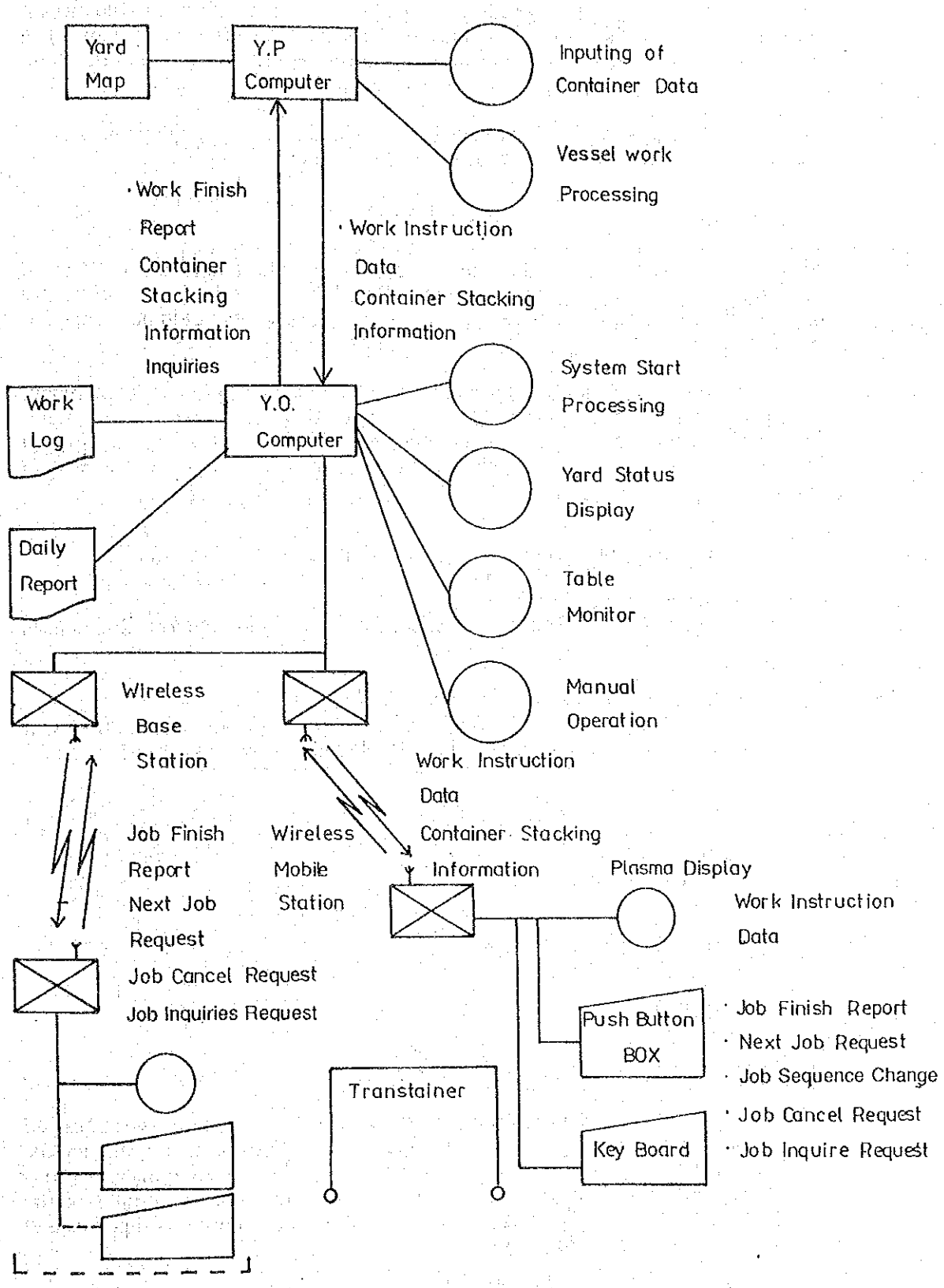

Fig. 6.4.3 Outline of the container Terminal Operation System and Information Flow

The Yard Operation System interchanges the container stacking information, etc. with the Yard Plan System.

The Yard Operation System transmits the work instruction data etc. to the mobile station installed in the transtainer through the Data Transmission System. The instruction is displayed in the transtainer. From the transtainer, the job finishing report is transmitted to the Yard Operation System.

The Yard Operation System displays the yard status on the display (usually in color) in the terminal building and prints out daily reports.

(3) Cost of System

At major container terminals of exclusive use for shipping companies in Western countries, the Container Terminal Operation Systems, which are originally developed by the shipping companies, are used. Thus, the development cost and details of those systems are not usually published.

An estimation of the cost is shown below, which includes the cost of development and installation of the Yard Operation System with the Data Transmission System. This is calculated form the experience of a terminal which is transtainer type and has plural berths, therefore it is thought that this can serve as a model for BCT in Gdynia.

(a) Yard Operation System

- Development of Software and Installation
  About 2 ~ 3 million US$ (Most of this represents personnel expenses required for system engineers.)

- Hardware (In Case of Purchase)
  About 2 ~ 3 million US$ (Mainframe computer with about 30 MB of main memory with hard disks of 7 GB capacity was assumed)

(b) Data Transmission System

- Hardware (In Case of Purchase)
  About 0.5 million US$

3) Port Cargo Information Network System

(1) Outline of System

(a) Cargo Information Interchange System at Container Terminal

When the electric data interchange system, i.e. EDI system, is introduced between a container terminal and shipping companies and shipping agents, usually the shipping companies and the shipping agents need to install various equipment which enable them to connect with the main computer of the container terminal. The required equipment for the shipping companies and shipping agents are as follows:

* 2 telephone lines
* MODEM
* Communication Controller
* Micro computer (with about 30 MB hard disk)

The above applies to the case where shipping companies and shipping agents are using the same make of hardware as the container terminal. If it is different, software which can adapt the former's system to the latter's system is needed.

(b) Port Cargo Information Network System

This type of system has been developed in several countries; modifications are made according to documents to be interchanged, related entities, and system construction. Sufficient study is needed to determine the type of network system to be introduced in Polish ports. Thus, in this study, only an outline of the systems which are already in use in Western countries will be given.

As an example in Europe, Fig. 6.4.4 shows an outline of DAKOSY system in Hamburg. This is an example where a mainframe computer is introduced.

Fig. 6.4.5 shows an outline of SHIPNETS in Japan, which uses VAN (Value Added Network) system service of NTT Data Communications System Co.

(2) Outline of Input and Output Items

(a) Cargo Information Interchange System at Container Terminals

Through the cargo information interchange system between container terminals and shipping companies and shipping agents, the information shown below will be interchanged.

From Shipping Companies and Shipping Agents to Container Terminal

* Concerning Import Container:
  S/P (Stowage Plan), M/F (Manifest), etc.

* Concerning Export Container:
  Booking List, etc.

From Container Terminal to Shipping Companies and Shipping Agents

* General information of containers in the terminal (name of the ship, size, weight, origin port and destination port of the container),

* Loading and unloading information for the particular ship,

* Yard Plan, etc.

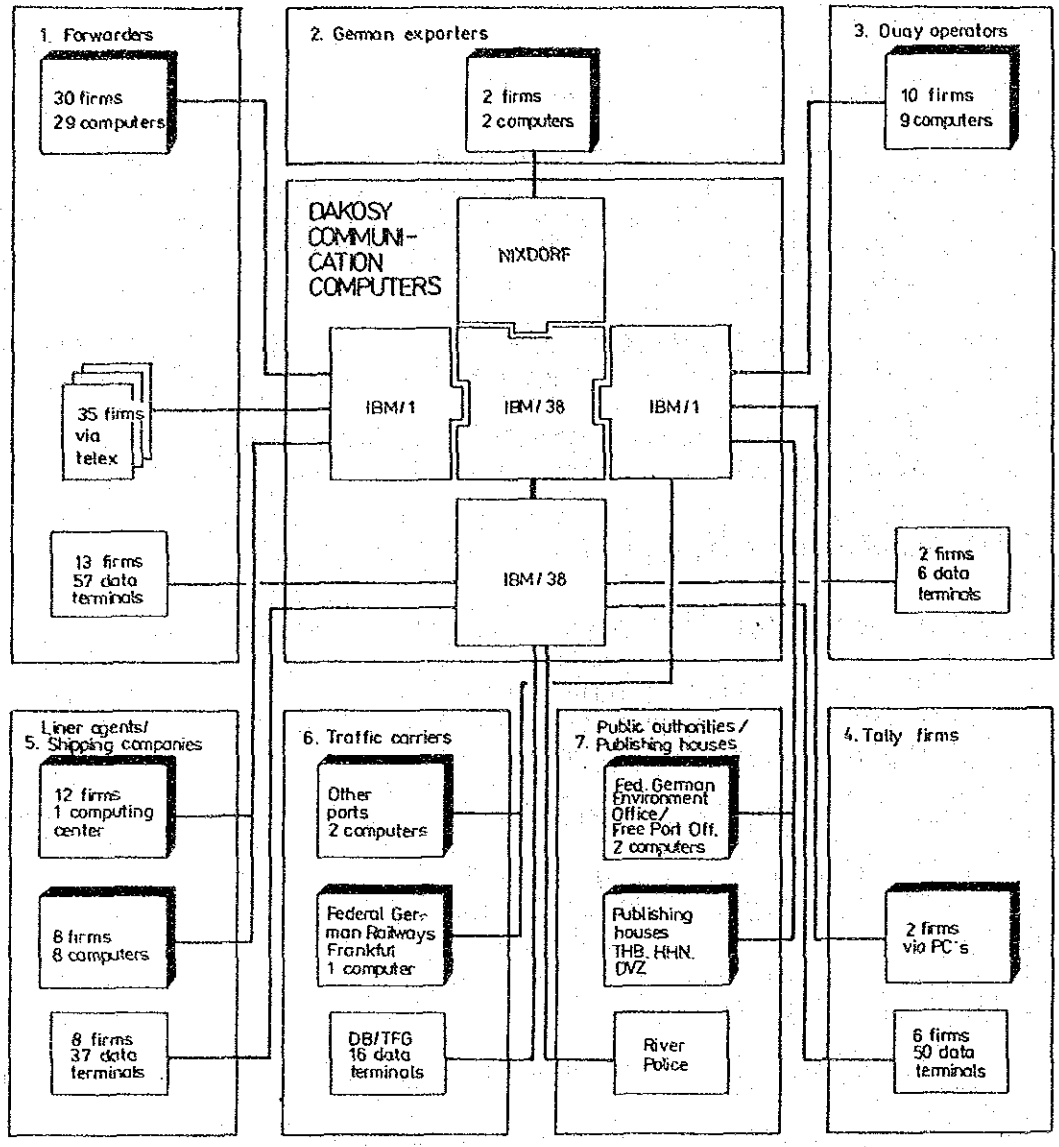

Fig. 6.4.4 Outline of the Port Cargo Information Network System (DAKOSY System; Germany)

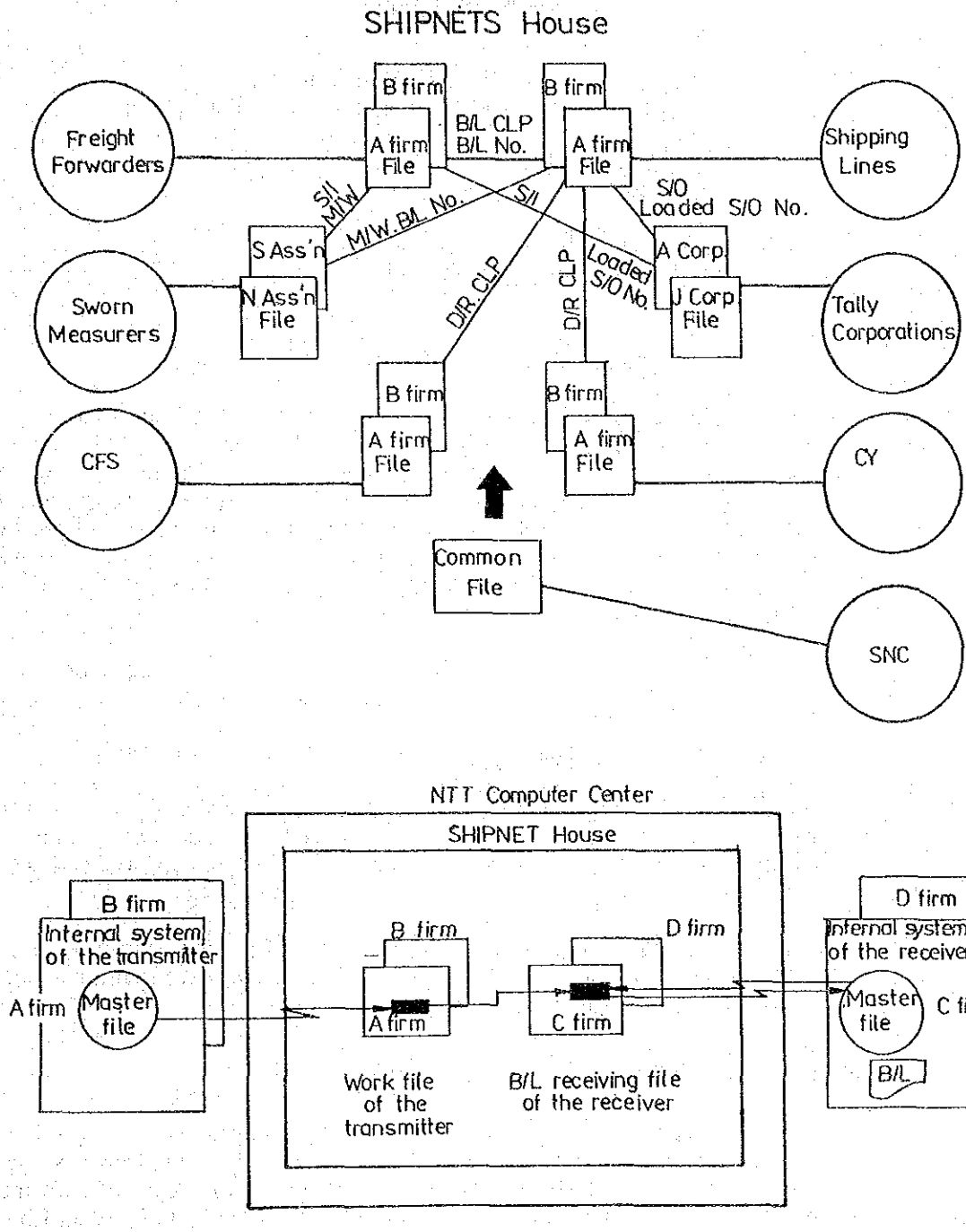

Fig. 6.4.5 Outline of the Port Cargo Information Network System (SHIPNETS System; Japan)

(b) Port Cargo Information Network System

Concerning this system, documents to be interchanged, related entities, types of the system construction are different by each country.

Taking the case of Japanese SHIPNETS, the following information is interchanged

* Shipping Companies and Shipping Agents:
  D/R (Dock Receipt), CLP (Container Load Plan), etc.

* Freight Fowarders:
  S/I (Shipping Instruction), etc.

* Sworn Measurers:
  M/W (Measurement and Weight)

* Tally Corporations
  Loaded S/O (Shipping Order) No., etc.

This network system is a mailbox system. Each participant of this system must first establish a user file (a mailbox) for his exclusive use at the computer center. To send data, the sender transmits the data to a receiving file. Thus each participant can access the data from their in-house system. For instance, tally corporations input tally information to their in-house system, then the information is automatically sent to the file of the freight fowarders in SHIPNETS house. The freight fowarders can then read the information through their in-house system.

(3) Cost of System

(a) Cargo Information Interchange System at Container Terminal

As mentioned above, the shipping companies and the shipping agents usually need to install various equipment which enable them to connect with the main computer of the container terminal when an EDI system is introduced between them.

If they have the same make of hardware, the cost of the required system will be about US$20 thousand. But, if it is different, a software which adapts the former's system to the latter's system is needed.

(b) Port Cargo Information Network System

It is difficult to show the cost for developing the system to be introduced in Polish ports. It is knows that the cost for developing the VAN system, whose cost is usually a mid-range equipment for this kind of information network system, can vary sharply according to circumstances. Careful study is needed to determine the cost of the network system to be introduced in Polish ports.

Thus, an example of the system being planned at Los Angeles, which can be used as a standard for the Polish ports will be given.

* Cargo Information Network System at Los Angeles port

This is a network system which is planned at Los Angeles, this system will cover Los Angeles Port, Long Beach Port, and Los Angeles Air Port. Through this system cargo/customs information, cargo status information in container terminals, etc. can be interchanged between related entities i.e. customs, shipping companies, freight forwarders, airlines, etc. The developing cost is estimated at 10 ~ 14 million US$.

The participant entities of this network usually need to install some software which enables them to connect with the central system, in addition to their in-house computer systems.

The cost of the software varies according to the quantities of the information to be interchanged. The cost for the companies which have large quantities of items to be interchanged, for example shipping companies, will be higher, while the cost for small companies will be lower. Thus, in case of Japanese SHIPNETS system, the cost for the software is thought to be about US$0.1 ~ 1 million.

4) Cargo Information Tracing System

(1) Outline of System

This system has been developed by major shipping companies mainly in North America according to the demand for on-time transport of container cargo in recent years.

Fig. 6.4.6 shows an outline of this type of system developed by a major shipping company, which covers not only North America but also the Far East.

In this system, large scale host computers are installed in North America and the Far East, an information network is constructed between major ports and inland points connecting to these host computers.

(2) Outline of Input and Output Items

Input data for this system are B/L Number, container number, name of shipper, etc. Through this system, container cargo transport information such as transport schedule, location of container cargoes, customs clearance information, etc. can be reported in real time.

(3) Cost of System

The cost to develop the system is about US$25 million in general.

This system is too large for the system in Europe, thus a smaller system will be sufficient. It is thought important that this kind of system should be examined in Poland with reference to this example.

