

No.

Japan International Cooperation Agency (JICA)

The Department of External Resources,  
Ministry of Foreign Affairs, Republic of Maldives

MAIN REPORT

3rd Report

# 3rd Report

VOLUME TWO : MAIN REPORT

Third Report of  
The Study on Tsunami Recovery, Rehabilitation  
and Development of Islands in Maldives

February 2006

YACHIYO ENGINEERING CO.,LTD.  
NIPPON KOEI CO.,LTD.

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The Study on Tsunami Recovery, Rehabilitation  
and Development of Islands in Maldives

February 2006



**VOLUME 2 :**  
**MAIN REPORT**

THE THIRD REPORT OF  
THE STUDY ON TSUNAMI RECOVERY, REHABILITATION  
AND DEVELOPMENT OF ISLANDS IN THE MALDIVES

## PREFACE

In response to a request from the Republic of Maldives, the Government of Japan decided to conduct "The Study on Tsunami Recovery, Rehabilitation and Development of Islands in the Maldives" and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Masatsugu Komiya of Yachiyo Engineering Co., Ltd. and consists of NIPPON KOEI CO., LTD. between March, 2005 and February, 2006.

The team held discussions with the officials concerned of the Government of Maldives and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Maldives for their close cooperation extended to the study.

February 2006

Kazuhisa Matsuoka  
Deputy Vice President  
Japan International Cooperation Agency

## LETTER OF TRANSMITTAL

February 2006

Mr. Kazuhisa MATSUOKA  
Vice President  
Japan International Cooperation Agency

Dear Mr. MATSUOKA

It is my great pleasure to submit herewith the Final Report of "The Study on Tsunami Recovery, Rehabilitation and Development of Islands in the Maldives".

The Study Team comprised of Yachiyo Engineering Co., Ltd. and NIPPON KOEI CO., LTD. conducted in Maldives over the period between March, 2005 and February, 2006 according to the contract with the Japan International Cooperation Agency (JICA).

The Study Team compiled this report, which proposes immediate needs regarding post-tsunami disaster recovery and rehabilitation and also to find concrete projects to be urgently implemented, through close consultations with officials of Ministry of Planning and National Development and other authorities concerned.

On behalf of the Study Team, I would like to express my sincere appreciation to Ministry of Planning and National Development and other authorities concerned for their cooperation, assistance, and heartfelt hospitality extended to the Study Team.

We are also very grateful to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, and the Embassy of Japan in Sri Lanka for valuable suggestions and assistance during the course of the Study.

Yours faithfully,

Masatsugu Komiya  
Team Leader  
The Study on Tsunami Recovery,  
Rehabilitation and Development  
of Islands in the Maldives

## TABLE OF CONTENTS

### 3<sup>rd</sup> Report

## The Study on Tsunami Recovery, Rehabilitation and Development of Islands in the Republic of Maldives

### VOLUME ONE: SUMMARY REPORT

### VOLUME TWO: MAIN REPORT

#### PART ONE: Project Finding

#### Chapter 1 Introduction

1.1	Background of the Study .....	1-1
1.2	Objectives of the Study.....	1-1
1.3	Study Area.....	1-2
1.4	Scope of the Study.....	1-2
1.5	Schedule of the Study and Reports.....	1-3
1.6	Contents of the Third Report.....	1-4

#### Chapter 2 Project Finding

2.1	Method and Procedure for Project Findings .....	2-1
2.2	Criteria for Selecting Projects .....	2-2
2.3	Candidate Project List.....	2-3

#### Chapter 3 Summary and Progress of the Study

3.1	Short-term Projects .....	3-1
3.2	Medium-term Projects .....	3-17
3.3	Community Based Recovery Project.....	3-27

#### Chapter 4 National and Regional Development Context

4.1	National Development Context .....	4-1
4.2	Regional Development Context.....	4-12

## PART TWO: Project Descriptions

Chapter 5	Multi-purpose Building and Island Office .....	5-1
5.1	Introduction .....	5-1
5.2	Present Conditions of the Construction Site .....	5-2
5.3	Planning and Design Policies .....	5-4
5.4	Room Requirements .....	5-5
5.5	Cost Estimation .....	5-8
5.6	Construction and Implementation Plan .....	5-11
5.7	Description of Solar Power Generation System .....	5-11
Chapter 6	Island Harbours and Causeways .....	6-1
6.1	Introduction .....	6-1
6.2	Port and Harbour Development in Transport Sector .....	6-3
6.3	Planning Policy and Alternatives .....	6-10
6.4	Design of Marine Facilities and Structures .....	6-14
6.5	Construction and Project Implementation .....	6-62
6.6	Cost Estimation .....	6-77
6.7	Recommendations .....	6-90
Chapter 7	Power Supply .....	7-1
7.1	Introduction .....	7-1
7.2	Present Conditions .....	7-1
7.3	Planning and Design Policies .....	7-2
7.4	Cost Evaluation .....	7-2
7.5	Construction and Implementation Plan .....	7-3
7.6	Technical Specification of Equipment .....	7-8
7.7	Recommendations .....	7-11
Chapter 8	Sewerage System .....	8-1
8.1	Introduction .....	8-1
8.2	Present Condition in Isdhoo Island .....	8-3
8.3	Planning and Design Policies .....	8-5
8.4	Cost Estimation .....	8-20
8.5	Construction and Implementation Plan .....	8-24
8.6	Recommendations .....	8-25

Chapter 9	Alternative Communication and Network.....	9-1
9.1	Introduction .....	9-1
9.2	Telecommunications in the Maldives.....	9-2
9.3	Impact of Tsunami .....	9-10
9.4	Alternative Communication and Network Development.....	9-13
9.5	Preliminary Cost Estimation .....	9-40
9.6	Preliminary Implementation Schedule.....	9-43
9.7	Recommendations.....	9-45

#### Chapter 10 Environmental Considerations

10.1	Introduction.....	10-1
10.2	Environmental Legislation in the Maldives .....	10-2
10.3	IEE of the Reconstruction of the 11 Island Harbours.....	10-4
10.4	IEE of the Reconstruction of the Two Causeways in Laamu Atoll.....	10-12
10.5	EIA of the Upgrading of the Sewerage System in Ishdoo Island.....	10-17
10.6	Recommendations.....	10-23

#### Chapter 11 Economic and Financial Considerations

11.1	Introduction.....	11-1
11.2	Present Conditions of Economy in the Maldives .....	11-1
11.3	Preliminary Economic and Financial Analysis .....	11-10
11.4	Recommendations.....	11-28

#### Chapter 12 Community Based Recovery Project (Demonstration Project in Laamu Fonadhoo)

12.1	Outline of the Project .....	12-1
12.2	Framework of the Project.....	12-2
12.3	Activities in the Project .....	12-6
12.4	Supervision of the Project .....	12-13
12.5	Monitoring of the Project .....	12-15

**VOLUME THREE: SUPPORTING REPORT-1: Tender Documents for Short-term Projects**

- S1-1 Rehabilitation of Power Distribution System
- S1-2 Recovery and Development of Causeways
- S1-3 Redevelopment of Administrative Facilities
- S1-4 Upgrading of Sewerage System

**VOLUME FOUR: SUPPORTING REPORT-2: Miscellaneous**

- S2-1 Reference Data on Marine Transport Sector
- S2-2 Reference Data on Telecommunication Sector
- S2-3 Scope of Work
- S2-4 Minutes of Meeting
- S2-5 Requests of the Maldives Side and Changing Situation of the Study Contents
- S2-6 List of Parties Concerned
- S2-7 Study Team Member List
- S2-8 Presentation Materials at Seminar in Male'



# CHAPTER 1 INTRODUCTION

## 1.1 Background of the Study

On 26 December at 9:20 am, the great tsunami struck the Maldives, destroying the lives and livelihood of a third of its population. According to the Joint Needs Assessment Report, the tsunami claimed 82 lives, left 26 people missing and displaced over 15,000 people. The tsunami destroyed much of the Maldivian's assets including housing, public facilities, water supply and sewerage systems, transport, communication infrastructure, private business and livelihoods. The main industries of fisheries and tourism were badly affected, deprived of investment and economic development of two decades. The total asset loss is estimated to be 62% of the GDP. The Government of the Republic of Maldives (hereinafter referred to as "the GOM"), requested to the world-wide donors to support for the recovery and reconstruction of the disaster-stricken islands in the Maldives.

In response to the official request of the GOM, the Government of Japan (hereinafter referred to as "the GOJ") has decided to undertake a study on "Tsunami Recovery, Rehabilitation and Development of Islands in Maldives" (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan. Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the GOJ, will undertake the Study, in close cooperation with the authorities concerned of GOM.

The Department of External Resources, Ministry of Foreign Affairs (hereinafter referred to as "the DER/MFA"), and the Ministry of Planning and National Development (hereinafter referred to as "the MPND") shall act as the counterpart agencies to the JICA Study Team (hereinafter referred to as "the Study Team"), and also act as the coordinating bodies with other relevant organizations for the smooth implementation of the Study, on behalf of the GOM.

On 12<sup>th</sup> April, 2005 agreement on the Scope of Works (S/W) and the Minutes of Meeting (M/M) was reached between the DER/MFA and JICA with the witness of the MPND.

## 1.2 Objectives of the Study

The objectives of the Study are:

- (1) to formulate detailed project plans for the study areas described in "1.3. Study Area" based on the National Recovery and Reconstruction Plan (hereinafter referred to as "the NRRP")
- (2) to assist and monitor the implementation of recovery and rehabilitation projects to be funded under the Japanese Non-Project Grant Aid (hereinafter referred to as "NPGA") and ODA Loan,
- (3) to share Japanese experiences in disaster management through the implementation of

the Study and to monitor process and outcome.

### 1.3 Study Area

Study areas in the S/W originally consisted of four atolls (Alifu Alifu, Vaavu, Thaa and Laamu; total 13 islands), and the following two atolls and 11 islands were finally selected as the study areas through the series of discussions between the related agencies of GOM and the Team;

- (1) Laamu Atoll (Isdhoo/Isdhoo-Kalaidhoo, Maabaidhoo, Gan, Fonadhoo, Maavah), and
- (2) Thaa Atoll (Dhiyamigili, Guraidhoo, Thimarafushi, Kinbidhoo, Veymandoo, Hirilandhoo)

Figure 1.1 is the location map of the Study Area.

### 1.4 Scope of the Study

In order to achieve the objectives mentioned above, the Study will cover the following components, in collaboration with the GOM:

Component-1: Technical assistance project for emergency recovery for implementing short-term reconstruction of social and economic infrastructure development:

Project formulation based on the NRRP for the following sectors shall be conducted under the Study.

- (1) Multi-purpose building with solar power in Laamu Gan
- (2) Island office with solar power in Laamu Fonadhoo
- (3) Causeways between Laamu Gan and Fonadhoo
- (4) Power distribution facilities in Laamu Isdhoo/Isdhoo-Kalaidhoo, Maabaidhoo, Gan, Fonadhoo and Maavah
- (5) Sewerage system for Laamu Isdhoo/Isdhoo-Kalaidhoo

Component-2: Project for supporting the implementation of medium-term reconstruction of social and economic infrastructure development:

- (1) Coastal facilities including harbours, jetties and coastal protection in Laamu (five islands) and Thaa (six islands)
- (2) Alternative communication system in Laamu

Note: The contents of the projects in the above component-1 and -2 have also changed from the list provided in the S/W due to the change of study areas and also prioritization of the projects.

Component-3: Implementation of community based recovery project (demonstration project) for debris recycling and disaster evacuation platform assisted by the Study Team in Laamu Fonadhoo.

Table 1.1 below shows the projects and islands covered in the Study.

**Table 1. 1 JICA Study Projects**

Atoll	Island	Short-term Recovery Projects				Demonstration Project	Medium-term Infrastructure Projects	
		Public facilities	Power distribution facility	Causeway *1)	Sewerage		Coastal facilities *2)	Alternative communication system
Laam	Isdhoo/Isdhoo-Kalaidhoo		●			●	●	●
	Maabaidhoo		●				●	●
	Gan	● Multi-purpose Building	●	●			●	●
	Fonadhoo	● Island Office				●	●	●
	Maava		●				●	●
Thaa	Dhiyamigili						●	
	Guraidhoo						●	
	Thimarafushi						●	
	Veymandhoo						●	
	Kinbidhoo						●	
	Hirilandhoo						●	

Notes: ● JICA Study Projects

\*1) consists of two causeways of Laamu Maandhoo – Kadhdhoo and Laamu Kadhdhoo and Fonadhoo

\*2) consists of an island harbour, jetties and coastal protection facilities.

## 1.5 Schedule of the Study and Reports

The Study shall be carried out from March 2005 to January 2006. Figure 1.2 shows the activity flow of the Study. The Study Team shall prepare the following reports in English and submit them to the GOM.

(1) First Report: Twenty (20) copies, to be submitted in April, 2005.

This First Report shall include the following information;

- a. Project concept paper which shows description of the project, sector, estimated cost, proposed implementation schedule, etc. with regard to the Component-1 projects.
- b. A list of candidate projects for Component-2
- c. Preliminary idea for demonstration projects

(2) Second Report: Twenty (20) copies, to be submitted in August, 2005.

This Second Report shall include the following information;

- a. Technical tender specifications for the selected projects in Component-1, to be submitted in or before August, 2005
- b. Conceptual plans for the prioritized projects on the candidate project list with regard to the Component-2 projects
- c. Progress and monitoring of the demonstration project

- (3) Third Report: Twenty (20) copies, to be submitted in January, 2006, reporting on the results of the Study.

Figure 1.2 shows the overall schedule of the Study.

## 1.6 Contents of the Third Report

This Third Report consists of 3 Volumes: Volume One is the Summary Report, explains the brief of the whole picture of the JICA Study Project, Volume Two is the Main Report, contains Chapter 1 to 12, explains the detail descriptions of the Project, and Volume Three and Four are the Supporting Report-1, and Supporting Report-2, involving technical papers of tender document and background data and information of the Study.

### Volume One: Summary Report

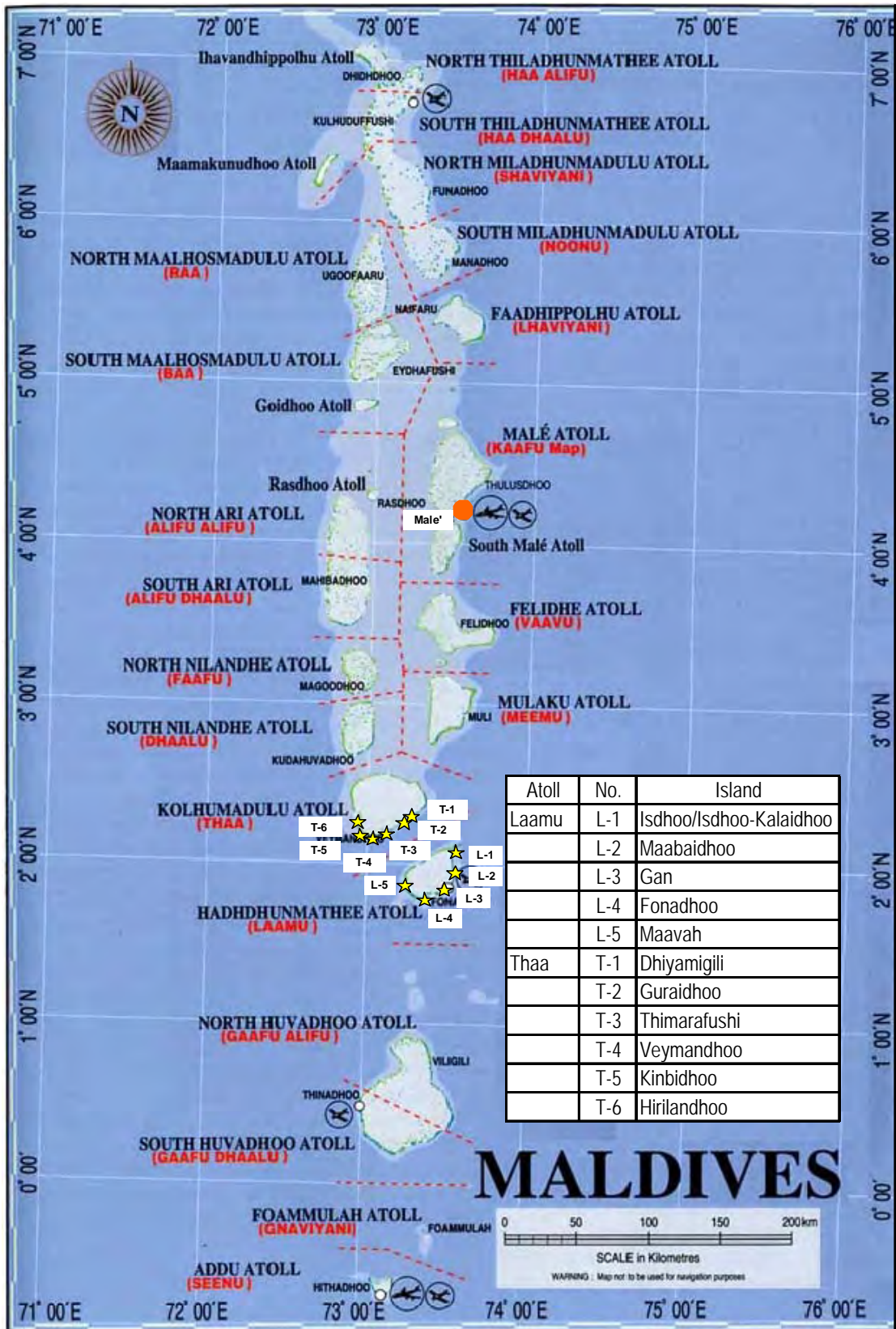
This Volume contains brief explanations of the Short-term Recovery Projects, Medium-term Reconstruction of Social and Economic Infrastructure Development Projects and Community Based Recovery Project. The important descriptions, tables and figures in the Main Report are shown in this report.

### Volume Two: Main Report

This volume contains Part One: Project Finding and Part Two: Project Descriptions. Part One is composed of 4 Chapters including Introduction, Project Finding, Summary and Progress of the Projects and National and Regional Development Context. Part Two is composed of 5 Chapters including the explanation the selected projects in detail by each sector, i.e. the Multi-purpose Building and Island Office with Solar Power), Island Harbours and Causeways, Power Supply, Sewerage System, and Alternative Communications System, and descriptions of the project evaluations from the environmental, and economic and financial points of view.

### Volume Three: Supporting Report

This volume contains Part One: Tender Documents of the Short-term Projects and Part Two: Miscellaneous. The Tender Documents covers 4 short-term projects; Rehabilitation of Power Distribution System, Recovery and Development of Causeway, Redevelopment of Administrative Facilities (Multi-purpose Building and Island Office) and Upgrading of Sewerage System. Part Two is composed of the reference data and information related to the Study.



