

Grenada

**Ministry of Agriculture, Lands, Forestry,
Fisheries and the Environment**

**THE PREPARTORY SURVEY
FOR
THE PROJECT FOR IMPROVEMENT
OF FISHERY EQUIPMENT AND MACHINERY
IN
GRENADA**

August 2014

Japan International Cooperation Agency

System Science Consultants Inc.

RD
JR
14-081

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 Grenada, 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 two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Grenada 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 are a highly favored source of protein in Grenada. The per capita fish consumption in 2011 was estimated about 28kg/year. Imported fish products volume of 1,217 tons is equivalent to about 50% of the country's landed volume of 2,273 tons. On the other hand, about 25% or 586 tons of the country's landed volume were exported, and most of them are tuna species. Reducing the volume of imported fisheries products is essential, but quality control of fish and raising the consumption rate are also important issues.

The Japanese Government has provided assistance to improve major landing sites at seven (7) locations over the past 20 years. Presently, about 70% of the country's fish catch is landed and distributed at these facilities.

In recent years, these facilities are deteriorating, especially the cooling equipment which is necessary for quality control of fish. Various cases where lowering of the cooling efficiency or loss of original function of these facilities have risen, and the country is faced with the need to replace this cooling equipment.

In addition, overfishing in the coastal waters has been pointed out and the government is also faced with the issue of focusing on adequate fisheries management for sustainable use of its resources. In this context, the Government of Grenada formulated the "Project for Improvement of Fisheries Equipment and Machinery in Grenada," 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 of three (3) fisheries centers out of seven (7) centers that were built by Japanese assistance in the past.
- b) Introduction of the equipment for promoting activities of the Fisheries Division such as a multi-purpose fishing boat, Vessel monitoring system(VMS) transponder, computers, environmental survey equipment, submerged Fish aggregating devices(FAD), etc.

(3) Circumstances on the requested Project

1) Natural Conditions

The country of Grenada is an island nation with a population of 103,390 people as of the end of 2012 and consists of the three major islands of Granada, Carriacou, and Martinique that are located in the southern region of the Windward Islands, which are a part of the Lesser Antilles Islands located in the eastern Caribbean Sea. Saint Vincent and the Grenadines are located to the north, with Barbados to the northeast, and Trinidad and Tobago and Venezuela to the south.

Grenada encompasses a land area of 345km² and the area of the continental shelf is about 3,100km². Although offshore waters on the west side of the main island on the Caribbean Sea side drop to deep-sea levels, the continental shelf stretches 8km to 10km on the Atlantic Ocean side of the main island. The surrounding oceans are the route of offshore migratory fishes.

Grenada is a country with the consistent average high temperature of 30°C and the low temperature of 26~28°C throughout the year. There is not much difference in temperature between the capital city, St. George's, and a northeastern town, Grenville. Although the rainy days and rainfall slightly increases during the rainy season, which is from June to November, the annual precipitation is as low as 1,500 mm. The 80 % of the wind blows from the directions of east northeast and east primarily due to the trade wind. The wind is mostly calm except during the hurricanes. The occurrence rate of wind speed less than 5m per second is nearly 81%.

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 fisheries 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 Grenada 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 Grenada 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

Grenada has a 10-year development plan for fisheries industry entitled “A Fisheries & Aquaculture Policy for Grenada: 2012”. It is emphasized in the policy that investment to modern technology and distribution infrastructure will play important roles in the medium run and proper resource management is addressed as an important issue. There are 5 goals and 23 issues in this policy as follows:

Goal 1: Enhancement of the status and skills of fishers

Issues: Fisheries license and registration, promotion of fisher associations, improvement of the commercial knowledge of fishers, preparation of co-management of resources (encouragement of fishers to develop a sense of responsibility for the resources they depend on), promote independence, (pursue responsibility for fishers’ socioeconomic position), securement of safety at sea.

Goal 2: Management and conservation of fisheries resources that will enable sustainable use

Issues: Sustainable use of large migratory fish, rational response to Grenada’s international obligations, sustainable use of demersal fishes and small pelagic resources and efficient data collection and analysis, establishment of a reporting system, monitoring control and surveillance of illegal fishing methods in Grenada waters and their eradication, creation of Marine Protection Area (The goal is to designate 20% of the coastal area as protected areas by 2020), application of the ecological approach in fisheries management to the sites where application is possible.

Goal 3: Realization of the latent development that is intrinsic to the fisheries sector.

Issues: Maximization of economic benefits (avoidance of post-harvest loss), marine food processing and export, promotion of aquaculture, subsidies and licenses

Goal 4: Maintaining the role of fisheries to help support the livelihoods of disadvantaged people

Issues: Maintaining the livelihood rooted in traditional fisheries, fisheries division given to disadvantaged persons (licenses, etc., of small-scale fishers within the MPA), fisheries and a wider range of economic activities and their interaction)

Goal 5: Building positive reciprocal relations with Grenada’s economic society over a wide range

Issues: Interaction between fisheries, tourism and leisure industries, conservation of high profile marine species (turtle, manta, banana sailfish, coral reef ecosystem, etc.), tourist fish market

Thereby, as a part of measures to achieve the said goals, 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 three (3) sites among seven (7) 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 19 to May 20, 2014: Explanation of the Draft Final Report

(3) 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 Grenada's fish distribution and needs urgent repairs is targeted..
- New equipment will keep the same capacities and functions of the existing equipment. New
- 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.

Grenada 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, "Caribbean Fisheries Co-management Project" (CARIFICO), by linking both projects.

(3) Outline and Project Design

Based on the Grenada Government's request, field survey and discussions with the representatives of the country, the following equipment/ machineries and facilities are planned in this Project.

- 1) Due to progressive depreciation of the cooling equipment at Melville Street and Grenville, their cooling equipment will be completely replaced. The current capacity will be retained. Based on

the request of the Grenadian government, the Freon refrigerant will be converted to ammonia, a natural refrigerant.

- 2) At Gouyave, the defective compressor for the ice machine will be replaced. The current capacity of ice machine will be kept. The electronic control oil sensor, which was the cause of the malfunction, will be eliminated and replaced with an analog type sensor to prevent further malfunctions from occurring. In addition, since there are four more compressors of the same type in operation, a supplemental oil tanks will be installed to these compressors to prevent similar malfunctions from occurring.
- 3) In lieu of the floating FADs, submerged FADs that have a longer service life will be introduced. A total of three units will be installed on the Atlantic Ocean and Caribbean Sea sides.
- 4) PCs and a server will be installed to process fisheries data at the Fisheries Division and three other sites (Melville Street, Grenville and Gouyave).
- 5) Equipment to measure the environment in the coastal waters will be provided for the Fisheries Division.

VMS responder is not included although there are needs for it .Because the Survey team could not find out a fixed annual operation and management plan.

Multipurpose fishing vessel and trial fishing gear for Diamond Back Squid are not included although there are need for it. Because the survey team could not find out a fixed operational plan or specifics for using the new vessel.

Likewise, the sea disaster prevention related training equipment was also excluded since it did not meet the purpose of this Project.

(4) Design Summary

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

List of Planned Equipment /machineries

Site and Planned Equipment	Components	Quantity		
Melville Street				
1	Refrigerating system	1 lot		
	1-1	Ice plant	1 lot	
		1-1-1	Compressor for Ice machine	2
		1-1-2	Ice machine (Flake type, 2ton/day)	2
		1-1-3	Evaporative condenser	1
		1-1-4	Ice storage, 5160mm(L) x 2700mm(W) x 2200mm(CH) t=100mm	1
		1-1-5	Control panel	2
	1-2	Cold storage	1 lot	
		1-2-1	Compressor for Cold storage	2
		1-2-2	Cooling unit for Cold storage	2
		1-2-3	Evaporative condenser	1
		1-2-4	Chilled/Cold room, 4700mm(L) x 5400mm(W) x 2200mm(CH) t=100mm	1
		1-2-5	Defrost tank	1
		1-2-6	Control panel for Cold storage	2
	1-3	Ammonium detector • Auto water sprinkler system	1 lot	
*1	Subsidiary works	1 lot		
	*1a	New machine building	1 lot	
	*1b	Electric main distribution line	1 lot	
Grenville				
2	Refrigerating system	1 lot		
	2-1	Ice plant	1 lot	
		2-1-1	Compressor for Ice machine	2
		2-1-2	Ice machine (Flake type, 1ton/day)	2
		2-1-3	Evaporative condenser	1
		2-1-4	Ice storage, 3600mm(L) x 2700mm(W) x 2200mm(CH) t=100mm	1
		2-1-5	Control panel	2
	2-2	Cold storage	1 lot	
		2-2-1	Compressor for Cold storage	2
		2-2-2	Cooling unit for Cold storage	2
		2-2-3	Evaporative condenser	1
		2-2-4	Chilled/Cold room, 4800mm(L) x 2500mm(W) x 2200mm(CH) t=100mm	2
		2-2-5	Defrost tank	1
		2-2-6	Control panel for Cold storage	2
	2-3	Ammonium detector and Auto water sprinkler system	1 lot	
Gouyave				
3	Ice plant	1 lot		
	3-1	Compressor for Ice machine	1 lot	
	3-2	Supplemental oil tank for Ice machine	1 lot	
	3-3	Supplemental oil tank for Freezer compressor	3 lots	
Fisheries Division				
4-1	Submerged-type FAD	3 lots		
4-2	PC and server for fisheries data processing and analysis	1 lot		
	4-2-1	PC	8 units	
	4-2-2	Server	1 unit	
4-3	Equipment for fisheries environmental monitoring	1 lot		

*: 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 11 months to complete their tasks.

(2) Cost Estimate

Estimated cost borne by Government of Grenada is approximately EC\$ 118.1 thousand, for the accomplishment of the Grant-in-aid project by Government of Japan.

4 Project Implementing Agencies

The responsible government body of the Project is the Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment (Ministry of Agriculture: MOA), and the implementing agency is the Fisheries Division (FD) under the MOA. The MOA takes care of Banking Arrangement (B/A), Authorization to Pay (A/P), etc. The FD 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.

In addition, no maintenance and management costs will incur with the newly introduced submerged-type FADs, and the PCs that will be used to collect and analyze fisheries data.