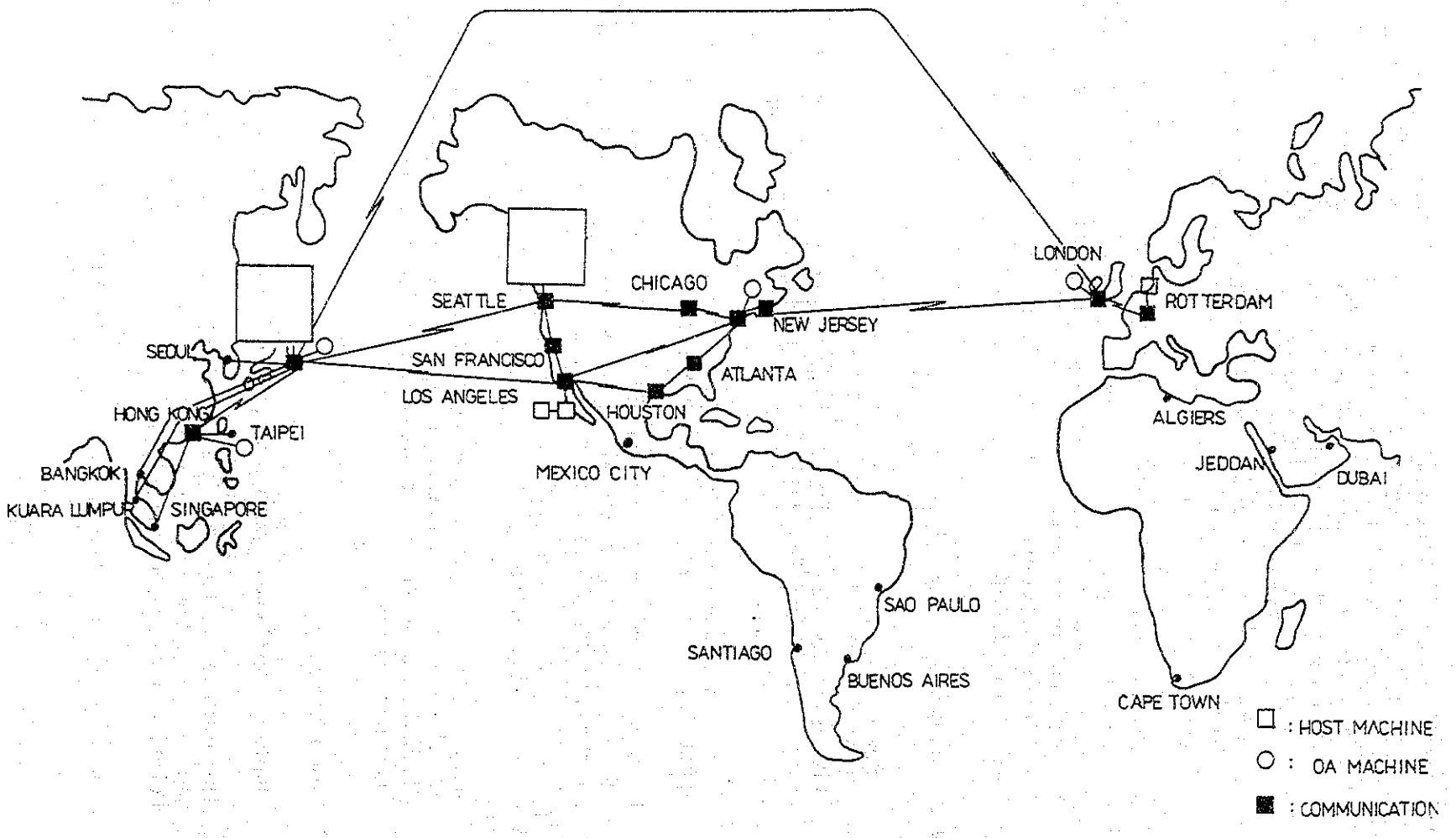

Fig. 6.4.6 Outline of the Cargo Information Tracing System

6.5 Conditions for Implementation

6.5.1 Schedule for Introducing Information System

In Poland, a detailed study and coordination concerning the introduction of the information systems needs to be conducted as quickly as possible. In this section, a rough schedule for introducing the information systems will be shown in reference to Basic Concept and Outline of Information System.

1) Short Term (until 1996)

(1) Port Management System

* Start study on introducing the Port Management System. Check the work items concerning port management, find out the items to be computerized

* Computerize the work items; determine which items can be handled using mini size computer, i.e. the personal computer.

(2) Container Terminal Operation System

* Add certain functions, for example, storage management, personnel management, billing to the present system at BCT, if necessary modify the existing hardware.

* Start study on introducing the Yard Operation System at BCT.

(3) Port Cargo Information Network System

* Start study on introducing the EDI system between BCT and shipping companies and shipping agents, commence interchanging the data between BCT and major companies, if possible. If EDI is impossible, try interchange data by micro floppy disk, etc.

* Start study on the port cargo information system among port related entities.

* Promote the introduction of an in-house system for making up the port cargo documents to port related entities.

* Appeal to customs office to introduce an automatic customs clearance system.

(4) Cargo Information Tracing System

* Start study on introducing cargo information tracing system.

2) Medium Term (1997 - 2000)

(1) Port Management System

* Start development of the Port Management System at major ports.

(2) Container Terminal Operation System

* Start development of the Yard Operation System at BCT, taking the increase of container cargo volume into consideration.

(3) Port Cargo Information Network System

* Try to increase the number of the participants in the EDI system between BCT and shipping companies and shipping agents.

* Establish the nucleus committee including port related entities, study in greater detail the port cargo information system.

* Appeal to custom office to introduce an automatic custom clearance system.

* Promote again the introduction of an in-house system for making up the port cargo documents to port related entities.

(4) Cargo Information Tracing System

* Appeal to inland carriers to provide an container cargo transport information in Poland.

* Develop the in-house system through which the information concerning container cargo transfer to the inland transport sector at Polish ports can be accessed.

* Make further studies on introducing a cargo information tracing system.

3) Long Term (2001 - 2005)

(1) Port Management System

* Start to operate the Port Management System in major ports.

(2) Container Terminal Operation System

* Start to operate the Yard Operation System at BCT at an appropriate time, taking the increase of container cargo volume into consideration.

(3) Port Cargo information Network System

* Try to increase further the number of participants in the EDI system between BCT and shipping companies and shipping agents.

* Study further the port cargo information system in the established nucleus committee including port related entities, decide the outline of the system, the items to be interchanged, etc.

* Taking the present condition of development of communication infrastructure in Poland into consideration, if possible, construct and start to use the cargo information network system among major related port entities like shipping companies, freight forwarders, etc., in limited areas.

* Appeal further to custom office to introduce an automated custom clearance system further more, if possible adapt it to the EDI system.

(4) Cargo Information Tracing System

* Construct the Cargo Information Tracing System through which container cargo location and transport condition in Poland can be accessed.

6.5.2 Important Issues

Above schedule is only a rough example. More detailed examination and coordination are needed to be made to introduce the information systems. Issues to be paid attention to in examination and coordination are listed below.

* To construct the systems, not only the cost for the hardware but also sufficient time for detailed analysis and examination by the system engineers as well as substantial cost for designing will be needed.

* In introducing a system for rationalizing the port management work, details of the work first needs to be analyzed. The work should be modified to adapt to computerization as much as possible.

In Poland, now that the old system is being reformed, certain items should be identified and reformed; for example modification in the port management work, unification of statistics, etc. using the introduction of the information system as a trigger.

* Cargo documents which cannot be adapted to computerization are obviously unnecessary should be modified with the reference to the examples in the Western countries; the introduction of the information system should act as a trigger. This is an opportune time when many regulations can be reformed; it should be recognized that this is a rare chance to effect significant changes.

* As mentioned above, at BCT, in-house engineers are employed; they not only have knowledge about software but also enough know-how concerning port management work. Thus their expertise should be utilized when software must be developed. Furthermore, the development cost can be minimized in this way.

* Not only the development cost, but also the maintenance cost of the systems is expensive. Usually larger scale systems are likely to be introduced, but careful examination is necessary so as not to introduce a needlessly large system.

* At Polish ports, many employees are thought to be unfamiliar with information equipment. The computerization of the work which can be done with min-size computer should be promoted to let them get used to the computer as well as examining introduction of large scale computers.

* To introduce the system, the consensus of the persons concerned will be necessary. For example, when constructing the Port Cargo Information System, a consensus among the related entities should be reached because a certain amount of expense is involved. When constructing the Port Management System, Container Terminal Operation System, consensus of labor unions will be necessary.

* When Poland was under the old, centrally planned economy system, the interest in information itself and cooperation through interchanging information seemed to be low. It should be now recognized that an information system is an indispensable service for the users of ports.

* When introducing the port Cargo Information System, certain expense will be necessary, to be borne by the participant entities. Thus a greater number of participants will reduce costs all around. Therefore, a nucleus which can juggle the various interests of the different entities is needed.

* One idea will be for the port authorities to perform the roll of the nucleus. The possibility of expanding the Cargo Information Interchange System of BCT to function as the Port Cargo Information Network System should be examined. This would seem to be the logical course to follow.

* The present situation of the communication infrastructure in Poland should be taken into consideration. The reliability of telephone lines must be improved for the sake of data interchange. In Holland and Japan, VAN service is used for the Port Cargo Information System.

* Once a system is put into operation, it should never be shut down. A perfect back-up system must be constructed.

* When introducing the Port Cargo Information System, examples concerning the protocol to be unified in Western countries should be examined to ensure compatibility with the European system.

* Japanese Government has dispatched specialists on port information system as advisers for the Container Terminal Operation System. This type of assistance should be made use of.

CHAPTER 7 PRE F/S ON GENERAL CARGO TERMINALS

CHAPTER 7 PRE F/S ON GENERAL CARGO TERMINALS

Summary

The aim of this study is to examine the feasibility to establish unit cargo terminals at the Port of Szczecin on a preliminary bases.

Based on several assumptions, the target volume of unitized general cargo is estimated as one (1) million tons or 100 thousands TEU, in which 500 thousands tons each for intra and inter Baltic trade.

The project is divided into two (2) stages. The first stage consists of a terminal by the redevelopment of the Czechoslovakia Quay and small modifications of a back-up yard which is located 1 km from the terminal. The first stage is planned to accommodate up to 400 thousand tons (40,000 TEU) of general cargo. The planned year of construction is 1994.

The second stage is the new development of Ostraw Grabowski. Together with the terminal at the Czechoslovakia Quay, the port can handle the target volume of general cargoes. The construction years of the second stage are 1998 and 1999.

Construction costs of stage 1 was estimated as 143,000 million zl. excluding contingency costs, while the cost of the stage 2 was 518,060 million zl. at current price levels.

The EIRR (Economic Internal Rate of Return) of this project, which shows an efficiency of the investment in economic terms, was calculated as 29.8 %. The FIRR (Financial Internal Rate of Return) of the project, which indicates the maximum interest rate payable, was 11.07 %.

The EIRR was considered sufficiently high. So, the project can be said to be viable to the national economy. The FIRR was sufficiently high as well. However, this project needs government subsidies in financial terms because of the current extremely high interest rate in Poland. Therefore, this project cannot said to be favorable in financial terms as long as this high interest rate continues.

As to financing of this project, a World Bank loan was assumed. For implementation, however, it is important to obtain loans with a lower interest rate to further improve the financial efficiency of the project.

Realization of the target volume depends largely on the competitiveness of the port. The specialized terminal for unit cargoes is regarded just as the starting point. The port authority, together with related entities such as forwarders and stevedoring companies, should be very keen to attract more and more cargoes through continuous efforts of improvement of their services, efficiency and port promotion.

The national economy of Poland is not stable at present and the estimation of project costs and benefit/revenue were not considered sufficiently accurate as the estimation was made on preliminary bases. Further study will prove the projects to be favorable.

7.1 Introduction

7.1.1 Background of the Study

It goes without saying that a modern port with an annual turnover of more than two million tons of general cargo, and with a potential of further increase of general cargoes, requires a Lo-Lo-/Ro-Ro terminal.

The Port of Szczecin, with an annual turnover of general cargoes of slightly more than two (2) million tons, has no specialized container terminal, nor Ro-Ro facility. The aim of the study is to determine whether a distribution/logistic center for the unitized cargoes is feasible at the Port of Szczecin and the proper timing of introduction, on a preliminary basis.

During the period of the centrally planned economy, trade was restricted almost exclusively to those countries which comprised the CMEA. Freedom to trade with Western countries was curbed and the trade structure of Poland was distorted. Within this controlled and rather limited scope of activities, the Port of Szczecin served as a gate for the Western part of Poland as well as Czechoslovakia and Hungary.

The port facilities are considerably well developed, although some of them are obsolete and cannot be adopted to modern transport demand. In particular, there are no special facilities for containers.

Since the liberalization of the economy, cargoes have started to look for the optimum way. The port of Szczecin has great potential in the future because she provides the shortest sea gate to the west part of Poland, east part of Germany and west part of Czechoslovakia. For bulky cargoes, water transport will offer the cheapest way (which means "best way" for bulky cargos) to the area.

For general cargoes, the meaning of "optimum" varies according to a given (client's) situation. Sometimes it means cost, time and sometimes both. Therefore, the competitiveness of the port should be carefully examined.

For cargoes to and from the Baltic Coast countries, the port would give the most economical and fastest service to the above mentioned hinterland. Currently, a few intra-Baltic liner services are already provided, and the volume of cargoes is expected to increase. Along the Sea Coast, there are several unexploited big cities, such as St. Petersburg with a population of nearly five (5) million and Stockholm with 700 thousand (1.4 million for the Greater Stockholm area). The port of Szczecin can give the best cargo transport service between her hinterland and these big cities (Berlin itself, has a population of four million).

7.1.2 Structure of the Problem and Study Procedure

Because port investment requires a huge amount of money, planning of the new port terminal should be based on a sound analysis of future cargo forecast, cost and benefit of the project.

Forecast of future cargo demand always includes some uncertainty. Under the current complete institutional transformation on economic as well as social aspects, the future forecast, by nature, includes rather considerable uncertainty and fluctuations.

For the Port of Szczecin, the analysis of the competitiveness is very crucial as mentioned before. The major European ports, such as Hamburg and Bremerhaven,

have already begun to strengthen their activities for attracting cargoes, in Central and Eastern Europe, including Poland. Thus, future cargo volume at the port of Szczecin depends largely on its competitiveness.

Construction of modern unit cargo terminals is one of the measures which will strengthen the competitiveness.

The absence of or insufficient Lo-Lo and Ro-Ro facilities at the port of Szczecin induces or will induce various problems such as,

(a) Inefficient cargo handling
(b) Insufficient adaptation to transport demand of the hinterland
(c) Inability to react to transport revolution
(d) Possible loss of potential cargoes

And these problems will bring heavy losses to Poland's national economy. So, without the modern unit cargo terminal, the port will undoubtedly lose competitiveness. Fig. 7.1.1 shows a procedure of this study.

7.1.3 Key Factors for the Pre Feasibility Study

Key factors which should be regarded as premises for the study are as follows:

1) Containerization is inevitable

In liner services between developed countries, the rate of containerization is very high (up to 80 to 90% in large Japanese ports). Even in developing countries, containerization has developed very rapidly. Poland, after liberating her economy, should adapt to this world wide trend.

In the scope of the Baltic Sea, Ro-Ro transport has developed very quickly. The Port of Szczecin should also catch up with this trend in order to be competitive.

2) Well balanced development of inland access

Railway systems are well developed in Poland. Every terminal in ports has good rail access. However, road access is very poor, practically non-existent in some places. When planning a container terminal, these factors should be taken into account.

Unitized general cargo including container is characterized by small volume and high frequency. For this type of cargo, trucks usually provide the best transport means because of their mobility.

Conversely, railway have advantages in cargo transport with rather long distances and large volumes.

The Port of Szczecin has historically, played a role of transit port for land locked countries. In the future, this will be very likely to continue. Based on this, the port would need both long distance transport modes and short distance transport modes.

Therefore, the port should provide good access to the above for both transport modes.

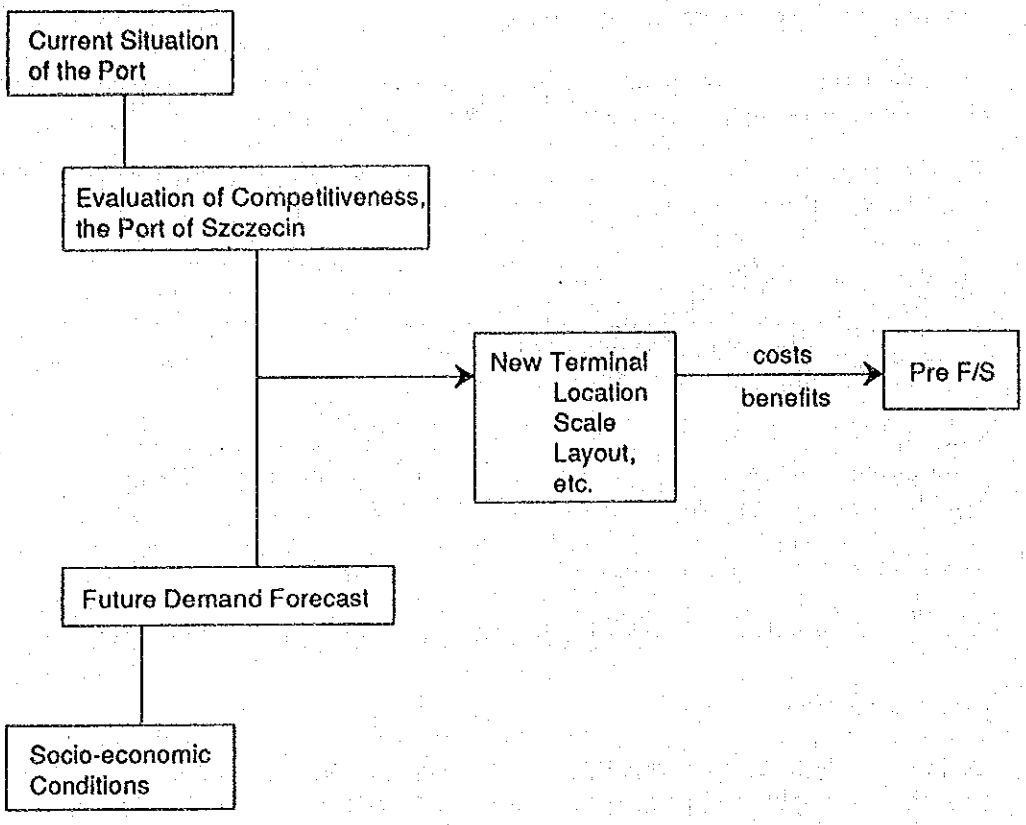

Fig. 7.1.1 Outline of the Study Procedure

3) Roles of the port of Szczecin

As described in section 7.1.1, the roles of the port of Szczecin should be considered from two (2) view points.

