

5.4 Management and Operation Plans for New Terminals

5.4.1 Introduction

Currently there are four terminals in Rajang Port, namely, Sibul, Sungei Merah, Sarikei and Bintangor. The RPA has a head office in Sibul and administration centers in Sarikei and Bintangor that deal with daily port services.

In the short-term development plan, a timber products terminal and a coal terminal in Tanjung Manis area and additional jetty at Sungei Merah are planned.

Among these, it is desirable that the coal terminal be built and managed by the private sector for reasons that will be given later. As for the other terminals except the coal terminal (especially the timber products terminal which is about 100km distant from the head office in Sibul), three management bodies can be considered; one is the RPA, the second is another public organization independent of the RPA and the third is a private company. However, the RPA should manage these terminals in an integrated way because of following reasons;

(1) Since each terminal is located in the same river system and the scale is small, to compete with each other would be counterproductive from the viewpoint of national economy especially in terms of securing talent and avoiding surplus investment, instead, each terminal should function in a manner best suited to its location.

(2) It is expected that the RPA will have about 1000 employees after implementation of the short-term plan. If this is the case, single organization would be better able to facilitate the interchange of personnel and accumulation and transfer of technical know-how of port construction, management and operation.

(3) It is difficult for each terminal to finance necessary funds individually, in the meanwhile, in case of unified organization, it is relatively easy to secure the funds and possible to invest intensively and efficiently. Consequently, this leads to the stabilization of management.

However, when managing and operating each terminal, it is necessary to delegate authority to administration centers as much as possible and manage/operate efficiently by displaying originality and ingenuity.

5.4.2 Timber products terminal in Tanjung Manis area

(1) Organization

The timber products terminal in Tanjung Manis area handles timber products as well as general cargo consumed in the timber processing zone, and it is expected to be one of the core components of the Rajang Port. Thus the RPA should manage and operate the terminal in an integrated way as it does existing ones.

The RPA should establish an administration center in Tanjung Manis area to manage the terminal. The center should have administration, operation, civil engineering, mechanical engineering and security & fire fighting sections.

(2) Personnel distribution

Required personnel for the administration center is shown in Table-5.4.2.1 taking into consideration cargo handling volume, site condition and present situation of Sibul terminal.

However, the RPA should first utilize existing personnel, ideally by reorganizing current staff; only then should new staff be hired.

Table-5.4.2.1 Required Personnel for the Timber Products Terminal

| Section | Officer | Staff | Total |
|--------------------------|---------|-------|-------|
| Administration | 1 | 6 | 7 |
| Operation | 16 | 64 | 80 |
| Security & Fire Fighting | 3 | 27 | 30 |
| Civil Engineering | 0 | 3 | 3 |
| Mechanical Engineering | 3 | 27 | 30 |
| Crew for tugboat | 4 | 6 | 10 |
| Total | 27 | 133 | 160 |

(3) Establishment of branch offices of port-related authorities

The timber products terminal will become a large port with more than one million tons of foreign trade cargo and more than 150 calling vessels in 1997, the target year in the Short-term Plan. Furthermore, this terminal will be located beyond the daily commutable distance from the Sibuh or Sarikei port. Therefore, to deal with port-related procedures and business generated in the new port, it will be necessary to set up, in addition to the RPA's administration center, port-related authorities' branch offices such as the Marine Department, customs office, quarantine office, etc..

For the convenience of port users, it is desirable that these offices be concentrated in one building, called a joint administration office. Special consideration also should be given to standardizing port-related documents commonly used by the authorities, to simplify procedures for port users.

Through such measure, the new terminal will be highly convenient and efficient for port users, thereby promoting greater utilization.

(4) Introduction of tugboats

As over 10,000 GRT vessels will berth the terminal, the RPA should introduce two tugboats to secure safe berthing of large vessels.

These tugboats should be utilized for vessels entering coal terminal, as well.

(5) Berth allocation

While the basic public-use principle "first-come, first-served" should be adopted, at the same time a preferential use system should be adopted for liner vessels navigating regularly.

(6) Operation system

As a lot of cargo including containers is handled at the terminal, it is desirable to prepare a third shift (night operation) when it is required by users to promote quick dispatch of vessels. To promote efficient use of the terminal and to avoid a vessel's waiting for a berth, a third shift is recommended.

Required stevedores for 1997 are as follows, taking into consideration estimated cargo handling volume and efficiency.

Required gang number: 19
Stevedore/gang: 20
Total number of stevedore: 380

(7) Management and operation of a shallow wharf

In the Short-term Plan, a shallow wharf is planned for discharging timber products from upstream and empty containers from Sibuhut. These cargo will be exported from the adjacent deep wharf. The RPA should manage and operate both wharves in an integrated way.

5.4.3 Coal terminal in Tanjung Manis area

As actual users of the coal terminal will be private companies with coal mining and export rights, while SESCO will manage the thermal power plant, three methods can be considered for construction and management of the terminal:

- (I) Construction and management by the RPA
- (II) Construction and management by a private company with coal rights or by a private company in a joint venture with SESCO
- (III) Construction by the RPA and leased to a private company or leased to a private company in a joint venture with SESCO

Compared with three methods, we can say as follows:

(1) Because users will be restricted to companies with the pre-assigned rights, method (II) or (III), which are managed by the private sector, are preferable to method (I), which is managed as a public berth.

(2) Because coal will be the sole cargo, method (II) or (III) are preferable for flexible, efficient construction and management.

(3) From the viewpoint of public control, method (III) ranks higher than (II) because the RPA has ownership of the terminal.

(4) In summary, method (II) or (III) are preferable because both cargo and users will be restricted. To maximize the vitality of the private sector and manage the terminal flexibly and efficiently, method (II) is desirable whereby the private sector builds and manages the terminal under

the control of the RPA, which should have responsibility for the facilities within the port limits.

5.4.4 New Oil terminal at Sungei Merah

The new oil terminal will be built to overcome problems associated with the old oil terminal. In future, the old and new oil terminal will complement each other, and therefore, it is desirable that the current method of management by the RPA will be adopted for the new terminal.

Required personnel for the terminal is estimated at eight, all of whom are necessary for operation and security & fire fighting.

5.5 A long-term Recommendation on Management

5.5.1 Improvement of port facilities for domestic transport

At present, port facilities for domestic transport are divided into State Government wharves and private wharves. The RPA has no responsibility in either case.

State Government wharves have no storage facilities, such as sheds, and the level of cargo handling efficiencies at these wharves is not high. In addition, there are no rules or restrictions on time and duration for wharf utilization, any vessel can berth for as long a period as it desires.

The flow of domestic cargo and foreign cargo is linked. To further promote the Sarawak economy, it is important to improve cargo handling efficiency at the port, not only in the field of foreign trade, but also in domestic transport within Sarawak State.

Therefore, port facilities for domestic transport should be improved and management of them should be reinforced, for example, it would be worthwhile examining the merits of handing over management of government wharves to the RPA.

5.5.2 Reinforcement of management of port limits

The limits of the Rajang Port extend from Kapit to the estuaries of

Rajang River. At present, the principal function of the limits is to indicate the range in which the RPA collects port dues. The Land & Survey Department, Ministry of Resource Planning, Sarawak is responsible for use of water areas.

However, the port management body should take part in control of the water area needed for the port. To promote the hinterland's economy, the port needs to function properly, and to achieve this purpose, it is necessary for the port management body to have collective responsibility for all management within the port limits. As a result, the water area needed for port activities will be managed under a consistent policy (Port Master Plan). And port facilities can be constructed with consistency following the Plan up to the target year. The scope of the port limit should be the minimum area required for existing and planning port management/operation and construction.

Furthermore, the port management body should have following authority:

- 1) Granting of permission for construction or improvement of facilities within the port limit
- 2) Granting of permission for exclusive occupation of a water area within the port limit
- 3) Granting of permission for mining sand within the port limit

When permission applications are submitted, the port management body should assess them by considering their alignment with the Port master Plan.

The port management body should collect charges when issuing exclusive use or mining rights.

6. ECONOMIC ANALYSIS

6.1 Purpose and Methodology of the Economic Analysis

6.1.1 Purpose

The purpose of the economic analysis is to appraise the economic feasibility of the Short-term Plan for the New Timber Products Terminal, Coal Terminal and Oil Jetty from the viewpoint of the national economy. For this purpose, after investigating the economic benefits and costs that will arise from the project, it is examined whether the net benefits of this project will exceed those that could be obtained from other investment opportunities (the opportunity cost of capital) in Malaysia.

To study this examination, the Study team has calculated the economic internal rate of return (EIRR) for the Short-term Plan and each of its component parts. Table-6.1.1.1 shows Categories where calculation of EIRR have been carried out. In the calculations of the component parts, the case of the oil jetty is not considered for the following reasons.

The oil Jetty is constructed about one kilometer down stream of the Igan River for reasons of safety. Safety is a very important benefit, but one that is very difficult to convert into a figure. Therefore we have not calculated EIRR for the Oil Jetty.

Table-6.1.1.1 EIRR Calculations for Each Category

| Category | EIRR calculation for project components |
|-------------|---|
| Category 1. | Total project (Timber Products Terminal+ Coal Terminal+ Oil Jetty) |
| Category 2. | Timber Products Terminal |
| Category 3. | Coal Terminal |

6.1.2 Methodology

(1) EIRR

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

(2) "With" and "Without" analysis

The EIRR value is obtained from benefit-cost analysis, the equation of which is shown in 6.5.2. The economic benefits are obtained from the difference between the "With" case and the "Without" case.

(3) Measurement of costs and benefits

In estimating the costs and benefits of the project, it should be noted that the value of goods quoted at a market price do not always represent the true value of those goods from the viewpoint of the national economy. The local currency portion of the goods and materials at market prices often includes customs duties. The labour cost at market prices is often influenced by a minimum wage system and other regulations. Therefore, "economic pricing" should be conducted for the economic analysis. Economic pricing here means the appraisal of costs and benefits in terms of international prices (border prices). In the calculation of the costs and benefits, transfer items such as import duties, other taxes and subsidies should be excluded. The market prices are changed to border prices by various conversion factors mentioned below.

6.1.3 Conversion into economic price

In general, all costs and benefits are divided into traded goods, non-traded goods, labour and transfer items. Labour is further divided into skilled and unskilled labour.

We can eliminate transfer items such as tax and subsidies because they do not cross the national border.

(1) Traded goods

Traded goods are expressed at CIF (cost, insurance and freight) prices for imports and at FOB (free on board) prices for exports, which are border prices themselves.

(2) Non-traded goods

The local currency portion, after deducting traded goods, labour costs and transfer items, is considered to be non-tradable goods, of which the economic price is calculated by multiplying the Standard Conversion Factor (SCF). The SCF is used to determine the economic prices of certain

non-traded goods and services that cannot be directly valued at border prices. By using the SCF, we are able to void the price differential between the domestic market and the international market, a differential caused by import duties and export subsidies.

SCF is expressed by the following equation:

$$SCF = \frac{I+E}{(I+D_i)+(E-D_e+S_e)}$$

Where, I : Total Amount of Import

E : Total Amount of Export

D_i : Total Amount of Import Duties

D_e : Total Amount of Export Duties

S_e : Total Amount of Export Subsidies

In this Study, 0.958, the SCF in 1989 is adopted.

Commodity groups to be used in this calculation are based on Commodity divisions of "Malaysia External Traded Statistics(1989)".

(3) Labour

1) Skilled labour

The economic cost of skilled labour is obtained by multiplying its market price by the Conversion Factor for Consumption (CFC), assuming that the market mechanism is functioning properly. The CFC is used for converting the prices of consumer goods from domestic market prices to border prices.

CFC is expressed by the following equation:

$$CFC = \frac{IC + EC}{(IC+D_{ic})+(EC-D_{ec}+S_{ec})}$$

Where, IC : Total Imports of Consumer Goods

EC : Total Exports of Consumer Goods

D_{ic} : Total Import duties of Consumer Goods

D_{ec} : Total Export duties of Consumer Goods

S_{ec} : Total Export Subsidies of Consumer Goods

In this Study, 0.949, the CFC in 1989, is adopted.

2) Unskilled labour

For the economic analysis, costs for unskilled labour should be measured in terms of their opportunity cost; that is, the value of lost marginal production that the employment of labourers for a given project would create for other purposes.

It is common that the inflow of unskilled labour to the project comes mainly from the agricultural sector which is relatively elastic in its use of labour and where wages are normally lowest. So, it is often assumed in a simplified manner that the economic cost of unskilled labour is equal to the per capita income of the agricultural sector. The general wage level for agricultural workers, according to discussion of relevant state authority in Sarawak, is 10 ringgit a day. Consequently, we can consider wages for agricultural workers as a reliable indicator of marginal productivity that is, the economic cost of unskilled labour.

Therefore, it can be considered that the economic cost is 10 ringgit a day. Multiplying this figure with the market price of unskilled labour for construction (estimated 20 ringgit a day) and CFC, the conversion factor for unskilled labour is calculated as 0.475.

$$\begin{array}{|c|} \hline \text{Conversion Factor} \\ \hline \text{for Unskilled Labour} \\ \hline \end{array} = \frac{\begin{array}{|c|} \hline \text{Workers' Opportunity} \\ \hline \text{Cost} \\ \hline \end{array}}{\begin{array}{|c|} \hline \text{General Workers' Construction} \\ \hline \text{Cost} \\ \hline \end{array}} \times \text{CFC}$$

$$= (10/20) \times 0.949 = 0.475$$

6.2 Prerequisites of the Economic Analysis

6.2.1 Period of calculation

Taking into consideration the depreciation period of the main facilities and the construction schedule, the period of calculation for the economic analysis is assumed to be the 30 years between 1994 and 2023.

6.2.2 "With" Case

According to the Short-term plans shown in Table-6.2.2.1, the projects for this study include construction of an oil jetty, timber products terminal and coal terminal.

