CHAPTER 5

MANAGEMENT AND OPERATION

5. MANAGEMENT AND OPERATION

5.1 Present Organization

The Betio Port is now being operated and managed by Kiribati Shipping Service Ltd. (KSSL) under the control of the Ministry of Transport, Communications and Tourism (MTCT). The port activity of the Betio Port has been enforced by the Kiribati Ports Authority Act 1990 (KPAA) enacted by Parliament on 29 December, 1990 and at the same time, restricted by the Harbours Ordinance (Cap 40).

Based upon the KPAA, the Government was to separate both functions of shipping company and port authority possessed by Shipping Corporation of Kiribati (SCK) after its dissolution and to built two companies.

However, KSSL has been only established and the company has taken almost SCK's business.

Organization Chart of MTCT and KSSL are shown in Figures 5-1-1 and 5-1-2.

Port staff related with port activity is shown in the following item (1) and (2).

(1) Existing Port Staff in KSSL Organization

The existing staff in KSSL performing Port functions are:

a) Port Manager	1 person
b) Wharf Supt and other operation staff	18 persons
c) Warehouse Supt and other operation staff	18 persons
d) Engineering Manager	1 Person (part-time)
Sub-total	37 persons plus 1 part-time
e) Accounting, Administration Tug, Stevedoring staff	35 persons
TOTAL	**72** persons plus 1 part-time

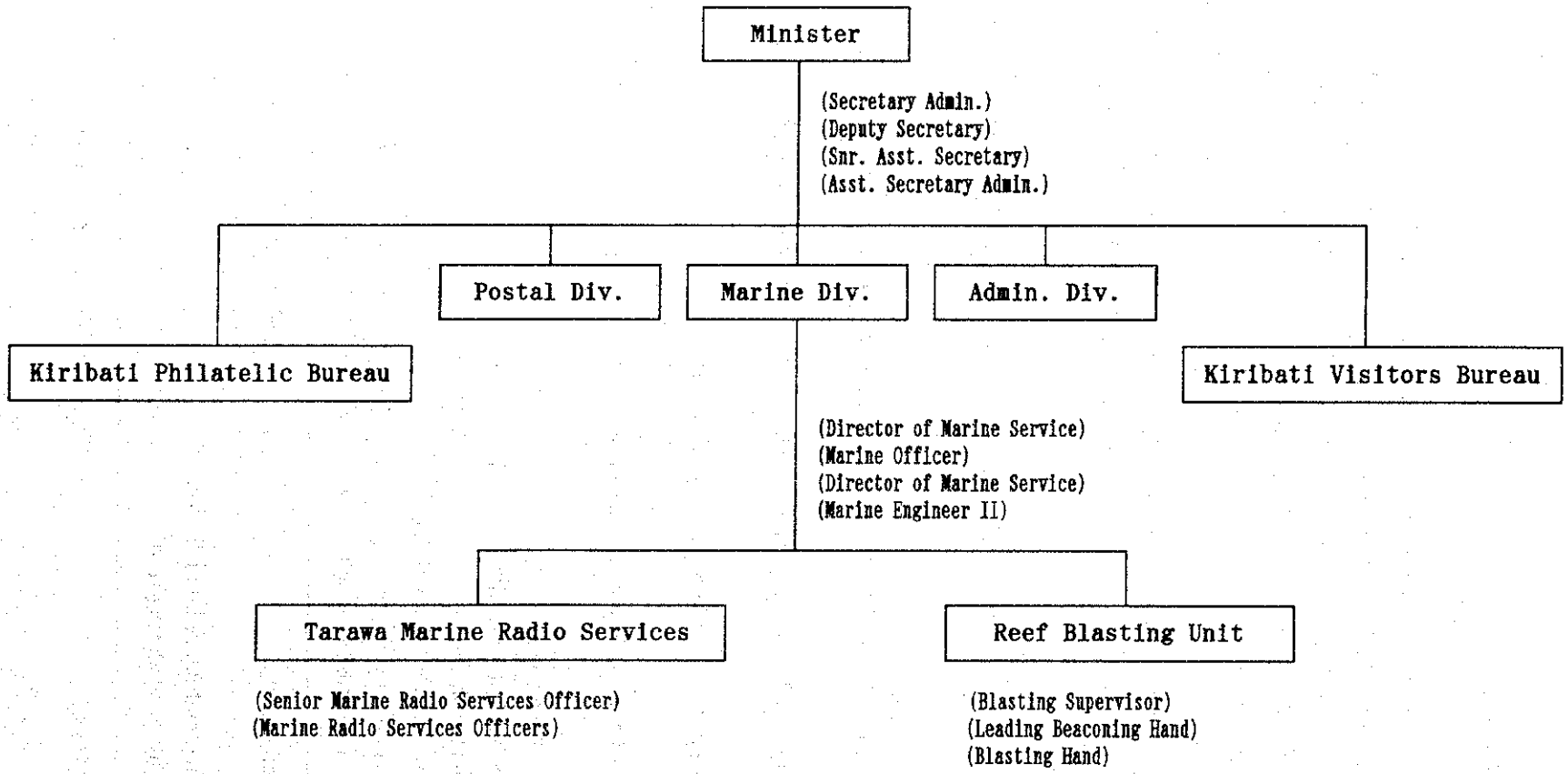

Figure 5-1-1 Organization Chart of the Ministry of Transport, Communications and Tourism (MTCT)

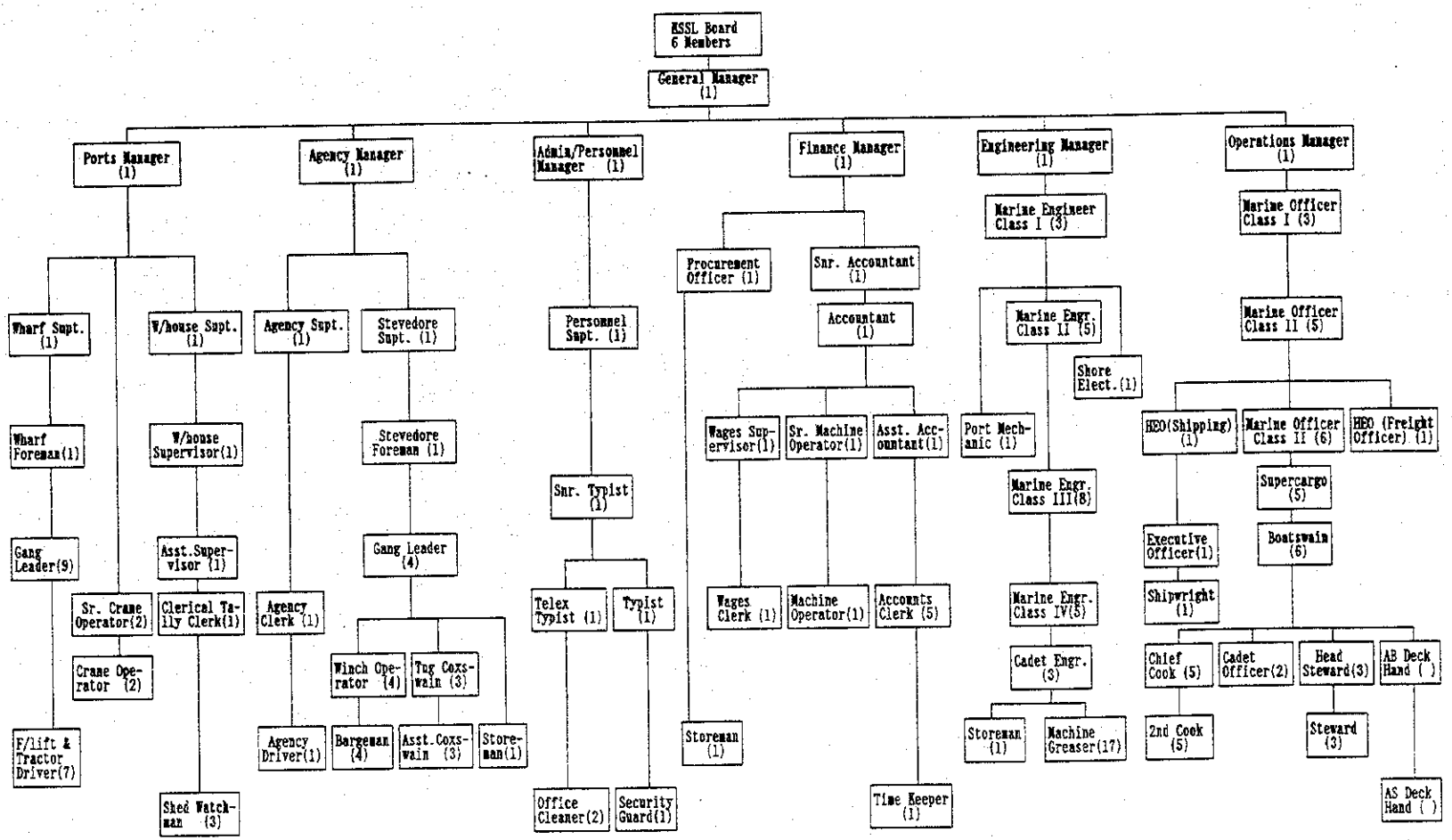

Figure 5–1–2 Organization Chart of Kiribati Shipping Services Limited (KSSL)

Casual daily rated staff are not included. Because they are part of the KSSL organi zation, various support services are rendered by KSSL's main staff in the financial, general administrative, engineering and personnel functions. The main thrust of KSSL's activities is its shipping and agency services, with less attention given to Port services.

(2) Existing Staff in Marine Department.

The existing staff in the Marine Department of the Ministry of Transport Communica-tions and Tourism (MTCT) who are performing port-related duties are :-

a) Director of Marine	1 person (part-time)
b) Snr. Marine Radio Officer	2 persons
c) Marine Radio Officer	7 persons
d) Marine Officer (Class 1)	1 person
e) Marine Engineer (Class 2)	1 person
f) Senior Accts Clerk	1 person
g) Reef Blasting Supervisor	1 person
h) Beacon Leading Hand	1 person
i) Beacon Hands	2 persons
	16 persons plus part-time

The Marine Radio Section maintains a 24 hours watch on a shift system, and contacts vessels approaching the port and passes information to the Pilots, who are KSSL staff-ing doubling up as licensed pilots. This is satisfactory for the current situation when there is no night pilotage and calls by international vessels are about once every month. Local vessels do not take pilots.

5.2 Kiribati Ports Authority Act 1990

(1) Introduction

The Kiribati Ports Authority Act (KPAA) shown in the Appendix 5-2-1 was enacted by Parliament on 29 Dec. 1990 but has not yet been implemented because of various reasons including the lack of suitably qualified staff to fill the principal positions.

It is noted that at the same time the Harbours Ordinance (Cap 40) is still in operation which permits the declaration of ports by the Minister and certain provisions including the levying of port dues and other charges.

(2) Overlap of Laws

1) The Harbours Ordinance

The old Harbours Ordinance provides for :-

i) The Declaration of Harbours by the Minister.
ii) The Appointment of Harbour Masters and port officers.
iii) The Powers of the Harbour Master and the penalties for non-compliance
iv) Signals for pilotage services, licensing of pilots and procedures and fees for licensing of pilots.
v) Explosives and the Handling of Dangerous Cargo.
vi) Wrecks, Obstructions, Moorings and the control of erection of wharves, slips etc.
vii) Prohibited Anchorages.
viii) Powers of Entry of Harbour Master in connection with lights.
ix) Lights and Light Dues.
x) Government wharves and Wharfage Dues.
xi) Harbour Dues and Port Charges.
xii) Offenses and Miscellaneous items (including Regulations, which, it is understood, covers the declaration of Betio Port and the Government Wharf at Bairiki, Pilotage fees and other miscellaneous fees).

In terms of modern port legislation, the above Harbours Ordinance are usually promulgated in the form of subsidiary Regulations made by the Minister under powers provided in the main Act. Extract from Harbours Ordinance (Cap 40) is shown in the Appendix 5-2-2.

2) Kiribati Ports Authority Act (KPAA)

The Kiribati Ports Authority Act enacted in Dec. 1990 is more comprehensive and is intended to establish a separate legal entity with autonomous functions and powers, including financial viability. It is more in keeping with legislation for autonomous port authorities in other countries, which gives the port authority wide powers to operate ports and regulate shipping activities and collect fees (dues and charges) for services rendered in a business-like port-user oriented manner.

The Ports Act distinguishes its functions as a separate port authority, and does not include operating shipping services (KSSL) or shipping agencies.

It spells out in fair detail :-

i) The establishment of the Port Authority and its membership.
ii) The Functions and Powers of the Authority.
iii) The Finances of the Authority, and its application.
iv) The Dues and Rates for various services.
v) The Appointment of Port Masters and Deputy Port Masters.
vi) The liability of the Authority for loss or damage to goods and the liability of its employees.
vii) Miscellaneous Provisions and offenses.
viii) Regulations (including handling of dangerous goods)

a) Adequacy of Provisions of the Ports Act.

The Provisions in the Ports Act 1990 appear to be adequate except for the followings :

i) The vesting of assets and liabilities of the Kiribati Shipping Corporation should be properly and carefully done as since 1990, KSSL had assumed many activities, including port functions. (Section 5).

ii) The submission of annual and supplementary budgets for approval by the Minister is inappropriate as it takes away the financial autonomy of the Port authority. However, there should be no objection to submit the budgets for the information of the Minister. (Section 14 -Estimates).

iii) The Authority should have to appoint the Director of Audit, or any duly recognized public accountant as its auditors. (Section 15).

iv) Though under Section 38, any person engaged by the Authority shall be deemed to be the servant of the master or owner of the vessel, it would be better to spell out in detail the declaration of pilotage districts and compulsory pilotage as well as regulating the employment and discipline of pilots etc. as this is international practice (see Schedule).

v) Similarly towage or assistance by tugs for berthing and unberthing of vessels should carry no liability but be deemed to be acting as servants of the owners or masters of vessels so assisted.

vi) Subsection 6 and 7 of Section 2 of Schedule 1 seem to be in conflict – one section should be adequate.

vii) The appointment of a General Manager as Chief Executive Officer instead of the Port Master (Schedule 2). This is important as the Chief Executive Officer shall be fully accountable to the Minister for the efficiency and financial viability of the port under his jurisdiction.

viii) New comprehensive Regulations under the Ports Act should be made as soon as possible and the Harbours Ordinance (Cap 40) should be repealed.

The provision that appointments should be recommended by the PSC should be removed.

b) Port Land and Property

All land within Port Limits should be consolidated in one lease of (say) 99 years in the name of the Port Authority by the Government in one title deed, and the Port authority will then sub-lease to the various existing lessees (eg KSSL and Copra Co-operative) the land and buildings for the unexpired periods of their existing leases. This will clean up odds and ends.

The Authority will then have full control of its premises which should be used solely for port activities.

5.3 New Port Organization

In the Seventh National Development Plan, separation of SCK to KSSL and KPA is described as quoted below;

"To improve inter-island shipping services in the country, Shipping and Ports Divisions of the Shipping Corporation have been separated and two separate entities - Kiribati Shipping Services Ltd (KSSL) and Kiribati Ports Authority (KPA) have been established."

5.3.1 Kiribati Ports Authority

(1) Introduction

Obviously, Kiribati Ports Authority (KPA) to be established cannot commence operations from a zero position, and some of the existing staff in the Port Section of KSSL, and the Marine Department should be taken over. Even if anyone is taken over, he should be prepared to accept new pay scales and conditions of service as a new employee.

Since a new organization is to be created, it is considered that the functions of the Director of Marine which are complementary to that of the Port Authority, the two functions could be combined in one organization with some offices performing dual duties. The new organization reflects this objective.