For the equipment to be used in environmental surveys, the collected marine samplings will be sent to the Dept. of Biology, Ecology and Conservation at St. George's University and the Food Chemist Lab under the MOA; and there will be no new costs for the FD.

Based on the above, the FD, as the implementing body, will not need to carry out new budgetary measures in order to implement this Project.

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

The Government of Grenada has formulated the "Fisheries & Aquaculture Policies for Grenada: 2012" with its target year of 2020. Its basic vision is stated as "the sustainable stewardship and conservation of aquatic resources". Among its issues, the modernization of technology, investment in the fish distribution infrastructure, and proper management of resources are stated.

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 Fisheries Policies stated above.

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

In the Assistance Policy to Grenada (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 Grenada 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 cooling equipment can be evaluated by whether they can supply enough ice or not.

The evaluation objective sites are expected to be Grenville, where the landed fish volume is large and ammonia cooling equipment will be installed.

To quantitatively evaluate whether replaced cooling equipment are 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 below]:

- 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

Quantitative Effect of the Project

Quantitative Effects	Baseline Value (2014)	Target Value (2018) [3 years after completion]
Ice/fish Ratio (Grenville)	α	$\alpha \leq$
Registered Number of Fishermen Operating at the point of submerged FAD as their fishing ground	No persons/Year	Total 500 persons/ year

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).

2) Qualitative Effects

The following are the expected qualitative effects by this Project.

Qualitative Effect of Equipment/ machinery at each Project site

Project Site	Project Contents	Project Effect
Melville Street	Replace refrigerating facilities (ice machine, freezer, refrigerator); switch to ammonia	A certain level of product freshness will be appreciated by users of the cooling equipment through the ice provided. Ice will be continuously supplied (volume sold)
Grenville	Same as above	
Gouyave	Replace the ice machine compressor, install a support oil tank for the same model compressor	
Fisheries Division	Introduce submerged FAD	Improve fisher awareness about resource management
Fisheries Division	Introduce environmental survey equipment	Water environment sanitation data demanded by countries importing marine products will be developed
Fisheries Division (Melville Street, Grenville and Gouyave)	Introduce PCs, server	Fisheries Division and Branch Divisions will expedite fisheries statistics.

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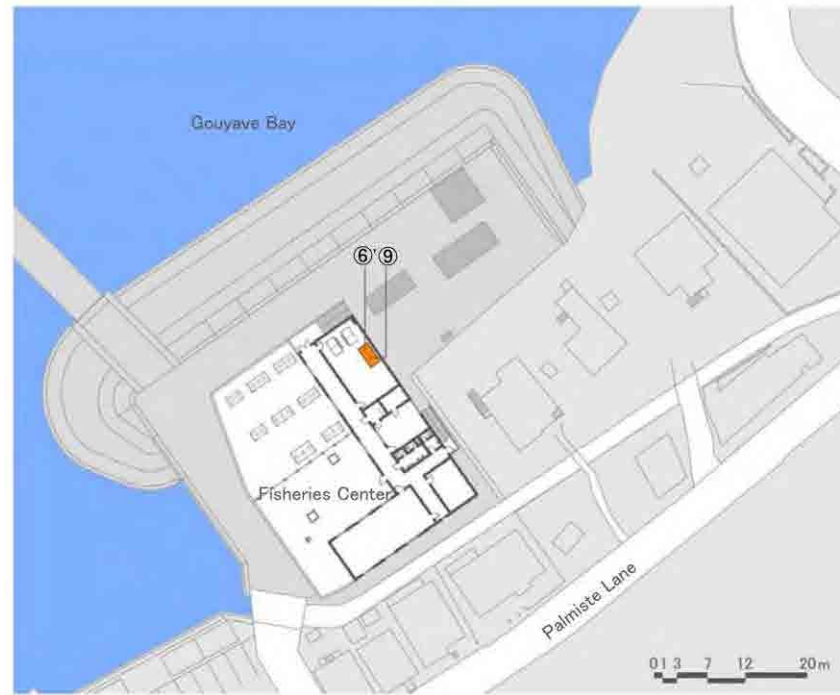
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LOCATION MAP



PERSPECTIVE



3. Gouyave



A/New Machine Building
1. Melville Street



① CHILLED ROOM
② ICE STORAGE



③ COOLING UNIT



④ ICE MAKING MACHINE
PLATE TYPE



⑤ EVAPORATIVE CONDENSER



⑥ COMPRESSOR
REPAIRING OF
COMPRESSOR



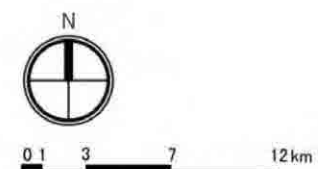
⑦ CONTROL PANEL



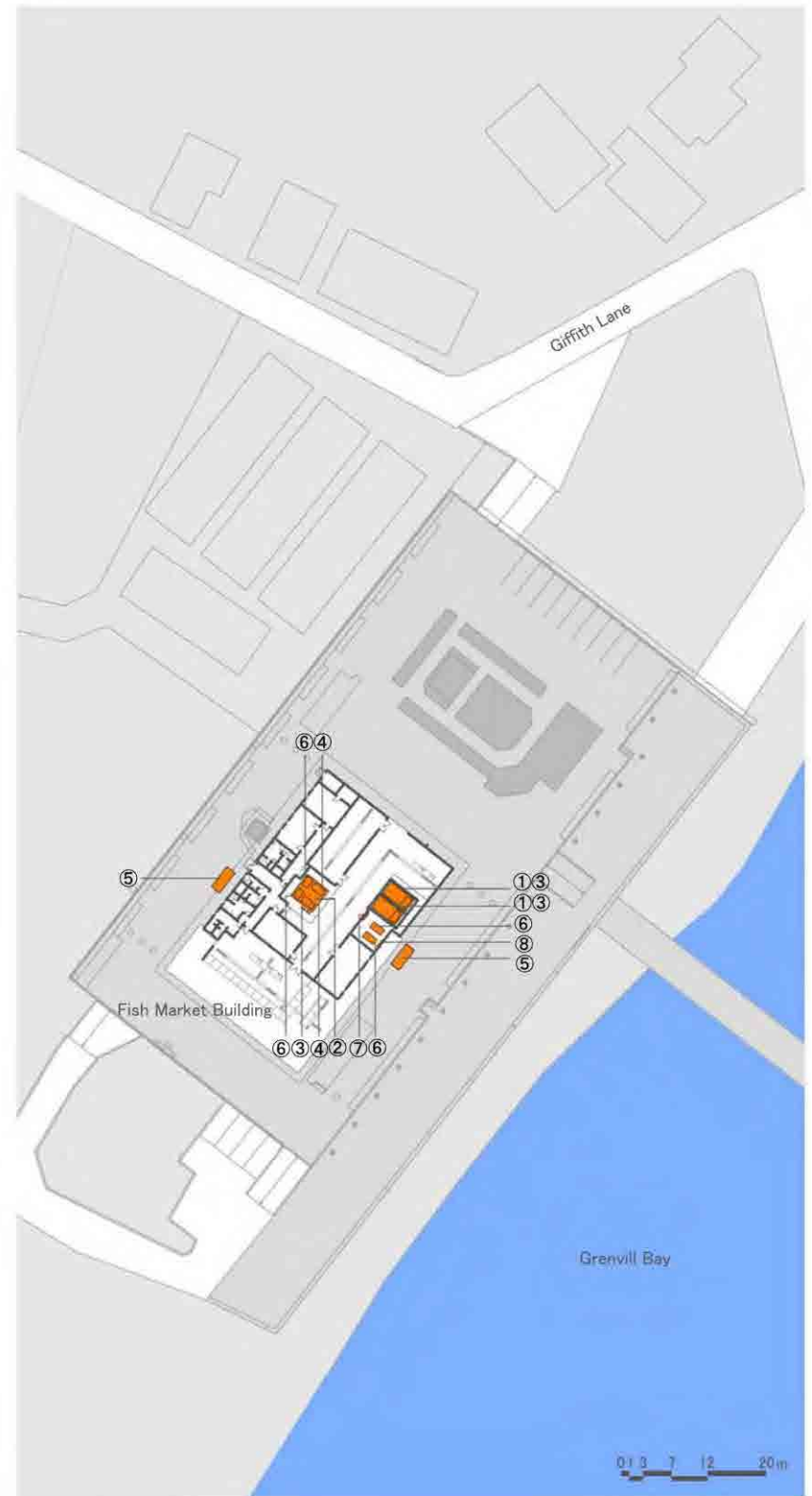
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SPRINKLER SYSTEM



⑨ LUBRICATING OIL TANK



Grenada Project Site Plan



2. Grenville

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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
EEZ	Exclusive Economic Zone
E/N	Exchange of Notes
FAD	Fish Aggregating Device
FD	Fisheries Division
G/A	Grant Agreement
GDP	Gross Domestic Product
HCFC	Hydro Chlorofluorocarbons
HFC	Hydro Fluorocarbons
JICA	Japan International Cooperation Agency
MOA	Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment
MPAs	Marine Protected Areas
NORDON	Nordom Seafood Ltd.
SIFH	Spice Isle Fish House Ltd.
SFA	Southern Fishermen Association Inc.
VMS	Vessel Monitoring System

Chapter 1 Background of the Project

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1-1 Background of the Request for Grant Aid

(1) Background of the Request

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In recent years, these facilities are deteriorating, especially the cooling equipment which is necessary for quality control of fish. Various cases where lowering of the cooling efficiency or loss of original function of these facilities have risen, and the country is faced with the need to replace this cooling equipment.

In addition, overfishing in the coastal waters has been pointed out and the government is also faced with the issue of focusing on adequate fisheries management for sustainable use of its resources. In view of these circumstances, the Government of Grenada formulated the "Project for Improvement of Fisheries Equipment / machinery in Grenada," and requested the grant assistance to Japan.

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

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1-2 Natural Conditions

Grenada is a country with the consistent average high temperature of 30°C and the low temperature of 26~28°C throughout the year. There is not much difference in temperature between the capital city, St. Georges, and a northeastern town, Grenville. Although the rainy days and rainfall slightly increase during the rainy season which is from June to November, the annual precipitation is as low as 1,500 mm. The 80 % of the wind blows from the directions of east northeast and east primarily due to the trade wind. The wind is mostly calm except during the hurricanes. The occurrence rate of wind speed less than 5m per second is nearly 81%. The natural environment of Grenada should not impact on the implementation of the Project.

