

THE STUDY
ON
COASTAL PROTECTION AND PORT IMPROVEMENT
IN
THE COOK ISLANDS

FINAL REPORT

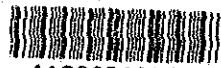
VOL. I. MASTER PLAN

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**THE STUDY
ON
COASTAL PROTECTION AND PORT IMPROVEMENT
IN
THE COOK ISLANDS**

**FINAL REPORT
(VOL. I : MASTER PLAN)**

August 1992

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

国際協力事業団

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PREFACE

In response to a request from the Government of Cook Islands, the Government of Japan decided to conduct a study on Coastal Protection and Port Improvement and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Cook Islands a study team headed by Mr. Mamoru Amemiya, Pacific Consultants International Co., Ltd., three times between October 1991 and March 1992.

The team held discussions with the officials concerned of the Government of Cook Islands, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of Cook Islands for their close cooperation extended to the team.

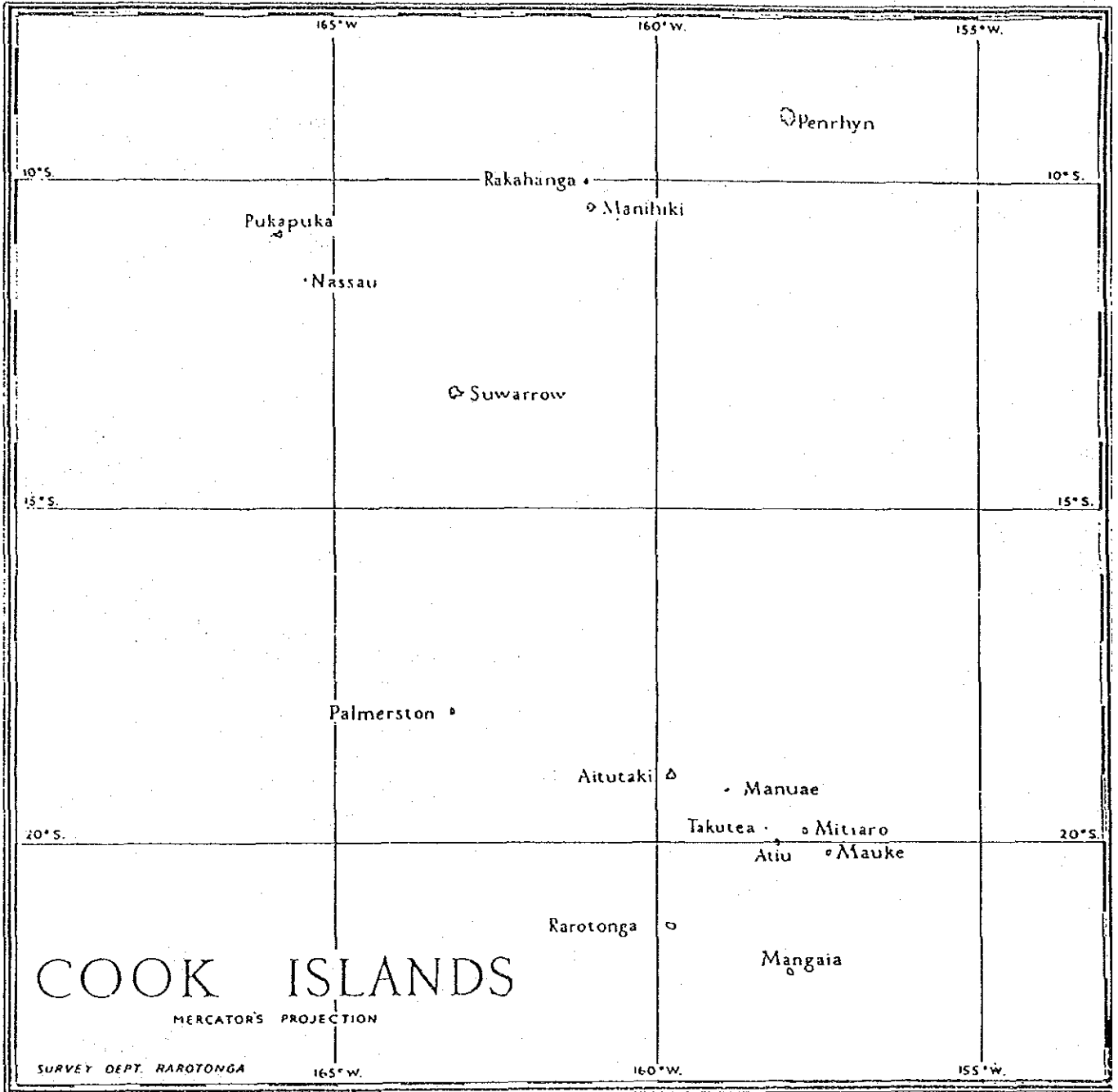
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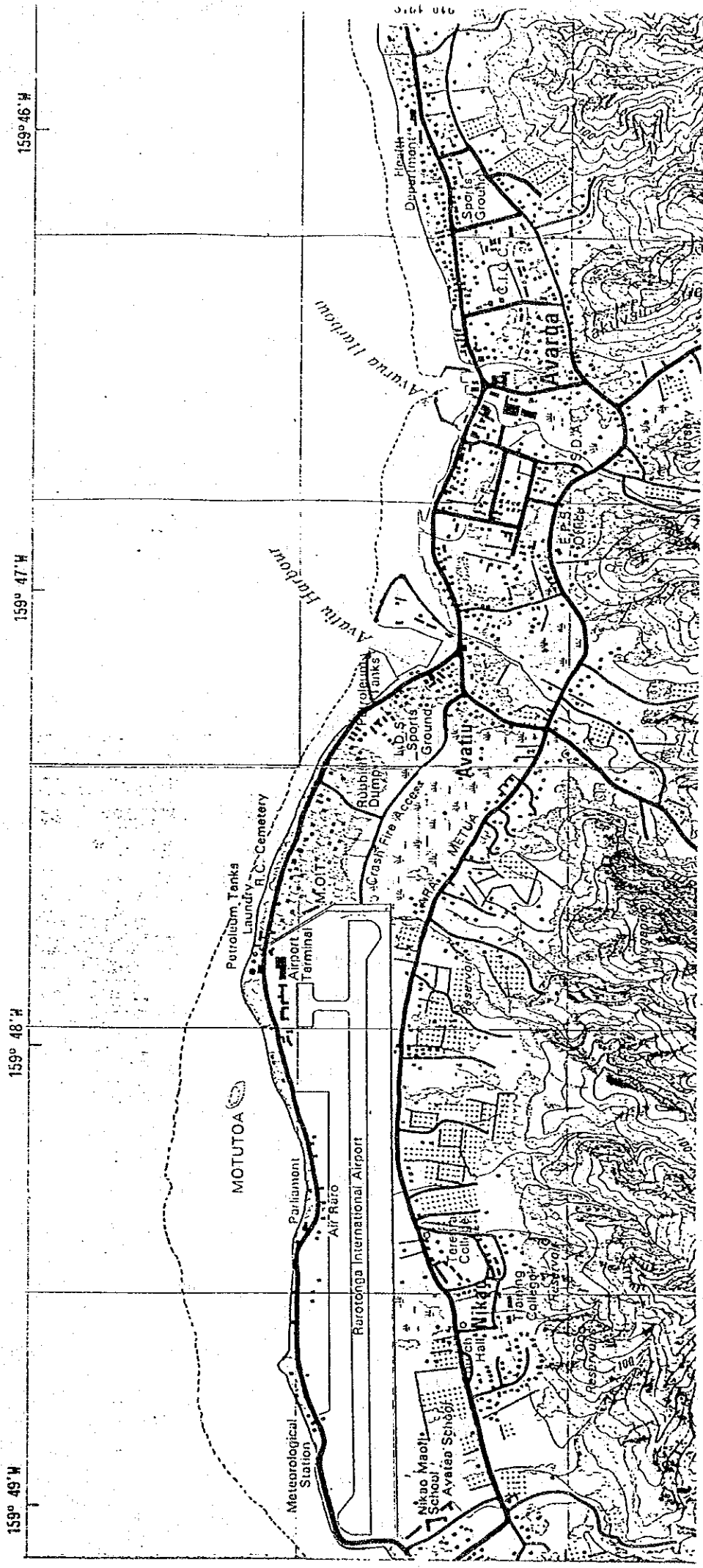


Kensuke Yanagiya

President

Japan International Cooperation Agency





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MOTUTOA

Metereological Station

Parliament

Air Rato

Rarotonga International Airport

Petroleum Tanks

Laundry

R.C. Cemetery

M.O.I.T.

Rubbish Dump

W.D.S. Sports Ground

Propanum Tanks

Crash Fire Access

Avatiu

Metua

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CONCLUSION AND RECOMMENDATIONS

CONCLUSION

1. Policy Objectives

The project is proposed based on the following policy objectives of the Government of Cook Islands.

- (1) Protection of the national land and the security of the nation against natural disasters.

The Cook Islands consists of 15 island situated from 156° - 167° west longitude to 8° - 23° south latitude.

Because of its location, the nation is attacked by cyclones every year and suffers heavy damage, such as coastal erosion. This is especially so on Rarotonga Island where the population is concentrated. Consequently, heavy damage is inflicted on commercial and business facilities, the airport, port and roads during cyclones.