(2) Board of Directors

Under Schedule 1 of the Ports Act, the Authority shall consist of not more than 5 nor less than 3 members all appointed by the Minister. Not less than 1 nor more than 3 shall be public officers at the time of appointment.

The criteria for appointing a member of the Authority is not mentioned, but it is assumed that the Minister will exercise his wisdom in appointing men who are knowledgeable in shipping and commercial affairs.

(3) Port Organization

1) An operations oriented organization with a minimum number of permanent officers is being proposed and is shown in Figure 5-3-1 and Table 5-3-1. In drawing up the organization, it is inevitable that some of the existing officers in the Port Section of KSSL and the Marine Department will be absorbed. However, the Port should be as selective as possible, and be consistent with Government practice.

2) Principal Officers

(a) General Manager

The General Manager should be the Chief Executive Officer (acting also as Director of Marine) rather than the Harbour Master and reporting direct to the Board of Directors as is common practice in port elsewhere. The General Manager will be responsible for the overall operations and efficiency of the port, and should ensure that the operations generate enough revenue to pay for all.

i) Interest and sinking fund contributions on any loan payable by the Port.

ii) The salaries, fees and allowances of members of the Board.

iii) The salaries, fees, allowances, pensions, gratuities, provident fund, and other benefits of the employees, agents auditor, technical and other advisers of the Authority.

iv) The working and operating expenses of the Authority, the provision for maintenance of any of its installations and the performance of its functions.

v) Such sums as the Authority may consider appropriate to set aside in respect of depreciation or renewal of assets of the Authority, having regard to the amounts set aside of revenue under paras. (a) and (b).

vi) Any other expenditure authorized by the Authority properly chargeable to revenue.

Figure 5-3-1 Organization Chart of Port Authority (KPA)

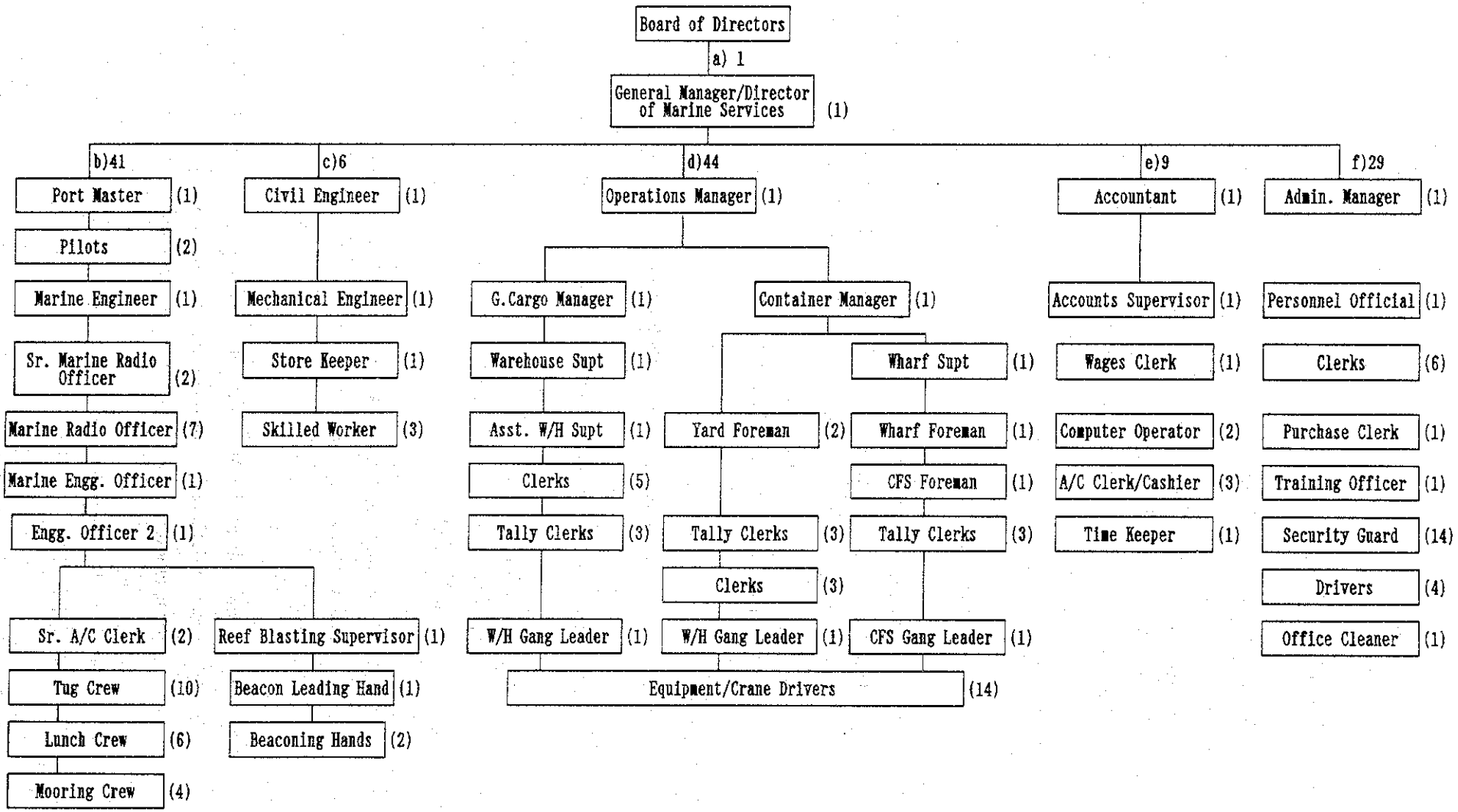

Table 5-3-1 Number of Staff of KPA and Office Area

(I)	OFFICE Title	Nos	Unit Aera (m2)	Total Area (m2)	Remarks
1	Board of Directors	3		20.52	Meeting Room
2	General Manager	1	18	18	Single
3	Port Master	1	13	13	Single
4	Pilot	2	5.2	10.4	
4	Marine Engineer	1	13	13	Single
5	Sn. Marine Radio Officer	2	5.2	10.4	
6	Marine Radio Officer	7	5.2	36.4	
7	Marine Eng. Officer	1	5.2	5.2	
8	Eng. Officer	1	5.2	5.2	
9	Civil Engineer	1	13	13	Single
10	Mechanical Engineer	1	5.2	5.2	
11	Operations Manager	1	13	13	Single
12	General Cargo Manager	1	5.2	5.2	
13	Container Manager	1	5.2	5.2	
14	Wharf Superintendent	1	5.2	0	
15	Accountant	1	13	13	Single
16	Account Supervisor	1	5.2	5.2	
17	Wages Clerk	1	5.2	5.2	
18	Computer Operater	2	5.2	10.4	
20	A/C Clerk, Cashier	3	5.2	15.6	
21	Admin. Manager	1	13	13	Single
22	Personell Officer	1	5.2	5.2	
23	Clerks	6	5.2	31.2	
24	Purchase Clerk	1	5.2	5.2	
25	Training Officer	1	5.2	5.2	
	Total Nos of Officer :			43 persons	
	TOTAL OFFICE AREA :			282.92 m2	
(II)	TOILET (for men and wemen)				
	Water Colset	2	1.3	2.6	
	Urinal	3		3.9	
	Wash fountain	2		1.9	
	Sub-total			8.4	
	Total			12.9	
(III)	Kitchinette			8	
(IV)	Corridor			36	
TOTAL				339.82	

(b) The Port Master

The Port Master and Deputy Port Masters shall be responsible for the administration and implementation of Port Rules or Regulation to be promulgated by the Minister for the proper and orderly conduct of activities of vessels within port limits. In addition, he will keep and maintain a proper record of Kiribati vessels, and conduct ships surveys or matters incidental thereto.

(c) Operations Manager

The Operations Manager will be a key man who will take charge of all cargo handling activities (including containers) on the landward side as well as stevedoring of vessels at the wharf or anchorages. He will also be responsible for the tugs and barges used for the efficient transfer of containers and other cargo from ship to shore, or vice-versa and the use of cranes, forklifts and other equipment on shore.

He will ensure that cargo and containers are properly stacked in the warehouses and open storage areas. For these purposes he will supervise, with the assistance of various officers, all labourers for the efficient cargo handling operations. Cargo for delivery should be properly documented for statistics purposes and control of all container and cargo movements.

Casual Labours are used to handle cargo and containers.

(d) Finance Manager (or Financial Controller)

The Finance Manager will be responsible for keeping proper accounting section should produce outputs for each month for discussion with the General Manager and Operations Manager and the need to review the Tariff structure and levels so that the Authority operates as a viable entity.

(e) Engineering Manager

The Engineering Manager's function is to ensure that the tugs, forklifts and other operating equipment are all maintained in tip-top condition, and be readily available to the Operations Section to handle containers and cargo. To achieve this, he should ensure that his stock of spare parts is kept at the opti-

mum level.

Record of equipment availability, actual hours of usage, down-time (including repair time) should be maintained for each piece of equipment so that operating costs can be calculated with a reasonable level of accuracy, and whether more equipment is needed.

A preventive maintenance program should be introduced so that the equipment does not break-down too frequently which will in turn disrupt operations and delay the turn-round of vessels.

(f) Administration/Personnel Manager

This manager should be responsible to ensure that the personnel recruited should be properly qualified and trained. Another primary function is to look after the welfare and good morale of the employees, so that the Port can recruit and retain good calibre personnel.

Legal, Housing, Purchasing and Port security also fall under his jurisdiction.

Security should be maintained at a high level of efficiency as this will affect insurance premiums for cargo imported into Kiribati, and the credibility of the port. Training of staff at all levels should be carried out continuously to up-grade the skills of the workers upon which lies the basis for higher productivity and increased pay for the workers.

(4) Pilotage

1) Pilotage for overseas vessels

Pilotage is a responsibility of the Port Authority but it is not compulsory. It also has no pilots. However, there is an arrangement, whereby two Master Mariners in KSSL are licensed to pilot overseas vessels. Most overseas vessels take pilots for safety reasons during daylight hours only.

2) Compulsory Pilotage

Pilotage should be made compulsory within Port limits for vessels over 75 GRT.

These pilots should be protected by a legal provision in the Ports Act, whereby they are deemed to be the employee/servant of the Master or owner of the vessel while under pilotage. The liability for any damage or accident is then passed worldwide. However, the Port Master should hold an inquiry over the conduct of the pilot and mete out the appropriate penalty/ punishment.

Local domestic vessels need not use pilots, as their Masters know the waters and channels well. These local Masters are given dispensation from using pilots by the pilotage Committee and this practice should be continued under the Port Authority. However these vessels should advise the Port Master concerning their ETAs and ETDs under the new Port Regulations.

(5) The Boats and Tug Assistance

Currently no tugs are used to assist vessels to berth/unberth vessels at the quayside as vessels anchor offshore to load/unload their cargo. The small tugs are used for towing barges carrying cargo or containers from ship to shore or vice-versa.

Later, when the new alongside facilities are built to service ships, tugs will be needed to assist vessels for berthing/unberthing. In common with worldwide practice, provision in the Ports act should be made to transfer the tug's liability to the Master/owner of the vessel in the event of an accident, just like the case of Pilots. This important provision should be made.

5.3.2 Port Regulations

For the proper and efficient serving of vessels, most ports promulgate detailed port regulations. There may be some old regulations (Harbours Ordinance) still applicable, but these should be reviewed to meet present day requirements. The Minister is empowered under the Ports Act to make regulations, and it is recommended that action be taken to promulgate these Regulations as soon as possible. The Regulations should cover :-

- The Power of the Port Master to direct movements of vessels.
- The Anchorages and berthing/unberthing of ships.
- Regulating handling of cargo and containers (especially Dangerous Cargo)
- Regulating safe and proper use of wharves etc.
- Emergency or accident procedures covering vessels.
- Designate certain anchorages for specific purposes.

- Port Clearance certificates
- Passenger Traffic and SOLAS Conventions.
- Regulating navigation of vessels and navigational signals, lights, etc. to avoid collisions or accidents.
- Information to be supplied by Masters, owners, agent etc. in respect of cargo/goods to be loaded/unloaded, or passengers disembarking or embarking.
- Controlling pollution or disposal of waste matters in the port and keeping clean the waters and premises of the port.
- Regulating the towage or other assistance to vessels in the port and the conditions of such towage, and prohibiting such towage except by the Port Authority or by Agreement with the Port Authority.
- Regulating, controlling and licensing the use of harbour craft.
- Regulating the provision and maintenance of adequate and efficient buoys, navigational aids, landing stages, mooring and private berthing facilities and providing for licensing thereof.
- Prescribing the manning requirements and the Standards of competence to be attained by officers and crew (subject to any exemptions) and providing for such purposes, the conduct any examinations and the issue of licenses, certificates or other documents.
- Regulating vehicular and other traffic in port premises.
- Conduct of inquires into any case where damage has been caused to or by a vessel.
- Prohibiting the loading and discharge of cargo other than at authorized piers under the Customs Act or Control of Exports and Imports or regulations made thereunder.

5.3.3 Port Tariff

The Port Tariff effective 1 April 1991 is given in Appendix 5-3-1.

The study team is of the view that this Tariff list is not comprehensive nor descriptive enough, as there are several services which are being rendered and not charged. Moreover, stevedorage should be provided by the port as prescribed in the Ports Act and not by the KSSL. Such discrepancies should be removed and rectified to reflect clearly what is port revenue proper.

Normally, the Port Tariff covers 3 parts as follows:-

a) Charge Vessels (for Vessels' Account)

1) Port or Harbour Dues (including Light Dues) on GRT of vessel

2) Pilotage on GRT of vessel per hour
3) Tugs (for berthing/unberthing) on GRT of vessel per hour
4) Dockage/Berthage (including mooring) on GRT of vessel per hour
5) Labour Stand-by (waiting for ship etc.) per Gang per hour
6) Storage of FCLs or Empties per TEU per day
7) Freezer container 20' per TEU per day (including electricity)

b) Charge Cargo-owner

1) Wharfage on Cargo passing over wharf per ton/m^3
2) Wharf Handling from landing point to warehouse per ton/m^3
3) Stuffing/unstuffing cargo from LCLs per ton/m^3
4) Storage of cargo in Shed or Open Yard per ton/m^3
5) Movements of cargo and containers within the yard per ton/m^3
6) Tally of Cargo at shipside or for Delivery per ton/m^3

c) Miscellaneous Charges

1) Hire of Tugs and Lighters per hour
2) Hire of Tugs per hour
3) Hire of Lighters per hour
4) Hire of crane (35 tons) per hour
5) Hire of crane (20-25 tons) per hour
6) Hire of Heavy F/Lift (25 tons) per hour
7) Hire of Small F/Lift (3-3.5 tons) per hour
8) Hire of Tractor/trailer per hour
9) Hire of Bull-dozers/Graders per hour
10) Hire of Trucks per hour
11) Hire of Microbus (minibus) per hour
12) Hire of Water Pump per hour

To improve productivity performance more supervisory and management attention should be given to the cargo handling activities, besides improving the quay apron conditions plus more equipment. Suggested targets for consideration of management are:-

1) Containers (FCL + Empties) - 7 TEUs/operation hour.
2) General Cargo : 9 - 10 freight tons/per gross ship-hour.

The present port tariff should be revised with considering the soundness of management when the alongside berths are completed in a few years' time.

5.3.4 Proposed Additional Incentive Scheme

(1) Setting minimum targets

To encourage faster and more efficient handling of imports/exports discharged/loaded by international vessels, it is suggested that targets be set for handling containers and loose general cargo (including the loading of bagged copra). These targets will be based on the existing mode of cargo handling (3 tugs and 4 barges) and equipment available, as follows:

Type of Packing/Cargo	Target
FCL and LCLs (discharging)	10 – 15 TEUs/Ship–hour
Empty Containers (loading)	14 – 20 TEUs/Ship–hour
General Cargo (loose–disch/load)	11 – 20 tons/Ship–hour
Copra (loading/discharging)	50 tons/Ship–hour
General Cargo (pre–slung/palletised)	40 tons/Ship–hour

The workers are already being paid $1.00 each per hour for working on international ships, which together with the ordinary wage = $1.80/hour.