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.

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 Grenada 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 converted to 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. 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:

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* 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

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2-1 Basic Concept of the Project

(1) Overall Goal and Project Purpose

Grenada has a 10-year development plan for fisheries industry entitled “A Fisheries & Aquaculture Policy for Grenada: 2012”. It is emphasized in the policy that investment to modern technology and distribution infrastructure will play important roles in the medium run and proper resource management is addressed as an important issue. There are 5 goals and 23 issues in this policy as follows:

Goal 1: Enhancement of the status and skills of fishers

Issues: Fisheries license and registration, promotion of fisher associations, improvement of the commercial knowledge of fishers, preparation of co-management of resources (encouragement of fishers to develop a sense of responsibility for the resources they depend on), promote independence, (pursue responsibility for fishers’ socioeconomic position), securement of safety at sea.

Goal 2: Management and conservation of fisheries resources that will enable sustainable use

Issues: Sustainable use of large migratory fish, rational response to Grenada’s international obligations, sustainable use of demersal fishes and small pelagic resources and efficient data collection and analysis, establishment of a reporting system, monitoring control and surveillance of illegal fishing methods in Grenada waters and their eradication, creation of Marine Protection Area (The goal is to designate 20% of the coastal area as protected areas by 2020), application of the ecological approach in fisheries management to the sites where application is possible.

Goal 3: Realization of the latent development that is intrinsic to the fisheries sector.

Issues: Maximization of economic benefits (avoidance of post-harvest loss), marine food processing and export, promotion of aquaculture, subsidies and licenses

Goal 4: Maintaining the role of fisheries to help support the livelihoods of disadvantaged people

Issues: Maintaining the livelihood rooted in traditional fisheries, fisheries division given to disadvantaged persons (licenses, etc., of small-scale fishers within the MPA), fisheries and a wider range of economic activities and their interaction)

Goal 5: Building positive reciprocal relations with Grenada’s economic society over a wide range

Issues: Interaction between fisheries, tourism and leisure industries, conservation of high profile marine species (turtle, manta, banana sailfish, coral reef ecosystem, etc.), tourist fish market

Thereby, as a part of measures to achieve the said goals, 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 three (3) sites among seven (7) 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. In addition, 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 replacement or repairs. Despite a slight fluctuation in the landed volume after 2008, it is assessed that the same levels of landed volume have been maintained.

The following principles for equipment replacement will be employed:

- All the cooling equipment that has strong impact on Grenada's fish distribution and needs urgent repairs is targeted.
- New equipment will keep the same size and functions of the existing equipment. New equipment will be installed to the facilities which have shown significant fisheries development.
- 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.

Grenada 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 maximizes 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 for Natural and Environmental Conditions

Target sites are the sites where fisheries facilities had been constructed 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		Melville Street	Grenville	Gouyave
Temperature	°C	30.0~32.0 / 22.0~25.0 (Max. Temp./ Min. Temp.)		
Humidity	%	70.1~81.0		
Annual Rainfall	mm	1,300~2,500 (by the coast)/ 4,000 (inland/ high land)		
Wind direction/ Wind speed (m/s)		ENE~SE/ 2.5~12.5		
Seismic force (horizontal seismic force)		0.14 (Building Standard Act in Japan)		
Soil property	Surface	coral sand	clay layer	sand layer mixed with sand gravel
	Basement	rock bed	silt	sand layer bed
Reference		BDR(1998)	BDR(2000)	BDR(2009) Detailed Design (2011)

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

Grenada is located along the path of hurricane. Since extreme rainfall is also experienced due to the global warming effect in recent years, the work plan shall be well developed considering such weather conditions.

2) Policy for Socio economic Conditions

When the Project carries out its works, especially for replacing cooling equipment/ machinery, the operation of existing equipment/ machinery needs to be stopped. In other word, cooling equipment/ machinery will not be accessible during the replacing work. Therefore, the 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. As for the Grenville fisheries center, more than 20% of the country's fish catch is landed, therefore, the Project tries to minimize the burden on its users.

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 (Mar. to July) is 3 times bigger than that of the lean fishing season (Aug. to Feb.) in Grenada, the construction period shall be designed during the lean fishing season.

2-2-2 Basic Plan (Equipment/ machinery Plan)

(1) Requested Contents

Requested equipment/ machineries are broadly classified into 2 categories. They are: i) replacing cooling equipment/ machinery; and ii) introducing necessary equipment for appropriate fisheries management. The list of requested items is shown in Table 2.2.

Table2.2 List of Requested Equipment/ machinery

Site/ Category		Name of Equipment/ machineries (replaced/ newly introduced)		Quantity	
1	Melville Street				
	1-1	Cooling system	Ice plant, cold storage, blast freezer (refrigerant: ammonia) (replacement)	1 set	
2	Grenville				
	2-1	Cooling system	Ice plant, cold storage, blast freezer (refrigerant: ammonia) (replacement)	1 set	
3	Gouyave				
	3-1	Equipment for cooling system	Compressor for ice machine (replacement)	1 set	
4	Fisheries Division (FD)				
	4-1	Equipment for fisheries management			
		4-1-1	VMS transponder (new introduction)		1 set
		4-1-2	Submerged-type FAD (new introduction)		3 sets
		4-1-3	Multi-purpose fishing boat (new introduction)		1 boat
		4-1-4	Fishing gear for test fishing of diamond back squid (new introduction)		1 set
		4-1-5	PC and server for fisheries data processing and analysis (new introduction)		1 set
		4-1-6	Training equipment for 'safety training program for fishermen' (new introduction)		1 set
4-1-7	Equipment for monitoring fisheries environment (new introduction)		1 set		

(2) Plan of Equipment

Based on the content of request explained in the section "2-2-1 Basic Policy," the condition of the equipment at the sites, and discussions with the Government of Grenada, the following equipment and facilities are planned to be targeted in this Project.

- 1) Due to progressive depreciation of the cooling equipment at Melville Street and Grenville, their cooling equipment will be completely replaced. The current capacity will be retained. Based on the request of the Grenadian Government, the Freon refrigerant will be converted to ammonia, a natural refrigerant.
- 2) At Gouyave, the defective compressor for the ice machine will be replaced. The current capacity of the ice machine will be kept. The electronically controlled oil sensor, which was the cause of the malfunction, will be eliminated and replaced with an analog type sensor to prevent further

malfunctions from occurring. In addition, since there are four more compressors of the same type in operation, a supplemental oil tanks will be installed for these compressors to prevent similar malfunctions from occurring.

- 3) In lieu of the floating FADs, submerged FADs that have a longer service life will be introduced. A total of three units will be installed on the Atlantic Ocean and Caribbean Sea sides.
- 4) A PC and a server will be installed to process fisheries data at the Fisheries Division and other three sites (Melville Street, Grenville and Gouyave).
- 5) Equipment to measure the environment in the coastal waters will be provided for the Fisheries Division.

VMS responder is not included although there are needs for it .Because the Survey team could not find out a fixed annual operation and management plan.

Multipurpose fishing vessel and trial fishing gear for Diamond Back Squid are not included although there are need for it. One reason is, in accordance with the record submitted to the team, that the previously procured vessel 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.

Likewise, the sea disaster prevention related training equipment was also excluded since it did not meet the purpose of this Project.

2-2-3 Outline Design Drawing

The list of planned equipment/ machineries and drawings of those site plan/layout plan, are shown in the following (1) and (2).

(1) Planned Equipment /machineries and Quantity

Reflecting the result of the survey assessment in 2-2-2(2), a list of planned equipment/ machineries is shown in Table2.3. In the contents of the request by Grenada indicate only the names and quantity of equipment/ machineries. However, as the cooling system is composed of several equipment/ machineries, the following list also includes the names of these composing equipment/ machineries.

Table2.3 List of Planned Equipment/ machineries

Site and Planned Equipment	Components	Quantity		
Melville Street				
1	Refrigerating system	1 lot		
	1-1	Ice plant	1 lot	
		1-1-1	Compressor for Ice machine	2
		1-1-2	Ice machine (Flake type, 2ton/day)	2
		1-1-3	Evaporative condenser	1
		1-1-4	Ice storage, 5160mm(L) x 2700mm(W) x 2200mm(CH) t=100mm	1
		1-1-5	Control panel	2
	1-2	Cold storage	1 lot	
		1-2-1	Compressor for Cold storage	2
		1-2-2	Cooling unit for Cold storage	2
		1-2-3	Evaporative condenser	1
		1-2-4	Chilled/Cold room, 4700mm(L) x 5400mm(W) x 2200mm(CH) t=100mm	1
		1-2-5	Defrost tank	1
	1-2-6	Control panel for Cold storage	2	
	1-3	Ammonium detector • Auto water sprinkler system	1 lot	
*1	Subsidiary works	1 lot		
	*1a	New machine building	1 lot	
	*1b	Electric main distribution line	1 lot	
Grenville				
2	Refrigerating system	1 lot		
	2-1	Ice plant	1 lot	
		2-1-1	Compressor for Ice machine	2
		2-1-2	Ice machine (Flake type, 1 ton/day)	2
		2-1-3	Evaporative condenser	1
		2-1-4	Ice storage, 3600mm(L) x 2700mm(W) x 2200mm(CH) t=100mm	1
		2-1-5	Control panel	2
	2-2	Cold storage	1 lot	
		2-2-1	Compressor for Cold storage	2
		2-2-2	Cooling unit for Cold storage	2
		2-2-3	Evaporative condenser	1
		2-2-4	Chilled/Cold room, 4800mm(L) x 2500mm(W) x 2200mm(CH) t=100mm	2
		2-2-5	Defrost tank	1
	2-2-6	Control panel for Cold storage	2	
	2-3	Ammonium detector • Auto water sprinkler system	1 lot	
Gouyave				
3	Ice plant	1 lot		
	3-1	Compressor for Ice machine	1 lot	
	3-2	Supplemental oil tank for Ice machine	1 lot	
	3-3	Supplemental oil tank for Freezer compressor	3 lots	
Fisheries Division				
4-1	Submerged-type FAD	3 lots		
4-2	PC and server for fisheries data processing and analysis	1 lot		
	4-2-1	PC	8 units	
	4-2-2	Server	1 unit	
4-3	Equipment for fisheries environmental monitoring	1 lot		

