PART B

FEASIBILITY STUDY FOR PRIORITY PROJECTS

CHAPTER 10 ECONOMIC ANALYSIS OF F/S PROJECTS

10.1 Purpose of Economic Analysis

Two projects, namely the grain terminal phase 1 and barge terminal were nominated to the first priority projects from the Short Term Development Plan. The economic evaluation for these selected projects is carried out accordingly.
The purpose of the economic analysis is to evaluate its economic viability of the proposed projects in comparison to other alternatives. This evaluation will be conducted from the viewpoint of national economy. An indicator, namely, the economic internal rate of return (EIRR), will evaluate the viability of the proposed project.

10.2 Basic Methodology

10.2.1 Project Classification by Characteristics

The candidate projects of the Master Plan Study were classified into two evaluation groups:

- **New Master Plan Project**
- **Existing Project (including the projects under consideration)**

Both the grain terminal and barge terminal are belong to the former.

10.2.2 Proposed Methodology

The project economic evaluation summarizes its impact on the national economy of Romania, that is in economic terms. Hence, it shows the benefits for the port users and for other port-related activities and the cost of both project sponsors, which is MOT(CPA), plus the private investors (cargo terminal operators etc.).

The port development consists of several stages. Stage 1 contains only the Master Plan development projects. Stage 2 comprises a Short- term Plan. Only the selected projects from the Short-term Plan will be part of the purpose of feasibility study.

The economic evaluation of the Port of Constantza is conducted based on the project **Cost-Benefit Analysis (CBA).** The methodology applied is in concordance with international standards as required for projects financed by IBRD, JBIC or by other international financial agencies.

10.2.3 Cost Benefit Analysis

The cost estimations are made in the previous chapters (see Chapter 9). They are based on the market prices at site. For the economic analysis, the financial cost estimates are divided into foreign currency portions and local currency portions in order to deduct the import duties from the foreign currency portion and also the indirect taxes from local currency portion.

The project benefits are derived from a comparison between the anticipated situations “with“ and “without“ the project (i.e. with-the-project case and without-the-project case). The without-the-project case reflects the potential impacts if the Port of Constantza project was not implemented.
The benefits of the project cover quantifiable and non quantifiable benefits. Benefits will be quantified as far as possible. Based on the comparison of “with-the-project“ case versus “without-the-project” case, **the following benefits are quantified.**

- Savings of waiting times for vessel at the Port of Constantza.
- Savings of interest value of the cargoes generated by the waiting times of the vessels.
- Savings of ship lease cost for the saved waiting time of the vessel in the Port Constantza.
- Savings of ship lease cost for navigation by ship size scales of economy

The major **non-quantifiable benefits** of the Port of Constantza project are:

- Avoidance of traffic diversion to other ports and the savings by avoiding higher transport cost
- Benefits from port generated investments in the Port of Constantza Free Zone
- Avoidance of negative factors influencing the national economy

Other than these, there are other possible benefits such as from cost saving on the cargo transport on direct route services by using a larger mother vessel including the Post-Panamax fleet without transshipment in other major ports. These benefits will dramatically increase and change the port’s status from “feeder port” to “call port”. There will be also undoubtedly be cost savings due to the use of larger (Post-Panamax) vessels.

Such cost savings will accrue directly to the shipping companies that operate such vessels. As most (if not all) of the shipping companies operating Post-Panamax vessels are based abroad, it is very doubtful whether or not and to what extent they would transfer such cost savings, as an indirect benefits, to the Romanian economy (i.e. to exporters and importers), in form of freight tariff reductions. The freight tariffs are subject to market conditions, which are often determined and dominated by the international shipping conferences formed by the large shipping companies.

In order to calculate benefits on the "safe side", this benefit which is difficult to be quantified will not be included as a quantifiable benefit but rather as a non-quantifiable one.

10.2.4 With-The-Project Case versus Without-The-Project Case

The definition of the without-the-project case is one of the crucial prerequisites for a practical economic evaluation of the project. The without-the-project case does not usually include any major investments for extension of the existing infrastructure capacities. The without-the-project case is therefore usually a hypothetical case. It should nevertheless represent, as far as possible, a realistic simulation scenario of such a hypothetical situation.

The basic assumptions of the without-the-project case for the Port of Constantza are the following:

- The infrastructure and facilities of the Port of Constantza will be used to their capacity limits.
- The Government and MOT(CPA)'s policies will be applied according to the outlined objectives, as officially stated.

Under these constraints, the whole traffic volume would have to be loaded and unloaded at existing facilities within the Port of Constantza, and the following will result:

- All remaining volumes as stated in cargo forecast for the Port of Constantza are assumed to be handled by the Port of Constantza
- The increasing congestion of the Port of Constantza will entail long ship waiting times.
- The diversion of large parts of the estimated cargo volumes to other ports or transportation modes will have the consequence of higher transportation cost and longer transport times.

10.2.5 Economic Pricing

The project cost, as evaluated by financial prices, is converted into the economic prices in order to avoid any economy distortion generated by the following factors;

- Controlled prices not reflecting the real market prices (of which example is the minimum wage regulation)
- 'Artificial' raising (or lowering) of goods prices and services by compulsory charges on the existing added value of such goods and services (e.g. by indirect taxes on value added, customs duties, fees etc.) or by subsidies
- Inflationary trends;

Thus, project costs have to satisfy the following conditions:

- Reflect the real economic value of a determined good or service;
- Exclude expected inflationary trends by using only real terms: i.e. constant prices (at 2000 prices).

Financial prices do not usually reflect real market prices as they are distorted. Thus, **shadow prices** have to be used in economic evaluation instead of such distorted prices. The project cost in financial prices is divided into a local currency portion and a foreign currency portion. Then the standard conversion factor (SCF) for shadow pricing as 0.986 for the local currency portion is applied to the economic pricing of the project costs. The SCF was derived by averaging the international trade statistics for five years from 1994 to 1998 in Romania.

The costs for unskilled labor (being a part of the construction cost and to some extent part of the cargo handling cost which is subject to minimum wage regulations) does not usually reflect real market prices. Thus, the shadow price is applied to the economic pricing as the cost for unskilled labor.

In this study, it is assumed that the basic minimum gross salary of Romania (1.4 million lei per month) is a realistic market price for unskilled labor. Thus, the wage of unskilled labor of construction works for the projects in this Study will be converted into realistic market price by the shadow price (70% of financial price of unskilled labor) on the basis of the basic minimum gross salary mentioned above.

The economic versus financial cost calculations therefore focus on the two major items:

- Deduction of Indirect taxes, VAT (tax on value added) of 19 %
- Deduction of customs duties for the investment cost for imports.

10.2.6 Assumption

(1) The “Base Year“ in this Study means the starting year of the economic analysis and is set at the year 2000.
(2) The period of evaluation in the economic analysis is a 30-year time span, that is, after the implementation works of the projects.
(3) The exchange rate adopted for this analysis is US $ 1.00 = 26,000 Lei (113Yen).*

Most of the benefits come from avoiding waiting times, savings on the ship lease cost, by ship size which will accrue to foreign shipping companies. The share of Romanian shipping companies in Romania’s total sea transport is still comparatively low.

The benefits accruing to foreign subjects and institutions are not included in the economic analysis; only the benefits accruing to the national economy are considered. However, it is no doubt that the additional cost for waiting times as incurring to the foreign shipping companies is transferred to Romania's national economy in terms of higher than world market prices both for imported and exported goods. In the end, Romania's producers and consumers have to pay for the longer waiting times at the Port of Constantza. Furthermore, it is expected that Romania will acquire the EU membership in the near future. After the Romania becomes an EU member, Romania will be socially and economically more closely related to other EU member countries and the attributability of the benefit to the Romanian economy will be more strengthened. Thus, in this Study, a hundred percent of the benefits are included in the benefit generated from the short-term development plans.

10.2.7 Criteria of Project Evaluation

CBA, Cost Benefit Analysis aims at a realistic estimation of project benefits and costs. The key indicators of the CBA results are:

- **NPV (Net Present Value)**
- **EIRR (Economic Internal Rate of Return)**
- **B/C Ratio (Benefit Cost Ratio)**

These criteria are related to the adopted economic discount rate which is also often referred to as **'cut-off ratio'** or 'target rate'. Although the economic discount rate is more or less clearly defined in economic theory (equal to **the Opportunity Cost of Capital** or alternatively to the social time preference), there is a wide range of definitions in practice. According to the sources the obtained, 'target rate' for public transport projects in Romania is assumed to be located within a range of **12 to 15 %**.

10.3 Analysis of Economic Feasibility

10.3.1 Costs

1) Initial Cost, O/M Cost and Tax

The economic costs estimation of the project is based on the financial cost calculations outlined in Chapter 9. These financial cost estimates are calculated on an on-site-basis. Therefore, they had to be converted to economic costs.

The economic cost in this study will include:

- The investment cost in the Port of Constantza as general works to be funded by MOT(CPA)

- Investment cost of the Port of Constantza, that is structures and equipment to be funded by terminal operators (MOT or Lease Contract)
- Maintenance and operation costs related to the terminals that are to be developed.

In order to estimate the import duties, the project cost is divided into foreign and local cost for all major cost components.

Based on the existing custom duties, the following items are assumed as deductions from the financial cost for the economic evaluation.:

- Cargo handling equipment
- Utilities, drainage and sewerage
- Other investment goods

Because the financial costs are calculated at market prices, the VAT of 19% will be deducted from the total financial cost.

As a result of this calculation scheme, the total economic cost over the whole study period (including replacement) for the Port of Constantza was estimated.

2) Equipment Replacement Cost

Besides those costs mentioned above, equipment replacement cost is also included. As discussed in Chapter 9, the equipment replacement period is ten (10) years and five (5) years for the major equipment such as quay/wharf crane and yard crane and other supplemental equipment respectively. The average life of the equipment is shorter than UNCTAD recommendations to give fifteen (15) years and eight (8) years respectively.

In this economic evaluation, a shorter life of equipment is used for the following reasons:

- The life estimates are given by terminal operators in the Port of Constantza.
- The enormous increase of cargo throughput, which has to be handled by the equipment, will certainly lead to a higher “wear and tear” of the equipment than at the current throughput levels. All this will lead to a decrease of the use-life.
- The estimate of the future use-life lies, from an economic point of view, “on the safe side”. An extension of the use-life does not have any significant impact on EIRR/NPV in terms of initial investment cost, whereas cargo throughput, productivity, revenues etc. are much more important for EIRR than the use-life of equipment. If the longer lives are taken into account, the change on EIRR is seen only in marginal figures

10.3.2 Estimation of Ship Waiting Time

1) General Approach

The ship waiting times are directly related to the amount of economic benefits. Thus the estimation should be carefully carried out theoretically and by common value of actual experience. Actually the UNCTAD method applies to the former one.

2) UNCTAD Method

The procedure to estimate the ship waiting times by using the UNCTAD method in the without-the-project case starts with the following basic approach:

- A modified vessel call forecast is taken into consideration; hence, in the existing facilities (which defines the port capacities and facilities of the without-project case) the maximum vessel size will be limited.
- The basis for the waiting time calculation model is applied as published in the handbook for PORT DEVELOPMENT by the United Nations Conference of Trade and Development (UNCTAD) (Second Edition 1985) .

3) Value of Cargoes

In this study, the cargo value is considered to be the capital fund saved in a bank during the period where the vessels are waiting for berthing and would earn interest for short-term deposits. This interest is attributed to the "with-the-project" case as benefit.

The value per cargo unit is calculated according to import-export statistics outlined in previous chapter and then multiplied with:

- Number of cargo volume in tons
- Saving time on waiting ships

The unit price of cargo and unit time value of cargo are shown in Table 10.3.1.

Table 10.3.1 Unit Price and Time Value of Traded Cargo of Romania

No.	Cargo Classification	Unit Price		Time Value	
		Lei/ton	US$/ton	(Lei/ton/day)	(US$/ton/day)
1	Cereals	3,213,399	111	2,905.26	0.10
2	Fresh Fruits and Vegetables	12,653,824	436	11,440.44	0.39
3	Foods, Liquors, Tobacco	29,220,989	1,008	26,418.98	0.91
4	Seeds, oils, fats	11,353,965	392	10,265.23	0.35
5	Timber, fire wood	9,536,861	329	8,622.37	0.30
6	Natural, chemical fertilizers	3,063,843	106	2,770.05	0.10
7	Mineral rough products(quarry)	3,462,625	119	3,130.59	0.11
8	Iron Ore, scrap	730,476	25	660.43	0.02
9	Non metal ore	1,366,104	47	1,235.11	0.04
10	Textile, textile fiber and products	401,792	14	363.26	0.01
11	Paste, recycled paper	30,283,532	1,044	27,379.63	0.94
12	Crude Oil	3,213,399	111	2,905.26	0.10
13	Oil Products and gas	4,990,520	172	4,511.98	0.16
14	Coal and Natural Gas Tars	2,594,680	89	2,345.87	0.08
15	Chemical Products	11,743,091	405	10,617.04	0.37
16	Chalk, cement, construction materials	1,056,461	36	955.16	0.03
17	Glass, ceramic products	24,286,761	837	21,957.89	0.76
18	Iron / Non Iron Metals	13,217,762	456	11,950.31	0.41
19	Cars, transport materials	170,698,316	5,886	154,329.98	5.32
Container Cargo		323,580	11	292.55	0.01
General Cargo		323,580	11	292.55	0.01

Source : 1. Unit price was calculated on the basis of "Annual International Trade Statistics", National Commission of Statistics, Romania
2. Time value was calculated on the basis of Interest rate for one month of Bancpost in June 2001.

10.3.3 Benefits

1) Quantifiable Benefits

The most important monetary quantifiable benefits of the Port of Constantza (“with-the-project” case) when compared to the “without-the-project” case“ (port capacity of the existing Port of Constantza) are the waiting times of the ships calling at the port.

As outlined in the traffic forecast, transhipment/transit is of major importance for the Port of Constantza. The predominant role of the port is to assure, not only import and export flows of cargoes and goods, but also transhipment/transit cargoes.

Beside the limited port capacities of other ports, the Port of Constantza is (and will be in the foreseeable future) the only deep sea port for cargoes and goods that would be carried by mother vessels in Romania.

It is quite evident that in the “without-the-project” case would very rapidly incur long waiting times for ships calling at the Port of Constantza after years of saturation and over-flow of cargoes. Despite the ship long waiting times, only some limited cargoes volumes can be handled at the design capacity of the existing Port of Constantza.

In addition, aged equipment and facilities should be replaced by new ones. If not, ships will again incur long waiting times at the Port of Constantza in the near future.

2) Non Quantifiable Benefits

In addition to the quantifiable benefits, other non-quantifiable benefits will arise in the project case when compared to the without-the-project case in the form of:

- Contribution to the national economic development through upgrading the industries in accordance international standards.
- Improvement of cargo handling safety and reduction of cargo damage.
- The project would induce a job-creation at the Industrial Zone and Export Processing Zone near the Port of Constantza.

All other cargo volumes that would be exceed the maximum handling capacity of the existing facilities would have to be diverted to other ports or modes of transport. From this diversion of traffic from the Port of Constantza a large amount of benefit loss would result; however, these are not quantified in this study for reasons already mentioned.

10.3.4 Economic Evaluation of First Priority Projects in Short Term Plan

As the first priority project in the Short -Term Development Plan for the Feasibility Study, the two development plans of the Master Plan should be implemented. They are:

- Grain Terminal Plan
- Barge Terminal Plan

10.3.5 Grain Terminal Plan, Phase 1

The Grain Terminal Plan focuses on building a new terminal construction in the South Port Pier 3 area. According to the Master Plan, the two alternatives were assumed for the “without-the-project” case.

Alternative-1 suggests that most grain handling facilities, except those located on Berth No. 113 and 114 in the North Port area, will have to cease their operation to relocate to the South Port area because most of these facilities are quite old and have not yet been overhauled. Alternative-1 was divided into three cases for “with-the-project” case, to form an Innovative Plan. They are actually categorized by the construction site of the terminal: (a) S3 Pier , (b) at S1 Pier and (c) Berth No. 31/33.

Alternative-2 is the case where all existing grain handling facilities will remain in the North Port area in the "without-the-project" case.

In the Master Plan Study, all of these alternatives were evaluated from the economic point of view. As the result of the economic evaluation, Alternative-2 was judged to be non feasible, but all the other three Plans of Alternative-1 proved to be fairly feasible for Case-1 (high growth scenario for traffic demand). From the comprehensive evaluation point of view including the economic, environmental and technical issues, the Study Team judged that Alternative-1a Plan which proposes to build the terminal at Pier S3 should be given priority in the Short-Term Development Plan for the Feasibility Study.

Thus the economic evaluation is conducted for Alternative-1a for the grain terminal plan. Alternative-1a, which will be constructed at S3 pier, is a considerably innovative plan from the view point of alignment of pier, handling capacity and cost performance including construction, operation and management cost.

1) Benefit

The benefits of this Plan are three quantifiable ones:
(i) savings of ship waiting time for cargo, (ii) savings of ship lease cost resulting from the saved waiting time and (iii) savings of ship lease cost for navigation by ship size scales of economy.

Savings of Ship Waiting Time for Cargo

For benefit of port users, the benefit by savings of ship waiting time is estimated on the basis of UNCTAD method mentioned above.

- Traffic Demand Forecast: Export Bulk Grains

The savings of waiting time is estimated for revised traffic demand forecast for the export bulk grain cargo of the Case-1 in the high growth scenario. Refer to Table 3.6.3 of Chapter3, Part II or Appendix IIA.

- No. of Berths

The number of the existing berths in the without-the-project case is assumed to be two, consisting of one berth already in use (berth no. 114) which is operated by SILOTRANS in the South Port and another berth that is used by the AGROEXPORT and other operators in the North Port. It is assumed that handling capacity will increase from 2.5 million tons in 2001 to 3.7 million tons in the year 2003. **In the**

with-the-project case, the number of berths will be three in total. The additional berth of 2.0million tons will be constructed in the South Port area, as Alternative 1a. It is expected that this new terminal starts to operate in 2008.