Any productivity above the targets will allow the workers (casual or permanent) to earn an extra 10 cts per addition TEU per ship–hour. If the current wage plus ordinary bonus is $1.80 per hour, and the number of FCL containers handled per ship–hour is 17 TEUs then the worker will be paid $2.00 per hour ($1.80 + 20 cts). Similarly for overtime he will be paid $2.00 + 20 cts = $2.40/ship–hour. For loose and pre–slung/palletised general cargo and copra, he will be paid an extra 10 cts for every 10 tons above target (fractions of 10 tons will be discharged).

(2) Who will participate in this "extra" bonus

This productivity bonus is directly related to the people handling cargo, (excluding supervising & clerical staff). So all stevedores, tug crew, shore workers (excluding shed labour) will enjoy this extra pay. For permanent salary workers, they will be paid the same extra 20 or 30 ¢ per ship–hour, but cumulative at the end of the month. This

means that for each day the wages clerk should be informed on a daily basis the "bonus" to be paid to each worker, whether casual or permanent. careful and accurate discharge/loading records must be kept.

No "extra" bonus will be paid for work on Domestic Vessels.

(3) Benefits and Costs

The workers involved in cargo handling is encouraged to work more productively, thus gaining more pay for themselves. International vessels will enjoy faster turn-around of their vessels, and save on ship's time in port. As a trade-off the stevedoring and other labour tariff rates may be slightly increased, but the increases will amount to no more than 10% of the savings ship's time in port.

5.3.5 Transitional Arrangements for Establishment of KPA

(1) General

It is important for some preliminary arrangements to be made when the Kiribati Ports Act 1990 is to be implemented. These arrangements include:-

a) The legislative amendments to the Ports Act 1990.
b) Providing temporary office accommodation for the staff.
c) Recruitment and transfer of staff.
d) Formulating a new Port Tariff which should be separate from KSSL shipping staff.
e) Arrange with KSSL for the transfer of Assets and Liabilities, and make an inventory as at date of transfer.
f) Arrange with KSSL for the temporary on-going operating procedures until agreement is finalized.
g) Purchase of Equipment
h) Make a Public announcement of the changes and the effective date.

(2) Legal Amendments

This will be the most time consuming part with the Attorney-General having to vet and introduce amendments for approval by Parliament. Meanwhile other actions can take place (eg. recruitment of staff etc.)

(3) Office Accommodation

Somehow office accommodation separate from the KSSL office must be found until a new office is built at the new facilities. The changes must be seen as a reality by port users, who will then expect more drive and efficiency from the new organization. One suggestion is to refurbish the Marine Office near the Ministry of Transport.

(4) Recruitment and Transfer of Staff

The three key position of General Manager, Port Master and Operations Manager must quickly be filled as soon as the Act is brought into operations. Expatriate managers, preferably retired professionals could be offered fixed term contracts of 2–3 years to get things going, but they must be done correctly from the start. It may be expensive, but it is better to do it right from the beginning.

Meanwhile the Board members could be appointed by the Minister, as certain major policy decisions need Board approval.

Also certain employees from the Ports Section of KSSL and the Marine Department should be transferred on a very selective basis as from observations made, taking the opportunity of establishing KPA, they are recommended to acquire management know-how through training in a port with the same level of development like Honiara. Their transfer terms should also be spelt out and agreed at policy level, but it is important to be independent and attractive as a commercial outfit with as little involvement as possible from the Public Service Commission.

(5) Formulating a New Tariff

The existing "Port Tariff" is inappropriate, lacking in comprehensiveness and clarity, and highly geared towards KSSL's shipping operations. This was inevitable when KSSL started operations in Sept 1990, but the Ports Act could not be implemented due to the lack of senior staff. Several services/operations (including stevedoring) were left to KSSL, but this should be rectified. However this does not mean that KSSL or any other body could not act as the contractor for the Port Authority which will receive the revenue and pay the contractor an agreed fee.

The existing "Port Tariff" should quickly be formulated, even if it is not cost-based, to identify the collection of revenue for the services and facilities provided by the

Port.

(6) Transfer of Assets and Liabilities

This exercise will be tricky, as many things have happened since KSSL assumed the stevedoring functions some time back. It need not be done urgently, but from day one all billing and debts should belong to Port Authority as well as new liabilities. Meanwhile the old debts and liabilities as well as the Assets existing before day one should be properly sorted out.

(7) Existing KSSL/Port Procedures

While action is being taken to carry out Items 1.2 to 1.6, port and shipping activities should not be allowed to mess up the whole exercise. It is best to allow existing procedures to proceed as usual, until the General Manager of the Port Authority is able to assume his functions separately. When this takes place on a date to be announced, there will be some hiccups and staff must be patient with port-users who may not fully comprehend the changes. Hopefully with detailed consultation, planning and directives (internal orders) among Port Authority, KSSL, Customs and port-users, the transfers can take smoothly.

(8) Purchase of Equipment

Since the usage of equipment is very low, the General Manager should review the situation critically, before any decision is made to buy any new equipment, relative to immediate future use.

(9) Official Announcement

No official public announcement should be made by KPA or KSSL until every facet of the take-over has been discussed and agreed. This announcement should be made over the radio and to the Press. A copy should be placed at strategic locations for the information of the public.

5.4 Management of KPA

Kiribati Ports Authority is expected to be established in 1995 and to commence port operations as an independent entity with taking over the some of the existing staff in the Port Section of KSSL and the Marine Department of MTCT and recruiting new staff for management. After completion of a new port in 1997, all facilities newly constructed will be registered to be assets of KPA and KSSL's assets will be transferred to the KPA's. 34 officers for management staff will be recruited to be permanent staff and total number of staff will be 127. Tables 5-4-1, 5-4-2 and 5-4-3 shows existing assets to be transferred to KPA, new assets of KPA and KPA staff respectively.

Financial profitability and soundness of KPA management were examined with Financial Rate of Return(FIRR) and Financial Statements through Financial Analysis as stated in Chapter 7.

Table 5-4-4 shows an income and expenditure statement concerning the port activity of KSSL during 1989 and 1993 which states the net profit rate between 34 and 37 % were reckoned and KSSL was in sound finance.

New investment to construction of port facilities and purchase of equipments will induce yearly depreciation of A$780,000 and increase of A$ 210,139 for additional personnel expenditure. Tables 7-2-8 and 7-2-12 show the depreciation costs of fixed assets and expenditures of KPA,1995-2022,respectively.

The necessary fund for the investment will be raised from two sources; The foreign portion of the investment is assumed to be a loan from international funds with yearly interest rate of 1 %, grace period of 10 years and 20 years repayment, and the local portion will be a loan from local governmental authority with the same financing conditions as the foreign portion. Yearly interest of A$185,680 for the former and A$66,270 for the latter, being summed up as A$251,950, will be paid. Tables 7-2-6(1) and 7-2-7(1) show repayment schedule of foreign loan and local loan,respectively.

The financial conditions of KPA will be in a red debt of A$211,000 in 1997 when KPA has to bear the total A$2,711,000 consisted of operating expenditures of A$1,480,000, interest of A$252,000 and depreciation cost of A$979,000, while the incomes by the present tariff will remain the level of A$2,500,000.

In financial analysis in the chapter 7, trials are made to calculate incomes by the both present tariff and the revised tariff. Tables 7-2-13(1) shows the statement of income and expenditure using by present tariff for 1995 to 1996 and by revised tariff in and after 1997.

Table 5-4-5 shows present port tariff rates applied to the ports in the vicinity countries in the Pacific. They are selected for reference considering similar sizes of the ports as Betio Port. The revised tariff for Betio Port is recommended to be modified to the standard of the port tariff as port due, berthage, stevedoring of empty containers, etc. stated in the Table.

For sound management of KPA, it is recommended that appropriate port tariff be set for the master/owner of vessels and for the consignee/consigner through examination of port tariff from a financial viewpoint.

Table 5-4-1 Existing Fixed Assets to be Transferred to KPA

Fixed Assets	Quantity	Acquisition Year	Acquisition Cost (A$)	Depreciation Life (Y)	Depreciation Rate (%)	Accumulated Depreciation Cost (A$)	Residual Value at Aug. 1996 (A$)	Repair & Maintenance per Year (A$)	Depreciation Cost per year (A$)	Remark
1 Wharf & Other Structures										
East Mole	1	1940's	160,000.00	50.0	2.0	160,000.00	0.00	60,000.00	0.00	L 600m
West Mole	1	1940's	210,000.00	50.0	2.0	210,000.00	0.00	70,000.00	0.00	L 330m
3.0m Wharf	1	1940's	850,000.00	50.0	2.0	850,000.00	0.00	110,000.00	0.00	L 130m (Net 110m)
Open Yard	1	1940's	0.00	50.0	2.0	0.00	0.00	0.00	0.00	Lease
UK Jetty	1	1940's	3,000,000.00	50.0	2.0	3,000,000.00	0.00	160,000.00	0.00	L 220m, 4 Berths
Total		1940's	4,220,000.00			4,220,000.00	0.00	400,000.00	0.00	
2 Building										
Cargo Shed No.2	1	1940's	29,025.00	35.0	2.9	27,087.00	1,938.00		829.29	11.7m x 28.2m
Cargo Shed No.3	1	1940's	25,800.00	35.0	2.9	24,080.00	1,720.00		737.14	12.2m x 28.5m
Cargo Shed No.4	1	1940's	29,025.00	35.0	2.9	27,087.00	1,938.00		829.29	11.7m x 28.2m
Gate Keeper's Office & Toilet	1	1940's	31,515.40	35.0	2.9	5,909.13	25,606.27		900.44	
Canteen	1	1940's	2,098.10	35.0	2.9	1,951.50	146.60		59.95	90.7m x 4.23m
MICI Building	1	1972	120,000.00	35.0	2.9	120,000.00	0.00		0.00	
Total			237,463.50			205,114.63	31,348.87		3,356.11	
						0.00				
						0.00				
3 Floating Equipment										
Tug Boat-Tabuariki	1	1976	75,000.00	20.0	5.0	75,000.00	0.00		0.00	210HP
Tug Boat-Riiki	1	1976	100,000.00	20.0	5.0	100,000.00	0.00		0.00	210HP
Tug Boat-Teraoi	1	1978	168,441.30	20.0	5.0	168,441.30	0.00		0.00	2 x 127HP
Barge	1	1985	60,000.00	20.0	5.0	60,000.00	0.00		0.00	18.35x6.65x 1.5m
Barge	1	1988	79,500.00	20.0	5.0	66,250.00	13,250.00		3,975.00	18x8.8x1.5m
Barge	1	1988	79,500.00	20.0	5.0	66,250.00	13,250.00		3,975.00	18.35x8.8x1.5m
Total			562,441.30			535,941.30	26,500.00		7,950.00	
					100.0	0.00			100	
4 Cargo Hanling Equipment						0.00				
OMEGA Mobile Crane	1	1987	86,893.76	7.0	14.3	86,893.76	0.00		0.00	15t
TAYCO 1500STD Crane	1	1993	699,000.00	7.0	14.3	684,437.50	14,562.50		99,857.14	32.5t
Tractors(Ford)	2	1986	22,858.12	7.0	14.3	22,858.12	0.00		0.00	
Tractors(Kubota)	2	1993	22,605.22	7.0	14.3	22,605.22	0.00		0.00	
Trailers	6	1986	45,622.92	7.0	14.3	45,622.92	0.00		0.00	5t
Crane Track	1	1988	41,223.00	7.0	14.3	41,223.00	0.00		0.00	3t
Fork-Lifts(Komatsu)	1	1993	54,471.10	7.0	14.3	40,626.36	13,844.74		7,781.59	2.5t
Fork-Lift(Komatsu)	1	1989	28,000.00	7.0	14.3	28,000.00	0.00		4,000.00	2.5t
Bull Dozer	1	1992	21,000.00	7.0	14.3	15,662.50	5,337.50		3,000.00	
Mini Bus	1		31,497.82	7.0	14.3	31,497.82	0.00		0.00	
Yamaha Sanso Water Pump	1		2,937.07	7.0	14.3	2,937.07	0.00		0.00	
Set Driving Gear	1		200.00	7.0	14.3	200.00	0.00		0.00	
Water Tank	1		270.00	7.0	14.3	270.00	0.00		0.00	
Walkie Taukie	20		2,600.00	7.0	14.3	2,600.00	0.00		0.00	
Radio Receiver	1		228.00	7.0	14.3	228.00	0.00		0.00	
Radio Equipment	1		3,154.00	7.0	14.3	3,154.00	0.00		0.00	
Battery Charger	1		235.62	7.0	14.3	235.62	0.00		0.00	
Electrical Drill	1		45.00	7.0	14.3	45.00	0.00		0.00	
Container(EX KCFS)	1		3,500.00	7.0	14.3	3,500.00	0.00		0.00	
Portable Water Pump	2		1,586.84	7.0	14.3	1,586.84	0.00		0.00	
Feeler Cage	1		366.00	7.0	14.3	366.00	0.00		0.00	
Container Spreader	1		6,350.00	7.0	14.3	6,350.00	0.00		0.00	
CB Radio(Tug Teraoi)	2		577.16	7.0	14.3	577.16	0.00		0.00	
Freezer Container	1		5,702.00	7.0	14.3	5,702.00	0.00		0.00	
Deep Freezer(Stevedore)	1		705.35	7.0	14.3	705.35	0.00		0.00	
Semi Rotary Compressor	1		160.00	7.0	14.3	160.00	0.00		0.00	
Sub-Total			1,081,790.98			1,048,046.24	33,744.74		114,638.73	
					100.0	0.00			100.00	
Sliding Bead Breaker	1		92.72	7.0	14.3	92.72	0.00		0.00	
12 CM FM Compressor	1		1,248.29	7.0	14.3	1,248.29	0.00		0.00	
Set Type Lever	1		148.77	7.0	14.3	148.77	0.00		0.00	
Easy Outset	1		18.10	7.0	14.3	18.10	0.00		0.00	
Electrical Drill	1		280.10	7.0	14.3	280.10	0.00		0.00	
Set Drill Bits	1		110.68	7.0	14.3	110.68	0.00		0.00	
Set Tap Dies	1		97.85	7.0	14.3	97.85	0.00		0.00	
Bench Grinder	1		329.93	7.0	14.3	329.93	0.00		0.00	
Set Tranceiver Walkie Taukie	1		17,668.31	7.0	14.3	17,668.31	0.00		0.00	
Water Pilot Canvas	1		42,907.08	7.0	14.3	42,907.08	0.00		0.00	
Sub-Total			62,901.83			62,901.83	0.00		0.00	
Total			1,144,692.81			1,110,948.07	33,744.74		114,638.73	
						0.00				
						0.00				
5 Communication Equipment						0.00				
VHF	16		0.00			0.00	0.00		0.00	Not Fixed Assets
Medium Wave Station	7		0.00			0.00	0.00		0.00	Not Fixed Assets
H.F Station	2		0.00			0.00	0.00		0.00	Not Fixed Assets
Radio System	1	1993	350,000.00	20.0	5.0	70,000.00	280,000.00		70,000.00	
Total			350,000.00			70,000.00	280,000.00		70,000.00	
						0.00				
G.Total			6,514,597.61			6,143,004.00	371,593.61		195,944.84	
						0.00				
						0.00				
					100.0	0.00			100.00	
6 Navigation Aids						0.00				
Buoy No1	1	1993	8,149.00	20.0	5.0	2,037.25	6,111.75		407.45	
Buoy No2	1	1993	8,149.00	20.0	5.0	2,037.25	6,111.75		407.45	
Buoy No3	1	1993	3,000.00	20.0	5.0	750.00	2,250.00		150.00	
Buoy No5	1	1993	0.00	20.0	5.0	0.00	0.00		0.00	
Buoy No6	1	(1994)	2,500.00	20.0	5.0	250.00	2,250.00		125.00	excluded
Buoy No8	1	1991	2,900.00	20.0	5.0	1,015.00	1,885.00		145.00	
Buoy No10	1	1993	3,000.00	20.0	5.0	300.00	2,700.00		150.00	
Beacon A	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon W	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon B	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon C	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon D	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon E	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon X	1		0.00	20.0	5.0	0.00	0.00		0.00	
Beacon Y	1		0.00	20.0	5.0	0.00	0.00		0.00	
Bikeman	1		30,000.00	20.0	5.0	18,000.00	12,000.00		1,500.00	
Total			55,198.00			24,139.50	31,058.50		2,759.90	
Grand-Total			6,569,795.61			6,167,143.50	402,652.11		198,704.74	
					100				100	