★ : JICA Study Area

Figure 1. 1 JICA Study Area

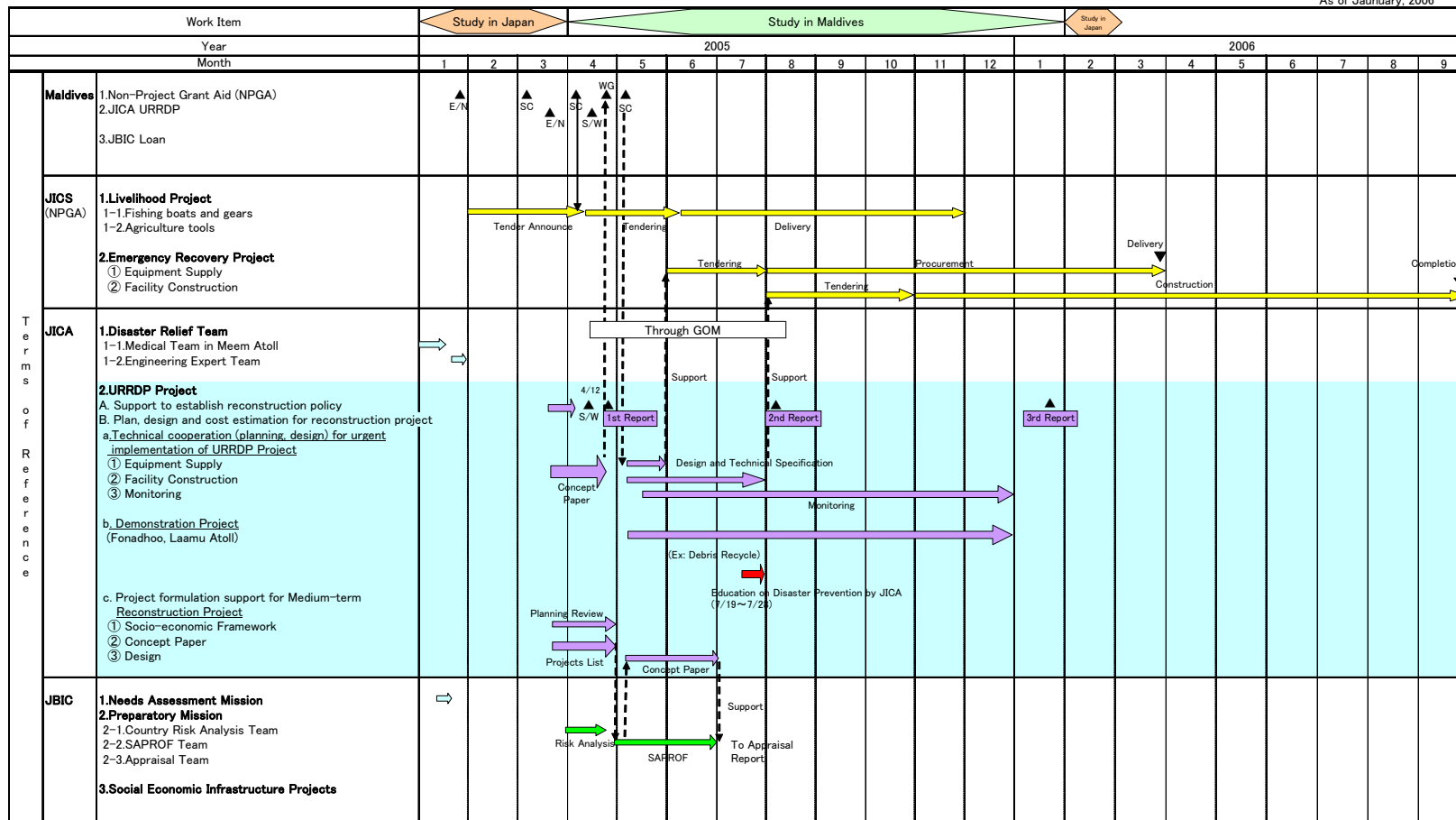


Figure 1. 2 Overall Schedule of the JICA Study

## CHAPTER 2 PROJECT SELECTION

### 2.1 Method and Procedures for Project Selection

This project commenced when the S/W was agreed upon on 12<sup>th</sup> April, 2005. However, in light of the urgent nature of recovery projects, need for avoiding duplication among the commitments of various donors, and heavy loads on the GOM in terms of coordination among the government agencies, the study areas and projects have been reviewed and modified. The final scope of work (study areas and projects) was agreed at the Steering Committee meeting held on 5<sup>th</sup> May. The major changes made thereto are as follows;

	Original S/W dated 12 April	S/C held on 5 May
Major changes	-	1) The study area was limited to two atolls. 2) Causeways, sewerage facilities and solar power systems were nominated as short-term NPGA projects. 3) All the island harbours were classified as medium-term project.
Study areas	13 islands in 4 atolls (Alif Alif, Vaavu, Laamu, Thaa)	11 islands in 2 atolls (Laamu and Thaa)
Short-term projects	1) Multi-purpose building 2) Island offices 3) Power generation and distribution facilities, 4) Island harbours	1) Multi-purpose building 2) Island office 3) Causeways 4) Power distribution facilities 5) Solar Power 6) Sewerage
Medium-term projects	1) Island harbour and jetty 2) Coastal protection 3) Causeways 4) Sewerage system/ network 5) Water supply system 6) Alternative communication system	1) Island harbours in 11 islands (incl. coastal protection) 2) Alternative communication system
Demonstration project	Debris recycling and disaster evacuation platform	Same as left

All the necessary projects are already listed in the NRRP, and thus the NRRP was the basis for the project selection. Many organizations were involved in the process of project selection. The major organizations involved are;

- 1) GOM coordination ministries; the DER/MFA, the MPND, and the Ministry of Finance and Treasure (hereinafter referred to as "MFT")
- 2) GOM line ministries; Ministry of Atoll Development (hereinafter referred to as "MOAD"), the Ministry of Trade and Economic Development (the former Ministry of Trade and Industry), the Ministry of Transport and Communication (the former Ministry of Transport and Civil Aviation) (hereinafter referred to as "MTC"), and the Ministry of Health (hereinafter referred to as "the MOH").
- 3) Donors (Multi- and By-lateral, NGO)

- 4) Steering Committee on Japan's NPGA projects (GOM and GOJ)
- 5) JBIC and SAPROF missions

The Study Team carries out continuous discussions and coordination meetings with the GOM's coordination and line ministries, especially with regard to technical matters. The Study Team also keeps close contact with other donors related to the Study and attends the donor coordination meetings. Meanwhile, the Steering Committee meetings composed of the GOM and GOJ officials are held periodically to discuss the short-term projects (NPGA projects) during the Study period. The Steering Committee is a decision making mechanism for the implementation of the short-term NPGA projects. The review of the short-term projects is confirmed at the Steering Committee meeting, whereas another coordination activity was made with JBIC and SAPROF missions as for the selection of the medium-term project. Through the discussions and coordination on the above activities, the projects and study areas are reviewed.

Figure 2.1 shows the method and procedures for project findings adopted by the Team.

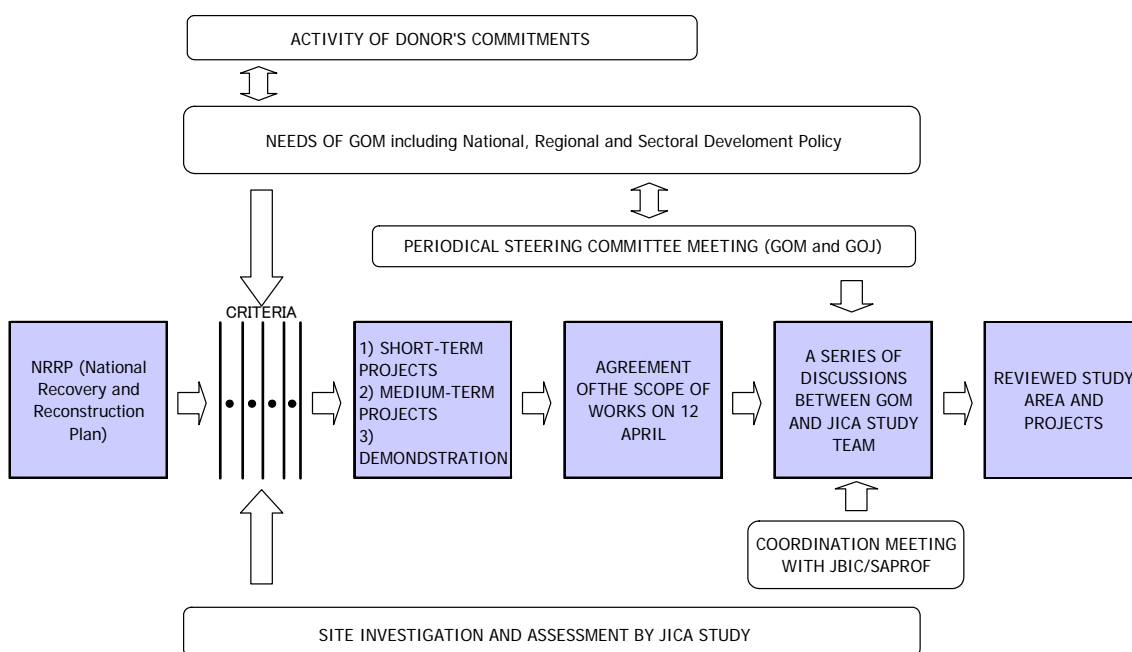


Figure 2. 1 Method and Procedures for Project Findings

## 2.2 Criteria for Selecting Projects

The major criteria for the project selection in the above discussions are summarized as follows;

- (1) Japanese knowledge and experience on disaster management technology can be utilized.
- (2) Urgency of the project due to damage by tsunami can be acknowledged.
- (3) The project covers small-scale basic infrastructures for human needs and expedites future development by the Maldives.



- (4) The project contributes to sustainable economic development by local communities.
- (5) Study areas geographically concentrate as much as possible,
- (6) Priority of the project by the Maldivian side (both Male' and local islands) should be confirmed.
- (7) Duplication by other donors' projects must be avoided.
- (8) The project does not directly contribute to private property.
- (9) The concept of the project is consistent with the NRRP.
- (10) The project must meet with national and regional development policies and demands.
- (11) Short and mid-term projects are demarcated in accordance with the following definitions:
  - 1) Urgent, small-scale projects with short implementation periods
  - 2) Mid-term projects contribute to medium to long-term socioeconomic development but require a long time for technical and financial consideration.

### 2.3 Selected Project List

Table 2.1 is a list of the selected short-term NPGA projects.

**Table 2. 1 Selected Project List (Short-term NPGA Project)**

No.	Name of Project	Location	Cost (Million Yen) *1)
S-1	Power distribution facilities	1) Laamu Isdhoo/ Isdhoo-Kalaidhoo 2) Laamu Maabaidhoo 3) Laamu Gan-Mukurimagu 4) Laamu Maavah	79.7
S-2	Causeways	1) between Laamu Maandhoo and Kadhdhoo 2) between Laamu Kadhdhoo and Fonadhoo	616.8
S-3-1	Multi purpose building with solar power	Laamu Gan	210.7
S-3-2	Island office with solar power	Laamu Fonadhoo	95.5
S-4	Sewage system	Laamu Isdhoo/Isdhoo-Kalaidhoo	194.0
Total Cost for Short-term NPGA Project			1,196.7

Note: \*1) includes construction and engineering costs (support for tendering only), but does not include engineering cost for supervision. The exchange rate is 1 US\$=106.24 Yen.

Table 2.2 is a list of the selected medium-term loan projects.

**Table 2. 2 Selected Project List (Medium-term Loan Project)**

No.	Name of Project	Location	Cost (Million Yen)
M-1	Rehabilitation of island harbours and coastal protection	1) Thaa Dhiyamigili 2) Thaa Guraidhoo 3) Thaa Thimarafushi 4) Thaa Veymandoo 5) Thaa Kinbidhoo 6) Thaa Hirilandhoo 7) Laamu Isdhoo / Isdhoo –Kaladhoo 8) Laamu Maabaidhoo 9) Laamu Gan 10) Laamu Fonadhoo 11) Laamu Maavah	1,323.6
M-2	Alternative Communications System Development	20 atoll offices (all atoll offices) and Ishidhoo, Maabaidhoo, Gan, Fonadhoo, Maavah	341.5
Total Cost for Medium-term JBIC and other ODA Loan Project			1,665.1

## CHAPTER 3 SUMMARY AND PROGRESS OF THE STUDY

The JICA Study has three project components: short-term projects, medium-term projects and the Demonstration Project. The followings are the project outlines and the progress of each component of the Study.

### 3.1 Short-term Projects

#### 3.1.1 Outlines of the Projects

**Table 3.1 Outlines of the Short-term (NPGA) Projects**

Project Title	Purpose	Implementation Body	Project Contents	Benefits and Benefiting Population
<p>(1) Rehabilitation of Power Distribution System</p> <p><u>Project site:</u> Laamu: Isdhoo/Isdhoo-Kalaidhoo, Maabaidhoo, Gan-Mukurimagu and Maavah)</p> <p><u>Project cost (Contract Amount):</u> approx. 58 million yen</p>	<p>Rehabilitation of the low voltage distribution system in the areas most severely damaged by the tsunami in Laamu Atoll</p>	<p>MOAD</p> <p>Technical support body: Maldives Electricity Board (MEB)</p>	<p>Procurement and installation of the following equipment, and materials</p> <ul style="list-style-type: none"> <li>• Low voltage distribution cables</li> <li>• Distribution panels</li> <li>• Maintenance tools, etc.</li> </ul> <p>(see Figure 3.1 – Perspective Drawing of Power Distribution System)</p>	<p>[Benefiting population] 4,432</p> <p>Breakdown Isdhoo/Isdhoo-Kalaidhoo: 1,432 Maabaidhoo: 793 Gan-Kukurimagu: 856 Maavah: 1,351</p> <p>[Benefits] Rehabilitation of the power distribution system will enable a stable supply of electricity which is an important part of the public infrastructure.</p>
<p>(2) Recovery and Development of Causeways</p> <p><u>Project site:</u> Laamu: between Gan and Fonadhoo)</p> <p><u>Project cost (Contract Amount):</u> approx. 660 million yen</p>	<p>Urgent repair of two causeways between Gan and Fonadhoo which were extensively damaged by the tsunami</p>	<p>Ministry of Transport and Communication (the former Ministry of Transport and Civil Aviation: MTCA)</p>	<p>Construction of the following facilities</p> <ol style="list-style-type: none"> <li>1) Causeway No. 1 (between Kadhoo and Mandhoo: approx. 300 m long)</li> <li>2) Causeway No. 2 (between Fonadhoo and Kadhoo: approx. 900 m long, including one 18 m long bridge)</li> </ol> <p>(see Figure 3.2 – Perspective Drawing of Causeways)</p>	<p>[Benefiting population] approx. 5,600 (including potential settlers on Gan from two neighbouring islands)</p> <p>[Benefits] Fonadhoo which is the administrative centre of Laamu Atoll is located southernmost of four islands connected by causeways and has the only commercial port of the atoll. Meanwhile, public facilities (hospital, secondary school, public sports ground and desalination plant) are located on the northernmost Gan island. Such important socioeconomic facilities as the airport and fish processing plant are situated between Fonadhoo and Gan. Because of such distribution of facilities, repair of the two causeways will secure safe access between the islands and will contribute to the improvement of life and the development of industries and the economy. Urgent work is necessary as further erosion is in progress at the sites damaged by the tsunami.</p>
<p>(3) Redevelopment of Administrative</p>	<p>1) Multi-purpose building (Gan)</p>	<p>Ministry of Atolls</p>	<p>Construction of the following facilities</p>	<p>1) Multi-purpose building (Gan)</p>

Project Title	Purpose	Implementation Body	Project Contents	Benefits and Benefiting Population
<p>Facilities</p> <p><u>Project site:</u> Laamu: Gan and Fonadhoo)</p> <p><u>Project cost (Contract Amount):</u> Building construction: approx. 260 million yen Solar power system: approx. 65 million yen</p>	<p>For the reconstruction of the island office building damaged by the tsunami, a community centre, post office, police station and courthouse functions will be added in order to construct a multi-purpose building to improve community activities and administrative services.</p> <p>2) Island office building (Fonadhoo) Reconstruction of the damaged island office to secure administrative services</p>	Development	<p>1) Multi-purpose building (Gan) (total floor area: 1,484.7 m<sup>2</sup>) GF: equipment room; storage room; multi-purpose hall 1F: island office; local courthouse; police station; bank; community room; others Roof top: solar power system</p> <p>2) Island office building (Fonadhoo) GF: equipment room; storage room; multi-purpose hall 1F: island office; community room; others Roof top: solar power system</p> <p>See Figures 3.3, 3.4 – Perspective Drawing of Multi-Purpose Building on Gan Island)</p>	<p>[Benefiting population] All islanders of the three communities on Gan, settlers from two islands and those on Fonadhoo which has a land link to Gan (total: approx. 5,600); all islanders on the Laamu Atoll in the case of the local courthouse (approx. 11,600)</p> <p>[Benefits] The multi-purpose building will provide efficient administrative services, greatly contributing to the restoration of socioeconomic activities and sound living. The building will also function as a shelter for islanders at the time of any future tsunami.</p> <p>2) Island office building (Fonadhoo)</p> <p>[Benefiting population] Some 1,740 islanders of Fonadhoo</p> <p>[Benefits] The provision of efficient administrative services will be secured, greatly contributing to the restoration of socioeconomic activities and sound living.</p>
<p>(4) Upgrading of Sewerage System</p> <p><u>Project cost (Contract Amount):</u> Laamu: Isdhoo/Isdhoo-Kalaidhoo)</p> <p><u>Project cost:</u> approx. 210 million yen</p>	<p>The existing sewerage system consists of septic tanks and infiltration tanks but the infiltration of foul water is contaminating the groundwater. This situation has been worsened by the tsunami damage. The development of a new sewerage system will prevent environmental deterioration.</p>	<p>MEEW</p> <p>Technical support body: Maldives Water and Sanitary Authority: (MWSA)</p>	<p>Construction of the following facilities</p> <ul style="list-style-type: none"> <li>• Septic tanks</li> <li>• Sewer network</li> <li>• 2<sup>nd</sup> septic tanks</li> <li>• Pressure pump</li> <li>• Soil treatment bed</li> <li>• Sludge drying bed</li> <li>• Others</li> </ul> <p>(see Figure 3.5 – Perspective Drawing of Sewerage System)</p>	<p>[Benefiting population] 1,432 (Isdhoo/Isdhoo-Kalaidhoo)</p> <p>[Benefits] The adverse impacts of foul water on the soil, groundwater and seawater will be reduced so as to improve the health of the islanders and to contribute to an improved living environment and environmental conservation.</p>

Figures 3.1 to 3.5 show the project images of the causeways between Laamu Fonadhoo and Kadhoo, the multi-purpose building in Laamu Gan, the island office in Laamu Fonadhoo, and the layout plans of the sewerage systems in Laamu Isdhoo/Isdhoo-Kalaidhoo. The detailed description of each project is given in the form of a summary table.