First, its role should be considered in the context of the intra-Baltic trade. The port would play a very important role for her hinterland.

Second, it has a role to play in the context of the inter-Baltic trade. In this context, the role of the port is rather limited. The depth limitation would curb calls of large ocean liners. Therefore, the port should be regarded as a feeder port.

7.2 Current Situation of General Cargo Handling

7.2.1 Characteristics of the Port of Szczecin in terms of General Cargo

While the economy has recorded about a 20 % decrease in GDP in 1991 compared with 1989, the volume of general cargo showed a slight increase in 1991. The volume of general cargo has maintained a steady level of around a little over three million tons per annum in the past two (2) years. The other major Polish ports also share this trend (Tables 7.2.1 and 7.2.2).

The transit general cargo volume at the Port of Szczecin also shows an increasing trend in the past three (3) years, being at a level of 1.4 million tons in 1991, while the overall transit cargo volume at Polish ports dropped sharply. The trend is quite different from other major ports at which transit general cargo volume has dropped sharply since the liberalization of the economy has taken place (Tables 7.2.3 through 7.2.5).

Meanwhile, the volume of container cargo at the Port of Szczecin had been stagnant until 1990 at a level of just over hundred thousand tons. In 1991, the decrease of container cargo was remarkable compared with the rather stable general cargo volume at the Port (Tables 7.2.6 and 7.2.7).

The decline in the volume of container cargo reflects an inherent weakness of the port which has no terminal specially designed and equipped for containers. The longer handling time, less security for the cargo and so on, due to the lack of the container handling facilities, might invite shippers' hesitation.

Table 7.2.1 Economic Data for the Years 1989, 1990, 1991

year	1989	1990	1991
GDP (mlln US$)	66,755	58,744	53,400
Population ('000)	38,038	38,190	38,310
GDP/capita	1,755	1,538	1,394

Source: GUS

Table 7.2.2 Total Volume of General Cargo

(thousand tons)

year	Gdansk	Gdynia	Szczecin	Swinoujscie
1987	1,391	3,207	2,208	1,008
1988	1,345	3,322	2,097	1,096
1989	1,464	3,333	2,020	1,115
1990	1,409	3,347	2,171	1,275
1991	2,074	3,289	2,063	1,251

Source: Maritime Institute

Table 7.2.3 Volume of Transit Cargo

(general cargo in '000 tons)

year	Gdansk	Gdynia	Szczecin	Swinoujscie
1987	367	919	1,421	
1988	441	912	1,221	
1989	323	814	1,258	
1990	284	726	1,333	
1991	109	208	1,403	

Source: Maritime Institute

Table 7.2.4 Transit Countries in 1991

(all cargoes in '000 tons, total, import, export)

	Gdansk			Gdynia			Szcin-Swjcie		
Total	121	70	51	227	66	161	2,253	1,225	1,028
Czech slvak	51	18	35	104	17	87	880	314	566
Germany	-	-	-	-	-	-	722	503	219
Austria	26	17	9	-	-	-	217	162	55
Hungary	15	11	5	68	22	46	70	35	35
Bulgaria	-	-	-	1	1	-	20	12	8
Romania	-	-	-	3	3	-	17	7	10
USSR	-	-	-	1	1	-	3	1	2
Yugoslavia	-	-	-	-	-	-	3	1	2
Others	28	24	4	50	22	28	321	190	131

Source: Maritime Institute

Table 7.2.5 Transit Cargo Comparison at Szczecin

('000 tons)

	Total	Czekia	Germany	Austria	Hungary	USSR	Others
1989	3,365	2,058	260	472	249	1	325
1991	2,253	880	722	217	70	3	361

Source: Maritime Institute

Table 7.2.6 Containers

(TEU, '000 tons)

Year	Gdansk		Gdynia		Szcin Swjcie	
1985	1,050	16	59,875	719	12,401	96
1986	1,737	20	56,685	659	13,658	116
1987	2,901	21	71,688	819	16,365	133
1988	1,829	14	87,615	989	17,254	135
1989	3,382	30	108,280	1,009	15,950	128
1990	(3,333)	30	(114,111)	1,027	(17,750)	142
1991	(1,667)	15	(111,000)	999	(13,250)	106

Source: Maritime Institute
Note: Numbers in parentheses were converted to TEU from volume using the TEU-volume relation, 9 tons per TEU for the port of Gdansk, 11 for Gdynia and 8 for Szczecin. The share of empty containers was 30 % at the port of Gdynia in 1989.

Table 7.2.7 Rate of Containerization at Polish Ports

(%)

Year	Gdansk	Gdynia	Szcin Swjcie
1987	1.6	25.8	4.4
1988	1.0	29.8	4.6
1989	2.0	30.3	4.5
1990	2.1	30.7	4.1
1991	0.7	30.4	3.2

Source: Maritime Institute

7.2.2 Evaluation of Container Cargo at the Port

The volume of container cargoes handled at a port depends on the socio-economic conditions of her hinterland and the competitiveness of the port. The hinterland is a function of various factors such as, distance from the port, accessibility to/from the port, business traditions, the level of services at the port, and so on.

In this study, the analysis is based on the following very rough assumptions;

a. Hinterlands depend only on distances from the ports

b. Volume of container cargo relates to GNP per capita and population of the hinterland

1) Evaluation of container cargo in 1989

Using the assumption above, Fig. 7.2.1 is obtained. It is assumed that under the so-called planning economy, hinterland is restricted to the country where the port belongs. Table 7.2.8 gives the population and GNP for each country. From this Figure and the Table, theoretical volume of container cargo is obtained as Table 7.2.9. In the Table, the actual turnover is also listed.

The past data shows a relatively good relation between the number of containers and GNP per capita, for Poland and East Germany. The actual turnover of Poland seems to be a little below the Medium case (10%).

Table 7.2.8 Socio Economic Indices, 1989

	Population (million)		GNP/Capita
	Total	Hinterland	(US$)
Poland	38	12	1,790
E. Germany	17	13	(3,450)
Czechoslovakia	16	10	3,450
Hungary	11	4	2,590

Note: Data for total population and GNP per capita are based on the World Development Report 1991, IBRD. GNP per capita for former East Germany is assumed equal to Czechoslovakia. Hinterland population are obtained through very rough estimation, depending mainly on distribution of population density.

Table 7.2.9 Comparison, Potential and Actual, 1989

	Population	GNP/Capita	Potential (1,000 TEU)			Actual
	(million)	(US$)	Max	Med	Min	(1,000 TEU)
Poland	38	1,790	308	148	103	128
E. Germany	17	3,450	263	129	88	143

2) Container cargo at Polish ports in 1991 and its implications

After the economic transformation, although the process is still a transitional one, the market mechanism should start working. Let us examine what happened at the Polish port. There is no Origin/Destination information about containers. So, the following analysis was carried out based on very rough assumptions.

The basic socio-economic data for the year 1991 are given in Table 7.2.10. In the Table, the data are divided into each hinterland as shown in Fig. 7.2.2. Using these data together with Fig. 7.2.1, we get Table 7.2.11. The potential number of containers for the Polish ports is 118 thousand TEU, while actual turnover is 128 thousand TEU. Here, the actual turnover is slightly over the potential.

By using Table 7.2.3 and 7.2.4, the volumes of transit general cargo for each port can be obtained. After applying the rate of containerization at each port, we obtain volumes of transit container cargo. 90% of the transit cargo at the Port of Gdansk is general cargo, and 92% at Gdynia and 62% at Szczecin and Swinoujscie. The rates of containerization are 0.7% at the port of Gdansk, 30.4% at the port of Gdynia and 3.2 % at the port of Szczecin and Swinoujscie. Thus, the volume of transit container can be obtained at 108,000 tons.

Comparing this number with Table 7.2.11, the share of transit container cargo is very close to 10%. This coincides with the balance of the actual turnover of containers and the potential.

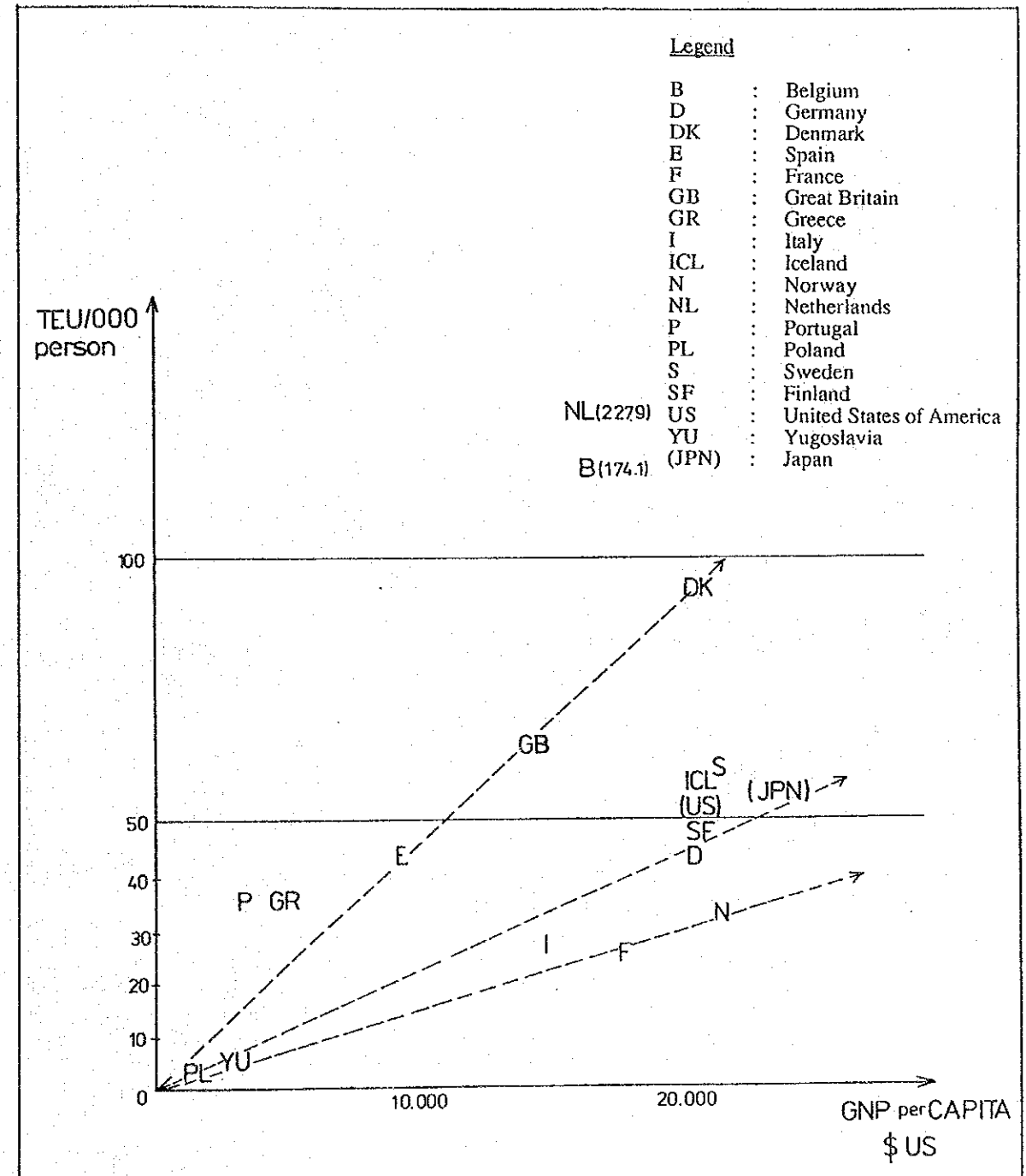

Fig. 7.2.1 **Relationship between Number of Containers Per Population and GNP Per Capita**

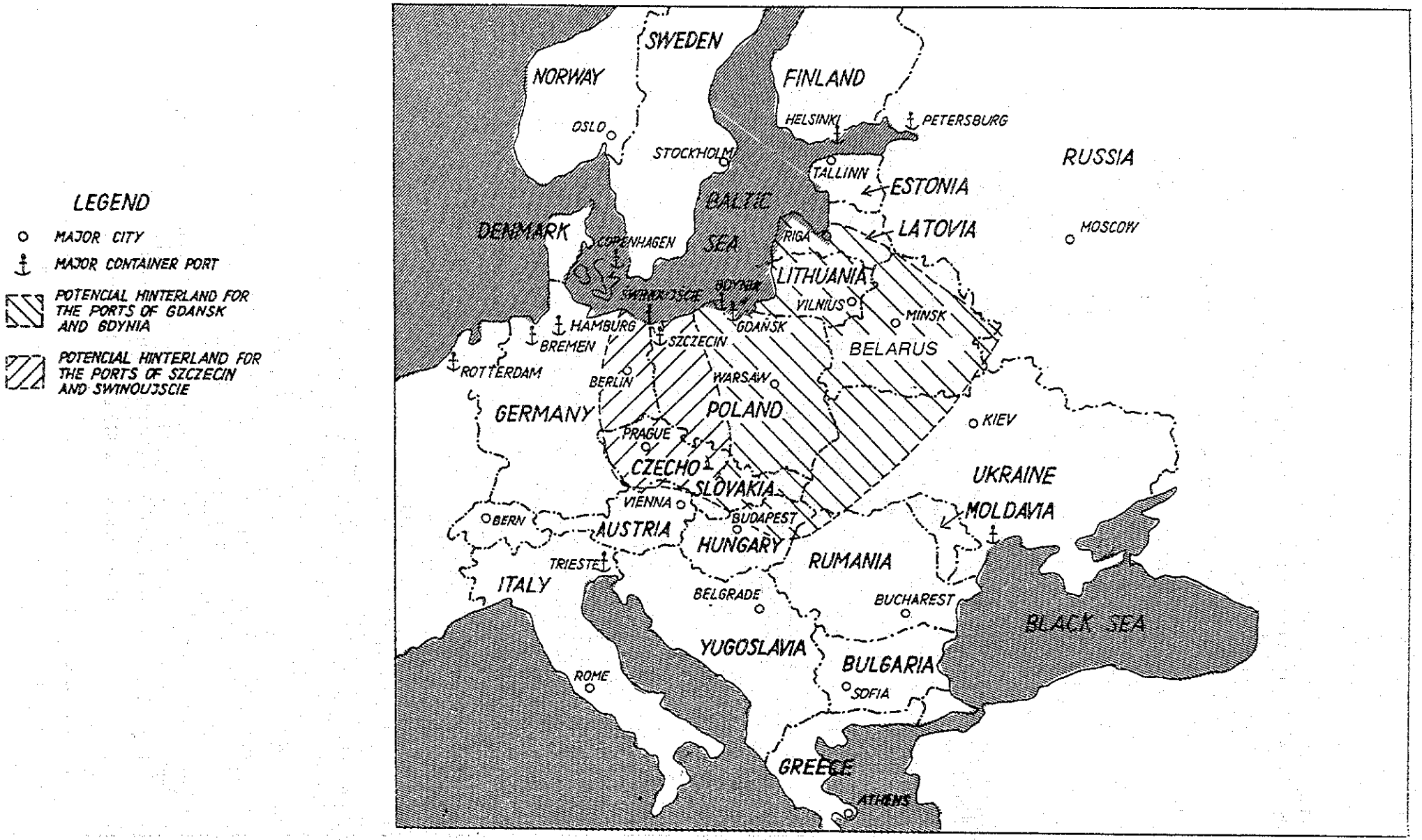

Fig. 7.2.2 Potential Hinterlands for Polish Ports

Table 7.2.10 Socio-Economic Data for Polish Port, 1991

	Population (million)		GNP/Capita
	Total	Hinterland	(US$)
Poland (G-G)	38	26	1,391
Poland (S-S)	38	12	1,391
Czechoslovakia	16	6	(2,681)
Hungary	11	4	(2,013)

Note: GNP/Capita for Czechoslovakia and Hungary are estimated by multiplying the 1989 Value and decrease rate of Poland GNP/Capita in 1991.

G-G stands for "Gdansk-Gdynia"

S-S stands for "Szczecin-Swinoujscie"

Table 7.2.11 Potential Container Cargo Volume and Actual Turnover of Polish Ports, 1991

	Population	GNP/Capita	TEU/1,000			Total TEU ('000)		
	(million)	(US$)	Max	Med	Min	Max	Med	Min
Poland (G-G)	26	1,391	6.3	3.1	2.1	163	81	55
Poland (S-S)	12	1,391	6.3	3.1	2.1	76	37	25
Czechoslovakia	6	2,681	11.7	5.9	4.0	70	35	24
Hungary	4	2,013	8.8	4.4	3.0	35	18	12

Note: G-G stands for "Gdansk-Gdynia"

S-S stands for "Szczecin-Swinoujscie"

In 1989 when the centrally planned economy was still in effect, sea container traffic presumably moved through domestic ports. So, no containers from East Germany were expected at the Port of Szczecin at the time.

Taking into account the above possible reasons, the hinterland of the port of Szczecin, in terms of container cargo, was likely to be restricted to the very small North-West part of Poland.

Then the potential volume of cargoes which would flow into/out of the port of Szczecin can be estimated, if the cargo moves according to the market mechanism. For this purpose, we assume that Fig. 7.2.1 can be applied even for cross border hinterlands. (The adaptability of the Figure was already verified for both Poland and former East Germany)

Using the values of GDP per capita in each hinterland, the result shown in Table 7.2.12 can be obtained. The Table gives 37 thousand TEU containers (Medium) from the domestic hinterland and 136 thousand TEU from foreign hinterland assuming that the port could obtain all potential container cargo in the foreign hinterland.