- Average Capacity Per Ship and Unit Load Per Ship

The average capacity of ship and unit load per ship are set as 7,500 ton/ship and 6,750 ton/ship (loading factor: 90%) from 2000 to 2036 for the “without-the-project” case and 7,500 ton/ship (unit load: 6,750 ton/ship) from 2000 to 2009, 11,250 ton/ship (10,125 ton/ship) from 2010 to 2019 and 17,500 ton/ship (15,750 ton/ship) for the “with-the-project" case.

In order to simplify the analysis, 7,500 ton/ship was applied to all cases. However to adjust the vessel size scale merit, vessel lease cost was discounted based on the data presented in Table 10.3.5.

- Cargo handling capacity

The cargo handling capacity is set as 670 ton/ship•hour.

- Waiting Time

On the basis of the assumptions above, the occupancy ratio is calculated and waiting time factor is estimated according to the UNCTAD Queuing Table handbook for port development (See Table10.3.2). The waiting time is derived by multiplying the waiting time factor by ship time spent at berth (hour/ship) and No. of ships per year.

- Saved Time of Ship Waiting

The saved time of the waiting ship is the difference between the waiting time in the without-the-project case and the with-the-project case, that is after the grain traffic demand has attained the handling capacity of existing container terminal.

Conversion of Terminal Capacity considering the Cargo Fluctuation

The handling capacity calculated for the economic evaluation is not the same as the physical capacity for designing the facilities. The reason is that the traffic demand forecast for the economic evaluation is not based on the total demand, including the annual fluctuation, but on the net traffic demand as the median value.
Thus, the handling capacity of the existing grain terminal (without-the-project) and the new grain terminal (with-the-project) are set by taking account of the net traffic demand (4.41 million tons) and the total traffic demand including the annual

fluctuation (Total: 6.40 million tons ; Annual Fluctuation: 1.99 million tons) in the year 2010 (the rate: 0.689 = 4.41 / (4.41+1.99).

The existing handling capacity and the total capacity including the new grain terminal are set as 2.55 million tons (= 3.7 x 0.689) and 3.93 million tons (= 3.7+2.0) x 0.689) respectively.

Calculation of Saved Time

Then the saved time is calculated as the difference between the waiting time in the without-the-project case and the with-the-project case after 2008, the completion year of construction implementation.

- Time Saving Benefit of Waiting Time for Bulk Grains

The time saving cargo benefit due to shorter ship waiting time is calculated as the balance between the cargo waiting cost of Without Case and With Case.

The Cargo waiting cost by the ship waiting time is derived by multiplying the waiting time in days per annum by the traffic demand in tons and the unit time value of grain cargo (lei/ton-day) as 2,905 lei/ton-day or approx. 0.1 US$/ ton-day.

This calculation were carried out both the Without Case and With Case. Of course the required cost by the Without Case is larger than those of the With Case.

The estimation results of waiting time and the costs are shown in Tables 10.3.3 and 10.3.4. Net benefit as explained above is given in the last column in Table 10.3.4.

Savings of Ship Lease Cost for Saved Waiting Time

Similar to cargo saving costs, the time saving vessel benefit due to shorter ship waiting time is calculated as the balance between the ship waiting cost of Without Case and With Case.

- Ship Lease Cost

The ship lease cost per day per ship for Without Case is set as US$ 4,800 per ship• hour for the type of ship with average capacity of 7,500 ton/ship. Taking consideration of the vessel scale merit, US$3,600 was applied to With Case.

Without Case	**7,500tons x US$0.8 x 0.8 = US$4,800**
With Case	**7,500tons x US$0.8 x 0.6 = US$3,600**

- Saving Benefit of Ship Lease Cost

The ship lease cost produced by the waiting time is derived by multiplying the time in days per annum by the unit ship lease cost.

This Calculation was conducted both the Without Case and With Case. Of Course the required cost by the Without Case is larger than those of the With Case. The estimated results of waiting time and the ship costs are shown in Tables 10.3.3.and 10.3.4. Net benefit is provided in the last column of Table 10.3.4.

Savings of Ship Lease Cost for Navigation by Ship Size Scales of Economy

Previous two savings are due to the shorter time of cargo handling in the port by advantage of new grain terminal of 2.0 million tons. Introduction of large carriers will create savings out of the port. Unit lease cost of large carriers (US$/ton) is less than those of small vessels. Saving costs on the voyage should be taken into account.

This benefit is generated from transportation of bulk grains by bigger size ships.

- Ship Lease Cost

Lease cost for the project if taken of 80% of present market rate.
The unit ship lease cost is set by averaging capacity per ship and the unit load per ship as seen in Table 10.3.5. For example, unit load cost for vessel of 7,500 tons is:

US$0.8/ton x 29,500Lei/US$ x 0.8 = Lei 18,88,000.

- Transport Distance

The average navigated distance is estimated for the main routes of grain transport which are mostly trips between the Port of Constantza and the ports of the northern part of Africa that is 4,000km (2,100 NM).

- Transport Time

The average transport time per ship is estimated as 175 hours (7.3 days) assuming the average speed as 12 NM/hour and the transport distance as mentioned above as 2,100 NM.

- Saving Benefit of Ship Lease Cost

The ship cast saving benefit is calculated as the balance between the ship voyage lease cost of Without Case and those of With Case.
The ship lease cost for navigation is derived by multiplying the ship lease cost for navigation by the transport time.

This estimation was conducted both the Without Case and With Case. Of course the required cost by the Without Case is larger than those of the With Case.

Table 10.3.5 Unit Ship Lease Cost in Market

	Period	Average Capacity (ton/ship)	Unit Load (ton/ship)	Unit Ship Lease Cost (US$/ton•day)
Without	2000-2036	7,500	6,750	0.80
With	2000-2009	7,500	6,750	0.80
	2010-2019	11,250	10,125	0.58
	2020-2036	17,500	15,750	0.40

Source: JICA Study Team
Note: 1. Load factor of ship is assumed to be 90%.
2. The average capacity is the average of two types of ship : 7,500ton and 15,000ton (2010-2019) and 7,500ton and 27,500ton (2020-2036).

The result of savings of ship lease cost for navigation is shown in Tables 10.3.6 to 10.3.7 for the Without Case and the With Case respectively. Net benefit of vessel navigation is given in the last column of Table 10.3.7.

2) Cost

Construction Cost

The economic construction cost, as the initial cost for new grain terminal (2.0 million tons exports and 0.5 million ton imports of bulk grains) is calculated to be US$ 79.9 million, which includes indirect contractor's cost the administration cost and the cost of engineering services. The physical contingency is 10% for civil works and 5% for equipment respectively.

Operation and Maintenance Cost

The Operation cost is US$ 0.62 per ton of the throughput volume at the Port of Constantza. The throughput volume is calculated on basis of the assumption that it is proportional with the rate of the additional terminal capacity to the total capacity of the terminals, whereas the total capacity consists of the existing capacity (3.7 million tons) and the additional capacity (2.0 million tons). The maintenance cost is 0.3% for civil works and 3% for equipment.

These costs do not include taxes such as VAT and are not divided into local currency and foreign currency portions, or into materials cost and labor cost. Thus, for the purpose of economic pricing, the standard conversion factor (SCF) of 0.986 for the project cost as a shadow price is adopted for the local currency portion.

The disbursement schedule for the Grain Terminal Plan in economic cost is shown in Table 10.3.8.

3) Economic Evaluation

The economic evaluation was carried out by preparing cashflow streams of economic cost and benefit during the evaluation period. (See Table 10.3.9). The result of indicators of economic evaluation such as EIRR, B/C and NPV is as follows:.

Table 10.3.10 The Result of Calculation of Indicators for Economic Evaluation

Case No. of Traffic Demand Forecast	EIRR (%)	B/C	NPV (1,000 US$)
Case-1	18.9	1.27	16,015

Note: The discount rate for B/C and NPV is 15%.

The figures for EIRR and B/C ratio of Case-1 are 18.9% and 1.27 respectively and the discount rate is 15%. The value of EIRR is higher than the maximum cut-off ratio (15%) which is the criteria of project feasibility. This high level EIRR mainly due to the implementation of a more effective cargo handling capacity for the new grain terminal than the existing capacity. Consequently, the Grain Terminal Plan, as the first priority project in the Short Term Development, is approved to have significantly high economic viability.

Sensitivity analysis is conducted with regard to the EIRR, to check the feasibility of the project from increasing level of the project cost and decreasing the project benefit. The following table shows the results of the sensitivity analysis. EIRR values range from 13.6% in the worst case (20% decrease of benefit and 20% increase of cost) to 16.7% in the best case (10% decrease of benefit and 10% increase of cost). Also, all EIRR values are over the minimum level cut-off ratio, 12%. Thus it is concluded that the Grain Terminal Plan has high credibility with regard to its feasibility.

Table 10.3.11 The Result of Sensitivity Analysis for EIRR(%)

Cost / Benefit	+10%	+15%	+20%
-10%	16.7	16.0	15.3
-15%	15.8	15.1	14.4
-20%	14.8	14.2	13.6

10.3.6 Barge Terminal Plan

Existing barge terminal area is used by operators. Its management is damaged by lack of required facility and well-prepared controlling system. There is no management at all in respect to efficient area use.

This plan is intended to increase the terminal capacity by providing a new quay wall for the stand-by of empty barges and of waiting laden barges that are about to form a convoy. Once its completion, this terminal will accelerate the services to be rendered for the new grain terminal by means of supporting the bulk grain collection from the deep inland area.

Addition to these, the terminal will insist its advantage to connect the barge convoy to Central Europe through the canal. The convoy will provide reasonably economical hauling.

1) Benefit

This plan is expected to improve the efficiency of barge movement in the basin of the Port of Constantza and the cargo handling efficiency of the modernized barge terminal. The following benefits could be quantified: (i) savings of cargo moving time, (ii) savings of moving time for lease cost of the barges and pushers, (iii) savings on forming of a cargo convoy and (iv) savings on forming of a convoy for ship lease cost of the barges and pusher-tug..

Savings of Moving Time for Cargo

- Traffic Demand Forecast to be carried by Barges

  The savings of moving time is estimated for traffic demand forecast for barge cargo (Case-1) as the high growth scenario. Refer to Section 4.2 of Part II, Chapter 2 " Inland Transportation".

- Average Carrying Capacity and Unit Load Per Barge

  The average barge capacity and the unit load per barge are set as 1,500 tons/barge and 1,050 ton/barge (loading factor: 70%) from 2000 to 2036 for both the "Without-the-Project" and "With-the-Project" cases respectively.

- Moving Time Saving

  The JICA Study Team carried out the site investigation to observe barge operation, and estimated that the average dwelling time in Port of Constantza area is about eight days per barge.

This **eight days** gap includes mainly:

(i) Waiting time for loading and unloading,
(ii) Time for forming and disassembling a convoy including document procedures (4 – 6 hours in average),
(iii) Moving time from the waiting position to the berth for loading or unloading
(iv) Moving time from the berth, after loading and unloading, to the waiting as needed for forming a convoy.

In this Study, there are two assumptions. The first assumption is that it takes about **two days out of the eight day** period for this type of movement excluding the time for forming a convoy which is the period needed for a convoy to move in the area of Port of Constantza.

This moving time will increase in accordance with the traffic volume. Thus second assumption is that **moving time will decrease to 50% of all moving hours of this plan**.

The **balance of six days** is considered to consist mostly of waiting time which will change depending mainly on the traffic volume and decrease as the traffic volume increases. Thus the waiting time will change regardless of the with- or without-the-project case and will not generate benefits.

- Time Saving Benefit of Barge Moving Time

The time saving benefit of barge moving time is derived by multiplying the saved moving time in days per annum by the traffic demand in tons and the unit time value of barge cargo.

The unit time value is estimated from the weighted average valuing on the basis of the traffic volume weight (%), the kind of commodity transported by barge and the unit time value of these cargoes. (See Table 10.3.12)
Unit time value (Lei/day) are 2,866.5 in 1999, 3,071.9 in 2010 and 3,559.5 in 2020 respectively.

The result of estimation of saved time for cargo and the benefit are shown in Table 10.3.13.

Table 10.3.12 Weighted Average Time Value for Commodity Transported by Barge

(Unit: Lei/Ton/Day)

Category of Commodity	1999	2010	2020
Cereals	243.3	452.0	559.4
Foods, Beverages, Tobacco	151.9	270.9	566.1
Timber, Charcoal	-	-	-
Natural / Chemical Fertilizers	33.2	16.9	19.4
Iron Ore, Scrap	273.2	305.0	99.1
Non-ferrous Ore	113.8	112.6	56.7
Solid Fuel (Coal, Coke, etc.)	412.8	288.6	293.9
Crude Oil	0.0	0.0	0.0
Oil and Gas Products	47.7	50.5	44.7
Chemical Products	0.0	0.0	0.0
Chalk, Cement, Construction Materials	91.8	32.8	16.6
Ferrous / Non-ferrous Metals	1,010.0	846.5	712.4
Various Manufactured Products	393.3	583.8	995.9
Other Cargoes	95.3	112.6	195.3
The Weighted Average	2,866.5	3,071.9	3,559.5

Source : The JICA Study Team

Savings of Moving Time for Ship Lease Cost

- Ship Lease Cost

Assuming that one convoy is composed of five barges and one pusher-tug, the lease cost per unit is set by the average capacity per barge and pusher-tug as follows:

Table 10.3.14 Unit Ship Lease Cost

(at 2000 price)

	Average Capacity (ton/ship)	Unit Load (ton/ship)	Daily Cost (Yen/day)	Unit Ship Lease Cost (Yen/ton•day)	Unit Ship Lease Cost (US$/ton•day)	Unit Ship Lease Cost (Lei/ton•day)
Barge	1,500	1,000	24,000	24,000/1500 =16	0.15	3,760
Pusher -Tug	(4,000PS)	(400GT)	130,000	130,000/1,500 =86.7	0.80	20,375

Source: "Standard of Costing for Port Engineering Works by the Ministry of Transport", 1995 Foundation of Port Construction Technical Center

For the benefit calculation, unit lease cost was discounted by 50% in order to obtain a conservative benefit. Refer to Table 10.3.14.

Table 10.3.14B Unit Ship Lease Cost for Project

(at 2000 price)

	Full Cost (Yen /day)	Full Cost (Lei /day)	Combined Barge plus Pusher-Tug Full Cost (Yen /day)	Combined Barge plus Pusher-Tug **50% Cost** (Yen /day)	Notes
Barge	24,000	5,640,000	5,640,000	**2,820,000**	1,500tons
Pusher -Tug	130,000	30,550,000	6,110,000	**3,055,000**	400GT

Note, 1. Combination means a theoretical fleet consisting of one barge and one fifth of pusher-tug

Saved Ship Lease Cost for Navigation

The saved cost on the ship lease, needed for moving, is derived from the difference of the with-the-project and the without-the-project situations with regard to the ship lease cost for moving during the transport. However in this case, the navigation time in the with-the-project case is negligible, as mentioned above, and the benefit of the saved lease cost is the same as the one in the "without-the-project" case.

Savings of Forming Up of Convoy for Cargo

As already mentioned, it is assumed that the average time for forming a convoy is about 5 hours, and 50% of the time, 2.5 hours, will be saved. The benefit of saved time for forming a cargo convoy is derived by multiplying the saved time by the traffic volume and the weighted average unit time value of commodity transported by barge.

Savings of Forming up of Convoy for Ship Lease Cost

The benefit generated from the time saving for forming a convoy is estimated by multiplying the saved time by the unit lease cost of barges and pusher and the number of barges and pusher per convoy.

The result of savings of ship lease cost for navigation is shown in Table 10.3.13.

2) Cost

Construction Cost

The economic construction cost, that is the initial cost for a new barge terminal, is calculated as US$ 26.1 million, which includes indirect contractor's indirect cost, plus the engineering service fee. Physical contingency is 10% of the construction cost. No cargo handling equipment is necessary for the plan.

Operation and Maintenance Cost

The operation cost of throughput traffic volume is US$ 0.005 per ton for barges and US$ 0.05 per ton for pusher respectively. The throughput traffic volume at the Port of Constantza is calculated based on the assumption that the throughput traffic volume is proportional with the ratio of barge additional capacity to the total capacity, where the total capacity is composed of the existing capacity (approximately 10 million tons) and the additional capacity (approximately 10 mullion tons). The maintenance costs are 0.3% for civil works. There are no maintenance costs for equipment.

These costs do not include taxes such as duties and VAT. Thus, when for economic pricing, the foreign currency portion is not necessary to be converted into economic costs. However the standard conversion factor (SCF) of 0.986 as shadow price is adopted to the financial project cost for the local currency portion.

The disbursement schedule for the Barge Terminal Plan in the economic cost is shown in Table 10.3.15.

3) Economic Evaluation

The economic evaluation is carried out by preparing cash flow streams of the economic cost and benefit during the evaluation period. (See Table 10.3.16). The result of indicators of the economic evaluation such as EIRR, B/C and NPV for the Case-1 of the traffic demand forecast are shown as follows:

Table 10.3.17 The Result of Calculation of Indicators for Economic Evaluation

Case No. of Traffic Demand Forecast	EIRR (%)	B/C	NPV (1,000 US$)
Case-1	23.9	1.64	10,847

Note: The discount rate for B/C and NPV is 15%.

The EIRR and B/C ratio values for Case-1 are 23.9% and 1.64 respectively. The EIRR is considerably higher than the cut-off-ratio (15%) that is the maximum needed for judging the project’s feasibility. This high viability is considered to be generated mainly by the integrated and accelerated improvement of efficiency of barges behavior (which could be as well be called a “Synergy Effect”) in the area of the existing and the new barge basin due to well organized and systematic management of barge movement. Thus the Barge Terminal Plan, as the first priority project in the Short Term Development, is approved to be significant and economically viable.