Of future concern are the electric cables, gas pipelines and water supply lines that are buried along the coast, and other public facilities such as schools and hospitals, that may be damaged if a strong cyclone strikes.

- (2) Maintaining a supply of items essential for human life and related fundamental items.

Rarotonga Island has the most important transportation foot-holds, such as the Rarotonga Airport and Avatiu Harbour. The transported materials include items essential for human life and related fundamental items.

Therefore, by protecting transport facilities and ensuring the safety of ship maneuvering, the nation's social and economic stability will be maintained.

- (3) Promotion of Industries

Future economic growth depends upon the promotion of industries in the various region by utilizing prevailing natural conditions.

Therefore, certain facilities, such as a marina, will be needed as the core of industry.

Moreover, because the basic purpose of a fishery is to supply food to inhabitants and tourists on the island, small craft mooring facilities and stock facilities are required.

(4) Increase Employment Opportunities and Prevent of Population Outflow

Because of the current shortage of employment opportunities, the labor force, especially the younger workers, have sought employment outside the country. The people have vague misgivings about future social-cultural development. To erase these misgivings, it will be necessary to increase employment opportunities and promote the growth of industries.

2. Master Plan Policies

The following general policies should be taken into consideration in the Master Plan for the coastal protection and port improvement of Rarotonga Island:

- (1) The scale of investment cost should be evaluated by comparing it with the benefits of the project. The priority of project components should be considered to obtain maximum investment efficiency.
- (2) Long-term policies for coastal protection and port improvement should be prepared. This policy should be conducted based on both the long-term land use plan and facility layout.
- (3) Encouragement to the industries should be taken into consideration. The mitigation of damage to public utilities including port, roads, power supply and water supply should be conducted. The tourism industry should be encouraged by the implementation of coastal protection work and port improvements.
- (4) Most of the daily consumer goods are imported through the gate port, Avatiu Harbour. The harbour should be maintained not only as a transport life line, but as a hub port to the remote islands.
- (5) Flexibility for future land use should be taken into account since existing available land for public use is so limited. New land should be generated by reclamation along the Avarua Coast.

- (6) The proposed system in the Master Plan should meet with the locality including natural conditions and material availability.
- (7) Since tourism is one of the leading industries, adverse environmental effects to the industry by the project should be minimized.
- (8) As staged development plan should be prepared by considering the priority of project components.

3. Initial Investment Cost for the Master Plan

The target year of Master Plan is 2010. The total initial investment cost is 60.89 million dollars: 27.99 million dollars in coastal protection and 33.10 million dollars in port improvement.

4. Coastal Protection Master Plan

Damage by Cyclone Sally amounted to 13 million dollars at current prices. Total expected coastal damage by cyclones over the next 30 years amounts to 120 million dollars. This is equivalent to damages caused by 9.3 Sally class cyclones.

Coasts to be protected as proposed in the Master Plan were selected under the following conditions.

- i. Coastlines having an expected wave over-topping of more than 2 meters
- ii. Coastlines with active erosion observed by the Conservation Department or villagers

Coastal protection work should be considered at the following seven coasts:

- a) The shoreline between the northeast corner at Village Matavera/Tupapa to the east end of the airport (8,750 meter long)
- b) West of the airport (760 meter long)
- c) The northwest shoreline (1,500 meters) at Villages Poloinu I.R. and Tokerau/Inave against coastal erosion. This area is immediately south of Black Rock where the lagoon width is the narrowest and is exposed to the northern direction from which larger waves approach.

- d) The southwest corner (880 meters) at Village Aroa against coastal erosion.
- e) The southwest shoreline (200 meters) at Village Vaimaanga against coastal erosion. This area faces Papua Passage.
- f) The southeast corner (1,170 meters) at Villages Akapuao and Tikioki against beach erosion.
- g) The east coast (1,690 meters in total) at Villages Areite, Nukupure, Aroko and Avana. The shoreline (920 meters) at the first three villages requires countermeasures against beach erosion. The remaining 770 m at Avana coast requires countermeasures against coastal erosion.

Of these, 5,468 m of coastlines were finally selected for protection areas in the Master Plan. The existing land use behind the proposed coasts and the total project costs should be evaluated carefully.

- Urbanized area in Avarua	870 m
- Rural areas	4,178 m
- Tourism areas	420 m
<hr/>	
Total	5,468 m

Avarua coast should be reclaimed as a buffer zone against cyclone wave overtopping and new public spaces. This area, named the Port Park Complex, should be utilized for road, car park, park and port expansion area. Coastal protection work at Avarua should harmonize with the proposed improvement work for two harbours. The east breakwaters for both harbours should be lengthened to ensure a required wave calm condition.

The breakwater arrangements should be prerequisite for both port improvement and coastal protection.

5. Port Improvement Master Plan

The primary objective of port improvement should be to provide proper port facilities and maintain a gateport to the island. This is essential to the people and various industries here. There is no other alternative than to improve the existing two ports located along the northern coast of the island.

Following are the proposed ideas for improving both Avatiu and Avarua Harbours:

- a) To provide a container storage area to accommodate the increase in container cargoes.
- b) To expand the east breakwater, the width of the entrance channel, turning basin and depth of the quay wall and the basin at Avatiu Harbour to ensure the safety of large vessels.
- c) To repair the existing quay wall.
- d) To prepare the facilities of the fishery port for the increase in both number and size of fishing boats to realize more fish catch.
- e) To construct a marina for the increase in the number of pleasure boats, especially large yachts to enhance tourism industry development.
- f) To protect small fishing boats from high waves during a cyclone.

Estimated cargo volume, fish catch, number of vessels for both harbours are as follows:

Demands	Short-term Year 1997	Master Plan Year 2010
Trade cargo (Import)	46,400 FT	54,200 FT
Container	1,390 TEU	1,730 TEU
Domestic Cargo	2,400 FT	2,800 FT
Fish catch	150 MT	200 MT
Calling vessels per year		
- General cargo vessels	40	50
- Tankers	14	16
- Pleasure boats	190	340
Required berths		
- Pleasure boats	33	60
- Fishing boats	35	50

Note: FT = Freight Ton, 1 TEU = 15 Freight Ton
 MT = Metric Ton

6. Initial Investment Cost of Short-term Plan and its Evaluation

The target year for the Short-term Development is 1997. The Short-term Plan should consist of high priority components among the Master Plan Development. The total initial investment cost amounts to 21.26 million dollars.

- Coastal Protection	8.46 million dollars
- Port Improvement	12.80 million dollars

According to the economic analysis, an economic internal rate of return (EIRR) is 10.7%. Taking the important role of the project in the national economy into consideration, this project should be given the highest priority towards its implementation.

A financial analysis for the port improvement elements was conducted. According to the analysis, a financial internal rate of return (FIRR) is 3.9% subject to the following two conditions:

- i. The operation and maintenance cost is decreased to 60% or less than the current state.
- ii. The present port tariff is raised by 50% to obtain a sufficient return.

Both TLT and WFC are requested to conduct further austerity measures for a stable port account.

7. Outline of the Short-term Development

- (1) To protect the national land and to ensure the nation's safety, appropriate coastal protection will be undertaken in the project.
The area to be protected is the coastline since public utilities, such as the airport and port as well as the city environs, are in close proximity to the coast.
- (2) To provide coastal protection works in respect to natural disasters by wave over-topping and coastal erosion. The location to be protected will be selected based on past damage and land use requirements at its hinterland.

(3) To cover the damaged areas by coastal protection work.

- Coastal area near the Health Department and its surroundings
- Coastal area in front of the Avarua urbanized area
- Coastal area in front of the fuel storage yards at the eastern end of the existing airport
- Beach road near the MET
- Beach road at the northwest corner of the airport
- Beach road at the west end of the airport

Cyclones Val/Wase and Gene as well as Sally should be taken into consideration when preparing the protection plan.

(4) To maintain an adequate supply of items essential for life and related fundamental items.

The improvement of breakwaters, the basin and wharfs, and the procurement of a tugboat in Avatiu Harbour will be undertaken to minimize damage to the port caused by cyclones and to ensure the safety of ships maneuvering.

Additionally, to enhance physical distribution, the procurement of necessary cargo handling equipment is also considered in the project.

(5) To establish and promote industries, such as tourism, the improvement of breakwaters, the basin and the wharf in Avarua Harbour which is used for regular mooring and emergency evacuation of small fishing crafts.

(6) To create both comfortable and safety circumstances, a port-park complex in the Avarua central coast that will function not only as a green zone and parking area but also as a cyclone buffer zone will be established.

(7) To supply food to the nation's people and to tourists, fishery related facilities in Avatiu Harbour will be established.

(8) By promoting industries and, through the implementation of the project, employment opportunities and the number of permanent residents will increase.

(9) The aim of the above measures is towards the realization of land protection, the safety of the nation, and a stabilized national economy.

8. Total Evaluation

Based on the above, the project can be considered to be in harmony with the policy objectives of the Cook Islands Government.

Furthermore, if the current situation remains unchanged, there is a strong likelihood that heavy damage will be inflicted in the near future. Therefore, given that the primary aim of the project is to protect the national land and to defend it against natural disasters, the urgency of the project should be recognized.

It is concluded that the Short-term Development Plan is feasible.