Table 5-4-2 New Fixed Assets of Kiribati Ports Authority

Fixed Assets	Quantity	Acquisition Year	Acquisition Cost	Depreciation Life	Depreciation Rate	Accumulated Depreciation Cost	Residual Value	Repair & Maintenance per Year	Depreciation Cost per year	Rate of Repair & Maintenance
			(A$)	(Y)	(%)	(A$)	(A$)	(A$)	(A$)	
1 Land										
Land	1	1997	7,147,000							
Total			7,147,000							
2 Wharf & Other Structures										
-5.5m Wharf	1	1997	6,032,000	50.0	2.0			30,160	120,640	0.005
Rehabilitation of -3m Wharf	1	1997	469,000	50.0	2.0			2,345	9,380	0.005
Slope Protection	1	1997	3,389,000	50.0	2.0			16,945	67,780	0.005
Total			9,890,000					49,450	197,800	
3 Building										
Shed	1	1997	2,698,000	35.0	2.9			26,980	77,086	0.01
Passenger Terminal	1	1997	772,000	35.0	2.9			7,720	22,057	0.01
Total			3,470,000					34,700	99,143	
4 Cargo Handling Equipment										
Cargo Handling Equipment	1	1997	2,677,000	7.0	14.3			80,310	382,429	0.03
Total			2,677,000					80,310	382,429	
5 Maintenance Dredging Equipment		1997								
Dredger			1,610,000	20.0	5.0			48,300	80,500	0.03
Total	1		1,610,000							
5 Navigation Aids										
Navigation Aids	1	1997	401,000	20.0	5.0			12,030	20,050	0.03
Total			401,000					12,030	20,050	
G.Total			25,195,000					224,790	779,922	

Table 5-4-3 Staff and Basic Salary of Kiribati Ports Authority

Division	Position	Staff Number		Basic Salary		Remarks
		1993 Nos	1997 Nos	1993 (A$)	1997 (A$)	
Manager Class	General Manager	0	1	0	9,820	
	Port Master	0	1	0	9,360	
	Operation Manager	0	1	0	9,065	
	General Cargo Manager	0	1	0	8,352	
	Container Manager	0	1	0	8,352	
	Civil Engineer	0	1	0	9,065	
	Marine Engineer	1	1	9,065	9,065	
	Accountant	1	1	9,065	9,065	
	Admini/Personal Manager	0	1	0	9,065	
	Port Manager	1	0	9,065	0	
	Pilots	0	2	0	18,130	
	Total	3	11	27,195	99,339	
Operation	(Wharf)					
	Wharf Superintendendant	1	1	6,347	6,347	
	Cargo Supervisor	1	0	4,364	0	
	Cargo Asst. Supervisor	1	0	3,473	0	
	Container Wharf Foreman	0	1	0	4,104	
	CFS Foreman	0	1	0	4,104	
	Wharf Foreman	1	0	4,104	0	
	Tally Clerk	3	3	6,771	6,771	
	CFS Gang Leader	1	1	3,166	3,166	
	Yard Foreman	0	2	0	8,208	
	Tally Clerk	3	3	6,771	6,771	
	Yard Gang Leader	1	1	3,166	3,166	
	Clerk	3	3	9,179	9,179	
	(Warehouse)					
	Warehouse Superintendant	1	1	6,588	6,588	
	Warehouse Asst. Superintendant	1	1	5,793	5,793	
	Tally Clerk	3	3	6,771	6,771	
	Warehouse Gang Leader	1	1	3,166	3,166	
	Clerk	5	5	15,299	15,299	
	(Equipment/Crane Driver)					
	Senior Crane Operator	2	1	7,392	3,359	
	Crane Operator	2	4	6,332	12,664	
	Fork Lift and Tractor Drivers	7	9	16,731	20,575	
	(Stevedore)					
	Stevedore Foreman	1	1	4,104	4,104	
	Senior Gang Leader	2	2	8,066	8,066	
	Gang Leader	2	2	6,332	6,332	
	Total	42	46	133,915	144,533	
Civil Engineering	Mechanical Engineer	1	1	4,364	4,364	
	Store Keeper	1	1	3,166	3,166	
	Skilled Work	2	3	5,652	8,478	
	Total	4	5	13,182	16,008	
Marine	Senior Marine Radio Officer	2	2	8,066	8,066	
	Marine Radio Officer	7	7	23,513	23,513	
	Marine Engineering Officer	1	1	7,712	7,712	
	Marine Engineering Class 2	1	1	6,830	6,830	
	Senior Accts Clerk	1	2	3,247	6,494	
	Tug Coxswain	3	3	9,498	9,498	
	Tug Asst. Coxswain	3	3	8,478	8,478	
	Winch Operator	3	3	8,818	8,818	
	Bargeman	3	3	7,798	7,798	
	Reef Blasting Supervisor	1	1	4,033	4,033	
	Beacon Leading Hand	1	1	3,259	3,259	
	Beaconing Hands	2	2	5,382	5,382	
	Total	28	29	96,634	99,881	
Accountants	Accounts Supervisor	1	1	5,867	5,867	
	Wages Clerk	1	1	3,583	3,583	
	Computer Operator	2	2	7,166	7,166	
	Accounts Clerk	3	3	9,772	9,772	
	Time Keeper	1	1	3,583	3,583	
	Total	8	8	29,971	29,971	
Administration	Personnel Officer	0	1	0	5,867	
	Clerk	1	6	3,166	18,996	
	Purchase Clerk	0	1	0	3,166	
	Trainning Officer	0	1	0	5,867	
	Security Guard	6	14	13,566	29,506	
	Driver	0	4	0	7,688	
	Office Cleaner	1	1	2,486	2,486	
	Total	8	28	19,218	73,576	
	G.Total	93	127	320,115	463,308	

Table 5-4-4 Income and Expenditure Statement of KSSL, 1989-1993

(Unit:A$)

Item		1993	1992	1991	1990	1989
Fiscal Year		92.9-93.8	91.9-92.8	91.1-8	90.1-12	89.1-12
Income		1,754,731	Unknown	937,853	1,477,066	1,518,787
Expenditure						
	Salaries & Wages	666,368		384,228	603,364	623,396
	Employee Benefit & Other Related Costs	60,046		30,500	37,944	43,490
	Repair & Slipping	144,443		66,660	51,260	58,740
	Fuel and Lubricants	56,699		32,484	53,076	39,651
	Operating Supplies, Stationary & Telex	46,368		10,624	38,595	41,865
	Depreciation	51,943		37,456	69,676	93,592
	Insurance	11,612		4,825	24,777	21,108
	Electricity and Water	14,675		9,255	15,395	13,058
	Claims Uninsured	87,466		1,411	5,353	3,585
	Miscellaneous Expenses	13,681		9,150	14,779	6,779
	Total	1,153,301		586,593	914,219	945,264
Operating Profit/Loss		601,430		351,260	562,847	573,523
Prior Year Item		0		0	0	0
Profit/(Loss) on Sale of Fixed Assets		0		0	0	0
Net Profit/(Loss)		601,430		351,260	562,847	573,523

Table 5-4-5 Port Tariff

Tariff	KIRIBATI						Solomon Islands			Western Samoa		
	Present Tariff			Revised Tariff			Honiara Port Tariff			Apia Port Tariff		
	Unit	Rate	Remarks	Unit	Rate	Remarks	Unit	Rate	Remarks	Unit	Rate	Remarks
1. Charge to ship owner									Exchange Rate S$=¥38,A$=¥78 *S$=0.49A$			Exchange Rate W$=¥50,A$=¥78 *W$=0.64A$
Light Dues	NRT	0.04	for every ship per visit	NRT	0.04	for every per visit	-	-	-	visit Annum *(GRT)	25.6(40) 128(200) (0.023)	for Overseas ship for local ship (359shpx25.6)/164,616 +127,468GRT)
Pilotage	GRT	0.03 x2	for overseas ship	GRT	0.05 x2	for Overseas ship	length *(GRT)	1.72(2) S$3.5x2 0.066x2	for Overseas ship (86mx1.72m)/2255GRT	GRT	0.064(0.1)	for Overseas ship
Port Dues	-	-	-	GRT	0.04	for Overseas ship	length *(GRT)	0.098(0.2) (0.037)	for Overseas ship (86mx1.72m)/2255GRT	GRT	0.032(0.06)	for Overseas ship
	-	-	-	GRT	0.01	for Domestic ship	length *(GRT)	0.98(2) 0.01	for local ship (48mx0.098)/446GRT	GRT/Annum *(GRT)	3.2(5) (0.007)	for local ship (286shpx3.2)/127486GRT
Berthage	- -	- -	- -	GRT per Day GRT per Day	0.30 0.10	for Overseas ship for Dmestic ship	length/hour *GRT per Day length/hour GRT per Day	0.29(0.6) 0.27 0.074(0.15) 0.19	for Overseas ship for Domestic ship	Operation *(GRT) Operation *(GRT)	25.6x2 (WS$40x2) (0.11 38.4x2 (WS$60x2) (0.034)	for ship up to 1500GRT (286shpx25.6x2)/127468GRT for ship over 1500GRT (73shpx38.4)/164,616GRT
Dockage	-	-	-	-	-	-	-	-	-	GRT per Day Annum	0.032(0.06) 32(50)	for Overseas ship for Local ship
Stevedoring	((NRT)TEU(F) (G.Cargo)M³/T (Copra) M³/T TranshpTEU(F) M³/T	135.5 10.0 8.5 135.5 8.5	for Overseas ship " " ' for local ship	((NRT)TEU(F) TEU(E) (G.Cargo)M³/ (Copra) M³/T M³/T	135.5 135.5 10.0 8.5 8.5	for Overseas ship " " " for local ship	((NRT)TEU(F) TEU(E) (G.Cargo)T (Copra) T (B.Palm) T TranshpTEU(F) TEU(E)	33(68) 33(68) 2.7(5.5) 2.1(4.2) 0.37(0.75) 25(50) 25(50)	for Overseas ship " " " " " "	-	-	-
	-	-	-	-	-	-	G. cargo -	1.23(2.5) -	-	-	-	-
Tonnage Dues (Cargo Dues)	-	-	-	-	-	-	(Import) T (Export) T	0.93(1.9) 0.47(0.95)	for overseas ship	GRT	0.64(0.1)	for Overseas ship entering a port

Table 5-4-5 Port Tariff (Con'td)

(Unit:A$)

Tariff	KIRIBATI						Solomon Islands			Western Samoa		
	Present Tariff			Revised Tariff			Honiara Port Tariff			Apia Port Tariff		
	Unit	Rate	Remarks	Unit	Rate	Remarks	Unit	Rate	Remarks	Unit	Rate	Remarks
2. Charge to cargo owner							•Charge to ship owner					
Lighterage	M^3/T	5	Import/Export cargo	M^3/T	5	Import/Export cargo	T	0.49(1)	for Overseas ship	-	-	-
	M^3/T	1	Inward/Outward cargo	M^3/T	1	Inward/Outward cargo	T	0.98(2)	" (heavy lift cargo)			
	M^3/T	5	for overseas tranship cargo	M^3/T	5	for overseas tranship cargo				-	-	-
	M^3/T	1	for local tranship cargo	M^3/T	1	for local tranship cargo						
Wharfage	M^3/T	10	Import/Export cargo	M^3/T	10	Import/Export cargo	(CNTR) T	2.35(4.8)	Import/Export cargo	T	1.28(2)	Import cargo
	M^3/T	5	Inward/Outward cargo	M^3/T	5	Inward/Outward cargo	(G. Cargo)T	3.43 (7)	Import Cargo	T	0.96(1.5)	Export cargo
							T	2.70(5.5)	Export cargo	T	0.64(1)	Import petroleum
							(Copra) T	2.45(5.0)	"	T	0.64(1)	Transhipment cargo
							(G.Cargo) T	2.35(4.8)	Local cargo			
Stuffing Unstuffing	M^3/T	2.5	Import/Export cargo	M^2/T	2.5	Import/Export cargo						
Storage	M^3/T per Day	2	Import cargo prior to 10 working days same carrier's arrival	M^3/T per Day	2	Import cargo prior to 10 working days same carrier's arrival	1) Charge to ship owner TEU (E) per month	10(20)	After one free mth CNTR cargo	1)Overseas cargo T per Day	0.96(1.5)	After 3 free days 4th day
							TEU(F/E) per month	2.5(5)	Tranship cargo	"	1.28(2.0)	5th day
										"	1.6 (2.5)	6th day
										"	1.92(3)	7th day
										"	3.84(6)	8th day
										"	1.92(3)	After 8th day
	M^3/T per Day	2	Export cargo prior to 10 working days same carrier's arrival	M^3/T per Day	2	Export cargo prior to 10 working days same carrier's arrival	2) Charge to cargo owner T	0.25(0.5)	After 7 free days 8-12 days for import/export cargo	2)Local cargo T per Day	0.32(0.5)	After 3 free days 4th day
							T	0.49(1)	13-19 days	"	0.64(1.0)	5th day
							T	0.98(2)	20-30 days	"	0.96(1.5)	6th day
							T	1.47(3)	31 and subsequent	"	1.28(2)	7th day
										"	1.92(3)	8th day
										"	1.92(3)	after 8th day
								0.074(0.15)	After 2 days local cargo	3) Tranship cargo T per day	3.84(6)	after 30 days
Delivery & Collection	M^3/T	8.50	provides by port workers and equipment	TEU M^3/T	100 8.5	CNTR G. cargo	T					

CHAPTER 6

ENVIRONMENTAL EXAMINATION

6. ENVIRONMENTAL EXAMINATION

6.1 Initial Environmental Examination

6.1.1 Principal Policy

(1) Environmental Law for Kiribati

The Government of the Republic of Kiribati established the Environment Unit in the Ministry of Environment and Natural Resources Development in June, 1991 with the purposes as follow:

1) To deal with the problem of survival of their atoll nation which is in danger by sea level rise due to the global warming resulted from greenhouse effect.

2) To protect environment and to maintain and utilize properly natural resources.

The Government conducted study on climate change, potential sea level rise, and shoreline change along the Tarawa Atoll during and after causeway construction. As an initial stage of environmental planning and management, the government has started registration for protection of environment applying the existing ordinances of various fields relating to the environment.

a) Harbours ordinance 1957, which prohibits the discharge of sewage or other filth into a harbor;

b) Fisheries ordinance 1959, which provides for the regulation and conservation of fisheries resources, and for licensing of foreign fishing vessels;

c) Local Government Ordinance 1966, which restricts activities which will cause land erosion and degradation;

d) Wild life conservation Ordinance 1971, which provides for the protection of designated bird species and definition of sanctuary areas;

e) Prohibited Areas Ordinance 1971, which permits designation of prohibited areas for the purpose of environmental conservation on any island in Kiribati; and

f) Land Planning Ordinance 1973, which provides for land use planning, zoning and establishment of regulations for the conservation of the natural environment.