*: Subsidiary Works

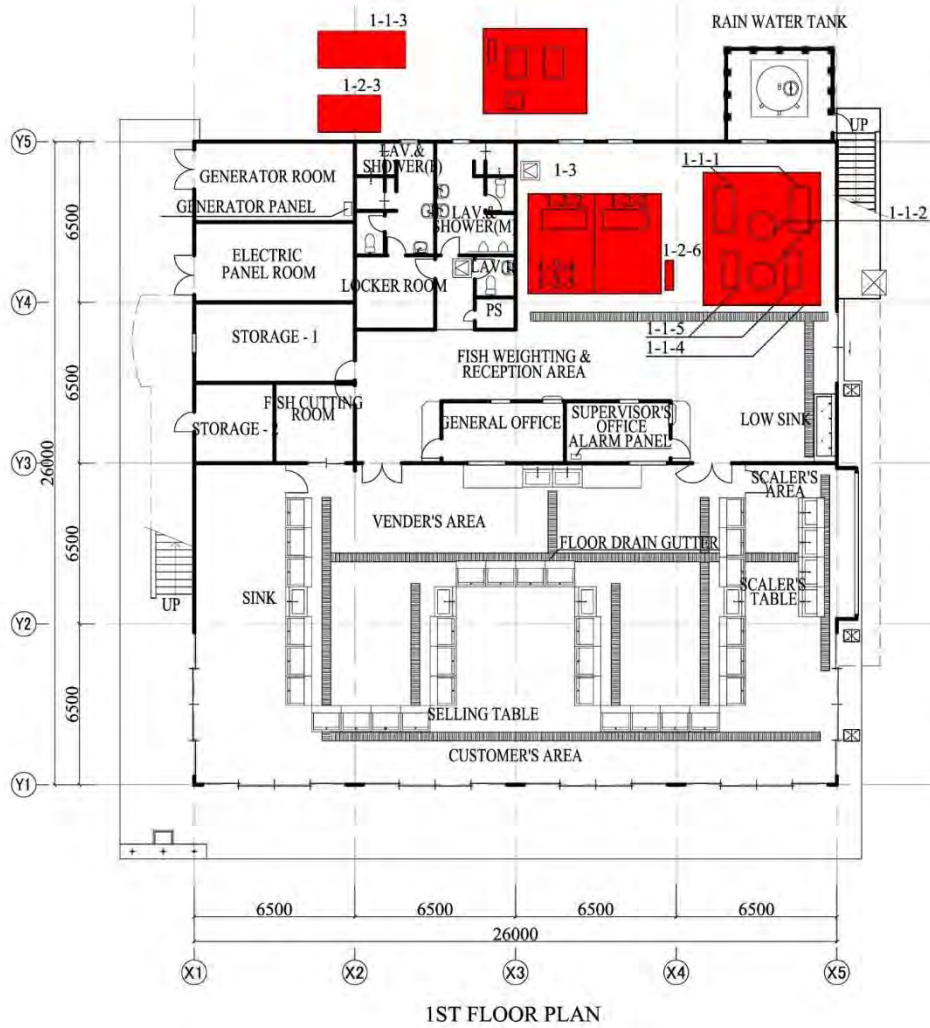
(2) Site Plan and Equipment Layout Plan

Drawings of the site plan and the equipment layout plan in each Project site are shown in Fig.2.1 ~ Fig.2.6. The Project sites are Melville Street, Grenville and Gouyave.

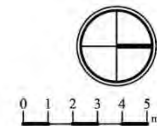


Fig. 2.1 Site Plan of Melville Street

Fig.2.2 Layout Plan for Equipment/machinery in Melville Street



Code	Equipment	Qty
1-1-1	Compressor for Ice machine	2
1-1-2	Ice machine (Flake Type 2ton/day)	2
1-1-3	Evaporative condenser	1
1-1-4	Ice storage (5,160mm(L) x 2,700mm(W) x 2,200mm(CH))	1
1-1-5	Control panel	2
1-2-1	Compressor for Chilled/Cold storage	2
1-2-2	Cooling unit for Chilled/Cold storage	2
1-2-3	Evaporative condenser	1
1-2-4	Chilled/Cold room, 4,700mm(L) x 5,400mm(W) x 2,200mm(CH)	1
1-2-5	Defrost tank	1
1-2-6	Control panel for Cold storage	2
1-3	Ammonium detector and Auto water sprinkler system	1 lot



The Project for improvement of fishery equipment/machinery in Grenada / 1. Melville Street
Layout Plan for Equipment/ machinery

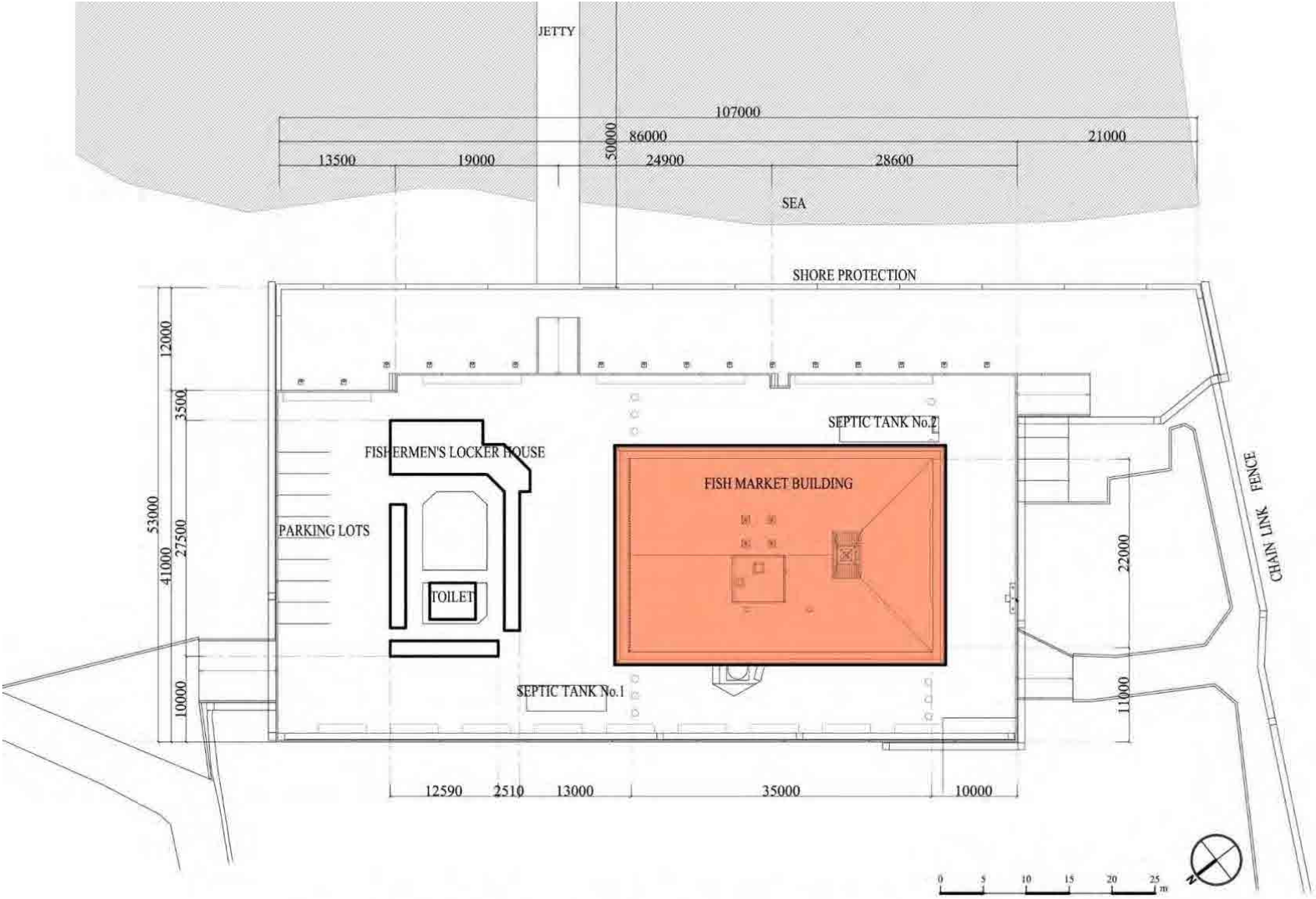
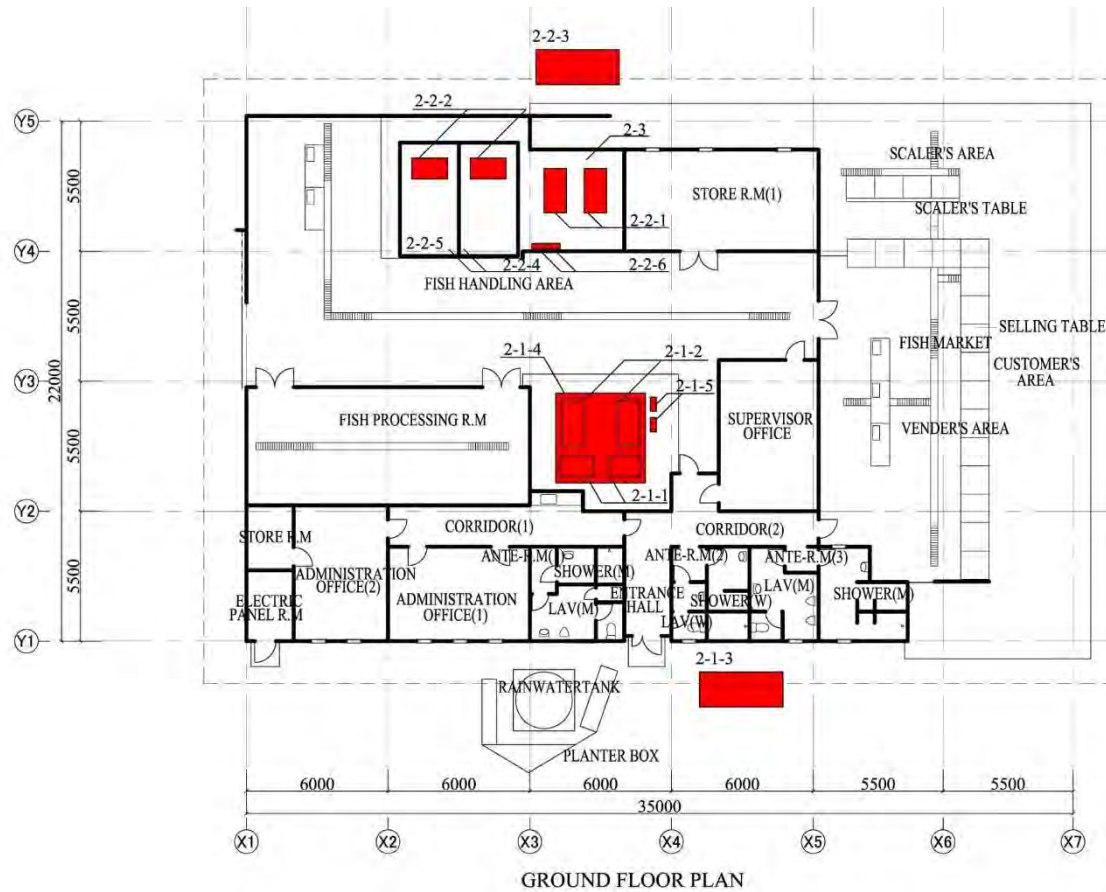