When a port lacks efficient container handing equipment, shippers hesitate to use that port. From Table 7.2.12, potential volume of containers only to/from the Western part of Poland amounts to 37,000 TEU. In contrast, the actual turnover in 1991 was only 13,209 TEU. The share of the port in the potential hinterlands probably were:

to the domestic market : around 30 %

to foreign market : nil

Table 7.2.12 Potential Container Cargo Volume for the Port of Szczecin, 1991

	Population	GNP/Capita	TEU/1,000 person			Total TEU ('000)		
			Max	Med	Min	Max	Med	Min
Poland	12	1,391	6.3	3.1	2.1	76	37	25
E. Germany	13	2,681	11.7	5.9	4.0	152	77	52
Czechoslovakia	10	2,681	11.7	5.9	4.0	117	59	40

Again, the problems for the Port of Szczecin in terms of container handling can be obtained as follows:

(1) Low rate of containerization in the area.

(2) The port was not competitive for container cargo, lacking special facilities for containers.

(3) This results in possible loss of potential container cargo

(4) More specifically,

(a) Container cargo from former East Germany region, having been handled at the port of Rostock, possibly tends to go to the port of Szczecin if the Port could realize its potential

(b) The same would happen to the container cargo to/from Czechoslovakia.

7.2.3 Shipping Lines to/from the Port of Szczecin

The shipping lines currently calling at the port are shown in Tables 7.2.13 and 7.2.14 (Data: "Sailing" by Polish Ocean Lines; valid for January - March, 1991). They are all operated by POL or POL joint ventures. The port, however, suffering from economic slump of the hinterland, has only three (3) liner services in operation as of June, 1992 (Fig. 7.2.3).

The dimensions of the ships are rather small, from the minimum ship of 1,904 DWT to the maximum ship of 7,490 DWT.

There are three (3) types of ship, RO-RO, LO-LO, and conventional (and their mixtures).

The dimensions of ships are as follows:

Length 79 m - 127 m

Draught -7.65 m

Table 7.2.13 Dimensions and Schedule on Liner Ships at the Port of Szczecin

* Szczecim-Finland (RO-RO) Weekly (Thursday/Friday), 4,014DWT, 223TEU, 12 Passngr, 106.9 m, 6 m
* Szczecin-Copenhagen-Aarhus-Holten-Oslo Monthly (every second Saturday), 2,116 DWT, 54 TEU, 6 Passngr, 78.9 m, 5.4 m
* Szczecin-Copenhagen-Aarhus-Oslo (Container) Weekly (Sunday), 2,116 DWT, 54 TEU, 6 Passngr, 79 17 m, 5.4 m
* Szczcin-Ireland (Con-ro) Monthly (Every second Wednesday), 3,408 DWT, 116 TEU or 1,730 DWT, 91 TEU 100.79 m, 5.68 m
* Szczecin-Rotterdam-Antwerp (Semi-Con) Weekly (Friday), 3,408 DWT, 116 TEU, 100.72 m 5.68 m
* Szczecin-Gdynia-Hamburg (General) every 10-14 days, 1,904 DWT, 6 Passngr, 83.71 m, 5.1 m o73
* African Line (Szczecin-Hamburg-Antwerp-Rotterdam-) every 10 days, 5 general cargo ship, 7,000 DWT, reefer 7,490 DWT, 134 TEU (Semi-con) 126.9 m, 7.65 m or 118.29 m, 7.64 m

Table 7.2.14 Liner Schedule at the Port of Szczecin

Sun	Mon	Tue	Wed	Thu	Fri	Sat
[Con] Scan. 54 TEU				[RO-RO] Finld 223 TEU		*1[Cov] Scan. 54 TEU
				[Semi-com] Rttdm, Antwp 116TEU		
			*1[Con-ro] Ireland 116/91 TEU			
		*2[Cov] Hamburg 1,904 DWT	*3[Cov/Semicon] Africa 7,000 DWT/134TEU			

*1 : Monthly service (every second Wednesday)
*2 : Every 10-14 days service
*3 : Every 10 days service

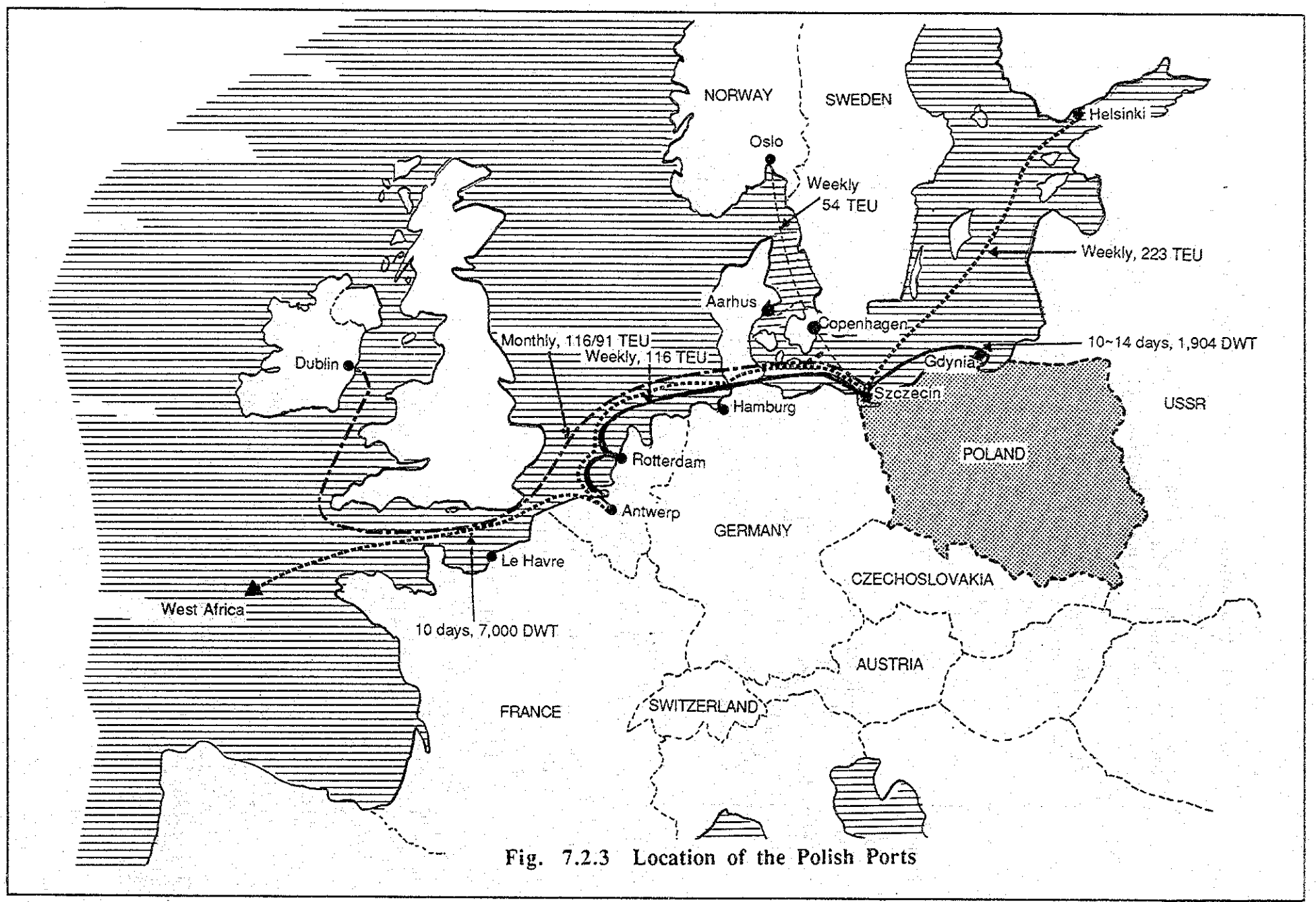

Fig. 7.2.3 Location of the Polish Ports

7.3 Evaluation of Szczecin Port's Competitiveness

7.3.1 Methodology

The Polish ports, being located along the Baltic Sea coast, are under severe competition with other European ports. Especially in the scope of inter-Baltic general cargo trade, cargoes tend to concentrate at several major foreign ports such as Hamburg, Bremenhaven and Rotterdam.

The major aspects for the evaluation of Polish ports' competitiveness are costs and times of sea transport. Other factors such as security and business tradition are very difficult to quantify and were not included in the study. Therefore, this study should only be regarded as the first stage in the process of evaluation.

Table 7.3.1 lists the distances between ports and some major cities in potential hinterland.

Table 7.3.1 Distance from Ports to Cities

(distance in km)

	Szczecin	Hamburg	Bremerhaven	Rotterdam
Poznan	200	480	570	860
Wroclaw	300	550	630	880
Katowice	480	730	800	1,040
Berlin	120	260	340	620
Prague	370	490	550	720
Vienna	600	750	800	940
Budapest	740	940	1,000	1,150

The following diagram shows, schematically, the methodology to evaluate competitiveness (In the diagram, "Port" means one of the major ports of Rotterdam, Bremerhaven and Hamburg). For the evaluation purpose "Cost" includes such costs as transportation, transfers between transport modes and other necessary expenditures.

[Case 1] Major foreign port plus inland transport

[Case 1-1]

shipper —ship→ Port —rail→ inland terminal —truck→ client

[Case 2-1]

shipper —ship→ Port —truck→ client

[Case 2] Feeder service from major foreign ports

[Case 2-1]

shipper —ship→ Port —ship→ Szczecin —Rail→ inland terminal —truck→ client

[Case 2-2]

shipper —ship→ Port —ship→ Szczecin —truck→ client

[Case 3] Direct calling of mother vessels

[Case 3-1]

shipper —ship→ Szczecin —rail→ inland terminal —truck→ client

[Case 3-2]

shipper —ship→ Szczecin —truck→ client

7.3.2 Assumptions for Cost and Time Estimation

The following are estimations conducted by Polish transport experts for transport cost and time;

1) Cost

Rail : Hearing

Truck : Basically 20% discount of the rail fare. Eventually 2-3 DM/km in Poland (International rate is different due to severe competition)

Handling charges at the ports :

US$120/TUE (regular charge)→US$60 (discount charge)

Navigation cost to/from the port of Szczecin, from/to the port of Hamburg or Bremerhaven:

800 - 900 DM/TEU (regular charge)→450 DM/TEU (discount charge)

2) Travel Time

At ports: 9 hours/TEU

From Hamburg and Bremerhafen to Szczecin:
60 hours

From Rotterdam to Szczecin:
80 hours

Storage time at the port of Szczecin:
2-3 days

Inland transport: 24 hours
9 hours for loading on truck
6 hours for discharging from truck
9 hours for storage at port

The environment which surrounds the inland transportation hinders free cargo flows, especially the border crossing. Necessary times for the border crossing are:

For train : 4 - 7 hours
For truck : 8 hours for west border and 2 hours for south border

7.3.3 Study Results

With the assumptions stated above, the results shown in Table 7.3.2-4 were obtained. From this result, advantages of direct calls are very clear. (It should be noted that time from the port of Szczecin to Berlin is longer than the item from Hamburg and Bremerhaven, although the land distance is shorter) This is one of the major reasons why ports try very hard to seek as many cargoes as possible and to maintain regular ocean routes to/from their ports. The port of Szczecin, however, can not be treated as a mother port in the scope of inter-Blatic trade because of the depth limitation.

The study results as feeder port are not very advantageous to the port. For domestic hinterlands, the port provides better service in terms of cost than trucks for inland transport. However, for foreign hinterlands including Berlin, the cost by direct inland transport to/from major foreign ports is cheaper compared to the feeder service.

Even for the cost, the study results, at the moment, are not favorable to the port of Szczecin as a feeder port except in the case for Rotterdam. For Rotterdam, the cost is lower to/from the Port of Szczecin than to/from Rotterdam or almost even. Taking into consideration the difference of land distances (it reaches up to 500 km in the case of Berlin), it would be possible to reduce the cost for feeder service.

The methodology shown in the report should be treated as one approach to ascertaining the bottle-neck in the transport chain including the port of Szczecin. In future, when the volume of cargoes handled at the Port of Szczecin increases, cost for inland transport will possibly decrease because of a scale merit.

Other aspects should also be taken into consideration. One of them is shortening of time for border crossings. This issue should be improved as soon as possible.

Transport conditions such as severe road traffic congestion in Germany, for example, are aspects to be considered. Polish ports should, through various studies, understand the transport environment and should establish a strategy for the future development of the Polish port sector.

Table 7.3.2 Transport Cost and Time to/from Poznan

(000 zl, hours)

Ports/case	[3-1] [1-1]	[3-2] [1-2]	(for Szczecin) [2-1]	[2-2]
Szczecin				
Cost	7,851	7,382	-	-
Time	10	5	-	-
Hamburg				
Cost	23,139	13,829	31,000	12,850
Time	50	22	108	106
Bremerhaven				
Cost	26,691	14,204	31,000	13,521
Time	52	22	114	112
Rotterdam				
Cost	36,428	21,092	41,980	14,914
Time	60	28	158	156

Table 7.3.3 Transport Cost and Time to/from Katowice

(000 zl, hours)

Ports/case	[3-1] [1-1]	[3-2] [1-2]	(for Szczecin) [2-1]	[2-2]
Szczecin				
Cost	13,956	13,722	-	-
Time	12	11	-	-
Hamburg				
Cost	25,048	21,494	29,227	19,190
Time	56	30	112	111
Bremerhaven				
Cost	27,057	21,976	31,907	19,860
Time	58	30	118	117
Rotterdam				
Cost	36,697	24,040	42,939	21,254
Time	64	36	162	161

Table 7.3.4 Transport Cost and Time to/from Berlin

(000 zl, hours)

Ports/case	[3-1] [1-1]	[3-2] [1-2]	(for Szczecin) [2-1]	[2-2]
Szczecin				
Cost	13,956	5,571	-	-
Time	14	11	-	-
Hamburg				
Cost	17,792	8,063	23,243	12,787
Time	8	6	112	111
Bremerhaven				
Cost	19,760	8,700	23,243	12,787
Time	10	6	118	117
Rotterdam				
Cost	24,010	12,382	24,583	14,127
Time	18	12	132	131

7.4 Future Prospects for General Cargo Handling

7.4.1 Methodology

The economic transformation, begun in 1990 and still currently taking place in Poland, possibly has brought a complete change of trade and transport pattern. Therefore, trend analysis which is generally used to forecast future cargo volume is not applicable.

One of the possible methods we can be adopted for the study is to observe the Polish ports in the scope of global picture, mainly considering European ports. The method is based on an idea of applying experiences of other countries to Poland. One of these methods is already presented in the Interim Report.

Here, two(2) methodologies will be used for the forecast of future unit general cargo volume.

[Method 1]

This method is to get the unit cargo volume by multiplying the volume of general cargo volume with the rate of unitization.

The total volume of general cargo at the port is forecasted, using the past experience of other ports operating under the market economy, as follows:

The past experiences teach us that the volume of general cargo at a port depends on the scale of economy of her hinterland. Although it is said that export volume of general cargo tends to correlate with an amount of industrial production of the hinterland and that import with consumption outlay of the hinterland, there are no such data in hand. So, it can be assumeed that the volume of general cargo simply depends on GDP of the hinterland.

[Method 2]

This method utilizes correlation of the number of containers and GDP per capita. The validity of the method was verified in section 7.2.

Beside the economic forecast, there are matters, though small, such as operation and efficiency of the terminal which could be referred to the Baltic Container Terminal at the Port of Gdynia. Because, the terminal is practically the only one container terminal in Poland and after the operation commences at the new terminal at the port of Szczecin, the BCT can serve as a valuable model. In this regard, the experience at this terminal should be carefully examined and utilized.

In this study, unitized cargo includes containers and non-container ro-ro cargoes. Container trades are undoubtedly developed in the scope of ocean trade and so are the ro-ro trades in the Baltic Sea. These cargoes are the transport means which should play a major role in modernized transport business.

7.4.2 Method 1

Table 7.4.1 shows the socio-economic indices for the year 1995, 2000 and 2005.

As mentioned in section 7.4.1, the volume of general cargo will be forecasted from a simple relationship with the GDP of the hinterland, setting the base year as 1991. In the course of this study, we assumed that there could be no change in the hinterland. In terms of the rate of transit general cargo volume at the Port of Szczecin, it was assumed as constant at 40%.

After these assumptions, the following estimates can be obtained for the projected volume of general cargo at the port of Szczecin in the year 1995, 2000 and 2005 (Table 7.4.2.).

Table 7.4.1 Socio Economic Indices

	GDP (Million US$)			Popultn	GDP/Capita (US$)		
	high	medium	low	(000)	high	medium	low
1991	(actual 53,400)			38,310	(actual 1,394)		
1995	59,520	59,073	53,400	39,595	1,503	1,492	1,349
2000	72,740	70,841	61,900	40,797	1,783	1,736	1,517
2005	106,410	87,021	71,760	41,994	2,534	2,072	1,709

Source : Interim Report

Table 7.4.2 Projection of General Cargo Volume

(000 tons)

	G C volume		
	high	medium	low
1991	(actual 2,063)		
1995	2,299	2,282	2,063
2000	2,810	2,736	2,391
2005	4,110	3,361	2,772

The rate of containerization of general cargoes in developed countries are very high, reaching 80% or more. Even in developing countries such as East Asian countries and South East Asian countries, containerization has remarkably progressed in recent years.

In the long term perspective, Polish ports will undoubtedly tend to be containerized. The problem is the pace of containerization. There is very limited materials to determine future prospect of containerization in Poland. One of the few materials is the current containerization rate at Polish port(s) in 1991.

- The rate of containerization at the Port of Szczecin : 4 %
- The rate of containerization at Gdynia : 30 %
- Gdynia and Gdansk Port Complex : 20 %
- Overall Polish ports : 13 %

Coupling these numbers with the total volume of general cargo, the following container cargo volume can be obtained for the years of 1995, 2000 and 2005.

For the year 2005, at maximum 1.008 million tons (fairly quick containerization of 30%), at minimum 437 thousands (slow containerization of 13%), assuming the medium economic growth.

