

UNIVERSIDAD POLITECNICA DE CATALUÑA

TITLE

**“ANALYSIS OF THE MARITIME LOGISTIC SYSTEM IN CHILE AND THE
DESIGN OF A PARAMETRIC MODEL TO DECISION MAKING”**

Ph. D. Thesis Proposal presented by: RODRIGO GARCIA – BERNAL

Director: Ph.D. German de Melo Rodriguez

**“A thesis submitted in partial fulfilment of the requirements of the
Polytechnic University of Cataluña, Department of Nautical Engineering
for the degree of Doctor in Nautical, Marine and Naval Radioelectronic
Engineering“**

Barcelona, October 2015

SUMMARY

1. Personal Information of Doctor Candidate and Thesis Director, Title of the Thesis

1.1 Personal Details of Doctor Candidate and Thesis Director

a) Doctor Candidate: Rodrigo **GARCIA-BERNAL**

b) Thesis Director: Dr. German **de MELO RODRIGUEZ**

1.2 Thesis Title:

Analysis of the Maritime Logistic System in Chile and the Design of a Parametric Model for Decision Making

2. Project Summary

Throughout the course of time, the world has witnessed changes that have only recently been contemplated by strategists and politicians. Advances in technology and research have triggered the development of industry with unanticipated speed, a good example of this being the revolution in communications and information systems.

The internationalisation of investments and the globalisation of markets have created a high level of competition among manufacturing and service companies which has transcended the competition among nations. In this environment, quality information and exact timing are the sole answers for generating comparative and competitive advantages with respect to other manufacturers and providers.

Inspired by these challenges, Latin American countries have searched for ways to increase and diversify their exports in order to heighten their trade balance surpluses. This, in turn, helps them to overcome their debt problems and gain access to a better quality of life.

With these criteria in mind, these countries have begun to join the economic aperture and globalisation processes. United by their common ethnic heritage, they are driven by the growing need to co-ordinate national and regional decisions in order to achieve a harmonic community development.

The efficiency principle imposed by the present international trade scenario requires extreme attention to detail in the administration of production costs and in placing products on the market. Because a product's success is highly sensitive to cost and distribution methods, maritime transport and its associated systems require very specific management techniques. Those management techniques must take into account that as transport is a service it gives added value to the cargo.

Thus, the management model, costs involved, planning processes, and area policies are topics of vital importance for achieving these nations' development objectives. The design of specific policies, both operational as well as for development (investments), should comply with certain minimum conditions. The resulting policies

should satisfy integrally and harmoniously the requirements the State establishes in its general National Development Strategy. This strategy considers the factors of monetary and trade uncertainty. States must be particularly careful to interpret changes, tendencies, circumstances and difficulties which emerge in the international markets they serve, correctly.

Therefore, the purpose of this study is to analyse the existing maritime transport logistic system in Chile, beginning with the history of ports and economic development. Subsequently, this study will analyse all relevant information related to logistics and the lesson learnt during the process of modernization.

For analytical purposes, the study establishes an evaluation area which has been represented by a “graph” built up from nodes and links. These symbolise the complex network of port systems, hinterlands, roads, railways and coastal shipping. Likewise, the links and nodes have direction, intensity and values that the study intends to describe and evaluate.

Moreover, nowadays hinterlands are not as exclusive as they were before. Consequently, most of the port systems face an extremely competitive market in offering services for international hinterlands/foreland. Therefore, this thesis will conclude that at least some Latin American countries establish land bridges between them. There have already been some studies about the land bridges, “inter-oceanic corridors” or “integration corridors” options in South America.

The Pacific Ocean Basin and the APEC countries represent a huge market for those Atlantic countries which have products to export and import from that vast area of the globe. The existence of the main industrial site of South America running from the Atlantic side of South America to the Pacific Coast, which forms an “Industrial Banana”, is the foundation of a massive demand to and from both coasts.

The study evaluated the logistics system through different criteria, such as logistics, physical capacities, and economic, social, environmental and political considerations.

Having established these criteria, the researcher can better evaluate which are the relevant parameters and variables to consider in the design of the parametric model. The model itself constituted a valuable tool in the decision-making process.

3. Project Objective

To study the historical development of the Chilean port system, learn from the modernization process, evaluate its success and failures; describe the logistic platform in Chile and its Region; and derive the relevant components, parameters, and variables to design a Parametric Model for decision making at the port sector of Chile.