Fig.2.3 Site Plan of Grenville

Fig.2.4 Layout Plan for Equipment /machinery in Grenville



Code	Equipment	Qty
2-1-1	Compressor for Ice machine	2
2-1-2	Ice machine (Flake type 1ton/day)	2
2-1-3	Evaporative condenser	1
2-1-4	Ice storage, 3600mm(L) x 2700mm(W) x 2200mm(CH)	1
2-1-5	Control panel	2
2-2-1	Compressor for Cold storage	2
2-2-2	Cooling unit for Cold storage	2
2-2-3	Evaporative condenser	1
2-2-4	Chilled/Cold room, 4,700mm(L) x 5,400mm(W) x 2,200mm(CH)	2
2-2-5	Defrost tank	1
2-2-6	Control panel for Cold storage	2
2-3	Ammonium detector and Auto water sprinkler system	1 lot



The Project for improvement of fishery equipment/machinery in Grenada / 2.Grenville
Layout Plan for Equipment/ machinery

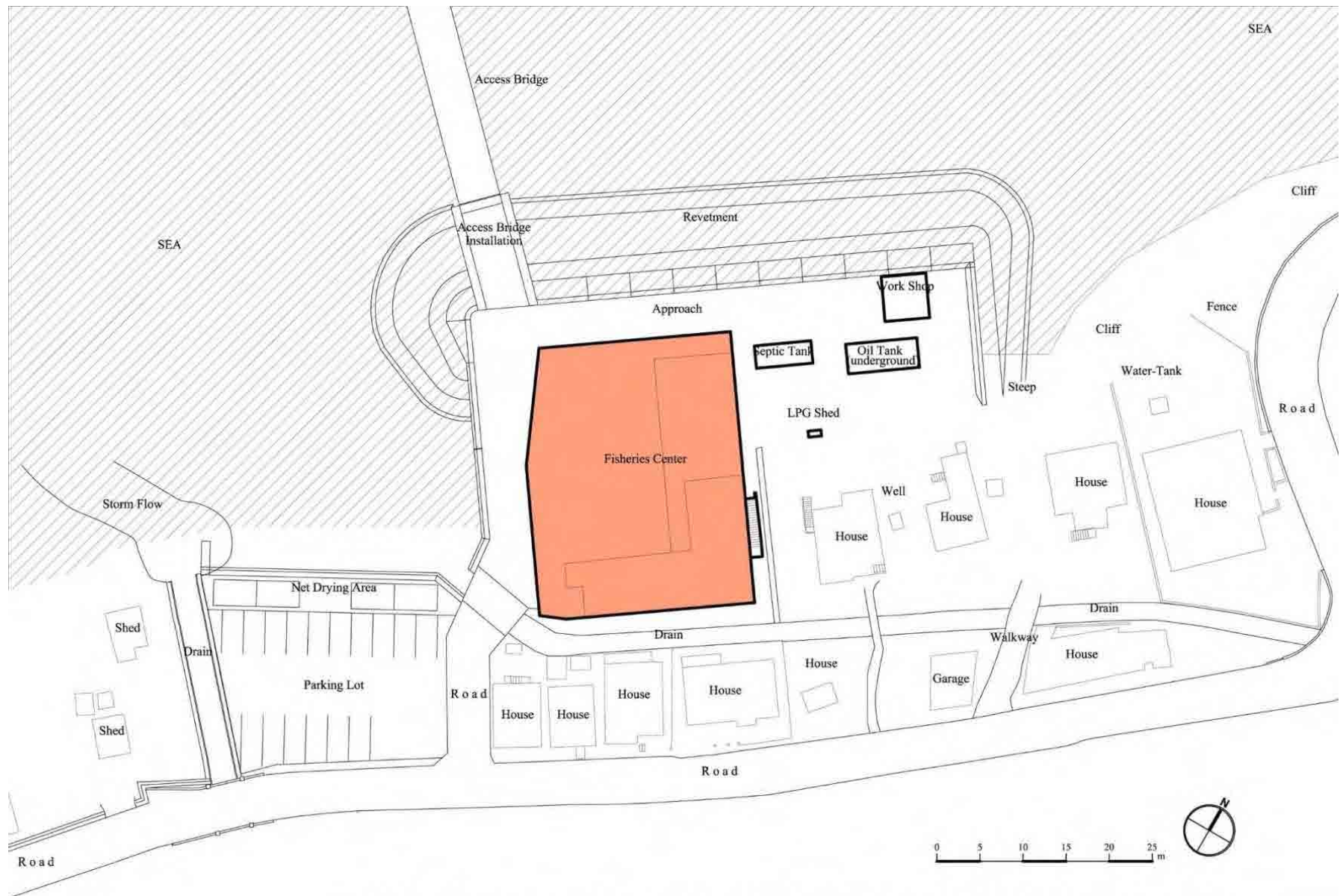
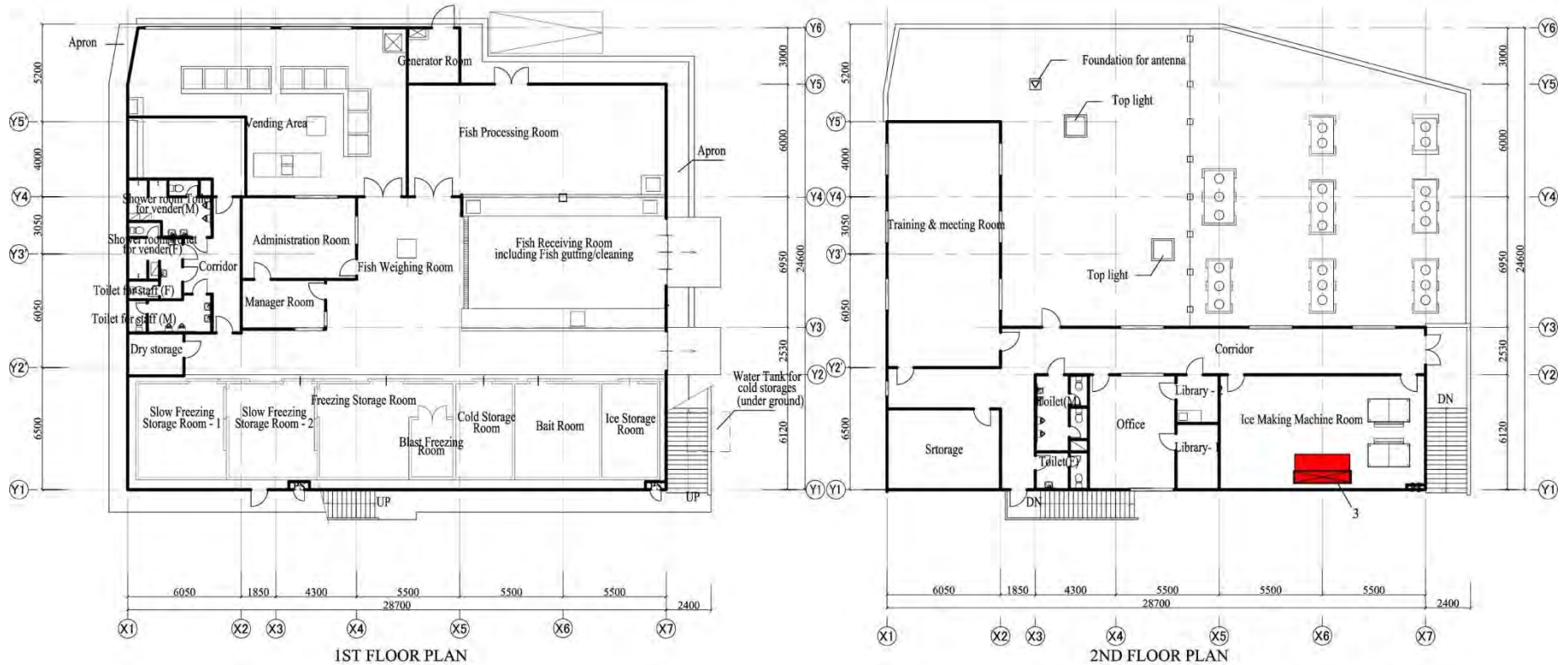


Fig.2.5 Site Plan of Gouyave

The Project for improvement of fishery equipment/machinery in Grenada / 3.Gouyave
Site Plan

Fig.2.6 Layout plan for Equipment/machinery in Gouyave



Code	Equipment	Qty
3	Ice plant (Compressor for Ice machine and Supplemental oil tank)	1 Lot



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 implementing agency of the recipient country, the Japanese consultant and a contracted contractor 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 Grenada 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 by the consultant, the Government of Grenada 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 Grenadian side is the Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment (hereinafter referred to MOA) and the implementing body for operation and maintenance is the Fisheries Division (hereinafter referred to FD) 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 three (3) replaced sites and three (3) FAD sites is important for their appropriate operation and sustainable development of fisheries in Grenada. Therefore, the Project shall prepare users' manuals for major equipment/ machineries and provide advises and training for their operation and maintenance by dispatching engineers.