In 2005, the containerization should progress and the rate of containerization at the Polish ports in total should be well over 13% which is the average rate of containerization for overall Polish ports in 1991. Experiences in the developed countries including Japan shows that containerization progresses much faster than predicted. This indicates that the volume of containers at the port of Szczecin will, at least, reach 672 thousand tons(20%) in the near future.

Moreover, as for the Port of Szczecin, non-container unitized general cargoes occupy a considerable share. So, even the rate of containerization is not high, the rate of unitization will develop very quickly.

If the rate of the unitized cargo including containers is assumed as 30 %, one (1) million tons of container cargoes (Table 7.4.3) can be obtained.

With these volume of unitized cargoes, the port can not be operated sufficiently without specialized terminals.

Table 7.4.3 Projection of Container Cargo Volume

('000tons)

	G C volume	Container cargo volume		
	medium	high	medium	low
1991	2,063	(actual 106)		
1995	2,282	685	456	297
2000	2,736	821	547	356
2005	3,361	1,008	672	437

7.4.3 Method 2

In this section, Fig 7.2.1 is utilized to forecast future container volume.

In 7.2, the applicability of the Figure is verified. The trend of container-GDP per capita tends to be somewhere close to the medium case.

Table 7.4.4 lists the populations and GNP per capita for medium case in the year 2005. Using the socio-economic data in Table 7.4.4, together with Fig. 7.2.1, 60 thousand TEU can be obtained for the future container volume. This corresponds to 480-600 thousand tons, depending on the weight of a box of container(TEU).

The number almost coincides with the medium case acquired in 4.2. The rate of containerization is some 14-18%.

For the Port of Szczecin, non-container ro-ro cargoes are very important. Close consultations with Polish experts gave us an idea that almost the same amount of general cargoes are carried as non-container ro-ro cargoes. Hence, the total volume of unitized general cargoes including containers, as 960-1,200 thousand tons.can be obtained

Table 7.4.4 Socio-Economic Indices (2005)

	Population(million)		GNP per capita (US$)
	Total	Hinterland	
Poland	42	13	2,100

Note: Data for Poland are based on JICA Study.

7.4.4 Future Unitized Cargo Volume at the Port of Szczecin

According to the results obtained by the Method 1 and 2, the range of future container volume at the port of Szczecin in the year 2005 would be considered around one (1) million tons.

The Fig. 7.4.1 shows the expected container numbers handled at the port up to 2005. From the Figure, expected numbers for the years 1995 and 2000 are 20,000 TEU and 50,000 TEU, respectively.

7.4.5 Effect of Cargo Unitization in Economic Terms

A large number of unitized cargo would go to another port, unless the port has an efficient cargo handling terminal. It is most probable that the intra- Baltic cargoes would go to the port of Gdynia and inter-Baltic cargo to the ports in Germany. The economic effects of the new terminal can be measured by comparing the following case.

[Case-1 : with terminal]

The port would handle some 3.3 million tons of general cargo, in which 1 million tons are unitized cargo.

[Case-2 : without terminal]

From the past data, the port's capacity of handling unitized cargoes would be around 20 thousand tons. Recent cargo statistics show that after the liberalization of the economy, container cargoes seem to keep away from the port.

This is the most likely example of market economy in action. The movable crane which the Port of Szczecin has recently installed could help to bring back cargoes, but probably in small quantities only.

In assuming that the port could handle 20 thousand tons of unitized cargoes in the year 2005. The rest of the potential unitized cargoes, which would be 980 thousands tons, would go to other ports.

Then the total volume of general cargo at the Port of Szczecin in the year 2005 will be some 2.32 million tons in which 20 thousands tons are unitized general cargoes (Table 7.4.5).

Table 7.4.5 Future Cargo Volume at the Port of Szczecin

(unit:tons)

	1995	2000	2005
[With]			
General cargo	2,280,000	2,740,000	3,360,000
in which			
Unitized cargoes	200,000	500,000	1,000,000
Container	100,000	250,000	500,000
Non-container	100,000	250,000	500,000
[Without]			
General cargo	2,100,000	2,260,000	2,380,000
in which			
Unitized cargoes	20,000	20,000	20,000
Container	10,000	10,000	10,000
Non-container	10,000	10,000	10,000

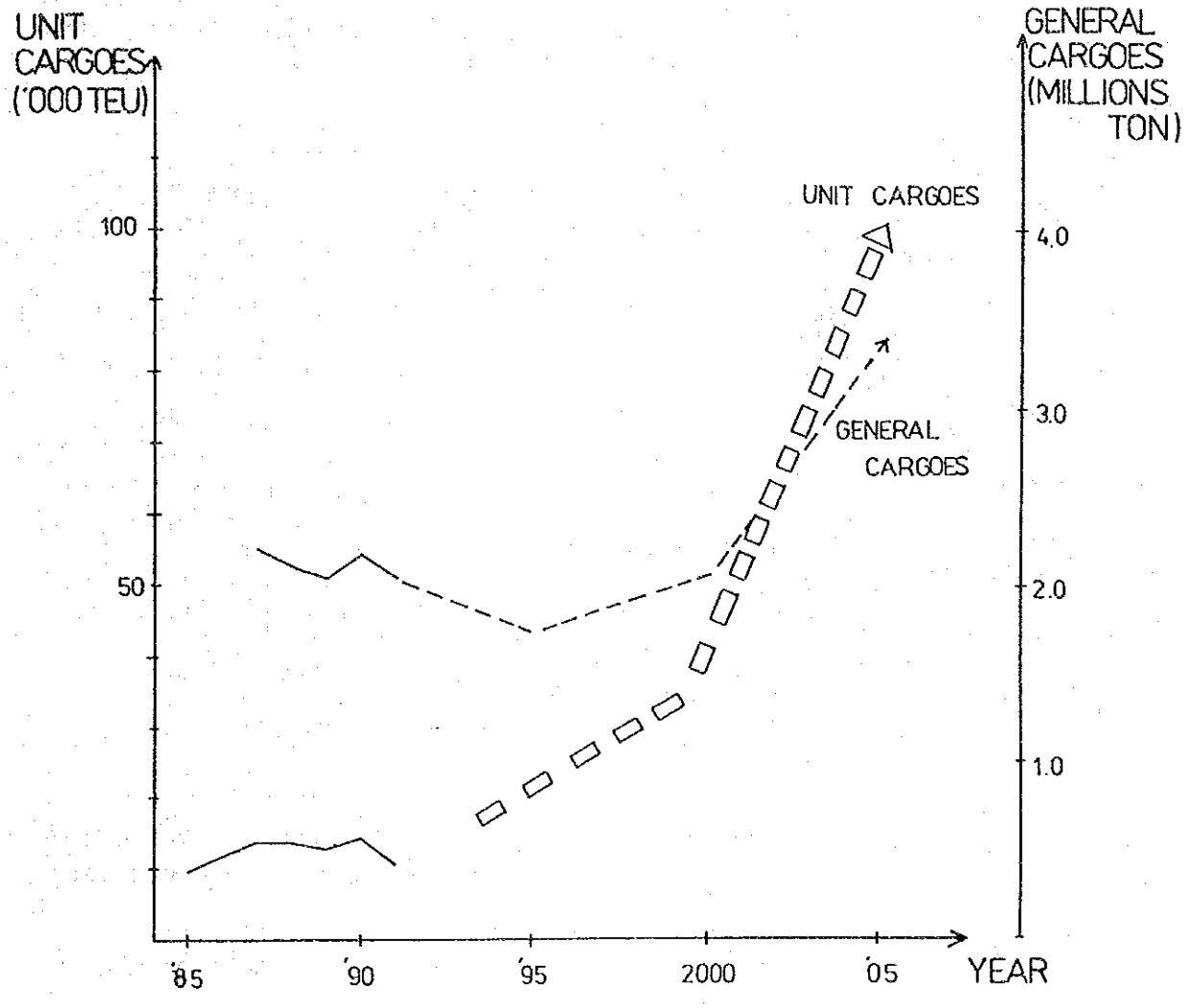

Fig 7.4.1 Number of Unit Cargoes at the Port of Szczecin

7.5 Terminal Plan

7.5.1 New Terminal

1) Location and general characteristics of possible terminals

Based on visits and discussions at the port site, the following four(4) locations are selected as sites for the new terminal (Fig. 7.5.1). The dimensions of the sites and depths of the quays for new terminals are listed below.

(a) Option 1

Czechoslovackie Quay 300 m long x 120 m wide x -9.6 m deep
(Southern end of the quay. Conversion from conventional general cargo quay)

(b) Option 2

Ostrow Grabowski
(New development)

(c) Option 3a

Noteckie Quay 315 m long x 180 m wide x -6.7 m deep
(Conversion from a bulky terminal)

(d) Option 3b

Gornoslaski Quay 282 m long x 350 m wide x -9.6 m deep
(Conversion from a bulky terminal)

Back-up yard
Several hundred meters from Czechoslovakie Quay 300 m x 200 m (This yard will be used together with the Czechoslovackie Quay and supplement the spatial limitation of the Quay)

Table 7.5.1 briefly compares merits and demerits of each Option. (Option 3a is deleted because of the space and depth limitation)

The volume of container cargo in the year 2005 at the port will be around 100,000 TEU. In the long term, due to the increase of cargoes and progress of containerization, the volume will be much larger.

Therefore, the location of the new terminal should have potential for further development. From this view point, the Ostorow Grabowski is the best place, Option 3b should be deleted from our study.

At the same time, because of the current turmoil of the Polish economy, the timing of the introduction of the new terminal should be carefully examined.

Experiences in developed countries teach us that the container trade grows gradually in the early stages, and after a certain point it suddenly begins to flourish. At the same time, it is usually said that around 50,000 TEU of containers are needed to make a new terminal feasible.

In a very competitive climate such as in Europe, cargoes tend to move to more efficient ports. Thus, a port without a container terminal will face great difficulties in attracting cargoes.

As Poland is faced with severe financial difficulties, a big investment from the domestic sector cannot be expected at present. Even for foreign investors, the environment is not very fascinating at the moment.

Taking the above matters into consideration, the first step should be an effort to attract more cargo without inflicting a big economic burden to the port.

From this point of view, the action being taken by the Port Authority is regarded as appropriate. Their basic idea is implementing Option 1 plus the Back-up yard. (They purchased a movable crane (50t) for container handling at the Czechoslovakie Quay.)

The forecast cargo volume for the year 2005 is well over the capacity of modified Czechoslovackie Quay, therefore this study will cover a broader scope of the project and its stage plan. The Czechoslovackie Quay was regarded as Phase One (1) of the Project. In this study, the development of Czechoskovackie Quay is treated as the first phase of the project and the development of Ostraw Gravowski as the second phase.

It is obvious that areas available for terminal operation is very limited. Therefore, the plan should focus on using the Quay for cargo handling purpose only and the Back-up yard for storage. When the number of unitized cargoes becomes large, construction of a new terminal at the Ostrow Grawowski should begin.

As for the modification of the Czechoslovackie Quay as well as Ostrow Grabowski, the study team should stress, again, two points. One is the importance of road transport for container transportation. While the Czechoslovackie Quay has very good rail access, road access is very poor. As stated in section 7.1, road transport is vital for container transport because of its high mobility. So, when planning a new terminal, good access to the main road should be highlighted. The other thing to be stressed is the need for a flat ground requirement in the container marshaling yard. The surface of the Czechoslovakie Quay is observed to have considerable undulations. For the speedy and efficient cargo handling operation, leveling of the surface is required.

Table 7.5.1 Merits and Demerits of Development Options

	Option 1	Option 2	Option 3b
Name of Location	Czechoslovackie Q	O Grabowski	Gornoslaski Q
Specification	conversion frm general terml	new development	conversion from bulk terminal
Space	short back-reach	adequate	almost enough
Depth of Quay	sufficient	new construction	enough
Further Development	difficult (possibly switch to O Grabowski)	easy	difficult
Access			
Railway	good	none	good
Road	available	none	good, if improved
Civil works	Demolish Pavement	Soil Improvement Quay construction Railway, road	Demolishing Pavement
Admnstrtn	easy	easy	duplicated
Investment	fair	huge	medium
Operation	rather complicated	good	fair
Others	Bad effects to adjacent termls		Scattering G.C. termls

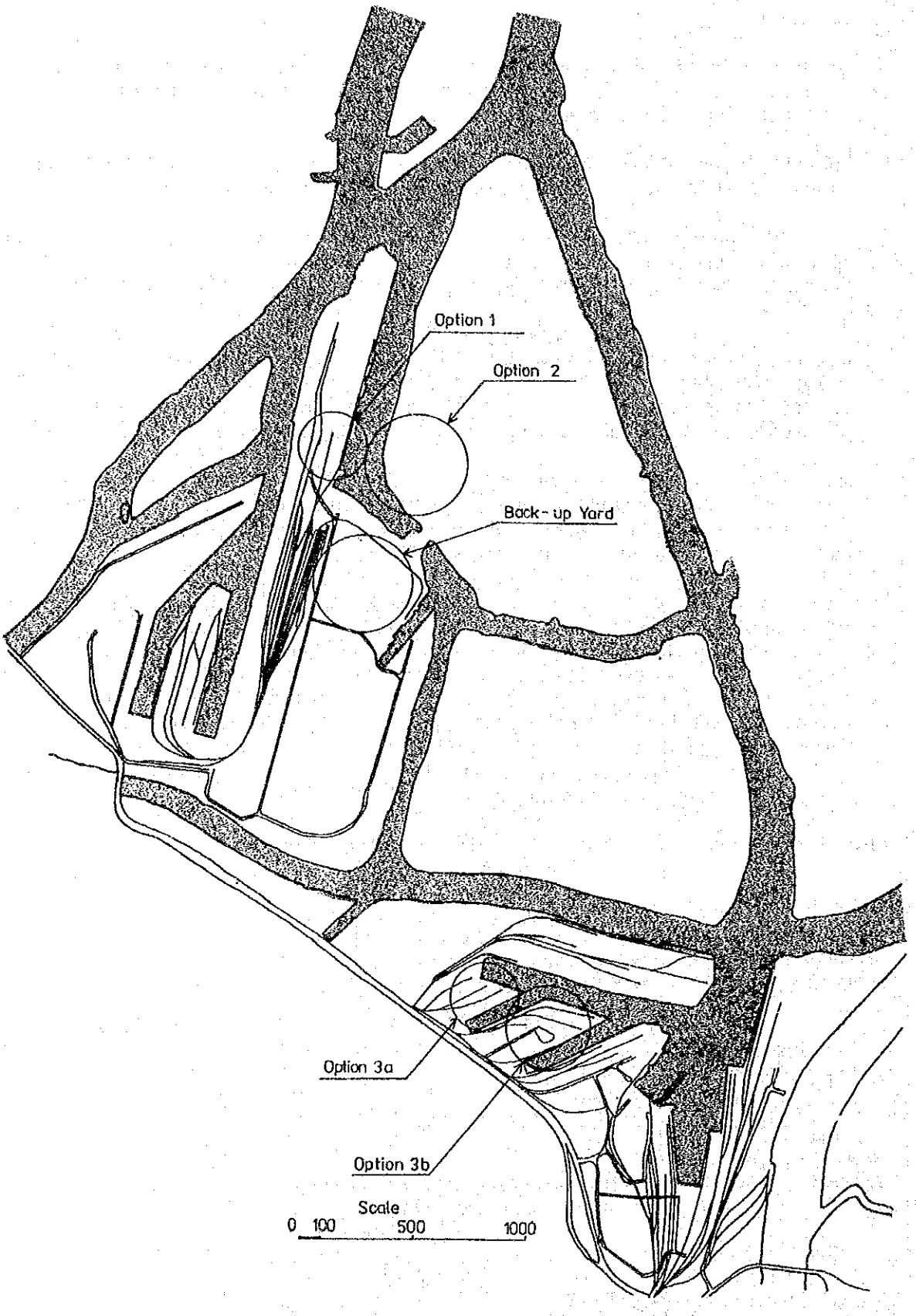

Fig. 7.5.1 Overview of the Szczecin Port

7.5.2 Basic Data for Terminal Planning

[Basic numbers for port planning]

Depth in front of Quays	:	-9.5 m
Length of the Quays	:	200 m
Target cargo volume	:	1,000,000 tons (100,000 TEU)
in which container is	:	500,000 tons (50,000 TEU)

(a) Depth

Depth in front of the quays should be -9.5m which is the maximum depth for the Keel Canal that maintains the access waterway to the port. Because deepening the basin and channel requires huge amounts of investment, the depth of the port of Szczecin is limited to -9.5m. This obliges the port to function as a feeders port from/to major European ports as mentioned before. The depth of -9.5m is regarded to be sufficient to accommodate intra-Baltic ships.

Draughts of currently entering ships at the port are from 5.4m to 7.65m. Thus, -9.5m provides sufficient depth for the entering ships.

(b) Length

As for the length, 106.9m for the Baltic Sea Line and 126.99m for the outside Baltic Sea lines including feeder services which are currently in service.

Taking into account the ship's length corresponding to -9.5m, which is around 180m, the quay length should be around 200m. This length is well over the ships length of the maximum Keel Canal type.

(c) Cargo volume

For planning purposes, the volume of containers handled at the port in 2005 is 1,000,000 tons per year. Although half of the volume is expected to be non-container cargoes, the study will simplify and treat all cargoes as containers. By assuming 10 tons for a box of twenty foot container, we get 100,000 TEU in 2005.

7.5.3 Stage Plan of the Project

The timing of the construction of new terminals should be carefully examined. So, the project will be divided into several stages. Having ascertained the capacity of a unit container terminal at BCT (170,000 TEU by four (4) quays with three (3) gantry cranes), the number of terminals should be two (2) or more.

Taking the areal limitation in the Czechoslovackie Quay into consideration, the first priority should go to areal requirement. Half of the total volume is non-container unitized cargo. This means there will be some constraints for cargo handling methods. The cargoes are to be stored in single layers and thus a straddle carrier is not regarded as suitable equipment. This results in a pretty large land requirement, which conflicts with the very limited land area behind the Quay.