Sensitivity analysis was also conducted for EIRR to check the credibility of the project feasibility by increasing the project cost and decreasing the project benefit. Table 10.3.18 shows the results of the sensitivity analysis. EIRR values range from 16.4%, in the worst case, (20% decrease of benefit and 20% increase of cost) to 19.9% in the best case (10% decrease of benefit and 10% increase of cost). All values of EIRR are well over the 15% cut-off-ratio. In this context, it is confirmed that the Barge Terminal Plan has significantly high credibility with regard to its feasibility.

Table 10.3.18 The Result of Sensitivity Analysis for EIRR (%)

Cost / Benefit	+10%	+15%	+20%
-10%	19.9	19.1	18.3
-15%	18.9	18.1	17.4
-20%	17.8	17.1	16.4

10.4 Conclusion

Both the Grain Terminal Plan and the Barge Terminal Plan as objects of feasibility study are satisfactorily feasible with credibility to be the Short-Term Development Plan for the Port of Constantza. The former will contribute to increasing the agricultural product exports by means of providing supporting facilities at the port. Especially in high harvest time, the proposed terminal will show its capability to cover the excess volume than the domestic demands.

It is recommended for the public sector to invest as a national project to support the country's leading industry, the agriculture and the government and/or public sector should play a grate role to realize this.

The latter will contribute to smooth use of the port basin by barges. To accelerate the barge activity in the cargo transport deep in the country and beyond the western border is a must to maintain the economic inland transport mode. It is also recommended for the public sector to invest to this vital plan as a national project to support the economic transport mean in the inter-modal split.

History tells us that agriculture has been a basic and fundamental industry of the world. Romania is no the exception.

Both projects directly assist the Romanian leading engines, the Agriculture Industries, which may shear a high portion until it becomes an industrialized country. Barge terminal will help to reduce the transport cost of export bulk grain cargo generating from the deep inland areas where are far from the Black Sea. New grain terminal will provide an excellent bulk grain export opportunities by two sets of 800 tons/hr large ship loaders and storage capability by 100 tons silo bins.

Silo will provide chances not only quality control and reduce the berthing time of ocean-going vessel by high speed loading of bulk grain. All these contribute to increase the quality and to reduce the unit price of bulk grain and keeping the bargaining power, in the agri-products exports.

Thus if both projects are implemented simultaneously, its effect will enlarge by so-called Multiplier Effect and give a great inertia to be the real market mechanism in the agriculture sector.

It is strongly recommended that the Romanian Government including its representative agency should take a clear initiative to achieve these vital projects to implement as soon as possible,

Table 10.3.2 Average Waiting Time of Ships in the Queue M/E2/n Expressed in Units of Average Service Time (Random Arrivals, Erling 2-Distributed Service Time)

Utilization	Number of Berthing Points							
	1	2	3	4	5	6	7	8
0.0300	0.108	0.051	0.010	-	-	-	-	-
0.0400	0.114	0.052	0.010	-	-	-	-	-
0.0500	0.120	0.052	0.010	-	-	-	-	-
0.0600	0.126	0.053	0.010	-	-	-	-	-
0.0700	0.132	0.053	0.010	-	-	-	-	-
0.0800	0.138	0.054	0.010	-	-	-	-	-
0.0900	0.144	0.054	0.010	-	-	-	-	-
0.1000	0.150	0.055	0.010	-	-	-	-	-
0.1100	0.154	0.055	0.010	-	-	-	-	-
0.1200	0.158	0.056	0.015	-	-	-	-	-
0.1300	0.162	0.056	0.015	-	-	-	-	-
0.1400	0.166	0.057	0.015	-	-	-	-	-
0.1500	0.170	0.058	0.015	-	-	-	-	-
0.1600	0.178	0.059	0.015	-	-	-	-	-
0.1700	0.186	0.060	0.020	-	-	-	-	-
0.1800	0.194	0.061	0.020	-	-	-	-	-
0.1900	0.202	0.062	0.020	-	-	-	-	-
0.2000	0.210	0.063	0.020	-	-	-	-	-
0.2100	0.220	0.066	0.020	-	-	-	-	-
0.2200	0.230	0.068	0.025	-	-	-	-	-
0.2300	0.240	0.070	0.025	-	-	-	-	-
0.2400	0.250	0.072	0.025	-	-	-	-	-
0.2500	0.260	0.075	0.025	-	-	-	-	-
0.2600	0.272	0.078	0.025	-	-	-	-	-
0.2700	0.284	0.082	0.030	-	-	-	-	-
0.2800	0.296	0.085	0.030	-	-	-	-	-
0.2900	0.308	0.089	0.030	-	-	-	-	-
0.3000	0.320	0.092	0.030	0.020	0.010	-	-	-
0.3100	0.340	0.104	0.030	0.020	0.010	-	-	-
0.3200	0.350	0.104	0.040	0.020	0.010	-	-	-
0.3300	0.360	0.104	0.040	0.020	0.010	-	-	-
0.3400	0.370	0.115	0.040	0.020	0.010	0.010	-	-
0.3500	0.390	0.127	0.040	0.020	0.010	0.010	-	-
0.3600	0.410	0.127	0.050	0.030	0.020	0.010	-	-
0.3700	0.430	0.138	0.050	0.030	0.020	0.010	-	-
0.3800	0.440	0.150	0.050	0.030	0.020	0.010	0.010	-
0.3900	0.460	0.150	0.060	0.030	0.020	0.010	0.010	-
0.4000	0.480	0.161	0.060	0.030	0.020	0.010	0.010	-
0.4100	0.500	0.173	0.060	0.030	0.020	0.010	0.010	-
0.4200	0.520	0.184	0.070	0.040	0.020	0.010	0.010	0.010
0.4300	0.540	0.184	0.070	0.040	0.020	0.020	0.010	0.010
0.4400	0.560	0.196	0.080	0.040	0.030	0.020	0.010	0.010
0.4500	0.590	0.207	0.080	0.040	0.030	0.020	0.010	0.010
0.4600	0.610	0.219	0.090	0.050	0.030	0.020	0.020	0.010
0.4700	0.640	0.230	0.090	0.050	0.030	0.020	0.020	0.010
0.4800	0.660	0.242	0.100	0.050	0.040	0.030	0.020	0.010
0.4900	0.690	0.265	0.110	0.060	0.040	0.030	0.020	0.010
0.5000	0.720	0.276	0.120	0.060	0.040	0.030	0.020	0.010
0.5100	0.740	0.288	0.130	0.070	0.040	0.030	0.020	0.020
0.5200	0.780	0.299	0.130	0.070	0.050	0.030	0.020	0.020
0.5300	0.810	0.322	0.140	0.080	0.050	0.030	0.030	0.020
0.5400	0.840	0.334	0.150	0.080	0.050	0.040	0.030	0.020
0.5500	0.880	0.357	0.160	0.090	0.060	0.040	0.030	0.020
0.5600	0.910	0.380	0.170	0.100	0.060	0.050	0.030	0.020
0.5700	0.950	0.403	0.180	0.110	0.070	0.050	0.040	0.030
0.5800	1.000	0.426	0.190	0.110	0.070	0.050	0.040	0.030
0.5900	1.040	0.449	0.200	0.120	0.080	0.060	0.040	0.030
0.6000	1.080	0.483	0.220	0.130	0.080	0.060	0.050	0.040
0.6100	1.130	0.506	0.230	0.140	0.090	0.070	0.050	0.040
0.6200	1.180	0.541	0.250	0.150	0.100	0.070	0.060	0.040
0.6300	1.230	0.564	0.270	0.160	0.110	0.080	0.060	0.050
0.6400	1.290	0.587	0.290	0.170	0.120	0.080	0.070	0.050
0.6500	1.340	0.610	0.310	0.190	0.120	0.090	0.070	0.050
0.6600	1.400	0.690	0.330	0.200	0.130	0.100	0.080	0.060
0.6700	1.480	0.725	0.360	0.220	0.140	0.110	0.090	0.060
0.6800	1.550	0.759	0.380	0.230	0.160	0.120	0.090	0.070
0.6900	1.620	0.805	0.420	0.250	0.170	0.130	0.100	0.080
0.7000	1.700	0.828	0.440	0.270	0.190	0.140	0.110	0.090
0.7100	1.800	0.897	0.480	0.290	0.200	0.160	0.120	0.100
0.7200	1.900	0.955	0.510	0.310	0.220	0.170	0.130	0.110
0.7300	1.990	1.001	0.540	0.340	0.240	0.190	0.140	0.120
0.7400	2.080	1.070	0.590	0.360	0.260	0.200	0.160	0.130
0.7500	2.200	1.150	0.630	0.390	0.280	0.220	0.170	0.140
0.7600	2.310	1.242	0.680	0.420	0.300	0.240	0.190	0.150
0.7700	2.460	1.334	0.730	0.450	0.330	0.260	0.210	0.170
0.7800	2.590	1.415	0.790	0.490	0.360	0.280	0.230	0.190
0.7900	2.750	1.495	0.840	0.530	0.400	0.310	0.250	0.210
0.8000	2.950	1.610	0.920	0.570	0.430	0.340	0.270	0.220
0.8100	3.170	1.725	0.980	0.630	0.470	0.380	0.300	0.240
0.8200	3.450	1.955	1.080	0.680	0.520	0.420	0.340	0.270
0.8300	3.750	2.128	1.160	0.740	0.570	0.470	0.380	0.310
0.8400	4.100	2.185	1.280	0.810	0.640	0.500	0.420	0.340
0.8500	4.400	2.358	1.400	0.900	0.700	0.560	0.460	0.380
0.8600	4.750	2.530	1.520	0.980	0.760	0.610	0.510	0.420
0.8700	5.200	2.760	1.680	1.070	0.840	0.670	0.560	0.470
0.8800	5.600	2.990	1.830	1.160	0.920	0.750	0.630	0.520
0.8900	6.100	3.278	2.000	1.290	1.010	0.830	0.700	0.580
0.9000	6.600	3.680	0.000	1.430	1.120	0.920	0.760	0.640

Source : "Port Development", A handbook for planners in developing countries, Prepared by the secretariat of UNCTAD, UNITED NATIONS, New York, 1985

Table 10.3.3 Ship Waiting Time for Grain Terminal Plan (Alternative-1a&b) and Benefit Estimate (Traffic Demand Forecast:Case-1) : Without-the-Project

Year	Existing& Planned Capacity, Without Project	Net Traffic Demand (ton/year)	Average Capacity (ton/ship)	Unit Load (ton/ship)	No. of Ships (Ship/Year)	No. of Berth, (Terminal)	Operator	Capacity (ton/terminal・hour)	Port Capacity (ton/port・hour)	Required Vessel Stay at Port (Hour/Year)	Required Ship Days/Year	Terminal-Days/Year	Occupancy Ratio	Waiting Time Factor	Ship Time at Berth (hour/ship)	Waiting Time (hour/ship)	Waiting Time (days/Year)	Waiting Time (days/Year)	Waiting Time Cost for Cargo, 10^6 Lei	Waiting Time Cost for Vessel 10^6Lei	Time Value of Grain Cargo (Lei/day)	Ship Lease Cost (Lei/day/ship)
		(A)	(B)	(C)	(D)	(E)		(H)	(I)	(P)'	(P)	(Q)	(R)	(S)	(S)'	(T)'	(T)	(U)	(V)	(W)	(X)	(Y)
				(B)x0.9	(A)/(C)				(E)x(H)	(A)/(I)	[(P)'/24] x(E)	(E)x365	(P)/(Q)	Queueing Table (VIII)	(C)/(H)	(S)x(S)'	[(T')x(D)]/24	(T)-(Total Waiting Time of Capacity)	[(A)x(U)x (X)]/1000000	[(U)x(Y)]/1000000		
1999	1,722,656	1,760,000	7,500	6,750	261	2	SILOTRANS&AGROEXPORT	670	1,340	1,313	109	730	0.150	0.057	10.07	0.57	6.231					
2000	1,722,656	1,913,281	7,500	6,750	283	2		670	1,340	1,428	119	730	0.163	0.059	10.07	0.59	6.978					
2001	1,722,656	2,079,911	7,500	6,750	308	2		670	1,340	1,552	129	730	0.177	0.060	10.07	0.60	7.735					
2002	2,067,188	2,261,052	7,500	6,750	335	2		670	1,340	1,687	141	730	0.193	0.062	10.07	0.63	8.732					
2003	2,549,531	2,457,970	7,500	6,750	364	2	SILOTRANS&AGROEXPORT	670	1,340	1,834	153	730	0.209	0.063	10.07	0.64	9.668					
2004	2,549,531	2,672,038	7,500	6,750	396	2	SILOTRANS,AGROEXPORT&Others	670	1,340	1,994	166	730	0.228	0.068	10.07	0.68	11.275					
2005	2,549,531	2,904,749	7,500	6,750	430	2		670	1,340	2,168	181	730	0.247	0.072	10.07	0.73	13.088					
2006	2,549,531	3,157,727	7,500	6,750	468	2		670	1,340	2,357	196	730	0.269	0.078	10.07	0.79	15.357					
2007	2,549,531	3,432,738	7,500	6,750	509	2		670	1,340	2,562	213	730	0.292	0.089	10.07	0.89	18.904					
2008	Capacity	2,549,531	7,500	6,750	378	2		670	1,340	1,903	159	730	0.217	0.066	10.07	0.66	10.393					
2008	2,549,531	3,731,699	7,500	6,750	553	2		670	1,340	2,785	232	730	0.318	0.104	10.07	1.04	24.019	13.6	**147,729**	**1,929.5**	2,905.3	141,600,000
2009	2,549,531	4,056,697	7,500	6,750	601	2		670	1,340	3,027	252	730	0.346	0.115	10.07	1.16	29.012	18.6	**219,443**	**2,636.5**	2,905.3	141,600,000
2010	2,549,531	4,410,000	7,500	6,750	653	2		670	1,340	3,291	274	730	0.376	0.138	10.07	1.39	37.847	27.5	**351,745**	**3,887.5**	2,905.3	141,600,000
2011	2,549,531	4,602,036	7,500	6,750	682	2		670	1,340	3,434	286	730	0.392	0.150	10.07	1.51	42.786	32.4	**433,101**	**4,586.9**	2,905.3	141,600,000
2012	2,549,531	4,802,435	7,500	6,750	711	2		670	1,340	3,584	299	730	0.409	0.161	10.07	1.62	48.084	37.7	**525,877**	**5,337.0**	2,905.3	141,600,000
2013	2,549,531	5,011,560	7,500	6,750	742	2		670	1,340	3,740	312	730	0.427	0.184	10.07	**1.85**	57.346	47.0	**683,632**	**6,648.6**	2,905.3	141,600,000
2014	2,549,531	5,229,791	7,500	6,750	775	2		670	1,340	3,903	325	730	0.446	0.196	10.07	1.97	63.584	53.2	**808,172**	**7,531.8**	2,905.3	141,600,000
2015	2,549,531	5,457,526	7,500	6,750	809	2		670	1,340	4,073	339	730	0.465	0.219	10.07	2.20	74.159	63.8	**1,011,036**	**9,029.2**	2,905.3	141,600,000
2016	2,549,531	5,647,647	7,500	6,750	837	2		670	1,340	4,215	351	730	0.481	0.242	10.07	2.43	84.820	74.4	**1,221,190**	**10,538.9**	2,905.3	141,600,000
2017	2,549,531	5,844,391	7,500	6,750	866	2		670	1,340	4,361	363	730	0.498	0.265	10.07	2.66	96.134	85.7	**1,455,844**	**12,141.0**	2,905.3	141,600,000
2018	2,549,531	6,047,989	7,500	6,750	896	2		670	1,340	4,513	376	730	0.515	0.288	10.07	2.90	108.134	97.7	**1,717,408**	**13,840.1**	2,905.3	141,600,000
2019	2,549,531	6,258,680	7,500	6,750	927	2		670	1,340	4,671	389	730	0.533	0.322	10.07	3.24	125.329	114.9	**2,089,898**	**16,275.0**	2,905.3	141,600,000
2020	2,549,531	6,476,710	7,500	6,750	960	2		670	1,340	4,833	403	730	0.552	0.357	10.07	3.59	143.591	133.2	**2,506,329**	**18,860.9**	2,905.3	141,600,000
2021	2,549,531	6,702,336	7,500	6,750	993	2		670	1,340	5,002	417	730	0.571	0.403	10.07	4.06	167.767	157.4	**3,064,389**	**22,284.1**	2,905.3	141,600,000
2022	2,549,531	6,935,822	7,500	6,750	1,028	2		670	1,340	5,176	431	730	0.591	0.449	10.07	4.52	193.452	183.1	**3,688,719**	**25,921.2**	2,905.3	141,600,000
2023	2,549,531	7,177,442	7,500	6,750	1,063	2		670	1,340	5,356	446	730	0.611	0.506	10.07	5.10	225.857	215.5	**4,492,938**	**30,509.7**	2,905.3	141,600,000
2024	2,549,531	7,427,478	7,500	6,750	1,100	2		670	1,340	5,543	462	730	0.633	0.564	10.07	5.68	260.285	249.9	**5,392,366**	**35,384.7**	2,905.3	141,600,000
2025	2,549,531	7,686,226	7,500	6,750	1,139	2		670	1,340	5,736	478	730	0.655	0.610	10.07	6.14	291.340	280.9	**6,273,699**	**39,782.1**	2,905.3	141,600,000
2026	2,549,531	7,953,987	7,500	6,750	1,178	2		670	1,340	5,936	495	730	0.678	0.725	10.07	7.30	358.375	348.0	**8,041,307**	**49,274.2**	2,905.3	141,600,000
2027	2,549,531	8,231,076	7,500	6,750	1,219	2		670	1,340	6,143	512	730	0.701	0.828	10.07	8.34	423.839	413.4	**9,886,918**	**58,543.9**	2,905.3	141,600,000
2028	2,549,531	8,517,818	7,500	6,750	1,262	2		670	1,340	6,357	530	730	0.726	0.955	10.07	9.62	505.613	495.2	**12,254,965**	**70,123.1**	2,905.3	141,600,000
2029	2,549,531	8,814,549	7,500	6,750	1,306	2		670	1,340	6,578	548	730	0.751	1.150	10.07	11.59	630.394	620.0	**15,877,344**	**87,792.1**	2,905.3	141,600,000
2030	2,549,531	9,121,617	7,500	6,750	1,351	2		670	1,340	6,807	567	730	0.777	1.334	10.07	13.44	756.731	746.3	**19,778,486**	**105,681.5**	2,905.3	141,600,000
2031	2,549,531	9,439,382	7,500	6,750	1,398	2		670	1,340	7,044	587	730	0.804	1.610	10.07	16.22	945.112	934.7	**25,633,644**	**132,356.2**	2,905.3	141,600,000
2032	2,549,531	9,768,217	7,500	6,750	1,447	2		670	1,340	7,290	607	730	0.832	2.128	10.07	21.43	1,292.406	1,282.0	**36,382,555**	**181,533.0**	2,905.3	141,600,000
2033	2,549,531	10,108,507	7,500	6,750	1,498	2		670	1,340	7,544	629	730	0.861	2.530	10.07	25.49	1,590.455	1,580.1	**46,403,090**	**223,736.8**	2,905.3	141,600,000