Table-6.2.2.1 Short-term plans

Mooring Facilities

| Wharf | Depth | Length | Remarks |
|----------------|--------|-------------|--------------------------|
| Sungei Merah | -5.0m | 1 (jetty) | |
| Tg. Manis Area | -10.0m | 300m | Timber Products Terminal |
| | -5.0m | 180m | Timber Products Terminal |
| | -10.0m | 165m | Coal Terminal |
| | -5.0m | 150m | Coal Terminal |
| TOTAL | | 795m | plus 1 jetty |

Storage Facilities (m²)

| Wharf | Shed | Open Yard | Remarks |
|----------------|---------------|---------------|--------------------------|
| Tg. Manis Area | 12,800 | 31,600 | Timber Products Terminal |
| | - | 25,000 | Coal Terminal |
| TOTAL | 12,800 | 56,600 | |

Cargo Handling Equipment & Crafts to be procured

| Equipment | Nos |
|----------------------------------|-----|
| Tractor + Chassis | 5 |
| Forklift (25t/42t) | 4 |
| Forklift (3t) | 6 |
| Dump Truck (10t) | 4 |
| Shovel Loader (3m ³) | 2 |
| Shovel Loader (1m ³) | 2 |
| Shiploader (250t/h) | 1 |
| Tugboat (2000ps) | 1 |
| Tugboat (1000ps) | 1 |

COSTS (million Ringgit)

| Wharf/etc. | Cost |
|-----------------|------------|
| Sungei Merah | 3 |
| Timber Wharf | 78 |
| Coal Wharf | 26 |
| Navigation Aids | 18 |
| Others | 20 |
| TOTAL | 145 |

6.2.3 "Without" case

In the "Without" case we should see the most likely future "Without" the projects, assuming that all other conditions will be the same as those in the "With" case. The following conditions are adopted as the "Without" case after various possibilities are discussed:

(1) Timber Products Terminal

- 1) The TPZ of STIDC is constructed.
- 2) The distribution of ships and cargo volume are the same as in the "With" case.
- 3) The Timber Products Terminal is not constructed and handed cargo at Tg. Manis is loaded/unloaded at anchorage.
- 4) Small mooring facilities, transit sheds and open storage should be built next to the New Timber Product Zone at Tg. Manis for transporting the products to ships anchoring offshore the TPZ area through barges.

(2) Coal Terminal

- 1) The Thermal Power Plant is constructed.
- 2) The distribution of ships and bulk cargo volume are the same as in the "With" case.
- 3) A small mooring facility and coal yard should be constructed next to the Thermal Power Plant at Tg. Manis for supplying coal to the thermal power plant.

6.2.4 Cargo throughput

The cargo volume under the "With" case already has been forecast. The Short-term Development Plan at Tg. Manis is formulated in response to the cargo throughput expected in 1997 with the optimum berth occupancy of that year. Thus, for the economic analysis, it is assumed that capacity will not increase after 1997. However the cargo volume that can be handled in the timber products terminal will reach its limit in 1998. The increment portion of the cargo volume after that year is to be dealt with in the following stages of the development plan for the new port.

6.3 Benefits

6.3.1 Benefit items

Considering the "With" and "Without" situations mentioned above, the following items are identified as benefits of the Short-term Plan for the new Timber Products Terminal and Coal Terminal:

- 1) Savings in the staying cost of vessels
- 2) Savings in tugboat and barge costs
- 3) Savings in interest payments
- 4) Savings in stevedore costs
- 5) Construction cost of "Without" case
- 6) Other Benefits

6.3.2 Savings in the staying cost of vessels

If the new port is not constructed, the cargo will have to be handled at anchorage and the staying time of calling ships will increase, because the efficiency of anchorage operation is lower than that of wharf operation.

Investment in the new port will reduce the staying time of calling ships and this cost reduction is one of the major benefits of the project.

Benefits from the project for Malaysia can be calculated by comparing the "With" case to the "Without" case.

We obtain the staying time by calculating waiting time and service time separately for the "With" case, and we calculate staying time directly for the "Without" case. The assumed arriving distribution of calling vessels will be similar to the actual current distribution. The share of foreign ships calling at Tg. Manis is assumed to be 50% of the total. In this study it is assumed that 50% of the benefits attributed to foreign ship operators will be transferred to the Malaysian economy as well as 100% of the benefits for Malaysian ship operators will accrue to the Malaysian economy. The ship cost can be estimated simply by totaling the various cost components such as depreciation, wages, maintenance cost and so forth. Although it is possible to estimate the ship cost based on the charter rate, this rate fluctuates sharply with market conditions, so it is not appropriate for use as the base for the economic price of the ship

cost. After interviewing Japanese shipping companies with international routes, we chose to estimate the ship cost based on the hire rate. The formula used to calculate this benefit is as follows:

$$\boxed{\text{Savings in ships' staying costs}} = \boxed{\text{Difference in staying time between "with" \& "without" cases}} \times \boxed{\text{Ship cost (unit cost)}} \times \boxed{\text{Share of benefits accruing to Malaysia}}$$

Table-6.3.2.1 shows the savings in the staying costs of vessels.

Table-6.3.2.1 Savings in the Staying Costs of Vessels

(1997)

| Export Type | Average Ship Size (DWT) | Average Ship Costs (M\$/Ship/Day.) | Staying Time | | | | Ship's Waiting Costs (M\$'000) | Benefits Accruing to Malaysia (M\$'000) |
|---------------|-------------------------|------------------------------------|---------------------|-----------|-------------------|-------------------|--------------------------------|---|
| | | | Without Case (Hrs.) | With Case | Difference (Hrs.) | Difference (Days) | | |
| Timber (-10n) | 7,750 | 22,000 | 44,440 | 6,846 | 37,594 | 1,566 | 34,461 | 25,846 |
| Coal (-10n) | 15,000 | 22,000 | 8,065 | 1,342 | 6,723 | 280 | 6,163 | 4,622 |
| Total | | | | | | | | 30,468 |

(1998)

| Export Type | Average Ship Size (DWT) | Average Ship Costs (M\$/Ship/Day.) | Staying Time | | | | Ship's Waiting Costs (M\$'000) | Benefits Accruing to Malaysia (M\$'000) |
|---------------|-------------------------|------------------------------------|---------------------|-----------|-------------------|-------------------|--------------------------------|---|
| | | | Without Case (Hrs.) | With Case | Difference (Hrs.) | Difference (Days) | | |
| Timber (-10n) | 7,750 | 22,000 | 51,040 | 7,528 | 43,512 | 1,813 | 39,886 | 29,915 |
| Coal (-10n) | 15,000 | 22,000 | 8,065 | 1,342 | 6,723 | 280 | 6,163 | 4,622 |
| Total | | | | | | | | 34,537 |

6.3.3 Savings in tugboat and barge costs

In the "Without" case, all exported cargo such as timber products and coal are loaded at anchorage. In this case, tugboats and barges are utilized to load cargo (see Figure-6.3.5.1). It is assumed that three barges come alongside a vessel simultaneously when cargo is loaded. On the other hand, in the "With" case tugboats and barges are used only when cargoes from upstream are unloaded at shallow wharves.

Therefore, there is difference of time between "With" case and "Without" case in terms of the use of tugboats and barges. Saving time is one of the benefits of the "With" case.

The formula used to calculate these benefits is as follows:

$$\boxed{\text{Savings in Tugboat \& Barge Costs}} = \left(\boxed{\text{Handling hour at Anchorage "Without" Case}} - \boxed{\text{Handling hour at Shallow Wharf "With" Case}} \right) \times \boxed{\text{Tugboat \& Barge Cost/hour}}$$

Where, handling efficiency and rate of idle time are assumed as in the following table.

Table-6.3.3.1 Handling Efficiency and Rate of Idle Time

| | "Without" Case | | "With" Case | |
|-----------------|------------------------------------|--|--|-----------------------------|
| | Handling efficiency (at anchorage) | Rate of idle time (assumption based on measured value) | Handling efficiency (at shallow wharf) | Rate of idle time |
| Timber Products | 47ton/hour (measured) | 50% (cargo from TPZ) 40% (cargo from up-stream) | 59ton/hour (see Appendix-II.5.2.4) | 30% (see Appendix-II.5.2.4) |
| Coal | 58ton/hour (measured) | 40% | 84ton/hour (see Appendix-II.5.2.4) | 30% (see Appendix-II.5.2.4) |

Table-6.3.3.2 shows the savings in tugboat and barge costs.

Table-6.3.3.2 Savings in Tugboat and Barge Costs

(1997)

| Export Type | Tug (300HP) Barge Size (ton) | Tugboat Barge Costs (M\$/hr.) | Working Time | | | Tug. Barge Loading Costs (M\$'000) | Benefits Accruing to Malaysia (M\$'000) |
|-------------|------------------------------------|-------------------------------------|------------------------|---------------------|----------------------|---|--|
| | | | Without Case (Hrs.) | With Case (Hrs.) | Difference (Hrs.) | | |
| Timber | 1,000 | 177 | 34,587 | 10,854 | 23,733 | 4,201 | 4,201 |
| Coal | 1,000 | 177 | 6,034 | 4,488 | 1,546 | 274 | 274 |
| Total | | | | | | | 4,474 |

(1998)

| Export Type | Tug (300HP) Barge Size (ton) | Tugboat Barge Costs (M\$/hr.) | Working Time | | | Tug. Barge Loading Costs (M\$'000) | Benefits Accruing to Malaysia (M\$'000) |
|-------------|------------------------------------|-------------------------------------|------------------------|---------------------|----------------------|---|--|
| | | | Without Case (Hrs.) | With Case (Hrs.) | Difference (Hrs.) | | |
| Timber | 1,000 | 177 | 39,787 | 12,065 | 27,722 | 4,907 | 4,907 |
| Coal | 1,000 | 177 | 6,034 | 4,488 | 1,546 | 274 | 274 |
| Total | | | | | | | 5,180 |

6.3.4 Savings in interest payments

Generally speaking, funds and time are critical ingredients in cargo transportation, and savings in time can help reduce interest payments on funding. In this project, one of the benefits is derived from time savings between the "With" case and "Without" case.

Most merchants or manufacturers borrow money for their transportation from banks. If the time between receipt of orders and payment for orders can be shortened, interest payments can be reduced; that is, if manufacturers can speed up their cash flow, interest payments can be trimmed.

The following is a practical way of calculating the savings in interest costs.

Savings in
Interest
Payments

$$= Q \times V \times I \times D / 365$$

Q: Cargo volume (ton)

=1,111,000tons

D: Average difference of staying time between "Without" and "With" case (days)

=1,566days/148ships=10.6days

V: Average price of cargo (607 ringgit/ton)

This is the price of timber products based on "EXTERNAL TRADE STATISTICS MALAYSIA 1989"

I:Interest Rate (6.1%)

The interest rate is estimated at 6.1% per annum based on the London interbank offered rate (LIBOR) in June 1991.

$$\text{Savings in Interest payments} = 1,111,000 \times 607 \times 0.061 \times 10.6 / 365$$

$$= 1,194,663 \text{ ringgit}$$

Table-6.3.4.1 shows savings in interest payments and these parameter.

Table-6.3.4.1 Savings in Interest Payments

| Year | Q(ton) | V(ringgit/ton) | I(%) | D(days) | Savings in Interest Payments (ringgit) |
|------|-----------|----------------|------|---------|--|
| 1997 | 1,111,000 | 607 | 6.1 | 10.6 | 1,195,000 |
| 1998 | 1,276,000 | 607 | 6.1 | 10.6 | 1,385,000 |

6.3.5 Savings in stevedore costs

There is a difference between "With" case and "Without" case in terms of stevedoring time. The amount of time required for stevedoring in the "With" case is less than that of the "Without" case; therefore, "With" case is more cost efficient. Figure-6.3.5.1 shows the handling situation of "Without" and "With" cases.

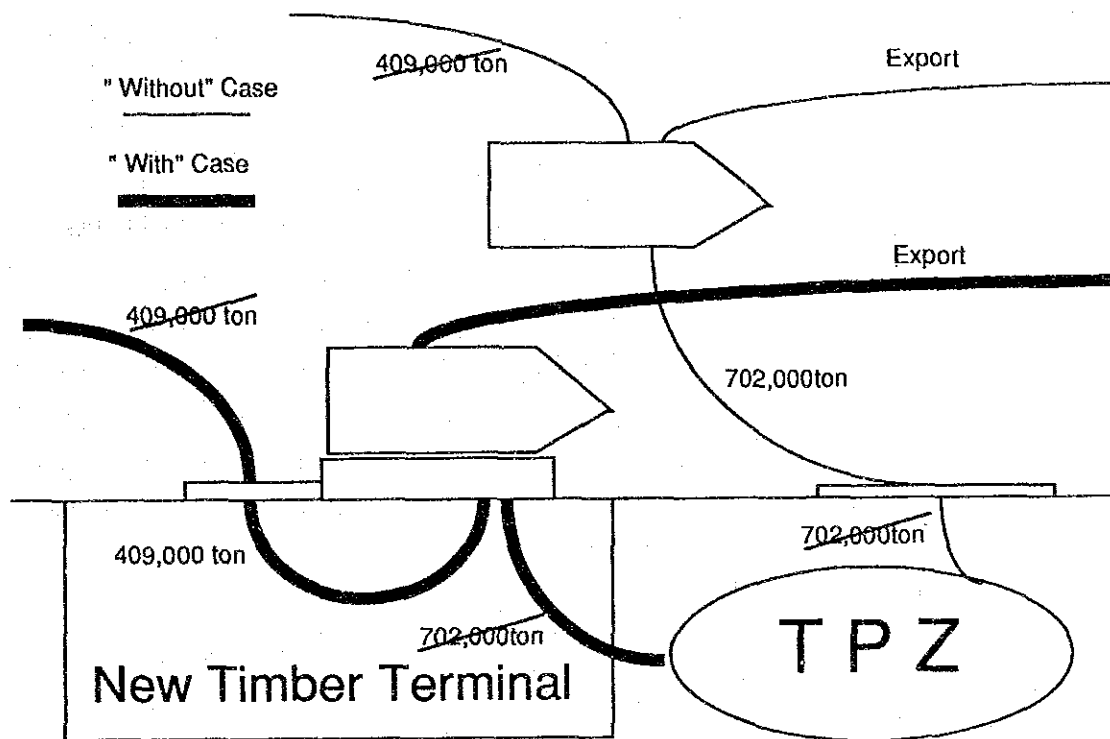


Figure-6.3.5.1 Handling Situation of "Without" and "With" Cases

The formula used to calculate this benefit is as follows :

| |
|----------------------------------|
| Savings in Stevedore Costs |
|----------------------------------|

$$= M \times P \times D$$

M: Labour wage (29.41 ringgit/day/person)
(based on financial analysis)

P: Workers per gang (20persons)

D: Difference of working days between "Without"
case and "With" case

$$= \frac{\text{Handling volume}}{\text{Handling efficiency} \times \text{Working time/day}}$$

$$= \frac{293,000\text{tons}}{63.6\text{ton/hour} \times 14 \text{ hour}}$$

$$= 329\text{days}$$

| |
|----------------------------------|
| Savings in Stevedore Costs |
|----------------------------------|

$$= 29.41 \times 20 \times 329$$

$$= 193,518 \text{ ringgit}$$

Table-6.3.5.1 shows savings in stevedore costs and these parameter.