RECOMMENDATIONS

The recommendations below concern matters noticed while conducting this study and drafting the plans.

1. Action requested of the Cook Islands Government

The government is requested respectfully to pay special attention to the following for the meaningful implementation of the proposed coastal protection and port improvement at Rarotonga Island:

- (1) The basic land use plan should be prepared orderly to meet the island's development policy. In order to meet future demands, a public space at the Avarua urbanized area should be retained.
- (2) It is recommended that the coastal protection work conducted by MOW at the Avarua Coast and the surrounding coastlines be expanded.
- (3) The present distribution of building codes to villagers should be maintained. MOW should give an appropriate advice to villagers to ensure that their facilities are durable enough to withstand cyclones.

In respect to land ownership, the rights of tenants might gradually be strengthened.
- (4) To reduce overhead and enhance port operation and management, the establishment of a port authority is strongly recommended.
- (5) The existing LPG and fuel storage facilities at the center of Avatiu Harbour should be relocated to an appropriate site.
- (6) Dredged sandy materials in the port basin should be used for the nourishment of beaches where erosion is critical.
- (7) Prohibition of sand digging should be maintained.
- (8) MOW should continue its efforts to establish a new quarry to meet rock demands during the Short-term Development. Rocks should be the main materials for coastal protection work; it is cheaper than concrete.

- (9) Utility mains, including water supply and power supply, along the damaged coastal areas should be relocated to a safety site.
- (10) Road pavement at the northwest corner of the existing airport should be strengthened by concrete instead of asphalt.

2. Respect to Villagers Perception

One third of villagers understand that cyclone disaster here is the natural disaster. However the other one third believe that coastal protection work conducted in the past is not sufficient.

Villagers' requests to the coastal protection are to plant trees along the coastal bank, to prohibit sand mining and to construct such protection structures as seawall.

The government is strongly requested to pursue coastal protection work by taking villagers' desires into consideration.

3. Development Circumstances

By covering the entire the island coastline, this project may have various impacts. Since the proposed work should be concentrated along the coastlines where existing major developments are located, it is essential for the smooth construction to maintain the villagers' cooperation and understanding of the project.

Development of the coastal areas can be achieved once the general circumstances are improved. The most important step is to let villagers participate in project preparation. To carry this out, the best effort to improve the villagers' consensus of the project should be made by the government.

- (1) For better understanding of the project, a basic planning process should be disclosed to the villagers.
- (2) For better agreement on the project, the final layout together with alternatives should be provided to the villagers.

(3) Data and information relating to the utilization of coastal areas and the possible effects of cyclones should be published and made available to the villagers and to industries.

a) Coast File

Available information should be kept on file as permanent records. The file shall include the physical characteristic and existing land use of each section of coast. This file may provide the people with an opportunity to learn about their coast.

b) Coastal Disaster Forecast

Possible disasters by cyclone waves and surges should be shown on a map and distributed to the public.

(4) The government can not share all the responsibility for cyclone disasters. The budget is normally limited in any country, thus budget allocation to the project shall be carried out to selected projects having the highest priorities based on real demands. It is recommended that the private sector should do its best to protect their property from cyclone damage. The private sector should not locate their properties in high risk areas. The government may provide protection work at danger areas if damage cannot be prevented through the efforts of the private sector.

The government should locate their new property in safe places and should provide protection measures for the existing facilities located in danger zones. For project economy, relocation of existing facilities to safety zones may be a possible choice. MOW is requested to take the initiative in this matter.

(5) The Conservation Department should play a role in controlling the ordinary development of specified coastal areas. The monitoring of the coastal areas should be maintained. The department should provide villagers with a proper explanation of benefits of coastal conservation.

(6) A project executing agency should be established for smooth project implementation. Financial assistance, if so required, should be considered by the government for better maintenance efforts.

4. Preparation for Project Implementation

For smooth project implementation and its fruitful completion, the government should make necessary preparations.

(1) Administrative Aspects

It is recommended that an organization for the project implementation be established. Since the project covers various technical fields, participation by related governmental agencies will be needed. The project will be managed by a project executing agency under the multi-discipline task force (MDT) which may consist of representatives from related agencies.

(2) Technical Aspects

The executing agency should manage the detailed design of project components together with the preparation of Tender Documents. The agency should also manage construction supervision.

At present, there is no firm city master plan for the Avarua Urbanized Area. The utilization of the new reclamation area, including the Port Park Complex, should meet the proposed concept regarding city planning. MOW may be the leading ministry for this task. Other public sectors and private sectors should also participate in this arrangement. Since it faces the open sea, the newly reclaimed area is not only used as a cyclone buffer zone but also for improving land resources. The maximum utilization of this land should be performed accordingly.

(3) Financial Aspects

The proposed Short-term Development Plan will cost about 21.26 million Cook dollars: 8.46 million for coastal protection and 12.80 million for port improvement. It will take about three years to complete the construction work. Thus, approximately seven million Cook dollars should be paid to the contractor each year.

If the government intends to obtain financial assistance from an external monetary source, necessary arrangements should be made to meet the construction schedule.

5. Consideration to Better Environment

It is important to remember that tourism industries here are simply based on natural resources. Within certain limits, nature has the power to recover from adverse environmental impacts. If the impacts override this natural sustaining capacity, the ecosystem will gradually change. The costs required for maintaining the present ecosystem could be much lower than that for recovering the environment after being severely damaged.

To maintain sustainable environmental conditions, it is recommended that continuous efforts be made to provide coastal areas with a better future environment. Necessary action to be taken by the government are as follows:

(1) Investigation and Monitoring

It is recommended that periodical investigations be made of the seawater quality including, BOD, COD, HP and coliform bacteria. It is also recommended that environmental standards be established by which surveyed data can be evaluated.

(2) Enforcement

It is reported that the Conservation Department is preparing water quality regulations that will require the private sector to provide their own septic tanks if they are located within thirty meters of the high water mark.

It is also recommended that large-scale coastal developments be assessed to minimize environmental impacts that may severely damage the existing environmental conditions and that measures to mitigate the impacts be instituted.

(3) Advertising

At present, the island environment is generally good. It is, however, recommended that necessary information be passed on to the villagers so that they can understand the importance of maintaining and protecting the environment.

Foreign Exchange Rate

1.00 Cook Dollar = 1.00 NZDollar = 69.1 Japanese Yen

(as of January 1992)

Currency used in this report is the Cook Dollar otherwise noted.

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Coastal Protection and Port Improvement

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(Separate Issue)

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Chapter 1: Introduction

Chapter 1 Introduction

This chapter deals with the background of the Study and the aim of this report along with other related information.

1.1 Background of the Study

Avarua-Avatiu Area of Rarotonga Island is the socio-economic center of the Cook Islands. Avarua and Avatiu Harbours are the hub ports in terms of trade and domestic marine transport of the Islands. These areas have suffered a lot of damage by wave run-up and flooding due to waves surges.

Since the damage by Cyclone Sally in 1987 was quite severe, the Government of Japan provided the Islands with a grant aid and dispatched an expert team three times. The team recommended an integrated coastal protection plan together with the port improvement of Avarua and Avatiu Harbours, based on the discussion between the Cook Islands Government and the team as the result of site investigation.

In April 1990, the Cook Islands Government requested the Government of Japan for a technical assistance regarding the port improvement of Avarua and Avatiu Harbours and the coastal protection of Rarotonga Island. In response to this request, JICA dispatched a preliminary investigation team and concluded the Scope of Work.

Subsequent to the signed Scope of Work, a JICA a study team was dispatched in October 1991 and commenced the study. The Final Report was completed by the end of August 1992.

1.2 Objectives of the Study

The objectives of the Study are to carry out the data analysis and the preparation of phased development on coastal protection and port improvement at Rarotonga Island from both the technical and economic points of view. Rorotonga is a circular shaped island having a 31 km long shoreline. It is located in the southern Pacific Occan at a latitude of 21°S in the region of the Tropic of Capricorn. Unfortunately, the island is located on a main route taken by cyclones. Every five years a large scale cyclone (wave height in 6.5 m or larger) passes near the island and causes extensive damage to the island's nature and property.

The government has exerted its best efforts to mitigate cyclone disasters. This includes preliminary coastal area conservation control, structural improvement of private housing, control of beach sand digging and provision of coastal protection work together with breakwaters at two major harbours.

The main target in this study is the high seas generated by air turbulent due to a low atmospheric pressure, the cyclone. At first; it generates a strong gale which creates waves and secondly make happen of high tide. Additionally, wave set-up resulting from the concentration of wave energy in the shoal water may occur in the lagoon. All of these tend to take place whenever a large wave breaks over the reef and into the lagoon.

It is said that the old islanders built their homes and villages in the forest on the hill, not close to the beaches. Since then, there have been changes in the ways of living here and people tend to stay along the beach main road, Ara Tapu, which runs just behind the coastal zone. Tourism development has acceralated this trend, although a new hotel in Village Vaimaanga is being built at a relatively safe area well behind the beachline.

In 1987, Sally made a large impact on the islanders not only as a result of the damage done to their properties but also in realizing the tremendous power of a cyclone when it hits the coastal areas. According to the damage records of Sally prepared by MOW and the Conservation Office, high seas attacked the northern beaches of the island causing beach erosion, and in many places, the run-up of water bodies containing coral rocks. These effects have been well observed at the Avarua and Avatiu areas and their adjacencies.