Figure 3.1 Perspective Drawing of the Power Distribution System Project





Figure 3.2 Perspective Drawing of the Causeway between Laamu Fonadhoo and Kadhoo





Multi-purpose Building : Thundi, Gan Isalind, Laamu Atoll

Figure 3.3 Perspective Drawing of the Multi-purpose Building in Laamu Gan





Island Office : Fonadhoo, Laamu Atoll

2005 / JICA Study Team



Figure 3.4 Perspective Drawing of the Island Office in Laamu Fonadhoo

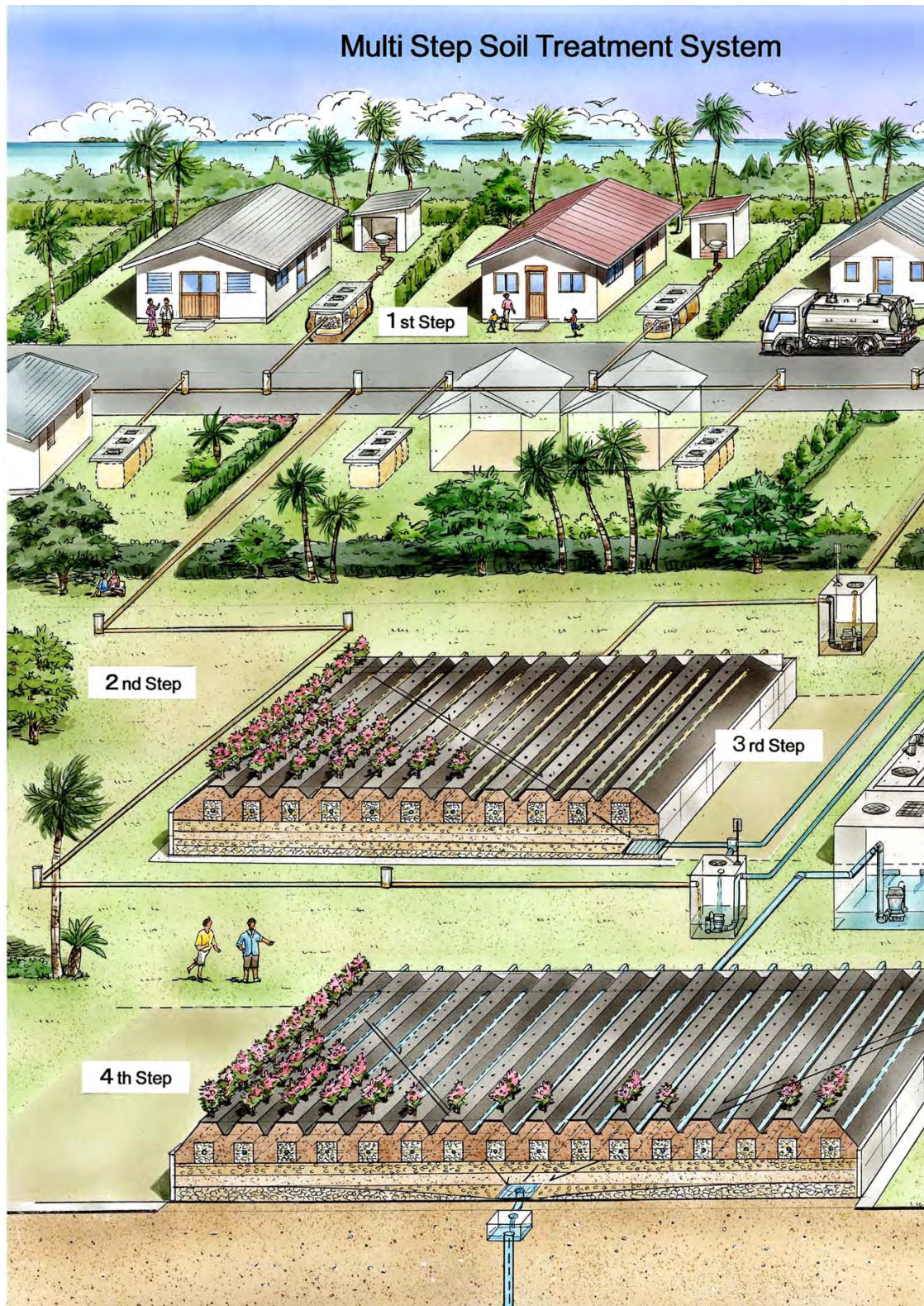


Figure 3.5 Perspective Drawing of the Sewerage System in Laamu Isdhoo- Kalaidhoo

Table 3.2 Power Distribution Facilities (Project Summary)

<b>JICA Study Code No.:</b> S-1		<b>Expected Fund:</b> NPGA / JBIC /
<b>NRRP Project Code:</b> PWR 001	<b>Project Title:</b> The Project for Rehabilitation of Power Distribution System in Laamu Atoll	
<b>Executing Agency:</b> Ministry of Finance and Treasury		<b>Implementing Agency:</b> Ministry of Atolls Development (MOAD) Maldives Electricity Bureau (MEB) in MEEM (former MEC)
<b>Location of the Project:</b> <b>Atoll name:</b> Laamu Atoll <b>Island name:</b> Isdhoo, Isdhoo-Kalaidhoo, Maabaidhoo, Gan-Mukurimagu and Maavah		<b>Implementation stage:</b> SHORT / MEDIUM / LONG
<b>Background:</b> The tsunami on 26 <sup>th</sup> December caused severe damages on the power supply system in at least 95 islands (about 48% of the total islands with electricity). Underground distribution cables as well as distribution boxes were critically disrupted, while powerhouses, generators and switchboards were also damaged to a varying degree. Maldives Electricity Bureau (MEB) is the regulating authority and policy maker for generation, distribution and utilization including tariff setting in whole country. Electricity is being supplied by the Island Development Committees (IDCs), which lacks proper engineering capabilities to assess and repair damaged power supply equipment. Power supply has already been recovered in many affected islands but only temporarily. Many cables are connected without jointing materials underground, distribution boxes are substituted by plastic buckets. Those improper installation will result in frequent line fault and cause severe damage on consumers equipment. It was confirmed by JICA Study Team that distribution systems were more severely damaged compared with generation facilities and urgent recovery of distribution cables is required.		
<b>Objectives:</b> 1. To restore and rehabilitate power distribution system within the shortest possible time. 2. The system should be rehabilitated to the level which complies with the technical standard established by MEB. 3. To procure and install equipment and materials necessary for the rehabilitation of distribution system including consumer connections (excluding Meters and consumer panels).		
<b>Preliminary Estimated Cost (Million Yen)</b>		79.7
<b>Implementation Plan</b>		
<b>Procurement of goods</b>	Procurement and Installation of Distribution cables and Distribution Boxes	
<b>Services</b>	1) Installation of cables 2) Installation of distribution boxes	
<b>Effect of the project/Beneficiaries:</b> The Project would directly benefit all inhabitants who have been interrupted electricity supply due to tsunami. Number of beneficiaries: total 4,432 inhabitants in 5 islands (districts)		
<b>Implementation of Similar Project by Other Donors/organizations</b> International Red Cross procured and installed generators in the project site as grant aid		
<b>Environment Implications:</b> Screening assessment was done and no further assessment is required. Precautions will be taken to prevent any accident for public during construction of underground cables.		



Laamu  
Ishidhoo



Laamu Maabaidhoo



Laamu Fonadhoo



**Table 3.3 Causeways (Project summary)**

<b>JICA Study Code No.:</b> S-2		<b>Expected Fund:</b> NPGA / JBIC /
<b>NRRP Project Code:</b> TRN004 G	<b>Project Title:</b> Rehabilitation and Reconstruction of Causeways	
<b>Executing Agency:</b> Ministry of Finance and Treasury		<b>Implementing Agency:</b> Ministry of Transport and Communication (former Ministry of Transport and Civil Aviation)
<b>Location of the Project:</b> <b>Atoll name:</b> Laamu <b>Island name:</b> Maandhoo-Kadhoo-Fonadhoo		<b>Implementation stage:</b> SHORT / MEDIUM / LONG
<p><b>Background:</b></p> <p>The Gan (Biggest island in Maldives), Maandhoo (Fishery land base), Kadhoo (Airport) and Fonadhoo (Atoll capital) are connecting by causeways, and formed a potential regional growth corridor. Although, the existing total population of these islands is still 4,000, the resettlement scheme and host island development plan are scheduled at Gan, the population and economic activities will be accelerated toward the future.</p> <p>The Tsunami gave damages to the 2 causeways connecting the islands of Maandhoo-Kadhoo-Fonadhoo. It is also continuing deterioration of facilities after the Tsunami through day-by-day erosion. The urgent recovery of the causeways is required to solve the problem. This project is to strengthening the damaged causeways by Tsunami. Reconstruction is planned to carry out along the original structures are remaining. It should be noted that the sea bottom condition at the north section of Maandhoo-Kadhoo causeway (No. 1) is completely deteriorated due to the tidal current. Thus it is proposed to provide artificial openings by means of passages by concrete box culverts and a bridge of 18 m span at the causeway Kadhoo-Fonadhoo (No.2). It is planned that a 6 meter wide temporary access will be provided throughout the entire construction period ensuring a ceaseless services to the inhabitants.</p>		
<p><b>Objectives: The project aims at;</b></p> <ul style="list-style-type: none"> <li>● Ensure safety and smooth inland transport among 4 islands (Gan- Maandhoo- Kadhoo- Fonadhoo ) by reconstruction of causeways between Maandhoo- Kadhoo- Fonadhoo</li> </ul>		
<b>Preliminary Estimated Cost (Million Yen)</b>		616.8
<b>Implementation Plan</b>		
<b>Procurement of goods</b>	-	
<b>Services</b>	1) Construction of structures (Causeways of 1,000m and 250m long) 2) Construction of a bridge (18m span)	
<p><b>Effect of the project/Beneficiaries:</b></p> <ol style="list-style-type: none"> <li>1) Rehabilitating the causeways damaged by the tsunami</li> <li>2) Facilitating easy and safety accessibility among the islands to transport and for commuting</li> <li>3) Help facilitate to regenerate and sustain livelihoods of islands</li> <li>4) Repairing and upgrading of the related facilities</li> </ol> <p>Number of beneficiaries: Whole islands population (4,000 persons) and visitors from the other islands.</p>		
<p><b>Implementation of Similar Project by Other Donors/organizations</b></p> <p>None in the same island.</p>		
<p><b>Environment Implications:</b></p> <p>The IEE was submitted and approved by the former Ministry of Environment, Energy and Water. Although impact will be minor, provision of necessary measures in the dredging and reclamation works during reconstruction works is required according to the IEE.</p>		

**Table 3.4 Multi-purpose Building (Project summary)**

<b>JICA Study Code No.:</b> S-3-1		Expected Fund: NPGA / JBIC /	
<b>NRRP Project Code:</b> ADMIN 001		<b>Project Title:</b> Reconstruction of Multi Purpose Buildings including administrative complex in Laamu Gan	
<b>Executing Agency:</b> Ministry of Finance and Treasure		<b>Implementing Agency:</b> Ministry of Atolls Development	
<b>Location of the Project:</b> <b>Atoll name:</b> Laamu <b>Island name:</b> Gan / Thundi		<b>Implementation stage:</b> SHORT / MEDIUM / LONG	
<b>Background:</b> The tsunami caused several damages to the important social and community infrastructure such as community centre, youth facilities. These facilities are the base of all social and development activities of the community and the source of income to sustain such activities. The community funds are inadequate to meet the present rehabilitation and reconstruction needs due to the extensive damage. The GOM requested the following facilities;			
Required Facilities	Existing Facility	Damage	Target area of new facility
Island Office	Thundi	Minor damage	Thundi and resettlement area
Island Court	Fonadhoo and Gan (single room within other bldg.)	Minor damage	Whole Gan
Post Office	Not exist in Gan	-	Gan, Fonadhoo, Kadhoo, MMAandhoo
Community Hall	Not exist in Laamu Atoll	-	Gan, Fonadhoo, Kadhoo, MMAandhoo
According to above requests, island office and island court is to be reconstructed and integrated, post office and community hall is subject to new construction respectively. Hence, the multi purpose building for the community and administration of local government needs to be constructed immediately, to support restart/vitalise community activities. This building has a function of disaster evacuation space at first floor and solar power for emergency use.			
<b>Objectives:</b> • Reconstruct and normalise social and community infrastructure in the islands and atoll.			
<b>Preliminary Estimated Cost (Million Yen)</b>		210.7 (including solar power)	
<b>Implementation Plan</b>			
<b>Procurement of Goods</b>	-		
<b>Services</b>	Construction works are included following items; Ground Floor: 1) Utilities and mostly vacant space for avoided high water 1 <sup>st</sup> Floor : 1) Island office, 2) Island court, 3) Police office, 4) post office, 5) Banking booth, and 6) Community hall, conference / meeting room, community gathering space, youth facilities, etc. Total floor area 1,485 sqm		
<b>Effect of the project/Beneficiaries:</b> Number of beneficiaries: 2,244 inhabitants and residents in Gan and 1,740 inhabitants in Fonadhoo. The airport in Kadhoo, fishery company and agricultural farm in Maandhoo are also beneficiaries.			
<b>Environment Implications:</b> Screening assessment was done and no further assessment is required.			

Table 3.5 Island Office (Project summary)

<b>JICA Study Code No.:</b> S-3-2		<b>Expected Fund:</b> NPGA / JBIC /
<b>NRRP Project Code:</b> ADMIN 002 A	<b>Project Title:</b> Reconstruction of Island Office	
<b>Executing Agency:</b> Ministry of Finance and Treasure		<b>Implementing Agency:</b> Ministry of Atolls Development
<b>Location of the Project:</b> <b>Atoll name:</b> Laamu <b>Island name:</b> Fonadhoo		<b>Implementation stage:</b> SHORT / MEDIUM / LONG
<b>Background:</b> An assessment of the damage and needs of recovery to island offices are highly required to reconstruct the office buildings in Laamu Fonadhoo island. The physical destruction caused by tsunami includes damages to administrative function in local government. It is also considered that the ages of buildings mostly over 20 years. Reconstruction of the island offices are vital to enable them to function efficiently in support of the recovery efforts. It would be an increased demand for their services due to the processes involved in reconstruction efforts where public administrative issues can arise. Thus, the project aims to address these critical infrastructure reconstruction needs in the islands.		
<b>Objectives:</b> <ul style="list-style-type: none"> <li>Rebuild critical infrastructure of local government in Fonadhoo islands that were damaged by tsunami, has resulted in a speedy and successful relief effort in addition with the function of disaster shelter for inhabitants and solar power applicable for emergency.</li> </ul>		
<b>Preliminary Estimated Cost (Million Yen)</b>		95.5 (including solar power)
<b>Implementation Plan</b>		
<b>Procurement of Goods</b>	-	
<b>Services</b>	Construction services are included following items: Ground Floor : 1) Utilities and mostly vacant space for avoided high water 1 <sup>st</sup> Floor : 1) Administration, island chief office, assistant chiefs office 2) Committee room, conference room, filing/radio/sore room 3) Guest house, lounge, etc. Total floor area : 612 sqm.	
<b>Effect of the project/Beneficiaries:</b> The project would directly benefit the inhabitants of the affected islands in which the reconstruction works are undertaken.		
<b>Implementation of Similar Project by Other Donors/Organizations</b> No duplication among other donors / organizations.		
<b>Environment Implications:</b> Screening assessment was done and no further assessment is required.		

**Table 3.6 Sewerage System (Project summary)**

<b>JICA Study Code No.:</b> S-4		<b>Expected Fund:</b> NPGA / JBIC /
<b>NRRP Project Code:</b> WSN 005	<b>Project Title:</b> Upgrading of the Sewerage System in Laamu Isdhoo	
<b>Executing Agency:</b> Ministry of Finance and Treasury		<b>Implementing Agency:</b> Maldives Water and Sanitation Agency (Ministry of Environment, Energy and Water), former MWSA(former Ministry of Health)
<b>Location of the Project:</b> <b>Atoll name:</b> Laamu <b>Island name:</b> Isdhoo-isdhoo/Kalaidhoo		<b>Implementation stage:</b> SHORT / MEDIUM / LONG
<p><b>Background:</b> Sanitation in the Isdhoo island, same as all islands in Maldives, is consisted with latrines connected to permeable holes through septic tanks, and kitchen and shower wastewater directly connected to another permeable hole. This traditional On Site Treatment System contributed to reduced volume of black-water by separating gray-water treatment. But a large number of septic tanks are solely associated to a soak-pit, from which black-water freely migrate through porous islands soil, contaminating groundwater sources. The tsunami accelerated the deterioration of water quality. The treatment of waste water is required to keep the underground water be clean and human body be healthy and Maldives be beautiful.</p>		
<p><b>Objectives:</b> To replace septic tanks and establish new sewage piping and treatment system for protection of ground water; Existing septic tanks made by coral bricks or rocks with mortal trowel can easily leak, so replacing all septic tanks to new one is crucially important. And effluent is connected to newly installed sewage treatment system by PVC piping network. Revised reed bed system will be installed for this system.</p> <ol style="list-style-type: none"> <li>1) Installation of septic tank for each house</li> <li>2) Installation of sewer pipe network</li> <li>3) Installation of dry bed sludge treatment system</li> </ol>		
<b>Preliminary Estimated Cost (Million Yen)</b>		194.0
<b>Implementation Plan</b>		
<b>Procurement of goods</b>	- Vacuum pump with car Carbonizing device	
<b>Services</b>	<ol style="list-style-type: none"> <li>1) Home septic tank, septic tank for office and school</li> <li>2) Mounted leach field with dual treatment beds</li> <li>3) PVC Pipe Network with dump station</li> <li>4) Dry bed sludge treatment system</li> </ol>	
<p><b>Effect of the project/Beneficiaries:</b></p> <ol style="list-style-type: none"> <li>1) Keep groundwater and seawater clean</li> <li>2) Improve human health</li> <li>3) Usable for fertilizer or agricultural farm</li> </ol> <p>Number of beneficiaries is 1,432 inhabitants of the island</p>		
<b>Implementation of Similar Project by Other Donors/organizations:</b> NON		
<p><b>Environment Implications:</b></p> <p>The EIA was submitted and approved by the former Ministry of Environment, Energy and Water.</p> <ol style="list-style-type: none"> <li>1) Improper sewage systems are harmful to the environment. It will have the potential for effluent to leak into ground water thus making it contaminated with faecal matter. Appropriate technology shall be used to ensure groundwater protection and efficient system performance. Furthermore, the sea out falls should be designed in a way that hose reefs around the islands and flora of the reefs are protected.</li> <li>2) Desludging system must be introduced to the islands. The system consisted with vehicle type desludging machine and sludge treatment bed with sawdust or chip, charcoal of coconut shell.</li> <li>3) Capacity build for operation and maintenance should be done through construction stage, for village people. They will have responsible for environmental monitoring.</li> </ol>		

### 3.1.2 Progress of the Projects

The most important element of short-term recovery projects is swiftness. In addition to the swiftness, the JICA Team has adopted such a basic concept that the planned infrastructure will contribute to the environmental conservation and the development of local islands with disaster prevention functions, including a tsunami evacuation function. Immediately after the Maldivian side made a final decision on projects to be carried out in the Study at the Steering Committee meeting on 5<sup>th</sup> May, 2005, the Study Team started the detailed design as part of technical cooperation and preparation of the tender documents. This led to the commencement of the tender process for the rehabilitation project for the power distribution system consisting of the supply (and installation) of the equipment in early June of the same year. The tender evaluation for this project has already been completed and its contract is scheduled for early August.