(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 Grenada and CARICOM are shown below.

Table2.4 Name of Contractors

Grenada	CARICOM
<ul style="list-style-type: none">• Best Quote Construction and Engineering Services• Creative Design & Building Construction Co. Ltd.• Quinn Company Limited	DEVCON (TCI) Ltd. (Antigua)

2-2-4-3 Scope of Works

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

Table2.5 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 Grenada 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 Grenadian Governments and the Grant Agreement (G/A) is signed by JICA and the Grenadian Government. The following tasks are executed after a contract is signed between the Grenada'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 (FD) 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 Lucia, and Saint Vincent and the Grenadines). 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 three (3) 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 Granada's implementing agency (the FD) 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 Grenada. 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 Operational 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 Grenada 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 11 months to complete their tasks (see Table 2.7 below).

Table 2.7 Project Implementation Schedule

Months	1	2	3	4	5	6	7	8	9	10	11	12
Implementation Design	■ (Field Survey)											
		▬ (Works in Japan)										
			■ (Approval of tender documents)									
				▬ (Tender)								
Implementation/ procurement		▬ (Preparation of drawings)										
						▬ (Production of equipment)						
								▬ (Transportation of equipment)				
											▬ (Subsidiary works, installation, guidance on handling and operation)	

2-3 Obligations of Recipient Country

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

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

For replacing cooling equipment, works of removal of existing equipment and installation to 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 FD, 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 waist refrigerant

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

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

Existing cooling equipment, pipes, bulbs and other dismantled materials that are to be removed during the installation work are sorted and stored by the contractor side in an open space near the site by the contractor.. They include materials which can still be used. The FD, 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 Grenada, the Government of Grenada 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 Grenada will have to pay 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 Grenada 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 Grenada will exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in Grenada 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 Grenada needs to provide necessary measures for Japanese nationals to enter into and stay in the county in order for them to accomplish their duties 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 Grenada allocates the necessary personnel and operational and maintenance budget to ensure the effective utilization and upkeep equipment to be 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 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.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

Estimated cost borne by the Government of Grenada is approximately EC\$118.1 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 Grenadian side

Estimated cost borne by the Grenadian side: EC\$118.1 thousand (JPY approx. 4.55million)

Table 2.8 The Breakdown of the Project Cost borne by the Government of Grenada

Items	Costs		Remarks
	EC\$	JPY ('000)	
Removal and storage of cylinders filled with refrigerant that to be discarded, existing equipment, dismantled materials and others to the outside of the site	80,000	3,078.6	Budgeted by FD
Commissions of B/A and A/P	38,146	1,468.0	Budgeted by MOA
Total	118,146	4,546.6	

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 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.

In addition, no maintenance and management costs will incur with the newly introduced submerged-type FADs, and the PCs that will be used to collect and analyze fisheries data.

For the equipment to be used in environmental surveys, the collected marine samplings will be sent to the Dept. of Biology, Ecology and Conservation at St. George's University and the Food Chemist Lab under the MOA will analyze them; and there will be no new costs for the FD.

Based on the above, the FD, as the implementing body, will not need to carry out new budgetary measures in order to implement this Project.

Chapter3 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 Grenadian side. It is essential for the FD 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 FD 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 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 FD 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 Grenville 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

Grenada is prone to hurricanes with a maximum wind speed of 60 meters a second. In case the direct attack of a hurricane, it may give a serious damage to the equipment/machineries installed by the Project. In such cases, the FD has to carry out the damage inspection after each hurricane and identify strategies and actions to take to prevent possible damages before the next hurricanes.

c) Seasonal variation of fish landings

Grenada has seasonal variation of fish landings. 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

The Government of Grenada has formulated the “Fisheries & Aquaculture Policies for Grenada: 2012” with its target year of 2020. Its basic vision is stated as “the sustainable stewardship and conservation of aquatic resources”. Among its issues, the modernization of technology, investment in the fish distribution infrastructure, and proper management of resources are stated.

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 Fisheries Policies stated above.

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

In the Assistance Policy to Grenada (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 Grenada 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 Grenville, 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

Table 3.1 Quantitative Effect of the Project

Quantitative Effects	Baseline Value (2014)	Target Value (2018) [3 years after completion]
Ice/fish Ratio (Grenville)	α	$\alpha \leq$
Registered Number of Fishermen Operating at the point of submerged FAD as their fishing ground	No persons/Year	Total 500 persons/ year

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).

(2) Qualitative Effects

The following are the expected qualitative effects by this Project.

Table 3.2 Qualitative Effect of Equipment/ machinery at each Project Site

Project Site	Project Contents	Project Effect
Melville Street	Replace refrigerating facilities (ice machine, freezer, refrigerator); switch to ammonia	A certain level of product freshness will be appreciated by users of the Cooling equipment through the ice provided. Ice will be continuously supplied (volume sold)
Grenville	Same as above	
Gouyave	Replace the ice machine compressor, install a support oil tank for the same model compressor	
Fisheries Division	Introduce submerged FAD	Improve fisher awareness about resource management
Fisheries Division	Introduce environmental survey equipment	Water environment sanitation data demanded by countries importing marine products will be developed
Fisheries Division (Melville Street, Grenville and Gouyave)	Introduce PCs, server	Fisheries Division and Branch Divisions will expedite fisheries statistics.

[Appendices]

Appendices 1. Member List of the Survey Team

(1) Field Survey for the Outline Design

	Title	Name	Affiliation
1	Team Leader (1 st period)	Mr. Kenichi Kato	Director, Field Crop Based Farming Group, Rural Development Department, JICA
2	Team Leader (2 nd 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	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. Hiroataka 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

			Team Leader	Project Manager(PM) /Representative Team I	Team II (St. Lucia, Grenada)			Quantity Surveyor Team	
Date			Mr. K. KATO Mr.T. NISHIMURA	Mr. T. TOMIYAMA PM/Operation & Maintenance Management Planning I	Mr. T. MORIMOTO Operation & Maintenance Management Planning II	Mr. K. NISHIYAMA Facility Planning/Environment & Social Consideration II	Mr. m. YOSHIOKA Equipment Designing II	Mr. M. TSUJI Equipment Procuring Planning/Cost Estimation I	Mr. A. HAYAHARA Construction Procurement/Cost Estimation II
1	11-Jan	Sat	NRT(00:05)→LosA(17:00) LosA(22:27)→NY(06:36)	NRT(14:35) → NY/JFK (13:14)					
2	12-Jan	Sun	NY(7:40)→Dom/Las AM (12:31)	NY/JFK(7:30)→Dom/Las AM (12:27)					
3	13-Jan	Mon	JICA Office(Rep.Dominica)	Visit & Conference	DL172/I	NRT(14:35) → NY/JFK (13:14)			
4	14-Jan	Tue			BG 0021	NRT(08:00) → St. Lucia/HN(13:40)			
5	15-Jan	Wed							
6	16-Jan	Thu							
7	17-Jan	Fri							
8	18-Jan	Sat	→GRD(6:35)	→GRD(21:50)					
9	19-Jan	Sun	Filling					Atlanta/NRT(01:40) →Paris(10:40) Paris(14:10) →	
10	20-Jan	Mon	Official Meeting ICR Explanation & Conference in Ministry of AFFPRD(St. Vincent)/Fishery Division /Survey of the Facilities of Melville Street					NY/JFK(8:05) → ST.L/HN(13:40)	
11	21-Jan	Tue	LI727 GND(13:25)→	GRD(11:05)→					
12	22-Jan	Wed							
13	23-Jan	Thu							
14	24-Jan	Fri							
15	25-Jan	Sat	→NRT						
16	26-Jan	Sun					→ GND(16:45)		
17	27-Jan	Mon					Visit to Fishery Division(Grenada), Prep. & Scheduling of Survey/Visit of related facilities & stakeholders		
18	28-Jan	Tue					Survey of the Facilities of Melville Street		
19	29-Jan	Wed					Survey of the Facilities of Grenville		
20	30-Jan	Thu					Survey of the Facilities of grand Mal		
21	31-Jan	Fri					Survey of Concerned Regulations & Laws/User Information etc.		
22	1-Feb	Sat					Team Meeting		
23	2-Feb	Sun					Filling		
24	3-Feb	Mon					Meeting with Concerned Parties & Stakeholders (Grenada)		→ GND(21:50)
25	4-Feb	Tue					Visit of related Facilities & Stakeholders		Team Meeting/Construction & Procurement Survey
26	5-Feb	Wed					GND(18:30)→		Construction & Procurement Survey
27	6-Feb	Thu					→NRT(16:50)		Survey of Facilities & Equipment
28	7-Feb	Fri							ditto
29	8-Feb	Sat	NRT→NY						ditto
30	9-Feb	Sun	NY→St.L(St. Lucia)	Filling	DL349/D	St.L/HN(16:14)→AT/HF(20:12)	ST.L/HN(14:45)→ NY/JFK(18:49)		Filling
31	10-Feb	Mon			DL295/D	AT/HF(12:30) → NRT(機中)	NY/JFK(12:25) → NRT(機中)		LI 727 GRENADA(13:20) →
32	11-Feb	Tue				→成田(機中) (16:50)	→成田(機中) (16:35)		
33	12-Feb	Wed							
34	13-Feb	Thu							
35	14-Feb	Fri							
36	15-Feb	Sat							
37	16-Feb	Sun							→NRT(16:50)
38	17-Feb	Mon							Official Meeting/Survey(Melville Street Market)/Conference & Revision of ICR
39	18-Feb	Tue							Confirmation of Survey Items
40	19-Feb	Wed							Exchange of Minutes
41	20-Feb	Thu							GND(13:25) →
42	21-Feb	Fri							
43	22-Feb	Sat							
44	23-Feb	Sun							→NRT(16:30)

16days

31days

44days

Legend 2: Stay of the Survey Teams

	: Grenada		: Other countries
	: Travel days		: Republic of Dominica

(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
13 th , May	Tue	NRT → NY/JFK		
14 th , May	Wed	NY/JFK → Antigua → St.L / HN		
15 th , May	Thu	—		
16 th , May	Fri			
17 th , May	Sat	→ GND		
18 th , May	Sun	Preparation of Minutes		
19 th , May	Mon	Official Meeting (GND)		
20 th , May	Tue	Exchange of Minutes, GND → St.V		
21 st , May	Wed	—		
22 nd , May	Thu			
23 rd , May	Fri	→ GND		
24 th , May	Sat	GND → NY/JFK		
25 th , May	Sun	NY/JFK →		
26 th , May	Mon	→ NRT		