Table-6.3.5.1 Savings in Stevedore Costs

| Year | (A) riverine(in '000tons) | (B) TPZ '000tons) | (B)-(A) '000tons) | M (ringgit) | P (persons) | D (days) | Savings costs (ringgit) |
|------|---------------------------------|-------------------------|----------------------|----------------|----------------|-------------|-------------------------------|
| 1997 | 409 | 702 | 293 | 29.41 | 20 | 329 | 194,000 |
| 1998 | 440 | 836 | 396 | 29.41 | 20 | 356 | 209,000 |

6.3.6 Construction cost of "Without" case

Table-6.3.6.1 shows construction costs of "Without" case.

Table-6.3.6.1 Construction Costs of "Without" Case

| Item | Quantity | Unit Price (M\$) | Amount (M\$'000) |
|------------------------------------|-----------------------|------------------|------------------|
| Small Facilities for TPZ | 3 | 1,818,500 | 5,456 |
| Transit Shed | 4,100 m ² | 506 | 2,075 |
| Open Storage | 2,500 m ² | 95 | 238 |
| Small Facilities for Power Station | 1 | 1,818,500 | 1,819 |
| Coal Station | 12,500 m ² | 47.84 | 598 |
| Total | | | 10,184 |

In the "Without" case, the Timber Products Zone and the Coal Power Station of these areas will need some facilities for barges and so forth. Small facilities for barges will be constructed for the export of timber products, and a transit shed and open storage also will be constructed for efficient loading at the Timber Products Zone. Figure-6.3.6.1 shows "Without" case timber products terminal layout. Figure-6.3.6.2 shows "without" case coal terminal layout.

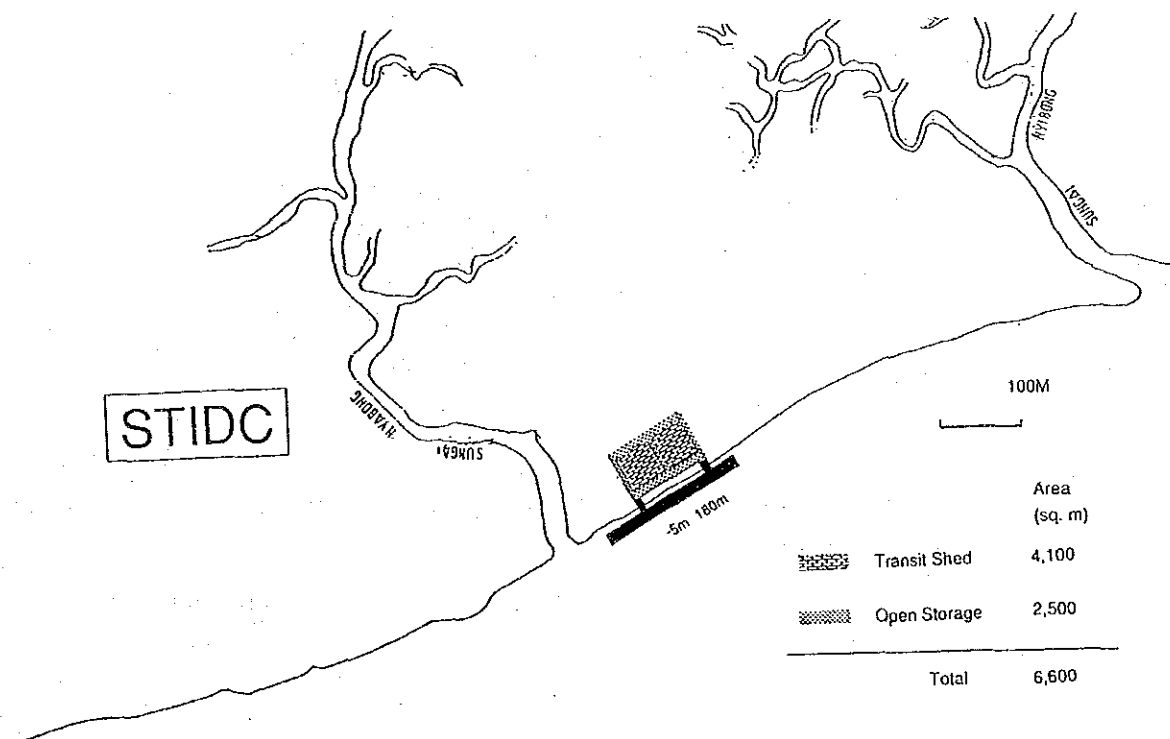


Figure-6.3.6.1 "Without" Case Timber Products Terminal Layout

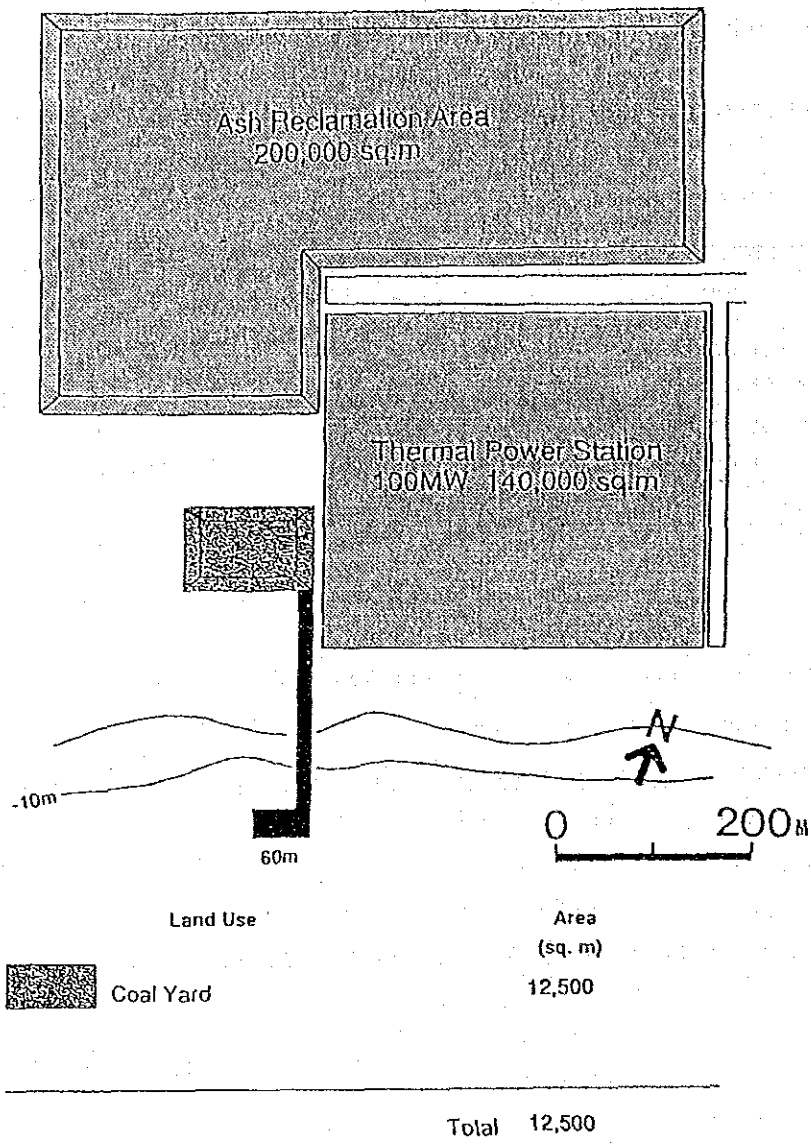


Figure-6.3.6.2 "Without" Case Coal Terminal Layout

6.3.7 Other benefits

There are other important benefits stemming from this project even though they are not measured quantitatively.

(1) Effect of port construction

1) Increased demand for construction materials

In the Short-term Plan, materials such as cement, stone and steel will be needed for port construction. Most of these materials will be available in Malaysia. This demand stimulates the development of related industries.

It goes without saying that employment opportunities in these industries will increase according to this increase in demand for these materials.

2) Employment opportunities resulting from port construction

In the Short-term Plan, construction of the new port will be implemented from 1994 to 1997. During this period, many labourers will be needed for construction work.

The estimated total number of skilled and unskilled labourers required are listed below:

| Type of labourer | No. of labourers |
|---------------------|------------------|
| Skilled labourers | 39,000 |
| Unskilled labourers | 40,000 |

Though the benefits of construction work have already been taken into account for the cost-benefit analysis, the effect of employment should not be overlooked from the viewpoint of countering unemployment.

(2) Increase in employment opportunities

The port operation will increase employment opportunities for port workers.

The increase in port workers is listed below:

| Year | 1997 | 2010 |
|---------|------|------|
| Workers | 160 | 206 |

(3) Promotion of regional development in Tg. Manis

The effect of the Timber Products Zone and the Coal Power Station depends upon the transportation for materials and products; therefore, the efficiency of the new port will have a strong impact on the outcome of these projects. Without the new port, it would be very difficult to carry out the promotion of regional development and the diversification of Malaysian industry, the key objectives.

1) Increase in foreign investment

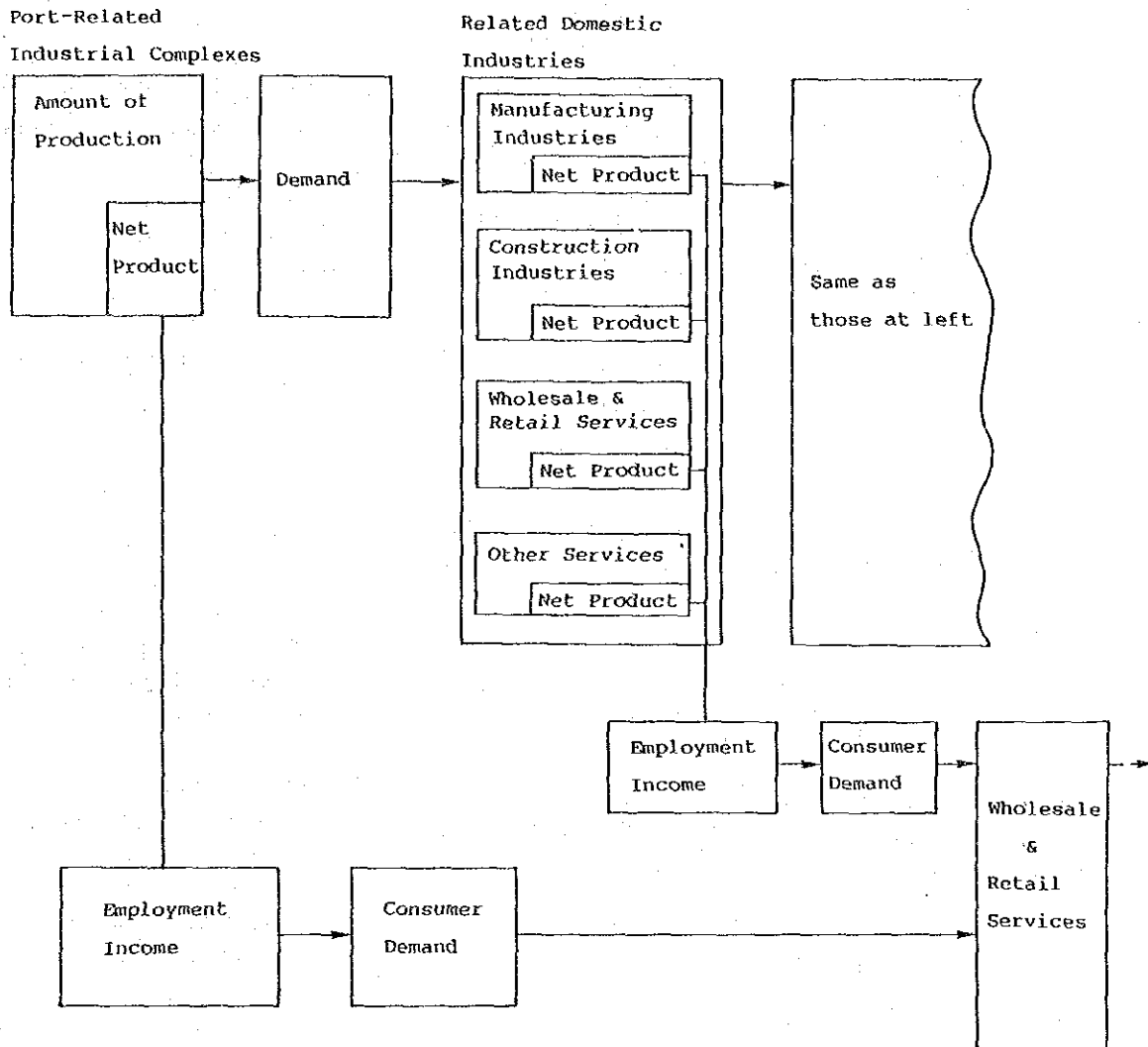
The new port will increase the likelihood of higher capital investment by foreign companies. The poor cargo handling conditions in this area will make it difficult to attract foreign investment if all things are equal.