The following is the areal requirement for each type of equipment by the number of stacking layers. From this table, it is obvious that the areal requirement is very large for non- container cargoes.

		layers	sqm per TEU
a. Trailer	:	1	60
b. Fork-lift truck	:	1	60
		2	30
(Straddle Carrier	:	1	30)
(		2	15)

source: "Port Development"; UNCTAD

The maximum back reach of the Quay is 120m and quay length is 200m. The quay side area of 20m should be reserved for an apron. The rest could, possibly, be used for container stacking. So, we get 10,000sqm. The available area is rather limited and it should be used only for temporary storage purpose.

Half of the volume is non-container cargo which needs to be handled by tractor or fork-lift and be stored at one(1) layer. It will be assumed for two (2) layer storage for containers. From the Table above, a figure of 222 TEU is obtained.

This corresponds to the capacity of the ship currently in service of Helsinki Line (223 TEU, 4,014 DWT). It should be noted that for the full loaded ship of this capacity, unloaded cargoes should directly be carried on to the Back-up Yard from the Quay. The Quay should be used only for temporary storage of the loading cargoes.

Assuming a cargo handling capacity 20 TEU/hour (this number is derived from BCT), and that all ships are full loaded, the expected cargo handling time would be 22-27 hours. Adding non- handling time, ship's turn-around time would be 28-33 hours.(As far as Polish statistics are concerned, there is no direct data on non-handling time. After a close look at the statistics, the team determined that the non-handling time is rather long and not conducive to the planning of a new terminal which is supposed to be efficient. For this reason, the team adopts the number which is generally accepted as non-handling time.)

Theoretically, the terminal could accommodate 5-6 ships a week, which would make the maximum capacity of the terminal about 110,000 TEU. However, taking into account the terminal layout and rather long non-handling time in Polish ports, the capacity of the terminal should be regarded as less than half of that figure. So, the target cargo volume should be at the level of 40,000-50,000 TEU.

A certain period of time before the turnover of unitized cargoes reaches this level, the construction of another terminal should be initiated.

As for the Ostoraw Grabowski, there is almost no areal limitation. The capacity of the terminal located there will be higher than the Czechoslovackie Quay.

Table 7.5.2 Stage Plan of the Project

	Location	Target turnover
Phase 1	Czechoslovackie Quay	40,000 TEU
Phase 2	Ostoraw Grabowski	60,000 TEU or more

7.5.4 Phase 1: Short Term Plan

1) Cargo handling aspects at the Quay

As mentioned before, for the Czechoslovackie Quay, the limitation of the available space would be the first factor to be examined. The area behind the Quay can accommodate 222 TEU in total, 111 TEU container and the same number of non-container. When the volume of cargo increases close to the level of 40,000, the area behind the Quay can accommodate only loading cargoes for one (1) ship only.

Although prior consideration assumes one (1) container crane, the case with two(2) cranes does not work because of the areal limitation. So, the permanent installment of container crane at the Quay should be limited to one (1). (Movable crane could be utilized for unexpected contingencies.)

Let us, again, assume 50% of unitized cargoes, including the containers, is to/from the Baltic coast ports, and another 50% is mainly served by feeder ships to/from major European ports along the North Sea.

a. Baltic Sea : 20,000 TEU / year (385 TEU / week)
b. Feeder Service : 20,000 TEU / year (385 TEU / week)

To carry the cargo mentioned above, at first, the ships currently in operation is assumed.

a. Baltic Sea:

4,014 DWT, 223 TEU (Helsinki Line)
draught -6 m, length 106.9 m
---> 385/2/223=0.86 ---> 1 call/week

b. Feeder Service:

3,408 DWT, 116 TEU (Currently in service)
draught -5.68 m, length 100.72 m
---> 385/2/116=1.66 ---> 2 calls/week

After adding one (1) call for the compensation of the volume imbalance between export and import and empty containers (30% at BCT), the following numbers are obtained.

a. Baltic Sea : 2 calls/week (4,014 DWT, 223 TEU)
Number of cargoes handled per call: 200-300

b. Feeder Service(1) : 3 calls/week (3,408 DWT, 116 TEU)
Number of cargoes handled per call: 130-200

Here, we can see that with 40,000 TEU turnover a year the terminal is in full operation. And as mentioned before, ships can leave the terminal on the next day and the terminal would provide customers quite good service in terms of time.

However, it should be borne in mind that the terminal operation would require a high degree of skill when the cargo volume approaches 40,000 TEU a year. Many equipment, cars and cargoes will be moving in the limited terminal space. The loading cargoes should be carried into the terminal concurrently with the unloading operation. So, before the turnover of the cargo reaches 40,000 TEU, the second terminal should be put into operation.

2) Quay side area

Schematical plan of the area is shown in Fig. 7.5.2.

The Port Authority of Szczecin tends to keep the rail lines inside the area to serve the terminal as well as the other section of the Quay. At an early stage of the project when the cargo volume is not large, the cargoes carried by rail might be handled inside the terminal, however, those lines would be an obstacle to efficient cargo handling at a later stage.

3) Back-up Yard

Assuming five (5) days for the average storage period for loading cargoes and seven (7) days for unloaded cargoes ("Port Development" A handbook for planners in developing countries; UNCTAD). We get 20sqm for the necessary area for a container yard.

The dwelling time at BCT is said to be about two (2) weeks. Cargoes can stay in the terminal for two (2) weeks free of charge. And the rate of non-container cargoes is much smaller there (20%). These factors possibly prolong the dwelling time inside the terminal. Considering these factors, the dwelling time at the Port of Szczecin would be higher than the above assumption. Therefore, the storage area should be 30,000-40,000 sqm (Fig. 7.5.3).

4) Container Freight Station

Container Freight Station is used for stuffing and stripping containers inside the terminal. The dimensions for a CFS depend on the total volume and dwelling time of cargo. Due mainly to the lack of an inland depot for containers, the rate of cargo volume which is stuffed and stripped inside a port is around 50%. As there is no data for dwelling time of cargoes in CFS, we have chosen one (1) week for the dwelling time. Thus, we get two (2) thousand sqm for CFS.
The warehouse next to the terminal could be utilized for the time being and lessen the areal requirement for CFS. However, the warehouse is not designed as an efficient CFS and obviously has certain limitations.

5) Equipment

a. Quay cranes

Gantry crane 30t x 1

b. Equipment for yard operation

There are several yard operation systems. For the Port of Szczecin, fork-lift and tractor, trailer system would be the most appropriate systems for consideration. The reasons are as follows;

i. High rate of non-container unit cargoes.
ii. Comparatively long distance transport requirement inside the port.
iii. Relatindy easier operation and maintenance

The system comprise of the following equipment.
folk lifts 30t x 4, 3t x 6, 6t x 2
tractors 6
trailers 12

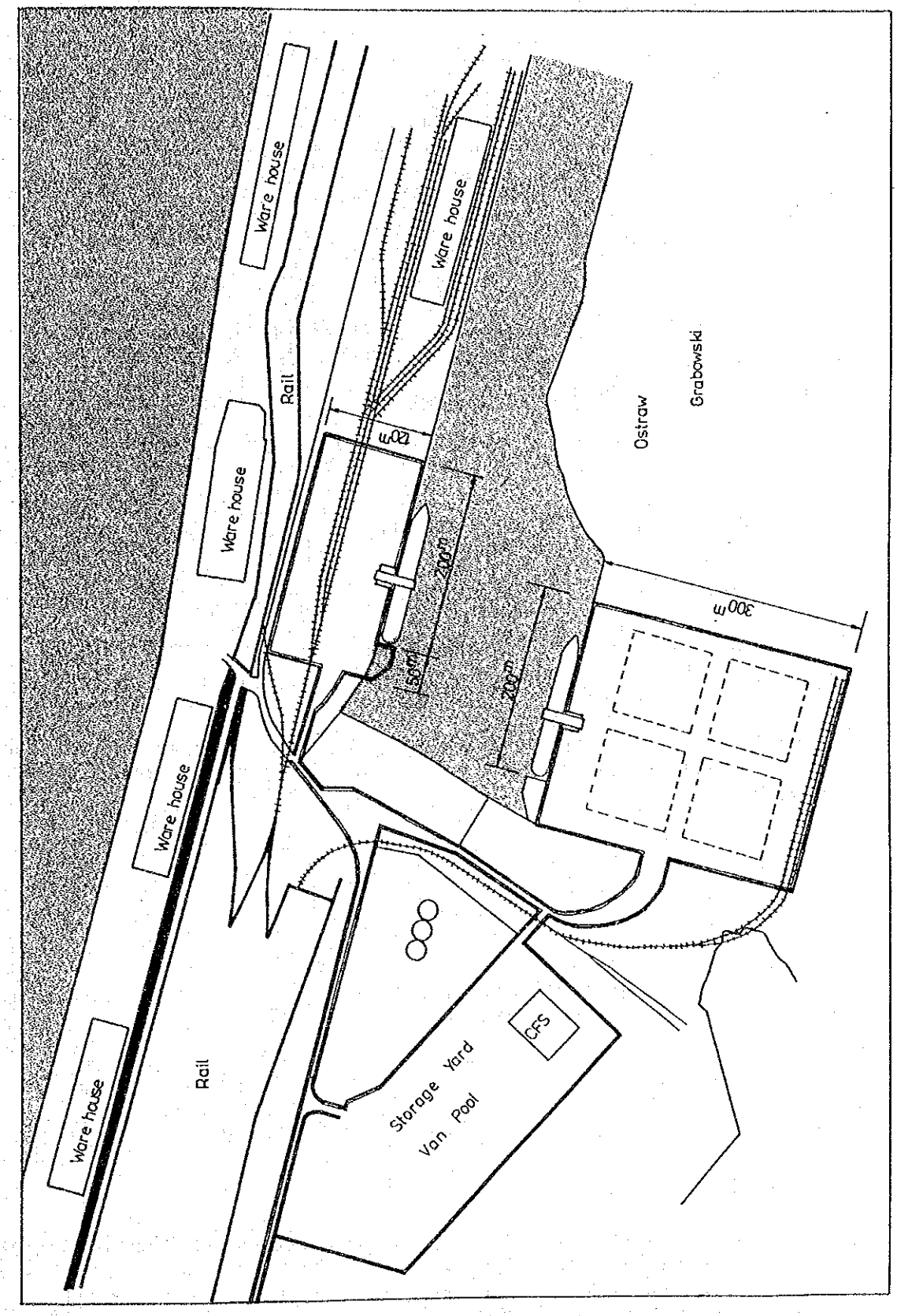

Fig. 7.5.2 Rough Layout of the Project Area

7.5.5 Phase 2: Long Term Plan

1) Cargo handling aspects at the Quay

For the long-term planning purpose, a cargo volume of 100,000TEU is adopted (in which 40,000TEU is handled at the Czechoslovackie Quay).

Let us, again, assume 50% of unitized cargoes, including the containers, is to/from the Baltic coast ports (Helsinki, Stockholm, St. Petersburg, Oslo and so on), and another 50% is mainly served by feeder ships to/from major European ports along the North Sea.

a. Baltic Sea : 50,000 TEU / year (960 TEU / week)
b. Feeder Service : 50,000 TEU / year (960 TEU / week)

To carry the volume of cargoes mentioned above, at first, let us assume the ships currently in operation.

a. Baltic Sea:

4,014 DWT, 223 TEU (Helsinki Line)
draught -6 m, length 106.9 m
---> 960/2/223=2.15 ---> 3 calls/week

b. Feeder Service:

3,408 DWT, 116 TEU (Currently in service)
draught -5.68 m, length 100.72 m
---> 960/2/116=4.13 ---> 5 calls/week

As for the feeder service ships, a larger ship might be put into service. In the Polish ship inventory, we have the following candidate as a possible type of semi-con ship for the service.

c. Feeder Service (2):

9,400 DWT, 220 TEU (Currently in Indian Line)
draught -9.7 m, length 160.92 m
---> 960/2/220=2.18 ---> 3 calls/week

Again, taking export/import imbalance and empty containers into consideration, let us assume one (1) additional call for each liner service.

a. Baltic Sea : 4 calls/week (4,014 DWT, 223 TEU)
b. Feeder Service(1) : 6 calls/week (3,408 DWT, 116 TEU)
c. Feeder Service(2) : 4 calls/week (9,400 DWT, 220 TEU)

2) Quay

The terminal at the Ostoraw Grabowski is a completely new project. There is a need to construct new quay with the depth of -9.5m. (The depth of the basin in front of the quay could be shallower for the time being, however, the quay structure should be designed and constructed for -9.5m)

3) Container yard

No areal limitation is foreseen, in contrast with the Czechoslovackie case. All the necessary functions could be arranged behind the Quay, which enables the terminal operation to be much more efficient.

After taking various factors into consideration such as the dwelling time, the areal requirement would be 80,000-100,000sqm. The Back-up Yard already has 30,000-40,000sqm, so, the areal requirement at the terminal in the Ostoraw Grabowski will be 50,000-60,000sqm.

4) Container Freight Station

After similar calculations shown in section 7.4.4, we get 10,000 sqm. There is already 2,000sqm for the Czechoslovackie Quay. So, 8,000sqm is needed for Ostoraw Grabowski.

5) Equipment for the terminal at Ostoraw Grabowski

a. Quay cranes

Gantry crane 30t x 2

b. Equipment for yard operation

The system is comprised of the following equipment.

folk lifts 30t x 3, 3t x 8, 6t x 2
tractors 10
trailer 20
rail gantry crane x 1

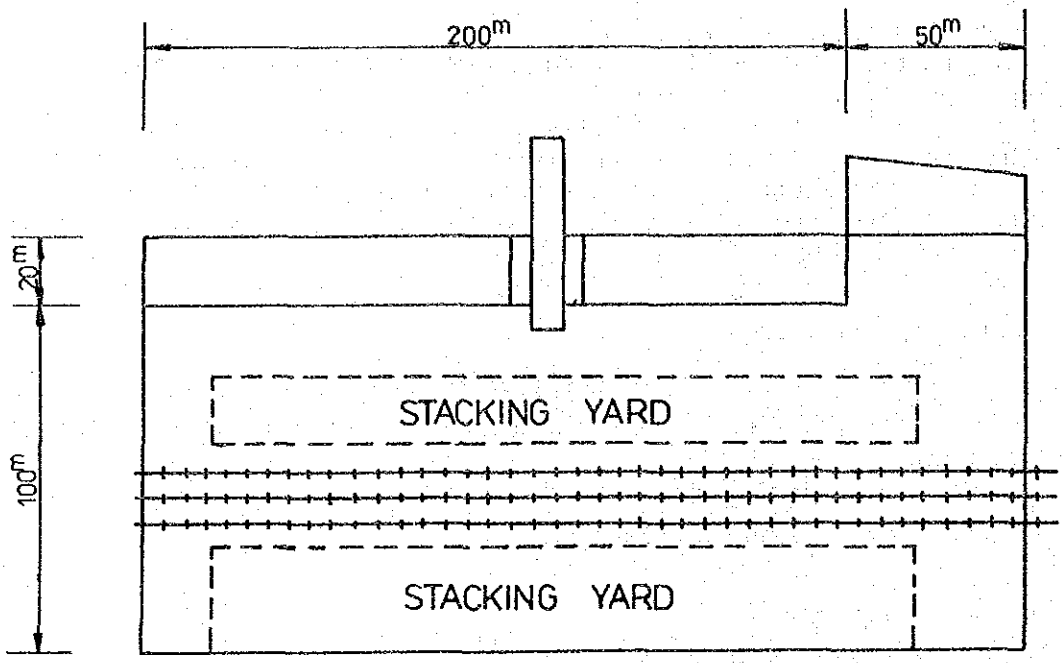

Fig. 7.5.3 Rough Layout of Czeck Quay

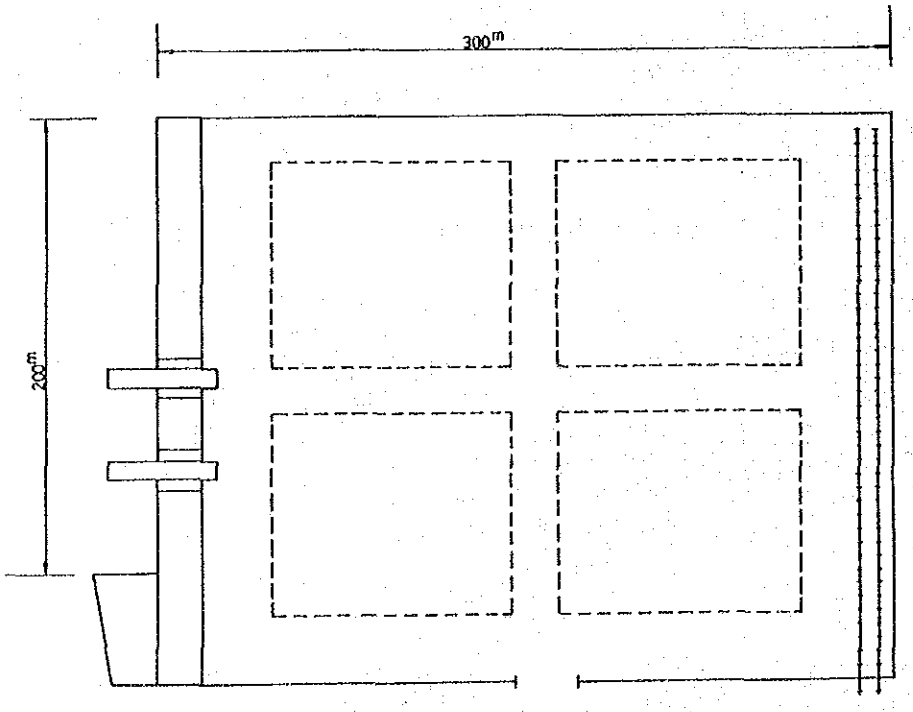

Fig. 7.5.4 Rough Layout at Ostraw Grabowski

7.6 Cost Estimation

7.6.1 Total Plan of the Project

Year : 2005

Location : Czechoslovackie Quay (plus Back-up Yard) and Ostraw Grabowski

Target cargo volume : 1,000,000 tons (100,000 TEU)

Areal Requirement : Container yard 100,000 sqm
Container Freight Station 10,000 sqm
2,000 sqm for the 1st phase

Dimensions of calling ships :

Type	DWT	Capacity		Draught	Length	
ro-ro	4,014		223	TEU	6 m	106.9 m
semi-con	3,048	116 TEU	5.68 m	100.72 m		
(semi-con	9,400	220 TEU	9.7 m	160.92 m)		

7.6.2 Stage Plan of the Project

1) Phase 1 [Short Term Plan]

Year : 1994 (one (1) year)

Location : Czechoslovackie Quay

Dimensions : -9.5 m deep, 200 m long plus 50 m ro-ro ramp, 120 m wide

Target cargo volume : 4,000,000 tons (40,000 TEU)

Areal Requirement : 10,000 sqm behind the Quay
30,000 sqm in the Back-up Yard
2,000 sqm for CFS

Equipment : Gantry (30 t) x 1
Fork-lift (30 t) x 4
Fork-lift (6 t) x 2
Fork-lift (3t) x 6
Tractor x 6
Trailer x 12

2) Phase 2 [Long Term Plan]

Year : 1998, 1999 (two (2) years)

Location : Ostraw Grabowski

Dimensions : -9.5 m deep, 200 m long plus 50 m ro-ro ramp, 300 m wide

Target cargo volume : 6,000,000 tons (40,000 TEU)

Areal Requirement : 60,000 sqm behind the Quay
8,000 sqm for CFS

Equipment : Gantry (30 t) x 2
Fork-lift (30 t) x 3
Fork-lift (6 t) x 2
Fork-lift (3t) x 8
Tractor x 10
Trailer (Chassis) x 20

7.6.3 Costs of Civil Works and Equipment

Costs of civil works and equipment were obtained at the port of Szczecin.