Appendices 3. List of Parties Concerned in the Recipient Country

Ministry of Agriculture, Lands, Forests, Fisheries and the Environment (MOA)		
Name	Title	Organization
Hon. Roland Bhola	Minister	Ministry of Agriculture, Lands, forestry, Fisheries and the Environment (MOA)
Mrs. Marilyn Austin-Cadore	Permanent Secretary	
Mr. Michael Church Jr.	Planning Officer	
Mr. Justin Rennie	Chief Fisheries Officer	Fisheries Division (FD)
Mr. Johnson P. St. Louis	Fisheries Officer	
Mr. Moram Michell		
Mr. Francis T. Calliste	Extension Fisheries Officer	Grenville Fisheries Complex
Mr. Jerry St. Louis	Supervisor	Melville Street Fish Market
Mr. Bernard Macintyre		Gouyave Fish Market
Mr. Michael Grant	Manager	Grenville Fish Market
Mr. Tabia Paul		Victoria Fish Market
St. George's University		
Dr. Clare E. Morrall	Director	Marine Biology Programme Dpt. of Biology, Ecology & Conservation
SIFH (Spice Isle Fish House Ltd.)		
Mr. James Ince	Manager Director	

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

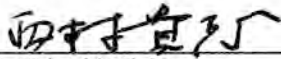
(1) Minute of Discussions on the Survey I

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

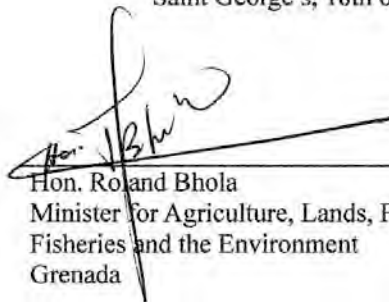
The Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to conduct a Preparatory Survey for "The Project for Improvement of Fishery Equipment/Machinery in Grenada" (hereinafter referred to as "The Project") and sent the survey team (hereinafter referred to as "the Team") to Grenada, headed by Mr. Takashi Nishimura, Advisor, Rural Development Department, JICA. The Team is scheduled to stay in the country from 18th of January to 19th of February, 2014.

The Team held a series of discussions with officials concerned of the Government of Grenada (hereinafter referred to as "GOG") 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.

Saint George's, 18th of February, 2014



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



Hon. Roland Bhola
Minister for Agriculture, Lands, Forestry,
Fisheries and the Environment
Grenada



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 Grenada”.

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, Lands, Forestry, Fisheries and the Environment.

The implementing agency shall be the Fisheries Division under the Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment.

The organizational chart of the Fisheries Division is shown in Annex-1.

4. Project site

The Project site is shown in Annex- 2.

5. Items requested by the Government of Grenada

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

6. Japan's Grant Aid Scheme

The Grenadian 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 outline design of The Project and dispatch a mission in order to explain its contents scheduled tentatively 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 Grenadian 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 Grenadian side agreed to abide by ‘JICA Guidelines for Environmental and Social Considerations’ in addition to the national environmental laws and regulations in Grenada.

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

9. Other important issues

(1) Official request letter for Grant Aid from Japan

The Grenadian side agreed that the GOG 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 Grenadian 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 Grenadian 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 GOG should inform to the GOJ through the diplomatic channel based on the Exchange of Notes (E/N) before disposing it.

- (4) Explanation to stakeholders

The Grenadian side agreed that the GOG 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 GOG

The Grenadian side understood that the GOG 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.

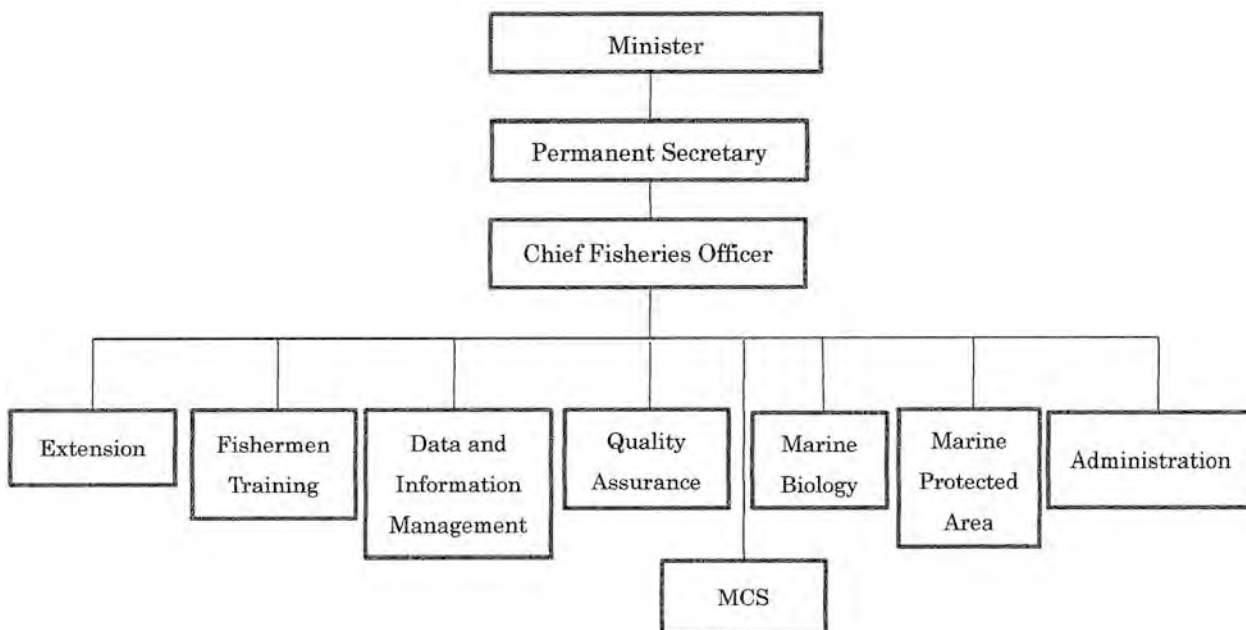
END

Annex-1	Organizational Chart
Annex- 2	Location of Project Sites
Annex -3	List of Items Requested by the Government of Grenada
Annex- 4	Japan's Grant Aid Scheme
Annex- 5	Major Undertakings to be taken by Both Governments



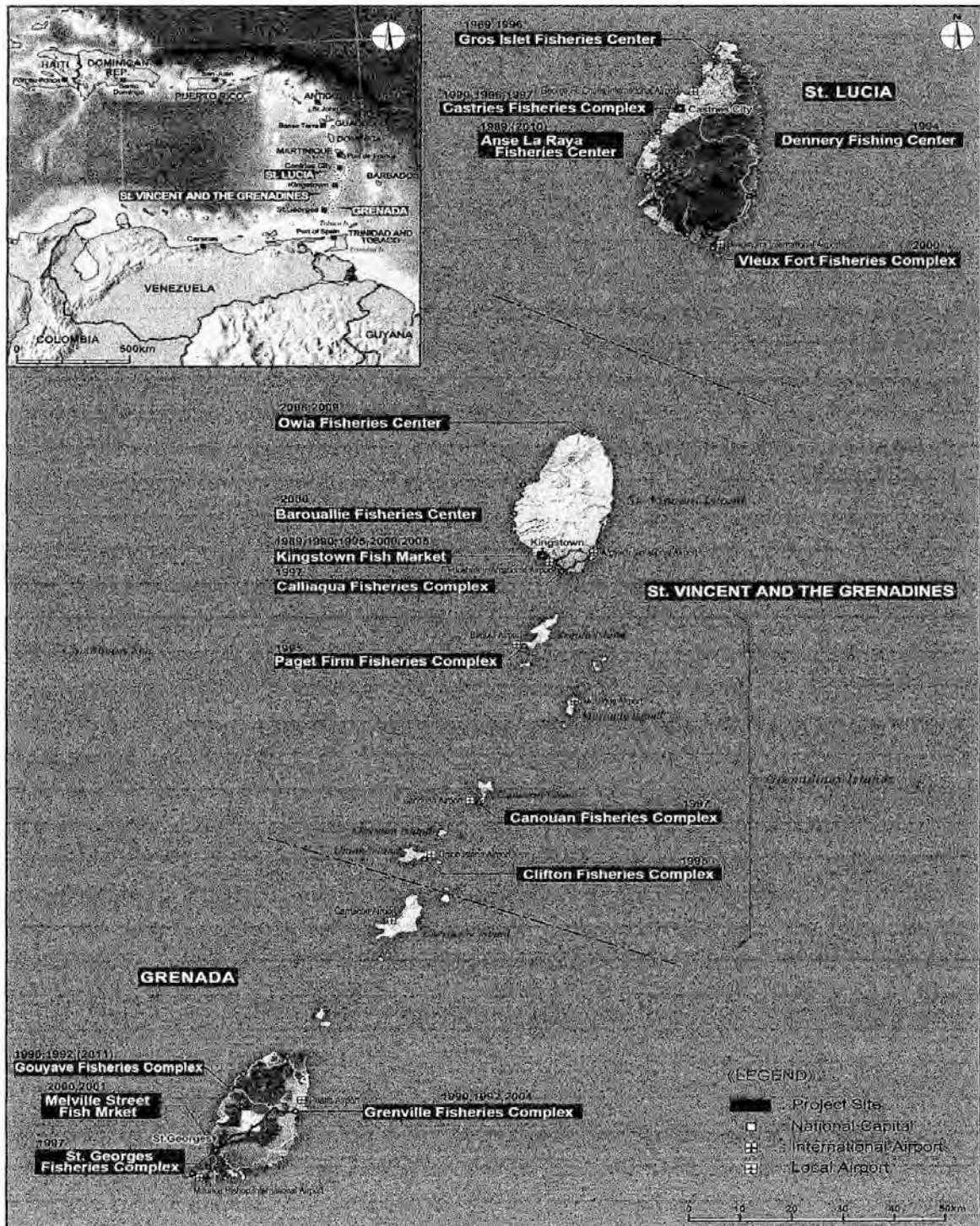
Annex – 1 Organizational Chart

Fisheries Division
Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment
Grenada