4. Current Situation at the Port Sector

Currently the port and logistic system in Chile is made up of a model which beginning in 1978, with the design of a new Economic Policy. The new policy was oriented to the reduction of the last consumer prices by mean of: protecting the private ownership of the productive means, promoting competition, liberalization of the unionism, opening the labour market to all citizen without restriction deregulating the labour market,

liberalization of all economic sectors, implementing a liberalization of the exchange rate for export and import currency (US Dollar), decentralization of the decision making, deregulating the financial sector, reducing the customs' rates and barriers, promoting the improvement of the management and business innovation, and implementation of the "subsidiary principle", as a way to increase the industrial and service sector productivity and provide more job opportunities for the population.

As a result of that the productive and economic sectors were able to increase their mobilization and productivity originating a surplus in those productive sector and product which present better comparative and competitive advantages. The Government start to help the exporters with promotion policies (zero subsidies, Chilean Product as guarantee of quality, promoting and organizing international road show for exporters, looking for market opportunities abroad) that initiative together with and improvement on the marketing strategies of the private companies, allowed to increase the foreign trade of the country. Regarding imports, because of the reduction of the import taxes the commercial sector was able to import those products were the national factories were not competitive, resulting in a reduction of the prices for the last consumers, especially on certain products like textile and clothes, electronics and cars. Off course that impact negatively in the related national industry which was not able to compete with the import ones. The measures applied do not helped some of the productive sectors which were not competitive and when out of the market, but help the majority of the country population (main objective of the economic policy).

Therefore, considering the structural changes were generalized and applied to all productive sectors, the port sector was able to reduce their operational costs mainly on labour costs using the liberalization of the labour market and rationalization of the work force use (start in 1978, against all predictions and tendencies). The private port operators saw an opportunity with the increasing volume of export and import cargoes. In that sense, private management schemes and innovative methodologies were applied to increase the port productivity and decrease the ship turnaround time. This approach, against all predictions from the European experts and academicians because the new port model do not implied big investment neither in infrastructure nor in technology until the port concession start in 1997, however, was successful increasing 4 times the port productivity.

Because of the market oriented policies, for the State was not allowed to intervene and or invest on areas were the private sector was interested, for instance the port sector, unless some strategic development was required and the private sector was not available or interested then the State became forced to intervene protecting or helping the development (mainly on remote areas) of the local population (application of the "subsidiarity principle" of the National Constitution) until the private show interest, time when the State phase out.

However, the port sector works in a proper manner, some restriction and rule of engagement (regulatory regime) were necessary especially because many foreign investors appear on scene, with different behaviour and requirements for a proper rule of law.

No matter the several changes and modernization processes, still exist some not well developed areas like the logistic services, where the Intermodal transport system do not perform under UNCTAD standards, but mainly because of the liberalization of the Chilean system where the client is the cargo and the cargo owners put the conditions of the transport under normal open market system, road carriers are free to enter or to leave the market under certain safety conditions, tariffs are not regulated and commercial agreements are in accordance to the Commercial Code, been the parties who agree on the service modalities and conditions, existing legal and judicial options to solve the problems. That made difficult to applied more restrictive or invasive models like the UNCTAD standard.

Regarding the investment approach is mainly done with an assessment of the project financial feasibility, if the result is positive and financially feasible, the investment is made; only when the maximum capacity of the existing system is reached. Is important to consider that because, there are not subsidies in the market, no over investments are made. Only those investments which provide a good rate of return (financial for private and social and financial for State) to the investors, are made, this approach can be seen either in State and private investment.

Nonetheless, the Chilean port model was pioneer around the world (1978-1981) the process took long time until was complete (1978 till 1997) specially because of the unique form and lack of similar experiences around the world on the matter. However, the gained experiences there are very few Chilean publications on the issue. Majority of the papers have been written by foreigners, international organization, even though sometimes do not represent the real model and its objectives of the modernization process, because their studies are mainly concentrated on investment and level of salaries.

Currently, the presence of Chilean professional (experts) on international forum is still scarce; even though most of the delegations are form by politicians without technical expertise. That is mainly because of the very practical approach of the nationals from the private sector, and also not to many professional are interested in to research and write a document, to which we can add the big constrain and barrier of English language. In that sense, the use of methodological tools is still one constrain and restrain on the making decision process, for what a more practical approach is used.