For the Environmental Law expected to be legislated, the Kiribati Government has started in 1994 drafting a framework of Environmental Law by the experts of the South Pacific Region Programme (SPREP) and United Nations Environmental Programme (UNEP) as the 1st phase. At the 2nd stage, the national workshop will start from with discussion on the report by the workshop in May 1995. At the 3rd stage, approval of the Environmental Law by the National Assembly is expected in August or September, 1995.

(2) A Guideline for Environmental Consideration

A guideline for environmental consideration is not established at present. It is decided to investigate "Environmental Issues for Discussion Between Government of Kiribati and JICA in 1993" and to conduct Initial Environmental Examination on this base.

(3) The background of IEE

The global Sea Level Rise is believed to seriously influence Kiribati against its land conservation, and studies have been conducted to assess the influence. The reports are prepared on the impact of domestic waste, South Tarawa waste management, and on littoral drift and pollution problems in the coastal zone.

University of Hawaii has been monitoring sea level rise in the Betio Islet and a preliminary study on the matter was made in a village at the eastern end of South Tarawa with Australian finances .

A study on environment issues in the Tarawa lagoon was carried out by foreign consultants and the draft report submitted in 1994 details present environmental resources in the lagoon without referring to IEE.

6.1.2 Initial Environmental Examination

(1) Subject of IEE

The JICA sent a study team pointed out the environmental issues listed below:-

a) Environmental Issues in Relation to the Project

* Global Sea Level rise and its effect on port structure (seawalls, wharf–facilities),
* Effects on shoreline change with construction of port facilities
* Effects on corals, shellfish and benthic organisms with dredging
* Selection of suitable locations for the disposal of dredging material
* Effects from construction activities on marine environments specifically fish populations,
* Assessment of a quarry of sand and coral rocks

b) Social Issues in Relation to the Project

* Coordination of the port development plan with the Betio town planning by Ministry of Home Affairs and Rural Development,
* The effect on employment with port development
* Enhancement of commercial activities
* Effects of port development on cargo traffic and its associated effect on the population in Betio,

The area where is surveyed is shown in Figure 6–1–1.

(2) Site Description

1) Environmental features around Betio Port

Betio port is located at the south–west corner of South Tarawa and faces the lagoon side. The approach channel runs from the west ocean into the lagoon.

Each islet in South Tarawa is chained by the causeways and sea water circulation in the lagoon dominates from the west ocean.

2) Outline of natural environment

The natural environment of the port is outlined below, based on the results of survey in the area shown in Figure 6–1–1.

The reef flats are 1m to 2m deep below the lowest low water level (LWL) with being 2m to 3m deep at the reef edge and are deepened gradually towards the sea bottom. Dead and live corals are dotted on the seabed.

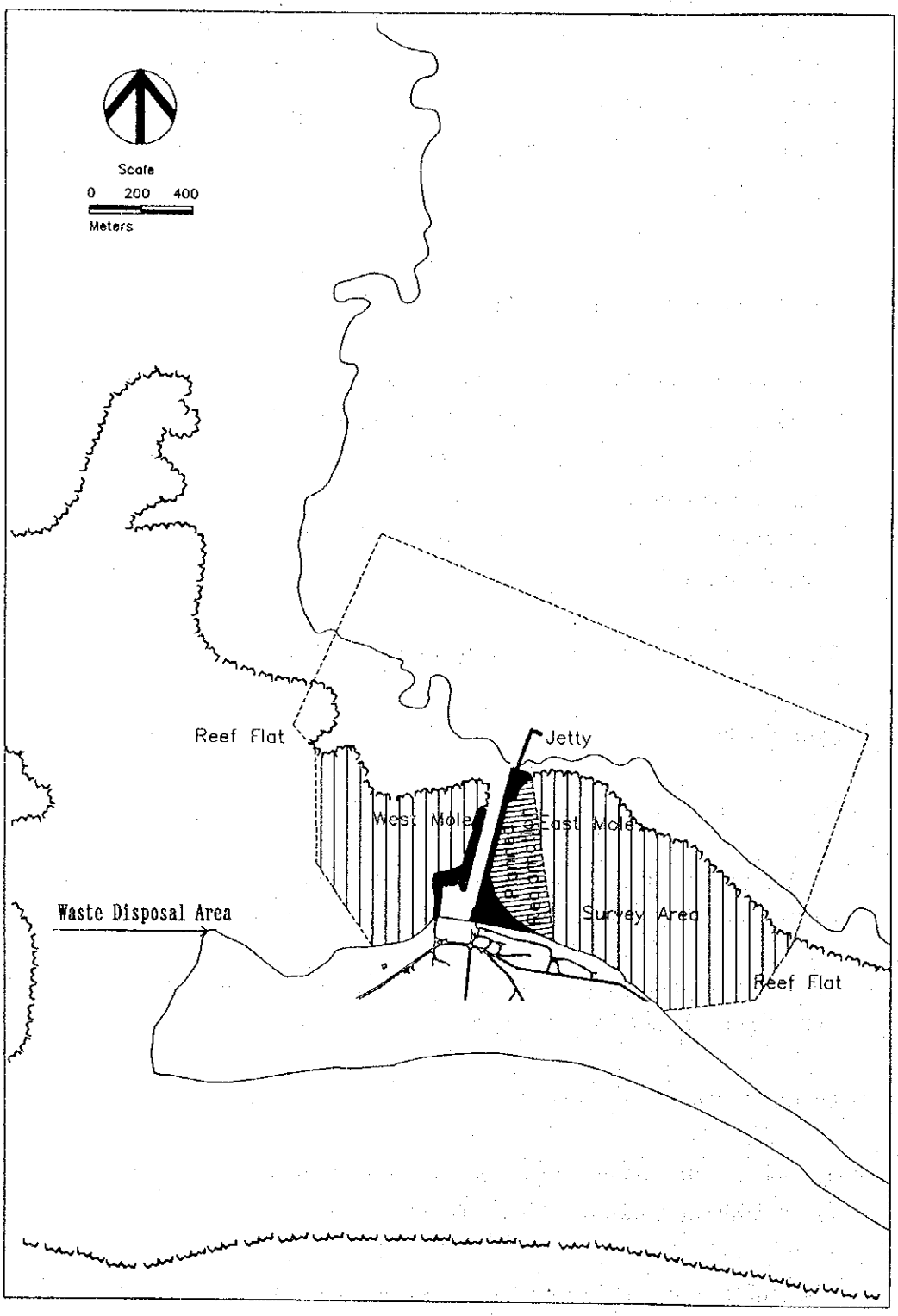

Figure 6-1-1 Survey Area for Environmental Assessment

The reef flat extends to the east and the west of the port, where the reef zone around the High Water Level (HWL) is covered with coarse sand. A little spots of sand deposition are scattered around the reef zone between HWL and LWL. But sand is partially deposited in the zone below LWL. In the east side of the port, some tide-pools remain near the breakwater. In the west side of the port, very poor biota inhabits because of the intensive influence of the ocean waves.

Compared with such conditions of the Betio islet, deposition of sand in the reef zone between HWL and LWL is large in the neighboring islets as Bairiki, etc. In the zone below LWL, a sandy mud layer widely covers the seabed, which forms the seaweeds belt and becomes deeper towards offshore. In Bonriki islet located at the most inner lagoon, a thick sand layer provides habitable conditions for mangroves. In Betio islet, the reef edge drops down almost vertically, where notch created by erosion due to waves has been developing and it is suitable for octopus 'te nonu' to live in.

This is directly reflected to big catch of octopus in Betio islet, while there is no octopus catch in other islets. In Betio islet, because of little sand at the reef zone between HWL and LWL, shellfishes 'to bun' (Andaria maculosa) does not live, notwithstanding they are caught in other islets. Sea cucumber species 'Holothecre-ia' and also very few, as they live only in the small sandy zone.

Massive corals are found at some places of the bottom of the reef zone below LWL in Betio islet.

When the aerial survey was conducted by the study team at low tide on 28th March, 1994, about 20m width of white-colored turbidy was observed along the reef edge around the both sides of the Port. The study team made the transparency measurements at high tide on 3rd April.

Locations of Measuring Points of Transparency and the results are shown in Figure 6-1-2 and Table 6-1-1, respectively.

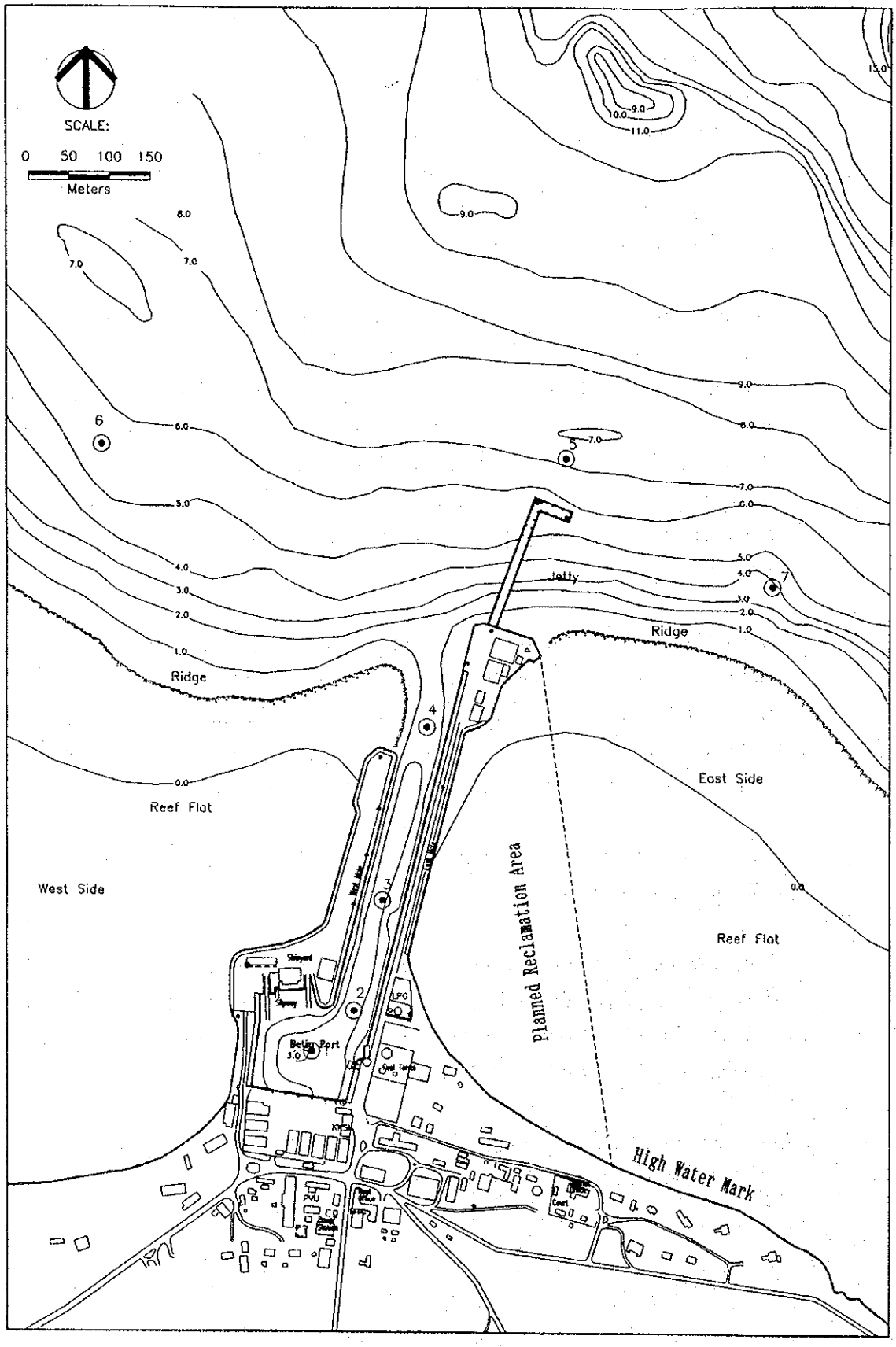

Figure 6-1-2 Locations of Measuring Points of Transparency

Table 6-1-1 Results of Transparency Measurement

Test No.	Location	Transparency (m)
1.	Boat Basin	2.1
2.	Boundary between Basin and Channel	2.1
3.	Middle of Approach Channel	2.3
4.	Mouth of Approach Channel	2.2
5.	Fisheries Jetty Top	3.3
6.	500m west away from F/Jetty	3.0
7.	500m east away from F/Jetty	3.7

When another field survey was executed along the Fisheries Jetty, a white-colour turbidy belt was partially observed with low transparency at flood tide, and the turbidity movement was observed around the mouth of approach channel toward the inner port.

At that time, the transparency was 2.5 m within the sea area of 30m away from the Fishing Jetty.

The turbidity became gradually lighter and transparency of 5 m was observed offshore 30m and 50m away from the Fisheries Jetty.

During the ebb tide, no turbidity was observed. Even at the flood tide no turbidity was observed at neap tide.

Summarizing the above survey, turbidity becomes more dense at spring tide and the maximum is at the spring flood tide, due to entrainment of suspended solids from the seabed by waves and tides.

3) Reef flats

The reef flats in this area are divided in 2 categories. One is covered with the outcropped stones and rocks, and the other is covered with a thin sand layer.

It is apparent in the inner part of Tarawa lagoon that the layer of sand becomes thicker than that around the west lagoon.

4) Biota survey

It is known that giant clam inhabits in the sea near the port but it was not seen during the diving survey along flat ridge and its off-shore. No bentos was not seen at the sandy bottom layer, except some holes of sandy goby of about $50m^2$. Only a few seaweed was observed on the flats but lots of seaweed was growing on the dead coral or on the rocks.on the flats offshore about 350-400m away from each Mole below low tide line.

The following seaweeds are observed:

* Chorophyceae: Cladphoropsis, Halimeda
* Phaeophyceae: Podina, Zoneria
* Rhodophyceae: Bangla, Plocamium, Hypnea

Also, sea cucumbers' Holothuria, snail'oliva, crab'Callappa and gobies inhabits are very small number.

In the offshore area between 400m and 500m away from the East Mole, a mass of corals were found on the exposed as listed below:

* Pocilloporidae
* Acroporidae
* Poritidae
* Favilidae

Fish of small size is observed in the tide-pool of reef flats. On the flats where corals grow in flocks, schools of Bluepuller and Blue O Green Puller are seen. When sea water is very transparent in the channels, fish for size 3 to 4 cm in school was observed.

The result of survey of sea area of the port is shown in Table 6-1-2. It is concluded that Biota is very few in species and quantity.

Table 6-1-2 Result of Survey of the Port Sea Area

Point No.	Location	Depth of Water	Transparency	Seabed Conditions
1.	1°21.47N 172°56.80E	6.9m	4.2 m	2 types of seaweeds growing but covered with sand. In the area of 5cm radius, small branch coral (about 30cm size) are found in 3 place.
2.	1°21.68N 172°56.48E	9.7m	4.5 m	Seabed is not flat. No biota including seaweed is found. Only small sea-anemones are found.
3.	1°21.96N	10.0m	5.2 m	There are growth of 2 types of seaweed in flocks. But coral is not existing.
4.	1°21.97N	4.5m	3.2 m	Seaweed can be seen a little here and there. Seabed is sand and not flat.

5) Fisheries

Fishing is prohibited around the anchorage area near the port. The flat area is not suitable for seaweed aquaculture, because the area is dried up during spring tides. It is not suitable for the propagation of sea-cucumber because of shortage of feed.