The detailed design work and tender documents preparation work for the other projects, i.e. the recovery and development of the causeways, construction of a multi-purpose building and an island office, construction of a solar power system and upgrading of the sewerage system, are being conducted in parallel in view of their urgency. As a result, the PQ process commenced for the causeway project in early July, 2005. It is anticipated that the signing of the contract for each of the remaining projects will be completed by mid-October via the PQ, tendering and tender evaluation. The progress of NPGA projects is summarized in Table 3.7. (The implementation schedules for these projects are given in Figure 3.6).

**Table 3.7 Progress of NPGA Projects (as of 26<sup>th</sup> December, 2005)**

Project Title (Infrastructure-Related)	Progress Situation							Planned Completion Date
	P/Q Notice	P/Q Evaluation	Submission of Technical Specifications	Tender Notice	Tender Opening	Tender Evaluation	Contract Awarding	
(1) Rehabilitation of Power Distribution System	n/a	n/a	'05/05/24	'05/06/09	'05/07/03	'05/07/04~ '05/08/03	'05/08/10	End of Mar. '06
(2) Recovery and Development of Causeway	'05/07/07	'05/07/20~ '05/07/31	'05/06/30	'05/08/11	'05/08/31	'05/09/01~ '05/11/14	'05/11/21	Middle of Sep. '06
(3) Redevelopment of Administrative Facilities (Construction of Multi-Purpose Building, Island Office and Solar Power System)	'05/07/24	'05/08/08~ '05/08/14	'05/08/01	'05/08/22	'05/09/20	'05/09/21~ '05/11/01	'05/11/02	Beginning of Aug. '06
(4) Upgrading of Sewerage System	'05/08/02	'05/08/15~ '05/08/21	'05/08/21	'05/09/08	'05/10/02	'05/10/03~ '05/11/09	'05/11/09	Beginning of July '06

#### Notes

- (1) Out of the two billion yen provided in NPGA, some ¥1.2 billion is allocated to infrastructure-related projects.
- (2) The other NPGA projects in which this Study Team is not involved are:



Development of fisheries facilities: 500 million yen

Supply of agricultural equipment: 240 million yen

Laamu Ishidhoo-Klaidhoo





## 3.2 Medium-term Projects

### 3.2.1 Outlines of the Projects

For the medium-term development projects, which will be financed by JBIC or other ODA loan programmes, the development projects of island harbours and emergency communication systems have been selected, considering the national and regional development policies, environmental protection, mitigation of regional gap, rising sea level, etc.

#### (1) Outlines of the Projects

**Table 3.8 Project Outlines of the Medium-term Projects**

Project Title	Purpose	Implementation Body	Project Contents	Benefits and Benefiting Population
<p>Rehabilitation and Reconstruction of Island Harbours and Coastal Protection</p> <p><u>Project site:</u> Laamu Atoll: Isdhoo/Isdhoo-Kalaidhoo, Maabaidhoo, Gan, Fonadhoo, Maavah islands, and Thaa Atoll: Dhiyamigili, Guraidhoo, Thimarafushi, Veymandhoo, Kinbidhoo, Hirilandhoo islands]</p> <p><u>Project cost:</u> approx. 1,380 million yen</p>	<p>Recovery of the function of island harbours by rehabilitation and reconstruction of damaged quay walls, seawalls and coastal protection facilities</p>	<p>MTC</p>	<p>Construction of the following facilities:</p> <ol style="list-style-type: none"> <li>1) Structures <ul style="list-style-type: none"> <li>- quay walls</li> <li>- seawalls</li> <li>- breakwaters</li> </ul> </li> <li>2) Dredging <ul style="list-style-type: none"> <li>- Harbour basins</li> <li>- channels</li> </ul> </li> <li>3) Coastal protection facilities</li> </ol> <p>(see Figure 3.7 –General Layout of Island Harbours of Laamu Fonadhoo and Thaa Dhiyamigili)</p>	<p>Island harbour is really basic infrastructure for living and economic activities in the remote island without airport. The recovery of the damaged island harbour contributes to ensure transport access of persons and goods.</p>
<p>Alternative Communication System Development</p> <p><u>Project site:</u> Laamu Atoll: Fonadhoo, Isdhoo/Isdhoo-Kalaidhoo, Maabaidhoo, Gan and Maavah)</p> <p><u>Project cost:</u> approx. 341.6 million yen (in the case of only those islands listed above)</p>	<p>Establishment of an alternative communication system (network) to enhance the general disaster prevention function. The implementation of a pilot project at Laamu Atoll will be considered with a view to possible nationwide extension.</p>	<p>MTC</p> <p>Target organizations: DOM, MOAD and NDMC</p>	<p>Procurement and installation of the following equipment, etc.</p> <ul style="list-style-type: none"> <li>• Digital HF system (between Male and the atoll)</li> <li>• Multiplex radio system (between government offices at Male)</li> <li>• Trunked line radio system (between the Atoll office and island offices; between offices and ships/vehicles/staff members)</li> <li>• Early warning system (speakers and broadcast communication systems)</li> <li>• Training</li> </ul> <p>(see Figure 3.8 and 3.9 –System Concept of Alternative Communication</p>	<p>[Benefiting population] 10,916</p> <p><u>Breakdown:</u> Fonadhoo: 1,740 Isdhoo/I-M: 1,432 Maabaidhoo: 793 Gan: approx. 5,600 Maavah: 1,351</p> <p>[Benefits] The availability of an alternative communication network owned by the administration will enable the issue of warnings and guided evacuation prior to a disaster and will also establish systems to assess</p>

			System and Conceptual System Diagram of Alternative Communication System)	the situation and to assist recovery activities immediately after a disaster.
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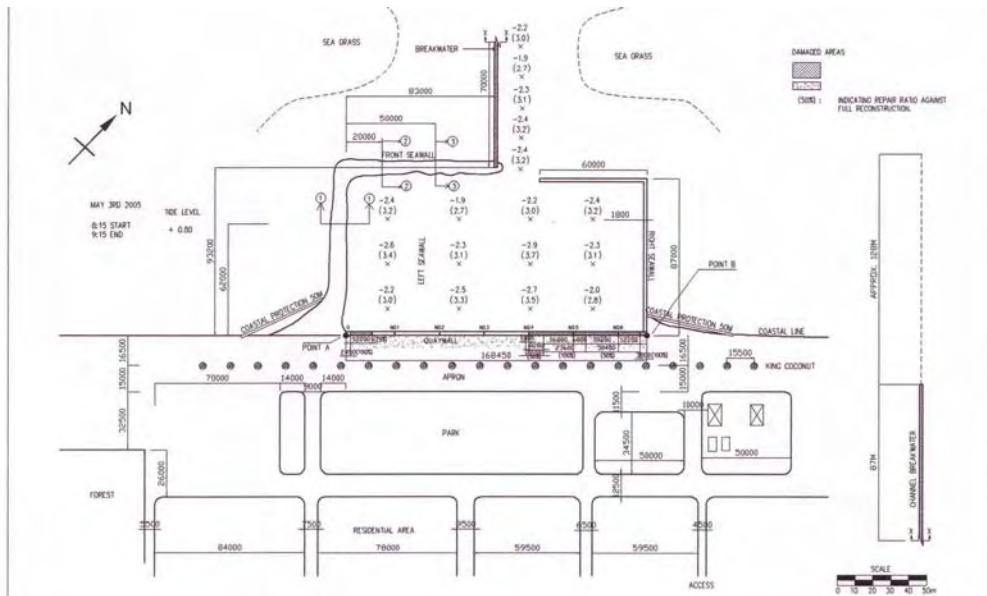
Table 3.9 shows the detail components of the rehabilitation works for island harbours and coastal protection of 11 islands in Laamu and Thaa Atolls.

**Table 3.9 Proposed Rehabilitation Works for Island Harbours and Coastal Protection**

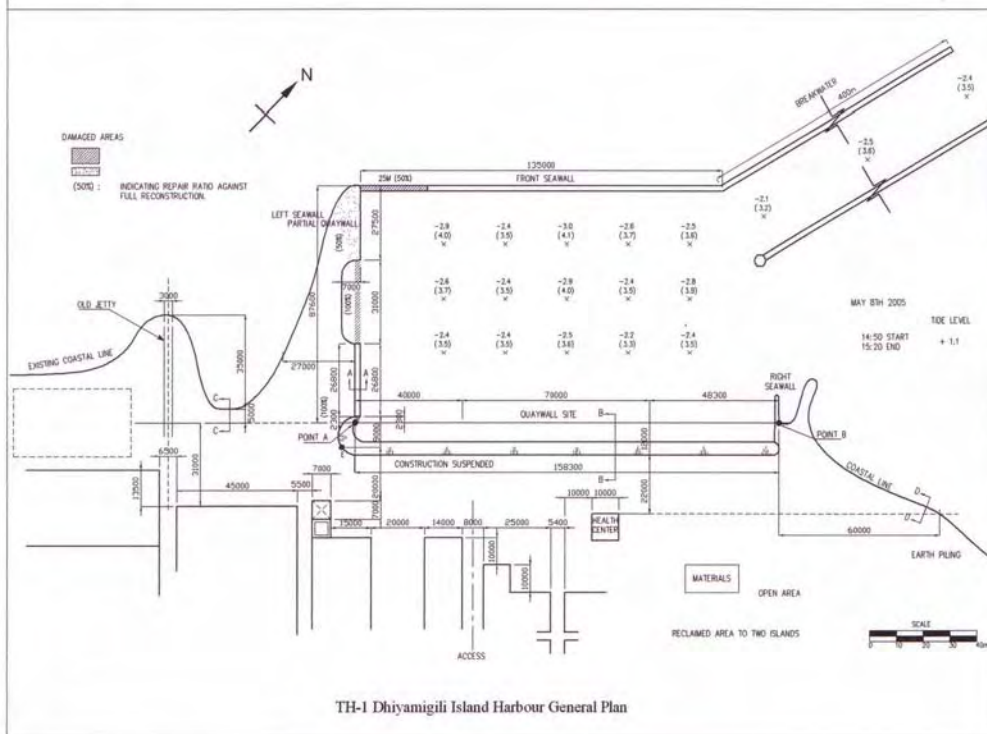
Atoll	Island (District)	Island Harbour		Coastal Protection
		Structures	Dredging	
Laamu	Isdhoo			
	Isdhoo/Kalaidhoo			
	Maabaidhoo			
	Gan-Thundi			
	Gan-Mathemaradhoo			
	Gan-Mukurimagu			
	Fonadhoo			
	Maavah			
Thaa	Dhiyamigili			
	Guraidhoo			
	Thimarafushi			
	Veymandhoo			
	Kinbidhoo			
	Hirilandhoo			

Ishidhoo





L-4 Fonadhoo Island Harbour General Plan



TH-1 Dhiyamigili Island Harbour General Plan

Figure 3.7 General Layout of Island Harbours (Fonadhoo and Dhiyamigili)

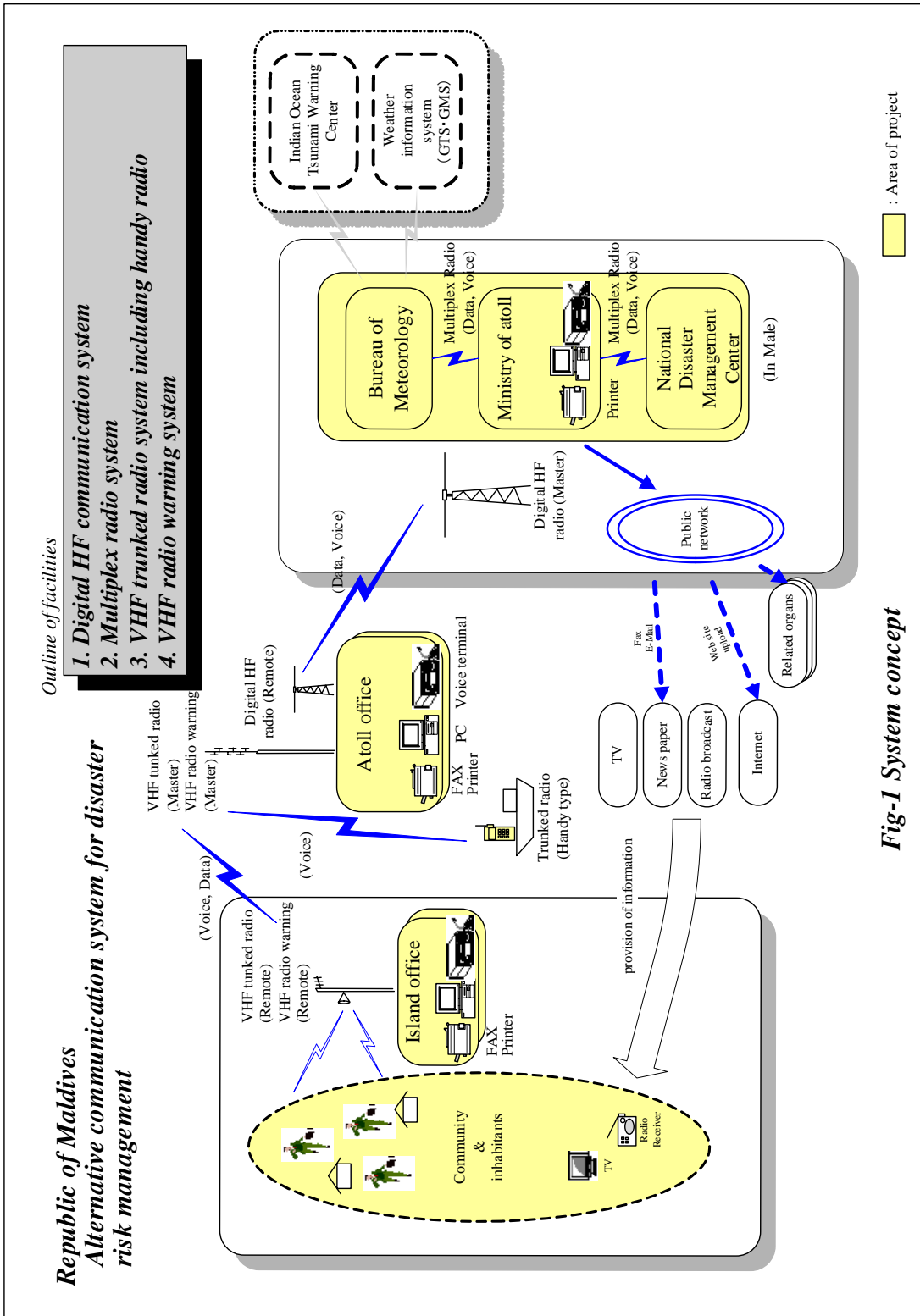
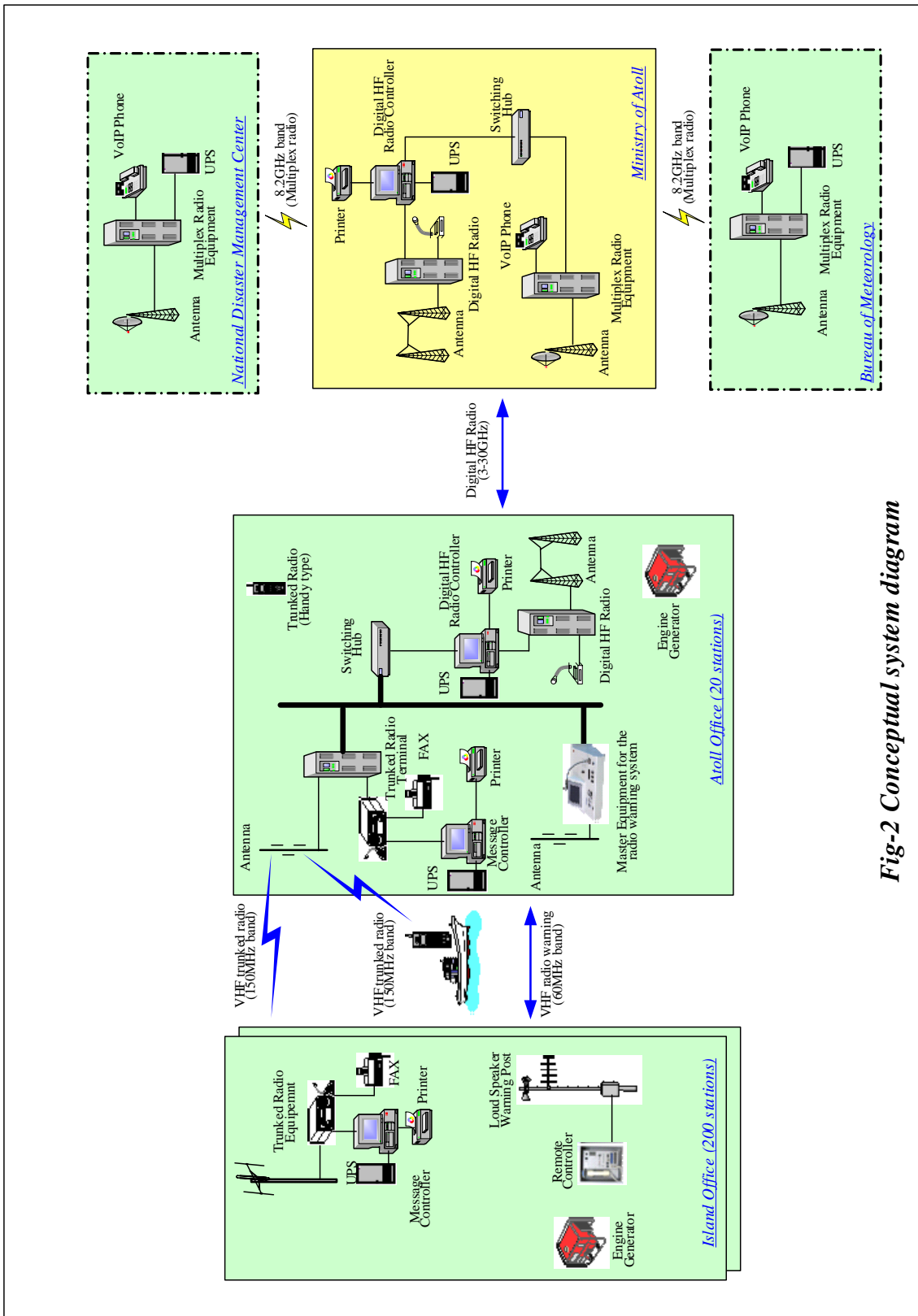


