

**Appendix D-1 Outlines of Master Plan and
Short-term Development Plan
Preparation**

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This section deals with work methodology of most important part namely "Master Plan" and "Short-term Development Plan". Discussion will commence by Stage 3 and complete by Stage 7 as indicated in Table 2-1.

1. Formulating the Master Plan for the Year 2010: Stage 3

Preparation of the original Master Plan was conducted in Tokyo. It was based on the analysis of collected data and preliminary discussions undertaken between the Government of Cook Island and the team at the study office in Rarotonga in the middle of November, 1991. On the second visit in February 1992, extensive discussions were carried out for finalization of plan.

This section deals with highlights of the work methods for the preparation of the Master Plan.

Master Plan for Coastal Protection

1) Setting up the Area for Coastal Protection [Step 6]

Based on the result of the field survey conducted and the data/information collected in the island, areas where coastal protection or countermeasures are required were selected. These selected areas are listed in order of priority.

In order to standardize site selection, the entire 31 km long shoreline was divided into five zones by characteristics of coastal damage during Sally.

2) Classification of Erosion Mechanism [Step 7]

Based on the collected information, the analysis on the erosion mechanism of the island was conducted.

3) Selection of Suitable Countermeasures [Step 8]

The required measures for coastal protection will depend upon the demand for protection based on required land use. It will then be evaluated

whether or not the present coastal condition is provided with enough protection. If any damaged area is not yet protected, it will be a target for the provision of suitable countermeasures.

Before the selection of the best countermeasures, it is recommended to confirm the possibility of modification of land use by means of setting the existing facilities far enough back to maintain their safety. If this is possible, the necessity of protection will be reevaluated based on the new facility location.

When it is identified that countermeasures should be provided, the objectives of such work should be clarified place by place.

Possible countermeasures will be provided with one or a combination of the following aims.

- a) Against wave over-topping under wave set-up
- b) Against erosion of beach bank consisting of coarse particles like coral rock
- c) Against erosion of beach slope consisting of fine particles like sand

Appropriate countermeasures will be selected among:

- a) Defense on the lagoon
 - Detached submerged breakwater
 - Detached exposed breakwater
 - Groin and jetty
- b) Defense on the shoreline
 - Rigid seawall with steep slope
 - Flexible seawall by moderate slope
 - Flexible riprapping by gentle slope
 - Artificial supply of sand (Sand nourishment)
- c) Defense behind top of beach
 - Dike by coral rocks
 - Plantation

Adaptability of these protection works should be evaluated by means of cost comparison between the prevented damage and the protection cost.

Master Plan for Port Improvement

Port improvement is concentrated at two existing harbours, Avatiu and Avarua. Due to limited existing passages suitable for port use, these harbours should be developed to meet all future cargo demands. The existing areas adjacent to these ports are the most valuable spaces for public use in the island. The present congested land use may be largely improved if additional land space is obtained through reclamation works.

1) Projection of Land Requirement [Step 9]

Land requirements can be classified into three categories, namely:

- a) Areas required for future port expansion, Avatiu and Avarua
- b) Areas required for public use in areas adjacent to the two ports
- c) Areas required for buffer zones to ensure the mitigation of cyclone damage

Of the above, item b) will be over-lapped with item c).

Land requirement for the space adjacent to the two ports, Avatiu and Avarua, shall be projected until the year 2010. Land requirement will be based on the land demand for such use as tourism, leisure, shopping, parking, roads, etc.,

2) Land Use Plan (Adjacent to the two ports) [Step 10]

A plan to reclaim the lagoon between Avatiu and Avarua together with the eastern coast of Avarua should be studied as a part of the coastal protection work.

The land use plan for this area will be prepared with the following included:

- a) Public space for amenity such as a park
- b) Public space to mitigate traffic congestion, such as road widening and parking areas
- c) Others

The faceline of the coast and its protection means will harmonize with the proposed coastal protection. It will be important to consider the environmental affects and landscaping by reclamation works since the said area is one of the tourism centers.

3) Port Traffic Forecast [Step 11]

The hinterland of both Avatiu Port and Avarua Port is inclusive of the entire area of the Cook Islands.

The cargo handling volume at these ports in 2010 will be forecasted based on the estimated economic activity and social conditions in 2010. The forecast of the cargo handling volume will be carried out for each major commodity group. The major commodity groups at present are light industry products, agriculture products, foods industry products, construction materials, oil products and machinery. Therefore, the cargo handling volume will be estimated when the future trend of each major commodity group, population and GDP can be ascertained.