Table 10.3.4 Ship Waiting Time for Grain Terminal Plan (Alternative-1a&b) and Benefit Estimate (Traffic Demand Forecast:Case-1) : With-the-Project

Year	Existing & Planned Capacity With Project	Net Traffic Demand (ton/year)	Average Capacity (ton/ship)	Unit Load (ton/ship)	No. of Ships (Ship/Year)	No. of Berth (terminal/port)	Operators	Capacity (ton/terminal •hour)	Port Capacity (ton/port • hour)	Required Vessel Stay at Port (Hour/Year)	Required Ship Days/Year	Days/Year	Occupancy Ratio	Waiting Time Factor	Ship Time at Berth (hour/ship)	Waiting Time (hour/ship)	Waiting Time (days)/Year	Waiting Time (days)/Year	Waiting Time Cost for Cargo (days/Year) 10^6 Lei	Waiting Time Cost for Vessel 10^6 Lei	Time Value of Grain Cargo (Lei/day)	Ship Lease Cost (Lei/day/ship)	Net Benefit See Table 10.3.3: Waiting Time Savings Benefit for Cargo	Net Benefit See Table 10.3.3: Waiting Time Savings Benefit for Vessel
		(A)	(B)	(C)	(D)	(E)		(H)	(I)	(P)'	(P)	(Q)	(R)	(S)	(S)'	(T)'	(T)	(U)	(V)	(W)	(X)	(Y)		
				(B)x0.9	(A)/(C)				(E)x(H)	(A)/(I)	[(P)'/24] x(E)	(E)x365	(P)/(Q)	Queueing Table (VIII)	(C)/(H)	(S)x(S)'	[(T')x(D)]/24	(T)-(Total Waiting Time of Capacity)	[(A)x(U)x (X]/1000000	[(U)x(Y)]/1000000			(W:without-the-project)-(W:with-the-project)	(V:without-the-project)-(V:with-the-project)
1999	1,722,656	1,760,000	7,500	6,750	261	2	SILOTRANS&AGRO EXPORT	670	1,340	1,313	109	730	0.150	0.057	10.07	0.57	6.231							
2000	1,722,656	1,913,281	7,500	6,750	283	2		670	1,340	1,428	119	730	0.163	0.059	10.07	0.59	6.978							
2001	1,722,656	2,079,911	7,500	6,750	308	2		670	1,340	1,552	129	730	0.177	0.060	10.07	0.60	7.735							
2002	1,595,642	2,261,052	7,500	6,750	335	2		670	1,340	1,687	141	730	0.193	0.062	10.07	0.63	8.732							
2003	2,549,531	2,457,970	7,500	6,750	364	2	SILOTRANS&AGRO EXPORT	670	1,340	1,834	153	730	0.209	0.063	10.07	0.64	9.668							
2004	2,549,531	2,672,038	7,500	6,750	396	2	SILOTRANS,AGROE XPORT&Others	670	1,340	1,994	166	730	0.228	0.068	10.07	0.68	11.275							
2005	2,549,531	2,904,749	7,500	6,750	430	2		670	1,340	2,168	181	730	0.247	0.072	10.07	0.73	13.088							
2006	2,549,531	3,157,727	7,500	6,750	468	2		670	1,340	2,357	196	730	0.269	0.078	10.07	0.79	15.357							
2007	2,549,531	3,432,738	7,500	6,750	509	2		670	1,340	2,562	213	730	0.292	0.089	10.07	0.89	18.904							
2008	Capacity	3,927,656	7,500	6,750	582	3	SILOTRANS,AGROE XPORT&Others + New Termianl	670	2,010	1,954	244	1095	0.223	0.025	10.07	0.25	6.106							
2008	3,927,656	3,731,699	7,500	6,750	553	3	SILOTRANS,AGROE XPORT&Others + New Termianl	670	2,010	1,857	232	1095	0.212	0.020	10.07	0.20	4.641	1.47	**22,236**	**156**	2,905.3	106,200,000	**169,966**	**2,085**
2009	3,927,656	4,056,697	7,500	6,750	601	3		670	2,010	2,018	252	1095	0.230	0.025	10.07	0.25	6.307	-0.20	**-3,310**	**-21**	4,067.4	106,200,000	**216,133**	**2,615**
2010	3,927,656	4,410,000	7,500	6,750	653	3		670	2,010	2,194	274	1095	0.250	0.025	10.07	0.25	6.856	-0.75	**-13,451**	**-80**	4,067.4	106,200,000	**338,294**	**3,808**
2011	3,927,656	4,602,036	7,500	6,750	682	3		670	2,010	2,290	286	1095	0.261	0.025	10.07	0.25	7.155	-1.05	**-19,626**	**-111**	4,067.4	106,200,000	**452,727**	**4,698**
2012	3,927,656	4,802,435	7,500	6,750	711	3		670	2,010	2,389	299	1095	0.273	0.030	10.07	0.30	8.960	-2.85	**-55,735**	**-303**	4,067.4	106,200,000	**581,612**	**5,640**
2013	3,927,656	5,011,560	7,500	6,750	742	3		670	2,010	2,493	312	1095	0.285	0.030	10.07	**0.30**	9.350	-3.24	**-66,115**	**-344**	4,067.4	106,200,000	**749,747**	**6,993**
2014	3,927,656	5,229,791	7,500	6,750	775	3		670	2,010	2,602	325	1095	0.297	0.030	10.07	0.30	9.757	-3.65	**-77,655**	**-388**	4,067.4	106,200,000	**885,826**	**7,919**
2015	3,927,656	5,457,526	7,500	6,750	809	3		670	2,010	2,715	339	1095	0.310	0.030	10.07	0.30	10.182	-4.08	**-90,467**	**-433**	4,067.4	106,200,000	**1,101,503**	**9,462**
2016	3,927,656	5,647,647	7,500	6,750	837	3		670	2,010	2,810	351	1095	0.321	0.040	10.07	0.40	14.049	-7.94	**-182,446**	**-843**	4,067.4	106,200,000	**1,403,636**	**11,382**
2017	3,927,656	5,844,391	7,500	6,750	866	3		670	2,010	2,908	363	1095	0.332	0.040	10.07	0.40	14.538	-8.43	**-200,436**	**-895**	4,067.4	106,200,000	**1,656,280**	**13,036**
2018	3,927,656	6,047,989	7,500	6,750	896	3		670	2,010	3,009	376	1095	0.343	0.040	10.07	0.40	15.045	-8.94	**-219,877**	**-949**	4,067.4	106,200,000	**1,937,285**	**14,789**
2019	3,927,656	6,258,680	7,500	6,750	927	3		670	2,010	3,114	389	1095	0.355	0.040	10.07	0.40	15.569	-9.46	**-240,879**	**-1,005**	4,067.4	106,200,000	**2,330,777**	**17,280**
2020	3,927,656	6,476,710	7,500	6,750	960	3		670	2,010	3,222	403	1095	0.368	0.050	10.07	0.50	20.139	-14.03	**-369,663**	**-1,490**	4,067.4	106,200,000	**2,875,993**	**20,351**
2021	3,927,656	6,702,336	7,500	6,750	993	3		670	2,010	3,334	417	1095	0.381	0.050	10.07	0.50	20.841	-14.73	**-401,666**	**-1,565**	4,067.4	106,200,000	**3,466,056**	**23,849**
2022	3,927,656	6,935,822	7,500	6,750	1,028	3		670	2,010	3,451	431	1095	0.394	0.060	10.07	0.60	25.880	-19.77	**-557,821**	**-2,100**	4,067.4	106,200,000	**4,246,540**	**28,021**
2023	3,927,656	7,177,442	7,500	6,750	1,063	3		670	2,010	3,571	446	1095	0.408	0.060	10.07	0.60	26.781	-20.68	**-603,574**	**-2,196**	4,067.4	106,200,000	**5,096,511**	**32,705**
2024	3,927,656	7,427,478	7,500	6,750	1,100	3		670	2,010	3,695	462	1095	0.422	0.070	10.07	0.71	32.334	-26.23	**-792,329**	**-2,785**	4,067.4	106,200,000	**6,184,695**	**38,170**
2025	3,927,656	7,686,226	7,500	6,750	1,139	3		670	2,010	3,824	478	1095	0.437	0.070	10.07	0.71	33.460	-27.35	**-855,145**	**-2,905**	4,067.4	106,200,000	**7,128,845**	**42,687**
2026	3,927,656	7,953,987	7,500	6,750	1,178	3		670	2,010	3,957	495	1095	0.452	0.080	10.07	0.81	39.572	-33.47	**-1,082,674**	**-3,554**	4,067.4	106,200,000	**9,123,981**	**52,828**
2027	3,927,656	8,231,076	7,500	6,750	1,219	3		670	2,010	4,095	512	1095	0.467	0.090	10.07	0.91	46.069	-39.96	**-1,337,915**	**-4,244**	4,067.4	106,200,000	**11,224,833**	**62,788**
2028	3,927,656	8,517,818	7,500	6,750	1,262	3		670	2,010	4,238	530	1095	0.484	0.100	10.07	1.01	52.972	-46.87	**-1,623,646**	**-4,977**	4,067.4	106,200,000	**13,878,611**	**75,100**
2029	3,927,656	8,814,549	7,500	6,750	1,306	3		670	2,010	4,385	548	1095	0.501	0.120	10.07	1.21	65.780	-59.67	**-2,139,426**	**-6,337**	4,067.4	106,200,000	**18,016,770**	**94,129**
2030	3,927,656	9,121,617	7,500	6,750	1,351	3		670	2,010	4,538	567	1095	0.518	0.130	10.07	1.31	73.744	-67.64	**-2,509,436**	**-7,183**	4,067.4	106,200,000	**22,287,922**	**112,865**
2031	3,927,656	9,439,382	7,500	6,750	1,398	3		670	2,010	4,696	587	1095	0.536	0.140	10.07	1.41	82.184	-76.08	**-2,920,869**	**-8,079**	4,067.4	106,200,000	**28,554,512**	**140,436**
2032	3,927,656	9,768,217	7,500	6,750	1,447	3		670	2,010	4,860	607	1095	0.555	0.160	10.07	1.61	97.196	-91.09	**-3,619,083**	**-9,674**	4,067.4	106,200,000	**40,001,638**	**191,207**
2033	3,927,656	10,108,507	7,500	6,750	1,498	3		670	2,010	5,029	629	1095	0.574	0.180	10.07	1.81	113.155	-107.05	**-4,401,304**	**-11,369**	4,067.4	106,200,000	**50,804,394**	**235,105**

Table 10.3.6 Ship Lease Cost for Navigation for Grain Terminal Plan (:Without-the-Project: Traffic Demand Forfecast:Case-1)

Year	Existing & Planning Capacity Without Project	Net Traffic Demand (ton/year)	Average Ship Capacity (ton/ship)	Ship Lease Cost for Navigation by Ship Scale Economy (Million Lei)	Ship Lease Cost for Navigation (Lei/day/ton)
		(A)	(B)	(C)	(D)
				[(A)x(D)xTransportation Time(days:7.3)]/1000000	US$0.8/tonx 29,500x 0.8= Lei18,880
1999	1,722,656	1,760,000	7,500	242,570	18,880.00
2000	**1,722,656**	**1,913,281**	**7,500**	**263,696**	**18,880.00**
2001	1,722,656	2,079,911	7,500	286,662	18,880.00
2002	2,067,188	2,261,052	7,500	311,627	18,880.00
2003	2,549,531	2,457,970	7,500	338,767	18,880.00
2004	2,549,531	2,672,038	7,500	368,271	18,880.00
2005	2,549,531	2,904,749	7,500	400,344	18,880.00
2006	2,549,531	3,157,727	7,500	435,211	18,880.00
2007	2,549,531	3,432,738	7,500	473,114	18,880.00
2008	2,549,531	3,731,699	7,500	514,318	18,880.00
2009	2,549,531	4,056,697	7,500	559,110	18,880.00
2010	**2,549,531**	**4,410,000**	**7,500**	**607,804**	**18,880.00**
2011	2,549,531	4,602,036	7,500	634,271	18,880.00
2012	2,549,531	4,802,435	7,500	661,891	18,880.00
2013	2,549,531	5,011,560	7,500	690,713	18,880.00
2014	2,549,531	5,229,791	7,500	720,791	18,880.00
2015	2,549,531	5,457,526	7,500	752,178	18,880.00
2016	2,549,531	5,647,647	7,500	778,381	18,880.00
2017	2,549,531	5,844,391	7,500	805,497	18,880.00
2018	2,549,531	6,047,989	7,500	833,558	18,880.00
2019	2,549,531	6,258,680	7,500	862,596	18,880.00
2020	**2,549,531**	**6,476,710**	**7,500**	**892,646**	**18,880.00**
2021	2,549,531	6,702,336	7,500	923,743	18,880.00
2022	2,549,531	6,935,822	7,500	955,923	18,880.00
2023	2,549,531	7,177,442	7,500	989,224	18,880.00
2024	2,549,531	7,427,478	7,500	1,023,685	18,880.00
2025	2,549,531	7,686,226	7,500	1,059,346	18,880.00
2026	2,549,531	7,953,987	7,500	1,096,250	18,880.00
2027	2,549,531	8,231,076	7,500	1,134,440	18,880.00
2028	2,549,531	8,517,818	7,500	1,173,960	18,880.00
2029	2,549,531	8,814,549	7,500	1,214,856	18,880.00
2030	2,549,531	9,121,617	7,500	1,257,178	18,880.00
2031	2,549,531	9,439,382	7,500	1,300,973	18,880.00
2032	2,549,531	9,768,217	7,500	1,346,295	18,880.00
2033	2,549,531	10,108,507	7,500	1,393,195	18,880.00

Table 10.3.7 Ship Lease Cost for Navigationfor Grain Terminal Plan (Alternative-1&2:With-the-Project: Traffic Demand Forfecast:Case-1)

Year	Existing & Palnned Capacity With Project	Net Traffic Demand (ton)	Average Ship Capacity (ton/ship)	Ship Lease Cost for Navigation by Ship Scale Economy (Million Lei)	Ship Lease Cost for Navigation by Ship Scale Economy (Lei/day/ton)	Ship Lease Cost Savings for Navigation by Ship Scale Economy (Million Lei)
		(A)	(B)	(C)	(D)	(E)
				[(A)x(D)xTransportation Time(days:7.3)]/1000000		(Without)-(With)
1999	1,722,656	1,760,000	7,500	242,570	18,880.00	0
2000	**1,722,656**	**1,913,281**	**7,500**	**263,696**	**18,880.00**	**0**
2001	1,722,656	2,079,911	7,500	286,662	18,880.00	0
2002	1,595,642	2,261,052	7,500	311,627	18,880.00	0
2003	2,549,531	2,457,970	7,500	338,767	18,880.00	0
2004	2,549,531	2,672,038	7,500	368,271	18,880.00	0
2005	2,549,531	2,904,749	7,500	400,344	18,880.00	0
2006	2,549,531	3,157,727	7,500	435,211	18,880.00	0
2007	2,549,531	3,432,738	7,500	473,114	18,880.00	0
2008	3,927,656	3,731,699	7,500	514,318	18,880.00	0
2009	3,927,656	4,056,697	7,500	559,110	18,880.00	0
2010	**3,927,656**	**4,410,000**	**11,250**	**329,227**	**10,226.67**	**278,577**
2011	3,927,656	4,602,036	11,250	343,563	10,226.67	290,708
2012	3,927,656	4,802,435	11,250	358,524	10,226.67	303,367
2013	3,927,656	5,011,560	11,250	374,136	10,226.67	316,577
2014	3,927,656	5,229,791	11,250	390,428	10,226.67	330,362
2015	3,927,656	5,457,526	11,250	407,430	10,226.67	344,748
2016	3,927,656	5,647,647	11,250	421,623	10,226.67	356,758
2017	3,927,656	5,844,391	11,250	436,311	10,226.67	369,186
2018	3,927,656	6,047,989	11,250	451,511	10,226.67	382,047
2019	3,927,656	6,258,680	11,250	467,240	10,226.67	395,357
2020	**3,927,656**	**6,476,710**	**17,500**	**557,904**	**11,800.00**	**334,742**
2021	3,927,656	6,702,336	17,500	577,339	11,800.00	346,404
2022	3,927,656	6,935,822	17,500	597,452	11,800.00	358,471
2023	3,927,656	7,177,442	17,500	618,265	11,800.00	370,959
2024	3,927,656	7,427,478	17,500	639,803	11,800.00	383,882
2025	3,927,656	7,686,226	17,500	662,091	11,800.00	397,255
2026	3,927,656	7,953,987	17,500	685,156	11,800.00	411,094
2027	3,927,656	8,231,076	17,500	709,025	11,800.00	425,415
2028	3,927,656	8,517,818	17,500	733,725	11,800.00	440,235
2029	3,927,656	8,814,549	17,500	759,285	11,800.00	455,571
2030	3,927,656	9,121,617	17,500	785,736	11,800.00	471,442
2031	3,927,656	9,439,382	17,500	813,108	11,800.00	487,865
2032	3,927,656	9,768,217	17,500	841,434	11,800.00	504,861
2033	3,927,656	10,108,507	17,500	870,747	11,800.00	522,448