1) Phase 1 [Short Term Plan] (unit: mln zls)

i.	Preparation including demolition		3,500
ii.	Leveling and pavement (warehouse demolition site)		
		10,000 sqm	12,000
iii.	leveling and pavement	27,000 sqm	2,700
iv.	Purchase and assembly of a Gantry crane		75,000
v.	Railway for gantry crane		3,100
vi.	Railway reconstruction		1,000
vii.	Cable network system		2,500
viii.	Lighting system		600
ix.	Drainage system		2,500
x.	CFS		6,700
xi.	Equipment		
	Fork-lift (30t) x 4		18,000
	Fork-lift (6t) x 2		1,600
	Fork-lift (3t) x 6		2,220
	Tractor x 12		2,880
	Total		142,700
xii.	Engineering Fee		143,000
	Grand Total		157,000

2) Phase 2 [Long Term Plan] (unit: mln zls)

i.	Preparation including levelling (1998)	4,300
ii.	Quay construction work 200 m (1998)	40,000
iii.	Ro-Ro ramp with operation equipment (1998)	6,500
iv.	Dredging work	
	270,000 cbm next to quay, 300,000 cbm at waterway	28,500
v.	Revetment construction works	
	(north side and south side) (1998)	8,800
vi.	Terminal surface (pavement etc.) 6 ha	90,000
vii.	Purchase and assembly of two (2) Gantry cranes	
	(half in 1998)	150,000
v.	Railway for gantry crane	3,600
vi.	Transtainer for rail (half in 1998)	30,000

vii.	Railway construction		4,000
viii.	Access road construction		1,500
ix.	Cable network system		5,000
x.	Watering system (1998)		2,500
xi.	Drainage system (1998)		400
xii.	Sanitation system (1998)		5,000
xiii.	Administrative building		1,500
xiv.	Work-shop for maintenance		3,000
xv.	CFS	8,000 sqm	33,000
xvi.	Reconstruction of CPN structure		4,000
xvii.	Equipment		
	Fork-lift (30t) x 3		13,500
	Fork-lift (6t) x 2		1,600
	Fork-lift (3t) x 8		2,960
	Tractor x 10		14,000
	Trailer x 20		4,800
	Total		470,960
xviii.	Engineering Fee		47,100
	Grand Total		518,060
	in which payment in the year 1998		(162,000)

7.7 Project Evaluation

7.7.1 Project Description

This project aims at modernization of the Port of Szczecin to cope with the increasing unitized sea cargoes to and from Poland. At present, sea cargo transport has been remarkably changing to the direction of the unitized cargo transportation system. The system reduces cargo handling time and ship in port time which results in efficiency in the transport field. However, ports in Poland have not been modernized enough to cope with the circumstances. If the ports in Poland are not modernized, they would lose their sea cargoes significantly. Poland may have to rely on ports in foreign countries to transport the unitized cargoes in the future as long as the ports are not modernized. However, a substantial investment is necessary to modernize the ports. Therefore, this project should be evaluated carefully. Effects to the national economy should be evaluated appropriately as well as its financial effects to an entity which operates the modernized cargo handling business.

The plan of the Szczecin Port modernization consists of two stages. In the first stage, the existing Czechoslovackie quay will be improved to be able to handle 400 thousand tons of unitized cargoes per year. Necessary construction works with modern cargo handling equipment are planned in 1941.

In the second stage of the modernization, Ostraw Grabowski quay will be newly constructed which has a cargo handling capacity of 600 thousand tons of unitized cargoes per year. In 2000, the new quay will be in operation.

In general, expected major benefits by a port improvement project are time savings in cargo handling and time savings of ships-in-port. However, major benefits expected to the economy by this project are different from the usual port improvement projects. Because, if the port is not improved to a modernized one)without project case), almost unitized cargoes are considered to be handled in foreign ports. Foreign truckers and railways transport the unitized cargoes to Poland. The Polish economy will be required to pay the freight to the foreign countries. Therefore, major benefits considered i this study are saved expenses of the freight for land transport.

However, other effects to the economy, which were not calculated as the benefits of the project in this evaluation, are considered important as described below. Regarding decision making of the project execution, these effects should be taken into account together with the results of the economic and financial evaluation.

The development of the Port of Szczecin is considered to stimulate urban development of the city of Szczecin. The improvements and construction work will attract many laborers to the city. Related services to the workers will be necessary. Szczecin must cope with the demand and it will lead to the urban development of the city. After the completion of the project, the Port of Szczecin will become one of the most modernized and important ports in Poland. It will function as a distribution center of import and export cargoes by sea to and from the West European countries and the Baltic countries. The port will become one of the important ports of transit cargoes of foreign hinterlands such as Berlin in Germany and Prague in Czechoslovakia, as well. This will require more expansion of urban functions of Szczecin in its scale and quality. Further development of the city can be expected. Furthermore, the areas neighboring the modernized port and the developed city will have a great potential as an industrial development zone. Because, the area will have an excellent access to Western Europe and the area will be able to have access to one of the most advanced cargo information systems.

The development of the Port and the city of Szczecin will contribute to develop a regionally balanced growth of the nation as well.

Expected effects to financial aspects of an entity which operates the improved port are not different from the usual financial analysis. The entity will obtain increased cargo handling charges by the improvement. The profitability of the entity by the investment will be analyzed.

Regarding procedures of the economic and financial analyses, refer to Chapter 3 of this report which deals with the CMK Line improvement project.

7.7.2 Financial Evaluation

At present, various functions of the Port of Szczecin are shared by 16 port companies. The Port Authority leases the assets to the companies. The financial evaluation of the Port improvement project treated the companies as an aggregated group of companies (an entity) for simplification in this study.

The financial evaluation deals with the increased cost and the increased revenue of the group of the companies by the implementation of the project.

The coasts considered were investment cost of the improvement and construction of the two quays, maintenance and operation cost, depreciation and interest expenses. The revenues considered were from cargo handling and from ship services.

Assuming conditions of the project financing, future cash flow and profit/loss statements were projected based on the future cargo handling volume.

1) Major Premise

(1) Pricing date: Prices of June 1992

(2) Foreign exchange rate: 1 US dollar = 13,500 Zl = 130 Japanese Yen

(3) Project life: Twenty years after the commencement of the operation

2) Financial Analysis

(1) Investment Cost

a) Initial Investment Cost

Table 7.7.1 shows the initial investment cost of the project. The cost was derived from the costs shown in section 7.6 (Project Costs) by adding 15% of customs duty on the costs of foreign portion to obtain financial costs of the project. The turnover tax were not considered because the tax is exempted if the purpose of a project is for investment. The period of the investment are 1994 for the first stage improvement of Czechoslovackie quay, and for the second stage construction of Ostraw Grabowski quay in 1998 and 1999. The initial investment costs in 1994, 1998 and 1999 are 18,631,217,783 and 383,436 million Zl respectively.

Table 7.7.1 Construction Cost for the Port Improvement (Financial)

(Million Zl)

	1994	1998	1999	Total
Preparation including levelling	18200	4300	0	22500
Domestic portion	14560	3440	0	18000
Labor cost	3640	860	0	4500
Quay construction work	0	40000	0	40000
Domestic portion	0	32200	0	32200
Labor cost	0	7800	0	7800
Ro-Ro ramp with operation equipment	0	7475	0	7475
Foreign portion	0	7475	0	7475
Domestic portion				0
Labor cost				0
Dredging work	0	0	28500	28500
Domestic portion	0	0	23500	23500
Labor cost	0	0	5000	5000
Revetment construction works	0	8800	0	8800
Domestic portion	0	7040	0	7040
Labor cost	0	1760	0	1760
Terminal surface	0	0	90000	90000
Domestic portion	0	0	76500	76500
Labor cost	0	0	13500	13500
Purchase and assembly of gantry cran	86250	86250	86250	258750
Foreign portion	86250	86250	86250	258750
Domestic portion				0
Labor cost				0
Railway for gantry crane	3100	0	3600	6700
Domestic portion	2480	0	2880	5360
Labor cost	620	0	720	1340
Transtainer for railway	0	17250	17250	34500
Foreign portion	0	17250	17250	34500
Domestic portion				0
Labor cost				0
Railway construction	1000	0	4000	5000
Domestic portion	800	0	3200	4000
Labor cost	200	0	800	1000
Access road construction	0	0	1500	1500
Domestic portion	0	0	1200	1200
Labor cost	0	0	300	300
Cable network system	2500	0	5000	7500
Domestic portion	2000	0	4000	6000
Labor cost	500	0	1000	1500
Lighting system	600	0	2500	3100
Domestic portion	480	0	2000	2480
Labor cost	120	0	500	620
Telephone network	0	0	400	400
Domestic portion	0	0	320	320
Labor cost	0	0	80	80
Watering system	0	5000	0	5000
Domestic portion	0	4000	0	4000
Labor cost	0	1000	0	1000
Drainage system	2500	6000	0	8500
Domestic portion	2000	4800	0	6800
Labor cost	500	1200	0	1700
Sanitation system	0	1500	0	1500
Domestic portion	0	1200	0	1200
Labor cost	0	300	0	300
Administrative building	0	0	3000	3000
Domestic portion	0	0	2350	2350
Labor cost	0	0	650	650
Work-shop for maintenance	0	0	6500	6500
Domestic portion	0	0	5200	5200
Labor cost	0	0	1300	1300
CFS	6700	0	33000	39700
Domestic portion	6700	0	33000	39700
Labor cost	0	0	0	0
Reconstruction of CPN structure	0	0	4000	4000
Domestic portion	0	0	4000	4000
Labor cost	0	0	0	0
Equipment				0
Fork-lift(30t) (Foreign portion)	20700	0	15525	36225
Fork-lift(6t) (Foreign portion)	1840	0	1840	3680
Fork-lift(3t) (Foreign portion)	2553	0	3404	5957
Tractor (Foreign portion)	9660	0	16100	25760
Trailer (Domestic portion)	2880	0	4800	7680
Sub total	158483	176575	327169	662227
Foreign portion	121003	110975	140369	372347
Domestic portion	31900	52680	162950	247530
Labor cost	5580	12920	23850	42350
D/D and Engineering Service	14300	23550	23550	61400
Contingency	15848	17658	32717	66223
Total	188631	217783	383436	789850
Foreign portion	121003	110975	140369	372347
Domestic portion	62048	93888	219217	375153
Labor cost	5580	12920	23850	42350

b) Additional Investment Cost

Additional investment was not considered in the project. So, no additional investment costs were appropriated.

c) Reinvestment

Facilities and equipment invested for the improvement of the port have useful lives. Equipment such as fork-lifts has only 8 years of useful life. These are reinvested at the last year when the useful life expire. Reinvestment schedule and the amount of the investment by facility and equipment is shown in Table 7.7.2.

d) Residual Value

The financial viability of the project was analyzed on condition that the project life is twenty years. However, facilities and equipment invested and reinvested to this project last even after the project life. The project cost should be allocated appropriately within the project life. Therefore, the remaining value of the invested cost after the project life is appropriated as the residual value. The value is appropriated as a negative investment cost in the last year of the project life and is shown in Table 7.7.5.

(2) Revenues

According to the information of the Maritime Institute of Poland, cargo handling revenue per 1 TEU was 1,545 thousand Zl under the current tariff rate in Poland. Assuming that 75% of containers are 20-feet and the rest are 40-feet, the revenue of cargo handling is estimated as 1,598 thousand Zl per one container on the average. One container weighs 9.6 tons in average. Therefore, the unit revenue by cargo handling is estimated as 166.458 thousand Zl per one ton. Although various discount rates are usually adopted for cargo handling, the study team used the above value as an income rate for cargo handling at the Port of Szczecin for the analysis. The discounts are dealt with in a latter part of this section.

As to revenue from ship services at the port, a rate of 7,756.35 Zl per ton was adopted. The rate was derived from results at the TCT (Temporary Container Terminal) of Szczecin in 1991 by the Maritime Institute, in consideration with tonnage and berth dues for entering and leaving the port, charges for use of the berths at quay, towage, mooring and pilotage dues.

The increased port revenue by the project is shown in the Table 7.7.3 based on the future demand of increased unitized cargoes described in section 7.4 (Future Prospects).

Table 7.7.2 Reinvestment Schedule (Financial)

(Million Zl)

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Residual
Purchase and assembly of gantry cran	12					86250					172500	158125
Transtainer for railway	12					0					34500	25875
Telephone network	12					0					400	300
Reconstruction of CPN structure	5			4000					4000			0
Equipment												
Fork-lift(30t)	8	20700					15525			20700		12291
Fork-lift(6t)	8	1840					1840			1840		1150
Fork-lift(3t)	8	2553					3404			2553		1702
Tractor	8	9660					16100			9660		6843
Trailer	8	2880					4800			2880		2040
Total		37633	0	4000	0	86250	41669	0	4000	37633	207400	208325

Table 7.7.3 Revenue Increase of the Port of Szczecin

(Million Zl)

Revenue	1995	2000	2005
Cargo Handling Revenue	33,292	83,229	166,458
Ship Service Revenue	1,551	3,878	7,756

(3) Expenses

a) Maintenance and Operation Costs

Detailed information on maintenance and operation costs of the ports in Poland could not be obtained. The study team relied on the Maritime Institute regarding maintenance and operation cost information of the improved port.

Table 7.7.4 shows the maintenance and operation costs of the port regarding the Czechoslovackie and the Ostraw Grobowski quay. The cost is estimated by cargo handling volume of 200 and 340 thousand tons.

Table 7.7.4 Maintenance and Operation Cost Increase of the Port (Financial)

(Million Zl)

Maintenance and Operation cost	Czecho-Sl. 200,000	Czecho-Sl. 340,000	Ostrow Grobowski 200,000	Ostrow Grobowski 340,000
Material	644	1,220	668	1,285
Energy	1,220	2,073	1,400	2,300
Fuel	401	593	420	630
Personnel	3,269	4,150	3,269	4,150
Social Insurance	1,457	1,784	1,457	1,784
Taxes	726	726	726	726
Other Cost	157	267	157	267
Overhead	2,635	4,094	3,036	4,687
Total	10,509	14,907	11,133	158,529
Unit Cost (thous. Zl/ton)	52.55	43.84	55.66	46.56

The unit cost of 43.84 and 46.56 thousand Zl/ton was adopted to estimate the total maintenance and operation costs of the port for the Czechoslovackie and Ostraw Grobowski quay, respectively.

b) Depreciation

Table 7.7.5 shows depreciation costs based on the investment cost and an useful life table which was supplied by the Maritime Institute. The residual value includes the value of the reinvestment.

c) Interest Expense

Interest expenses on short term and long term loans were appropriated according to the conditions described in section (4) Financing.

Table 7.7.5 Depreciation and Residual Value of Port Improvement (Financial)

(Million Zl)

	Useful Life	Investment 1995	Investment 1998/9	1995 -1999	2000 -2014	Residual Value
Preparation including levelling	40	18200	4300	455	563	11788
Quay construction work	40	0	40000	0	1000	25000
Ro-Ro ramp with operation equipment	40	0	7475	0	187	4672
Dredging work	40	0	28500	0	713	17813
Revetment construction works	40	0	8800	0	220	5500
Terminal surface	25	0	90000	0	3600	36000
Purchase and assembly of gantry cran	12	86250	172500	7188	21563	158125
Railway for gantry crane	25	3100	3600	124	268	2060
Transtainer for railway	12	0	34500	0	2875	25875
Railway construction	25	1000	4000	40	200	1800
Access road construction	25	0	1500	0	60	600
Cable network system	40	2500	5000	63	188	4375
Lighting system	25	600	2500	24	124	1120
Telephone network	12	0	400	0	33	300
Watering system	25	0	5000	0	200	2000
Drainage system	25	2500	6000	100	340	2900
Sanitation system	25	0	1500	0	60	600
Administrative building	40	0	3000	0	75	1875
Work-shop for maintenance	40	0	6500	0	163	4063
CFS	40	6700	33000	168	993	23975
Reconstruction of CPN structure	5	0	4000	0	800	0
Equipment						
Fork-lift(30t)	8	20700	15525	2588	4528	12291
Fork-lift(6t)	8	1840	1840	230	460	1150
Fork-lift(3t)	8	2553	3404	319	745	1702
Tractor	8	9660	16100	1208	3220	6843
Trailer	8	2880	4800	360	960	2040
Total		158483	503744	12865	44135	354465

(4) Financing

The World Bank loan as a long term loan was assumed to finance the improvement project. The conditions of the loan are as follows:

Period	:	15 years with 5-year grace period
Interest rate	:	7.6 % p.a.

To finance the entity's working fund, a short term loan was considered as well. The condition of the loan (1 year) is assumed based on the prevailing loan condition in Poland. Its interest rate was assumed 55 % p.a.