6) Waste

The flat at the east side of East Mole is designated to be reclamation area as stated in the land usage plan of MHARD. Wastes are left along the Mole and there are wrecks of boats which were stranded during World War II at the flat ridge part of West Mole. The land around a far west part of the Betio islet is expanded with

wastes which are allowed to thrown away for disposal. A very few biota exists along the beach connecting with the west side of the Mole. In terms of fauna and flora, the above area is quite different from the neighboring zone of lagoon flat ridges. Special consideration is not taken regarding disposal of wastes at the expected reclamation area. The most part of wastes consist of branches, trunks and leaves of palm tree, and plastic containers and bags. The volume of wastes is $4m^3$ per day and weight is about 1.5 tons.

7) Cultural relics

There is no traditional cultural assets in the Betio Islet. There remains trenches or batteries constructed by the Japanese military forces during World War II. The World War II Peace Memorial Park is maintained behind the Customs Office. But these places are located out of scope of the present study.

8) Scenery

Regarding the scenery of the port, containers which are piled up so high looks conspicuous and block a distant view from the land. Many wrecked ships are left on the reef flats in front of the shipyard. Floating oil on the sea in the port gives very bad impression. Wastes left along the East Mole generates dirty impression in the scenery around the Port.

9) Dredging inside port and muddy sand seabed

Muddy sand is accumulated in the port and the surface layer is of liquidized mud with water content of 99%. This liquidity mud is about 20–30cm thick and in the channel and its thickness decreases in the approaching channel toward the port mouth. The liquidity mud forms a flock being coagulated by cationic polyelectrode coagulant and easily settled and compressed. Densifyed mud is compressed of very fine particles but water content is low. According to the test which dissolute and suspended this minute articles in sea water, it is found that nonionic or anionic coagulant is very effective.

10)Heavy metal at the bottom spoil inside the Betio Port.

Dredging inside the Port is necessary for maintaining the water depth for small ships. Survey on contamination of seabed material was conducted to find dis-

charging of heavy metal chemical compound which might come out from shipyard inside the port. Figure 6-1-3 shows the locations for sampling seabed material and the analysis results is shown in Table 6-1-3.

Samples from 1 to 6 were collected inside the port, where seems influenced largely by heavy metals discharged from shipyard. Samples from 7 and 8 collected from the channel indicated low contents of heavy metal compound.

Table 6-1-3 Heavy Metal found in seabed materials

Sample No.	Cu (mg/kg)	Pb (mg/kg)	TBT (mg/kg)	Remarks
1.	106	110	less than 0.05	allowable limits
2.	20	18	less than 0.05	Cu: 1 mg/kg
3.	76	461	less than 0.05	Pb: 0.2 mg/kg
4.	561	401	0.05	TBT: 0.05 mg/kg
5.	380	103	less than 0.05	
6.	17	25	less than 0.05	
7.	24	20	less than 0.05	
8.	11	9	less than 0.05	

TBT, the toxicity of which is strongest, is less than the quantity for analysis to be out of question. But contaminated density of Copper (Cu) and Lead (Pb) is very high. It is considered that the paint was tore off out of the bottom part of the boats. For removing and disposing this spoil by dredging, it is recommended elusion tests be conducted, based on Japanese criteria which requires Cu and Pb chemical compound contained in the spoil must be less than 3 mg/l. Contents of Cu and Pb chemical compound in dredge spoils will be required to be less than 3 mg/l only when they are removed to other places for disposal.

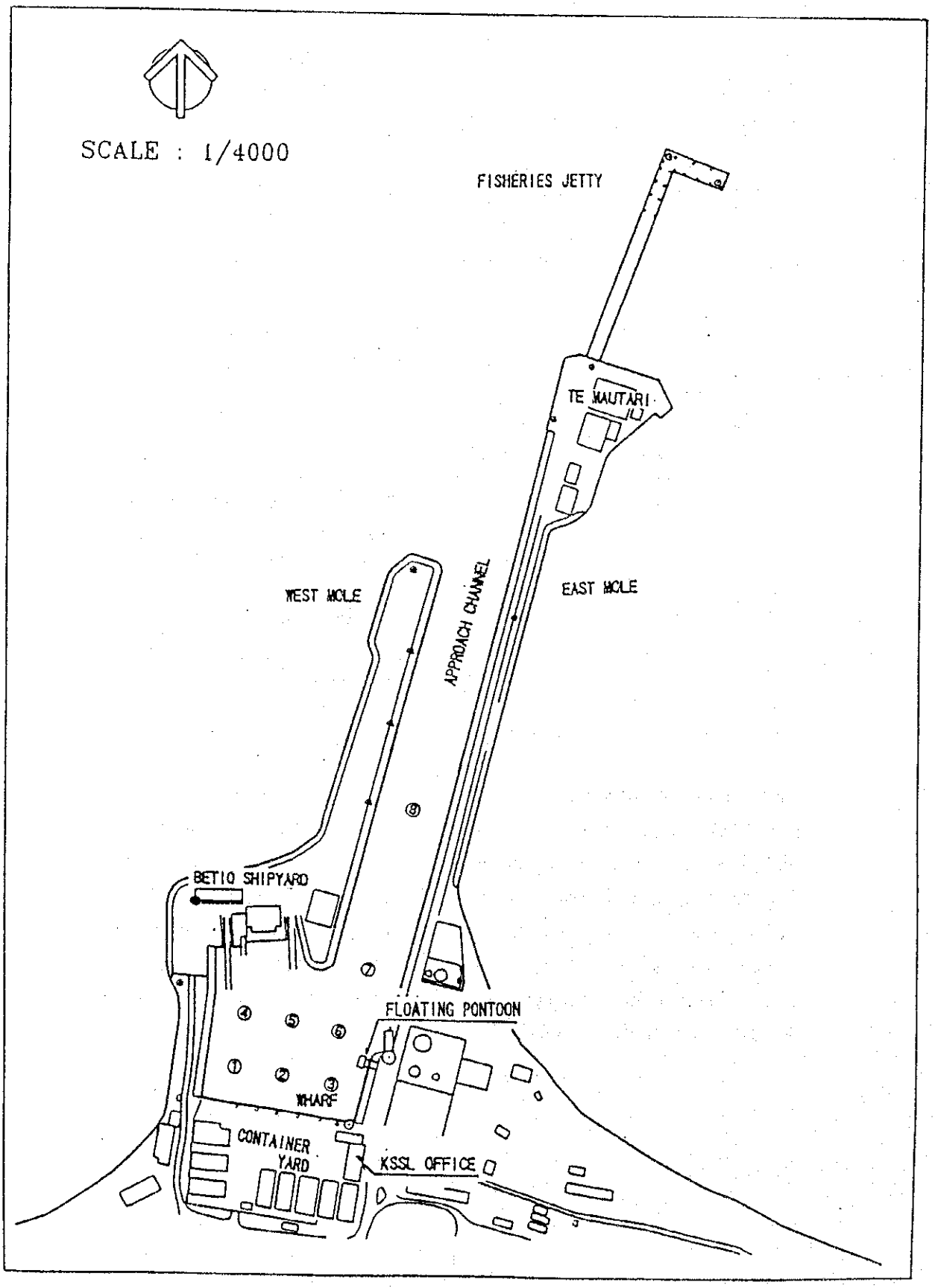

Figure 6-1-3 Sampling Points of Mud

11)Sea Level Rise

135,000 years ago, the sea level was 2m higher than that of present and it was 6m higher than that of present 125,000 years ago,. The reef corals which bred such old time exposed themselves above the sea level because the sea level became lower and they became the basic corals.

Rise of sea level is estimated to be 10cm during these 100 years. It is said that main causes of the sea level rise are:-

* Expansion of sea water due to sea water temperature rise, and
* Thaw of glacier on the land.

Two views on a annual rate of sea level rise are expressed as 1mm per year and 2.5mm per year. At this rate the sea level rise in the year 2100 is less than 30cm. The panel IPCC among each country regarding climate change estimates that, under the consideration of various uncertain factors, the sea level rise in the year of 2100 will be 32-113cm higher than that of present and 68cm rise is the most believable, according to the report on Sea Level Rise made by IPCC Eastern Hemisphere Workshop at Tsukuba in August 1993. Ms. Tererei Abete, Environmental Coordinator of Kiribati Government, quoted '30cm rise and 100cm rise by 2100.

Here, 68cm is applied as a basic rise as the predicated sea level rise in 2100.

12)Water quality contamination

Besides turbidity of sea area, discharging of bilge oil or water from the vessel anchoring there was observed quite often during the site survey. It causes coliform bacteria and oil film formation, and also may cause outbreak of oil smelling fish and shellfish and those price of comes down. Fauling of oil on seaweed or corals generates very bad influence.

13)Fisheries

The Environment Unit considers people collecting small size snails and sea cucumbers on the reef flat. According to the field survey, it is understood that collection is made with selecting sizes and that no management is conducted for

their source management. At the flat of cast side of the mole, propagation of seaweed was tried but the flat exposed at the time of spring tides is not suitable for propagation.

Fishery is not seen at the area where expected to be developed and net fishing is restricted by a port master. Then there will be no damage caused by development.

About fisheries in Tarawa, according to the survey conducted by Fisheries Division in 1992, the number of households which are engaged in fishery is 73.6%.

Fishing households are broken down as below:

Fulltime fishing households	10.0 %
Part time fishing households	6.8 %
Subsistence fishing households	83.1 %

The catch percentage by type of fishing and fishing ground are shown in Table 6-1-4.

Table 6-1-4 Catch Percentage

Fishing Ground	Full-time	Part-time	Sub-sistence	Catch (in kg) during survey period
Ocean	54.8	31.8	3.9	23,226
Reef	5.5	6.4	12.4	2,288
Lagoon	41.1	53.2	26.1	12,528
Collecting	5.5	19.1	33.4	19,341
Total	100.0	100.0	100.0	57,383

* Areas involved are Lagoon flat and tidal Reef flat.

The average catch per day is 0.45kg/fisherman. Shellfish catch at lagoon flat and tidal reef flat is 9.1% of the total catch and production of 1000 metric tons has been continuing every year. But there is no production in Betio. Main species of decapoda is octopus and catch is 0.4 % of the total catch mainly in Betio.

At the flats near the Betio Port, some gleaners are seen offshore 400 m away from the Moles. Number of gleaners at the west side flat is bigger than that of the east side flat.

14)Traffic

At present the width of the road on the East Mole is narrow for double lanes.

(3) Assumed impacts

Examining the environment around the project site as above, it is understood that Environmental Impact Assessment will be required in connection with the development in Betio Port. The impacts to be assessed for EIA will be abstracted from the said environmental characteristics and are itemized as follows:-

1) Turbidity

Judging from the present natural turbidity in the coastal area around the port, distinction will be impossible between turbidity caused by port operations and that of natural phenomenon. The present turbid area is created by natural phenomenon and it extends to the offshore of 650 m from the reef edges of the east and west flats. The turbid area caused by the construction work must be less than that by natural phenomena.

2) Bilge oil

Oil films are not good from a scenery point of view and they cause pollution of oilish smell of fish and shellfish.

3) Biota around the neighboring sea area

Very poor biota inhabits around the reef flats close to the mole where some area will be reclaimed, and the effect caused with reclamation is expected to be minimum.

4) Removal the inhabitant

The roads in the port development area will be one-way traffic. And a causeway will be constructed outside of the planned reclamation area and it is expect to be used as a road. But that road on the land area will be connected to the existing road directly, then there will be no effect to the inhabitant.

5) Wastes

The planned reclamation area will be used also for dumping waste disposal and it is expected that there will be influence caused by bad order or polluted water.

6) Dredge spoil

Problem will occur in dredging operations because it will be used as materials for closed reclamation area. But it is noted the spoil inside the Betio port contains Cu and Pb. The coagulation treatment must be conducted so that elviated Pb density is less than 3 mg/l and it must be disposed by reclamation after confirmation that the elviated Pb density from coagulated substance is less than the criteria.

7) Rise of sea level

This is a problem of global scale. In this report the figure of 68cm is applied which is said to be the height probability among the IPCC anticipated sea level in 2100.

8) Fisheries

The general fishing is prohibited in the sea in front of the Port and there is no effect to production. From the present conditions, suspended soilids generated from port construction are not expected to give any damages to propagation of shellfish.

In the planned construction area, gleaning is not observed and it is assumed that there will be no effect to the gleaning after the construction operation.

9) Remains and culture relic

As a result of survey captioned things are not found in the planned development area.

The Government of Kiribati pointed out problems which may be caused with implementation of port development and they were submitted to the JICA preliminary study team 1n 1993.

In this study the problems or impacts were preliminarily discussed and port con-

struction will not affect serious damages to environment around the project site since a few slight impacts to environment are assessed at the stage of IEE. As a conclusion of IEE, water turbidity during dredging work and sea level rise will be a kind of impacts to the environment around the port.

(4) Results of Environmental Examination

Based on the checklist, the results of IEE are shown in the following Table 6-1-5.

Table 6-1-5 Environmental Impact Checklist for Port Development

Environmental Impact Factors	Environmental Impact	Size of Impact (check appropriate boxes)			
		No	Small	Moderate	Major
1. Impact from natural conditions					
1.1 Sea level rise	1.1.1 Sea level rise				*
2. Impact from construction works					
2.1 Operation of working boats, onstruction machines	2.1.1 Generation of noise/vibration	*			
	2.1.2 Changes in marine ecosystem	*			
2.2 Dredging, stirring of bottom soil	2.2.1 Pollution of water and sediment (SS)				*
	2.2.2 Reduction of aquatic lives		*		
	2.2.3 Pollution of marine product	*			
2.3 Rock and sand removal	2.3.1 Extinction beach ecosystem	*			
2.4 Dumping of dredged spoil on flat	2.4.1 Pollution of water		*		
2.5 Employment of labours	2.5.1 Change in economic activity				*
2.6 Congestion of work boats	2.6.1 Devaluation of fishing ground		*		

Environmental Impact Factors	Environmental Impact	Size of Impact (check appropriate boxes)			
		No	Small	Moderate	Major
3. Impact from port facilities and site					
3.1 Emergence site	3.1.1 Pollution of water	*			
	3.1.2 Coral flat erosion	*			
	3.1.3 Changes in coastal currents	*			
	3.1.4 Suspended sediment		*		
	3.1.5 Decrease of habitats for aquatic lives	*			
	3.1.6 Decrease of habitats for beach lives	*			
4. Impact from dredging works (Betio Port)					
4.1 Dredging	4.1.1 Pollution of water and bottom sediments (SS, heavy metals)				*
4.2 Land reclamation	4.1.2 Leachate from landfill				*
5. The culture heritages and traditional culture		*			

6.2 Environmental Impact Assessment

6.2.1 Principal Policy

It is said that port construction/operation may have an effect on environment. EIA is necessary to investigate environmental effects under construction work. As a guide line for such investigation, "Preliminary Environmental Assessment Criteria" has been prepared by the Environment Unit of the Kiribati Government".

It is concluded to discuss and investigate this guide line and it will be supplemented by the Study Team if the guide line lacks of some articles to be added.

Sea level rise is a subject to be assessed because it relates directly to the plan and designs of port facilities.

Regarding the rear land of a planned new port construction area, the port and a new access road will produce a reclamation place of not only dredged spoil but other general wastes. Therefore, impacts caused by waste disposal will be assessed and countermeasures will be considered to protect dispersion of pollution from wastes.

(1) The environment guideline of port construction

Regarding port construction, "Preliminary Environmental Assessment Criteria" has been made by the Environment Unit of the Kiribati Government. The contents cover all the matters related expected influences by port construction. It aims at minimizing the influence given by the construction work to environment, with prior environmental consideration at the stage of port planning.

The following Table 6-2-1 shows the environmental matters issued in a port construction.