5. Brief Description of the Project

The project is suggested to be divided in 6 Chapters:

Chapter 1, includes some maritime economics facts fund in the Chilean maritime industry, analysis of the port development, costs related to ships in port, port tariff system, description of the port system, labour organization and its reform, the port modernization process, and its failures and successes.

Chapter 2: analyze the political and strategic level, discussing matters like the added value of the maritime transport, design of maritime policies, the Chilean case of maritime commercial policies, and a description of the port nodes in Chile.

Chapter 3: Made study the Regional logistics in Latino America, the logistics and the graph theory, the identification of the potential nodes of the Graph, and the Bio-oceanic Corridors or Integration Corridors, and the logistic platforms in the South Cone of LA.

Chapter 4: is for data collection of the details of the different corridors.

Chapter 5: This Chapter is for the design of the Parametric Model, describing its methodology, theoretical principles, and final design of the evaluation matrixes.

Chapter 6: Includes some Conclusions and Recommendations.

Finally some Annexes where prepared, as following:

- Annex 1: Present the description of the elements that constitute the port system;
- Annex 2: Includes the methodology to forecast the container terminal demand;
- Annex 3: The theoretical approach (matrixes of the model) applied to Port of Valparaiso.

For more details, please see Annex A

6. Methodology of Research

Research: Collection of historical data and interview of the actors;

Analysis: Assessment of the results and performance in the historical perspective. After the assessment of the results the author made a comparison with other BAT's.

Design of the solution: Because the lack of methodological approach on making decision processes.

Research: About the historical development of the Chilean port system, evaluation of the results, failures and successes; and research and analysis of the political and strategic development in the target sector.

Data collection and analysis of the performance compared with other BAT's.

Finally, the author made the identification of the requirements for the design of the matrixes and their analysis.

7. Work Plan

ACTIVITY/PERIOD	First Year		Second Year		Third Year
	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem
RESEARCH AND DATA COLLECTION					
Identification of the available bibliography					
Study and analysis of the bibliography					
Historical data collection for the years of the analysis					
ANALYSIS AND ASSESSMENT					
Analysis of the bibliography					
Assessment of the results					
DESIGN					
Design of the matrixes					
PROJECT WRITING					
Writing the Thesis					
DEFENSES					
Defend the Thesis presentation					
Final Thesis Defense					

8. Bibliography

Please see Annex A,page 161

Rodrigo Garcia – Bernal
Doctor Candidate
June 2012

ANNEX A

ABSTRACT

Throughout the course of time, the world has witnessed changes that have only recently been contemplated by strategists and politicians. Advances in technology and research have triggered the development of industry with unanticipated speed, a good example of this being the revolution in communications and information systems.

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Thus, the management model, costs involved, planning processes, and area policies are topics of vital importance for achieving these nations' development objectives. The design of specific policies, both operational as well as for development (investments), should comply with certain minimum conditions. The resulting policies should satisfy integrally and harmoniously the requirements the State establishes in its general National Development Strategy. This strategy considers the factors of monetary and trade uncertainty. States must be particularly careful to interpret changes, tendencies, circumstances and difficulties which emerge in the international markets they serve, correctly.

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The Pacific Ocean Basin represents a huge market for those Atlantic countries which have products to export and import from that vast area of the globe. The existence of the main industrial site of South America running from the Atlantic side of South America to the Pacific Coast, which forms an “Industrial Banana”, is the foundation of a massive demand to and from both coasts.

The study evaluated the logistics system through different criteria, such as logistics, physical capacities, and economic, social, environmental and political considerations.

Having established these criteria, the researcher can better evaluate which are the relevant parameters and variables to consider in the design of the parametric model. The model itself constituted a valuable tool in the decision-making process.

Declaration

No part of this thesis has been submitted for any award or degree at any other institute. While registered as a candidate for the degree of Doctor of Philosophy the author has not registered for another award at any other university or institute

Dedication

To Jacqueline for her support and perseverance. To my parents Teresa and Fernando, from whom I continue drawing inspiration and admiration.

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I would like to sincerely thank Dr. Malek Pourzanjani and Dr. German De Melo for their professional advice and continued encouragement and support.

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“ANALYSIS OF THE MARITIME LOGISTIC SYSTEM IN CHILE AND THE DESIGN OF A PARAMETRIC MODEL TO DECISION MAKING”

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INTRODUCTION

Throughout the course of time, the world has witnessed changes that have only recently been contemplated by strategists and politicians. Advances in technology and research have imbued the development of industry with unanticipated speed, a good example of this being the revolution in data management and communications systems.