2) Economic multiplier effect

If a new port is established in this area, there is a possibility of setting up not only timber product mills, but also other port-related industries such as exported-oriented agricultural products processing, glass based industry, clay based industry, and others. The Timber Products Zone will trigger development of the timber related industries, which will in turn stimulate the promotion of other industries. This effect is called the multiplier effect. From the viewpoint of the national economy, we can achieve an expansion of demand and an increase in incomes through this effect.

Table-6.3.7.1 shows the multiplier effects on port related industries.

Table-6.3.7.1 Multiplier Effects on Related Industries



(4) Reduction in cargo accidents and damage

Cargo accidents and damage will be reduced when cargo is handled at the new port instead of offshore.

(5) Savings in the cost of insurance

If the new port is established, the containerized ratio would increase gradually.

As a point of interest, the insurance cost of container cargo is about 1% to 1.5% of the product's price. Cargo handled in other types of packing will require 4% to 5% of the product's price for insurance.

Therefore, it can be said that the growth of containerization will

lead to a reduction in the cost of insurance.

(6) Protecting the area in and around the Oil Jetty

The Oil Jetty at Sungei Merah is currently located along the bight of the Igan River. Also, behind the jetty there are many houses in close proximity to the oil tanks; this situation is a serious fire hazard.

Negotiating the jetty is very difficult because there is a very complicated current at the point; therefore, the risk of an accident is high.

The construction of the New Oil Jetty would eliminate these risks. This is one of the benefits of safety measures.

6.4 Costs

The items that are considered as costs of the project are; construction costs, administration costs, operating/maintenance costs, and renewal investment costs.

The construction costs are estimated in chapter 4. The administration costs, operating/maintenance costs and renewal investment costs are estimated in chapter 7. Since all costs are shown in market prices, they have to be converted into economic prices using the conversion factors mentioned above.

6.4.1 Construction cost

In the economic analysis, construction costs have to be divided into the foreign currency portion and the local currency portion. Moreover, the local currency portion can be divided into skilled labour, unskilled labour, and others. Since the foreign currency portion is shown in CIF prices, there is no need for conversion into economic prices. The labour costs should be converted into economic prices by using the respective conversion factors. Table-6.4.1.1 shows the economic prices of construction costs (Category 1). Also Table-6.4.1.2 shows the economic prices of the Timber Products Terminal construction costs (Category 2).

Table-6.4.1.1 Construction Cost (Category 1)

| Item | Market Price '000ringgit | F/C 1.000 | Local Currency | | | | OCF | Economic Price | 1994 | 1995 | 1996 |
|-----------------------|-----------------------------|--------------|----------------|--------|--------|-------|------|-------------------|--------|--------|------|
| | | | ① | ② | ③ | ④ | | | | | |
| Oil Jetty | 3457 | 7.67% | 74.56% | 4.62% | 9.23% | 3.92% | 0.88 | 3,037 | 1,519 | 1,519 | |
| Timber Wharf Bridge | 10643 | 13.29% | 70.02% | 4.34% | 8.67% | 3.69% | 0.86 | 9,430 | 3,112 | 3,112 | |
| Timber Wharf(-10m) | 25705 | 24.70% | 60.80% | 3.76% | 7.53% | 3.20% | 0.90 | 23,160 | 5,790 | 5,790 | |
| Timber Wharf(-5m) | 12662 | 10.93% | 71.92% | 4.45% | 8.91% | 3.79% | 0.88 | 11,179 | 3,689 | 3,689 | |
| Container Stock Yard | 2796 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 2,428 | 2,428 | 2,428 | |
| Transit Shed | 7449 | 0.00% | 61.75% | 15.00% | 20.00% | 3.25% | 0.83 | 6,175 | 3,087 | 3,087 | |
| Administration Buil. | 1140 | 0.00% | 61.75% | 15.00% | 20.00% | 3.25% | 0.83 | 945 | 945 | 945 | |
| Maintenance Shop | 589 | 0.00% | 61.75% | 15.00% | 20.00% | 3.25% | 0.83 | 497 | 497 | 497 | |
| Washing Facilities | 258 | 0.00% | 61.75% | 15.00% | 20.00% | 3.25% | 0.83 | 214 | 214 | 214 | |
| Open Storage Area | 880 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 764 | 764 | 764 | |
| Port Road | 3040 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 2,640 | 2,640 | 2,640 | |
| Parking Area | 2502 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 2,173 | 2,173 | 2,173 | |
| Green Area | 12 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 10 | 10 | 10 | |
| Reclamation | 2720 | 80.00% | 16.15% | 1.00% | 2.00% | 0.85% | 0.97 | 2,648 | 2,648 | 2,648 | |
| Utilities | 2816 | 50.00% | 40.38% | 2.50% | 5.00% | 2.12% | 0.93 | 2,631 | 2,631 | 2,631 | |
| Coal Wharf(-10,-5m) | 15108 | 25.63% | 60.05% | 3.72% | 7.44% | 3.15% | 0.90 | 13,628 | 3,407 | 10,222 | |
| Coal Wharf Bridge | 5629 | 5.13% | 76.60% | 4.74% | 9.49% | 4.03% | 0.88 | 4,927 | 4,927 | 4,927 | |
| Coal Yard | 100 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 87 | 87 | 87 | |
| Port Road | 226 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 196 | 196 | 196 | |
| Reclamation | 870 | 80.00% | 16.15% | 1.00% | 2.00% | 0.85% | 0.97 | 847 | 847 | 847 | |
| Water Processing Faci | 300 | 0.00% | 80.75% | 5.00% | 10.00% | 4.25% | 0.87 | 261 | 261 | 261 | |
| Cargo Handling Equ. | 4343 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.00 | 4,343 | 4,343 | 4,343 | |
| Coal Handling Equip. | 3066 | 96.93% | 2.18% | 0.15% | 0.61% | 0.11% | 0.99 | 3,050 | 1,525 | 1,525 | |
| Utilities | 890 | 50.00% | 40.38% | 2.50% | 5.00% | 2.12% | 0.93 | 831 | 831 | 831 | |
| Navigation System | | | | | | | | | | | |
| Tug Boat(2000hp) | 6795 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.00 | 6,795 | 6,795 | 6,795 | |
| Tug Boat(1000hp) | 5094 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.00 | 5,094 | 5,094 | 5,094 | |
| Light Buoy(off shore) | 1544 | 59.84% | 32.43% | 2.01% | 4.02% | 1.71% | 0.95 | 1,462 | 1,462 | 1,462 | |
| Light Buoy(waterway) | 620 | 80.65% | 15.63% | 0.97% | 1.94% | 0.82% | 0.97 | 604 | 604 | 604 | |
| Other Facilities | 3539 | 62.67% | 30.14% | 1.87% | 3.73% | 1.59% | 0.95 | 3,365 | 3,365 | 3,365 | |
| Temporary Facilities | 1200 | 50.00% | 40.38% | 2.50% | 5.00% | 2.12% | 0.93 | 1,121 | 561 | 561 | |
| Mobi& Demobilization | 1200 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.00 | 1,200 | 600 | 600 | |
| Sub Total | 127201 | 35.10% | 49.70% | 1.52% | 7.76% | 2.62% | 0.97 | 115,746 | 42,329 | 68,398 | |
| Consulting Services | 5470 | 50.00% | 4.75% | 45.00% | 0.00% | 0.25% | 0.97 | 5,320 | 1,773 | 1,773 | |
| Physical Contingency | 7632 | 33.77% | 47.44% | 5.63% | 7.76% | 5.40% | 0.88 | 6,735 | 2,245 | 2,245 | |
| Total | 140303 | | | | | | | 127,800 | 46,347 | 9,037 | |

F/C: Foreign Currency ① : Non-tradable Goods OCF: Overall Conversion Factor

② : Skilled Labour

③ : Unskilled Labour

④ : Transfer Item

Table-6.4.1.2 Timber Products Terminal Construction Cost (Category 2)

(000' ringgit)

| Item | Market Price M\$('000) | F/C | Local Currency | | | | OCF | Economic Price | 1994 | 1995 |
|-----------------------|---------------------------|---------|----------------|--------|--------|--------|-------|-------------------|--------|--------|
| | | | ① | ② | ③ | ④ | | | | |
| Timber Wharf Bridge | 10643 | 1.00 | 70.02% | 0.96 | 0.95 | 0.36 | 0.00 | 9,430 | 6,318 | 3,112 |
| Timber Wharf(-10m) | 25705 | 13.29% | 60.80% | 3.76% | 3.42% | 8.67% | 3.89% | 23,160 | 17,370 | 5,790 |
| Timber Wharf(-5m) | 12662 | 10.93% | 71.92% | 4.45% | 4.55% | 8.91% | 3.79% | 11,179 | 7,490 | 3,689 |
| Container Stock Yard | 2798 | 0.00% | 80.75% | 5.00% | 5.00% | 10.00% | 4.25% | 2,428 | 2,428 | 2,428 |
| Transit Shed | 7449 | 0.00% | 61.75% | 15.00% | 15.00% | 20.00% | 3.25% | 6,175 | 3,087 | 3,087 |
| Administration Buil. | 1140 | 0.00% | 61.75% | 15.00% | 15.00% | 20.00% | 3.25% | 945 | 945 | 945 |
| Maintenance Shop | 599 | 0.00% | 61.75% | 15.00% | 15.00% | 20.00% | 3.25% | 497 | 497 | 497 |
| Washing Facilities | 258 | 0.00% | 61.75% | 15.00% | 15.00% | 20.00% | 3.25% | 214 | 214 | 214 |
| Open Storage Area | 880 | 0.00% | 80.75% | 5.00% | 5.00% | 10.00% | 4.25% | 764 | 764 | 764 |
| Port Road | 3040 | 0.00% | 80.75% | 5.00% | 5.00% | 10.00% | 4.25% | 2,640 | 2,640 | 2,640 |
| Parking Area | 2502 | 0.00% | 80.75% | 5.00% | 5.00% | 10.00% | 4.25% | 2,173 | 2,173 | 2,173 |
| Green Area | 12 | 0.00% | 80.75% | 5.00% | 5.00% | 10.00% | 4.25% | 10 | 10 | 10 |
| Reclamation | 2720 | 80.00% | 16.15% | 1.00% | 1.00% | 2.00% | 0.85% | 2,648 | 2,648 | 2,648 |
| Utilities | 2816 | 50.00% | 40.38% | 2.50% | 2.50% | 5.00% | 2.12% | 2,631 | 2,631 | 2,631 |
| Cargo Handling Equ. | 4343 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4343 | 4343 | 4343 |
| Navigation System | | | | | | | | | | |
| Tug Boat(2000hp) | 6795 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6795 | 6795 | 6795 |
| Tug Boat(1000hp) | 5094 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 5094 | 5094 | 5094 |
| Light Buoy(off shore) | 1544 | 59.84% | 32.43% | 2.01% | 2.01% | 4.02% | 1.71% | 1,452 | 1,452 | 1,452 |
| Light Buoy(waterway) | 620 | 80.65% | 15.63% | 0.97% | 0.97% | 1.94% | 0.82% | 604 | 604 | 604 |
| Other Facilities | 3538 | 62.67% | 30.14% | 1.87% | 1.87% | 3.73% | 1.59% | 3,365 | 3,365 | 3,365 |
| Temporary Facilities | 720 | 50.00% | 40.38% | 2.50% | 2.50% | 5.00% | 2.12% | 673 | 336 | 336 |
| Mobi& Demobilization | 1200 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1,200 | 600 | 600 |
| Sub Total | 97077 | 35.19% | 52.33% | 3.24% | 3.24% | 6.48% | 2.75% | 88,432 | 37,851 | 50,582 |
| Consulting Services | 4432 | 50.00% | 4.75% | 45.00% | 45.00% | 0.00% | 0.25% | 4,310 | 3,017 | 1,293 |
| Physical Contingency | 5825 | 35.19% | 47.44% | 5.63% | 5.63% | 7.76% | 3.98% | 5,223 | 2,246 | 2,977 |
| Total | 107334 | | | | | | | 97,986 | 43,114 | 54,852 |

F/C: Foreign Currency ① : Non-tradable Goods OCF: Overall Conversion Factor

② : Skilled Labour

③ : Unskilled Labour

④ : Transfer Item

6.4.2 Administration and operating/maintenance costs

The administration and operating/maintenance costs are estimated in chapter 7. Also some administration and operating/maintenance costs are considered for "Without" case according to handled cargo volume. Administration and operating/maintenance costs for both "With" and "Without" case are shown in Table-6.4.2.1. Economic prices for these costs are calculated in the above same manner. Table-6.4.2.1 shows the administration and operating/maintenance economic prices.

Table-6.4.2.1 Administration and Operating/Maintenance Economic Price

| | '000 ringgit | | | | | |
|--------------------------|--------------|-------|--------------|-------|----------------|-------|
| | With case | | Without case | | Economic Price | |
| | 1997 | 1998 | 1997 | 1998 | 1997 | 1998 |
| Timber Products Terminal | 9,281 | 9,744 | 2,508 | 2,533 | 8,775 | 7,211 |
| Coal Terminal | 1,908 | 1,908 | 630 | 630 | 1,278 | 1,278 |
| Oil Terminal | 208 | 208 | 0 | 0 | 208 | 208 |
| Total | | | | | 8,261 | 8,697 |

6.4.3 Renewal investment costs

Chapter 7 presents the schedule for investment renewal. Economic prices for these costs are calculated by multiplying the respective overall conversion factors. In the economic analysis, coal terminal and buoys also include renewal investment costs.

6.5 Calculation of EIRR

6.5.1 Annual costs and benefits

Annual costs and benefits in economic prices(Category 1) are shown in Table-6.5.1.1. Table-6.5.1.2 shows annual costs and benefits in economic prices of component parts as Timber Products Terminal(Category 2).