Table 6-2-1 Environmental Issues in Port Construction

Activity	Consequence to Environment	Impact on Environment
Dredging	Turbidity Sedimentation Benthic destruction	Water quality reduction Habitat destruction Species loss
Blasting	Concussion Noise Seismic shock	Destruction of coral Fish kills and escape Disturbance of marine species
Land based activities	Altered landscape	Soil erosion coral erosion
Waste disposal oil spills from construction	Leachate from landfill	Toxicity effect water quality degradation ecosystem damage
Land reclamation	Dredge spoil	Toxicity of soil
Seawall Construction	Sediment Alternation	Coastal erosion

These are conditions which must be observed by the construction project and also they may endanger natural environment. The project must avoid such influence which may be given to the environment.

The planners of the project must introduce the best constructional engineering technology to make the influence given to the environment as small as possible and they have to debate in the meeting how this could be realized.

The matter to be adapted in order to make the environmental damage the least are as follows:

a) To plan to avoid the area where is so sensible to the environmental impact.
   The designing factors of construction include the area where the construction is operated, the starting time and its period.
b) Management of muddy sediments.
c) Safe usage of big quantity of dredge spoil.
d) Recovery of environmental damages.
e) Pre-evaluation of biota before construction.

f) Monitoring during the construction.
g) Start of evaluation of biota and start of monitoring.
h) Improvement of quality of habitat in compensation.
i) Management of the guideline.
j) Controlling system of waste water.

(2) Study of the guideline

The articles and contents are very well arranged. After precise examination of this guide line, Q and A was made between the study team and the Environment Unit.

The results were very satisfactory and the both parties agreed that the guide line would be observed in the port constructions. However, the study team side explained the Kiribati side as follows:

a) The biota's environment at the area where construction operation will be started is effecting the present condition in that area. Therefore after the construction, it is difficult to improve the present environment.

b) Thinking of the present environmental impact in that area which is given not only by natural condition but by leachate from landfill, it is difficult, in the area where construction operations are going to start, to improve environment more better than of present.

6.2.2 Environmental Impact Assessment

In the course of environmental examination, three typical impacts are pointed out as follows:

a) Sea level rise
b) Turbidity of sea water
c) Heavy metal compound in the seabed mud in the existing port

The environmental effect from the listed impacts will be minimized with countermeasures. But monitoring of environmental indicators will be required, which might result in urging to tentatively terminate the work and to take countermeasures if sustained value of the indicators exceed the target.

(1) Subject to be invested

1) Water quality contamination by turbidity

a) Establishment of the safety standard regarding turbidity caused by the construction

b) Monitoring

(2) Counter-measures of Environment Safety

1) Suspends Solids
2) Treatment of dredge spoil
   a) Dredge spoil comes out from the port construction
   b) Dredge spoil in Betio Port
3) Bildge oil
4) Sea level rise
5) Waste disposal utilizing reclamation

(3) Safety counter measures for all items

The port construction operations may give influences to the ecological system in accordance with turbid conditions and to the migration change as zooplankton, phytoplankton, fish and shellfish, so that those larvae suffer damages and sink down. And also turbidity weakens the sun-light which seaweed needs impedes photo-synthesis.

1) Establishment of Environmental safety targets

Establishment of safety targets of SS is especially necessary for the area where turbidity is distinguished.

Based on the proposal from the Study Team, discussion and investigation were made to establish 3 classified monitoring lines in accordance with SS density and monitoring target value of turbidity of each class (see Table 6-2-2). However, in this sea area, white-colored turbidity is remarkable when relatively high waves occur. Therefore cause-effect relationship on density of turbidity must be considered before construction work. According to the results, reconfirmation of background values and judgment from the natural turbidity in the monitoring sea area

might require change of the values. At the time of spring tides when west wind blows, turbidity survey is needed to be conducted for sustaining high SS density as background values.

Table 6-2-2 Monitoring Line and Target Value of SS

Monitoring line	Area	East and West width (m)	Offshore side width (m)	Target Value SS (mg/l)
A	Monitoring line in construction sea area	400	250	15
B	Basic monitoring line	600	350	7
C	Monitoring line in Background	1,000	450	2.4

The monitoring center is the center of the construction area covering the whole area of the east side flat and the line position and monitoring region may be moved according to the construction area.

The background value of SS in the sea is from the 4 points located offshore 500m away from the reef edge near the port area. The sampled water is collected at the level of 1m above the seabed. The suspended solids in the collected sample sea water were measured to be 1.8-2.4mg/l.

Monitoring area is shown in Figure 6-2-1

2) Monitoring

a) Turbidity indicator

Measurement of suspended solids or measurement of transparency is applied. However, when measurement by transparency is applied, interrelation to SS must be cleared.

b) Biota indicator

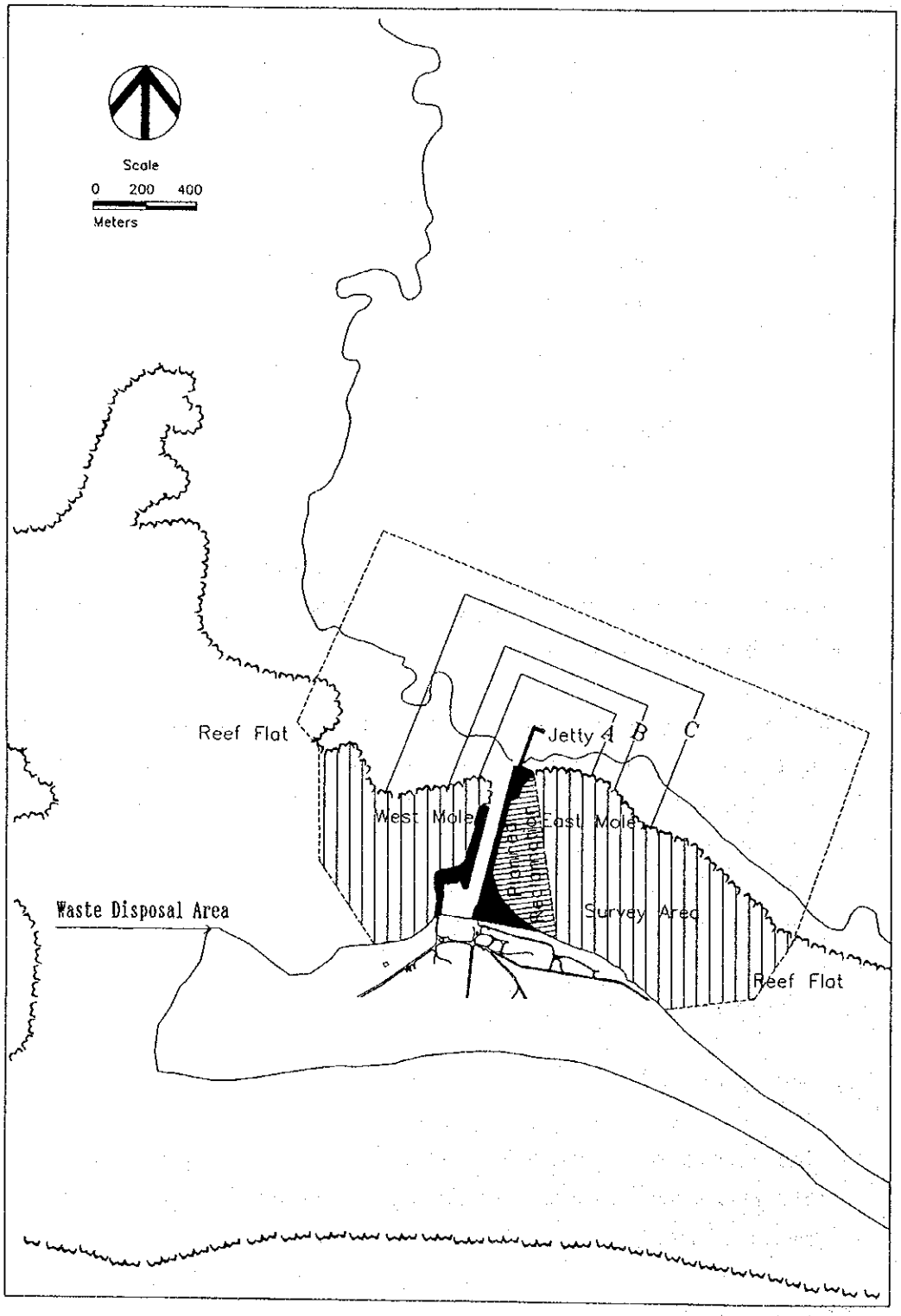

Figure 6-2-1 Monitoring Area

Biota indicator will be a class of corals of living below the low water level at the east and west flat.

Fauling conditions of density particles on the corals or dead corals covered by such particles can be used to assess effects. Fauling oil also sometimes damages, therefore oil analysis is necessary for survey of damages.

These two matters are used for monitoring during and after the construction.

The effect with development on Octopus in Betio can be judged by the catch statistics for the period of some years.

(4) Environment counter measures

1) SS

SS measurement will be conducted at two stages: during-construction stage and after-construction stage.

a) Construction period

About turbidity caused by dredging or reclamation, it is necessary to take perfect counter measures for prevention of water quality contamination by providing a shelter for preventing turbidity difussion near the source of turbidity. When the prevention effect is not enough, chemical treatment together will be applied to make more effective.

When turbidity exceeds the SS target in the sea area and some damages are observed on the corals, faulted SS must be quickly removed. And when coral die, counter measures as recover growth of corals by planting will be taken.

b) After construction operations

Turbidity observed after the construction work is assumed that most part of it is due to natural conditions at present. Therefore much attention have to be paid to the reason in case of evaluation by monitoring. There is a possibility that corals are subject to affection of bilge oil, etc.

2) Dredge spoil

a) When dredge spoil comes out in the course of reclamation, spoil will be kept in a pool which can keep the soil for long time enough to separate SS and deposition. Coagulant will be applied to accelate sedimentation of SS and water will be carefully discharged.

b) Contained density of heavy metal Cu and Pb in the dredged soil in the existing Betio Port is very high degree and diffusion of chemical heavy metal compound from dredged spoil is not allowed under dredging work. Dredged spoil can be disposed for reclamation but, when contents of the compound exceed more than 3m/l, spoil can be disposed for reclamation after being coagulated by cement, etc. for the contents of spoil to be less than 3 mg/l.

The following coagulational treatments must be done before dredging.

a) To stir up the bottom mud with propellar of a tugboat at the low tide
b) To add coagulant at the same time

For acceleration of sinking and agglutinating mud, coagulant of 2.5 % of weight of the dry mud is to be added. This operation will be completed in about 40 minutes at low tides. As a next step, special cement for coagulation will be mixed as the same operation above. Leaving them for 1 or 2 weeks, seabed material will be dredged.

3) Bilge oil

The Harbour Ordinance restricts dumping bilge oil in the port.

Installation of a bilge tank will be recommended on the land in the port area to collect bilge oil from vessels and keep it. After oil floats being separated, oil will be burnt. The remaining contaminated sea water is discharged after treatment by chemical agent to remove emulsion oil.

4) Sea level rise

In consideration of sea level rise in 2100, the height of new port facilities and seawall designed 70 cm higher present height but the limit of height is regulated

not to disturb landing and loading operations.

5) Disposal of waste for reclamation

The back ground area surrounded by a causeway from the new port will be place for reclamation and it is anticipated that when partially reclamation is conducted by disposal of ordinary wastes. It is worried that it will cause bad smell, leakage of waste water, propagation of flies and rats. For the protection of the environmental safety of the port area, enough consideration must be made. For reclamation by disposal of waste, deposition of waste items will be controlled and covering with appropriate thick soil will be recommended.

Recovery of natural resources from waste have to be done thoroughly if it is possible.

Waste water is a result of rain fall or intruded sea water. Density of BOD contained in waste water is very high. When it flows into the other place where is not reclamation area, it gives bad impact to the environment of the reef flat. Flowing out of the rain from the waste disposal reclamation is not avoidable. So disposal of following water is necessary. After serious consideration of collection of waste water and system of counter measures of purification, reclamation area for disposal of waste must be designed.

6) Waste water treatment in Betio Shipyard

The shipyard has to equip waste water treatment facilities.

(5) Overall Evaluation

Regarding sea level rise, the ground height of the reclaimed land will have enough allowance from the expected sea level.

Countermeasures to protect diffusion of turbidity (SS) during dredging work will be taken as installation of a silt curtain.

Other countermeasures shall be taken to prevent dispersion of dredged spoil from the existing basin of the port.

Through environmental examination as above, it is concluded that construction of a new port will not generate serious impact to the environment with conditions to take necessary countermeasures.

CHAPTER 7

ECONOMIC AND FINANCIAL ANALYSIS

7. ECONOMIC AND FINANCIAL ANALYSIS

7.1 Economic Analysis

7.1.1 Methodology

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project.

The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. It is calculated by using the following formula.

$$E = \sum_{t=0}^{\tau} \frac{B_t - C_t}{(1+r)^t}$$

Where, τ : Period of economic calculation (project life)
B_t : Benefits in the year " t "
C_t : Costs in the year " t "
r : Discount rate

The project costs and benefits are evaluated in terms of economic prices (shadow prices) converted from market prices by the method of conversion as under-mentioned in the item 7.1.3.

All the benefits and costs in the analysis are as of 1994.

7.1.2 Prerequisites of Economic Analysis

(1) Base Year

The "Base Year" for the study is set to be 1994 which is defined as the standard year in the estimation of costs and benefits.

(2) Project Life

The Project Life in the economic analysis is assumed to be 26 years from the completion of construction (from 1997 to 2022) as shown in Table 7-1-1.

Table 7-1-1 Fixed Assets of Kiribati Ports Authority

Fixed Assets	Acquisition Year	Acquisition Depreciation Cost	Accumulated Depreciation Cost	Residual Value in 1996	Depreciation Cost per Year	Project Life
	(Y)	(A$)	(A$)	(A$)	(A$)	(Year)
1. Exsisting Fixed Assets		6,569,796	6,167,144	402,652	198,705	2
2. New Fixed Assets	1997	25,195,000	0	25,195,000	779,922	32
Total		31,764,796	6,167,144	25,597,652	978,627	26

(3) Foreign Exchange Rate

The exchange rate adopted for this analysis is A$ 1.00 = ¥ 75.33 (US$ 1.00 = ¥99.50), the same as used in the cost estimation.

(4) "Without" case and "With" case

An alternative case against the Improvement of Betio Port for economic comparison, is the "WITHOUT" case in which all the cargoes are assumed to be handled with tugs and barges as at present.

In the "WITHOUT" case, only rehabilitation works of the existing damaged part facilities are assumed to be implemented.

1) "Without" case

(i) Port facilities

In the "Without" case, it is assumed that no additional capital investment will be made to improve the existing port facilities. The conditions of port facilities in the "Without" case are assumed as follows:

Table 7-1-2 Port Facilities in "Without" Case

Facilities	Scale	Remarks
Berth	Length :	128 m (Net about 92 m)
	Depth :	-2 m
Yard	Area :	3,000 m^2
Shed	Number :	8
	Area :	2,601 m^2

It is assumed that the maximum volume of port cargo in the "Without" case is the one which can be handled by the fixed tower crane stacking containers 7 tiers. The port capacity will saturate reach in the year of 2000.

In the "Without" case, the cargo handling volume and number of ship's call are shown in Tables 7-1-3 to 7-1-6.

2) "With" case

(i) Port facilities

In the "With" case, it is assumed that the Improvement Plan of Betio Port is completed and the cargo handling capacity of the port is improved. The conditions of port facilities in the "With" case are assumed as shown in Table 7-1-7.

(ii) Cargo Volume

In the "With" case, the cargo volume and number of ship's call are the same as "Without" case as shown in the above Tables 7-1-3 to 7-1-6.

The cargo volume in the "With" case is assumed to be constant in and after 2000, the target year of short term plan of this project. On the otherside, in the "Without" case, the port capacity will reach satuation in the year of 2000 as above-mentioned, although cargo handling efficiency will decrease 10% in 1998 from 1997, 20% in 1999 and 30% in 2000, respectively.