Government subsidy were also considered to make the project viable. They are subsidies to the short term interest expense.

(5) Analysis and Evaluation

Table 7.7.6 shows the results of the financial analyses of the project. FIRR of the project is 11.07%. The project does not seem bad from the value. However, the net profit which shows a positive value until 1999 changes to the negative after 2000, and after raising profits in 2005 and 2006, the value becomes negative again toward the last year of the project life. The reason why the entity suffers a deficit, although the FIRR is significantly high than the assumed interest rate of the long term loan, is largely due to the short term loans with extremely high interest rate to finance the reinvestment cost of the project. Government subsidy for interest payment needs to be considered. If the expense is subsidized by the government, the project can be operated favorably though the entity suffers a deficit from 2000 to 2002. If the government subsidizes 20% of the initial investment cost of the project, the FIRR will be improved to 15.54%. However, the entity will still suffer a deficit in 2001 and from 2012.

As described above, the financial prospect of the project was not satisfactory. For improving financial viability, maintenance and operation costs should be curtailed to the maximum possible extent while, at the same time, cargo handling charges should be reviewed to increase by taking account of international competitions as well as cost recovery.

Government subsidy is necessary to make the project financially viable. However, efficient management of the entity should be stressed strongly to reduce the maintenance and operation costs.

Table 7.7.6 Financial Analysis of Port Improvement Project

FIRR(%): 11.07
Construction Cost: 1.00
Revenue: 1.00
Interest Rate (%)
Long Term Loan: 7.60
Short Term Loan: 55.00
Government Subsidy 0.00

(Million Zl)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Profit and Loss											
Operating Revenue	0	34843	45296	55748	66201	69686	87107	104528	121950	139371	156793
Cargo Handling Fee	0	33292	43279	53267	63254	66583	83229	99875	116521	133166	149812
Ship Servicing Fee	0	1551	2017	2482	2947	3102	3878	4654	5429	6205	6980
Operating Expense	0	21633	24263	26894	29524	30401	35057	70983	75639	80295	84951
Maintenance & Operation	0	8768	11398	14029	16659	17536	22192	26848	31504	36160	40816
Depreciation	0	12865	12865	12865	12865	12865	12865	44135	44135	44135	44135
Operating Profit	0	13210	21032	28855	36677	39285	52050	33545	46311	59076	71842
Other Revenue											
Government Subsidy a)											
Interest Expense	0	14336	14336	14336	14336	30887	60029	66282	68954	66075	75289
Short Term Loan	0	0	0	0	0	0	0	7687	11793	10347	20995
Long Term Loan	0	14336	14336	14336	14336	30887	60029	58595	57161	55728	54294
Net Profit	0	-1126	6696	14519	22341	8397	-7979	-32737	-22643	-6999	-3448
Accumulated Net Profit		-1126	5570	20089	42430	50827	42849	10112	-12532	-19531	-22978
Financial Cash Flow											
Cash In	0	26075	33897	41720	49542	52150	64915	77680	90446	103211	115977
Operating Profit	0	13210	21032	28855	36677	39285	52050	33545	46311	59076	71842
Other Revenue											
Depreciation	0	12865	12865	12865	12865	12865	12865	44135	44135	44135	44135
Cash Out	188631	0	0	0	217783	383436	0	0	0	37633	0
Investment	188631	0	0	0	217783	383436	0	0	0	37633	0
Residual Value											
Cash Flow	-188631	26075	33897	41720	-168241	-331286	64915	77680	90446	65578	115977
Financial Program											
Source	188631	26075	33897	41720	267325	435586	64915	77680	90446	103211	115977
Long Term Loan	188631	0	0	0	217783	383436					
Operating Profit	0	13210	21032	28855	36677	39285	52050	33545	46311	59076	71842
Depreciation	0	12865	12865	12865	12865	12865	12865	44135	44135	44135	44135
Other Revenue											
Government Subsidy a)	0	0	0	0	0	0	0	0	0	0	0
Government Subsidy b)	0	0	0	0	0	0					
Use	188631	14336	14336	14336	232119	414323	78892	99122	109259	141384	154104
Investment	188631	0	0	0	217783	383436	0	0	0	37633	0
Principal Repayment	0	0	0	0	0	0	18863	32840	40305	37676	78815
Long Term Loan	0	0	0	0	0	0	18863	18863	18863	18863	40641
Short Term Loan	0	0	0	0	0	0	0	13977	21442	18813	38173
Interest Expense	0	14336	14336	14336	14336	30887	60029	66282	68954	66075	75289
Long Term Loan	0	14336	14336	14336	14336	30887	60029	58595	57161	55728	54294
Short Term Loan	0	0	0	0	0	0	0	7687	11793	10347	20995
Net Cash Flow	0	11739	19561	27384	35206	21262	-13977	-21442	-18813	-38173	-38127

Table 7.7.6 Financial Analysis of Port Improvement Project - Continued

FIRR(%):	11.07
Construction Cost:	1.00
Revenue:	1.00
Interest Rate (%)	
Long Term Loan:	7.60
Short Term Loan:	55.00
Government Subsidy	0.00

(Million Zl)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Profit and Loss										
Operating Revenue	174214	174214	174214	174214	174214	174214	174214	174214	174214	174214
Cargo Handling Fee	166458	166458	166458	166458	166458	166458	166458	166458	166458	166458
Ship Servicing Fee	7756	7756	7756	7756	7756	7756	7756	7756	7756	7756
Operating Expense	89607	89607	89607	89607	89607	89607	89607	89607	89607	89607
Maintenance & Operation	45472	45472	45472	45472	45472	45472	45472	45472	45472	45472
Depreciation	44135	44135	44135	44135	44135	44135	44135	44135	44135	44135
Operating Profit	84607	84607	84607	84607	84607	84607	84607	84607	84607	84607
Other Revenue										
Government Subsidy a)										
Interest Expense	72176	80703	91720	156235	231712	325785	464856	698915	1155078	1748061
Short Term Loan	20970	35500	52520	123038	204518	304594	448235	686863	1147595	1745147
Long Term Loan	51205	45203	39200	33197	27194	21191	16622	12053	7483	2914
Net Profit	12431	3904	-7113	-71628	-147105	-241178	-380249	-614308	-1070471	-1663454
Accumulated Net Profit	-10547	-6643	-13756	-85384	-232489	-473667	-853916	-1468225	-2538696	-4202150
Financial Cash Flow										
Cash In	128742	128742	128742	128742	128742	128742	128742	128742	128742	128742
Operating Profit	84607	84607	84607	84607	84607	84607	84607	84607	84607	84607
Other Revenue										
Depreciation	44135	44135	44135	44135	44135	44135	44135	44135	44135	44135
Cash Out	4000	0	86250	41669	0	4000	37633	207400	0	-354465
Investment	4000	0	86250	41669	0	4000	37633	207400	0	0
Residual Value										-354465
Cash Flow	124742	128742	42492	87073	128742	124742	91109	-78658	128742	483207
Financial Program										
Source	128742	128742	128742	128742	128742	128742	128742	128742	128742	128742
Long Term Loan										
Operating Profit	84607	84607	84607	84607	84607	84607	84607	84607	84607	84607
Depreciation	44135	44135	44135	44135	44135	44135	44135	44135	44135	44135
Other Revenue										
Government Subsidy a)	0	0	0	0	0	0	0	0	0	0
Government Subsidy b)										
Use	193288	224234	352447	500594	682549	943714	1377583	2215278	3301737	4959400
Investment	4000	0	86250	41669	0	4000	37633	207400	0	0
Principal Repayment	117112	143531	174477	302690	450837	613929	875094	1308963	2146658	3211338
Long Term Loan	78985	78985	78985	78985	78985	60122	60122	60122	60122	38344
Short Term Loan	38127	64546	95492	223705	371852	553807	814972	1248841	2086536	3172995
Interest Expense	72176	80703	91720	156235	231712	325785	464856	698915	1155078	1748061
Long Term Loan	51205	45203	39200	33197	27194	21191	16622	12053	7483	2914
Short Term Loan	20970	35500	52520	123038	204518	304594	448235	686863	1147595	1745147
Net Cash Flow	-64546	-95492	-223705	-371852	-553807	-814972	-1248841	-2086536	-3172995	-4830658

7.7.3 Economic Evaluation

Economic evaluation deals with costs and benefits of a project to the national economy. Efficiency of the project to the economy are analyzed by estimated EIRR and B/C. The NPV represents an increased surplus to the economy by the project.

The benefits and the costs of the project were measured as difference between "with" and "without" implementation.

Benefits considered in this study were cost saving and time saving of land/sea transport. Costs considered were investment costs. The maintenance and operation cost of the port including cargo handling cost was considered as disbenefit.

Evaluation criteria were calculated based on future economic cash flow which was projected based on the benefits and the costs.

1) Major Premise

Pricing date, foreign exchange rate and project life for the economic evaluation are same as the premises of the financial evaluation.

2) Benefits

As explained in 7.7.1, it is considered that a half of the unitized cargoes, which will be handled at the improved port in the case of "with project", will be handled at foreign ports and the cargoes will be transported from the foreign ports to Poland by various land transport modes in the case of "without project". The evaluation deals with necessary costs of the project and increased benefit to the national economy. The difference of the benefit between the "with" case and the "without" case should be measured.

Appropriated benefits in this evaluation are as follows:

- Time saving benefits of land transport between "with" and "without" case
- Cost saving benefit of land transport between "with" and "without" case
- Cargo handling cost increase was appropriated as disbenefit of the project

Cargo handling time saving and time saving of ship-in-port were not appropriated as benefits as mentioned before. The benefits were considered rather small than the above mentioned benefits regarding the land transport, and reliable information on the cargo handling/ship-in-port time was not obtained.

a) Assumptions

To calculate the time saving and the cost saving benefits, following assumptions were adopted for simplification:

- In the case of "without", Port of Hamburg was assumed to handle a half of the unitized cargoes which will be handled at the improved Port of Szczecin. The remaining half was assumed to be handled at the Port of Gdynia.

- Poznan was assumed as a representative origin and destination of all the unitized cargoes. Transit cargoes were no considered.

- Land transport mode was assumed as trucks.
- Transport time and freight between the Port of Hamburg/Port of Szczecin and Poznan was assumed as Table 7.7.7 (Refer to 7.3).

Table 7.7.7 Land Transport Time and Freight

(hours, thousand Zl)

Port	Time	Freight/TEU
Port of Hamburg	22.0	13,829
Prot of Gdynia	7.8	10,010
Port of Szczecin		
Mother Port	5.0	7,382
Feeder Port	106.0	12,850

b) Time Saving Benefit

A half of the unitized cargoes was assumed to generate form Baltic countries. The time saving is 2.8 hours, because the Port of Szczecin is considered as a mother port. The remaining half was assumed to use a feeder service from the Port of Hamburg. The time saving is -84 hours (necessary feeder transport time by sea between Hamburg and Szczecin was considered). Table 7.7.8 shows the time saving of land transport, though the total time saving is negative.

Table 7.7.8 Time Saving of Land Transport

(Thousand ton-hour/year)

Service	1995	2000	2005
Direct Service	252	672	1,372
Feeder Service	-7,560	-20,160	-41,160

Time value to convert the saved time in terms of money was estimated based on value of container cargo per ton. According to the customs office of Szczecin and Gdynia, the value of the cargo per one ton was 7.52 million Zl in 1991. Time value of the cargo was estimated as 472 Zl/ton/hour, assuming an annual interest rate of short term loan of 55 %. Total time saving benefit by the improvement project is shown in Table 7.7.9. Time value of the cargo in June 1992 was regarded as same as the value in 1991. The time value was assumed to grow in proportion to the GDP growth of Poland.

Table 7.7.9 Benefit of Land Transport Time Saving

(Million Zl)

	1995	2000	2005
Direct Service	132	421	1,065
Feeder Service	-3,963	-12,627	-31,667

c) Cost Saving Benefit

As explained before, the half of the unitized cargoes, which will be handled at the Port of Szczecin in the case of "with", were assumed to be handled at the Port of Hamburg in the case of "without". German truckers carry their cargoes to Poznan.

The Polish economy is required to pay the freight to the German truckers. This payment was considered as the economic cost to the country.

In the case of "with", the cargoes are handled at the Port of Szczecin. Polish truckers carry them to Poznan. The Polish economy pays only a portion of the economic cost of the cargo transportation. The cost savings of the remaining half, which is handled at the Port of Gdynia in the "without case", were appropriated based on the land transport cost difference shown in Table 7.7.7.

Difference of the transport cost between "with" and "without" case was considered as the cost saving benefit to the economy. Economic cost of the land transport by trucks of Poland was assumed as 80% of the freight in Table 7.7.7. Resultant cost saving benefit is shown in Table 7.7.10.

Table 7.7.10 Benefit of Land Transport Cost Saving

(Million Zl)

	1995	2000	2005
Cost Saving Benefit	58,347	155,593	317,668

Increase of the maintenance and operation cost of the Port of Szczecin is regarded as disbenefit of the project as mentioned before. The economic cost was derived from the cost in financial price. Taxes, tax elements and transfer elements were excluded from the financial cost. Table 7.7.11 shows the estimated maintenance and operation cost of the Port of Szczecin in economic price.

Table 7.7.11 Operation and Maintenance Cost (Economic)

(Million Zl)

	Czecho-Sl.		Ostrow Grobowski	
	200,000	340,000	200,000	340,000
Material	644	1,220	668	1,285
Energy	1,220	2,073	1,400	2,300
Fuel	304	449	318	477
Personnel	2,615	3,320	2,615	3,320
Social Insurance	0	0	0	0
Taxes	0	0	0	0
Other Cost	157	267	157	267
Overhead	2,195	3,571	2,595	4,163
Total	7,135	10,901	7,753	11,813
Unit Cost (thous. Zl/ton)	35.67	32.06	38.77	34.74

Future maintenance and operation cost in economic price was obtained by multiplying the unit costs with the future increased cargo handling volume.

3) Costs

(1) Investment Cost

a) Initial Investment Cost

Initial investment cost of the project in economic price was derived from the financial cost shown in 7.7.1. The customs duty of the foreign portion was

excluded. Social insurance cost and income tax elements were excluded from the labor cost of the table as well. Table 7.7.12 shows the initial investment cost. Additional investment cost of the project was not appropriated as explained before.

b) Reinvestment Cost

Reinvestment cost of the project was appropriated the same as the financial analysis. Adjustment to convert the financial price to the economic price was made. The reinvestment schedule and the cost in economic price are shown in Table 7.7.13.

c) Residual Value

Residual value was appropriated in the last year of the project life as well as the financial analyses. The value was calculated as 315,313 million Zl based on the investment costs in economic price.

Table 7.7.12 Construction Cost for the Port Improvement (Economic)

(Million Zl)

	1994	1998	1999	Total
Preparation including levelling	16198	3827	0	20025
Domestic portion	14560	3440	0	18000
Labor cost	1638	387	0	2025
Quay construction work	0	35710	0	40000
Domestic portion	0	32200	0	32200
Labor cost	0	3510	0	7800
Ro-Ro ramp with operation equipment	0	6500	0	8596
Foreign portion	0	6500	0	8596
Domestic portion				0
Labor cost				0
Dredging work	0	0	25750	28500
Domestic portion	0	0	23500	23500
Labor cost	0	0	2250	5000
Revetment construction works	0	7832	0	8800
Domestic portion	0	7040	0	7040
Labor cost	0	792	0	1760
Terminal surface	0	0	82575	90000
Domestic portion	0	0	76500	76500
Labor cost	0	0	6075	13500
Purchase and assembly of gantry cran	75000	75000	75000	225000
Foreign portion	75000	75000	75000	225000
Domestic portion				0
Labor cost				0
Railway for gantry crane	2759	0	3204	6700
Domestic portion	2480	0	2880	5360
Labor cost	279	0	324	1340
Transtainer for railway	0	15000	15000	30000
Foreign portion	0	15000	15000	30000
Domestic portion				0
Labor cost				0
Railway construction	890	0	3560	4450
Domestic portion	800	0	3200	4000
Labor cost	90	0	360	450
Access road construction	0	0	1335	1335
Domestic portion	0	0	1200	1200
Labor cost	0	0	135	135
Cable network system	2225	0	4450	6675
Domestic portion	2000	0	4000	6000
Labor cost	225	0	450	675
Lighting system	534	0	2225	2759
Domestic portion	480	0	2000	2480
Labor cost	54	0	225	279
Telephone network	0	0	356	356
Domestic portion	0	0	320	320
Labor cost	0	0	36	36
Watering system	0	4450	0	4450
Domestic portion	0	4000	0	4000
Labor cost	0	450	0	450
Drainage system	2225	5340	0	7565
Domestic portion	2000	4800	0	6800
Labor cost	225	540	0	765
Sanitation system	0	1335	0	1335
Domestic portion	0	1200	0	1200
Labor cost	0	135	0	135
Administrative building	0	0	2643	2643
Domestic portion	0	0	2350	2350
Labor cost	0	0	293	293
Work-shop for maintenance	0	0	5785	5785
Domestic portion	0	0	5200	5200
Labor cost	0	0	585	585
CFS	6700	0	33000	39700
Domestic portion	6700	0	33000	39700
Labor cost	0	0	0	0
Reconstruction of CPN structure	0	0	4000	4000
Domestic portion	0	0	4000	4000
Labor cost	0	0	0	0
Equipment				0
Fork-lift(30t) (Foreign portion)	18000	0	13500	31500
Fork-lift(6t) (Foreign portion)	1600	0	1600	3200
Fork-lift(3t) (Foreign portion)	2220	0	2960	5180
Tractor (Foreign portion)	8400	0	14000	22400
Trailer (Domestic portion)	2880	0	4800	7680
Sub total	139631	154994	295743	590368
Foreign portion	105220	96500	122060	323780
Domestic portion	31900	52680	162950	247530
Labor cost	2511	5814	10733	19058
D/D and Engineering Service	14300	23550	23550	61400
Contingency	13963	15499	29574	59037
Total	167894	194043	348867	710804
Foreign portion	105220	96500	122060	323780
Domestic portion	60163	91729	216074	367967
Labor cost	2511	5814	10733	19058