Figure 3.8 System Concept of Alternative Communication System



**Fig-2 Conceptual system diagram**

**Figure 3.9 Conceptual System Diagram of Alternative Communication System**

**Table 3.10 Island Harbour and Coastal Protection (Project summary)**

JICA Study Code No.: M-1		Expected Fund: NPGA / JBIC /	
NRRP Project Code: TRN004 A,B,C,D,E&F		Project Title: Rehabilitation and Reconstruction of Island Harbours and Coastal Protection	
Executing Agency: Ministry of Finance and Treasury		Implementing Agency: Ministry of Transport and Communication (MTC)	
Location of the Project: Atoll name: Laamu and Thaa Island name: 1) Laamu Isdhoo            6) Thaa Dhiyamigili 2) Laamu Maabaidhoo    7) Thaa Guraidhoo 3) Laamu Gan                8) Thaa Thimarafushi 4) Laamu Fonadhoo       9) Thaa Veymandhoo 5) Laamu Maavah          10) Thaa Kinbidhoo 11) Thaa Hirilandhoo		Implementation stage: SHORT / MIDIU / LONG	
<b>Background:</b> The Tsunami gave damages to the harbour facilities including quay walls, seawalls and coastal protection facilities at Laamu and Thaa Atolls similar to the rest of Atolls of Maldives. Major works are reconstruction of island harbour and its related facilities and channel dredging. The island harbour is a basic need for access for remote island and coastal protection is also basic need for safe island.			
<b>Objectives: The project aims at;</b> 1 ) Rebuilding the island harbour infrastructure lost due to the tsunami in order to Rebuild the lives and livelihoods of the people 2 ) Providing proper access to the islands is a basic need 3 ) Providing access between islands of Atoll for utilizing the limited public facilities, such as medical centre, education facilities.			
<b>Preliminary Estimated Cost (Million Yen)</b>		1,323.6	
<b>Implementation Plan</b>			
<b>Procurement of goods</b>	-		
<b>Services</b>	1) Reconstruction of quay walls 2) Restoration of seawalls 2) Deepening of the harbour basins and channels 4) Rehabilitation of breakwater		
<b>Effect of the project/Beneficiaries:</b> 1 ) Facilitating easy and safe accessibility to islands to transport goods and for commuting 2 ) Help facilitate to regenerate and sustain livelihoods of islands 3 ) Repairing and upgrading of the existing facilities  Number of beneficiaries: 5,307 inhabitants in 4 islands in Laamu and 4,425 inhabitants in 6 islands in Thaa .Visitors from the other island nearby and fisheries, and other industrial establishments also beneficiaries of the project.			
<b>Implementation of Similar Project by Other Donors/organizations</b> None in the same island.			
<b>Environment Implications:</b> The Team was made own IEE for the rehabilitation and reconstruction of island harbours, because comparatively large impacts on environment will be anticipated.			



**Table 3.11 Alternative Communication and Network Development (Project summary)**

JICA Study Code No.: M-2		Expected Fund: NPGA / <input type="checkbox"/> JBC /
NRRP Project Code: DRM 006	Project Title: Alternative Communication System Development	
Executing Agency: Ministry of Finance and Treasury	Implementing Agency: Telecommunication Authority of the Maldives	
Location of the Project: 3 alternative plans (Refer to project cost)	Implementation stage: SHORT / <input type="checkbox"/> MEDIUM / LONG	
<p><b>Background:</b> Communication in the Maldives is dependent on public telephone services. In this sense, each island is not able to communicate with other places when the public telephone network is out of service.</p> <p>On December 26, 2004 a major earthquake (M9.0), occurred in the Indian Ocean near Sumatra. The resulting tsunami caused extensive damage in the Maldives. The Maldives telecommunications infrastructure is based on a terrestrial microwave network backbone. This network consists of 37 nodes. Due to the tsunami disaster, 5 nodes were damaged and telecommunication services in 13 atolls (comprising 168 separate islands) were disrupted.</p>		
		
<p><i>Raiymandhoo equipment shelter</i></p>		
<p>Dhiraggu, which is the sole telecommunications operator in the Maldives, started restoration work immediately after the tsunami. As a result, telecommunication services were restored as follows:</p> <ol style="list-style-type: none"> <li>1) within 24hrs, telephone services were restored to 9 out of 13 atolls</li> <li>2) within 72hrs, telephone services were restored to all atolls, but with limited operating conditions</li> <li>3) within 3 weeks, telephone services were totally restored</li> </ol> <p>The Maldives government does not have an alternative communications network that can be used when the public telephone network is damaged. Moreover, when an aftershock related to the Sumatra earthquake occurred on March 29, 2005, it was reported that some telephone calls could not be made. This was due to line congestion caused by the increased traffic resulting from emergency calls.</p> <p>Based on the above circumstances, it is concluded that an alternative communications network, which is not affected by disasters, needs to be developed.</p>		
<p><b>Objectives:</b> The objective of the Project is to develop an alternative communications network, including a disaster warning system, to increase the comprehensive natural disaster management capability of the Maldives. A schematic layout of an alternative network is shown in Figure 3.8 and Figure 3.9. In order to realize the above, the following components are required:</p> <ol style="list-style-type: none"> <li>1) Development of a dedicated communications system and loud speaker disaster warning system, and</li> <li>2) Provision of training and technical skill transfer for local people.</li> </ol> <p>A dedicated communications system, consisting of a digital HF radio system, multiplex radio system and VHF trunked line system, is needed for the purpose of data and voice communication. When these facilities are</p>		

established, they will need to be kept in good condition and to be operated in a proper manner. In order to do this, training for both local engineers and technicians will be required in this Project.

**Project Cost:**

The project cost changes with system development scale. From the viewpoint of geographical condition of Maldives, estimates for 3 alternative development plans that have been prepared, as described below.

Alternative-1: 1) 3 organizations in Male', 2) Fonadhoo atoll office, 3) 5 priority islands (Ishidhoo, Maabaidhoo, Gan, Fonadhoo, Maavha)

Alternative-2: 1) 3 organizations in Male', 2) All atoll offices (20), 3) 5 priority islands (Ishidhoo, Maabaidhoo, Gan, Fonadhoo, Maavha)

Alternative-3: 1) 3 organizations in Male', 2) All atoll offices (20), 3) All inhabited islands (200)

Project Cost (including consulting services)

Alternative-1	Alternative-2	Alternative-3
341.5 million Yen	615.8 million Yen	7,322.7 million Yen

**Implementation Plan:**

The total implementation period for Alternative-1 is assumed to be 44 months from the date of approval of the Project until the end of the Project.

Procurement of goods	<ul style="list-style-type: none"> <li>1) Digital HF communication system, including control functions between the Male' head office and local atoll offices</li> <li>2) Multiplex radio system between 2 ministries in Male'</li> <li>3) VHF trunked radio system, including mobile radio between atoll offices and individual island offices</li> <li>4) Loud speaker disaster warning system</li> </ul>
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Services	<p>In addition to the above goods, the following consultancy services are required.</p> <ul style="list-style-type: none"> <li>1) Preliminary and detailed design</li> <li>2) Preparation of bid documents, and assisting with the bid evaluation</li> <li>3) Construction supervision, including approval of drawings and commissioning tests</li> </ul>
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**Effect of the Project/Beneficiaries:**

The project provides an alternative means of communication that can be used during emergency or disaster situations. The prospective direct beneficiaries are the general public, and administrators of atoll and island offices in the target area. However, indirectly all the people of the Maldives will benefit from the increased disaster readiness and post-disaster restoration capacity in the Maldives.

**Implementation of Similar Projects by Other Donors/organizations:**

There are no similar projects by other donors.

**Coordination among other assistance(s) with the JICA Non-Project Grant Aid or Other Donors:**

Not applicable

**Environmental Implications:**

The Project includes no specific environmental components.

### 3.2.2 Progress of the Projects

The Team prepared concept plans for island harbours and coastal protection in 11 islands, which were specified in the S/W. The output of the studies and plans were transferred to the JBIC SAPROF Study Team through the GOM on 16<sup>th</sup> May, 2005. On succeeding 22<sup>nd</sup> May, the GOM prepared a tentative list of JBIC projects and submitted it to the SAPROF Team, which contains four islands as shown in Table 3.12. According to the latest information from the JBIC, Isdhoo and Fonadhoo in Laamu Atoll and Dhiyamigili and Hirilandhoo in Thaa Atoll were selected from the islands covered by the JICA Study as candidate projects for JBIC loan.

**Table 3.12 Project Selection of Inland Harbours**

	S/W on 12 April	22 May *1)	As of September
Laamu	1) Isdhoo (2 harbours) 2) Maabaidhoo 3) Gan (3 harbours) 4) Fonadhoo 5) Maava	1) Isdhoo (2 harbours) 2) Fonadhoo	3) Isdhoo (2 harbours) 4) Fonadhoo
Thaa	1) Dhiyamigili 2) Guraidhoo 3) Thimarafushi 4) Veymandhoo 5) Kinbidhoo 6) Hirilandhoo	1) Guraidhoo 2) Hirilandhoo	1) Dhiyamigili 2) Hirilandhoo

Note: \*1) Out of the 4 islands in the column, Male' North quay wall, K. Maafushi, Lh. Hinnavaru, GA. Dhandhoo, HDh. Makunudhoo, Sh. Funadhoo and N. Lholi were listed as tentative candidate projects selected by GOM with the consultation of the Study Team and SAPROF Study Team.

The proposed project of the alternative communication system is not in the request list of the GOM to JBIC. The concept plan study is completed as scheduled in the S/W. Japan's experience in tsunami disasters suggests that an employment of hard measures, such as construction of breakwaters, is insufficient on its own and soft measures against disasters are also essential. In particular, transfer of accurate information to local areas together with properly-guided safe evacuation of residents play an extremely important role. Notwithstanding the above, the communications systems in the Maldives wholly depend on the public network and the GOM does not possess any kind of its own communication system, which illustrates the fragility of the disaster prevention function of the administration at the time of a disaster. For this reason, it is vital for the national and local administrations in the Maldives to establish, in addition to an international early tsunami warning system, a reliable communications system to transfer disaster information, thereby creating a comprehensive disaster prevention system which integrates hard and soft measures.

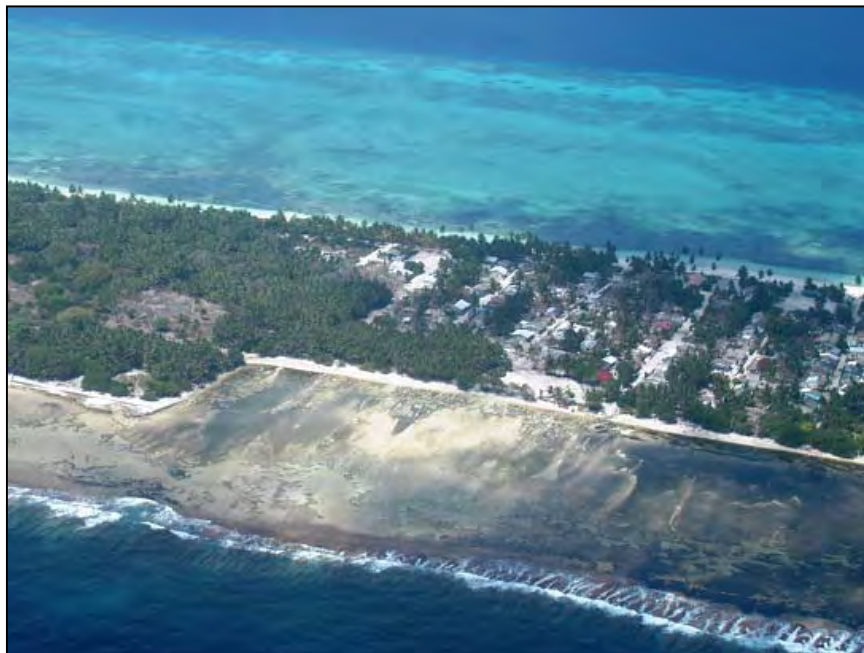
Gan-Thundi



Gan-Mathemaradhoo



Gan-Mukrimagu



### 3.3 Community Based Recovery Project (Demonstration Project in Laamu Fonadhoo)

#### 3.3.1 Outline and Framework of the Project

##### (1) Objectives of the Demonstration Project

Assistance in a community's post-disaster efforts for recovery, rehabilitation and development is most effective when administrative support from the government, self-reliant efforts by the residents and mutual cooperation among local societies are adequately tied and coordinated. For this purpose, the Study Team implemented a demonstration project which involves the residents' participation in recovery activities as a community-based initiative, in addition to short-term recovery projects implemented by the government, in order to enhance the country's recovery and reconstruction efforts.

##### Overall Goal:

To improve community empowerment towards natural disaster

##### Project Objectives:

- i) To recover the living environment deteriorated by the tsunami disaster by the community itself
- ii) To provide groundwork for the community's further reconstruction efforts
- iii) To enlighten the community in regard to the disaster prevention and the preparedness for natural calamity

##### Project Output:

- i) Clearance and recycling of debris resulting from the tsunami disaster
- ii) Construction of a platform to serve as an evacuation shelter as well as a memorial of the disaster
- iii) Disaster prevention education

##### (2) Demonstration Project and Japanese experience in reconstruction

The Community-Based Living Environment Recovery and Disaster Risk Management Project in Fonadhoo being implemented follows the reconstruction process derived from Japan's own experience of reconstruction in the aftermath of the devastating Hanshin-Awaji earthquake in 1995.

- Reconstruction requires the effective linkage of self-reliance, community empowerment and administrative support.
  - It is essential for the affected people to commence their own reconstruction activities (self-reliance).
  - The community should play a major role in tackling issues that cannot be solved by individuals using "community power" (community empowerment).

- The government should provide assistance for personal and communal activities (administrative support).
- The reconstruction process has two aspects: reconstruction of townships (hard aspect) and restoration of people's lives.

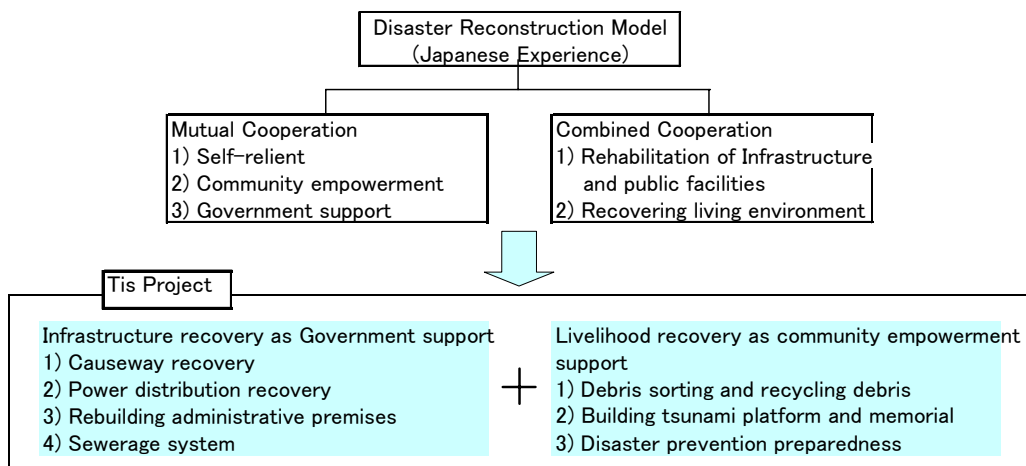
What is particularly important in the reconstruction process is an assumption of precise processes from start-up of reconstruction activities, mutual consultations among the affected people, negotiations/discussions with the administration and consensus formation regarding the reconstruction of township, industries and housing as well as people's lives. To this end, the first step of the reconstruction process should be an organization of affected people for the purpose of mutual assistance together with an establishment of a community-based organization (CBO) to plan, implement and monitor reconstruction activities.

**[Roles of CBO]**

The CBO should make efforts to solve the problems faced by the community by means of, for example, drawing up a reconstruction plan which reflects the actual conditions of the community, formulating rules and regulations for building designs and environmental conservation and negotiating with the administration to conclude vital agreements.

**[Roles of the administration]**

The administration should provide assistance for the activities of the CBO and should enlist cooperation of various experts and private enterprises. Because the issues involved in the post-disaster reconstruction process widely range from reconstruction/redevelopment of township to rebuilding of public health, social welfare, the environment and industries, an appropriate team of experts must be formed to provide assistance and advice for the self-help efforts of the people and their community and government support.