The government has decided to take the necessary action to mitigate these disasters along the entire shoreline of the island. Coastal protection should be implemented considering the grade of the disasters, the land use in the areas and their priorities.

Thus, the main objective of the Study is to prepare the Master Plan of coastal protection showing the necessary action to be taken by the private and public sectors. The feasibility study should be conducted for preparing the more detailed action plans for the most densely urbanized area, Avarua and Avatiu areas and their adjacencies.

The Avarua area is the center of Rarotonga, the capital of the Cook Islands, where the nation's major political and economical activities takes place. Furthermore, Avarua and Avatiu Ports also play major roles in the country's sea communications.

The Avarua area is therefore a target of this detailed analysis. Since these two ports are located in the midst of the urbanized area, the necessary action to be taken by them in the future are also studied and combined with the coastal protection works. Thus improvements for existing port facilities and the required extension to handle future traffic demands are also important objectives of the Study.

1.3 Scope of the Study

1.3.1 Study Area

Area for the Master Plan

1) Coastal Protection

The Master Plan of the coastal protection should cover the entire coastline of the island as a long-term development plan for the year 2010.

Table 4-1 shows the constituencies and the names of the villages on Rarotonga Island. The total shoreline length shown in the Table is 30,990 meter. This figure, however, is the measured length of the beach road instead of the actual shoreline. The combination of constituencies should be confirmed by the latest ones. There are fifty one villages under seven constituencies. Among them, forty seven villages are exposed to the open ocean. The average shoreline length per coastal village is about 660 meter.

Appendix C1 "Coast File" shows various data of the entire coastline of the island at each coast unit at every 200 meter.

2) Port Improvement

As shown in the agreement, the Master Plan of the port improvement should cover the two existing ports, Avatiu and Avarua, as a long-term port development plan for the year 2010. Land use of ports will be expanded to adjacent areas to meet further land requirements in future.

Avatiu is a fully development port and currently occupies a 500 meter long coastline, while Avarua is a port under construction and occupies coastline that is about 300 meter long.

Areas for the Short-term Development Plan

The Short-term Plan will be selected containing the project elements with higher priority and urgent requirement among the proposed concepts in the Master Plan. In this study, the area to be covered by the Short-term Development Plan is concluded at the beginning. However, minor modifications to the area may be required.

1) Coastal Protection

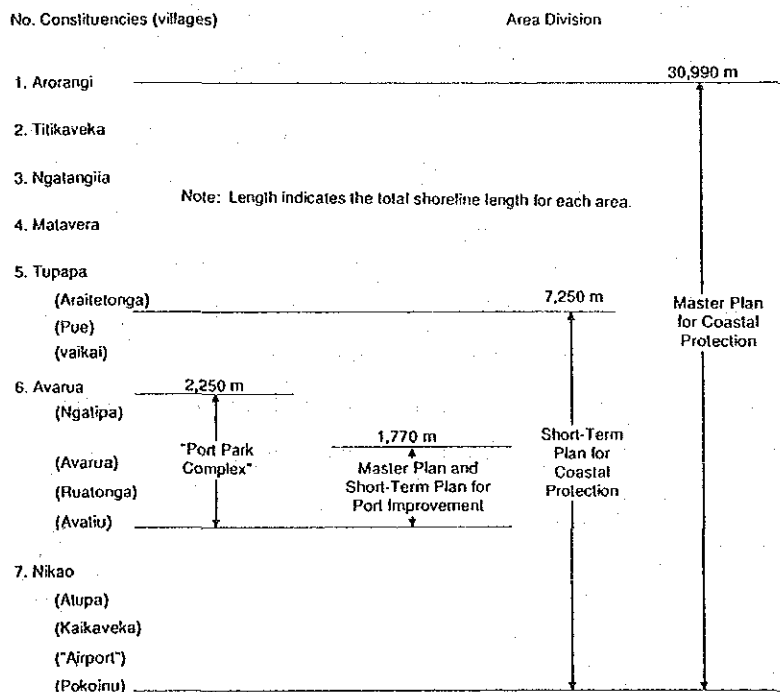
The Short-term Development Plan will cover the Avarua coastal area with its surroundings including the existing airport area and the Avarua eastern coast up to the Health Department where urgent protection work may be required by the year 1997.

Among the areas covered by the Short-term Development Plan, new reclamation work will be conducted at the Avarua coast as a buffer zone against waves and surges and will be named as the Port Park Complex. This area will be utilized not only for the coastal protection but also for various public uses including port expansion.

2) Port Improvement

Based on the proposed Master Plan, the Short-term Development Plan for port improvement will cover only urgent improvement works will be required for two ports by the year 1997. Based on the feasibility study that will follow, it will be decided whether or not to develop one port or both ports simultaneously.

Fig. 1-1 Area Division for Study Scope



1.3.2 Content of Study

The study shall cover the following items:

- 1) Collection, review and analysis of the existing data, information, and reports relevant to the Study
- 2) Undertaking of Site Surveys for the Study
 - a) Topographical data
 - b) Geological and geophysical data
 - c) Hydrological and hydraulic data
 - d) Hydrographical data
 - e) Meteorological data
 - f) Port activity, facilities and equipment
 - g) Land use survey
 - h) Coastal erosion survey
- 3) Preparation of the Master Plan for the period up to the year 2010

Master Plan for the coastal conservation of the Rarotonga Island;

- a) Setting up the area for the conservation plan
- b) Clarification of the mechanism of erosion
- c) Selection of suitable countermeasures

Master Plan for the improvements to the Avarua-Avatiu port area;

- a) Port traffic forecast
- b) Projection of land requirement
- c) Preparation of the basic layout plan of the major port facilities
- d) Preparation of the land use plan
- e) Undertaking of the rough design and its cost estimates
- f) Preparation of the phased development plan

4) Undertaking of the Feasibility Study for the period up to the year 1997

Coastal protection plan for the coasts adjacent to the Avarua area:

- a) Preparation of the basic layout plan of coastal protection facilities
- b) Undertaking of the preliminary design
- c) Cost estimates for construction, operation and maintenance
- d) Undertaking of the economic analysis
- e) Preparation of construction, operation and maintenance programs

Port improvement plan of the Port Area

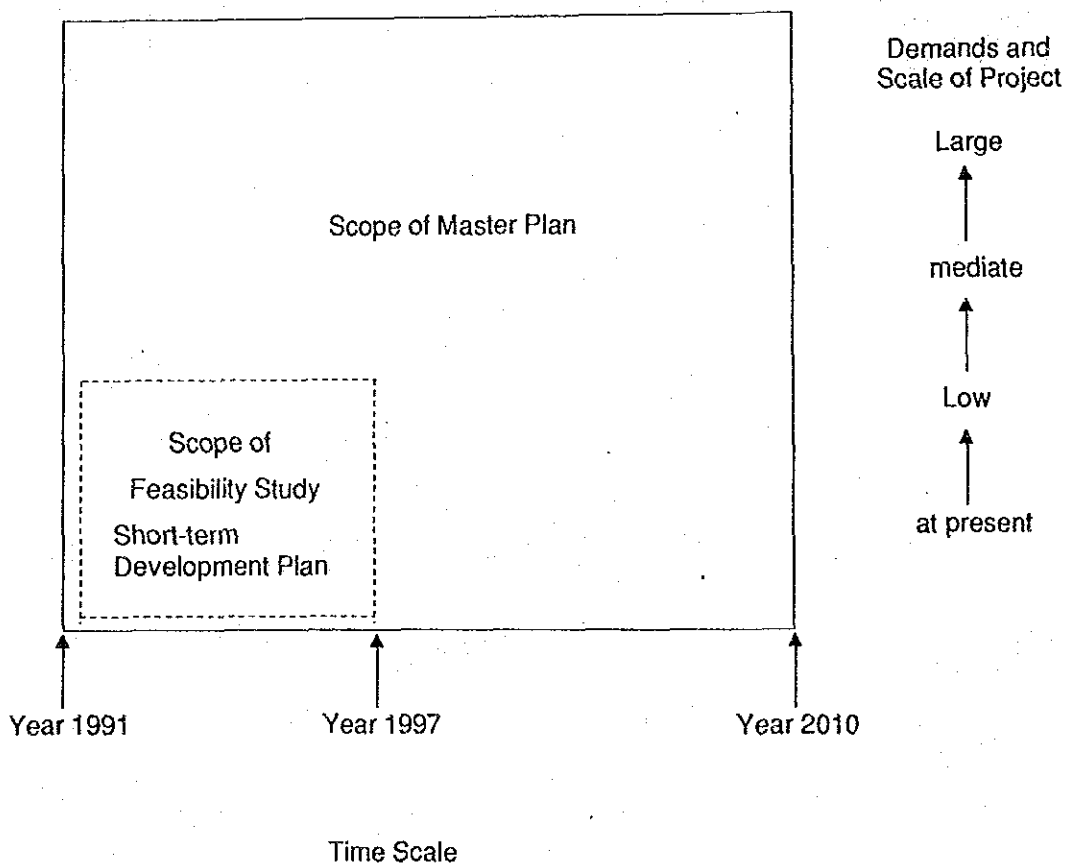
- a) Preparation of detailed layout plan of the major port facilities
- b) Undertaking of preliminary design and cost estimate
- c) Undertaking of the economic analysis and preliminary financial analysis
- e) Preparation of implementation program
- f) Recommendation on port management and operation system

5) Preparation of Conclusion and Recommendations

1.4 Composition of Reports

Results of the study were demonstrated in three stages, namely the Interim Report, Draft Final Report and Final Report. The Interim Report aimed at preparing a summary of the Master Plan for the year 2010, while the Draft Final Report described preliminary recommendations on the Short-term Development among the Master Plan based on the project's feasibility analysis. Then, all the conclusions and recommendations for the project including countermeasures on the comments were reported in the Final Report. The Final Report consists of two volumes, namely Volume I "Master Plan" and Volume II "Short-term Development Plan" based on feasibility study. The former is revised Interim Report.

