The built up drain after the heat exchange should be collected into an oil drum and removed from the drum after the ammonia gas is fully evaporated. Without the drum, it is extremely difficult to work on drains because of the strong odor. In this Project, the drum will be installed to all the systems with ammonia refrigerant to prevent the problem as much as possible.

The steps for drain removal are:

1) Make a quarter turn for the drain valve to open and discharge the drain into the oil drum. Make 1 and a half rotation when there is a big stack of drain.

2) When ammonia liquid and the gas are completely discharged into the oil drum, shut off the valve.

3) Open the suction valve of the oil drum and let ammonia evaporate. Leave the valve open until the suction pipe cools down to the room temperature.

4) Check that the suction pipe is at the room temperature and double check with the pressure meter of the oil drum to determine all ammonia is out of the oil drum. Make sure the pressure level does not increase after the suction valve is shut up. Then, remove the drain from the oil drum. Meanwhile, drain left in the drum does not harm the cooling system.

(5) A View on the appropriate period for local maintenance staff's Training

It should not be particularly difficult for technicians who have serviced R22 cooling systems for many years to service ammonia equipment. They would only need to learn distinctive characteristics of ammonia refrigerants and adequate safety measures, which can be covered in short training programs. Past experiences in African countries suggests that 3-month technical training can effectively provide practical knowledge and skills on ammonia equipment. Installing the oil drum itself prevents problems with the drain removal, the most important maintenance work of all, and enables the technicians to service the equipment properly and safely.