**Figure 3.10 Diagram of Disaster Reconstruction**



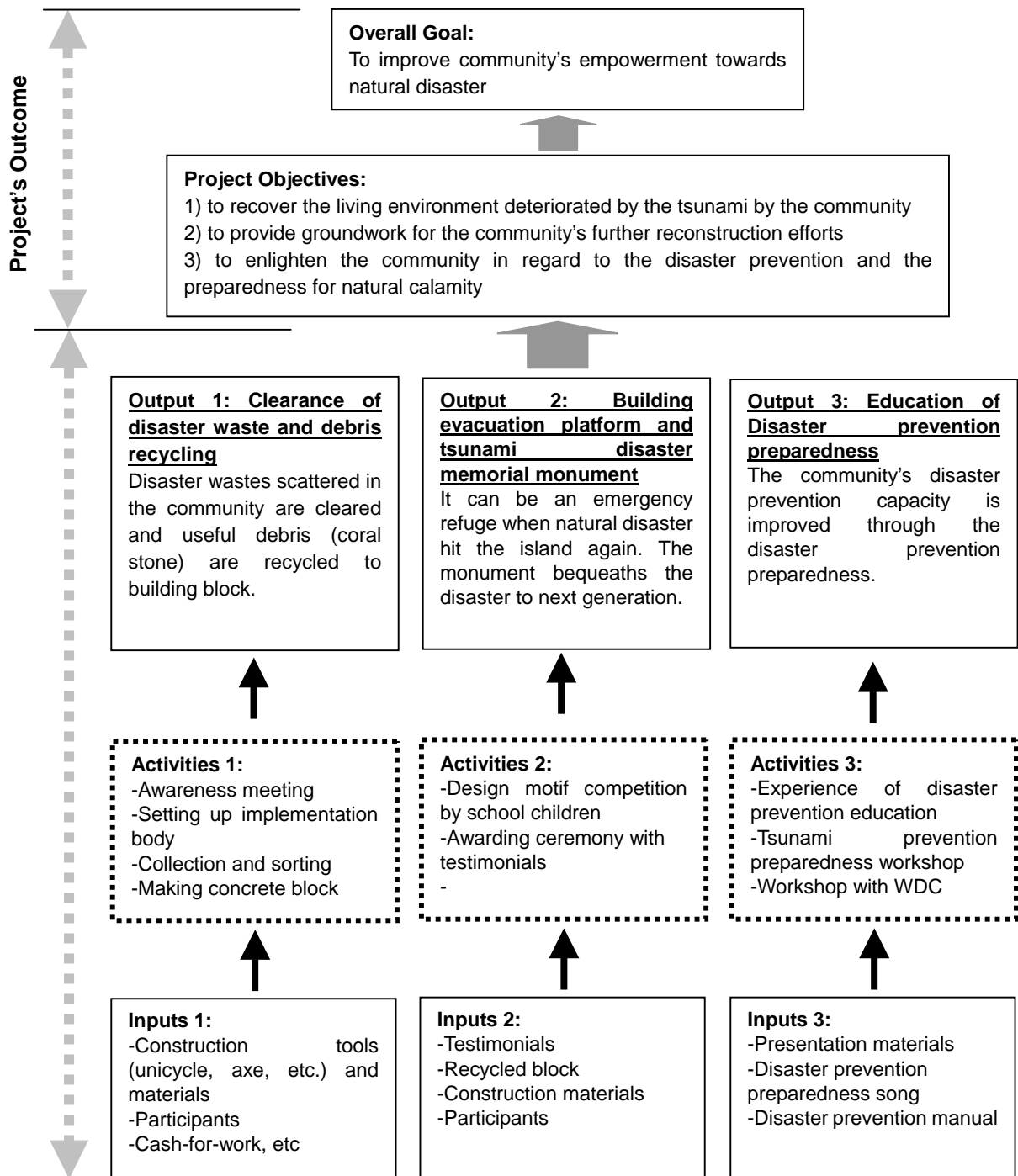


Figure 3.11 Logical Framework of the Community-cased recovery project

### 3.3.2 Activities of the Project

#### (1) Awareness to the Project

Meetings were held on 26<sup>th</sup> and 27<sup>th</sup> May, 2005 to explain about the demonstration project to the islanders of Fonadhoo. There were 187 attendees in the two meetings altogether, which is equivalent to two-thirds of the total households on the island based on the assumption that one person from one household turned up. The outline, purposes and implementation method, etc. of the project were explained to the attendees and the consent of the islanders was obtained.

#### (2) Establishment of a project implementation structure

As a project implementation body, the Recovery and Disaster Risk Management Unit was established. The seven members of this unit were appointed from among members of the Island Office (administration), Island Development Committee and Women's Development Committee. Cooperation from the Assistant Principle of the Laamu Atoll Education Centre to act as an advisor was also secured.

#### (3) Clearance of Disaster Waste and Debris Recycling

41 debris clearing spots were identified in Fonadhoo after inspection of the Unit and the Study Team and dialogues with the Unit and the community. After the on-site training, the clearing of debris actually started on 5<sup>th</sup> June, 2005. The clearing continued until 12<sup>th</sup> July, 2005. During the six weeks following 5<sup>th</sup> June, debris was cleared in 33 points out of 41. The cleared debris was about 150 m<sup>3</sup> equivalent to 250 tones.

After carried debris to the block production yard, debris was sorted and processed for recycling. The sorting and processing activities started on 13<sup>th</sup> June, 2005 after on-site training by the Unit and the Study Team. The debris was mainly sorted to coral, mortar and others.

The block production yard was scheduled to locate in the southern part of Medhuavah ward. After clearing the site, construction of block production yard was started on 24<sup>th</sup> June, 2005 and completed in end of July 2005. During construction of the recycle block production yard, the Unit and the Team conducted trial mixing to determine a suitable ratio of the mixture.

The production was started on 14<sup>th</sup> August 2005 by participants from the community. The works were carried out according to the production manual prepared by the Unit and the Study Team. The total production reached 38,400 blocks until 18<sup>th</sup> January, 2006 including one thousand and two hundred (1,200) blocks for using in the evacuation platform. Total participants from the community were 5,559 man-day.

#### (4) Building Evacuation Platform and the Tsunami Memorial Monument

The design was proposed and approved by the community as follows:

Location	a Park in front of the harbour, next to the new island office
Size	42 m <sup>2</sup>
Shape	Hexagon with steps, slider and storage on the ground floor
Height	2.6 m plus 1.4 m parapet wall
Monumental Facilities	8 tsunami tile pictures and 2 photographs plus memorial plate in Devihi and English. The important message from both Maldives side and Japan side are also indicated in the memorial plate.
Others	Covered with the recycle blocks

Construction of the platform and monument was started on 14<sup>th</sup> November 2005. The construction is scheduled to complete in middle of January 2006.



#### (5) Ceremony and Education of Disaster Prevention

A ceremony regarding the Demonstration Project was held on 24<sup>th</sup> July, 2005 in Fonadhoo. At this ceremony, eight primary and secondary school pupils were selected and awarded with prizes for the excellent works they had done in painting the pictures for the memorial monument on the tsunami platform. In addition, taking the ceremony as an opportunity, a play on disaster prevention education was performed under the guidance of the CODE (Citizens Towards Overseas Disaster Emergency), a Japanese NGO, and a primary school teacher from Aichi Prefecture to convey the experience of disaster prevention education in Japan. This was an attempt at disaster prevention education through children targeting at the empowerment of the community.



Pictures of Tsunami Memory by the Students



Song of Disaster Prevention

#### (6) Seminar and Handing Over Ceremony

Seminar of JICA Study on Tsunami Recovery, Rehabilitation and Development of Island in Maldives was held on 22<sup>nd</sup> January 2006 with the purposes of public relation to the related organizations and technology transfer to the Maldivian side. The presentation and speeches were made by DER, MPND, JICA Sri Lanka office, JICS, JICA Study Team and the representatives of the community of Fonadhoo. The major participants to the seminar were MOFT, MOAD, MEEW, MPA, MTC from the Maldivian Government side, and donor organizations such as UNDP, WB, ADB, IFRC, FRC.

On 24<sup>th</sup> January, Handing Over ceremony of the demonstration project was held in Fonadhoo Island, with the participations from Laamu Atoll Chief, JICA Sri Lanka Office, Fonadhoo Island Chief, DER, MPND, MOAD, EOJ Sri Lanka, JICS, JOCV and JICA Study Team. The following facilities, equipments and materials were handing over to the Fonadhoo Island Office from the JICA.

- Platform/Monument (W=12m, H=2.6m, 42 m<sup>2</sup>)
- Block Production Yard (30'x60')
- Toilet, Generator Space and Storage (18.5'x26')
- Wheel Barrow
- Mold
- Generator(7kW), and other
- Other tools for block production



Seminar at Male'



Handing Over Ceremony

### 3.3.3 Supervision of the Project

The implementing organization, the Recovery and Disaster Risk Management Unit, held weekly meetings with the Study Team to discuss the progress and problems in the activities. The Unit and the Study Team prepared the activity reports showing updated situations of the project in weekly basis. The accomplishments with the figure and photos of the activities were included in the each report. The reports were kept in the Island Office for their record and sent to Laamu Atoll Office, Ministry of Atoll Development, Ministry of Planning and National Development, National Disaster Management Centre and Department of External Resources, Ministry of Foreign Affairs for their information.

### 3.3.4 Monitoring of the Project

Upon termination of the project, the final monitoring was carried out with focus group interview and questionnaire survey (total 13 samples collected) in Laam Fonadhoo Island. DAC's project evaluation criteria (relevance, effectiveness, efficiency, impact, sustainability) that are also commonly used on JICA activities were applied to examine the project.

The project was commenced beginning of May 2005 and was terminated the middle of January 2006 in line with the schedule. In total approximately 5,559 man-day participated during the project period and cash-for-work generated approximately 1 million MRf. cash income to the community. A total number of recycled block produced was approximately 38,400 blocks and JICA supplied necessary construction equipments and materials for clearing disaster waste and debris recycling, building Tsunami platform, which is 2.39 million MRf. including cash-for-work budget. The summary of cash-for-work is tabulated below.

**Table 3.13 Summary of Cash-for-work of Demonstration Project**

Item	Value	Remarks
Population	1,740	Statistics year 2000
Number of households	262	Statistics year 2000
Average household size	6.6	Persons/household
Total Labour force	799	Excluding foreign employee and employment outside of the island
Total project cost	2,388,994	JICA's finance
Total cash-for-work (MRf.)	1,010,500	JICA's finance
Income amount per capita (MRf.)	581	Total cash-for-work/ population
Income per labour force (MRf.)	1,265	Total labour force / disbursed amount per labour force
Income per household (MRf.)	3,857	Disbursed amount per person / Number of households
Total man-day of cash-for-work	5,559	Total man-day of cash-for-work
Total duration of participated person by labour force (days)	7	Total Person-day / total labour force
Total project input per capita	1,373	Total project cost / population

Source: JICA Study Team, MPND, Fonadhoo Island Office

(1) Project's priority and needs (relevance) and effectiveness of the activities, which leads the objectives

The project brought emergency relief to the community partially especially cash-for-work generated additional household income to recover or repair damaged house or household goods by themselves. In addition, the project enhanced community's administrative empowerment towards natural disaster throughout the series of project activities such as establishment of implementation body, coordination among the community, implementation of activities, and so on. Thus, it pledges relevance with higher effectiveness of the project.

(2) Efficiency of timing, cost, and casual relationship among the project factors

It can be enumerated that the implementation body in addition to the inputs and the activity executed as it is a plan at first was promptly set up based on an administrative office of the island and the existing community organization, and the talent arrangement was done appropriately as a contribution factor.

Then, it is one of effective contribution factors to carry out a transparent way that is to advance at first, and to have built an excellent interpersonal relationship based on the trust upon counterpart activities with the Study Team.



Moreover, it was high effectiveness that it was smoothly able to execute the project from planning to implementation stages consistently by the way of JICA Study Team operating directory. Consequently it was able to meet needs of emergency support promptly.

### (3) Impact and sustainability of the project

The community had the initiative and acted from the establishment of the implementation body to the execution of the activities. This experience was accumulated in the community, and held the possibility of voluntarily developing it in the future.

It is recognized that the community based recovery project by the community participation accomplished the purpose for which it was originally intended enough. The participant received extraordinary income as a value of work by the project. And, the income becomes the foundation stone of reconstruction.

## CHAPTER 4 NATIONAL AND REGIONAL DEVELOPMENT CONTEXT

### 4.1 National Development Context

#### 4.1.1 National Development Plan

##### (1) National Development Plan

The Maldives stands on 1,190 low lying coral islands and has a population of 285,000 people distributed over 199 islands (called inhabited islands), which are dispersed over an area of 820 km in length. More than half of the inhabited islands have a population less than 1,000 people, while around 74,000 persons or more than 27% of the national population concentrate on the capital island of Male', one of the most densely populated places in the world with 376 persons/ha. The wide and uneven distribution of the island settlements is a unique nature of the nation building in Maldives. The major difficulties on the national development are;

- 1) Dispersed population at the local and overpopulation at Male'
- 2) Inefficiency on infrastructure investment
- 3) Bad access to the islands
- 4) Fragile environment
- 5) Limited economic resources in tourism and fishery
- 6) Small size of population and market

The GOM has taken challengeable measures to overcome those difficulties and accelerate socio-economic development through the past and the present Sixth Five-Year National Development Plan 2001-2005. The important measures stated in the present National Development Plan are;

- 1) Diversification of the economic base
- 2) Ensure the protection of the environment and the sustainability of development
- 3) Improvement of transport and communication network
- 4) Resettlement of small communities inhabiting small or remote islands
- 5) Human resources development

##### (2) Achievement of socio-economic development

In consequence, the Maldives has achieved significant growth and development over the last decade. Table 4.1 shows the selected socio-economic indicators and those trends in the recent years of Maldives. The total population has a growth rate of around 2.0% since 1995, while the GDP has continuously grown with a preferable rate of 6% (1995-2000) to 8% (2000-2003).

**Table 4.1 Selected Socio-economic Indicators**

	1990	1995	2000	2003
Total population	213,215	244,814	270,101	285,066
Population growth rate (%) <sup>*1)</sup>	-	2.8%	2.0%	1.8%
Infant mortality rate/ 1,000 live birth	34	32	21	14
Crude birth rate/ 1,000	41	28	20	18
Crude death rate/ 1,000	6	5	4	4
Life expectancy (years)	65.1	70.6	71.4	72.0
No. of hospital beds	167	305	470	643
Population/ hospital bed	1,277	803	577	443
Literacy rate (%)	98.0	n.a.	98.9	-
Primary school enrollment (Gr 1-7)	14,268	67,312	73,522	66,169
Secondary school enrollment (Gr 8-10)	1,626	6,993	18,254	25,486
Higher secondary school enrollment (Gr 11-12)	152	327	638	1,481
Government employees	11,602	18,007	26,790	28,651
Expatriate employment	8,689	18,510	27,716	33,765
GDP 1995 constant (millions US\$)	262.0	362.9	539.1	644.5
GDP growth rate (%) <sup>*1)</sup>	-	6.7	8.2	6.1
GDP per capita (US\$)	1,229	1,482	1,986	2,261
Exports (millions US\$)	52.9	49.8	76.2	113.0
Imports (millions US\$)	138.3	267.9	388.6	470.8
Exchange rate (Rf per US\$)	9.51	11.77	11.77	12.80
Tourist arrivals	195,156	314,869	467,154	563,593
No. of tourist resorts	64	73	86	87
Bed capacity	7,662	10,591	15,812	19,110
Bed occupancy rate (%)	60.3	70.5	68.3	77.2
Bed nights (1,000)	1,682	2,725	3,937	4,705
Tourism receipts (millions US\$)	88.7	210.7	320.7	387.8
Tourism contribution to GDP	34.1	34.5	33.0	32.7
Total fish catch (1,000 of metric tons)	76.0	104.6	118.9	155.4
Passengers movement (International flights)	435,794	746,840	1,073,788	1,271,527
Passengers movement (Domestic flights)	8,897	222,973	575,315	562,093
No. of motor cars	623	679	1,860	2,074
Electricity consumption in Male (million kwh)	20.3	44.2	73.7	96.6
Government revenue and grants	589.0	1,426.9	2,372.7	3,061.8
Total expenditure and net lending	747.2	1,708.5	2,694.2	3,428.4
Overall deficit	243.6	480.8	487.4	489.0

Note: \*1) Annual average increase ratios between 1990-1995-2000-2003

Source: Statistical Yearbook of Maldives, MPND

### (3) Regional Gap

However, despite of this significant growth at the national level, there is a trend of gap or disparity among the regions between Male' and the central region, and the rest of the country, especially the Central South Region where the Laamu and Thaa Atolls, JICA Study Area, are located.

### 1) Population

The concentration of the population to Male' and the Central Region is in progress, while the population in the atolls in the remote area has downward trend in the number of population as follows;

**Table 4.2 Population Distribution**

	1995	2000	Annual increase ratio
Male'	62,519	74,069	3.4 %
Atolls in the Central Region	23,630	26,795	2.5%
Other Atolls	158,665	189,237	1.3%
National Total	244,814	270,101	2.0%

Source: Statistical Yearbook of Maldives, MPND

### 2) Distribution of major economic activities

Figure 4.1 shows the distribution of the major economic activities, i.e. tourism, fishery and agriculture in the Maldives. It is clear that the tourism development is concentrated to Male' and the Central Region. Nearly 80% of the resort hotel rooms (16,444 beds in Maldives) are located in three atolls in the Central Region (Kaaf, Alifu Alifu and Alifu Dhaalu). On the other hand, the fish catch in 2003 is 155,400 metric tons in the Maldives. Of which 30% are in the Southern Region, 23% in the Central Region, 30% in the Northern and Central Northern Region. The Central Southern Region covers only 15%. The major agricultural areas to product food for the Male' market is located in the Central and Southern Regions. In this way, the dominant economic activities are concentrated in Male' and the Central Region zone, while the other parts of the nation are, especially the Central Southern Region, is out of the above economically active zone.

### 3) Income Gap

Table 4.3 shows the average per-capita expenditures in 1997/98 and 2002/03, which can represent the income gap between Male' and the other atolls. The table also proves that the gap becomes bigger, when comparing 1997 and 2002.