Figure below shows the image of two phases, namely the Master Plan and the Short-term Development Plan by Feasibility Study.



1.5 Site Visit and Activities by the Study Team

The first site visit was conducted by the team from the middle of October to 24th of November, 1991. The team met and exchanged opinions with the project steering committee of the Ministry of Planning and Economic Development, MOPED, on the behalf of government. The committee was chaired by Acting Secretary Mr. R.C. Chapman and Mr. Tai Manuella as vice chairman. The team collected valuable information on the project from the various government agencies including:

- a) Ministry of Works, MOW
- b) Department of Trade, Labour and Transport, TLT
- c) Conservation Department
- d) Survey Department
- e) Waterfront Commission
- f) Customs Department
- g) Ministry of Marine Resources
- h) Ministry of Agriculture
- i) Post Office
- j) Cook Island Meteorological Service, MET
- k) TV Rarotonga
- l) SOPAC
- m) Tourism Authority and
- n) MOPED

Project officers and economists in MOPED as the executing agency, provided the team with valuable data and suggestions. MOW, Survey Department and Conservation Department gave the team data on the damage records of Sally and their intention for coastal protection. TLT, Waterfront Commission, Customs Department, and Ministry of Marine Resources participated in the discussions on future port utilization.

Soil investigation, under the contract to the team was conducted by a local survey company. The topographical and hydrographical surveys have been undertaken directly by the team.

During the site investigation, villagers frequently asked the team members what was the purpose of the investigation. They are answered in detail so

that villagers would have a better understanding of coastal protection. In addition to this, direct interviews with 120 residents concerning cyclone disasters were successfully conducted with the assistance of the Chief Economist of MOPED, Dr. Charito Chapman. Of the discussions held between the committee and the team, the preliminary alternative layouts for the coastal protection works at the Avarua/Avatiu area was one of the most eager items.

It should be noted that the study team was encouraged by Prime Minister Geoffrey A. Henry and Minister J.J. Marsters of the Ministry of Works.

Immediately after returning to their home offices in Tokyo, the team reported major happenings on the island to the JICA supervisory committee and then commenced the study for the interim report.

Second Visit was made from the end of January to the middle of February, 1992. The team submitted the Interim Report to the government and conducted discussion on recommendation and findings in the said report. The Master Plan of coastal protection and port improvement were the main subjects. The tentative phased development plan which aimed at selection of urgent works to be implemented in the Short-term Development Plan was evaluated by both parties. The team accepted the request that the Short-term Development Plan should cover the damaged areas by cyclone Val/Wase at the end of 1991. The team provided the Cook Government officials with recommendation that scale of project should be scheduled within a reasonable range which might be justified by the cost and benefit analysis in the feasibility study to come.

The team met and exchanged opinions with the project steering committee about financial aspect of organizations which might be responsible for project execution and operation.

The team left the island for Tokyo on the 8th of February, 1991. On the way back to Tokyo, they dropped at the Japanese Embassy in Wellington and reported the results of discussion in the island. Immediately after arriving at Tokyo, the team reported also happenings in the island to the JICA supervisory committee and commenced the study for the preparation of Draft Final Report.

Submission of the Draft Final Report and discussion of it with the committee was undertaken by the team in the middle of March, 1992. The team submitted the Draft Final Report, Volume I and Volume II to the government for discussion on the 12th of March. However second meeting scheduled originally on the 17th of March was postponed by an emergency caused by Cyclone Gene. The second and final meeting was held on the 20th and 21st of March.

Major items in discussion by both parties were;

- a) Basic system of coastal protection including design method
- b) Port layout especially about the extension of breakwater
- c) Location of fisheries sector, Avatiu or Avarua
- d) Project economic feasibility
- e) Financial aspects

The team left the island for Tokyo on the 23rd of March, 1992. On the way back to Tokyo, they dropped at the Japanese Embassy in Wellington and reported the results of discussion in the island. Immediately after arriving at Tokyo, the team commenced the study again for the preparation of Final Report.

On the 27th of April, 1992, the study team received the comments on the Draft Final Report and commenced to preparation of Final Report. The Final Report was completed by the end of August 1992.

Chapter 2: Methodology

Chapter 2 Methodology

This chapter deals with both the schedule and basic methodology of the study.

2.1 Workflow Diagram and Work Schedule

The agreed work schedule is shown in Fig. 2-1.

The workflow diagram is shown in Fig.2-2. From the diagram it can be seen that the work can be divided into seven stages.

There are 29 work components, the highlights of which are summarized in Table 2-1.

Fig. 2-1 Study Schedule

Work Items by Stage	Year												
	1991				1992								
Month	S	O	N	D	J	F	M	A	M	J	J	A	
Stage 1 Preparatory Work		—											
Stage 2 Field Survey		△ IC/R	————										
Stage 3 Master Plan for the year 2010				————									
Stage 4 Submission of Interim Report					△ IT/R	————							
Stage 5 Feasibility Study for the year 1997						————							
Stage 6 Submission of Draft Finan Report							△ DF/R	————					
Stage 7 Finalization												△ FR	

Legend: — Preparation, — Work in Cook Islands, — Work in Japan

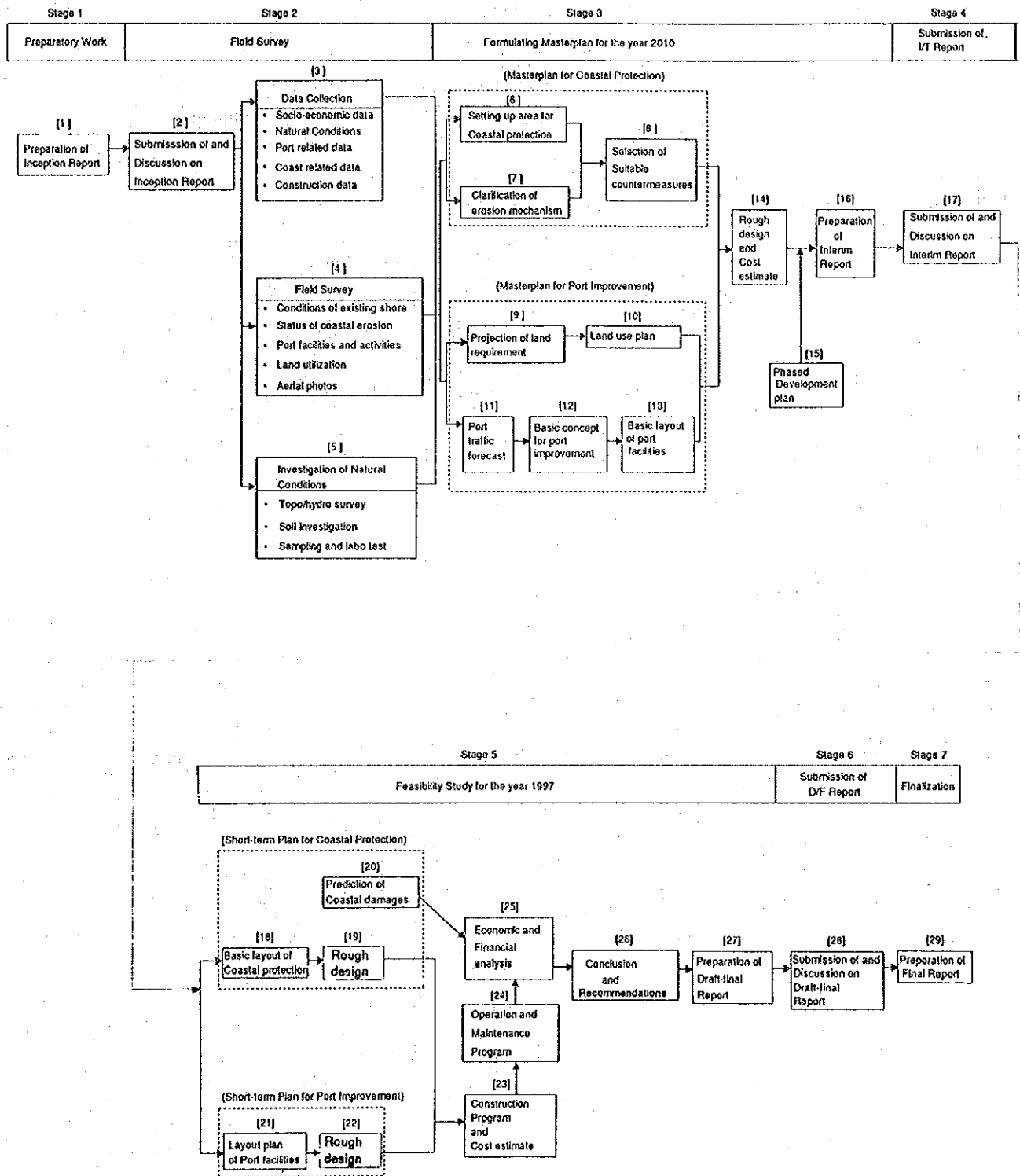
Note, The study team received comments on the Draft Final Report at the end of April, 1992. Explanatory Notes outlining the Final Report and countermeasures to comments was submitted to the Cook Islands Government prior to the submission of Final Report. Thus, completion of report was completed at the end of August, 1992.