The internationalisation of investments and the globalisation of markets have created a high level of competition among manufacturing and services companies which has transcended the competition among nations. In this environment, quality information and exact timing are the sole answers for generating comparative and competitive advantages with respect to other services providers.

Inspired by these challenges, Latin American countries have searched for ways to increase and diversify their exports in order to heighten their trade balance surpluses. This, in turn, helps them to overcome their debt problems and gain access to a better quality of life for their population.

With these criteria in mind, these countries have begun to join the economic aperture and globalisation processes. United by their common ethnic heritage, they are driven by the growing need to co-ordinate national and regional decisions in order to achieve a harmonic community development.

The efficiency principle imposed by the present international trade scenario requires extreme attention to detail in the administration of production costs and in placing products on the market. Because a product's success is highly sensitive to cost and distribution methods, maritime transport and its associated systems require very specific management techniques. These techniques must take into account that as transport is a service it gives added value to the cargoes.

Thus, model management, costs, planning, general and specific policies, and maritime governance are topics of vital importance for achieving these nations' development objectives. The design of specific policies, both operational as well as for investments, should comply with certain minimum conditions. The resulting policies should satisfy integrally and harmoniously the requirements the State establishes in its general Development Strategy or Agenda. This strategy considers the factors of financial and trade uncertainty. States must be particularly careful to interpret changes, tendencies, circumstances and difficulties which emerge in the international markets they serve correctly, for they have to ensure the use of qualified professionals and methods.

In accordance with the general work programme planned with the Polytechnic University of Cataluña, Nautical and Nautical Engineering Department, the researcher has been studying the references listed in the attached bibliography.

At the same time, he has been reviewing container forecasts for national trade, provided by the major national cargo carriers. The researcher has identified and taken into account such parameters and variables as: GNP; trade (exports and imports) growth rate; container penetration rate; etc.

The research has also focused on the existence of land bridges or "inter-oceanic corridors." Furthermore, the study identifies an industrial zone, named by the researcher as the "Industrial Banana", where demand for maritime transport should be measured.

A survey to determine how changes in maritime policy affect international trade. This data has been useful for understanding the relationship between the maritime environment and business and port operations. From this analysis, the researcher derived recommendations for maritime policy-making in developing countries.

Finally, a methodology has been designed to define the physical capacities of a port system and a container terminal. This methodology has assisted the researcher in evaluating the target ports' capacities. The researcher has attempted to design a model to forecast demand for containers and later to calculate a demand by land, which a containers terminal needs to fulfil the demand forecasted.

CHAPTER I. MARITIME ECONOMICS

1.1. SURVEY ON PORTS AND ECONOMIC DEVELOPMENT IN CHILEAN TRADE. INSTITUTIONAL CHANGES AND THEIR IMPACT ON PORT EFFICIENCY.

1.1.1. INTRODUCTION.

This study's principal objective is to carry out a global analysis of the difficulties associated with port systems in relation to the physical distribution of merchandise through international trade. This study also incorporates administrative and operational matters, as well as some aspects of the modernisation process Latin America is presently undergoing.

The inclusion of the historical evolution of each of the entities involved in the cargo transfer process is appropriate, as an analysis of the current situation and the future outlook would be partial and incomplete without it.

In the first stage, the researcher attempts to provide a general focus. This should serve as a basis for further analysis of the causes and effects of deregulation in Latin American ports. Hopefully, with this in mind, future studies will go deeper into the subject and deal adequately with each topic.

1.1.2. PORT SERVICES.

1.1.2.1. THE ROLE OF TRANSPORT IN THE ECONOMY.

Commerce requires the physical distribution of raw materials and manufactured goods from their production sources to the different consumer centres, where there is a need for the use of different modes of transport and where a temporary relationship exists for the product positioning between each of the modes. However, it is not enough that products merely arrive at their destination; it is also very important that they arrive at a precise moment, convenient price and in good condition. The intrinsic qualities which make a product desirable must be preserved. In short, consumers desire goods which have specific features and which are available when they want them and at a good price. Meeting all these demands requires economic resources.

Costs generated by merchandise distribution are determined by not only the means of transport but also by the cargo. These costs relate not only to the transport of products from one place to another, but also to the transport time to different destinations, connectivity of the ports of origin and destination, and the state of the merchandise once it arrives.