Table-6.5.1.1 Annual Costs and Benefits in Economic Prices (Category 1)

(000* ringgit)

| No. Year | Cost | | Without Case | | Benefits | | Interest Cost | Staved Cost | Total Benefit |
|----------|-------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------|---------------|-------------|---------------|
| | Construction & Purchase | Operation & Maintenance | 4 Berths for TPZ & Coal | Shed & Storage for IPZ | Staying Cost of Vessels | Hugboat Bare Cost | | | |
| 1 1994 | 46,347 | | 5,456 | 2,313 | 23,261 | 3,781 | 1,076 | 175 | 7,769 |
| 2 1995 | 72,416 | | 1,819 | | 30,468 | 4,747 | 1,195 | 194 | 30,710 |
| 3 1996 | 9,037 | 5,982 | | | 34,537 | 5,180 | 1,385 | 209 | 36,604 |
| 4 1997 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 5 1998 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 6 1999 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 7 2000 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 8 2001 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 9 2002 | | 4,343 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 10 2003 | | 3,066 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 11 2004 | | 5,982 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 12 2005 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 13 2006 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 14 2007 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 15 2008 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 16 2009 | | 4,343 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 17 2010 | | 20,558 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 18 2011 | | 5,982 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 19 2012 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 20 2013 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 21 2014 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 22 2015 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 23 2016 | | 4,343 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 24 2017 | | 3,066 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 25 2018 | | 5,982 | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 26 2019 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 27 2020 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 28 2021 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 29 2022 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| 30 2023 | | | | | 34,537 | 5,180 | 1,385 | 209 | 41,311 |
| Total | 127,800 | 240,481 | 7,275 | 2,313 | 951,691 | 143,208 | 38,261 | 5,803 | 1,149,169 |

Table-6.5.1.2 Annual Costs and Benefits in Economic Prices (Category 2)

(000' ringgit)

| No. Year | Cost | | | Benefits | | | | | Total Benefit | |
|----------|----------------------------|--------------------------------------|------------|--------------------------------------|-------------------------------|--------------------------|------------------|-------------------|---------------|-------------------------|
| | With Case | | Total Cost | Without Case 3 Berths for Coal | Staying Cost of Vessels | Tugboat Barge Cost | Interest Cost | Stevedore Cost | | |
| | Construction & Purchase | Operation & Renewal Investment | | | | | | | | Shed & Store for TPZ |
| 1 1994 | 43,114 | | 43,114 | | | | | | 0 | |
| 2 1995 | 54,852 | | 54,852 | | | | | | 7,769 | |
| 3 1996 | | 5,982 | 6,098 | 5,456 | 2,313 | 23,261 | 3,781 | 1,076 | 175 | |
| 4 1997 | | 7,211 | 6,775 | | | 25,846 | 4,201 | 1,195 | 194 | |
| 5 1998 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 6 1999 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 7 2000 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 8 2001 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 9 2002 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 10 2003 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 11 2004 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 12 2005 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 13 2006 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 14 2007 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 15 2008 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 16 2009 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 17 2010 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 18 2011 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 19 2012 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 20 2013 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 21 2014 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 22 2015 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 23 2016 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 24 2017 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 25 2018 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 26 2019 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 27 2020 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 28 2021 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 29 2022 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| 30 2023 | | 7,211 | 7,211 | | | 29,915 | 4,907 | 1,385 | 209 | |
| Total | 97,966 | 200,359 | 381,439 | 5,456 | 2,313 | 826,897 | 135,564 | 38,281 | 5,803 | 1,014,314 |

6.5.2 Calculation of EIRR

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

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

$$\sum_{i=1}^n \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

n: Period of economic calculation

B: Benefit in i-th year

C_i: Cost in i-th year

r: Discount rate

The EIRR of Short-term Development of the New Port(Category 1) is calculated as 22.2%. Calculated results of the EIRR is shown in **Table-6.5.2.1.**

Also EIRR of Timber Products Terminal(Category 2) is calculated as 25.1%. And EIRR of Coal Terminal(Category 3) is calculated as 10.6%.

Results of the EIRR for Timber Products Terminal(Category 2) is shown in **Table-6.5.2.2.**

Table-6.5.2.1 Calculation of Economic Internal Rate
of Return (Base Case), Category 1

EIRR (%): 22.2 ('000 ringgit)

| No. | Year | Cost | Benefit | Bnft.-Cost | P. Cost | P. Bnft | P. Value |
|-------|------|---------|-----------|------------|---------|---------|----------|
| 1 | 1994 | 46,347 | 0 | -46,347 | 46,347 | 0 | -46,347 |
| 2 | 1995 | 72,416 | 7,769 | -64,647 | 59,255 | 6,357 | -52,898 |
| 3 | 1996 | 15,135 | 30,710 | 15,576 | 10,133 | 20,562 | 10,429 |
| 4 | 1997 | 14,243 | 36,604 | 22,361 | 7,803 | 20,054 | 12,251 |
| 5 | 1998 | 8,697 | 41,311 | 32,614 | 3,899 | 18,520 | 14,621 |
| 6 | 1999 | 8,697 | 41,311 | 32,614 | 3,190 | 15,154 | 11,964 |
| 7 | 2000 | 8,697 | 41,311 | 32,614 | 2,610 | 12,400 | 9,789 |
| 8 | 2001 | 8,697 | 41,311 | 32,614 | 2,136 | 10,146 | 8,010 |
| 9 | 2002 | 13,040 | 41,311 | 28,271 | 2,621 | 8,302 | 5,682 |
| 10 | 2003 | 11,763 | 41,311 | 29,548 | 1,934 | 6,793 | 4,859 |
| 11 | 2004 | 14,679 | 41,311 | 26,632 | 1,975 | 5,559 | 3,584 |
| 12 | 2005 | 8,697 | 41,311 | 32,614 | 958 | 4,548 | 3,591 |
| 13 | 2006 | 8,697 | 41,311 | 32,614 | 784 | 3,722 | 2,938 |
| 14 | 2007 | 8,697 | 41,311 | 32,614 | 641 | 3,045 | 2,404 |
| 15 | 2008 | 8,697 | 41,311 | 32,614 | 525 | 2,492 | 1,967 |
| 16 | 2009 | 13,040 | 41,311 | 28,271 | 644 | 2,039 | 1,395 |
| 17 | 2010 | 29,355 | 41,311 | 11,956 | 1,186 | 1,668 | 483 |
| 18 | 2011 | 14,679 | 41,311 | 26,632 | 485 | 1,365 | 880 |
| 19 | 2012 | 8,697 | 41,311 | 32,614 | 235 | 1,117 | 882 |
| 20 | 2013 | 8,697 | 41,311 | 32,614 | 192 | 914 | 722 |
| 21 | 2014 | 8,697 | 41,311 | 32,614 | 157 | 748 | 591 |
| 22 | 2015 | 8,697 | 41,311 | 32,614 | 129 | 612 | 483 |
| 23 | 2016 | 13,040 | 41,311 | 28,271 | 158 | 501 | 343 |
| 24 | 2017 | 11,763 | 41,311 | 29,548 | 117 | 410 | 293 |
| 25 | 2018 | 14,679 | 41,311 | 26,632 | 119 | 335 | 216 |
| 26 | 2019 | 8,697 | 41,311 | 32,614 | 58 | 274 | 217 |
| 27 | 2020 | 8,697 | 41,311 | 32,614 | 47 | 225 | 177 |
| 28 | 2021 | 8,697 | 41,311 | 32,614 | 39 | 184 | 145 |
| 29 | 2022 | 8,697 | 41,311 | 32,614 | 32 | 150 | 119 |
| 30 | 2023 | -29,815 | 41,311 | 71,126 | -89 | 123 | 212 |
| Total | | 393,516 | 1,149,169 | 755,654 | 148,320 | 148,320 | 0 |

Note: P. Cost ..Present Value of Costs
P. Bnft ..Present Value of Benefit

Table-6.5.2.2 Calculation of Economic Internal Rate
of Return (Base Case), Category 2

EIRR (%): 25.1 ('000 ringgit)

| No. | Year | Cost | Benefit | Bnft.-Cost | P. Cost | P. Bnft | P. Value |
|-------|------|---------|-----------|------------|---------|---------|----------|
| 1 | 1994 | 43,114 | 0 | -43,114 | 43,114 | 0 | -43,114 |
| 2 | 1995 | 54,852 | 7,769 | -47,083 | 43,847 | 6,210 | -37,637 |
| 3 | 1996 | 6,098 | 28,293 | 22,196 | 3,896 | 18,079 | 14,183 |
| 4 | 1997 | 12,757 | 31,436 | 18,679 | 6,516 | 16,058 | 9,541 |
| 5 | 1998 | 7,211 | 36,416 | 29,205 | 2,944 | 14,869 | 11,925 |
| 6 | 1999 | 7,211 | 36,416 | 29,205 | 2,354 | 11,886 | 9,533 |
| 7 | 2000 | 7,211 | 36,416 | 29,205 | 1,881 | 9,502 | 7,620 |
| 8 | 2001 | 7,211 | 36,416 | 29,205 | 1,504 | 7,595 | 6,091 |
| 9 | 2002 | 11,554 | 36,416 | 24,862 | 1,926 | 6,072 | 4,145 |
| 10 | 2003 | 7,211 | 36,416 | 29,205 | 961 | 4,853 | 3,892 |
| 11 | 2004 | 13,193 | 36,416 | 23,223 | 1,406 | 3,880 | 2,474 |
| 12 | 2005 | 7,211 | 36,416 | 29,205 | 614 | 3,101 | 2,487 |
| 13 | 2006 | 7,211 | 36,416 | 29,205 | 491 | 2,479 | 1,988 |
| 14 | 2007 | 7,211 | 36,416 | 29,205 | 392 | 1,982 | 1,589 |
| 15 | 2008 | 7,211 | 36,416 | 29,205 | 314 | 1,584 | 1,270 |
| 16 | 2009 | 11,554 | 36,416 | 24,862 | 402 | 1,266 | 865 |
| 17 | 2010 | 24,803 | 36,416 | 11,613 | 689 | 1,012 | 323 |
| 18 | 2011 | 13,193 | 36,416 | 23,223 | 293 | 809 | 516 |
| 19 | 2012 | 7,211 | 36,416 | 29,205 | 128 | 647 | 519 |
| 20 | 2013 | 7,211 | 36,416 | 29,205 | 102 | 517 | 415 |
| 21 | 2014 | 7,211 | 36,416 | 29,205 | 82 | 413 | 331 |
| 22 | 2015 | 7,211 | 36,416 | 29,205 | 65 | 330 | 265 |
| 23 | 2016 | 11,554 | 36,416 | 24,862 | 84 | 264 | 180 |
| 24 | 2017 | 7,211 | 36,416 | 29,205 | 42 | 211 | 169 |
| 25 | 2018 | 13,193 | 36,416 | 23,223 | 61 | 169 | 108 |
| 26 | 2019 | 7,211 | 36,416 | 29,205 | 27 | 135 | 108 |
| 27 | 2020 | 7,211 | 36,416 | 29,205 | 21 | 108 | 86 |
| 28 | 2021 | 7,211 | 36,416 | 29,205 | 17 | 86 | 69 |
| 29 | 2022 | 7,211 | 36,416 | 29,205 | 14 | 69 | 55 |
| 30 | 2023 | 35,776 | 36,416 | 640 | 54 | 55 | 1 |
| Total | | 381,439 | 1,014,314 | 632,876 | 114,244 | 114,244 | 0 |

Note: P. Cost ..Present Value of Costs
P. Bnft ..Present Value of Benefit

6.6 Conclusion

6.6.1 Evaluation of base case

There are various views concerning the appropriate EIRR level used to determine whether a project is feasible. The prevailing view is that the project is feasible if the EIRR exceeds the opportunity cost of capital.

The opportunity cost of capital in Malaysia is not known. However, the opportunity cost of capital in various countries is considered to range from 8% to 15%. The opportunity cost is estimated to be 12% in developing countries according to the IBRD and the ADB.

According to this standard, this project(Category 1) is considered feasible. Also Timber Products Terminal(Category 2) is considered feasible.

6.6.2 Sensitivity analysis

To see if the project is still feasible when some factors vary, alternate cases are examined as follows.

Case A : The costs increase by 10%.

Case B : The benefits decrease by 10%.

Case C : The costs increase by 10% and the benefits decrease by 10%.

The results of the sensitivity tests(Category 1) are shown in Table-
6.6.2.1.

Table-6.6.2.1 Sensitivity Analysis for EIRR(Category 1)

| Case | EIRR (%) |
|-----------|----------|
| Base Case | 22.2 |
| Case A | 19.6 |
| Case B | 19.3 |
| Case C | 16.9 |

The results of the sensitivity tests for component parts are shown in Table-6.6.2.2.

Table-6.6.2.2 Sensitivity Analysis for Component Parts EIRR

| Case | EIRR(%) | |
|-----------|--|-------------------------------|
| | (category 2) Timber Products Terminal | (category 3) Coal Terminal |
| Base Case | 25.1 % | 10.6 % |
| Case A | 22.2 % | 9.0 % |
| Case B | 22.0 % | 8.8 % |
| Case C | 19.3 % | 7.4 % |

7. FINANCIAL ANALYSIS

7.1 Purpose of the Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the short-term development plan. The analysis focuses on the viability of the project itself and the financial soundness of the port management body during the project life.

7.2 Methodology of the Financial Analysis

7.2.1 Viability of the project

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR (financial internal rate of return). The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula;

$$\sum_{i=1}^n \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

n : project life

B_i: revenues in the i-th year

C_i: costs in the i-th year

r : discount rate

Costs and benefits which are taken into account for the calculation of the FIRR are summarized as follows:

| Cost | Benefit |
|---|--|
| 1) Total investment cost including initial capital and reinvestment for renewal | 1) Port operating revenue |
| 2) Operating cash expenses | 2) Residual value of the fixed assets at the end of the project life |

Costs and benefits exempt from calculation of the FIRR are summarized as follows:

| Cost | Benefit |
|------------------------------------|---------------------------|
| 1) Depreciation cost | 1) Fund management income |
| 2) Repayment of the principal loan | |
| 3) Interest on loans | |

When the calculated FIRR exceeds the weighted average interest rate of the total funds for the investments of the project, the project is regarded as financially feasible.