Table. 2-1 List of Work Components

Stage	Main Target	Step	Work Components
<u>Stage 1</u>	Preparatory Work	(1)	Preparation of Inception Report
<u>Stage 2</u>	Field Survey	(2)	Submission of and discussion on the report
			↓
		(3)	Data collection
		(4)	Field survey
		(5)	Investigation of natural conditions
Stage 3	Formulation of Master Plan for the year 2010		[Master Plan for coastal protection]
		(6)	Setting up area for coastal protection
		(7)	Clarification of erosion mechanism
		(8)	Selection of suitable countermeasures
			[Master Plan for port improvement]
		(9)	Projection of land requirement
		(10)	Land use plan
		(11)	Port traffic forecasts
		(12)	Basic concept for port improvement
		(13)	Basic layout of port facilities
			[Integration]
		(14)	Rough design and cost estimates
		(15)	Phased development plan
		(16)	Preparation of Interim Report
Stage 4	Submission of Interim Report	(17)	Submission of the report
Stage 5	Feasibility Study for the year 1997		[Short-term Plan for coastal protection]
		(18)	Basic layout of coastal protection
		(19)	Rough design
		(20)	Prediction of coastal damages
			[Short-term plan for port improvement]
		(21)	Layout plan of port improvement,
		(22)	Rough design
			[Integration]
		(23)	Construction program and cost estimates
		(24)	Operation and maintenance program
		(25)	Economic and financial analysis
		(26)	Conclusion and Recommendations
		(27)	Preparation of Draft-Final Report
			↓
Stage 6	Submission of Draft Final Report	(28)	Submission of and discussion on Draft Final Report
			↓
Stage 7	Finalization	(29)	Preparation and submission of Final Report

Fig. 2.2 Work Flow Diagram

Work numbers below are corresponding with work component numbers in Table 2-1.



Chapter 3: Socio-Economic Conditions

Chapter 3 Socio-Economic Conditions

This chapter presents the major socio-economic indices of the project hinterland. They will relate to the economic frames of Rarotonga island, and will be the background information for the possible future economic frame of the country. They will also relate to such a basic information like the cargo traffic forecast which may be handled at the ports with required improvements. The present industrial activities on the island will also be evaluated in order to identify necessary countermeasures to be undertaken in the Master Plan and Short-term Plan of the study.

Although information subdivided into the island are not available, discussion of these conditions will commence with indices in respect to the whole country since Rarotonga island is the core of national economy.

3.1 Major Socio-Economic Conditions

3.1.1 Population

The population of the Cook Islands grew steadily until 1971. From 1951 to 1971, an annual growth rate of around 2.1% was recorded. From 1971 to 1986, however, the population declined, especially from 1971 (peak) to 1976, when a 3.0% annual decline was experienced. The main reasons for the decline in population were the expansion of air services and the availability of employment opportunities in the New Zealand labour market. After 1976, the population declined at a very low rate; in recent years it has been relatively stable.

Rarotonga is the largest island and has the largest population in the country. The growth of population in Rarotonga has almost mirrored that of the country as a whole. The population has tended to concentrate here. About 55% of the population was concentrated here in 1986. The population in proportion to the rest of Southern and Northern Group was about 32% and 13% respectively in 1986.

Cook Islands' population growth in the is shown in Fig. 3-1-1.

To forecast the future population would be quite difficult since it depends strongly upon the future economic opportunities in the Cook Islands relative to those available in other countries, especially in New Zealand.

3.1.2 Gross Domestic Product (GDP)

The gross domestic product (GDP) in the Cook Islands has experienced continuous growth in both current and constant 1990 prices from 1982 to 1990 as shown in Fig. 3-1-2 and Table 3-1-1 a) and b).

Fig. 3-1-1 Population Growth in the Cook Islands by Census Years
Source: Statistics Office

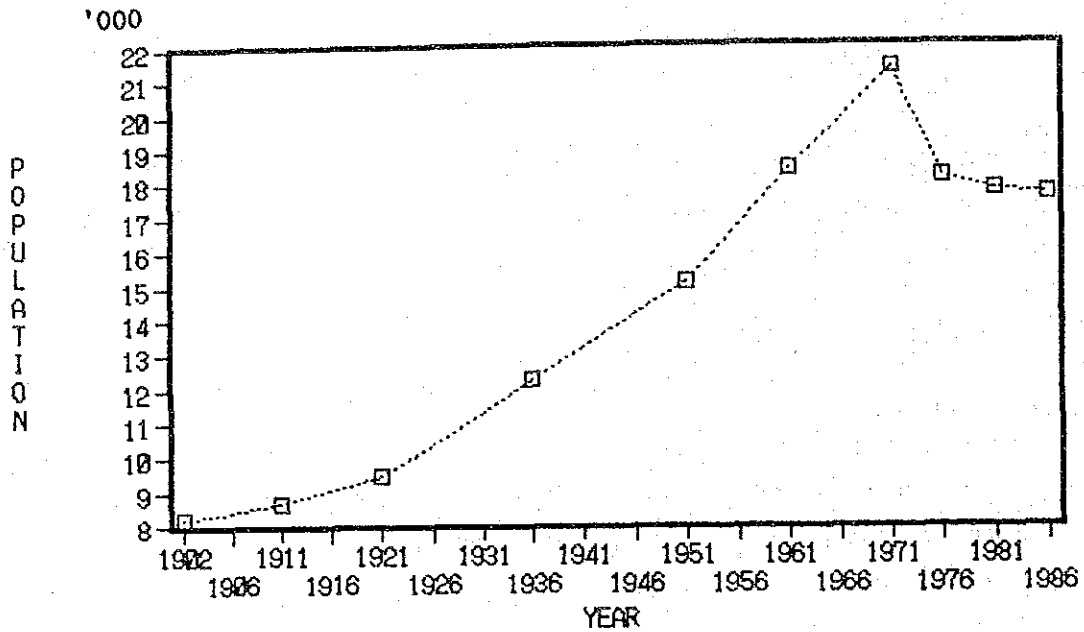


Fig. 3-1-2 GDP Current and 1990 Constant Prices from 1982 to 1990
Source: MOPED, Statistics Office

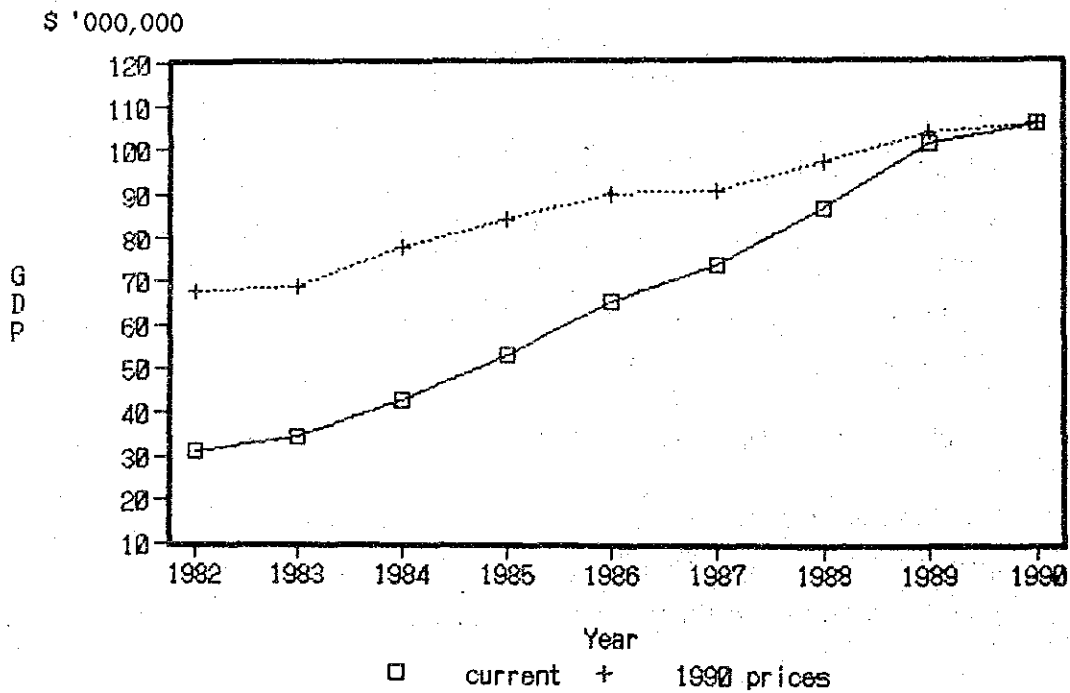


Table 3-1-1 a) GDP at Current Market Prices, by Industries

(\$ '000)