Products can be distributed by land, air or sea (modes of transport). Due to geographical variations, cargo in some cases may use different modes of transport from origin to destination, which means it is constantly transferred from one mode of transportation to another, especially in international trade operations. Therefore, since the physical distribution of merchandise requires cargo voyages and transfers, cargo should be taken as a whole.

At present, Latin American countries are facing the imperative need to improve trade relations, and thereby accelerate import/export development, by opening their economies to foreign trade. Consequently, cargo traffic to and from the continent has

increased tremendously. Part of this traffic consists of export products manufactured from these countries' own resources. Other exports are the result of value-added production supported by foreign investment capital (industrial free zone and "maquilas"). Once finished, these products are exported again to other destinations.

In an increasingly competitive system, the location and type of manufacturing centres depend on multiple variables such as raw materials, human resources, access to the market, distribution systems and the time needed to reach consumer points¹.

1.1.2.2. THE PORTS WITHIN THE TRANSPORT SYSTEM.

The ports' main objective is to transfer cargo between land and maritime transportation modes efficiently. There are intermediate services which add to transport costs. As such, ports should perform their functions in the least possible time and cost, while maintaining proper safety and security conditions for the means of transport and preserving the cargo.

The cost added to cargo when it passes through a port can be considered an economic efficiency measure.

It is important to emphasise how ports contribute to market development and expansion, as well as benefit the region in which they are located. The services and infrastructure which ports offer become a source of demand in and of themselves².

In regard to operations, ships require that ports provide them with adequate facilities to protect them from adverse weather conditions. This allows the ships to reach the transfer sites safely and, once there, operate in a safe and more efficient manner. Moreover, cargo needs to be handled carefully and expeditiously; thus, ports must have the proper loading and unloading equipment, storage facilities, etc.³⁴

On the other hand, land vehicles, either lorries or trains, are generally in charge of delivering and removing cargo to and from the port. Generally, these vehicles are highly inferior to ships in terms of transport capacity. This inferiority restricts access to ports and freedom of transit within. Ports should have enough space to regulate this lack of balance.

Ports must also take into account other activities, which are not directly related to transfer operations, but nonetheless affect transport and transfer time at port. Customs and Public Services enforcement are some of the most important of those.

Maritime transport, as well as air and land transport, should seek to reduce in-port time by improving their procedures and methods. Using containers on ships (cargo unitization) to form a cargo unit and enhance capacity facilitates cargo handling, ship stowage and unloading, and also makes the ships more secure. Unitization of cargo has mainly reduced ships' turn-around time in port. However, containers have also made it necessary to modify traditional port facilities and equipment, thereby

¹ Port Management Textbook, ISL, 1991.

² Management of Sea, NMRC, Kings Point, 1973.

³ Manual de Gestión de Puertos, ISL, 1979.

⁴ Conference Port, ISL, 1988.

substantially revolutionising the transport field. Such integration makes the multimodal system possible.

Maritime transport, characterised by high operational and capital costs, has constantly promoted improvements to the port system by trying to reduce the ships' waiting time in ports. They have been pioneers in technological innovations and operational organization.⁵

1.1.3. COSTS RELATED TO SHIPS IN PORT.

First we will analyse the costs associated with the port of call where the vessel is carrying out cargo transfer operations. These will be separated into two sections: those related to the ship and those to the cargo.

Generally, it is possible to divide the first section into four ship associated cost categories⁶. These are:

- a) Ship Daily Costs, expressed in dollars per ton of transferred cargo, based on the ship's daily costs while docked at the berthing site and the manoeuvres involved in arriving to and departing from the port.
- b) Berthing Costs, expressed in dollars per ton of transferred cargo, of vessel's payment to the port for permanence at the berthing site.
- c) Waiting Costs, expressed in dollars per ton of transferred cargo, of waiting to berth in case a berthing site is not readily available.
- d) The opportunity cost for the vessel when transport contracts are not fulfilled due to a prolonged stay in port and delays in line service causes dissatisfaction among clients. Cost quantification will not be simple in this case.

Furthermore, it is possible to distinguish at least two types of port costs related to cargo:

- a) Cargo Transfer Costs, expressed in dollars per ton of transferred cargo, for the utilisation of port facilities through the application of a cargo transfer rate.
- b) Loading and Stowing Costs, derived from loading or unloading operations and transport from/to reception/delivery points, depending on the labour group and the mechanised equipment.