The volume of container cargo will be estimated using the possible ratio of containerization.

The estimation of the number of ships calling at Avatiu Port and Avarua Port in 2010 will be carried out for each kind of ship (cargo ships, passenger ships, and pleasure boats).

With respect to fishing related facilities, the number of fishing boats and the volume of fish catch in 2010 will also be forecasted by taking into account the present situation, past records and future trend of fish catch and exports, fishermen and the policy for the development of the fishing industry in the Cook Islands.

4) Basic Concept for Port Improvement [Step 12]

The basic concept for port improvement at Avatiu Port and Avarua Port will be formulated in accordance with the long-term plan (target year 2010).

Development potential, necessity of port improvement, necessary future functions, physical port development and coastal protection plan near the port area are included in the basic concept.

Function allocation to both ports will be carried out.

- Commercial port function
- Marina function
- Fishery function

5) Basic Layout of Port Facilities [Step 13]

a) Estimation of Required Port Facilities in Avatiu and Avarua Ports

Estimated port demand will be distributed to Avatiu and Avarua ports in accordance with the basic concept. Then, the scale of the main port facilities, such as protective facilities (breakwaters), mooring facilities, cargo handling facilities, storage facilities and so on, will be determined by taking into account not only cargo volume and the number of passengers but also future changes to the cargo handling system and the dimensions of vessels.

Development of facilities for marine leisure will be required in order to achieve the target the Government of Cook Islands has set. Therefore, the required scale of facilities, such as marina for pleasure/fishing boats to call and moor, will also be estimated.

Fishery section will include loading/unloading berths, stand-by berths, fish market, ice making plant, parking space based on the estimated fish catches and boat size.

b) Formulation of Layout Plan of Port Facilities

A layout plan of the port facilities to be developed and for those already existing to be improved will be formulated to secure the required port demand shown above. In this Port Area, the safety of the back-up area depends upon the presence of coral lagoon and coastal structures to provide protection against cyclones. Accordingly, the plan shall be formulated in conjunction with the plan of coastal protection, since the layout of breakwaters share a close relation with the coastal protection plan. Also, a plan which gives due consideration to the surrounding environment shall be drafted, especially scenic conditions, as this Port Area is an important district for commercial and tourist activities.

c) Formulation of Reclamation Plan

A layout plan for reclamation will be formulated to meet the future demands for land use. The urban area in Rarotonga Island is limited due to its shape along the coast, and the existing area between Avatiu and Avarua ports has already been developed and the land area to be expanded is small at present. Therefore, future land space for various activities will be obtained by means of reclamation of lagoon. The land for marine leisure to expand recreational functions is also required from the viewpoint of the tourism development.

Since the revetment for reclamation also includes coastal protection, structural features and layout of the revetment shall be determined according to the coastal protection plan.

6) Rough Design and Cost Estimate [Step 14]

Rough design and cost estimation for the afore-studied coastal protection and port improvement will be conducted.

7) Phased Development Plan [Step 15]

The Master Plan will be phased into certain period of years up to 2010, considering the priority.

8) Preparation of the Interim Report [Step 16]

The report will contain various study items for the preparation of Master Plan.

2. Submission of the Interim Report: Stage 4

The Interim Report will be submitted to the Cook government and discussion will be held between two parties. The report shall be reviewed and modifications will be given based on the discussion accordingly.

3. Feasibility Study for the year 1997: Stage 5

Based on the discussions on the proposed phased development plan and priority of project components, work items for the short-term development will be evaluated through the feasibility study. 1997 is the study's target year.

Draft Final Report should be prepared to report the following informations.

Short-term Development Plan for Coastal Protection

1) Basic Layout of Coastal Protection Facilities [Step 18]

The short-term coastal protection plan will focus on the Avatiu/Avarua coastal area and adjacent areas. The protection work will cover the coastal area up to the existing airport to the west and Health Department at Village Vaikai to the east.

2) Rough Design [Step 19]

The coastal protection work proposed will be designed by considering appropriate construction method and available local materials. Drawings will also be prepared as a result of the design.

3) Prediction of Coastal Damage (with/without project) [Step 20]

Coastal damage caused by future cyclones will be predicted for the following two cases: when no protection is provided; when protection is provided. In order to evaluate the benefit of the proposed coastal protection for the upcoming economic analysis, the balance of damage between the two cases will be calculated.