7.2.2 Financial soundness of the port management body

The financial soundness of the port management body is appraised based on its projected financial statements (Income and Expenditure Account, Cash Flow Statement and Balance Sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

(1) Profitability

Rate of Return on Net Fixed Assets:

$$\frac{\text{Net Operating Income}}{\text{Total Fixed Assets}} \times 100(\%)$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is preferable to keep the rate above the average interest rate of the funds for the investments.

(2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$\frac{\text{Net Operating Income} + \text{Depreciation Cost}}{\text{Repayment and Interest of Long-term Loans}}$$

This indicator shows whether the operating income can cover the repayment and interest of long-term loans. It must be more than 1 and it is preferable that it be over 1.75.

(3) Operational Efficiency

Operating Ratio:

$$\frac{\text{Operating Expenditure}}{\text{Operating Revenue}} \times 100(\%)$$

Working Ratio:

$$\frac{\text{Operating Expenditure} - \text{Depreciation Cost}}{\text{Operating Revenue}} \times 100(\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port.

When the calculated operating ratios are less than 70-75%, and the working ratios are less than 50-60%, the operations are efficient.

7.3 General Prerequisites of the Financial Analysis

7.3.1 Scope of the Analysis

The short-term plan covers the timber products terminal, the coal terminal, the oil terminal and the navigational aids. The financial analysis considers the port management body (RPA) as an implementation body. Therefore, the focus of the analysis is as follows.

(1) The coal terminal is not included in the analysis because we assume that the coal terminal will be built and managed by the private sector (cf. 5.4.2 Coal terminal).

(2) The navigational aids excluding the tugboat service are not included in the analysis because the port management body is not in charge of them.

(3) The tugboat service is included in the analysis because we assume that

it will be provided by the port management body. We include the revenue and expenditure of tugboats in those of the timber terminal because the tugboat service is necessary for the terminal.

(4) Therefore, the analysis focuses on the timber terminal (including the tugboat service) and the oil terminal.

7.3.2 Project life

Taking account of the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined to be 30 years, including 3 years for the construction of the facilities.

7.3.3 Base year

For the estimation of costs, expenditures and revenues analyzed quantitatively here, 1990 prices are predominantly used. Neither price inflation nor increases in nominal wages are considered during the project life.

7.3.4 Cargo handling volume

The cargo handling volume is estimated based on the demand forecast. The volume is shown in Table-7.3.4.1. The cargo volume that can be handled in the timber products terminal of the short-term plan will reach its limit in 1998. The cargo volume of the new oil terminal is assumed zero in the financial analysis because the terminal is planned from a viewpoint of safety of oil tankers and the existing oil terminal can handle the estimated cargo volume.

Table-7.3.4.1 Projected Cargo Volume

| | 1996 | 1997 | 1998 | - - - - | 2023 |
|---------------------------------|--------|--------|--------|---------|--------|
| Timber Products Terminal | | | | | |
| Export & Import | | | | | |
| Conventional Cargo (1000P/T) | 806 | 896 | 989 | 989 | 989 |
| Container Cargo (TEU) | 12,400 | 13,800 | 19,900 | 19,900 | 19,900 |
| Laden Container (TEU) | 9,900 | 11,000 | 15,900 | 15,900 | 15,900 |
| Empty Container (TEU) | 2,500 | 2,800 | 4,000 | 4,000 | 4,000 |
| Riverine | | | | | |
| Timber Products (in, 1000P/T) | 368 | 409 | 440 | 440 | 440 |
| Container Cargo (TEU) | 6,700 | 7,400 | 8,400 | 8,400 | 8,400 |
| Empty Container (TEU) | 6,700 | 7,400 | 8,400 | 8,400 | 8,400 |
| Oil Terminal | 0 | 0 | 0 | 0 | 0 |

7.3.5 Port charges and revenues

The revenues from the port activities are calculated based on the present tariff system and the cargo handling volume presented in 7.3.4. The actual rates of the tariff are summarized in Table-7.3.5.1. (Details of the revenues are shown in Appendix-III.7.3.1.)

However, there is an exemption; Wharfage charges at the shallow wharf of the timber products terminal levied on timber products shipped from upstream and empty containers from Sibul Wharf, are waived because of the following reasons.

(1) Timber products from upstream should be exempt from wharfage charges to promote the use of the timber products terminal and to avoid double charging; timber products are charged wharfage when exported from the deep wharf.

(2) Empty containers from Sibul Wharf also should be exempt to promote receiving empty containers from Sibul Wharf and to avoid double charging as they are already charged wharfage when exported from the deep wharf as laden containers.

On the other hand, there is no bulk cargo rates in the present tariff. As for a stevedorage and receiving, sorting & delivery charge for the proposed coal terminal, we assume that these rates reflect a 30% discount from those of other non-palletized cargo or other cargo, because a weighted average gang of unloading and loading in the coal terminal will consist of 14 workers, which is 30% less than that of other terminals such as the timber products terminal, which will consist of 20 workers.

Table-7.3.5.1 Present Port Tariff

| (Unit Ringgit) | | |
|-------------------------------|---|--------|
| Item | Kinds of objects | Rate |
| Wharfage | Cargo loaded or discharged at the RPA's wharves | 2.30/t |
| | Rice, sugar & salt | 3.15/t |
| Stevedorage | Other non-palletized cargo | 6.00/t |
| | Palletized cargo | 5.00/t |
| | Container cargo | 60/TEU |
| Receiving, sorting & delivery | Rice, sugar & salt | 4.50/t |
| | Other cargo | 7.00/t |

7.3.6 Costs of initial investments

The initial investments of the short-term project are estimated in chapter 4, and the costs included in the financial analysis are shown in Table-7.3.6.1 (cf. 7.3.1 Scope of the analysis).

Table-7.3.6.1 Investment Costs Included in the Financial Analysis

| | (Unit 1000Ringgit) | | | |
|--------------------------|--------------------|--------|-------|---------|
| | 1994 | 1995 | 1996 | Total |
| Oil Terminal | | 1,728 | 1,729 | 3,457 |
| Timber Products Terminal | 41,336 | 36,229 | | 77,565 |
| Navigation Aids(Tugboat) | | 11,889 | | 11,889 |
| Land Aquisition Cost | 3,200 | | | 3,200 |
| Miscellaneous | 360 | 360 | | 720 |
| Mobilization | 600 | 600 | | 1,200 |
| Sub-total | 45,496 | 50,806 | 1,729 | 98,031 |
| Consulting Services | 1,956 | 2,185 | 74 | 4,215 |
| Physical Contingencies | 2,730 | 3,048 | 104 | 5,882 |
| Total | 50,182 | 56,039 | 1,907 | 108,128 |

7.3.7 Reinvestment

The facilities and equipment will be renewed based on their service lives which are shown as follows;

- (1) depreciable assets excluding cargo handling equipment and tugboat: 40 years
- (2) cargo handling equipment: 7 years
- (3) tugboat: 15 years

The funds for reinvestment will be financed by the state consolidated fund or internal resources of the port management body.

7.3.8 Maintenance, repair costs

The annual maintenance and repair costs for the port facilities are calculated as follows;

- (1) depreciable assets excluding cargo handling equipment and tugboat: 1% of the original construction cost
- (2) cargo handling equipment: 4% of the original procurement cost
- (3) tugboat: 4% of the original procurement cost

7.3.9 Personnel and administration costs

The annual personnel costs are estimated based on the required number of workers and existing pay scales.

The annual administration costs, excluding personnel, maintenance and repair costs, are calculated based on the 1989 actual costs, multiplied by the rate of increase in personnel. These administration costs are shown in Table-7.3.9.1.

Table-7.3.9.1 Administration Costs, 1997

| (Unit Ringgit) | | | |
|--|----------------|--------------|--------------------|
| 1 Personnel costs | | | |
| (1) Labourers' wages | | | |
| | Unit Cost/Year | Number | Total |
| Gang (daytime) | 266,120 | 15.20 | 4,045,024 |
| Gang (night) | 266,120 x 1.5 | 3.80 | 1,516,884 |
| Total | | 19.00 | 5,561,908 |
| (Note) One gang consists of 20 port workers. | | | |
| (2) Staff salaries & allowances | | | |
| | Unit Cost/Year | Number | Total |
| Full-time Staff | 12,500 | 168 | 2,100,000 |
| 2 Maintenance, Repair Costs | | | |
| | Invest. Costs | Main. & Rep. | Remarks |
| Oil Jetty | 4,956,000 | 49,560 | Invest. Costs x 1% |
| Timber Terminal | 84,736,000 | 847,360 | Invest. Costs x 1% |
| Handling Equipment | 10,325,000 | 413,000 | Invest. Costs x 4% |
| Tugboat | 11,889,000 | 475,560 | Invest. Costs x 4% |
| Total | | 1,785,480 | |
| 3 Other Expenditure | | | |
| 1989 actual | 1989(person) | 1997(person) | Total |
| 2,566,469 | 298 | 168 | 1,446,868 |
| 4 Total Administration Costs | | | 10,894,256 |

7.3.10 Depreciation costs

The annual depreciation costs of the port facilities and equipment are calculated by the straight line method based on their service lives.

7.3.11 Income tax

Income tax is calculated as follows:

$(\text{Interest Income} - \text{Loan Interest}) \times 30\% + \text{Net Income} \times 30\%$

7.3.12 Fund raising

(1) Sources of funds

1) Foreign funds

The foreign portion of project costs (which forms 31% of the project cost) is assumed to be raised by loans by loans from abroad as follows:

Loan period: 20 years

Grace period: 4 years

Interest rate: 6%

(Note) These conditions are based on Asian Development Bank's at July, 1991.

2) Domestic funds

As for domestic funds, the following funds are considered.

i) Loans from federal/state government

Because the projected port facilities are for public-use and will promote Sarawak's economy, it is necessary that federal/state government finances soft loans.

Loans from governments are assumed to be raised as follows:

Loan period: 20 years

Grace period: 4 years

Interest rate: 7% (source: RPA)

ii) Loans from banks in Malaysia

The other domestic portions except for federal/state government loans are assumed to be raised from banks in Malaysia. However, the raised funds should not exceed a level that would undermine the financial soundness of the project.

Loans from banks are assumed to be raised as follows:

Loan period: 14 years (including a renewal of loans)

Grace period: 3 years

Interest rate: 10.6% (Base lending rate 8.6% + spread 2%, based on conditions at November, 1991, source: Bank Bumiputra Malaysia Berhad, Tokyo Branch)

iii) Withdrawal from the State Port Development Fund

The RPA levies port dues and the dues are accounted for by the State Government and form part of the State Port Development Fund. The RPA can withdraw a grant from this fund in the range of the amount of its port dues to finance the capital expenditure.

We assume that this fund is basically used for port expansion projects of the RPA and reinvestment and not used for this project.

(2) Fund raising plan

We consider the following three cases concerning domestic funds (The share of foreign funds is assumed fixed.).

Case A: Half of the domestic funds are financed by loans from federal/state government and the remaining half are financed by loans from banks in Malaysia.

Case B: All domestic funds are financed by loans from federal/state government.

Case C: All domestic funds are financed by loans from banks in Malaysia.

These cases are shown in Table-7.3.12.1.

As for the weighted average interest rate of the funds, Case B is the lowest (6.7%) and Case C is the highest (9.2%).

When we choose an appropriate case, it is necessary to take into consideration the budget constraints of the governments and the weighted average interest rate needed to maintain financial soundness of the project.

Table-7.3.12.1 Case Study of Fund Raising Plan

| | Foreign Loan (6%) | Federal/State Loan (7%) | Bank Loan (10.6%) | Total | Weighted Average Interest Rate |
|--------|----------------------|----------------------------|----------------------|-------|-----------------------------------|
| Case A | 31% | 34% | 35% | 100% | 8.0% |
| Case B | 31% | 69% | 0% | 100% | 6.7% |
| Case C | 31% | 0% | 69% | 100% | 9.2% |

7.3.13 Fund management

The amount of cash on hand is assumed to be in banks with a 5% interest rate per annum.

7.4 Appraisal of the project

7.4.1 Viability of the project

(1) Study item

The calculation of the FIRR is examined on the following item.

- 1) Total project: Timber Products Terminal + Oil Terminal
- 2) Timber Products Terminal
- 3) Coal Terminal

Since the oil terminal is planned to secure safety of oil tankers and the estimated cargo volume in Sungei Merah can be handled in the existing

terminal as described in 7.3.4, we assume that there is no revenue in the oil terminal from viewpoint of the finance analysis. Therefore, the FIRR of the oil terminal is not calculated.

On the other hand, the coal terminal will be constructed by the private sector (another implementation body) as described in 5.4.2. Thus, it is not included in the total project and the FIRR of the coal terminal is calculated separately.