Table 7-1-3 Overseas Cargo Forecast per Ship Types (Except Bulk Fuel), 1995-2022

No.	Year	Container Ship									Copra Ship	Total
		Import					Export				Export	
		Transship		Container		G.Cargo	Container	G.Cargo	Transship		Copra	
		TEU(L)	Ton	TEU(L)	Ton	Ton	TEU(E)	Ton	TEU(L)	Ton	Ton	Ton
1	1995	199	3,773	1,828	34,736	6,130	1,828	3,027	199	3,773	7,054	58,493
2	1996	207	3,943	1,946	36,972	6,019	1,946	3,200	207	3,943	7,139	61,216
3	1997	217	4,121	2,071	39,347	5,879	2,071	3,386	217	4,121	7,225	64,079
4	1998	227	4,306	2,204	41,868	5,709	2,204	3,586	227	4,306	7,311	67,086
5	1999	247	4,500	2,345	44,546	5,506	2,345	3,801	237	4,500	7,399	70,252
6	2000	247	4,702	2,494	47,389	5,265	2,494	4,030	247	4,702	7,488	73,576
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
27	2022	247	4,702	2,494	47,389	5,265	2,494	4,030	247	4,702	7,488	73,576

(Note) TEU(L): Loaded Container, TEU(E): Empty Container

Table 7-1-4 Domestic Cargo Forecast, 1995-2022

No.	Year	Inward			Outward	G.Total
		Copra	G.Cargo	Total	G.Cargo	
		Ton	Ton	Ton	Ton	Ton
1	1995	7,054	3,027	10,081	20,610	30,691
2	1996	7,139	3,200	10,339	21,393	31,732
3	1997	7,225	3,386	10,611	22,208	32,819
4	1998	7,311	3,586	10,897	23,057	33,954
5	1999	7,399	3,801	11,200	23,942	35,142
6	2000	7,488	4,030	11,518	24,752	36,270
↓	↓	↓	↓	↓	↓	↓
27	2022	7,488	4,030	11,518	24,752	36,270

Table 7-1-5 Overseas Ships' Call, 1995-2022

Year	Cargo Volume										Numbers of Ship's Call					
	Container Ship							Transship (Export)	Copra Ship	Grand Total	Container ship				Copra Ship (Ton)	Total
	Cargo Volume Transship (Import)	Others	Total	Cargo Volume's Share							Cargo Volume per Ship(Ton)					
				CCS	PFL	BHL	Total				CCS	PFL	BHL	Transship (Export)		
				0.576 *Transship	0.306	0.118					2,045	624	1,162	570	1,717	
	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.
1995	3,773	43,893	47,666	29,055	13,431	5,179	47,665	3,773	7,054	58,492	14	22	4	7	4	51
1996	3,943	46,191	50,134	30,549	14,134	5,451	50,134	3,943	7,139	61,216	15	23	5	7	4	54
1997	4,121	48,612	52,733	32,122	14,875	5,736	52,733	4,121	7,225	64,079	16	24	5	7	4	56
1998	4,306	51,163	55,469	33,776	15,656	6,037	55,469	4,306	7,311	67,086	17	25	5	8	4	59
1999	4,500	53,853	58,353	35,519	16,479	6,355	58,353	4,500	7,399	70,252	17	26	5	8	4	60
2000	4,702	56,684	61,386	37,352	17,345	6,689	61,386	4,702	7,488	73,576	18	28	6	8	4	64
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2022	4,702	56,684	61,386	37,352	17,345	6,689	61,386	4,702	7,488	73,576	18	28	6	8	4	64

Table 7-1-6 Domestic Ships' Call, 1995-2022

Year	Cargo Volume			Ship Call		
	G. Cargo Ship			Cargo Vol. per Ship	KSSL Ship	KSSL L. Craft
	Copra	G. Cargo	Total	Total 114.6		
	Ton	Ton	Ton	Nos	Nos	Nos
1995	7,054	23,637	30,691	267	147	120
1996	7,139	24,593	31,732	276	152	124
1997	7,225	25,594	32,819	286	158	128
1998	7,311	26,643	33,954	296	163	133
1999	7,399	27,743	35,142	306	169	137
2000	7,488	28,782	36,270	316	174	142
↓	↓	↓	↓	↓	↓	↓
2022	7,488	28,782	36,270	316	174	142

Table 7-1-7 Port Facilities in "With" Case

Facilities	Scale	Remark	
Berth	Length :	80 m	
	Depth :	-6.0 m	
Yard	Area :	29,000 m^2	
Shed	Number :	1	in addition to
	Area :	800 m^2	existing 8 sheds

7.1.3 Economic Prices

(1) Method for Converting to Shadow Prices from Market Prices

For the economic analysis, prices are expressed in shadow prices rather than market prices based on the border price concept. There are various methods to convert the market prices into border prices. Here, the border prices (shadow prices) are calculated by eliminating transfer items such as taxes, subsidies, etc.

In general, all the costs and benefits are divided into three categories: labor, tradable goods and non-tradable goods. And labor is further classified into skilled labor and unskilled labor. As for skilled labor, the economic price is determined by conversion factor, the shadow price of unskilled labor is determined by multiplying the nominal wage by the shadow wage rate and the conversion factor for consumption.

The prices of tradable goods are expressed in CIF and FOB value for import goods and export goods respectively.

These values show the actual border prices. However, as the border prices of non-tradable goods cannot be converted directly, the border prices of the inputs needed to produce the non-tradable goods are considered. After some classification of the non-tradable goods, the shadow prices of a small amount of non-tradable goods are calculated by multiplying the market prices by the standard conversion factor directly.

(2) Transfer items

Import/export duties, other taxes and subsidies are merely transfer items which do not actually reflect any consumption of national resources. Therefore, these transfer items should be excluded in the calculation of the costs and benefits of the project for the economic analysis.

(3) Conversion factors

Conversion factors for goods and labor are determined as follows:

1) Standard Conversion Factor (SCF)

The standard conversion factor is used to determine the economic prices of certain

goods which cannot be directly revalued at border prices. These goods include most non-tradable goods and services. The standard conversion factor is expressed by the following equation:

$$SCF = \frac{I + E}{I + Di + E - De}$$

Where,
- I : Value of Import
- E : Value of Export
- Di : Value of Import Duties
- De : Value of Export Duties

In this study, the average SCF of 0.88 in 1989 to 1992 is adopted according to the past records of trade and customs as shown in Tables 7-1-8 to 7-1-9.

Table 7-1-8 Import and Export Statistics, 1989-1992

(Unit:A$'000)

Item	1989	1990	1991	1992
Import	28,596	34,446	33,226	50,530
Import Duty	5,190	5,380	6,193	6,739
Export	6,435	3,681	3,698	6,513
Export Duty	0	0	0	0

2) Factor for Consumption (CFC)

This conversion factor is used to convert the market prices of consumption goods into the border prices. The conversion factor for consumption is usually calculated in the same manner as the SCF, replacing total imports and exports by those of consumption goods only.

In this study, the CFC is adopted as 0.88 of SCF as shown in the above Table 7-1-9.

Table 7-1-9 Standard Conversion Factor (SCF)

	1989	1990	1991	1992	Average
SCF	0.87	0.88	0.86	0.89	0.88
(Remark)	SCF =	I+E / I+Di+E-De	I : Import E : Export Di : Import Duties De : Export Duties		

3) Conversion Factor for Labor (CFL)

For the economic analysis, labor costs are measured in terms of their opportunity costs, that is the value of the foregone marginal product from other alternate employment due to the employment of laborers for the project.

(i) Conversion factor for skilled labor

The cost of skilled labor is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as these are domestic costs or market costs, they are converted into border prices by multiplying the market wages by the SFC.

Thus, the conversion factor for skilled labor
= (Market wage rate) x (CFC)
= 1 x 0.88
= 0.88

(ii) Conversion Factor for unskilled labor

As the wages paid to unskilled labors by a project are usually far above the opportunity cost, these market wages should not be used for calculation of the economic value of the unskilled labors. Considering the labor market, the labor is usually provided from the agriculture and Fisheries.

Therefore, in this study, it is assumed in a simplified manner that the economic cost of unskilled labor is equal to the minimum wage or GDP per capita of the agriculture and fisheries sectors. Based on the data of Kiribati Shipping Service Ltd., an average daily wage for casual workers in 1994 is estimated to be A$ 17.81, and it can be considered as a proper indicator of marginal productivity, that is, the opportunity cost of unskilled labor. Based on government data, the minimum daily wage of unskilled labor is A$ 5.8 and GDP per capita is A$ 7.38 as shown in the Tables 7-1-10 and 7-1-11.

Table 7-1-10 Casual Labour Cost

Market Wage			A$17.81/D
Minimum Wage by Law	A$0.8/H	→	A$5.8/D (A$0.8 * 7.25H)
GDP per Capita	Agricaluture & Fisheries	:	A$8,024,000/Year A$21,984/D
	Population	:	2,979
	GDP per Capita		A$7.38

Table 7-1-11 Shadow Wage Rate

Labourer Cost	Conversion Factor	Shadow Wage
Skilled Labour	SCF x Market Price (SCF:Standard Conversion Factor)	0.88
Unskilled Labour	SCF x CF x Market Price (CF: Conversion Factor: A$7.38/A$17.81=0.414)	0.36

Here, the conversion factor for unskilled labour is calculated by the following formula, adopting the GDP per capita of agriculture and fisheries sectors as opportunity cost.

$$\text{CFL for Unskilled Labour} = \frac{\text{Opportunity Cost}}{\text{Market Price}} \times \text{SCF}$$

$$= 7.38 / 17.81 \times 0.88$$

$$= 0.36$$

7.1.4 Costs of the Project

The project costs must be converted from market prices into economic prices for the economic analysis. the costs arising from the implementation of this project are as follows:

(1) Investment Costs

In the economic analysis, investment costs have to be divided into the foreign currency portion and the local currency portion. Further, the local currency portion can be divided into non-tradable goods, skilled labor and unskilled labor. As the foreign currency portion is shown in CIF prices, it is not necessary to convert into shadow prices. However, the local currency portion should be converted into shadow prices. The consumption and labor costs (skilled and unskilled) should be converted into shadow prices by using the conversion factor estimated in section 7.9.3. Table 7-1-12 shows the shadow prices of the investment costs, A$ 11,749,807 in the first year and A$ 12,288,261 in the second year.

(2) Repair and Maintenance Costs

1) Repair and Maintenance Costs

As mentioned in section 7.10, about 0.9% of the investment costs of structures, equipment and rehabilitated facilities is to be considered as annual repair and maintenance costs of the amount of A$ 231,130 including maintenance dredging of the amount of A$ 6,340. The costs in shadow prices are calculated in the same manner as the investment costs and are estimated to be A$ 203,394. as shown in Table 7-1-12 (A).

2) Operation Costs

Operation costs consist of personnel costs and administration costs. Based on the estimation of operation costs in the following section 7.10, the necessary operation costs for the newly built wharf and rehabilitated facilities are estimated as follows:

Table 7-1-12 Shadow Prices of Construction Cost

(Unit:A$)

Year	Market Prices							
	Foreign Portion	Local Portion						Total
		Sub-Total	Labour Cost		Fuel Cost	Fuel Tax	Machine & Material	
			Skilled	Unskilled				
1st Year	9,076,038	3,239,278	729,151	419,986	374,379	3,782	1,711,980	12,315,316
2nd Year	9,491,962	3,387,722	762,566	439,232	391,537	3,955	1,790,432	12,879,684
Total	18,568,000	6,627,000	1,491,717	859,218	765,916	7,737	3,502,412	25,195,000
Year	Shadow Prices							
	Foreign Portion	Local Portion						Total
		Sub-Total	Labour Cost		Fuel Cost	Fuel Tax	Machine & Material	
			Skilled	Unskilled				
1st Year	9,076,038	2,673,769	641,653	151,195	374,379	0	1,506,542	11,749,807
2nd Year	9,491,962	2,796,299	671,058	158,124	391,537	0	1,575,580	12,288,261
Total	18,568,000	5,470,068	1,312,711	309,319	765,916	0	3,082,122	24,038,068
Conversion Factor			0.88	0.36			0.88	

Table 7-1-12 (A) Shadow Prices of Repair and Maintenance Costs for New Fixed Assets

(Unit:A$)

	Fixed Assets	Quantity	Market Price					Shadow Price
			Repair & Mainte Rate	Aquisition Cost	Repair & MainteCost	Mainte. Dredging	Total	
1	Wharf & Other Structures	1	0.005	9,890,000	49,450	0	49,450	43,516
2	Building	1	0.01	3,470,000	34,700	0	34,700	30,536
3	Cargo Handling Equipment	1	0.03	2,677,000	80,310	0	80,310	70,673
4	Maintenance Dredger	1	0.03	1610000	48,300	6,340	54,640	48,083
5	Navigation Aids	1	0.03	401,000	12,030	0	12,030	10,586
	Total			18,048,000	224,790	6,340	231,130	203,394
	Conversion Factor							0.88

(i) Personnel costs

As mentioned above, Kiribati Ports Authority has permanent staff of 127 persons from 1997, 34 plus to the present number of 93 of Kiribati Ports Au thority. The increased staff consist of 5 direct and 29 indirect labourers.

The former is counted as direct labour cost which is examined in the item of savings in cargo handling cost mentioned after. Here, the latter is considered as an increased cost with this project.

The conversion factor for skilled labor is applied to convert the personnel costs from market prices into the shadow prices by multiplying the market costs by the standard conversion factor,and are estimated to be A$ 142,261 as shown in Table 7-1-13.

Table 7-1-13 Shadow Prices of Additional Indirect Labour Costs and Administration Costs

Market Prices				Shadow Prices		
Indirect Labour Cost		Admi Cost	Total	I.D.L.Cost	Admi Cost	Total
Personnel	Cost					
Nos	A$	A$	A$	A$	A$	A$
29	161,660	48,498	210,158	142,261	42,678	184,939
Conversion Factor				0.88	0.88	

(ii) Administration Costs

The administration costs are set at 30% of the personnel costs. The shadow prices of the administration costs are calculated by multiplying the market prices by the standard conversion factor, and are estimated to be A$ 42,678 as shown in the above Table 7-1-13.

3) Fuel Costs

The fuel costs are shown in Tables 7-1-14 and 7-1-15. The shadow prices of the costs are calculated by multiplying the market prices by the standard conversion factor, and are estimated to be A$ 24,837 in 1997, A$ 26,007 in 1998 and A$ 27,128 in 1999 and 28,274 in and after 2000.

4) Renewal Investment Costs

The renewal investment costs for facilities and equipment after their useful life-times are not considered.

Table 7-1-14 Fuel Costs for New Equipment

Equipment	Spec.	Quantity	Consumption	Working Hour	Unit Price	Amount	Remark		Cargo Volume 1997	Cost per Ton
							Inc. Custom Duties			
			L/H	H	A$/L	A$	A$/L	A$	Ton	A$
Truck Crane	(200PS)	1	3.7	3,500	0.64	8,288	0.005	65		
Fork Lift	(200PS)	1	7.1	3,500	0.64	15,904	0.005	124		
Fork Lift	(72PS)	1	0.4	3,500	0.64	896	0.005	7		
Total						25,088		196	96,898	0.26

Table 7-1-15 Shadow Prices of Fuel Costs for New Equipment

Year	Cargo Volume	Unit Price per Ton	Market Prices	Shadow Prices
	Ton	A$	A$	A$
1997	96,898	0.26	25,088	24,837
1998	101,040	0.26	26,270	26,007
1999	105,394	0.26	27,402	27,128
2000	109,846	0.26	28,560	28,274
↓	↓	↓	↓	↓
2022	109,846	0	28,560	28,274
Conversion Factor				0.99