Short-term Development Plan for Port Improvement

1) Layout Plan of Port Facilities [Step 21]

The layout plan of major port facilities will be drawn up to meet the cargo demand and port requirements for the years up to 1997 considering the phased development plan of Master Plan. Systematic use of the two ports will be studied. The allocation of port functions to two ports will be studied considering the following:

- a) Construction economy by optimum investment
- b) Urgent requirements in terms of coastal protection
- c) Urgent requirements for port improvement

Although further discussions may be required, the following two schemes will be evaluated:

- a) Avatiu port development only
- b) Simultaneous development of both ports

The layout will also include utilization of the area to be reclaimed for further land requirement and partly for the buffer zone during a cyclone.

2) Rough Design [Step 22]

Rough design for the following facilities will be carried out:

- Berthing facilities
- Turning basin and approach channel
- Breakwater
- On-land port backup facilities
- Major cargo handling equipment
- Seawall
- Land reclamation work
- On-land facilities in the reclamation area
- Others

Drawings will be prepared as the result of the design.

Type of facilities will be proposed to meet the construction circumstances including local material availability.

Integration of Short-term Development Plans for year 1997

In order to evaluate the project feasibility, the proposed work will be assessed by a quantitatively monetary scale. A work component with higher priority and an urgent requirement may be adopted as the Short-term Plan for year 1997.

1) Construction Program and Cost Estimates [Step 23]

The quantity of work will be calculated based on the proposed plan. Unit prices will be estimated for each work component.

Based on local construction conditions a preliminary construction program will be drawn in a bar-chart form. Construction costs together with operation and maintenance costs will be estimated accordingly. The costs will be divided into the local components and foreign components. Tax and

land costs will be clearly separated for the estimation of the economic cost. Appropriate contingencies for both price escalation and physical changes should be included.

2) Operation and Maintenance Program [Step 24]

The operation and management program as well as the maintenance program for efficient activities in the port area will be prepared. Amendments to the existing system may be proposed, if necessary. The management program will include:

- a) Port organization
- b) Yard operation
- c) Customs
- d) Environmental aspects

With respect to coastal protection maintenance, a check-up monitoring system will be proposed.

3) Economic and Financial Analysis [Step 25]

An integrated economic analysis will be conducted for all of the proposed coastal protection and port improvement work. A preliminary financial analysis will be undertaken solely in respect to port improvement since no financial income is generated by coastal protection work.

a) Economic Analysis

The appraisal of the feasibility of the Integrated Short-term Development Plan will be carried out for the target year 1997 by means of a cost-benefit analysis from the viewpoint of the national economy. The appraisal will be basically performed supposing "Without project" case in comparison to "With project" case. The economic internal rate of return (EIRR) will be calculated by measuring the assumed economic costs and benefits.

Those benefits which cannot be measured quantitatively, but are considered to be important, will be examined qualitatively.

b) Preliminary Financial Analysis

The viability of the project is analyzed to determine if the investment required to implement the Short-term Port Improvement Plan can be

recovered once the port begins to generate revenue, and whether the project has the potential to be profitable by applying the financial internal rate of return (FIRR). The port tariff may be modified, if necessary, in order to improve financial conditions.

4) Conclusions and Recommendations [Step 26]

This is the summary of all of the studies to evaluate the Master Plan and the Short-term Plan, and how the project will effect Cook Island's development. Any recommendations relating to successful project implementation will also be prepared.

5) Preparation of Draft-Final Report [Step 27]

This report will contain study items for the Short-term Plan in addition to the Master Plan.

- Background of Project
- Results of Investigation
- Data Collection
- Master Plan
- Short-term Plan
- Economical and financial analysis
- Consideration to environment
- Conclusions and recommendations

4. Submission of Draft-Final Report: Stage 6

1) Submission and Discussion of Draft-Final Report [Step 28]

20 copies of the Draft-Final Report will be submitted by JICA and reviewed by the Government of Cook Islands for comments.

5. Preparation of Final Report

1) Preparation of the Final Report [Step 29 as final one]

Comments on the Draft-Final Report prepared by the Government of Cook Islands shall be incorporated in the report accordingly.

40 copies of the report was submitted by JICA to the Government of Cook Islands at the beginning of September, 1992.

Note, Explanatory Notes for the comments and Final Report were submitted to the Government of Cook Islands prior to the submission of Final Report.