1.1.4. PORT TARIFFING.

1.1.4.1. PORT TARIFFING CHARACTERISTICS.

The above-mentioned costs do not necessarily represent an actual cash disbursement; consequently, it is possible to divide them into the following categories:

- a) Direct Costs, those costs which generate specific expenses;
- b) Indirect Costs, those relating to the time ships or cargo are detained, without a specific disbursement; and

⁵TransporteMarítimo, Soulodre, 1982.

⁶ Manual de EconomíaMarítima, Musso, 1978.

c) Risk Costs, those relating to the risks of transfer and damage likely to occur during transfer operations.

Port tariffs, one of the expenses port users actually pay directly, are charges for services provided by the port and for the right to use it.

It should be kept in mind that port tariffs may differ substantially depending on tariffing policies, geographical location, infrastructure, facilities, etc., as well as operational organization. Given differing port conditions, we would hope that the amount paid for each service would vary in accordance with the characteristics of each port.⁷

The charges set for services, which often motivate users' conduct, also vary in their level of subjectivity. Some analysts from OAS, ECLAC, World Bank and UNCTAD have consistently argued for a basic tariff structure which allows, whenever possible, standardisation of service charges. Such a structure would reduce subjectivity and thereby avoid confusion about the nature of the charges.⁸

Standardisation is not an easy task and moreover, in the case of ports, it has become difficult, because of the cultural approach of a national industry. Different is the condition of shipping which is a truly international industry, where a ship which is not controlled adequately in her country, without doubt, will be inspected in a port of a third country.

Regarding port tariffs, the goal is to charge a ship an amount that corresponds to the effective services. Determining and assigning costs to each port operation and service, and to the cargo of specific ships, however, is a complicated matter.⁹ More during the current economic crisis.

1.1.4.2. IMPORTANCE OF TARIFFING.

A natural tariff adjustment, with charges truly based on the services rendered, is more likely in cases where there is free competition among ports, rather than monopolistic conditions. The tariff must include the capital cost of the infrastructure without neglecting the necessary funds for development and maintenance of the port's equipment. When the State maintains a monopoly on services, it must be careful when deciding how much to charge; unfortunately fiscal authorities consider the port a source of revenue instead of an effective international trade catalyst. The tariff should be subordinated to the port as an integral member of the distribution system and international trade as a whole, including the National Macro Objectives

We must take into account that port tariffs are only part of the costs involved in cargo transfer. Costs related to vessel immobilisation during waiting or transfer times are usually so significant that the major concern is minimising transient time at the port rather than reducing tariffs.¹⁰

A transfer system performance indicator is generally used to measure operational efficiency and costs. It incorporates a port efficiency rating, which is the ratio of "Cargo

⁷Economics of Regulation Shipping, Beth, 1984.

⁸ Port Management Textbook Containerisation, ISL, 1985.

⁹Conference Port, ISL 1988.

¹⁰Economics of Regulation in Shipping, 1984.

Transfer Ton/ Total In-port Time." In relative terms, this ratio enables port classification.

We must bear in mind that higher transfer expenses will be passed on to the cargo as part of the transport cost, and in the end to the final consumer. A product's competitiveness in the international market will suffer if distribution costs increase unnecessarily and if distribution is made using modern techniques of information management.

1.1.5. CHILEAN PORT SYSTEM DESCRIPTION.

1.1.5.1.LEGAL JURISDICTION OF PORTS.

It is appropriate that this study should include an analysis of legal jurisdiction of ports since they are one of the bases of the Latin American modernisation process.

We should bear in mind that ports unify land and water; therefore, their infrastructure is positioned between the two. The water, seabed and land strip that are in contact with the port infrastructure constitute public property which cannot be owned by any natural citizen or juridical person. This convention states from Roman rule and has been incorporated into Chile's Political Constitution or Civil Right Codes.

The State normally has taken on the responsibility of managing public property for the benefit of the people. In some cases, though, it has used bidding processes to transfer property to the private sector for commercial development.

Under the old concept of ports, the large investments required for their construction and infrastructure has come from State funding. Thus, we have facilities built on public property and financed by State resources.

1.1.5.2. INFRASTRUCTURE AND EQUIPMENT.

Port infrastructure is that which allows the safe realisation of cargo transfer operations and provides sheltered waters for the ships operations. It should also include: breakwaters; access channels; anchorage sites; surfaces built for cargo mobilisation and which also support the transfer equipment; and other transport means, access routes, storage sites, among others. The magnitude of the work project, therefore, will depend not only on the expected capacity of the port, but also on the geographic, oceanographic, and climatic peculiarities, etc. of the area that has been designated as the site for the port.