Table 10.3.8 Disbursement Schedule for Grain Terminal: Economic Cost: First Priority Project in Short Term Development

Traffic Demand Forecast	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Net and Medium Volume	**1000t**	**1,913**	**2,080**	**2,261**	**2,458**	**2,672**	**2,905**	**3,158**	**3,433**	**3,732**	**4,057**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**	**4,410**
Rate of New Capacity to Total Capacity: 2.0/(3.7+2.0)=0.351		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.351	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Throughput of New Terminal	**1000t**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.00**	**1,310**	**1,424**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**	**1,548**
Capital Cost ($1,000,000)																																		
Civil Works (50%,50%)	mil US$							**15.33**	**15.33**																									
Equipment (50%,50%)	mil US$							**19.33**	**19.33**																									
Physical Contingency (50%,50%)	mil US$							**2.50**	**2.50**																									
Engineering Fee (50%,25%,25%)	mil US$					**2.79**		**1.39**	**1.39**																									
Total	**mil US$**				**-**	**2.79**	**-**	**38.549**	**38.55**																									
Maintenance Cost																																		
Civil Works (0.3%)	mil US$								0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Equipment (3.0%)	mil US$								1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
Total	**mil US$**								**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**	**1.32**
Replacement Cost																																		
Equipment																																		
A. 30 year Life	mil US$																																	5.57
B. 20 year Life	mil US$																												12.17					
C. 15 year Life	mil US$																							15.81										
D. 5 year Life	mil US$													0.23					0.23					0.23					0.23					0.23
Total	**mil US$**													**0.23**	**-**	**-**	**-**	**-**	**0.23**	**-**	**-**	**-**	**-**	**16.05**	**-**	**-**	**-**	**-**	**12.40**	**-**	**-**	**-**	**-**	**5.80**
Operation Cost (US$ 0.62/ Ton)	**mil US$**					**0.00**	**0.00**	**0.00**	**0.00**	**0.73**	**0.79**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**	**0.86**
Grand Total	**mil US$**					**2.79**	**0.00**	**38.55**	**39.87**	**2.04**	**2.11**	**2.18**	**2.18**	**2.41**	**2.18**	**2.18**	**2.18**	**2.18**	**2.41**	**2.18**	**2.18**	**2.18**	**2.18**	**18.22**	**2.18**	**2.18**	**2.18**	**2.18**	**14.58**	**2.18**	**2.18**	**2.18**	**2.18**	**7.97**

Table 10.3.9 Cash Flow of Economic Cost and Benefit for Grain Terminal Plan (Alternative-1a) (Traffic Demand Forecast : Case-1) Development Alternative at New S3 Pier

(Unit : 1,000 US$)

No.	Year	Cost							Benefit				Net Benefit
		Civil Works	Equipment	Physical Contingency	Engineering Fee	O&M Cost	Repalacement Cost	Total	Waiting Time Savings for Cargo	Waiting Time Savings for Vessel	Ship Lease Cost Savings for Ship Scale Economy	Total	
-4	2004				2,786.7			**2,786.7**				**0.0**	**-2,786.7**
-3	2005							**0.0**				**0.0**	**0.0**
-2	2006	15,326.8	19,329.6	2,499.2	1,393.3			**38,548.9**				**0.0**	**-38,548.9**
-1	2007	15,326.8	19,329.6	2,499.2	1,393.3	1,318.9		**39,867.8**				**0.0**	**-39,867.8**
1	2008					2,044.5		**2,044.5**	6,718.0	82.4	0.0	**6,800.4**	**4,756.0**
2	2009					2,107.6		**2,107.6**	8,542.8	103.4	0.0	**8,646.2**	**6,538.5**
3	2010					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
4	2011					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
5	2012					2,176.3	232.3	**2,408.6**	13,371.3	150.5	11,010.9	**24,532.7**	**22,124.1**
6	2013					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
7	2014					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
8	2015					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
9	2016					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
10	2017					2,176.3	232.3	**2,408.6**	13,371.3	150.5	11,010.9	**24,532.7**	**22,124.1**
11	2018					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
12	2019					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
13	2020					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
14	2021					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
15	2022					2,176.3	16,045.7	**18,222.0**	13,371.3	150.5	11,010.9	**24,532.7**	**6,310.7**
16	2023					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
17	2024					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
18	2025					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
19	2026					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
20	2027					2,176.3	12,400.6	**14,576.9**	13,371.3	150.5	11,010.9	**24,532.7**	**9,955.8**
21	2028					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
22	2029					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
23	2030					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
24	2031					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
25	2032					2,176.3	5,798.2	**7,974.6**	13,371.3	150.5	11,010.9	**24,532.7**	**16,558.2**
26	2033					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
27	2034					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
28	2035					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
29	2036					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
30	2037					2,176.3		**2,176.3**	13,371.3	150.5	11,010.9	**24,532.7**	**22,356.4**
Total		**30,653.7**	**38,659.1**	**4,998.3**	**5,573.3**	**66,408.3**	**34,709.1**	**181,001.8**	**389,657.0**	**4,400.0**	**308,306.3**	**702,363.2**	**521,361.5**

EIRR = 18.8%

(Discount Rate 15%)

B/C = 1.27
NPV = 16,015

Table 10.3.13 Navigation Time Saving Benefit for Cargo and Vessel for Barge Terminal Plan (Traffic Demand Forfecast:Case-1)

Year	Traffic Demand (ton)	Average Capacity of Barge (ton/barge)	Unit Load per Barge (ton/barge)	Rate of Empty Barge	No. of Barge (Barge/Year)	Average Variable Dwelling Time --------- Without-Project (Days/barge)	Total Dwelling Time -------- Withut-Project (Days/\Year)	Rate of Improvement of Efficiency for Barge Operation (%)	Total Saved Dwelling Time ---------- With-Project (Days/\Year)	Average Time for Forming Up Convoy : -------- Without-Project (Hours/Convoy)	No. of Convoy	Total Time for Forming Up Convoy ---------- Without-Project (Days/Year)	Rate of Improvement of Efficiency for Convoy Forming Up (%)	Total Saved Time for Forming Up Convoy (Days/Year): With	Total Saved Time for Forming Up Convoy for Barge (Days/Year)	Total Saved Time for Forming Up Convoy for Cargo (Ton.Days/Year)	Ship Lease Cost for Navigation		Average Time Value of Cargo (Lei/Ton/Day)	Dwelling Time Saving Benefit for Cargo (Million Lei)	Dwelling Time Saving Benefit for Barge & Pusher (Million Lei)			Time Saving Benefit for Forming Up of Convoy for Cargo (Million Lei)	Time Saving Benefit for Forming Up of Convoy for Barge (Million Lei)		
																	Barge (Lei/day.barge)	Pusher-Tug (Lei/day.barge)			Barge	Pusher-Tug	Total		Barge	Pusher-Tug	Total
	(A)	(B)	(C)	(D)	(D)'	(D)''	(D)'''	(E)	(F)	(F)'	(FA)	(FB)	(FC)	(F)''	(F)'''	(FD)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(M)'	(N)	(O)	(P)
	See Part II Chapter 4		(B) x0.7		{(A)/(C)}/(1-(D)}		(D)' x (D)''		(D)''' x {E)/100}		(D)'/5	{(F)' x (FA)}/24		(FB) x (FC)/100	(F)'' x 5	(F)''' x (C)	(24,000/2 Yenx (235Lei/Yen)	[{(130,000/2Yen x(235Lei/Yen)}/5		{(I) x (F) x (C)}/1,000,000	{(F)x(G)}/ 1,000,000	[(F)}x(H)]/ 1,000,000	(K)+(L)	(I) x (FD}/1,000,000	{(F)'''x(G)}/ 1,000,000	[(F)'''}x(H)]/ 1,000,000	(K)+(L)
1999	10,432,077	1,500	1,050	0.10	11,039	2.0	22,078	0	0	5	2,208	460.0	0	0	0	0	2,820,000	3,055,000	2,866	0	0	0	0	0	0	0	0
2000	10,914,522	1,500	1,050	0.10	11,550	2.0	23,100	0	0	5	2,310	528.7	0	0	0	0	2,820,000	3,055,000	2,885	0	0	0	0	0	0	0	0
2001	11,419,278	1,500	1,050	0.10	12,084	2.0	24,168	0	0	6	2,417	607.6	0	0	0	0	2,820,000	3,055,000	2,903	0	0	0	0	0	0	0	0
2002	11,947,377	1,500	1,050	0.10	12,643	2.0	25,285	0	0	7	2,529	698.4	0	0	0	0	2,820,000	3,055,000	2,921	0	0	0	0	0	0	0	0
2003	12,499,898	1,500	1,050	0.10	13,227	2.0	26,455	0	0	7	2,645	802.7	0	0	0	0	2,820,000	3,055,000	2,940	0	0	0	0	0	0	0	0
2004	13,077,972	1,500	1,050	0.10	13,839	2.0	27,678	0	0	8	2,768	922.6	0	0	0	0	2,820,000	3,055,000	2,958	0	0	0	0	0	0	0	0
2005	13,682,779	1,500	1,050	0.10	14,479	2.0	28,958	0	0	9	2,896	1,060.4	0	0	0	0	2,820,000	3,055,000	2,977	0	0	0	0	0	0	0	0
2006	14,315,556	1,500	1,050	0.10	15,149	2.0	30,297	0	0	10	3,030	1,218.8	0	0	0	0	2,820,000	3,055,000	2,996	0	0	0	0	0	0	0	0
2007	14,977,597	1,500	1,050	0.10	15,849	2.0	31,699	0	0	11	3,170	1,400.8	0	0	0	0	2,820,000	3,055,000	3,014	0	0	0	0	0	0	0	0
2008	15,670,255	1,500	1,050	0.10	16,582	2.0	33,165	0	0	12	3,316	1,610.1	0	0	0	0	2,820,000	3,055,000	3,034	0	0	0	0	0	0	0	0
2009	16,394,946	1,500	1,050	0.10	17,349	2.0	34,698	0	0	13	3,470	1,850.5	0	0	0	0	2,820,000	3,055,000	3,053	0	0	0	0	0	0	0	0
2010	17,153,151	1,500	1,050	0.10	18,151	2.0	36,303	50	18,151	14	3,630	2,126.9	10	213	1,063	1,116,646	2,820,000	3,055,000	3,072	58,548	51,187	55,453	106,640	3,430	2,999	3,249	6,248
2011	17,451,444	1,500	1,050	0.10	18,467	2.0	36,934	50	18,467	15	3,693	2,311.6	10	231	1,156	1,213,612	2,820,000	3,055,000	3,118	60,450	52,077	56,417	108,494	3,783	3,259	3,531	6,790
2012	17,754,925	1,500	1,050	0.10	18,788	2.1	40,142	50	20,071	16	3,758	2,512.4	10	251	1,256.19	1,318,998	2,820,000	3,055,000	3,164	66,675	56,600	61,316	117,916	4,173	3,542	3,838	7,380
2013	18,063,683	1,500	1,050	0.10	19,115	2.3	43,627	50	21,814	17	3,823	2,730.5	10	273	1,365.27	1,433,535	2,820,000	3,055,000	3,211	73,540	61,514	66,641	128,155	4,603	3,850	4,171	8,021
2014	18,377,810	1,500	1,050	0.10	19,447	2.4	47,416	50	23,708	18	3,889	2,967.7	10	297	1,483.83	1,558,018	2,820,000	3,055,000	3,258	81,112	66,856	72,427	139,284	5,077	4,184	4,533	8,717
2015	18,697,400	1,500	1,050	0.10	19,786	2.6	51,533	50	25,767	20	3,957	3,225.4	10	323	1,612.68	1,693,311	2,820,000	3,055,000	3,307	89,464	72,662	78,717	151,379	5,599	4,548	4,927	9,474
2016	19,022,547	1,500	1,050	0.10	20,130	2.8	56,008	50	28,004	21	4,026	3,505.4	10	351	1,752.72	1,840,352	2,820,000	3,055,000	3,356	98,675	78,971	85,552	164,524	6,176	4,943	5,355	10,297
2017	19,353,349	1,500	1,050	0.10	20,480	3.0	60,872	50	30,436	22	4,096	3,809.8	10	381	1,904.92	2,000,162	2,820,000	3,055,000	3,406	108,835	85,829	92,981	178,810	6,812	5,372	5,820	11,191
2018	19,689,904	1,500	1,050	0.10	20,836	3.2	66,157	50	33,079	24	4,167	4,140.7	10	414	2,070.33	2,173,849	2,820,000	3,055,000	3,456	120,041	93,282	101,056	194,338	7,513	5,838	6,325	12,163
2019	20,032,311	1,500	1,050	0.10	21,198	3.4	71,902	50	35,951	25	4,240	4,500.2	10	450	2,250.11	2,362,618	2,820,000	3,055,000	3,507	132,401	101,382	109,831	211,213	8,287	6,345	6,874	13,219
2020	20,380,672	1,500	1,050	0.10	21,567	3.6	78,146	50	39,073	27	4,313	4,891.0	10	489	2,445.50	2,567,780	2,820,000	3,055,000	3,559	146,034	110,186	119,368	229,554	9,140	6,896	7,471	14,367
2021	20,735,092	1,500	1,050	0.10	21,942	3.9	84,932	50	42,466	29	4,388	5,315.7	10	532	2,657.86	2,790,757	2,820,000	3,055,000	3,612	161,070	119,754	129,734	249,488	10,081	7,495	8,120	15,615
2022	21,095,675	1,500	1,050	0.10	22,323	4.1	92,307	50	46,154	31	4,465	5,777.3	10	578	2,888.66	3,033,096	2,820,000	3,055,000	3,666	177,655	130,153	140,999	271,153	11,119	8,146	8,825	16,971
2023	21,462,528	1,500	1,050	0.10	22,712	4.4	100,323	50	50,161	33	4,542	6,279.0	10	628	3,139.50	3,296,480	2,820,000	3,055,000	3,720	195,947	141,455	153,243	294,699	12,264	8,853	9,591	18,445
2024	21,835,762	1,500	1,050	0.10	23,107	4.7	109,035	50	54,517	35	4,621	6,824.3	10	682	3,412.13	3,582,734	2,820,000	3,055,000	3,776	216,123	153,739	166,550	320,289	13,527	9,622	10,424	20,046
2025	22,215,485	1,500	1,050	0.10	23,508	5.0	118,503	50	59,251	38	4,702	7,416.9	10	742	3,708.43	3,893,847	2,820,000	3,055,000	3,832	238,376	167,089	181,013	348,102	14,919	10,458	11,329	21,787
2026	22,601,812	1,500	1,050	0.10	23,917	5.4	128,793	50	64,397	40	4,783	8,060.9	10	806	4,030.45	4,231,975	2,820,000	3,055,000	3,888	262,920	181,598	196,732	378,330	16,456	11,366	12,313	23,679
2027	22,994,857	1,500	1,050	0.10	24,333	5.8	139,977	50	69,989	43	4,867	8,760.9	10	876	4,380.44	4,599,465	2,820,000	3,055,000	3,946	289,991	197,368	213,815	411,183	18,150	12,353	13,382	25,735
2028	23,394,738	1,500	1,050	0.10	24,756	6.1	152,132	50	76,066	46	4,951	9,521.6	10	952	4,760.82	4,998,866	2,820,000	3,055,000	4,005	319,850	214,506	232,382	446,888	20,019	13,426	14,544	27,970
2029	23,801,572	1,500	1,050	0.10	25,187	6.6	165,343	50	82,671	49	5,037	10,348.5	10	1,035	5,174.24	5,432,950	2,820,000	3,055,000	4,064	352,783	233,133	252,561	485,695	22,080	14,591	15,807	30,399
2030	24,215,481	1,500	1,050	0.10	25,625	7.0	179,701	50	89,850	53	5,125	11,247.1	10	1,125	5,623.55	5,904,728	2,820,000	3,055,000	4,124	389,107	253,378	274,493	527,871	24,353	15,858	17,180	33,038
2031	24,636,588	1,500	1,050	0.10	26,070	7.5	195,305	50	97,653	56	5,214	12,223.8	10	1,222	6,111.88	6,417,474	2,820,000	3,055,000	4,186	429,172	275,380	298,329	573,709	26,861	17,236	18,672	35,907
2032	25,065,018	1,500	1,050	0.10	26,524	8.0	212,265	50	106,132	60	5,305	13,285.2	10	1,329	6,642.61	6,974,746	2,820,000	3,055,000	4,248	473,361	299,293	324,235	623,528	29,627	18,732	20,293	39,025
2033	25,500,898	1,500	1,050	0.10	24,287	8.5	207,627	50	103,814	64	4,857	12,995.0	10	1,299	6,497.49	6,822,367	2,820,000	3,055,000	4,311	469,891	292,755	317,151	609,906	29,410	18,323	19,850	38,173

Table 10.3.15 Disbursement Schedule for Barge Terminal: Economic Cost : First Priority Project in Short Term Development