(2) Scenarios

To examine the impact on the FIRR, the following conditions are established;

- 1) Tariff increase 20% from 1996 (when the timber products terminal opens)
- 2) Tariff increase 10% from 1996
- 3) Tariff increase 0%

(3) Results

The results are shown in Table-7.4.1.1 and the FIRR calculation of the total project in case of tariff increase 20% is shown in Table-7.4.1.2. (The FIRR calculations of the timber products terminal and coal terminal in case of tariff increases 20% are shown in Appendix-III.7.4.2 and III.7.4.3)

Table-7.4.1.1 Results of FIRR

| | FIRR |
|--|-------|
| Tariff Increase 20% | |
| Total Project (Timber Terminal+Oil Terminal) | 10.6% |
| Timber Products Terminal | 11.1% |
| Coal Terminal | 8.9% |
| Tariff Increase 10% | |
| Total Project (Timber Terminal+Oil Terminal) | 8.7% |
| Timber Products Terminal | 9.2% |
| Coal Terminal | 7.4% |
| Tariff Increase 0% | |
| Total Project (Timber Terminal+Oil Terminal) | 6.6% |
| Timber Products Terminal | 7.1% |
| Coal Terminal | 5.9% |

Table-7.4.1.2 FIRR of the Total Project in Case of Tariff Increase 20%

FIRR= 10.60%

(UNIT:1,000ringgit)

| YEAR | REVENUE | COST | | | REVENUE-COST | PRESENT VALUE IN 1994 | | |
|-------|---------|------------|---------|---------|--------------|-----------------------|---------|------------|
| | | INVESTMENT | EXPENSE | TOTAL | | REVENUE | COST | DIFFERENCE |
| 1994 | | 50,182 | | 50,182 | -50,182 | 0 | 50,182 | -50,182 |
| 1995 | | 56,039 | | 56,039 | -56,039 | 0 | 50,670 | -50,670 |
| 1996 | 20,385 | 1,907 | 9,806 | 11,713 | 8,673 | 16,666 | 9,576 | 7,090 |
| 1997 | 22,621 | 5,982 | 10,895 | 16,877 | 5,744 | 16,722 | 12,476 | 4,246 |
| 1998 | 26,543 | | 11,480 | 11,480 | 15,063 | 17,741 | 7,673 | 10,068 |
| 1999 | 26,543 | | 11,480 | 11,480 | 15,063 | 16,042 | 6,938 | 9,103 |
| 2000 | 26,543 | | 11,480 | 11,480 | 15,063 | 14,505 | 6,273 | 8,231 |
| 2001 | 26,543 | | 11,480 | 11,480 | 15,063 | 13,115 | 5,672 | 7,443 |
| 2002 | 26,543 | 4,343 | 11,480 | 15,823 | 10,720 | 11,858 | 7,069 | 4,789 |
| 2003 | 26,543 | | 11,480 | 11,480 | 15,063 | 10,722 | 4,637 | 6,085 |
| 2004 | 26,543 | 5,982 | 11,480 | 17,462 | 9,081 | 9,695 | 6,378 | 3,317 |
| 2005 | 26,543 | | 11,480 | 11,480 | 15,063 | 8,766 | 3,791 | 4,975 |
| 2006 | 26,543 | | 11,480 | 11,480 | 15,063 | 7,926 | 3,428 | 4,498 |
| 2007 | 26,543 | | 11,480 | 11,480 | 15,063 | 7,167 | 3,100 | 4,067 |
| 2008 | 26,543 | | 11,480 | 11,480 | 15,063 | 6,480 | 2,803 | 3,677 |
| 2009 | 26,543 | 4,343 | 11,480 | 15,823 | 10,720 | 5,859 | 3,493 | 2,366 |
| 2010 | 26,543 | 11,889 | 11,480 | 23,369 | 3,174 | 5,298 | 4,664 | 634 |
| 2011 | 26,543 | 5,982 | 11,480 | 17,462 | 9,081 | 4,790 | 3,151 | 1,639 |
| 2012 | 26,543 | | 11,480 | 11,480 | 15,063 | 4,331 | 1,873 | 2,458 |
| 2013 | 26,543 | | 11,480 | 11,480 | 15,063 | 3,916 | 1,694 | 2,222 |
| 2014 | 26,543 | | 11,480 | 11,480 | 15,063 | 3,541 | 1,532 | 2,010 |
| 2015 | 26,543 | | 11,480 | 11,480 | 15,063 | 3,202 | 1,385 | 1,817 |
| 2016 | 26,543 | 4,343 | 11,480 | 15,823 | 10,720 | 2,895 | 1,726 | 1,169 |
| 2017 | 26,543 | | 11,480 | 11,480 | 15,063 | 2,618 | 1,132 | 1,485 |
| 2018 | 26,543 | 5,982 | 11,480 | 17,462 | 9,081 | 2,367 | 1,557 | 810 |
| 2019 | 26,543 | | 11,480 | 11,480 | 15,063 | 2,140 | 926 | 1,214 |
| 2020 | 26,543 | | 11,480 | 11,480 | 15,063 | 1,935 | 837 | 1,098 |
| 2021 | 26,543 | | 11,480 | 11,480 | 15,063 | 1,750 | 757 | 993 |
| 2022 | 26,543 | | 11,480 | 11,480 | 15,063 | 1,582 | 684 | 898 |
| 2023 | 26,543 | -30,374 | 11,480 | -18,894 | 45,437 | 1,430 | -1,018 | 2,449 |
| TOTAL | 733,124 | 126,600 | 319,181 | 445,781 | 287,344 | 205,059 | 205,059 | 0 |

(4) Sensitive analysis

Sensitive analysis is conducted to examine the impact of unexpected future changes.

The following three cases are envisioned;

Case I: The project cost increases by 10%.

Case II: The revenue decreases by 10%.

Case III: The project cost increases by 10% and the revenue decreases by 10%.

Table-7.4.1.3 shows the calculation results of each case.

Table-7.4.1.3 FIRR Sensitivity Analysis

| | Original Case | Case I | Case II | Case III |
|--|---------------|--------|---------|----------|
| Tariff Increase 20% | | | | |
| Total Project (Timber Terminal+Oil Terminal) | 10.6% | 8.5% | 8.3% | 6.2% |
| Timber Products Terminal | 11.1% | 9.0% | 8.8% | 6.7% |
| Coal Terminal | 8.9% | 7.3% | 7.1% | 5.6% |
| Tariff Increase 10% | | | | |
| Total Project (Timber Terminal+Oil Terminal) | 8.7% | 6.6% | 6.4% | 4.4% |
| Timber Products Terminal | 9.2% | 7.1% | 6.9% | 4.8% |
| Coal Terminal | 7.4% | 5.9% | 5.7% | 4.2% |
| Tariff Increase 0% | | | | |
| Total Project (Timber Terminal+Oil Terminal) | 6.6% | 4.6% | 4.4% | 2.4% |
| Timber Products Terminal | 7.1% | 5.1% | 4.8% | 2.8% |
| Coal Terminal | 5.9% | 4.4% | 4.2% | 2.8% |

(5) Appraisal

Table-7.4.1.4 shows the contrast between the FIRR of tariff increase cases, that is, increase 20%, 10% and 0%, and the cases of the weighted average interest rate based on the fund raising plan as shown in 7.3.12. If the FIRR exceeds the weighted average interest rate of fund, we can judge the case to be financially feasible.

Table-7.4.1.4 Contrast between Tariff increase Cases and Fund Raising Plans

| | Case A Average Interest Rate (8.0%) | Case B Average Interest Rate (6.7%) | Case C Average Interest Rate (9.2%) |
|----------------------------------|---|---|---|
| Tariff Increase 20% | | | |
| Original Case (FIRR=10.6%) | ○ (10.6% > 8.0%) | ○ (10.6% > 6.7%) | ○ (10.6% > 9.2%) |
| Cost Increase 10% (FIRR=8.5%) | ○ (8.5% > 8.0%) | ○ (8.5% > 6.7%) | × (8.5% < 9.2%) |
| Revenue Decrease 10% (FIRR=8.3%) | ○ (8.3% > 8.0%) | ○ (8.3% > 6.7%) | × (8.3% < 9.2%) |
| Appraisal | ○ | ○ | △ |
| Tariff Increase 10% | | | |
| Original Case (FIRR=8.7%) | ○ (8.7% > 8.0%) | ○ (8.7% > 6.7%) | × (8.7% < 9.2%) |
| Cost Increase 10% (FIRR=6.6%) | × (6.6% < 8.0%) | × (6.6% < 6.7%) | × (6.6% < 9.2%) |
| Revenue Decrease 10% (FIRR=6.4%) | × (6.4% < 8.0%) | × (6.4% < 6.7%) | × (6.4% < 9.2%) |
| Appraisal | △ | △ | × |
| Tariff Increase 0% | | | |
| Original Case (FIRR=6.6%) | × (6.6% < 8.0%) | × (6.6% < 6.7%) | × (6.6% < 9.2%) |
| Appraisal | × | × | × |

(Note) ○: Feasible, ×: not Feasible, △: not so Feasible

From the viewpoint of revision of the present tariff, only original case of Case A and Case B are feasible in case of tariff increase 10%. In case of tariff increase 20%, Case A and Case B including the two cases of sensitive analysis are feasible. As for Case C, only the original case is feasible in case of tariff increase 20%.

The present tariff of the Rajang Port is more than 20% lower than the neighbouring Kuching's port's (as shown in Table-7.4.1.5), furthermore, there is not a large difference in the level of facilities and services between the two. Therefore, it is possible for the RPA to raise its tariff 20% and still remain competitive. As there are unexpected future changes when a project is implemented, a 20% raise of the tariff should be implemented.

Table-7.4.1.5 Comparison of Main Port Charges in 1990

| | (Unit Ringgit) | | |
|----------------------|----------------|------------|---------|
| | Sibu(A) | Kuching(B) | (B)/(A) |
| Wharfage | 2.30/t | 2.80/t | 1.21 |
| Port dues | 2.00/t | 2.00/t | 1 |
| Stevedorage | | | |
| Non-palletized cargo | | | |
| Rice sugar & salt | 3.15/t | 8.60/t | 2.73 |
| Other cargo | 6.00/t | 8.60/t | 1.43 |
| Palletized cargo | 5.00/t | 7.20/t | 1.44 |
| Container cargo | 60/TEU | 75.00/t | 1.25 |
| RSAD | | | |
| Rice, sugar & salt | 4.50/t | 5.60/t | 1.24 |
| Other cargo | 7.00/t | 9.00/t | 1.29 |

(Note) RSAD: Receiving, Sorting and Delivery

Comparing among the three cases of fund raising plan, we can appraise as follows;

As for Case C, only the original case is feasible in case of tariff increase 20%. Therefore, this case needs a measure to deal with unexpected future changes. For example, a withdrawal from the State Port Development Fund equaling about 10% of the project costs should be considered (This makes the weighted average interest 8%).

Case B is the plan with the lowest weighted average interest rate. However, financing the project using only domestic funds from federal/state government is not realistic because the project is comparatively profitable

and there are also budget constraints on the governments.

Since Case A is feasible including the two cases of sensitive analysis in case of tariff increase 20% and the source of funds is various and balanced, we can appraise that it is the most appropriate plan among the three cases.

Therefore, Case A in case of tariff increase 20% is chosen as a Base Case.

As for each project, the timber products terminal is financially feasible because the FIRR in case of tariff increase 20% including the two cases of sensitive analysis exceeds the weighted average interest rate.

On the other hand, the coal terminal is feasible in the case of original case of tariff increase 20%. However, the FIRR of the two cases of sensitive analysis can not reach the weighted average interest rate. Therefore, the implementation body of the coal terminal should make efforts to secure forecast cargo volume and to reduce the operation expenses to cope with unexpected future changes.

7.4.2 Financial soundness of the organization

The "Base Case" (Case A of fund raising plan in the case of tariff increase 20%) is appraised from the viewpoint of financial soundness of the organization.

The projected financial statements and financial indicators: working ratio, operating ratio, rate of return on net fixed assets and debt service coverage ratio are shown in Table-7.4.2.1.

(1) Profitability

The rate of return on net fixed assets is less than the average interest rate of the funds (8%) until 1997, but after 1998 it exceeds the average interest rate.

(2) Loan repayment capacity

The debt service coverage ratios exceed 1 throughout the project life. There will be no problem with the repayments of the long-term loans using the annual operating revenues.

(3) Operational Efficiency

Both the operating ratios and the working ratios maintain favorable levels.

7.5 Conclusion

Judging from the above analysis, this project can be regarded as financially feasible if the tariff is raised by 20%. Furthermore, it is recommended that the RPA should make efforts to secure forecast cargo volume, to improve cargo handling efficiency and to reduce operating expenses.