Construction, maintenance or repair costs of this infrastructure are extremely high, so that in many Latin American countries this task has been passed on to the State. The projects were simply not profitable enough to attract investors. Some private enterprises have invested in ports, but mainly global port operators, companies wanting to distribute their own products for their own direct benefit.

Important infrastructure concerns are a port's capacity to bear the weight of the transit of large cranes, the extent of the facilities for vehicle transit and access for each mode of transportation. Ports located within the city's urban limits or actually surrounded by the city, which is a very common situation, create access problems because the cargo vehicles passing through usually cause serious traffic jams that consequently affect

the cargo. It is essential to keep the entrance and exit roads clear, taking into account that the cargo transported by a ship requires several land-based transport units.

1.1.6.LABOUR ORGANIZATION.

An issue which must not be disregarded in any analysis of port systems is labour. Port workers in Latin America have traditionally been organised, influential and powerful labour force with the support of well-structured trade unions. Labour is vital when it comes to achieving efficient operations and improving port performance. Flexible manpower and lower average costs go hand-in-hand with efficiency.

These unions have often been the object of harsh criticism because they constantly exercise pressure over government or company officials. Many times the unions exceed tolerance levels, taking advantage of their position as members of the international distribution chain¹¹. The intention of this part of the research is not to criticise the actions or demands of these unions. On the contrary, it is mainly interested in analysing the causes that have contributed to the creation of such an organization, an organization which maintains strong links among port workers worldwide. We have to bear in mind that the source of these labour problems is the nature of the work itself; it is temporary, based on shifts, and vulnerable to abuse by management.

1.1.6.1. EVOLUTION OF LABOUR ACTIVITY IN PORTS.

In order to study the evolution of port labour activity (from 1981 on), either on land or aboard ship, it is convenient to divide the work into three different schemes:

- a) Temporary employment in which the labourers do not have any kind of organised group.
- b) Temporary employment but more stable activity sustained by union strength and its own stevedores' pool.
- c) Permanent and stable work scheme in those enterprises relating to port and maritime activities.

There are different combinations of all these schemes in practice today.

From the 16th century until the early 20th century, port jobs were occasional work in which labourers were hired only for a determined task. There were far more workers seeking for jobs than there were jobs available, thus exposing employees to work irregularity and abusive practices, mainly from their own group of workers and Union Directors. The temporary and irregular nature of the work, were strong motivations for port workers to organise trade unions¹².

Trade unions have usually fought against the transience of their work by restricting access to it and by rotating their affiliates in order to obtain the work. Frequently, the unions would appoint members to different work groups and pressure management to hire the largest possible number of their workers. On one hand, job irregularity and

¹¹ Chilean Maritime Chamber, 1993

¹²International Ocean Shipping, 1980.

abusive management were simply wrong and unjust for workers. On the other, the excessive pressure and demands exercised by the labour forces was considerably inconvenient not only for employers, but for the port system as well, thereby affecting transport costs in general.

Perhaps the best solution to these labour difficulties and their subsequent damage to port systems is a scheme which considers port work a permanent activity. Such a scheme would require training labour to work effectively with complex equipment and to adapt to the constant innovations and modernisation which ports undergo to maintain competitiveness. Improving the qualifications of personnel would thus improve employment stability. This approach would relieve traditional labour tensions and facilitate the workers' integration into the companies which employ them. The companies and their workers would work as a unit, competing to reach optimum output and thus achieve market prosperity and stability.

The latter scheme seems to be the most favourable for the international distribution system, and already it is possible to see it in the new private concession ports. However, it is most probable that this option is not available to all the workers in Latin American ports. An interesting compromise might be a combination of a basic but sufficient permanent salary and incentives based on output as demand for port services increases.

Port labour conflicts have never been beneficial to any of the parties involved. Countries dealing with fierce competition on the international markets, in particular, are well advised to resolve ongoing labour problems.

1.1.7. THE INCORPORATION OF NEW TECHNOLOGIES AND THE SOURCE OF PORT WORK.

Fierce competition and the demands of development have compelled ports to continuously incorporate new technologies in order to increase productivity. These demands have centred mainly on the maritime sector. Modernising or modifying operations to improve efficiency and effectiveness frequently reduces manpower needs, with a corresponding decrease in labour-related costs.