Remarks: MCS: Monitoring, Control and Surveillance

ANNEX 2 Location of Project Sites



Annex-3 List of Items Requested by the Government of Grenada (1/2)

No.	Project Site	Name of Previously Executed Project (Completion Year)	Candidate Component of the Project	Quantity	Discussion Results of the Field Survey (Preparatory Survey for Improvement of Fishery Equipment /Machinery in the Caribbean Region)	Executing Agency
1-1	Merville Street	The Project for Construction of Melville Street Fish Market 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	Overall replacement of existing refrigeration system using R22 and R404A to those of the ammonia system, has been requested. Through this replacement, electric cost reduction is expected. Existing refrigerating equipment (ice machine, ice storage, cold storage, etc.) has been maintained and been time to time renovated by DOF. However, occurrence of accident caused by a mistake is highly predicted because different types of refrigerant have been applied among these equipment. Further, these equipment have been getting old enough. The request is justifiable.	DOF
1-2	Grenville	The Project for Improvement of Fish Marketing for Grenville 2004	To replace existing refrigeration system using freon origin refrigerant to those of the ammonia system	1 set	At present, R22 is applied for the refrigerant of all existing refrigerating equipment in this site. As these equipment have been getting deteriorated, their replacement had been requested in the form of changing to R404A. However, the ammonia system has been finally requested after being pointed out that approx. 30% increase of electric cost by changing to R404A compared with that of the ammonia system. The site is facing to the Atlantic side and is the core landing center of large migratory fishes. The site has close relation with the Melville Street Market in terms of fish supply site for export and or fresh fish supply to the capital area.	DOF
1-3	Gouyave	The Project for Improvement of Traditional Fishing Community Infrastructure at Gouyave 2011	To replace existing refrigeration compressor (including its spareparts)	1 set	This center is still new, only three years after its commencement. However, one of two compressors got lock of its cylinders caused by malfunction of electronic sensor of compressor's oil level. This compressor is to be replaced because this is semi-closed type and is difficult to be repaired. Further, the supplemental oil tank to be installed to the new compressor to avoid repeated similar accident. Large sized fish such as tunas by long-liners are landed and exported from this center. It is necessary to take quick measures to solve this problem because existing long-liners here need ice produced by existing two ice machines during the peak season.	DOF
2	St. George's (Melville Street)	Not categorized into past projects	To install Vessel Monitoring System (VMS Transponder on 100 units Artisanal longline fishing vessels).	1 set	The Grenada fishing fleet comprised artisanal small scale longline fishing vessels which spends 3-6 days at sea. Grenada has a VHF Repeater system to enable long range communication with the national fishing fleet. In an effort to improve safety of our fishing fleet and enhance management capabilities, the Fisheries Division is piloting the introduction of a Vessel Monitoring System for the national Fishing fleet. The first phase is outfitting 100 artisanal longline vessels with VMS transponders. Fishing vessels with VMS capability will work in parallel with the VHF repeater communication system for safety and other functions. These units will be leased to 100 operators, and the Fisheries Division in collaboration with the vessel operators will provide for recurrent satellite air-time costs.	DOF
3-1	Caribbean side and Atlantic side of Grenada	Not categorized into past projects	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	3 set	Three sets of sub-merged type FAD which enable to avoid from damages by vessels navigation or lost caused by bad weather, has been requested for experiment. Based on the location of fishing ground and fishing method (trolling), two of them to be located in the Atlantic side and one in the Caribbean side. Fuel cost reduction effect is expected during the lean season's operation.	DOF
3-2	St. George's, St. John's, St. Mark's, St. Patrick's, Carriacou and Petit Martinique	Not categorized into past projects	To supply a new multi purpose fishing 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 3) survey on reservation of bottom fish resources using multi-beam echo-sounder (range up to 2,000m)	1 set	The last demonstration longliner donated by Japanese assistance was leased to the private sector nine years ago and is still being operated based in Gran Mal. DOF is now using two small boats for monitoring resources conditions of the marine protected zones. The demonstration longliner greatly contributed to development of the longline fishing in Grenada through activities of test fishing and training fishermen. The number of longliners have increased to approx. 200 boats. Recently needs of resources management have been significantly increased and supply of a larger research boat has been requested. The staff for this boat apart from two existing small boats will be smoothly found because of recent development of larger longliners in Grenada.	DOF
3-3			Fishing gear for experimental squid fishing (Medium size 3 way swivel for vertical line x 1,000 pcs., Plastic bait with stainless steel jig x 200 pcs., Iko line (brown tetoron) x 10 boxes, Underwater light (LED) x 200 pcs., Shock absorber x 1 coil, Large 3-way swivel for squid line x 200 pcs., Bulb for underwater light x 5 boxes, One-way swivel for squid line x 800 pcs., Stainless steel jig x 200 pcs., Small-size 3-way swivel for vertical line x 1,000 pcs., Monofilament line (#80 lbs, #30 lbs, #40 lbs) x 3 rolls each, Stainless steel hooks for vertical line	1 set	Fishing gears for test fishing of diamond back squid have been requested. Those are the list introduced by Japanese fishery expert for the test fishing and are presently out of stock and is difficult to procure in Grenada.	DOF
4	Melville Street / Grenville / Gouyave	Not categorized into past projects	To supply PC for fisheries data processing and analysis (2 computers for the data unit of Fisheries Division, 2 computers each for Melville Street, Grenville and Gouyave Fish Markets)	1 set	Supply of PC has been requested in order to upgrade the capacity of DOF for fisheries data processing and analysis.	DOF

Annex-3 List of Items Requested by the Government of Grenada (2/2)

No.	Project Site	Name of Previously Executed Project (Completion Year)	Candidate Component of the Project	Quantity	Discussion Results of the Field Survey (Preparatory Survey for Improvement of Fishery Equipment /Machinery in the Caribbean Region)	Executing Agency
5	Melville Street / Gouyave / Grenville	Not categorized into past projects	To supply training equipment for "Safety Training Program for Fishermen" (Handheld GPS x 12, Handheld VHF radio transmitter x 12, Flashlight/spotlight capable of communicating Morse code x 2, Lifejacket/vest x 6, Handheld compass x 12, Handheld day & night flares x 1 dozen, Handheld smoke flares x 1 dozen, Smoke flare in canister tin x 6, marine approved first aid kit x 1 kit, Navigation lights (port & starboard) x 2, Projector with screen x 1)	1 set	Training equipment used for the "Vessel Monitoring System" described in No.2 has been requested.	DOF
6	Melville Street	Not categorized into past project	Laboratory equipment facilitating testing of fish, ice and water used in the fishing industry (Programmable Stomacher, vacuum filtration manifolds, compound microscopes with built in digital cameras, vortex mix, surgical instrument kit, laptop computer, glass wares, medium, etc.)	1 set	In response to strong request of importing countries on the sanitary control of fish products, DOF should strengthen the monitoring activities of sanitary conditions of fish and fisheries environment, and has requested lab. test equipment that are used for testing activities collaborated with the St. George's Univ.	DOF

Remarks: DOF; Division of Fisheries

ANNEX-4 Japan's Grant Aid Scheme

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 signed 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.

A handwritten signature in black ink, consisting of stylized, cursive letters that appear to be 'JICA'.

ANNEX-5 Major Undertakings to be taken by Both 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. Wiring 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 frame/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
GRENADA
(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 Grenada" (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 Grenada (hereinafter referred to as "GOG") about the components of the draft report, JICA sent a Preparatory Survey Team (hereinafter referred to as "the Team") to Grenada from 19th to 20th 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.

Saint George's, 20th of May, 2014

正永 能久

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

M. Austin Cadore

Mrs. Marilyn Austin-Cadore
Permanent Secretary with Responsibility for
Forestry & Fisheries
Ministry of Agriculture, Lands, Forestry,
Fisheries and the Environment
Grenada

ATTACHMENT

1. Components of the draft report

The Grenadian 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 Grenadian 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 18th 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 Grenadian 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 Grenadian 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 Grenadian side agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in addition to the national environmental laws and regulations of GOG.

MAE
JIC

6. Other Relevant Issues

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

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

(1) Disposal of equipment/machinery/facilities

The Grenadian 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 GOG should inform the GOJ through the diplomatic channel based on the Exchange of Notes (E/N) before disposing it.

(2) Explanation to stakeholders

The Grenadian side agreed that the GOG 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.

(3) Arrangement of smooth VAT exemption measurement for the Project

The Grenadian side agreed to take note to establish a smooth VAT exemption measure for the Project by the time of commencement of the Project works.

(4) Planning of marine environmental surveys

The Grenadian side agreed to formulate an annual implementation plan of marine environmental survey by collaborating with the Produce Chemist Laboratory and the St. Georges' University.

(5) Proper action to provide an overnight storage services for landed fish

The Grenadian side agreed to take proper measures of temporary fish storage services for Fish Vendors and Fishermen when necessary during installation works by the Project.

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

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

*MAE
E.N.*

- (1) The Grenadian side assured that the same operation and maintenance system is to be applied before and after the Project.

- (2) The Grenadian side will arrange all the existing maintenance staff of the Fisheries Division 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.

MAE
正永

ANNEX

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

CONFIDENTIAL

MAE
JPC

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 Carib. 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	R-404a	R-22	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°C	Not flammable	Not flammable	-
Boiling point	-33°C	-40.8°C	-49°C	-

(2) Important point of maintenance

Refrigerant	Ammonia	R-404a	R-22
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 smell.	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 pump.	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

Refrigerant	Ammonia	R404a	R22
1) SERIOUS ACCIDENT This accident happens specialized in the ammonia liquid pump system. This system is not applied to the Project.			
Low temp. liquid blockade accident	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.	The low temp. liquid blockade by R-404a or/an R22 does not result in a death accident, but still a serious accident.	
Cause of the accident	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.		
Prevention of the accident	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.		
2) ANOTHER TYPE OF ACCIDENT More than 90% of accidents of refrigeration for equipment/machineries are caused by refrigerant leakages;			
Causes of refrigerant leakage accident	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		
Prevention of the accident	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.		

(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 R-22 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.