Table-7.4.2.1 Project Financial Statements and Financial Indicators

| INCOME AND EXPENDITURE ACCOUNT | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | | | |
|----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|--|--|
| Operating Revenue | 19,278 | 20,151 | 47,056 | 52,036 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | 55,958 | | | |
| Operating Expenditure | 19,614 | 20,873 | 36,825 | 39,631 | 41,222 | 41,389 | 41,572 | 41,774 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 41,996 | 42,261 | 42,261 | 42,261 | 41,366 | 40,697 | 40,697 | 42,022 | 42,160 | 42,160 | 42,160 | 42,160 | 42,160 | | | |
| Personnel Expenditure | 10,441 | 11,506 | 19,587 | 21,661 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | 22,246 | | | |
| Repairs & Maintenance | 1,118 | 1,118 | 2,725 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | 2,904 | | | |
| Other Administration Expenditure | 3,774 | 4,159 | 5,890 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | 6,507 | | | |
| Depreciation | 4,281 | 4,090 | 8,422 | 8,560 | 9,566 | 9,733 | 9,916 | 10,118 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,605 | 10,605 | 10,605 | 9,710 | 9,041 | 9,041 | 10,366 | 10,503 | 10,503 | 10,503 | 10,503 | | | |
| Net Operating Income | -1,336 | -722 | 10,431 | 12,405 | 14,736 | 14,569 | 14,386 | 14,184 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,697 | 13,697 | 13,697 | 14,592 | 15,281 | 15,281 | 13,936 | 13,798 | 13,798 | 13,798 | 13,798 | 13,798 | | | |
| Non-operating Revenue | 647 | 774 | 729 | 1,242 | 1,543 | 2,195 | 2,709 | 3,133 | 3,594 | 3,881 | 4,417 | 4,696 | 5,306 | 5,942 | 6,602 | 7,290 | 7,878 | 8,185 | 8,804 | 9,744 | 10,708 | 11,698 | 12,793 | 13,810 | 15,067 | 16,071 | 17,395 | 18,747 | 20,125 | 21,530 | | | |
| Interest Income | 647 | 774 | 729 | 1,242 | 1,543 | 2,195 | 2,709 | 3,133 | 3,594 | 3,881 | 4,417 | 4,696 | 5,306 | 5,942 | 6,602 | 7,290 | 7,878 | 8,185 | 8,804 | 9,744 | 10,708 | 11,698 | 12,793 | 13,810 | 15,067 | 16,071 | 17,395 | 18,747 | 20,125 | 21,530 | | | |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Non-operating expenditure | 190 | 4,276 | 8,546 | 8,723 | 8,723 | 8,530 | 8,051 | 7,405 | 6,756 | 6,106 | 5,456 | 4,806 | 4,156 | 3,507 | 2,857 | 2,207 | 1,751 | 1,455 | 1,168 | 881 | 593 | 306 | 144 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | | | |
| Interest on Long-term Loans | 109 | 4,167 | 8,420 | 8,584 | 8,584 | 8,390 | 7,911 | 7,266 | 6,616 | 5,966 | 5,316 | 4,666 | 4,016 | 3,367 | 2,717 | 2,068 | 1,611 | 1,316 | 1,028 | 741 | 454 | 167 | 4 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | | | |
| Interest on Short-term Loans | 81 | 89 | 126 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | | | |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Net Income Before Taxation | -879 | -4,225 | 2,615 | 4,924 | 7,556 | 8,294 | 9,043 | 9,911 | 10,800 | 11,737 | 12,923 | 13,852 | 15,112 | 16,397 | 17,707 | 19,044 | 20,089 | 20,692 | 21,333 | 22,580 | 23,811 | 25,983 | 27,910 | 28,931 | 28,884 | 29,730 | 31,054 | 32,405 | 33,783 | 35,189 | | | |
| Taxation | 161 | 0 | 784 | 1,477 | 2,267 | 2,470 | 2,713 | 2,973 | 3,240 | 3,521 | 3,877 | 4,155 | 4,920 | 5,691 | 6,478 | 7,280 | 7,906 | 8,268 | 8,732 | 9,469 | 10,228 | 11,254 | 12,210 | 12,822 | 13,179 | 13,740 | 14,535 | 15,346 | 16,172 | 17,016 | | | |
| Net Income After Taxation | -1,041 | -4,225 | 1,830 | 3,447 | 5,289 | 5,764 | 6,330 | 6,938 | 7,560 | 8,216 | 9,046 | 9,696 | 10,191 | 10,705 | 11,230 | 11,764 | 12,192 | 12,423 | 12,600 | 13,091 | 13,592 | 14,729 | 15,700 | 16,109 | 15,684 | 15,989 | 16,519 | 17,050 | 17,611 | 18,173 | | | |
| Accumulated Earnings | -1,463 | -5,688 | -3,858 | -411 | 4,878 | 10,642 | 16,972 | 23,910 | 31,470 | 39,686 | 48,732 | 58,428 | 68,619 | 79,325 | 90,554 | 102,319 | 114,501 | 128,924 | 138,524 | 152,616 | 166,207 | 180,936 | 196,637 | 212,746 | 228,430 | 244,419 | 260,939 | 277,998 | 295,609 | 313,783 | | | |
| CASH FLOW STATEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cash Beginning | 12,933 | 15,475 | 14,588 | 24,841 | 30,865 | 43,893 | 54,170 | 62,653 | 71,882 | 77,612 | 88,341 | 93,918 | 106,127 | 118,832 | 132,050 | 145,793 | 157,553 | 163,698 | 176,073 | 194,871 | 214,160 | 233,950 | 255,863 | 276,198 | 301,348 | 321,416 | 347,909 | 374,931 | 402,494 | 430,609 | | | |
| Cash Inflow | 55,608 | 62,198 | 23,709 | 24,648 | 31,487 | 28,938 | 29,452 | 30,876 | 30,337 | 30,624 | 31,160 | 34,639 | 32,050 | 32,685 | 33,346 | 34,033 | 34,621 | 46,528 | 38,747 | 36,487 | 37,451 | 38,441 | 39,536 | 93,553 | 47,311 | 46,014 | 44,139 | 46,490 | 46,888 | 48,274 | | | |
| Net Operating Income | -1,336 | -722 | 10,431 | 12,405 | 14,736 | 14,569 | 14,386 | 14,184 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,962 | 13,697 | 13,697 | 13,697 | 14,592 | 15,281 | 15,281 | 13,936 | 13,798 | 13,798 | 13,798 | 13,798 | 13,798 | | | |
| Depreciation | 4,281 | 4,090 | 8,422 | 8,560 | 9,566 | 9,733 | 9,916 | 10,118 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,340 | 10,605 | 10,605 | 10,605 | 9,710 | 9,041 | 9,041 | 10,366 | 10,503 | 10,503 | 10,503 | 10,503 | 10,503 | | | |
| Capital Grant | 1,834 | 2,018 | 2,220 | 2,442 | 5,642 | 2,442 | 2,442 | 3,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | 2,442 | | | |
| Long-term Loans | 50,182 | 56,039 | 1,907 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Other Current Liabilities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Other Fixed Liabilities | 647 | 774 | 729 | 1,242 | 1,543 | 2,195 | 2,709 | 3,133 | 3,594 | 3,881 | 4,417 | 4,696 | 5,306 | 5,942 | 6,602 | 7,290 | 7,878 | 8,185 | 8,804 | 9,744 | 10,708 | 11,698 | 12,793 | 13,810 | 15,067 | 16,071 | 17,395 | 18,747 | 20,125 | 21,530 | | | |
| Interest Income | 647 | 774 | 729 | 1,242 | 1,543 | 2,195 | 2,709 | 3,133 | 3,594 | 3,881 | 4,417 | 4,696 | 5,306 | 5,942 | 6,602 | 7,290 | 7,878 | 8,185 | 8,804 | 9,744 | 10,708 | 11,698 | 12,793 | 13,810 | 15,067 | 16,071 | 17,395 | 18,747 | 20,125 | 21,530 | | | |
| Cash Outflow | 53,067 | 63,085 | 13,457 | 18,624 | 18,458 | 18,661 | 20,969 | 21,647 | 24,607 | 19,895 | 25,583 | 22,430 | 19,345 | 19,466 | 19,603 | 22,272 | 28,475 | 34,154 | 19,949 | 17,198 | 17,661 | 16,528 | 19,202 | 88,404 | 27,243 | 19,521 | 17,116 | 18,921 | 18,754 | 19,597 | | | |
| Investment | 52,016 | 58,057 | 4,127 | 8,424 | 5,642 | 2,442 | 2,442 | 3,442 | 6,785 | 2,442 | 8,424 | 5,842 | 2,442 | 2,442 | 2,442 | 6,785 | 14,331 | 20,024 | 5,642 | 2,442 | 2,442 | 2,442 | 6,785 | 55,442 | 13,924 | 5,642 | 2,442 | 2,442 | 2,442 | 2,442 | | | |
| Payment for Long-term Loans | 699 | 752 | 0 | 0 | 1,826 | 3,220 | 7,163 | 7,827 | 7,827 | 7,827 | 7,827 | 7,827 | 7,827 | 7,827 | 7,827 | 8,001 | 4,488 | 4,487 | 4,497 | 4,497 | 4,497 | 4,497 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Interest on Long-term Loans | 109 | 4,187 | 8,420 | 8,584 | 8,584 | 8,390 | 7,911 | 7,266 | 6,616 | 5,966 | 5,316 | 4,667 | 4,017 | 3,367 | 2,717 | 2,068 | 1,611 | 1,316 | 1,028 | 741 | 454 | 167 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Interest on Short-term Loans | 81 | 89 | 126 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | | |
| Other Non-operating Expenditure | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Cash Inflow-Outflow | 2,541 | -887 | 10,252 | 6,024 | 13,029 | 10,277 | 8,483 | 9,229 | 5,730 | 10,729 | 5,577 | 12,209 | 12,704 | 13,218 | 13,743 | 11,761 | 6,145 | 12,374 | 18,799 | 19,289 | 19,790 | 21,913 | 20,335 | 25,159 | 20,068 | 26,493 | 27,023 | 27,563 | 28,114 | 28,677 | | | |
| Cash Ending | 15,475 | 14,588 | 24,841 | 30,865 | 43,893 | 54,170 | 62,653 | 71,882 | 77,612 | 88,341 | 93,918 | 106,127 | 118,832 | 132,050 | 145,793 | 157,553 | 163,698 | 176,073 | 194,871 | 214,160 | 233,950 | 255,863 | 276,198 | 301,348 | 321,416 | 347,909 | 374,931 | 402,494 | 430,609 | 459,285 | | | |
| Cash excess | 15,475 | 14,588 | 24,841 | 30,865 | 43,893 | 54,170 | 62,653 | 71,882 | 77,612 | 88,341 | 93,918 | 106,127 | 118,832 | 132,050 | 145,793 | 157,553 | 163,698 | 176,073 | 194,871 | 214,160 | 233,950 | 255,863 | 276,198 | 301,348 | 321,416 | 347,909 | 374,931 | 402,494 | 430,609 | 459,285 | | | |
| Short-term Loans | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| BALANCE SHEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current Assets | 15,475 | 14,588 | 24,841 | 30,865 | 43,893 | 54,170 | 62,653 | 71,882 | 77,612 | 88,341 | 93,918 | 106,127 | 118,832 | 132,050 | 145,793 | 157,553 | 163,698 | 176,073 | 194,871 | 214,160 | 233,950 | 255,863 | 276,198 | 301,348 | 321,416 | 347,909 | 374,931 | 402,494 | 430,609 | 459,285 | | | |
| Cash & Deposit | 15,475 | 14,58 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

8. PROJECT FEASIBILITY

A feasibility study of the short-term plan was conducted to calculate the EIRR (Economic Internal Rate of Return) and the FIRR (Financial Internal Rate of Return) and to check financial health of the port management body (RPA).

8.1 Feasibility of Entire Project

The EIRR is calculated based on a cost-benefit analysis from the viewpoint of the national economy. The FIRR is calculated to evaluate the profitability of the short-term plan for the RPA. The results of the calculation are as follows.

Table-8.1.1.1 Calculation Results of EIRR and FIRR

| Item | EIRR | FIRR |
|---|--------|--------|
| Base Case | 22.2 % | 10.6 % |
| Sensitivity Analysis | | |
| Increase in costs by 10% | 19.6 % | 8.5 % |
| Decrease in benefits (revenues) by 10% | 19.3 % | 8.3 % |
| Increase in costs by 10% and decrease in benefits (revenues) by 10% | 16.9 % | 6.2 % |

* an increase in the tariff of 20% from the current level is assumed for the above calculation

The EIRR exceeds 12%, that is, the project is viable according to the guideline set forth by the IBRD and the ADB, which state that the EIRR must be greater than the opportunity cost of capital in developing countries.

As for FIRR, the base case and the first two cases of the sensitivity analysis exceed 8%, which satisfies the guideline for the profitability of a project; thus FIRR is greater than the weighted interest rate of the total funds for the investment of the project, providing that the port tariff is raised by 20% from 1996. The financial analysis also evaluated

the financial soundness of the port management body (RPA) during the project life. From our financial analysis, the RPA would maintain its financial soundness throughout the entire project life. It will be able to pay all expenditures and will show a profit even after appropriating funds for the repayment of loans, including interest.

Judging from the above, we conclude that the short-term plan with the target year of 1997 is feasible both economically and financially.

8.2 Feasibility of the Component Parts of the Project

The project consists of three components; that is, a timber products terminal, a coal terminal in Tg. Manis area and an additional oil terminal at Sungei Merah. Of these components, the oil terminal will be constructed to ensure the safety of oil tankers using the terminal even though the existing oil terminal has a sufficient capacity to meet the cargo demand of petroleum products up to the year 2010.

We regarded the benefits or revenues from the construction of the additional oil terminal as zero because it is impossible to measure benefits derived from the enhancement of safety accurately and because the additional terminal is not needed to handle future cargo volume. Therefore, we did not calculate EIRR and FIRR of the oil terminal component.

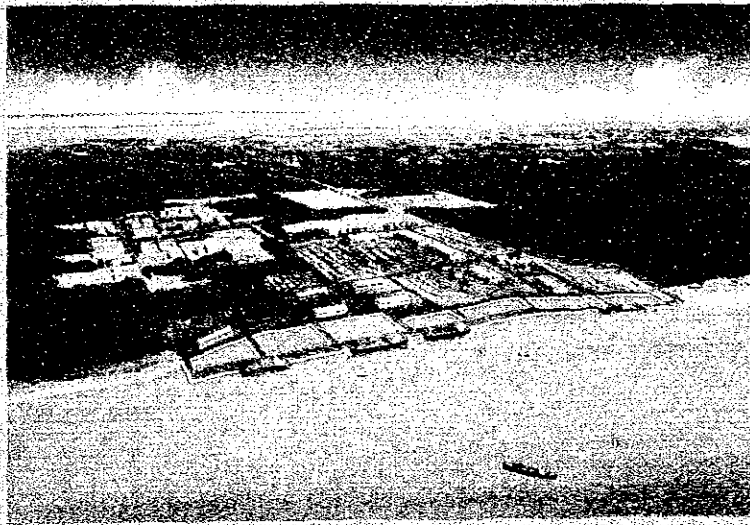
The EIRRs and FIRRs for the timber products terminal and the coal terminal are shown in Table-8.2.1.1.

Table-8.2.1.1 EIRR and FIRR for each Component of the Project

| Item | Timber Products Terminal | | Coal Terminal | |
|--|--------------------------|--------|---------------|-------|
| | EIRR | FIRR | EIRR | FIRR |
| Base Case | 25.1 % | 11.1 % | 10.6 % | 8.9 % |
| Sensitivity Analysis | | | | |
| Increase in costs by 10% | 22.2 % | 9.0 % | 9.0 % | 7.3 % |
| Decrease in benefits by 10% | 22.0 % | 8.8 % | 8.8 % | 7.1 % |
| Increase in costs by 10% and decrease in benefits by 10% | 19.3 % | 6.7 % | 7.4 % | 5.6 % |

Both EIRR and FIRR for the timber products terminal exceed the minimum guideline for the viability of a projects; 12% for EIRR and 8% for FIRR (although the third case of the sensitivity analysis does not meet the standard). As for the coal terminal only FIRR of Base Case exceeds the guideline.

Consequently, the timber products terminal component is feasible both economically and financially. On the other hand, the coal terminal component is feasible financially but not economically, which means that the coal terminal project may be suitable only for private investors.



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