Traffic by Modal Split	unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Cargo to be carried by Barges	1000t	10,914.5	11,419.3	11,947.4	12,499.9	13,078.0	13,682.8	14,315.6	14,977.6	15,670.3	16,394.9	17,153.2	17,451.4	17,754.9	18,063.7	18,377.8	18,697.4	19,022.5	19,353.3	19,689.9	20,032.3	20,380.7	20,735.1	21,095.7	21,462.5	21,835.8	22,215.5	22,601.8	22,994.9	23,394.7	23,801.6	24,215.5	24,636.6	25,065.0
Rate of Additional Capacity by Project to Total Capacity: 10mil.ton / (10mil.ton + 10mil.ton) = 0.5		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Throughput handled by New Terminal Facilites		0	0	0	0	0	0	0	0	**7,835**	**8,197**	**8,577**	**8,726**	**8,877**	**9,032**	**9,189**	**9,349**	**9,511**	**9,677**	**9,845**	**10,016**	**10,190**	**10,368**	**10,548**	**10,731**	**10,918**	**11,108**	**11,301**	**11,497**	**11,697**	**11,901**	**12,108**	**12,318**	**12,533**
Capital Cost ($1,000,000)																																		
Civil Works (50%, 50%)								**11.02**	**11.02**																									
Equipment (50%, 50%)								**-**	**-**																									
Physical Contingency (50%, 50%)	milUS$							**1.10**	**1.10**																									
Engineering Fee (50%, 25%,25%)	milUS$					**0.91**		**0.45**	**0.45**																									
Total	**milUS$**				**-**	**0.91**	**-**	**12.58**	**12.58**																									
Maintenance Cost																																		
Civil Works	milUS$								0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.1
Equipment	milUS$								-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total	**milUS$**				**-**	**-**	**-**	**-**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.1**
Replacement Cost																																		
Equipment	milUS$																							-										
Total	milUS$																							-										
Operation Cost																																		
Barge Operation ($ 0.005 / ton)	milUS$				0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Pusher Operation ($ 0.05x(1/6)/ ton)	milUS$				0.00	0.00	0.00	0.00	0.00	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Total	**milUS$**				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.11**	**0.11**	**0.11**	**0.12**	**0.12**	**0.12**	**0.12**	**0.12**	**0.13**	**0.13**	**0.13**	**0.13**	**0.14**	**0.14**	**0.14**	**0.14**	**0.14**	**0.15**	**0.15**	**0.15**	**0.16**	**0.16**	**0.16**	**0.16**
Grand Total	milUS$					**0.91**	**0.00**	**12.58**	**12.65**	**0.17**	**0.18**	**0.18**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.20**	**0.20**	**0.20**	**0.20**	**0.21**	**0.21**	**0.21**	**0.21**	**0.22**	**0.22**	**0.22**	**0.22**	**0.23**	**0.23**	**0.23**	**0.23**	**0.24**

Table 10.3.16 Cash Flow of Economic Cost and Benefit for Barge Terminal Plan (Traffic Demand Forecast : Case-1)

(Unit : 1,000 US$)

No.	Year	Cost						Benefit					Net Benefit
		Civil Works	Physical Contingency	Engineering Fee	O&M Cost	Repalacement Cost	Total	Dwelling Time Savings for Cargo	Dwelling Time Savings for Vessel	Time Savings for Forming Up of Convoy for Cargo	Time Savings for Forming Up of Convoy for Barge	Total	
-4	2004			909.2			**909.2**					**0.0**	**-909.2**
-3	2005						**0.0**					**0.0**	**0.0**
-2	2006	11,020.9	1,102.1	454.6			**12,577.6**					**0.0**	**-12,577.6**
-1	2007	11,020.9	1,102.1	454.6	72.7		**12,650.3**					**0.0**	**-12,650.3**
1	2008				174.8		**174.8**	2,314.2	4,215.0	135.6	128.4	**6,793.2**	**6,618.3**
2	2009				179.6		**179.6**	2,389.3	4,288.3	149.5	139.6	**6,966.8**	**6,787.2**
3	2010				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
4	2011				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
5	2012				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
6	2013				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
7	2014				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
8	2015				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
9	2016				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
10	2017				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
11	2018				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
12	2019				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
13	2020				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
14	2021				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
15	2022				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
16	2023				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
17	2024				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
18	2025				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
19	2026				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,612.7**	**7,428.2**
20	2027				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
21	2028				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
22	2029				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
23	2030				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
24	2031				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
25	2032				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
26	2033				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
27	2034				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
28	2035				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
29	2036				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
30	2037				184.5		**184.5**	2,635.4	4,660.7	164.9	151.7	**7,296.1**	**7,111.6**
Total		22,041.7	2,204.2	1,818.4	5,593.4	0.0	**31,657.8**	78,493.7	139,002.9			**223,432.4**	**191,774.7**

EIRR = 23.88%

(Discount Rate 15%)

B/C = 1.64

NPV = 10,847

Chapter 11 Financial Analysis of F/S Projects

11.1 Methodology of Financial Analysis

Figure 8-1-1 shows a flowchart of the financial analysis.

11.1.1 Viability of the Project

The viability of the project is evaluated by the Financial Internal Rate of Return (FIRR). The FIRR is a discount rate in which net present values of cash inflow and outflow during the project life are considered as being equal. It is obtained from the following formula:

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

where,
n : Project life
R_i : Cash inflow in the i-th year
C_i : Cash outflow in the i-th year
r: Discount rate

Here, the cash inflow and the cash outflow in this analysis consist of the following items.
Cash inflow : Increment of operating revenue by the project of the project
Cash outflow : (i) Initial and renewal investment costs for the project
(ii) Increment of operational, maintenance, repair, personal and administration costs of the project

Following revenue and costs are excluded from the calculation of FIRR.
Revenue : Fund management income
Cost : Depreciation, repayment of the principal and interest on loan

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

11.1.2 Financial Soundness of the Management Body

Financial soundness of the port management body is appraised with its projected financial statements (income statement, cash flow statement and balance sheet). The appraisal is made in terms of profitability, loan repayment capacity and operational efficiency, using the following ratios:

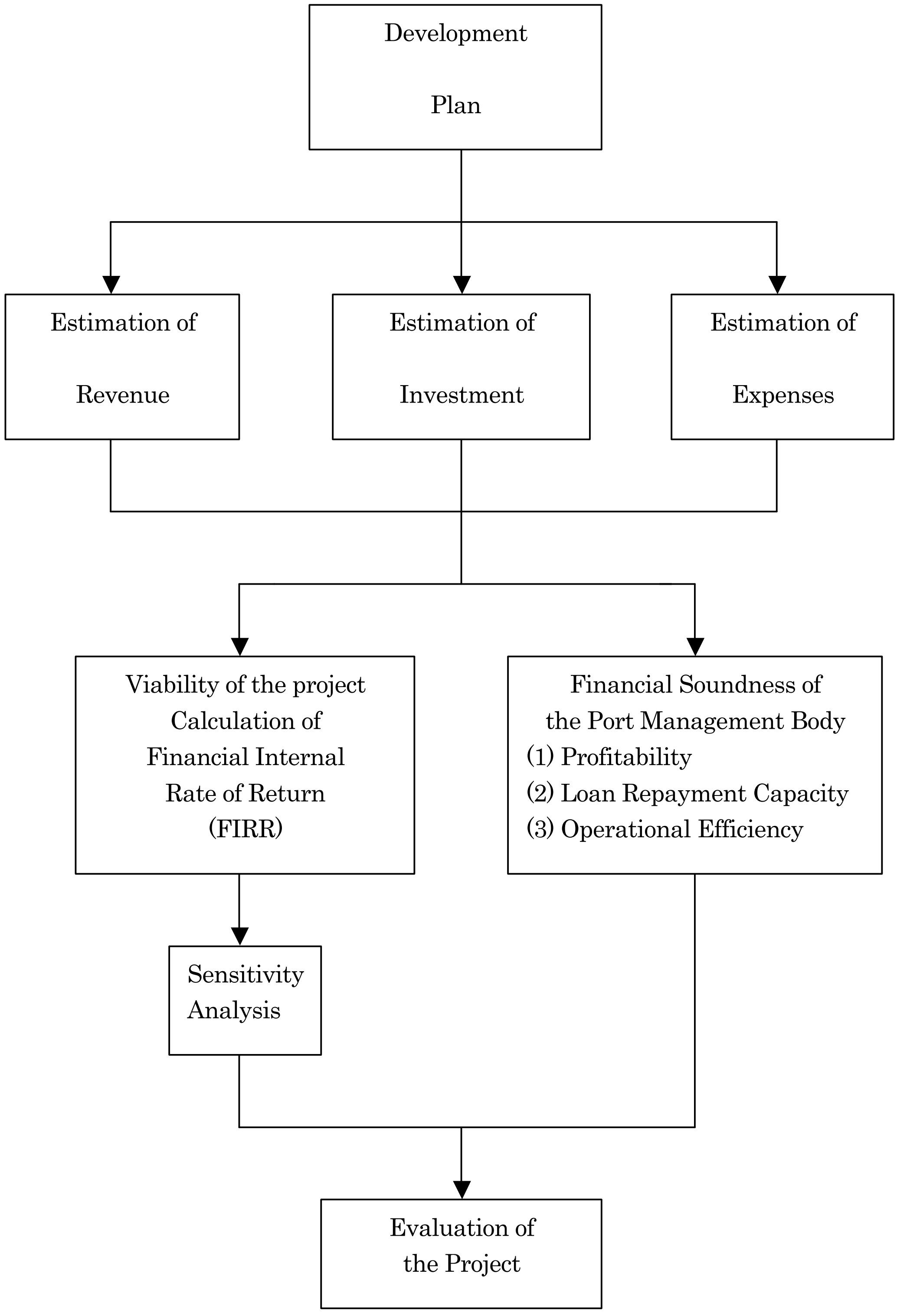

Figure 11-1-1 Flowchart of the Financial analysis.

(1) Profitability

$$\text{Rate of return on net fixed assets} = \frac{\text{Net operating income}}{\text{Total net fixed assets}} \times 100\%$$

Rate of return on net fixed assets is related to operating fixed assets. It is necessary to keep the rate above the average interest rate of the funds for the investment.

(2) Loan Repayment Capacity

$$\text{Debt Service Coverage Ratio} = \frac{\text{Net operating income before depreciation}}{\text{Repayment of principal and interest on long term loan}}$$

Debt service coverage ratio shows whether the operating income can cover the repayment of principal and interest on long-term loans. The ratio must be higher than 1.0.

(3) Operational Efficiency

Operational Ratio

$$\text{Operational Ratio (\%)} = \frac{\text{Operating expenses}}{\text{Operating revenue}} \times 100$$

Operating ratio shows the percentage of port revenue that is consumed by operating expenses. It must be less than 70-75%.

Working Ratio

$$\text{Working ratio (\%)} = \frac{\text{Operating expenses - Depreciation}}{\text{Operating revenue}} \times 100$$

Working ratio shows the efficiency of the routine operations in the port. It must be less than 50-60%.

11.2 Basis for Financial Analysis

11.2.1 Scope of the Financial Analysis

It is assumed that CMPA will construct the infrastructure of the new Grain terminal and Barge Terminal. Regarding the Grain Terminal, CMPA will lease it to private terminal operators. They will operate and manage the terminal and pay CMPA a lease fee. On the other hand, the Barge Terminal will be operated by CMPA.

Therefore, the investment by CMPA will be confined to the following:

(1) All the infrastructure construction work of the new Grain and Barge Terminal

(2) Dredging and reclamation for both terminals

(3) Operation of the Barge Terminal

The scope of this financial analysis is the same.

11.2.2 Project Lifetime

Project lifetime is of 34 years from the beginning of the project. It includes one year of detailed design and two years of the construction works of the above mentioned port facilities.

11.2.3 Base Year

All cost, expenditure and revenues are indicated in prices as of 2001, when the price survey was conducted.

11.2.4 Fund Raising

Fund raising is divided into two kinds: foreign and domestic funds. In this project, JBIC's yen loan is considered to be applied as foreign funds. Conditions of loans are as follows:

(1) Foreign Funds

Covered range: 75% of the initial investment costs of the project
Loan period: 25 years including a grace period of 7 years
Interest rate: 2.2% per year
Repayment: Fixed amount repayment of principal

(2) Other foreign funds

Covered range: 25% of the initial investment costs of the project
Loan period: 15 years including a grace period of 4 years
Interest rate: 5.77% per year
Repayment: Fixed amount repayment of principal

(2) Weighted Average Interest Rate

3.09% (2.2%×0.75+5.77%×0.25)

11.2.5 Revenue and expenditure

(1) Grain Terminal

1) Revenue

The public sector (CMPA) will develop the fundamental infrastructure of the new Grain Terminal (Quay, Terminal Site), a private sector operates and manages the facility. Therefore CMPA receives a lease charge for infrastructure (lands) from the private sector .

a. Land lease charge of the new Grain Terminal
b. Port access charge and Quay charge for entering vessel by CMPA Tariff

2) Expenditure

Investment

Initial investments cost for the infrastructure including a detailed design developed by the public sector are calculated. Since service lives of these infrastructure facilities are longer than the project life, reinvestment costs for these facilities are left out of consideration in the analysis.

Maintenance cost

Annual maintenance cost for infrastructure facilities is calculated as 0.3% of the initial construction cost.

Depreciation cost

Annual depreciation costs for the facilities are calculated by the straight line method, based on their service lifetimes. Residual value after all depreciation is estimated as being zero.

Tax

Cooperation Income tax is charged on the net income at a rate of 25%.

(2) Barge Terminal

1) Revenue

Port access charge for Entering vessel(barge and pusher) by CMPA Tariff

Basin charge by CMPA Tariff

2) Expenditure

Investment

Initial investment cost for the infrastructure (Barge Quay, Dolphins) developed by the public sector are calculated.

Maintenance cost

Annual maintenance cost for infrastructure facilities is calculated as 0.3% of the initial construction cost.

Depreciation cost

Annual depreciation costs for the facilities are calculated by the straight line method, based on their service lifetimes. Residual value after all depreciation is estimated as being zero.

Tax

Cooperation Income tax is charged on the net income at a rate of 25%.

Administration cost of CMPA

11.2.6 Sensitivity Analysis

Sensitivity Analysis is conducted to examine the impact of unexpected future changes. The Following three cases are envisioned:

Case 1 : The revenue decreases by 10%

Case 2 : The project cost increases by 10%

Case 3 : The revenue decrease by 10% and the project cost increases by 10%

Unexpected future changes could be as follows:

(1) Decrease of the revenue

- Decrease of the estimated cargo volume
- Decrease of the tariff level

(2) Increase of the project cost

- Increase of the facilities condition cost
- Sudden rise in building materials cost

11.3 Appraisal of the Project

11.3.1 Viability of the Project

The results of FIRR tentative calculation are summarized in Table 11.3.1. More details of the calculation for the Grain Terminal and the Barge Terminal are shown in Table 11.3.2 and Table 11.3.3, respectively.

Table 11. 3.1

	Original	Revenue 10 % down	Cost 10% up	Rev. 10% down Cos. 10% up	Weighted average. Interest rate
Grain Terminal	6.65	5.87	5.97	5.19	3.09
Barge Terminal	7.93	7.02	7.22	6.35	3.09

Since the FIRR exceeds the weighted averaged interest rate in all cases of both projects, these projects are deemed to be financially viable.

11.3.2 Financial Soundness of the Port Management Body

Projected financial statements and financial indicators for the management body (CMPA) are shown in Table 11.3.4.

In 2013-2017, the indicators of Cash Balance in this period are not satisfied, but the Cash - Flow (Cash Ending) has no problems due to appropriate accumulated earnings.

(1) Profitability

The rate of return on net fixed assets exceeds the weighted average interest rate of the funds from 2008.

(2) Loan Repayment Capacity

The debt service coverage ratio exceeds 1.0 except for 2013-2015.

(3) Operational Efficiency

The operating ratio keeps below 60% from 2008.

And working ratio keeps below 50% from 2008.

This means that the operation will be efficient.

As mentioned above, the financial condition of CMPA will be satisfactory regarding F/S project. But especially the operator of the new Grain Terminal should make continuous efforts to secure forecast cargo volume to improve cargo handling efficiency and reduce operating expenses.

11.4 A trial calculation on FIRR of Superstructure

We assume that a private company will construct the superstructure of the new grain terminal and operate and manage that facility.

Based on this assumption, a trial calculation of FIRR is carried out.

Revenues of the private company are to be generated from loading and unloading charges (US$6 / ton).

Investment in the superstructure and land lease fee, operation and maintenance costs comprise the company's expenditures.

The resulting FIRR is 13.9%. (shown in Table 11.3.5) If a private company can raise money at an interest rate less than this figure, this project is deemed to be financially feasible.