**Table 4.3 Average per Capita Expenditures in 1997 and 2002**

	1997/98		2002/03	
	Rf./person/day	Male=100	Rf./person/day	Male=100
Male	32	100	50	100
Atolls	19	59	27	54
(Central South)	17	53	26	52
Maldives	23	72	33	66

Note: Rent is excluded from per capita expenditure

Source: Household Income and Expenditure Survey 2002-2003" MPND,2005

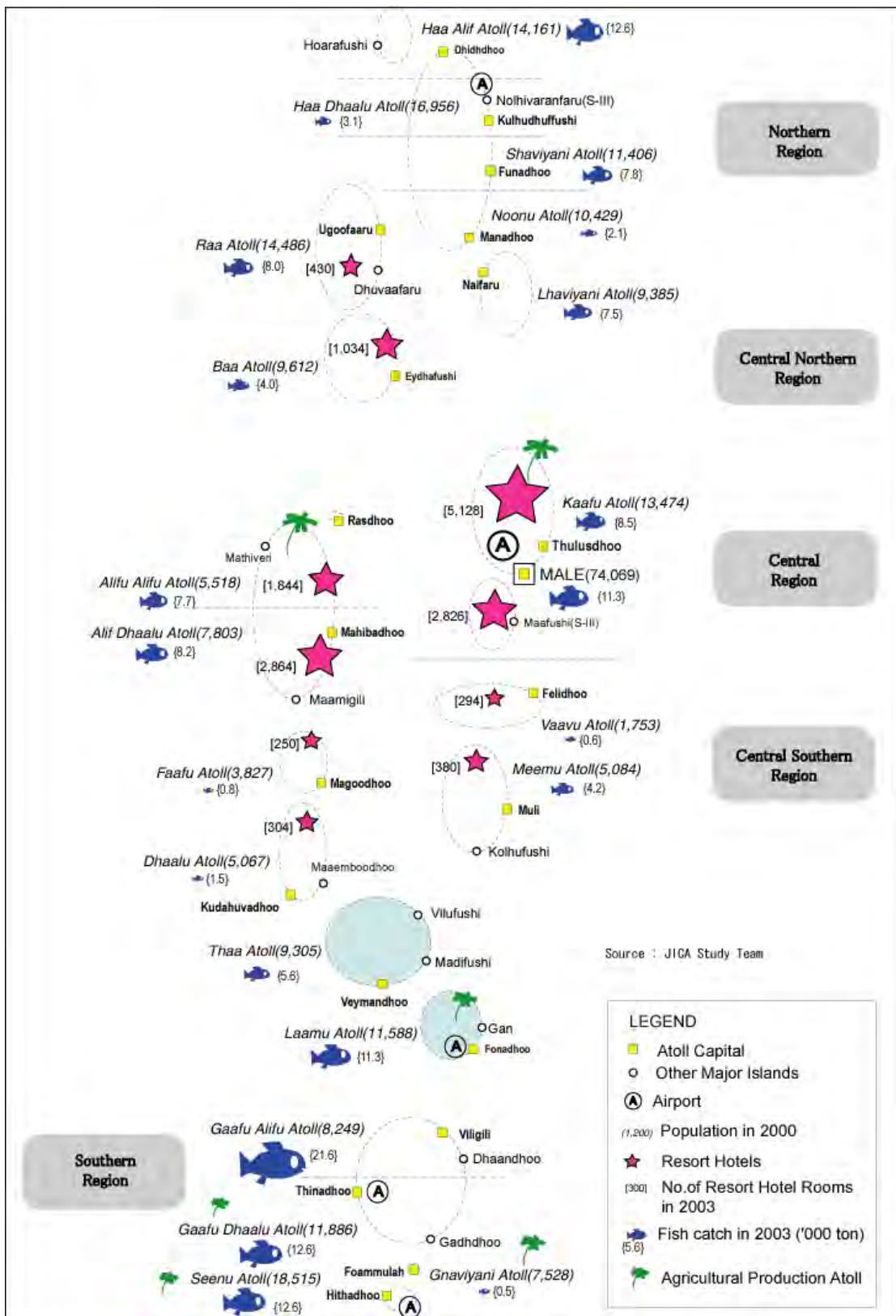


Figure 4.1 Population, Tourism, Fishery and Agriculture in Maldives

#### 4) First Regional Development Project

The GOM has planned to develop two regional development centres at the northernmost region and the southernmost region to mitigate regional gap as “First Regional Development Project”. This project is financed by the ADB and co-financed by the Islamic Development Bank (IDB). The project will provide for more equitable development of the Maldives through focused regional efforts in the NDR (Northern Development Region) and SDR (Southern Development Region) as follows:

- NDR includes; Haa Alif, Haa Dhaalu and Shaviyani Atolls (45,000 people)
- SDR includes; Gaafu Alifu, Gaafu Dhaalu, Gnaviyani and Seenu Atolls (56,000 people)

The institutional, infrastructure and environmental improvements will provide a better standard of living to the people in these regions far from capital Male’, the recipient of most development in the past. Nine islands from NDR including Kulhuduffushi, Hanimaadhoo, Dhidhdhoo, Hoarafushi islands, and four islands from the SDR including Hithadhoo, Gan, Feydhoo islands have been selected as the focus islands, which are determined primarily on the basis of population where implementation of development could be the most effective. The development projects in the focus islands will involve regional development and management offices, upgrading of a 10.5km road from Gan to Hithadhoo, enhancement of rainwater collection and sanitation, establishing solid waste management, etc.

The Study Area, Laamu and Thaa Atolls is located in the Central Southern Region, are remoted from the major economic activity zone and also excluded from the priority areas in the above regional development plan. However, the development potentials of these Atolls are high, as described below, the GOM should be pay more attention to these Atolls and the Central Southern Region in the future development plan.

#### 4.1.2 Tsunami Recovery and Reconstruction Plan

##### (1) Tsunami Disaster and the affected region

The tsunami on 26 December severely affected the above economic activities of the whole country. According to the Joint Needs Assessment Report, the tsunami claimed 82 lives, left 26 people missing and displaced over 15,000 people. The tsunami destroyed much of the Maldivian’s assets including housing, public facilities, water supply and sewerage systems, transport, communication infrastructure, private business and livelihoods. The main industries of fisheries and tourism were badly hit, wiping out two decade of investment and economic development. The total asset loss is estimated to be 62% of GDP. The report stated that the total losses of the national assets is estimated 470.1 US\$ millions, which includes tourism, housing, livelihoods, fishery, transport, education, and financing need for the reconstruction of those is estimated 406.3 US\$ millions. Of which 304.2 US\$ millions will be required from the public finance.

Table 4.4 shows the latest available data on tourism statistic, which can compare the tourist arrivals and room occupancy rate in March 2004 and those in March 2005, i.e. before and after



the tsunami. It is clear from the table that the most driven and dependant economic sector of tourism was severely damaged by the tsunami.

**Table 4.4 Tsunami Impact on Tourism**

	Jan-Mar 2004	Jan-Mar 2005	% change '05/'04 (Jan-Mar)
Tourist arrivals	185,408	83,880	- 54.8 %
Occupancy rate	99.7 %	57.0 %	- 42.7 %

Source: Statistic section, Ministry of Tourism

Again, the tsunami hit the country nationwide with big differences among the regions. Figure 4.2 shows the number of affected houses by the December 26 tsunami. The most affected atolls were Laamu, Thaa, Dhaalu, Meemu, and Raa Atolls from the south to the north. It is obvious that the affected atolls are concentrated in the Central Southern Region. According to the data of NDMC, the number of affected houses (including totally and partially destroyed) was 5,216 units (1,698 was totally destroyed and 3,518 partially). The most affected atolls are the Laamu Atoll and Thaa Atoll. The number of the affected houses in Laamu and Thaa are 1,118 (worst) and 741 (second worst). 3,151 houses or 67% of the total affected houses in the Maldives are concentrated in the Central South Region.

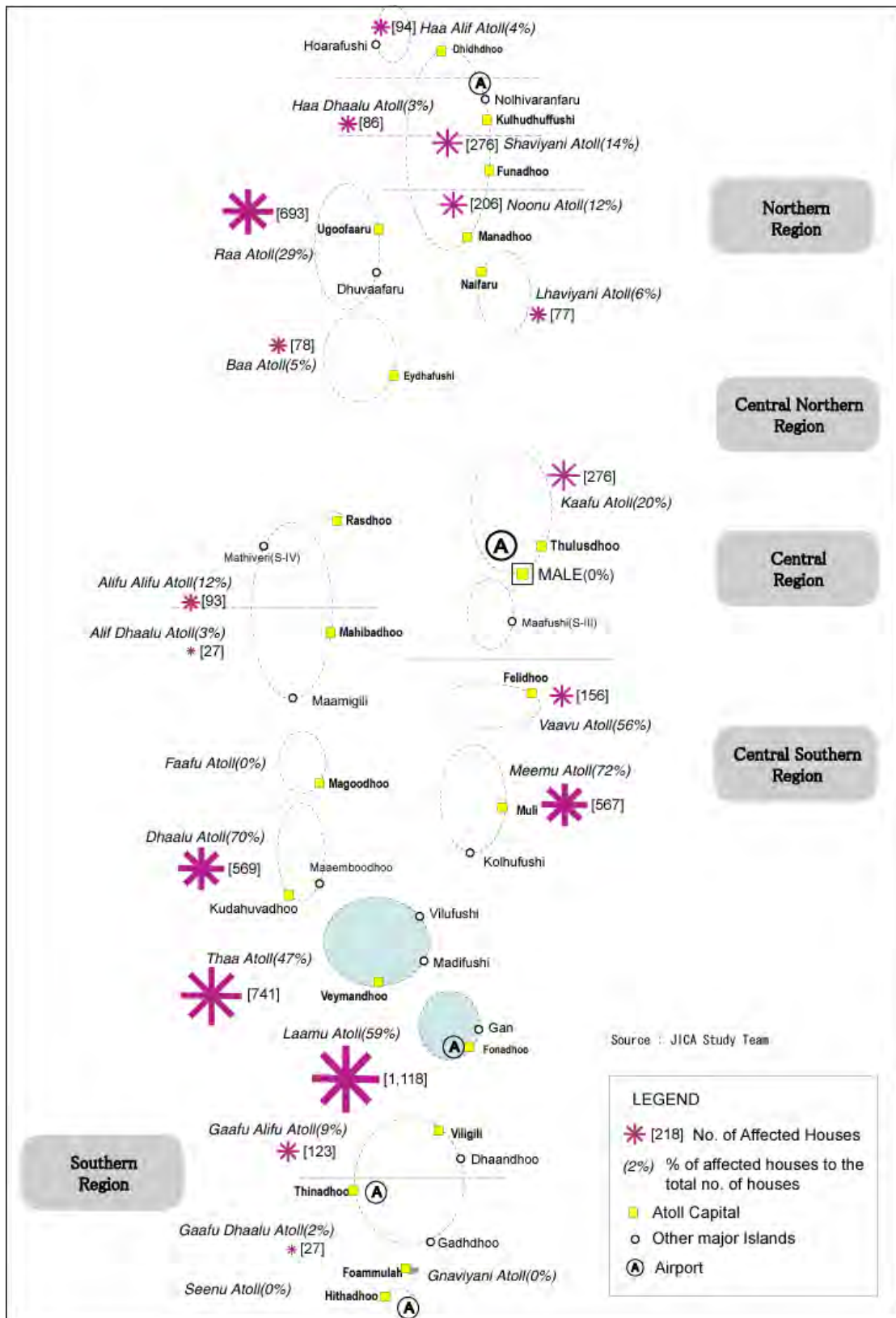


Figure 4.2 Affected Houses by the Tsunami

### (2) National Recovery and Reconstruction Plan (NRRP)

After the tsunami on 26<sup>th</sup> December, the Joint Needs Assessment carried out by the World Bank, the ADB, the UN System and the GOM worked closely and prepared NRRP, which outlines the objectives and strategies for meeting urgent immediate needs in housing and infrastructure development, reviving livelihoods, and creating the conditions for sustained economic recovery. The plan contains projects and programmes proposed by the different sectors to restore key industries and provide social and economic services and facilities. The NRRP is functioning as a shopping menu for all the donors and the projects to be studied by the JICA Team are basically selected from the project list in the NRRP. Table 4.5 shows the recent situation of the donor's commitment on the listed projects in the NRRP in Laamu and Thaa Atolls.

### (3) Safe Island and Host Island

In responding to the urgent needs of reconstruction of housing and infrastructures, the GOM provides enhancing migration measures. The disaster destroyed coastal structures, increased beach erosion, damaged reef structures, contaminated the fresh water lens, degraded the top soil and accumulated hazardous disaster and demolition waste. The GOM has developed a strategy of islands and incorporating measures such as wider environmental protection zones, creating elevated areas for vertical evacuation in the event of floods, and providing easy access in emergencies. These features would form the structural elements for enhanced mitigation. The GOM prepared "Safety Island Programmes" to implement the above policy, and designated 19 islands as "Safe Island" as shown in Table 4.6;

Table 4.5 Situations of Donor's Commitment

Atoll	Island	Educa-tion	Healt-h	Housi-ng	Desali-nation plant	Water collec-tion/distrib	Sewerage	Fisher-ies	Agric-ulture	Harbo-ur/rec-lamation	Gener-ator	Electr-icity distri-butio	Liveli-hood	Envir-onment	Admi-nistra-tion
Thaa	Madifushi	UNICEF	GRC	BRC	Germa-n THW	IFRC				UNDP			BRC		
	Vilufushi	UNICEF	GRC	BRC		IFRC				Netherl- and	n.i.	n.i.	BRC		
	Thimarafushi		-	UN	Germa-n THW	IFRC				KF					
	Guraidhoo		-		UNICEF	IFRC	KF			n.i.					
	Kibidhoo		GRC/WHO	UN		IFRC				n.i.					
	Dhiyamigili		-	UN	French G.	IFRC				JBIC					
	Omadhoo		-	UN		IFRC				-					
	Gadhiffushi	UNICEF	-	-		IFRC									
	Buruni	UNICEF	GRC/UNFPA	UN	Germa-n THW/UNICEF					GOM		ADB			
	Veymandoo		-	-		-				KF					
	Vandhoo	UNICEF	-	-		-				-					
	Kadhoodhoo		-	UN		IFRC				-					
	Hirilandhoo		WHO	-		-									
Laamu	Dhabidhoo	UNICEF	UNICEF/WHO	UN		IFRC				-					
	Kalhaidhoo	UNICEF	JUH/WHO	-		IFRC				-					
	Mundoo	UNICEF	WHO	-		IFRC				-					
	Maabaidhoo	UNICEF	WHO	BRC		IFRC				n.i.		JICS	BRC		
	Isdhoo-Kalaidho	UNICEF	GRC/UNFPA	BRC	UICEF	IFRC	JICS			n.i.		JICS	BRC		n.i.
	Fonadhoo		-	BRC		IFRC	ADB			JBIC			BRC		JICS
	Gan Thundi	FRC	FRC/Singapore	FRC/GOM	Singapore	FRC	FRC			GOM		n.i.			JICS/FRC
	Gan Mukrimagu	UNICEF	-	-		-				-		JICS			
	Gan Mathmaradhoo														
	Maava		-	-		-				n.i.		JICS			
	Maamendhoo		-	-		-				-					
	Kunahandhoo		-	-		-				-					
	Hithadhoo		-	-		-				-					
	Gadhoo		-	-		-				-					

Note; as of June 2005, the causeways between Fonadhoo and Mandhoo are not in the table and n.i. = not id

LEGEND;

JICS	Short-term NPGA Projects
JBIC	Medium-term Loan Projects

**Table 4.6 List of Safe Islands and Host Islands**

	Name of island	Name of atoll	Priority	Host island
1	Raa	Dhuvafaru	I	*
2	Vilufushi	Thaa	I	*
3	Muli	Meemu	I	
4	Gan	Laamu	I	*
5	Koluhufushi	Meemu	I	
6	Villingili	Gaafu Alifu	I	
7	Madifushi	Thaa	II	
8	Dhaandhoo	Gaafu Alifu	II	
9	Gaddhoo	Gaafu Dhaalu	II	
10	Nolhivaranfaru	Haa Dhaalu	III	
11	Maafushi	Kaafu (South Male)	III	
12	Kudahuvadhoo	Dhaalu	III	*
13	Hoarafushi	Haa Alifu	IV	
14	Funadhoo	Shaviyani	IV	
15	Manadhoo	Noonu	IV	
16	Thulusdhoo	Kaafu (North Male)	IV	
17	Mathiveri	Alifu Alifu	IV	
18	Maaemboodhoo	Dhaalu	IV	
19	Veymandoo	Thaa	IV	

Note; ADh. Maamigili is designated as "Host Island", although it is not specified as "Safe Island".

Source; NDMC

Based on the Safety Islands Programme, the GOM further selected five islands to be developed as "Host Islands" as shown in Table 4.6. Figure 4.3 shows the location of safe islands and host islands. In the Thaa and Laamu Atolls, Vilufushi and Gan islands are designated as Host Islands and Madifushi is designated as Safe Island.

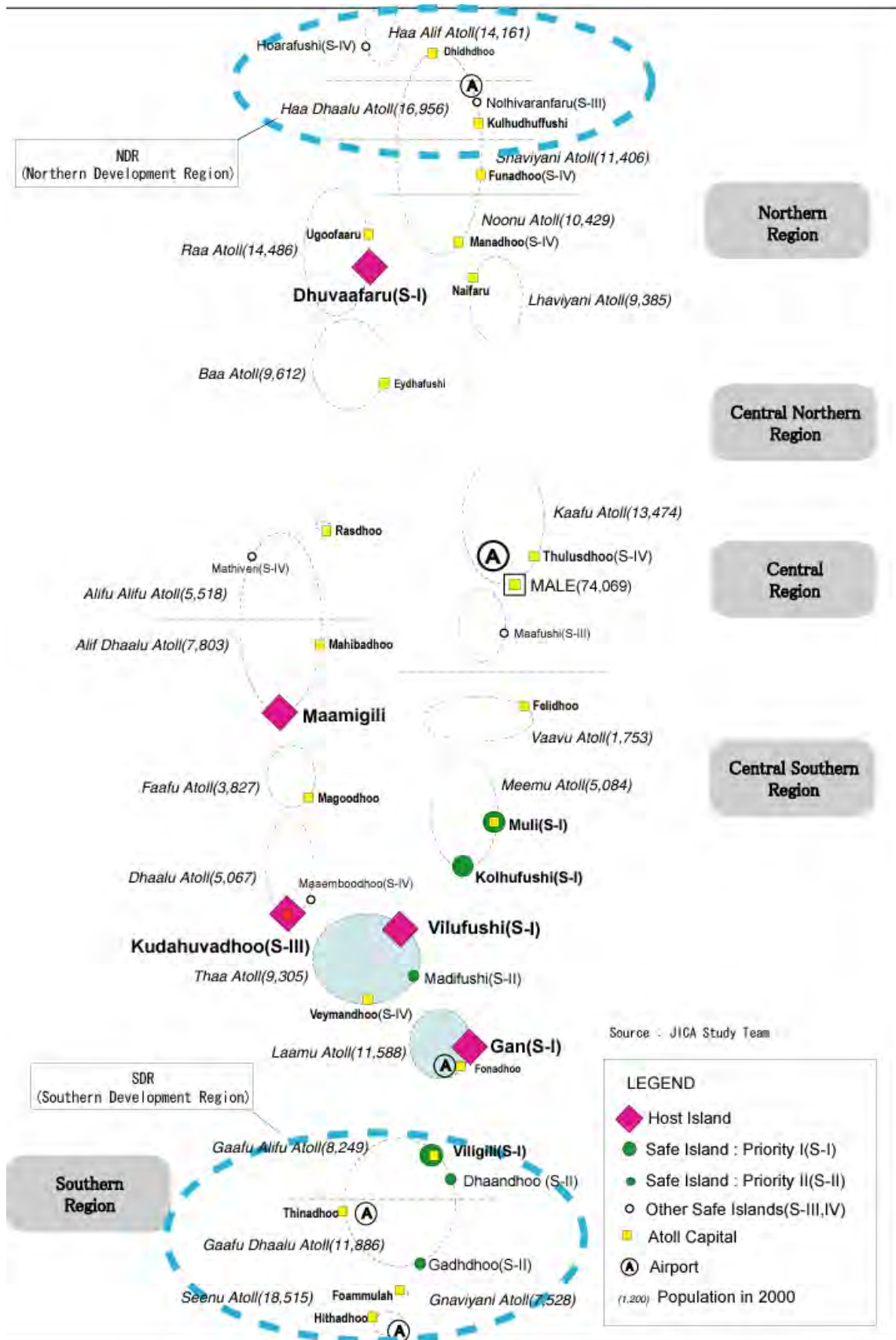


Figure 4.3 Safe Islands and Host Islands



## 4.2 Regional Development Context

### 4.2.1 Characteristics of the Thaa and Laamu Atolls

Table 4.7 summarizes the characteristics of the Laamu and Thaa Atolls.