Industry	1982	1983	1984	1985	1986	1987	1988	1989	1990
Agriculture & fishing	6,667	6,567	7,413	8,200	8,965	9,793	14,281	19,747	13,891
Mining	95	47	93	74	47	41	106	11	404
Manufacturing	597	1,585	2,320	2,449	3,332	4,033	4,033	3,271	3,246
Electricity & water	47	137	420	56	715	1,151	265	375	1,036
Construction	833	864	928	1,406	2,742	3,937	2,706	3,449	2,485
Wholesale and Retail Trade, Restaurants and Accommodations	3,460	3,872	11,717	15,508	16,077	13,061	19,460	20,791	23,439
Transport and Communications	3,291	3,455	4,682	5,754	7,962	3,658	3,357	12,068	12,652
Finance and Business Services	813	622	1,282	2,079	4,654	5,095	3,051	11,525	12,679
Community, Social, Personal	463	647	772	1,017	1,312	1,056	1,146	1,824	1,393
Public Administration	7,767	9,646	11,307	13,666	16,459	19,333	22,959	25,330	27,135
Ownership of Dwellings	2,346	2,315	3,306	3,320	4,355	4,566	4,310	5,259	5,404
Less: Imputed Bank Charge	730	820	865	1,035	1,605	1,914	2,022	2,069	2,302
All Industries	31,040	34,437	43,076	52,695	65,014	72,711	86,735	101,481	105,334

Table 3-1-1 b) GDP at Constant 1990 Prices, by Industries

(\$ '000)

Industry	1982	1983	1984	1985	1986	1987	1988	1989	1990
Agriculture & fishing	17,285	16,819	17,272	17,627	17,437	14,852	13,391	13,213	13,391
Mining	186	34	151	126	61	49	117	12	404
Manufacturing	1,321	2,759	3,511	3,449	4,273	4,745	4,440	3,432	3,046
Electricity & water	99	260	720	94	964	1,401	969	1,329	1,036
Construction	1,738	1,720	1,675	2,173	2,715	4,797	4,157	3,649	2,485
Wholesale and Retail Trade, Restaurants and Accommodations	16,399	15,301	20,027	23,233	21,599	21,338	21,772	21,300	23,409
Transport and Communications	6,612	6,542	9,003	9,620	10,697	10,517	9,350	12,712	12,652
Finance and Business Services	1,633	1,177	1,850	2,115	6,252	6,138	10,127	12,139	12,679
Community, Social, Personal	931	1,225	1,320	1,523	1,762	1,283	1,282	1,711	1,393
Public Administration	15,027	16,427	17,726	19,607	19,330	20,924	24,005	26,065	27,135
Ownership of Dwellings	4,664	5,336	5,310	5,561	5,676	5,511	5,333	5,292	5,404
Less: Imputed Bank Charge	425	306	482	611	1,622	1,612	2,637	2,161	2,302
All Industries	57,721	58,845	77,584	84,232	90,139	90,598	97,267	103,390	105,334

Source: MOPED, Statistics Office

The basic economic sectors are (i) agriculture and fishery, (ii) wholesale and retail trade, restaurant and accommodation, and (iii) public administration. These three sectors make a strong contribution to the economy in the Cook Islands. The share of agriculture and fishing, however, especially agriculture, is decreasing. The other two sectors have maintained their share in these years.

The sector with the highest growth rate is the electricity and water sector, while the agriculture and fishing sector has the lowest growth rate.

3.1.3 Other Indices

1) Expenditure of Cook Islanders

Total family expenditure at Rarotonga was \$ 3,876 million in 1987. Distribution of expenditures by major group is as follows.

Table 3-1-2. Distribution of Expenditures

Items	Distribution (%)
Foods and beverages	53
Housing and household	15
Clothing, footwear etc.	7
Medical care	3
Transport, recreation and communication	6
Education	6
Taxes and others	10

Source: MOPED, Statistics Office

2) Price Increase and Inflation

The inflation rate in the last five years has averaged 7.7% annually, which constitutes a reduction compared to previous years. For the years 1967 to 1986, an average rate of 13.3% has been recorded; the lowest was 4.8% in 1970 and the highest was 24.1% in 1976.

Due to the characteristics of the Cook Islands' economy, inflation is largely of an imported nature and the correlation between inflation in New Zealand and the Cook Islands has been close.

Food items, manufactured goods and machinery are the most important sectors in terms of values. Imported food items contribute significantly to expanding the inflation rate since the expenditure distribution for foods (53%) represents a large portion of the total expenditures as described above.

3.2 Industries

3.2.1 Composition of Industries

The main industries in the Cook Islands are agriculture, tourism, manufacturing and fishery (marine resources).

The leading sector identified to stimulate the economy growth in the Cook Islands is tourism. Agriculture is the main productive sector in the Cook Islands and will continue to contribute extensively to the economy of the country, particularly the outer islands. Although the performance has generally been poor, there is a potential for fishery (marine resources).

In addition, large vein of manganic nodule was found within the economic territorial waters of the Cook Islands in 1989. Mining and other related industries will be able to commence operations sometime in far future.

3.2.2 Major Industries

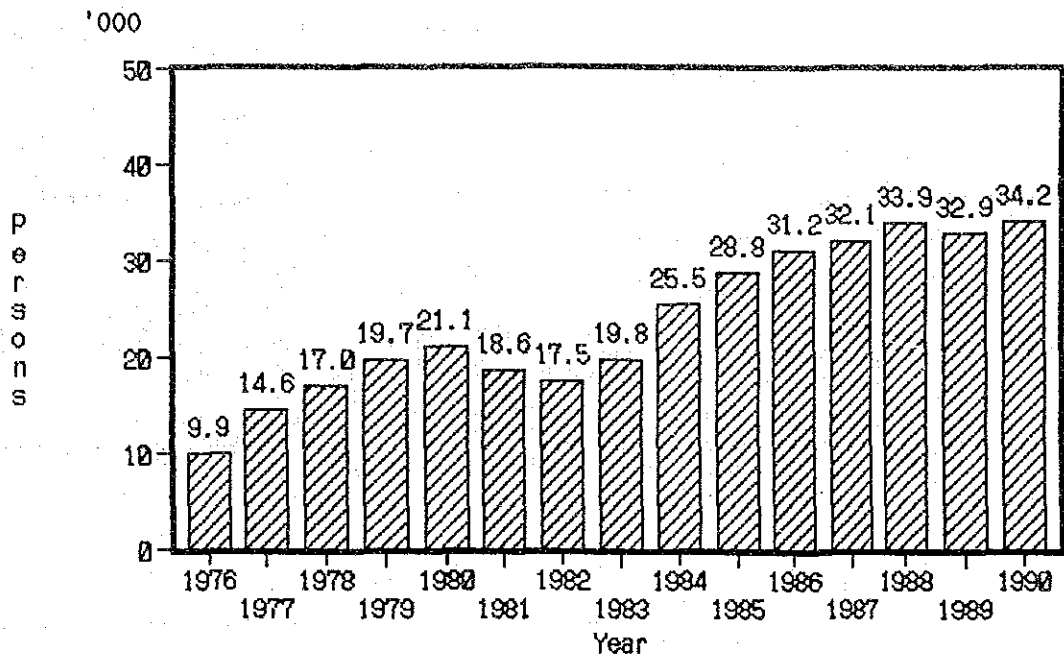
This section presents the current situation of the tourism and fishery industry, both of which will positively affect Cook Islands' economy in the future.

1) Tourism

Tourism has grown from the early 1970's to become the major foreign exchange earner and the principal force for economic growth in the Cook Islands. Tourism is also the largest export industry and provides more employment opportunities than any other single industry.

Significant tourism in the Cook Islands began in 1974 following the completion of the Rarotonga Airport in 1973. Tourist arrivals from 1976 to 1990 are shown in Fig. 3-2-1. Approx. 34.2 thousands tourists visited in 1990, which represents an almost three and half times increase over that of 1976. Furthermore, a jumbo jet began operation in October 1991. The majority of tourists come from New Zealand; this trend is unchanged at present.

Fig. 3-2-1 Past Records of Tourist Arrivals (1976 ~ 1990, '000 persons)
Source : Tourist Authority



In 1990 there were 618 rooms (hotels/motels) available in Rarotonga island, The Sheraton Hotel will open in 1993. The occupancy rate of the hotels and motels in recent years has been approx. 60%.

Tourism is currently confined to Rarotonga and the larger islands of the Southern Group as they offer accessible options from international tourist routes via domestic air and shipping services.

Most tourists arrive by air, while the proportion of tourists arriving by ship (mainly small cruisers and yachts) was only 1% of the total tourists in 1990. However, demand for the development of a marina is extremely high from the Government and private sectors from the viewpoint of the tourism development of the Cook Islands.

The Cook Islands suffers disadvantages in competing with favourably located destinations such as Hawaii, Fiji and Tahiti; from the higher cost of air fares to the Cook Islands than to the more developed and larger scale

markets in competing areas compounded by an absence of infrastructure support in marine leisure in the Cook Islands; the competition is fierce. Therefore, the development of marina facilities will contribute to the economy of the Cook Islands by increasing the number of calls for pleasure boats and tourist arrivals by ship in the future.