Table 11.3.2 Grain Terminal FIRR Calculation

(Unit: USD)

	Year	Revenue	Cost(2)			Difference	Net Present Value		
		(1)	Investment	Expenses	Total	(1)-(2)	Revenue	Cost	Difference
1	2,004	0	1,299,252		1,299,252	-1,299,252	0	1,299,252	-1,299,252
2	2,005	0	0		0	0	0	0	0
3	2,006	0	19,071,218		19,071,218	-19,071,218	0	16,768,552	-16,768,552
4	2,007	0	19,643,354		19,643,354	-19,643,354	0	16,195,388	-16,195,388
5	2,008	1,793,534		150,000	150,000	1,643,534	1,386,577	115,965	1,270,612
6	2,009	1,888,862		150,000	150,000	1,738,862	1,369,283	108,739	1,260,544
7	2,010	2,178,467		150,000	150,000	2,028,467	1,480,821	101,963	1,378,858
8	2,011	2,279,344		150,000	150,000	2,129,344	1,452,847	95,610	1,357,238
9	2,012	2,384,478		150,000	150,000	2,234,478	1,425,154	89,652	1,335,502
10	2,013	2,497,213		150,000	150,000	2,347,213	1,399,532	84,066	1,315,466
11	2,014	2,615,091		150,000	150,000	2,465,091	1,374,271	78,827	1,295,444
12	2,015	2,741,341		150,000	150,000	2,591,341	1,350,851	73,915	1,276,935
13	2,016	2,864,577		150,000	150,000	2,714,577	1,323,620	69,310	1,254,310
14	2,017	2,993,121		150,000	150,000	2,843,121	1,296,838	64,991	1,231,847
15	2,018	3,130,678		150,000	150,000	2,980,678	1,271,916	60,941	1,210,974
16	2,019	3,273,996		150,000	150,000	3,123,996	1,247,259	57,144	1,190,115
17	2,020	4,005,077		150,000	150,000	3,855,077	1,430,698	53,583	1,377,115
18	2,021	4,125,229		150,000	150,000	3,975,229	1,381,795	50,244	1,331,551
19	2,022	4,248,986		150,000	150,000	4,098,986	1,334,564	47,114	1,287,451
20	2,023	4,376,456		150,000	150,000	4,226,456	1,288,948	44,178	1,244,770
21	2,024	4,507,749		150,000	150,000	4,357,749	1,244,890	41,425	1,203,465
22	2,025	4,642,982		150,000	150,000	4,492,982	1,202,339	38,844	1,163,495
23	2,026	4,782,271		150,000	150,000	4,632,271	1,161,242	36,423	1,124,819
24	2,027	4,925,739		150,000	150,000	4,775,739	1,121,550	34,154	1,087,396
25	2,028	5,073,512		150,000	150,000	4,923,512	1,083,214	32,026	1,051,189
26	2,029	5,225,717		150,000	150,000	5,075,717	1,046,189	30,030	1,016,159
27	2,030	5,382,488		150,000	150,000	5,232,488	1,010,429	28,159	982,270
28	2,031	5,543,963		150,000	150,000	5,393,963	975,892	26,404	949,488
29	2,032	5,710,282		150,000	150,000	5,560,282	942,535	24,759	917,776
30	2,033	5,881,590		150,000	150,000	5,731,590	910,318	23,216	887,102
31	2,034	6,058,038		150,000	150,000	5,908,038	879,203	21,769	857,433
32	2,035	6,239,779		150,000	150,000	6,089,779	849,151	20,413	828,738
33	2,036	6,426,973		150,000	150,000	6,276,973	820,126	19,141	800,985
34	2,037	6,619,782		150,000	150,000	6,469,782	792,093	17,948	774,145
	Total	124,417,317	40,013,825	4,500,000	44,513,825	79,903,492	35,854,145	35,854,145	0

FIRR= 6.65%

Table 11.3.3 Barge Terminal FIRR Calculation

(Unit:USD)

	Year	Revenue (1)	Cost(2)			Difference (1)-(2)	Net Present Value		
			Investment	Expenses	Total		Revenue	Cost	Difference
1	2,004	0	1,223,854		1,223,854	-1,223,854	0	1,223,854	-1,223,854
2	2,005	0	0		0	0	0	0	0
3	2,006	0	17,991,934		17,991,934	-17,991,934	0	15,445,721	-15,445,721
4	2,007	0	18,531,692		18,531,692	-18,531,692	0	14,740,445	-14,740,445
5	2,008	2,322,120		480,000	480,000	1,842,120	1,711,376	353,754	1,357,621
6	2,009	2,526,360		500,000	500,000	2,026,360	1,725,127	341,425	1,383,702
7	2,010	2,748,785		520,000	520,000	2,228,785	1,739,129	328,999	1,410,130
8	2,011	2,876,060		530,000	530,000	2,346,060	1,685,987	310,693	1,375,293
9	2,012	3,009,146		530,000	530,000	2,479,146	1,634,424	287,871	1,346,553
10	2,013	3,148,615		540,000	540,000	2,608,615	1,584,550	271,757	1,312,794
11	2,014	3,294,210		550,000	550,000	2,744,210	1,536,042	256,457	1,279,585
12	2,015	3,446,493		560,000	560,000	2,886,493	1,488,999	241,938	1,247,060
13	2,016	3,606,378		570,000	570,000	3,036,378	1,443,622	228,169	1,215,452
14	2,017	3,773,941		570,000	570,000	3,203,941	1,399,724	211,408	1,188,315
15	2,018	3,949,169		580,000	580,000	3,369,169	1,357,120	199,315	1,157,804
16	2,019	4,132,605		590,000	590,000	3,542,605	1,315,835	187,858	1,127,977
17	2,020	4,324,272		600,000	600,000	3,724,272	1,275,721	177,008	1,098,713
18	2,021	4,528,806		610,000	610,000	3,918,806	1,237,917	166,739	1,071,178
19	2,022	4,743,052		620,000	620,000	4,123,052	1,201,243	157,024	1,044,220
20	2,023	4,967,402		630,000	630,000	4,337,402	1,165,648	147,836	1,017,813
21	2,024	5,202,017		640,000	640,000	4,562,017	1,131,033	139,150	991,883
22	2,025	5,448,396		650,000	650,000	4,798,396	1,097,583	130,943	966,640
23	2,026	5,705,601		650,000	650,000	5,055,601	1,064,965	121,324	943,641
24	2,027	5,975,252		660,000	660,000	5,315,252	1,033,368	114,141	919,227
25	2,028	6,257,922		670,000	670,000	5,587,922	1,002,754	107,359	895,395
26	2,029	6,553,362		680,000	680,000	5,873,362	972,957	100,957	871,999
27	2,030	6,862,990		700,000	700,000	6,162,990	944,078	96,293	847,785
28	2,031	7,187,037		710,000	710,000	6,477,037	916,030	90,494	825,536
29	2,032	7,526,572		720,000	720,000	6,806,572	888,837	85,027	803,810
30	2,033	7,881,793		730,000	730,000	7,151,793	862,412	79,875	782,537
31	2,034	8,254,433		740,000	740,000	7,514,433	836,840	75,022	761,818
32	2,035	8,644,229		750,000	750,000	7,894,229	811,982	70,450	741,532
33	2,036	9,051,931		760,000	760,000	8,291,931	787,820	66,145	721,674
34	2,037	9,479,463		770,000	770,000	8,709,463	764,424	62,093	702,331
	Total	157,428,413	37,747,480	18,810,000	56,557,480	100,870,933	36,617,545	36,617,545	0

FIRR= 7.93%

TABLE 11.3.4 Financial Statement for Feasibility Study

(Unit:USD)

Income Statement

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Operating Revenue	0	0	0	0	4,115,654	4,415,222	4,927,253	5,155,405	5,393,624	5,645,828	5,909,301	6,187,834	6,470,955	6,767,062	7,079,846	7,406,601	8,329,349	8,654,035
Operating Expenses	0	0	0	0	1,415,860	1,435,860	1,455,860	1,465,860	1,465,860	1,475,860	1,485,860	1,495,860	1,505,860	1,505,860	1,515,860	1,525,860	1,535,860	1,545,860
Personnel & Administration	0	0	0	0	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Maintenance	0	0	0	0	630,000	650,000	670,000	680,000	680,000	690,000	700,000	710,000	720,000	720,000	730,000	740,000	750,000	760,000
Depreciation	0	0	0	0	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360
Net Operating Income	0	0	0	0	2,699,794	2,979,362	3,471,393	3,689,545	3,927,764	4,169,968	4,423,441	4,691,974	4,965,095	5,261,202	5,563,986	5,880,741	6,793,489	7,108,175
Interest on Long-term Loans	0	55,508	55,508	870,898	2,404,768	2,404,768	2,404,768	2,404,768	2,327,768	2,250,767	2,141,150	2,014,361	1,887,571	1,760,781	1,633,991	1,507,201	1,380,411	1,253,621
Net Surplus	0	-55,508	-55,508	-870,898	295,025	574,594	1,066,624	1,284,776	1,599,997	1,919,201	2,282,291	2,677,614	3,077,524	3,500,421	3,929,995	4,373,540	5,413,078	5,854,554
Corporation Income Tax					73,756	143,649	266,656	321,194	399,999	479,800	570,573	669,403	769,381	875,105	982,499	1,093,385	1,353,269	1,463,638
Accumulated Earnings	0	-55,508	-111,017	-981,914	-760,645	-329,700	470,268	1,433,851	2,633,848	4,073,249	5,784,967	7,793,177	10,101,320	12,726,636	15,674,132	18,954,288	23,014,096	27,405,011

Cash Flow

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cash Beginning	0	0	-55,508	-111,017	-981,914	22,715	1,237,020	2,820,348	3,170,345	3,756,756	3,100,045	1,935,037	1,066,522	497,940	246,530	317,301	720,731	1,903,814
Cash Inflow	2,523,107	0	37,063,151	38,175,046	3,483,154	3,762,722	4,254,753	4,472,905	4,711,124	4,953,328	5,206,801	5,475,334	5,748,455	6,044,562	6,347,346	6,664,101	7,576,849	7,891,535
Net Operating Income	0	0	0	0	2,699,794	2,979,362	3,471,393	3,689,545	3,927,764	4,169,968	4,423,441	4,691,974	4,965,095	5,261,202	5,563,986	5,880,741	6,793,489	7,108,175
Depreciation	0	0	0	0	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360
Long-term Loans	2,523,107	0	37,063,151	38,175,046	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Outflow	2,523,107	55,508	37,118,660	39,045,944	2,404,768	2,404,768	2,404,768	3,801,714	3,724,714	5,130,239	5,801,236	5,674,446	5,547,656	5,420,866	5,294,076	5,167,287	5,040,497	4,913,707
Investment	2,523,107	0	37,063,151	38,175,046	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repayment of principal	0	0	0	0	0	0	0	1,396,946	1,396,946	2,879,472	3,660,085	3,660,085	3,660,085	3,660,085	3,660,085	3,660,085	3,660,085	3,660,085
Interest on Long-term Loans	0	55,508	55,508	870,898	2,404,768	2,404,768	2,404,768	2,404,768	2,327,768	2,250,767	2,141,150	2,014,361	1,887,571	1,760,781	1,633,991	1,507,201	1,380,411	1,253,621
Corporation Income Tax					73,756	143,649	266,656	321,194	399,999	479,800	570,573	669,403	769,381	875,105	982,499	1,093,385	1,353,269	1,463,638
Cash Balance	0	-55,508	-55,508	-870,898	1,004,629	1,214,306	1,583,328	349,996	586,412	-656,711	-1,165,007	-868,515	-568,582	-251,410	70,771	403,430	1,183,083	1,514,190
Cash Ending	0	-55,508	-111,017	-981,914	22,715	1,237,020	2,820,348	3,170,345	3,756,756	3,100,045	1,935,037	1,066,522	497,940	246,530	317,301	720,731	1,903,814	3,418,004

Balance Sheet

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Current Assets	0	0	0	0	22,715	1,237,020	2,820,348	3,170,345	3,756,756	3,100,045	1,935,037	1,066,522	497,940	246,530	317,301	720,731	1,903,814	3,418,004
Cash & Deposit	0	0	0	0	22,715	1,237,020	2,820,348	3,170,345	3,756,756	3,100,045	1,935,037	1,066,522	497,940	246,530	317,301	720,731	1,903,814	3,418,004
Fixed Assets	2,523,107	2,523,107	39,586,258	77,761,304	76,977,944	76,194,584	75,411,224	74,627,864	73,844,504	73,061,144	72,277,784	71,494,424	70,711,064	69,927,704	69,144,344	68,360,984	67,577,624	66,794,264
Total Assets	2,523,107	2,523,107	39,586,258	77,761,304	77,000,659	77,431,604	78,231,572	77,798,209	77,601,260	76,161,189	74,212,821	72,560,946	71,209,004	70,174,234	69,461,646	69,081,715	69,481,438	70,212,268
Liabilities	2,523,107	2,578,615	39,697,275	78,743,218	77,761,304	77,761,304	77,761,304	76,364,358	74,967,412	72,087,940	68,427,855	64,767,769	61,107,684	57,447,598	53,787,513	50,127,428	46,467,342	42,807,257
Short-term Loans	0	55,508	111,017	981,914	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long-term Loans	2,523,107	2,523,107	39,586,258	77,761,304	77,761,304	77,761,304	77,761,304	76,364,358	74,967,412	72,087,940	68,427,855	64,767,769	61,107,684	57,447,598	53,787,513	50,127,428	46,467,342	42,807,257
Net Worth	0	-55,508	-111,017	-981,914	-760,645	-329,700	470,268	1,433,851	2,633,848	4,073,249	5,784,967	7,793,177	10,101,320	12,726,636	15,674,132	18,954,288	23,014,096	27,405,011
Total Liabilities & Net Worth	2,523,107	2,523,107	39,586,258	77,761,304	77,000,659	77,431,604	78,231,572	77,798,209	77,601,260	76,161,189	74,212,821	72,560,946	71,209,004	70,174,234	69,461,646	69,081,715	69,481,438	70,212,268

Financial Indicators

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Rate of Return Fixed Assets					3.5%	3.9%	4.6%	4.9%	5.3%	5.7%	6.1%	6.6%	7.0%	7.5%	8.0%	8.6%	10.1%	10.6%
Debt Service Coverage Ratio					1.45	1.56	1.77	1.18	1.26	0.97	0.90	0.96	1.04	1.12	1.20	1.29	1.50	1.61
Operating Ratio					34.4%	32.5%	29.5%	28.4%	27.2%	26.1%	25.1%	24.2%	23.3%	22.3%	21.4%	20.6%	18.4%	17.9%
Working Ratio					15.4%	14.8%	13.6%	13.2%	12.7%	12.3%	11.9%	11.5%	11.2%	10.7%	10.3%	10.0%	9.0%	8.8%

TABLE 11.3.4 Financial Statement for Feasibility Study

Income Statement

(Unit:USD)

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Operating Revenue	8,992,038	9,343,858	9,709,766	10,091,378	10,487,873	10,900,992	11,331,434	11,779,079	12,245,479	12,731,000	13,236,854	13,763,383	14,312,471	14,884,009	15,478,904	16,099,245
Operating Expenses	1,555,860	1,565,860	1,575,860	1,585,860	1,585,860	1,595,860	1,605,860	1,615,860	1,635,860	1,645,860	1,655,860	1,665,860	1,675,860	1,685,860	1,695,860	1,705,860
Personnel & Administration	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Maintenance	770,000	780,000	790,000	800,000	800,000	810,000	820,000	830,000	850,000	860,000	870,000	880,000	890,000	900,000	910,000	920,000
Depreciation	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360
Net Operating Income	7,436,178	7,777,998	8,133,906	8,505,518	8,902,013	9,305,132	9,725,574	10,163,219	10,609,619	11,085,140	11,580,994	12,097,523	12,636,611	13,198,149	13,783,044	14,393,385
Interest on Long-term Loans	1,126,832	1,339,470	1,099,537	859,605	619,672	567,663	515,653	463,644	411,635	359,625	307,616	255,606	203,597	151,588	99,578	49,789
Net Surplus	6,309,346	6,438,528	7,034,369	7,645,914	8,282,341	8,737,469	9,209,920	9,699,575	10,197,984	10,725,515	11,273,378	11,841,917	12,433,015	13,046,561	13,683,466	14,343,596
Corporation Income Tax	0	0	1,758,592	1,911,478	2,070,585	2,184,367	2,302,480	2,424,894	2,549,496	2,681,379	2,818,345	2,960,479	3,108,254	3,261,640	3,420,866	3,585,899
Accumulated Earnings	33,714,357	40,152,886	45,428,662	51,163,097	57,374,853	63,927,955	70,835,395	78,110,076	85,758,564	93,802,700	102,257,734	111,139,171	120,463,932	130,248,853	140,511,452	151,269,149

Cash Flow

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cash Beginning	3,418,004	6,850,625	10,412,428	12,811,479	15,669,189	20,300,240	25,272,639	30,599,375	36,293,352	42,361,137	48,824,569	55,698,899	62,999,633	70,743,691	78,947,908	87,730,728
Cash Inflow	8,219,538	8,561,358	8,917,266	9,288,878	9,685,373	10,088,492	10,508,934	10,946,579	11,392,979	11,868,500	12,364,354	12,880,883	13,419,971	13,981,509	14,566,404	15,176,745
Net Operating Income	7,436,178	7,777,998	8,133,906	8,505,518	8,902,013	9,305,132	9,725,574	10,163,219	10,609,619	11,085,140	11,580,994	12,097,523	12,636,611	13,198,149	13,783,044	14,393,385
Depreciation	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360	783,360
Long-term Loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Outflow	4,786,917	4,999,555	4,759,623	4,519,690	2,983,736	2,931,726	2,879,717	2,827,708	2,775,698	2,723,689	2,671,679	2,619,670	2,567,661	2,515,651	2,362,718	2,312,928
Investment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repayment of principal	3,660,085	3,660,085	3,660,085	3,660,085	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,364,064	2,263,139	2,263,139
Interest on Long-term Loans	1,126,832	1,339,470	1,099,537	859,605	619,672	567,663	515,653	463,644	411,635	359,625	307,616	255,606	203,597	151,588	99,578	49,789
Corporation Income Tax	0	0	1,758,592	1,911,478	2,070,585	2,184,367	2,302,480	2,424,894	2,549,496	2,681,379	2,818,345	2,960,479	3,108,254	3,261,640	3,420,866	3,585,899
Cash Balance	3,432,621	3,561,803	2,399,051	2,857,710	4,631,052	4,972,398	5,326,737	5,693,977	6,067,785	6,463,432	6,874,330	7,300,734	7,744,057	8,204,217	8,782,820	9,277,917
Cash Ending	6,850,625	10,412,428	12,811,479	15,669,189	20,300,240	25,272,639	30,599,375	36,293,352	42,361,137	48,824,569	55,698,899	62,999,633	70,743,691	78,947,908	87,730,728	97,008,645