**Table 4.7 Characteristics of Laamu and Thaa Atolls**

	Thaa	Laamu
Economic situation	Remote and Low income	Remote and Low income
Tsunami Disaster	Second biggest damage area	First biggest damage area
Distance from Male'(km)	226.5	260
Area (ha)	368.5	1,413.9 (largest among 20 Atolls)
Population 1995→2000 (annual growth rate)	9,545→9,305 (- 0.5%)	10,156→11,588 (2.7%)
Population Density	34.7 p/ha	8.2 p/ha
Households 1995→2000 (annual growth rate)	1,424→1,572 (2.0%)	1,603→1,892 (3.4%)
Atoll Capital	Veymandhoo	Fonadhoo
Airport	none	Kadhoo domestic airport
Fishery Land Base	Fonaddoo Company at Fonaddoo Island	Horizon Company at Maandhoo Island
Agricultural Farm	Kanimeedhoo private farms	Mendhoo and Maandhoo Research Centres and private farms at Isdhoo and Gaadhoo Islands
Resort Hotel	Approved to build first resort hotel at Kalhufahalafushi Island in the Atoll (200 rooms)	Approved to build first resort hotel at Olhuveli Island in the Atoll (200 rooms)
Host island	Vilufushi	Gan
Safe island	Madifushi	none
Resettlement Scheme	none	Mundoo, Kalhaidhoo and Isdhoo/Isdhoo-Kalaidhoo
Hospital	Atoll Hospital in Veymandhoo	Regional Hospital in Gan
Secondary School	School Grade 1 to 10 at Thimarafushi	Laamu Atoll Education Centre at Fonadhoo (Grade1-10)
Larger Island	Kadoodhoo (78.2ha)	Gan (516.6ha), Isdhoo (293.7ha), Fonadhoo (159.2ha), Hithadhoo (108.7ha)
Bigger Population Islands	Thimarafushi (1,537), Vilufushi (1,155), Guraidhoo (1,433)	Gan (2,244), Fonadhoo (1,740), Isdhoo (1,432), Maavah (1,351)

The specific descriptions are follows:

(1) Kadhoo Airport

The Kadhoo Airport is the secondary established domestic airport in the Maldives, and has originally opened in December 1986. The rehabilitation work of terminal building and runway were made in 2002-2003. The length of the runway is 1,212m and has enough space of terminal building. There is one flight per day between Male' with the aircraft of Donyi 228 (17 sheets) in the normal season. At the peak season, they increase to two flights per day or use larger aircraft of Dash (37 sheets). The number of passengers and volume of the cargo are still lowest among other domestic airports in the Maldives, for instance, the number of flights at

Gan (Seenu Atoll) is five to six flights per day, however, the increase ratios of passengers and volume of cargo at the Kadhoo Airport appears very high. Table 4.8 shows the number of flights, passengers and cargo handling of four domestic airports in the recent years.

**Table 4.8 No. of Flights, Passengers and Cargo Handling at the Four Domestic Airports in Maldives**

Domestic Airports	No. of flights			Passengers (persons)	Cargo (tons)
	year	2001	2002		
L. Kadhoo	194	222	312	10,577	13
(Inc. ratio)	-	14.4%	40.5%	-	-
GDh. Kaadedh-dhoo	1,020	806	750	14,610	48
HDh. Hanimadhoo	653	563	515	17,991	36
S. Gan	1,914	1,944	1,936	40,503	6,332
<b>Total</b>	<b>3,781</b>	<b>3,535</b>	<b>3,513</b>	<b>83,681</b>	<b>6,429</b>
(Inc. ratio)	-	- 6.5%	- 0.6%	-	-

Source: Ministry of Transport and Civil Aviation, Statistical Yearbook of Maldives 2004.

The demand of the Kadhoo Airport will continuously increase due to the development of host island of Gan in Laamu Atoll. Another factor to boost the demand is an opening of the first resort hotel in each of Laamu and Thaa Atoll.

(2) Host Island Development in Gan

A large development scheme has been planned on the host island of Gan. The Mundoo and Kalhaidhoo Islands were totally destroyed by the tsunami, and the people of these islands have decided to resettle in the Gan Island. There are three indigenous communities in the Gan Island, namely Thundi, Mukurimagu and Mathimaradhoo, and the present population of the Gan Island is 2,244 persons (in 2000 Census) in total. The GOM prepared the land use plan of the Gan Island to accommodate above two resettlement communities and also other communities with the capacity of 3,000 persons. The total population will reach more than 5,000 persons in the near future. The GOM intends to accelerate the development of the infrastructures, including harbours, roads, parks, primary schools, health posts, stadium, community center, commercial and industrial buildings with the assistance of several donors. The multi-purpose building, studied by the JICA Study Team, is one of the infrastructures in the GOM plan, which has functions of island office, island court, police, post office, bank, etc. The area of Gan island is 516.6, the biggest island in the Maldives, which is 2.6 times of the area of the capital of Male'.

(3) First Resort Development in Laamu and Thaa Atolls

There was no resort hotel outside Male' and the Central Region except Seenu Gan Island. A new resort hotel with a planned capacity of 200 guest rooms in both Laamu and Thaa Atolls is proposed and already received approval by the GOM. It is expected to open in the next year.

The airport of Kadhoo as well as the harbour will play an important role in tourist access to these resorts. The increase of tourism activities in the region will stimulate other economic activities, such as transportation, agriculture, fishery, restaurants, souvenir shops, etc.

(4) Fishery Activities in the Region

There are four zones in the Maldives for the fishery activities as follows;

- 1) Zone 1: HA, HD, SH, NO (North).....Island Enterprises
- 2) Zone 2: RA, BA, LH, KA (Central North).....MIFCO
- 3) Zone 3: AA, AD, FA, DH, TH, VA, ME, LA (Central South).....Horizon and Fonadhoo
- 4) Zone 4: GD, GA, GN, SE (South)....MIFCO

The MIFCO is the government fishery company and the others are the private enterprises. The Horizon Company has the land base at Maandhoo Island in Laam Atoll and Fonadhoo Company at Fonadhoo Island in Thaa Atoll. Local fishermen can catch fish in any zone, and they can sell the fishes to any company, stationed in each zone. The majority of the fish catch is exported by the above companies in the forms of live, fresh, frozen and processed fish, mainly to Thai, Sri Lanka, Japan and other countries. Despite of the above large fishery companies, several small- and medium-scale fishing processing companies or organizations can be seen in many islands. Although the volumes of fish catch in the Central South Region is not high, land base facilities of Horizon and Fonadhoo companies have large potential for further fishery development, and also vital small-scale private companies and community-based fishery cottages can be seen in these atolls.

4.2.2 Regional Context of the JICA Project in the Thaa and Laamu Atolls

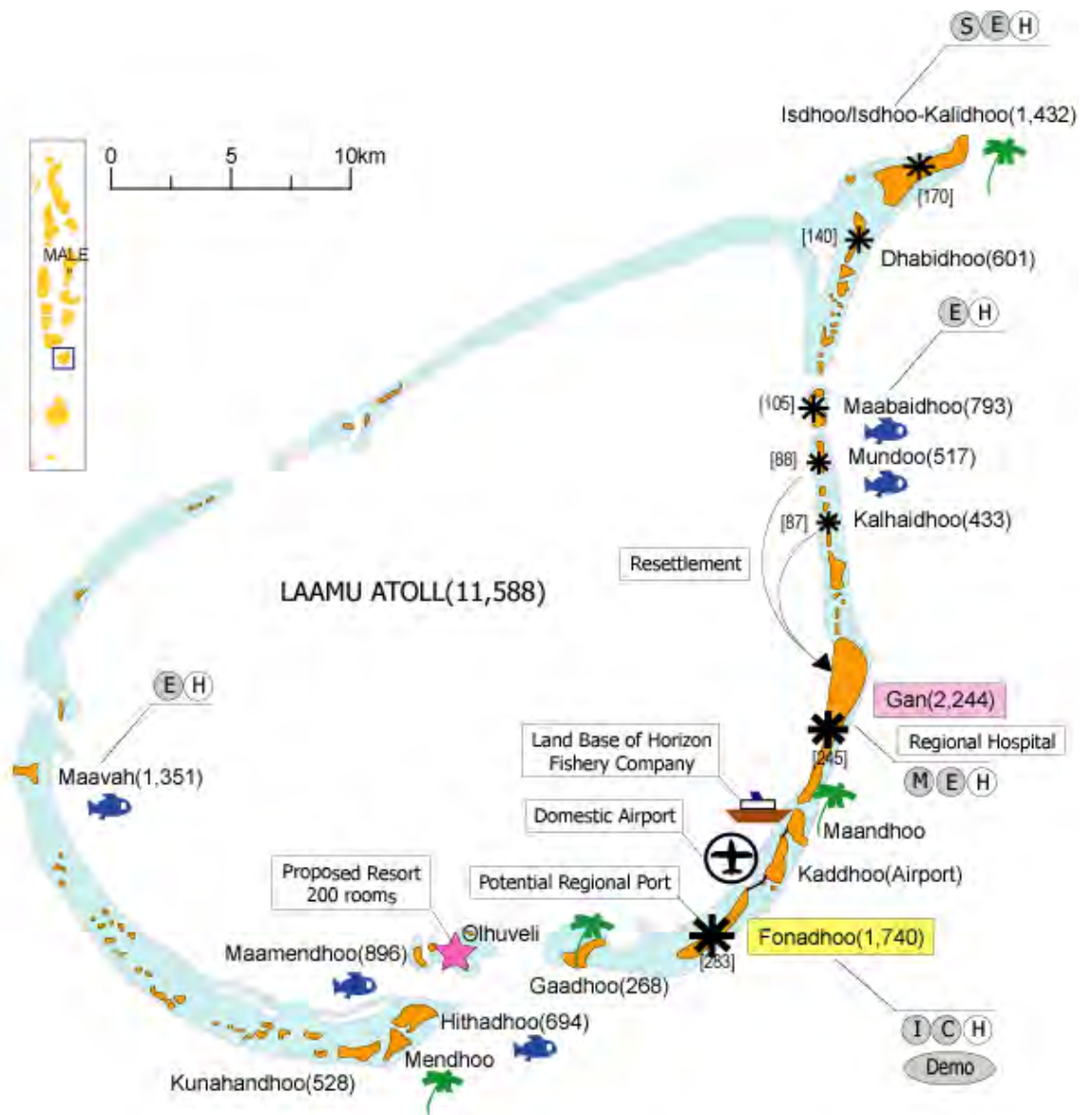
Table 4.9 and 4.10 shows the regional context of the short-term and mid-term infrastructure development projects in the JICA Study.

**Table 4.9 Regional Context of JICA Projects- Laamu Atoll**

Project	Island	Regional context
Multi-purpose Building	Gan	It is one of the basic infrastructures in the host island of Gan, which designated as a Regional Growth Centre. The construction site of the Multi-purpose Building is located between existing Thundi community and resettlement development areas. Island office and court is serving for Thundi and resettled communities, and bank, post office and police are serving wider population in not only Gan but also peoples of Fonadhoo, Kadho and Maandho. The MP Building has function of disaster prevention and evacuation.
Island Office	Fonadhoo	Reconstruction of Island Office at Fonadhoo Island. The existing Island Office was heavily damaged by the Tsunami. The reconstruction site is designated in the part of the waterfront park area, which has better accessibility from the harbour. The function of the Island Office is same as before, however, the new office has a function of disaster prevention and evacuation.
Causeway	Fonadhoo ~ Kaddho ~ Maandho	The 2 causeways between Fonadhoo ~ Kaddho, and Kaddho ~ Maandho were severely damaged by the Tsunami. The rehabilitation of these causeways are urgently required due to continuous erosion even after Tsunami. These causeways is the principal lifeline to connect Gan Host Island - Maandho Fishery Land Base - Kadho Airport and Fonadhoo Atoll Capital islands, which are formed as a Regional Growth Corridor.
Power Distribution facility	1) Isdhoo-Isdhoo/Kalaidho 2) Maabaidho 3) Gan-Mukrimagu 4) Maava	Restoration and replacement of cables and distribution boxes in the left 4 islands are urgently required to recover and ensure power supply to the people of islands. This is a basic need all over the country.
Sewerage	Isdhoo-Isdhoo/Kalaidho	Discharge of waste water into ground water causes water pollution and the Tsunami accelerated the deterioration of water quality. The appropriate sewerage system is required for the protection of water quality and for the health of the people. This is a basic need all over the country.
Harbour	1) Isdhoo-Isdhoo/Kalaidho 2) Maabaidho 3) Gan-Mukrimagu 4) Maava	Rehabilitation and reconstruction of island harbours in the left islands are urgently required to recover and ensure the functions of the harbour for fishery, transport, coastal protection, etc. This is a basic need all over the country, especially remote islands.
Alternative Communication System	1) Isdhoo-Isdhoo/Kalaidho 2) Maabaidho 3) Fonadhoo 4) Gan 5) Maava	Building alternative communication system to strengthen disaster risk management. An alternative scheme is proposed to build the system in Laamu Atoll as a pilot project to expand this system to nation wide in the future.

**Table 4.10 Regional Context of JICA Projects- Thaa Atoll**

Project	Island	Regional context
Island Harbour	<ol style="list-style-type: none"> <li>1) Dhiyamigili</li> <li>2) Guraidhoo</li> <li>3) Thimarafushi</li> <li>4) Veymandhoo</li> <li>5) Kinbidhoo</li> <li>6) Hirilandhoo</li> </ol>	<p>Rehabilitation and reconstruction of island harbours in the left islands are urgently required to recover and ensure the functions of the harbour for fishery, transport, and coastal protection. Rehabilitation and reconstruction of those harbours are basic needs for remote islands. Among them, The harbours of Veymandhoo as for the Atoll capital, and Hirilandhoo as for fishery development are important. The construction work of the Dhiyamigili harbour was not completed before the tsunami and it had big damage from the tsunami. This harbour is also important for rehabilitation and completion of the construction work.</p>



**LEGEND:**

- (395) No. of population in 2000
- Fishery Dominated Island
- Agricultural farms
- Damage of Tsunami [no. of affected houses]
- Atoll Capital
- Host Island
- Safe island
- Resort Project

- JICA Study Projects
- Multi-purpose Building (short-term)
  - Island Office (short-term)
  - Causeway (short-term)
  - Power Distribution Facility (short-term)
  - Sewage System (short-term)
  - Harbour Facilities (mid-term)
  - Demonstration Project

**Figure 4.4 Regional Development Context-Laamu Atoll**



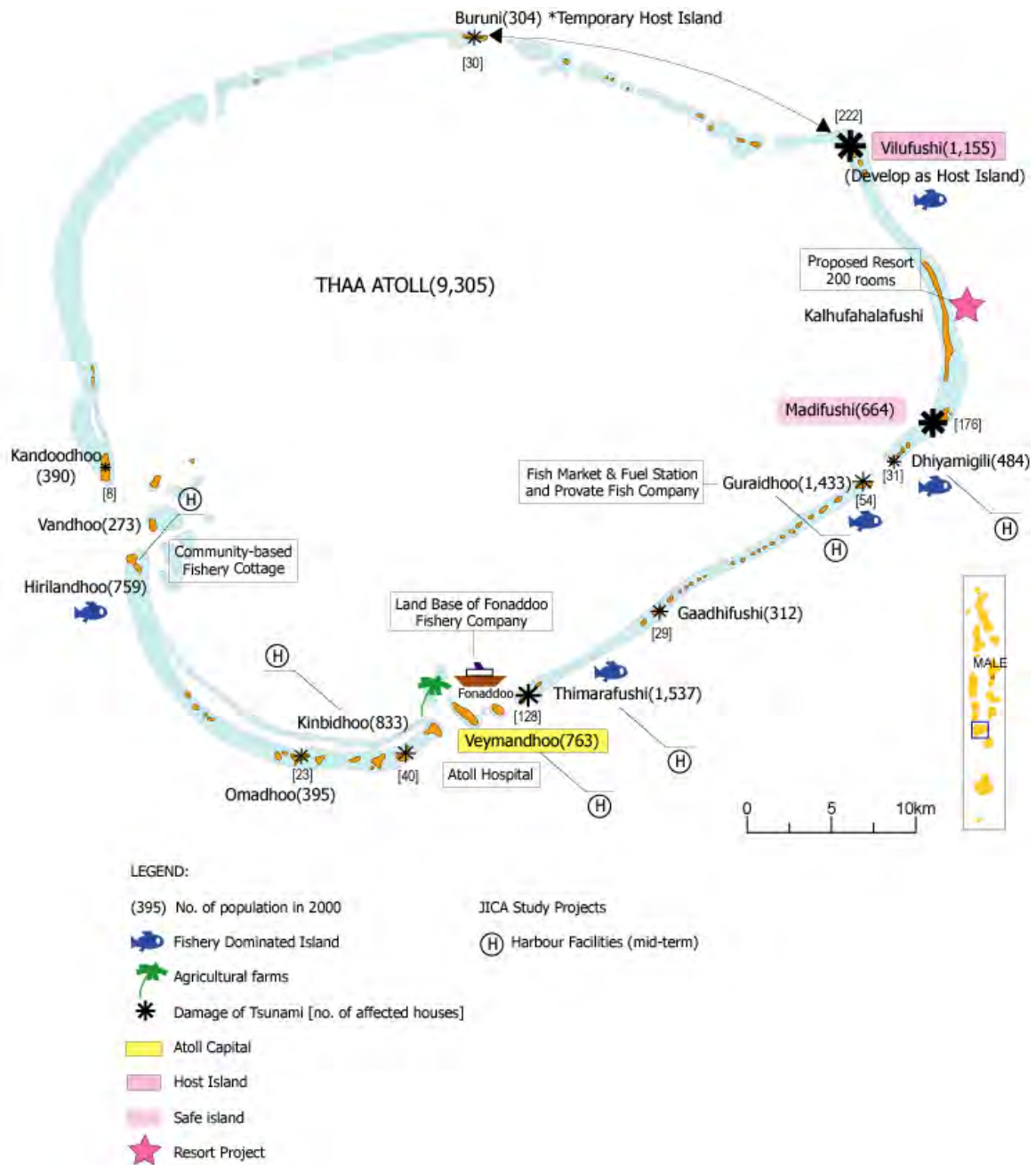


Figure 4.5 Regional Development Context-Thaa Atoll