The 2.3 km runway at the existing airport is scheduled to be expanded and become a 3.0 km class airport for more comfortable use by jumbojet. This will be other alternative to add more attractive to the island in respect to the tourism industries.

2) Fishery (Marine Resources)

Marine resources play a significant role in the culture, and traditional diet of the Cook Islanders.

Subsistence and artisanal fisheries are the main activities in the Cook Islands. Subsistence fishing provides the Cook Islanders with a significant proportion of the protein requirement. It includes the collection of shellfish and edible seaweed, reef-fishing and netting, free-dive and scuba spearfishing, handline for reef fish, trolling and droplining for tuna from canoes and small boats. Artisanal fishing consists of fishing by small and medium sized operations within the 12 mile territorial limit on a part-time or full-time basis. It includes the capture of tuna and other pelagic fish, mainly utilizing conventional trolling methods around Fish Aggregation Devices(FAD's).

Most fishermen are engaged in fishing for their own consumption; any excess is sold on the local market (for restaurants and hotels). However, it is reported that there are a few fishermen who earn their living by fishing.

There were 234 imported open type fishing boats, 228 locally made and 52 for small commercial fishing and tourist activities in 1986. Since then, according to the Ministry of Marine Resources, the number of fishing boats is estimated to have more than doubled due to the increase in marine activities such as the pearl industry in the Northern Group and fishing activities in other islands.

Exports of marine resources from the Cook Islands are generally limited, but a small amount of frozen tuna is being shipped overseas from the islands in the Northern Group, and cultured pearls, pearl shells and troches shells have been significant export items. Considerable quantities of canned and frozen fish are being imported.

Although there has been limited development of the fishery industry so far, a high seas fishery industry for tuna and other migrant species within the vast Exclusive Economic Zone (EEZ) holds considerable potential for the future; in this respect, the development of fishing facilities will be urgently required in the Cook Islands. However, the appropriate management and technology for the use and conservation of marine resources must be carefully considered at the same time.

Chapter 4: Outline of Coastal Areas

Chapter 4 Outline of Coastal Areas

This chapter provides discussion with the present condition of beach and coastal areas. The existing land use and efforts conducted by the Government will also be discussed.

4.1 Land Use Classification and Government Agencies

4.1.1 Land Use Classification

The total length of Rarotonga's coastal faceline is approximately 31 kilometer long. Most of these facelines consist of reefs, lagoons, and beaches the scale of which differ from point to point.

Coastal damage caused by past cyclones varied depending upon land use, natural conditions of the coastal areas and the scale of the cyclones in respect to waves and surges.

Land use is also varying among:

- (a) Urban areas
- (b) Rural areas "A" (Where the beach road is close to the shoreline)
- (c) Tourism areas
- (d) Rural areas "B"
- (e) Natural areas

4.1.2 Government Agencies

Since the study covers the coastline of the island, various governmental agencies are involved in the study. The nominated executing agency of the project is MOPED. Other related agencies are:

- a) Ministry of Works, MOW
- b) Survey Department
- c) Conservation Department
- d) Department of Trade, Labour and Transport, TLT
- e) Waterfront Commission
- f) Customs Department
- g) Ministry of Marine Resources
- h) Ministry of Agriculture
- i) Tourism Authority

Among them, MOW, TLT, Waterfront Commission and the Conservation Department are the most important organizations in respect to both the coastal protection and port improvement.

4.2 Historical Background of Coastal Area Use

This section will present a brief description about the utilization of coastal areas by people in the past and the present. This information was provided by villagers and recorded during the perception study.

4.2.1 Before the Arrival of Missionaries

It is reported that Rarotongan islanders built their homes on the hills or the moderate slopes of the mountains. They cultivated the hills and swamps (marshes) for their living and, when necessary, they walked to the nearby lagoon and made sustenance fishing and shell collection. It is not yet clear why they lived on the hill. The following might be the reasons:

- (a) Simple farming
- (b) They were well aware of the disasters caused by cyclones, winds and surges. The forests on the hills might have provided them with good shelter against the wind.

There might have been no Ara Tapu at that time. The main access might have run on the hill from village to village. Thus, there might have been less property damage from cyclone waves and surges. Also, they might have known that:

- (a) The wind from the sea becomes weakened by barriers consisting of forest and earth.
- (b) Wave run-up could not penetrate into the higher position.

In addition to the above, the coastal area might not be suitable for cultivation due to:

- (a) Coverage by high trees
- (b) Sandy soil with a coral rock foundation and
- (c) Poor soil for cultivation due to rapid drain

They did not dig sand from the beaches for construction material. They did not cut down the trees in the beach forest for their housing purposes. They might not have worried about beach erosion. And there were no insurance companies to cover cyclone damages.

4.2.2 Affects Caused by the Missionaries

It is reported that the missionaries introduced not only their belief but also let people stay near the beaches where the flat area was suitable for maintaining communities. They built churches, chapels, schools and hospitals. Additionally, the Ara Tapu beach road was constructed along the shoreline.

4.2.3 Recent Trends

Modern life in the town has been accelerated by:

- (a) Introduction of car transportation
- (b) Better business opportunities
- (c) Easy shopping and education

In addition to these, younger islanders may have a tendency to stay near the beach. This may be influenced by the way of life in other countries having moderate climatic conditions.

The tourism oriented businesses here are located basically near the beach or along the beach main road. They include hotels, restaurants, shops, car rental shops, etc. To make way for this business, trees in the natural beach forest have often been cut down in order to make wider open spaces. They planted lawns and coconut trees for scenic purposes.

Some beach areas as seen at Villages Tokurau and Nukupure have been reclaimed artificially by widening the flat space seaward. Some of these bank have been eroded by cyclones.

The development of the island has required more sand for construction purposes and, as there is little river sand, they dug up the sandy beaches and passages for this use.

Due to the increased concentration of people living near the beaches, the seawater quality near the town may be contaminated by waste water and solid wastes.

4.3 Existing Land Use

This section deals with the existing land use on the island. The description will commence with the outline of land use then concentrate on land use in the coastal area.

4.3.1 General View of Land Use

The island is located on the Tropic Capricorn and has a total area of about 75 square kilometers. About 68 % of the area is mountains covered by tropical forests and exposed volcanics. The highest mountain is Te Manga that is 653 meters above the datum, Mean Sea Level (MSL). The gradient of mountain slopes are relatively steep (30° or more), and likely are unsuitable for development by human beings. One of the important uses of this area is to provide sources of public utilities, such as power generation and intakes and reservoirs for water supply. Of course, this area has not been damaged by cyclone waves and surges.

Areas other than mountains consist of relatively flat topography, namely hills, marshes or wet lands and beach banks.

This hilly area shares about 16 percent (or 12 square kilometer) of island's total areas.

The hills actually form the skirts of the mountains, and range between +5.0 meters up to +30 meters above MSL, having an average slope gradient about three to six degrees. This area is utilized mainly for the agricultural development of fruit culture. Villager households are also scattered here. Households density is larger in the northern areas between Village Pue and Village Pokoinu, the most densely populated area.

Ara Mctua, one of two main roads of island runs through the middle of this area. This road might be the main road until the Ara Tapu beach road was developed.

These areas have not been damaged by cyclone waves and surges. This area forms a ring-shaped belt of 400 meters wide around the island and is located at the toe of the mountain but before the marsh and beach bank.

The marsh (or swamp) consisting of low wetlands with mud soil is 150 meters wide and is located between the hill and the beach banks. The

average ground level ranges from +1.5 meters to +5 meters above MSL where the richest soil and active floras and faunas can be seen. It is 4.5 square kilometer and shares 6 percent of the total land. Use of the wetlands is relatively lower due to frequent flooding and limited accessibility. Fine particles with rich earth is discharged here by rain water flowing down the hillside. Domestic sewerage concentrates here and is naturally treated by rich water and biochemical activities. When heavy flood water flows from the upper streams it may temporarily back up here until the lowering of the water level after the cyclone passes. Thus, this area plays a passive role in the stabilization of the natural environment.

The largest past development here was the Rarotonga International Airport with a 2,300 meter runway that runs to the beach bank and partly down to the lagoon.

The beach bank (or coastal area) is a 250 meter wide ring along the waterfront. It is 7.5 square kilometer in size and shares about 10 percent of the total land. The height of this land ranges between +1.5 meters to +7.5 meters above MSL.

The shoreward area of this is the last sea defense line. The beach bank consists geotechnically of coral rock and coral sand including boulders. According to the survey results, it is assumed that the beach bank was shaped by coral rock piling caused by waves generated by previous cyclones. The surface of this area is generally covered by sandy earth. More than 70 percent of the total population currently inhabits this area. Most of the public facilities, such as schools, the hospital, churches, cemeteries, sport grounds and government offices are located here.

The private enterprises located here include shops, restaurants, a factory, fuel storage tanks, motels and hotels except for the Sheraton which is under construction in the hilly area and wetland at Village Vaimaanga. The beach main road, Ara Tapu, is the only access existing along the shoreline. Connecting accesses from Ara Tapu lead to Ara Mctua.

About 40 percent of this area is covered by trees (Utu trees, iron trees, coconut trees, etc.). It is reported that the trees along the beachline are gradually being cut down for artificial land use. This area is the main target for providing appropriate coastal protection work.