Balance Sheet

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Current Assets	6,850,625	10,412,428	12,811,479	15,669,189	20,300,240	25,272,639	30,599,375	36,293,352	42,361,137	48,824,569	55,698,899	62,999,633	70,743,691	78,947,908	87,730,728	97,008,645
Cash & Deposit	6,850,625	10,412,428	12,811,479	15,669,189	20,300,240	25,272,639	30,599,375	36,293,352	42,361,137	48,824,569	55,698,899	62,999,633	70,743,691	78,947,908	87,730,728	97,008,645
Fixed Assets	66,010,904	65,227,544	64,444,184	63,660,824	62,877,464	62,094,104	61,310,744	60,527,384	59,744,024	58,960,664	58,177,304	57,393,944	56,610,584	55,827,224	55,043,864	54,260,504
Total Assets	72,861,529	75,639,972	77,255,663	79,330,013	83,177,705	87,366,743	91,910,119	96,820,736	102,105,161	107,785,233	113,876,203	120,393,577	127,354,275	134,775,132	142,774,592	151,269,149
Liabilities	39,147,171	35,487,086	31,827,001	28,166,915	25,802,852	23,438,788	21,074,724	18,710,661	16,346,597	13,982,533	11,618,470	9,254,406	6,890,342	4,526,279	2,263,139	0
Short-term Loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long-term Loans	39,147,171	35,487,086	31,827,001	28,166,915	25,802,852	23,438,788	21,074,724	18,710,661	16,346,597	13,982,533	11,618,470	9,254,406	6,890,342	4,526,279	2,263,139	0
Net Worth	33,714,357	40,152,886	45,428,662	51,163,097	57,374,853	63,927,955	70,835,395	78,110,076	85,758,564	93,802,700	102,257,734	111,139,171	120,463,932	130,248,853	140,511,452	151,269,149
Total Liabilities & Net Worth	72,861,529	75,639,972	77,255,663	79,330,013	83,177,705	87,366,743	91,910,119	96,820,736	102,105,161	107,785,233	113,876,203	120,393,577	127,354,275	134,775,132	142,774,592	151,269,149

Financial Indicators

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Rate of Return Fixed Assets	11.3%	11.9%	12.6%	13.4%	14.2%	15.0%	15.9%	16.8%	17.8%	18.8%	19.9%	21.1%	22.3%	23.6%	25.0%	26.5%
Debt Service Coverage Ratio	1.72	1.71	1.87	2.06	3.25	3.44	3.65	3.87	4.10	4.36	4.63	4.92	5.23	5.56	6.17	6.56
Operating Ratio	17.3%	16.8%	16.2%	15.7%	15.1%	14.6%	14.2%	13.7%	13.4%	12.9%	12.5%	12.1%	11.7%	11.3%	11.0%	10.6%
Working Ratio	8.6%	8.4%	8.2%	8.0%	7.7%	7.5%	7.3%	7.1%	7.0%	6.8%	6.6%	6.4%	6.2%	6.1%	5.9%	5.7%

Table 11.3.5 Grain Terminal FIRR Calculation on Private Superstructure

(Unit: USD)

	Year	Revenue (1)	Cost (2) Investment	Expenses	Total	Difference (1)-(2)	Net Present Value Revenue	Cost	Difference
1	2,004	0	2,456,997		2,456,997	-2,456,997	0	2,456,997	-2,456,997
2	2,005	0	0		0	0	0	0	0
3	2,006	0	36,060,669		36,060,669	-36,060,669	0	27,802,037	-27,802,037
4	2,007	0	37,142,489		37,142,489	-37,142,489	0	25,144,052	-25,144,052
5	2,008	9,666,809		3,852,500	3,852,500	5,814,309	5,746,042	2,289,962	3,456,080
6	2,009	10,823,284		3,974,375	3,974,375	6,848,909	5,648,929	2,074,321	3,574,608
7	2,010	12,118,733		4,097,206	4,097,206	8,021,527	5,553,742	1,877,657	3,676,085
8	2,011	13,022,550		4,181,022	4,181,022	8,841,527	5,240,177	1,682,412	3,557,765
9	2,012	14,002,910		4,625,853	4,625,853	9,377,057	4,947,544	1,634,418	3,313,126
10	2,013	15,047,480		4,361,729	4,361,729	10,685,752	4,668,276	1,353,167	3,315,109
11	2,014	16,177,367		4,448,681	4,448,681	11,728,687	4,406,787	1,211,840	3,194,946
12	2,015	17,388,731		4,546,741	4,546,741	12,841,990	4,159,140	1,087,516	3,071,623
13	2,016	18,527,349		4,635,943	4,635,943	13,891,405	3,891,081	973,633	2,917,449
14	2,017	19,747,517		5,086,322	5,086,322	14,661,196	3,641,589	937,956	2,703,634
15	2,018	21,053,973		4,817,911	4,817,911	16,236,062	3,409,054	780,115	2,628,939
16	2,019	22,441,473		4,920,748	4,920,748	17,520,724	3,190,602	699,604	2,490,998
17	2,020	23,914,316		5,024,871	5,024,871	18,889,445	2,985,387	627,289	2,358,098
18	2,021	24,631,745		5,070,317	5,070,317	19,561,428	2,699,972	555,775	2,144,197
19	2,022	25,370,697		29,907,127	29,907,127	-4,536,429	2,441,844	2,878,460	-436,616
20	2,023	26,131,818		5,165,340	5,165,340	20,966,478	2,208,394	436,522	1,771,872
21	2,024	26,915,773		5,215,001	5,215,001	21,700,772	1,997,263	386,975	1,610,288
22	2,025	27,723,246		5,266,151	5,266,151	22,457,095	1,806,317	343,118	1,463,199
23	2,026	28,554,943		5,318,835	5,318,835	23,236,108	1,633,626	304,290	1,329,335
24	2,027	29,411,592		24,533,100	24,533,100	4,878,492	1,477,444	1,232,381	245,063
25	2,028	30,293,939		5,428,993	5,428,993	24,864,946	1,336,195	239,460	1,096,735
26	2,029	31,202,758		5,486,563	5,486,563	25,716,195	1,208,449	212,489	995,961
27	2,030	32,138,840		5,545,860	5,545,860	26,592,980	1,092,917	188,593	904,324
28	2,031	33,103,006		5,606,936	5,606,936	27,496,070	988,430	167,419	821,011
29	2,032	34,096,096		14,629,844	14,629,844	19,466,252	893,932	383,565	510,366
30	2,033	35,118,979		5,734,639	5,734,639	29,384,340	808,468	132,016	676,452
31	2,034	36,172,548		5,801,378	5,801,378	30,371,170	731,176	117,266	613,909
32	2,035	37,257,724		5,870,120	5,870,120	31,387,605	661,272	104,186	557,086
33	2,036	38,375,456		5,940,923	5,940,923	32,434,533	598,052	92,585	505,467
34	2,037	39,526,720		14,973,851	14,973,851	24,552,869	540,876	204,899	335,977
	Total	749,958,372	75,660,155	214,068,879	289,729,034	460,229,338	80,612,976	80,612,976	0

FIRR= 13.89%

Revenue: Transhipment in Bulk（US$6/ton）

Cost: Investment for Superstructure，Land Lease Fee，Maintenance，Operation

CHAPTER 12 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF F/S PROJECTS

12.1 Introduction

Law No.137/1995 on Environmental Protection and the subsequent MWFEP Order No. 125/1996 and their various appendices, comprehensively define and stipulate the requirement of environmental impact assessment (EIA) and the environmental authorisation process of Romania. The project schemes subject to mandatory EIA are delineated in Appendix II of the above Law No. 137/1995, which includes all transportation infrastructure projects such as roads, rails, ports and airports. Accordingly, EIA study for the feasibility study project components (first priority projects selected among the short-term development plan) of this master plan, until the year 2010, was performed.

EIA study was conducted by having licensed institutions of MWFEP undertake the works as per the Romanian regulations on the conduct of EIA studies. IPTANA as the prime contractor in association with INCDM (The National Institute for Marine Research and Development, Constantza) and Ovidius University conducted the EIA study. The EIA study team, formed as a consortium of the above 3 institutions, was composed of the following 7 experts: namely, Team Leader/Port and Environmental Expert, Marine Biologist, Environmental/Water Quality Specialist, Terrestrial Biologist, Geologist, Sociologist and Archaeologist. It is noted that IPTANA and INCDM are licensed institutions to undertake EIA studies as per the Romanian regulations.

12.2 Project Components of EIA Study

The project components of the feasibility study (F/S) on port development until the year 2010 as described in Chapter 7 are also the projects targeted for this EIA study. The projects are as follows:

1. Provision of a new modern grain terminal with capacity of 2 million tons of bulk grains per annum at Pier S3 in the South Port as the most significant project component of F/S. It is noted that the modern terminal will use closed chain conveyor system to mitigate fugitive emission. Also the existing grain terminal at Pier S1, operated by SILOTRANS, utilises such a closed system.

2. Improvement of existing barge terminal located in the river-maritime basin area.
   This project contains not only construction of new barge quay, dolphin and basin for providing but also rehabilitation of the existing related facilities. These works will provide a wide wet basin and berthing places of barges.
   Currently barges are one of the main transport modes collecting the grain harvest from the deep inland farming areas and those beyond the western border.

It is expected that this project t save the energy consumption by smooth barge maneuvering

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3. Improvement of port road access of Gate 5.

12.3 Contents of the EIA Report

The EIA Report was organised into two separate volumes: Main Report and Annex. The Main Report contains 6 Chapters listed below, while the Annex contains detailed data, analytical methods and curriculum vitae of Experts conducting the EIA study.

1. Introduction (Chapter 1)

    1) Subject and purpose of the study
    2) Settlements used in the EIA
    3) Organization for the implementation of the EIA and specialists

2. Policy, legal and administrative framework concerning protection of coastal, water, marine environment and port (Chapter 2)

    1) Environmental protection policy
    2) Legislative framework
    3) Institutional framework

3. Description of the baseline environment (Chapter 3)

    1) Climate and climatological elements
    2) Topography and geology of harbor area and its proximities
    3) Aquatic and terrestrial (fauna and flora) life environment and landscape including protected/specified areas in the harbor basin and around it
    4) Aspects regarding environmental condition at Constantza
    5) Basic description of current port operation and environmental issues and compliance with the relevant laws and regulations
    6) Basic socioeconomic condition of Constantza city

4. Description of proposed projects in the Feasibility Study (F/S) (Chapter 4)

    1) Issues of existing situation
    2) Scope and content of the mater plan
    3) Viewpoints for the preparation of the new master plan
    4) Projects that correspond to future traffic demand
    5) Projects to improve cargo handling efficiency

6) Projects to improve inland transport
7) Phased implementation plan
8) Feasibility study

5. Consideration regarding environmental impact (Chapter 5)

1) The impact on aquatic environment in and around the port and water quality protection
2) The impact on ambient environment in and around the port and environmental protection
3) Impacts on the soil, including port seabed
4) Impacts on flora and fauna
5) Impacts on the socio-economic conditions
6) Environmental impact assessment of the proposed projects

6. Recommendations for mitigating of environmental actions and monitoring plan (Chapter 6)

1) Mitigating actions at pre-construction stage
2) Mitigating actions in construction stage
3) Mitigating actions in operation stage
4) Environmental management and monitoring plan

7. Bibliography

12.4 Findings of the EIA study

1. Overall, the implementation of the project facilities will lead to long-term environmental and social benefits. Even the potential short-term adverse environmental effects inherent to the construction activities are identified as not significant and manageable. In this respect, the results of water quality simulation on the extent of increased turbidity, consequent to the reclamation works for the creation of Pier S3, is also found to be not that significant. It is noted that this increased water turbidity is only a temporary adverse effect of reclamation works. The result of water quality simulation is given in Appendix IIIB.

2. It is noted that construction works for the development of the South Port, which is also the location of the most significant project of this F/S, the new grain terminal at Pier S3, has been on-going for a long time. Most recently the construction works for the development of the new container terminal financed by JBIC is about to commence in early in 2002.

3. Accordingly, it may be presumed that construction works in the South Port area is a long-term process that may continue even after the provision of the Pier S3 by this F/S. In this respect, the current road that is used to transport construction materials in the south port area passes adjacent to the sand dune reservation area (Borcea Reservation Area) in Agigia. The possibility of re-routing this road, so that it is not located adjacent to this reservation area, is recommended to be investigated by the concerned agencies of CPA and EPA of Constantza.

12.5 Conclusion and Recommendations

12.5.1 Conclusion

The port of Constantza is a large operational port, in fact the largest Black Sea Port, spanning over 18 km of coast line and a large number of operational berths. In this respect, the planned projects by this feasibility study (F/S) are of rather small scale in comparison to the total available operational terminals and facilities of the port. Based on this aspect alone, potential adverse environmental effects and impacts due to the provision of the new and improved facilities by this F/S projects are not that significant and are manageable.

12.5.2 Recommendations

1. There remain a variety of environmental issues concerning the present operational status of the port as delineated in section 7.2 of Chapter 7 (Part I). Most significant improvement in the overall environmental condition of the port can only be realised with measures undertaken to ameliorate these current environmental issues, which would basically be accomplished independently, irrespective of the implementation of the project components planned by this F/S. In this respect the prompt implementation of the planned waste management improvement projects is strongly recommended. Moreover, an action plan to improve dry-bulk handling in the port to mitigate fugitive emission is recommended to be initiated by CPA.

2. Currently, the port lacks adequate green area within its property. Still, there remain vast barren lands in the central area of the port from the area of Gate 6 to the south up to the Danube Canal (Gate 9). This area is also located behind the terminal areas that handle most of the dry-bulk cargo. Accordingly, as a means of ecological enhancement of this barren area and also to mitigate to the extent possible potential dispersion of dust during dry bulk handling to the city area, development of a linear forestation (linear green-belt) in this barren area is recommended. Such forestation would also help in protecting the city area from a potential snowstorm.

Chapter 13 Summary of the Feasibility Study Projects

The summary of the Feasibility Study Projects is presented in Table 13.1. In assessing the results, some issues should be paid a special attention to.

Table 13.1 Outline of the Feasibility Study Projects

	Grain Terminal	Barge Terminal
Project Location in the Port	South Port Pier S-3	River Maritime Basin & Central Island
Capacity of the Plant (Ton/Year)	2,000,000	17,000,000
Outline of the Facility	Main Quay Wall: 550 m Railway: 2,800 m Unloader: 400T/H x 2 Unit Ship Loader:800T/H x 2 Receiving and Delivery Line 5000T Silos: 20 Unit	Barge Preparation Quay: 1,100m Barge Stand-by Dolphin: 1,400m Barge Operation Quay: 700m Quay for Pushers: 450m
Project Cost (Total) (1000USD)	97,732	32,169
Project Cost (Infrastructure) (1000USD)	34,086	32,169
Completion of Construction	2007	2007
EIRR (%)	18.9	23.9
FIRR (%)	6.6	7.9

13.1 Grain Terminal Development Plan

(1) Business entity to invest in grain terminals

While evaluating the validity of the project as a whole, the feasibility study conducted on this project relies on a business style in which a single business entity (i.e. CMPA) invests in superstructures and infrastructures, and subsequently concedes them to traders or operators, which are private companies.

The usual investments made by private companies when operating grain terminals are those in superstructures. As for this case, CMPA will only invest in infrastructures and concede them to private companies that possess superstructures. This business style was also the basis of the feasibility study conducted by the World Bank during previous investigations (Grain Market and Export Project, Preparation Study for Maritime and River Infrastructure Component; 1998). Furthermore, in case the private companies invest in superstructures, the cost-bearing strength and investment criteria are significantly different, depending on whether the investors are traders or operators (stevedoring companies). In implementing this plan it is therefore necessary to clarify who will invest in superstructures and subsequently assess investments in infrastructures.

(2) Demand forecast

Within the present feasibility study, the results of the Master Plan study are reviewed and revised for the cereal traffic in 2010 and 2020. The forecast methodology adopted for the particular case of the transit cargoes is similar to the one used in the World Bank's investigation. As a result, forecast cargo volumes in this review are not significantly different from those in the World Bank Study. Present traffic forecast relies on the assumptions that 1) the Danube blockage will soon be removed and 2) the yield ratio per farm area unit is substantially increased by a) modernization of the agricultural industry, b) adoption of land reforms, mainly in terms of land ownership and farm size optimization and c) structural change of the regional agricultural economy so as to facilitate agro-services, especially financial and marketing services etc, in Romania and Eastern and Western European countries. In implementing the plan it is therefore necessary to examine the above-mentioned pre-requisites at date.

13.2 Barge Terminal Development Plan

The advantage of the Port of Constanta against its neighboring competing ports is that it can provide thrifty transportation services by water transport on the Danube to the landlocked Eastern and Central European countries in the hinterland by making the most of its huge facility range, capacities and big water depths.

Transit cargoes transported by barge are transshipped at the port of Constanta and exported or imported by oceangoing vessels. Both the transshipment to the oceangoing vessels with large draft and the use of the water transport on the Danube are services for which the potentials of the Port of Constanta can be fully made use of. In particular, when transit cargoes from hinterland are to be attracted, the river transport on the Danube will play an important role. It is therefore important to set the development vector of the Port of Constanta towards making full use of this significant advantage. In this respect, it is important to consider that the development of the barge terminal is a strategic ahead-time investment with a view at an increase of the barge traffic demand in the Port of Constanta in the future.

13.3 Other Short-term Development Plans

When considering the future of the Port of Constanta, mainly that of the North Port, preserving the present situation, with private operators sticking to each berth and struggling for small lots of cargo, is not an efficient approach. With an aim at modernizing the facilities, it is necessary to invest in their maintenance, to renew the cargo handling equipment, etc. In terms of funds recovery, it is necessary to aggregate same kind of cargoes and gather the facilities in one place to a maximum extent, this way increasing their utilization ratio. From this point of view, plans to consolidate the steel and timber terminals are proposed in the Long-term Master Plan. It is desirable that, regarding the future image of the North Port, the various bodies concerned should merge their intentions on the Study's proposal basis.

13.4 Administrative Issues regarding Authority in the Port of Constantza

Currently, a significant part of the waterfront in the South Port, both in terms of waterside and the respective land side behind the quay is, according to the existing laws, under the authority of the Free Zone Administration, therefore beyond CMPA's administrative authority. With the waterfront being a vital element for an efficient administration and development of the port, some difficulties might arise in the future, related to the berth allocation and construction of port facilities (such as reclamation, road construction, etc). It is likely that future changes in the port planning activities would stir conflicts between the port management body and the would-be concessionaire. Taking into account that administering the waterfront area is indispensable for the port management body, it is recommendable that CMPA should be provided with the necessary authority over a sufficient land side area behind the quay. This would imply a certain shift of authority from the Free Zone Administration to CMPA regarding this area, based on a change of the existing law on the Free Zone in the port.