Important changes in cargo handling on board ships as well as on shore have taken place. Unitisation has eased transport means, storage, specialised equipment requirements, etc. For example, in 1886 tanker vessels initiated bulk liquid transport, transferring their cargo via hose and pump systems to specially constructed terminals. This method proved to be much more efficient than transport with drums, which required far more personnel.

There are various examples of bulk cargo transport, supported by mechanised systems, improving performance and reducing employment opportunities. Likewise, due to cargo unitization, especially with containerisation, employment opportunities during the transfer phase have diminished substantially.¹³

It is understandable why port workers are not enthusiastic about technological advances which have allowed rationalisation and the reduction of manpower.

¹³ International Ocean Shipping, 1980.

Solutions to the resulting labour conflicts often include indemnities or the application of certain operational regulations which impede ports from fully utilising advancements.

1.1.8. CONTROL AND ENFORCEMENT.

Until the 1960s, Latin American countries generally engaged in import substitution as a means of development. Thus, a strong control system emerged which operated exclusively to control the exchange of goods with international competitors rather than facilitate it. Customs had a large role as an enforcement agency responsible for strongly impeding or taxing imported goods.¹⁴

The taxes so-earned provided a significant income for the State. In those days, governments did not value ports for their true worth, but rather merely as a way to detain cargo and check it, without paying considerable attention to the dwell time.

Years later, Latin America's opening toward international markets notably increased the flow of import and export cargo. The region thereby entered an eminently competitive commercial system where small cost variations made their goods exceed market price. Recognising the important role that the physical distribution of goods played in the reduction of costs, each country made different efforts to modernise their ports. The changes enabled these countries to reduce the time required for moving the cargo through the port. It is advisable here to distinguish between simple cargo handling operations and those activities related to public services.

Customs services should not be indifferent to the problems associated with cost reduction during the transfer process, mainly because they may tax transport costs as well as the cargo value. Nonetheless, this is not the full responsibility of National Customs; it is also a responsibility of the Central Government and the National Parliament. These taxable transport costs relate more to retention (cargo dwell time) than to entrance-related taxes. In addition, it is important to take into account that the advantages gained by the use of containers may be lost if these are checked one by one during their transit through the port.

Ports may require documents and paperwork as part of a complex bureaucratic apparatus; this is typical of the old concept of ports as instruments of closed economies. This tendency has to be overcome by information rationalisation processes (avoiding control duplicity), by use of an integrated computer system, and by an adequate communications network between the origin and destination ports. Public services should understand the importance of their role as efficient institutions, in a economy open to foreign trade. Furthermore, ports cannot neglect personnel training programs as workers may still be accustomed to the previous control system and not fully understand the changes that our present reality requires.

There are other control activities, either for the vessel or the cargo, such as phytosanitary control, health, maritime safety and immigration. These activities also have to facilitate rapid passage of the cargo through the port as well as prompt vessel attention and dispatch. Despite most government increase the pressure for those entities to establish schemes to be financially self-sustainable, which could create a contradiction with the reduction costs for the final consumer.

¹⁴ Maritime Policy Vol. 19.1-21.3, 1993.

The timetable that customs and other public entities establish to attend the public should be compatible with the port's work schedule and user requirements. There have been cases where work shifts did not coincide, causing co-ordination problems which in turn resulted in delays, congestion and finally a higher cost for the cargo and the vessel.

1.1.9. THE MODERNISATION PROCESS.

In this study, we will discuss the modernisation of ports in terms of their new role as part of the international trade distribution chain. The intention is not to establish absolute or inflexible standards for port management or organization. On the contrary, each country should seek new solutions suited to its particular economic, political and social realities, instead of trying to apply experiments and copy other existing models, indiscriminately which were successful in other nations under their own conditions.

Port modernisation should focus on those actions designed to decentralise administrative procedures, eliminate inadequate and inconvenient regulations, privatise some services and incorporate effective measures to encourage competition within the sector and between port actors.

1.1.9.1. DECENTRALISATION AND SUBSIDIARITY PRINCIPLE

Port users are subject to physical distribution needs in the national and international markets, and therefore require prompt and flexible services that adapt to the constant changes typical of this market. Port decentralisation presents a solution to these demands.

It is said that decentralisation and delegation would give more freedom of action to local port administrators, thereby speeding up the decision-making process. Locating control near where operations are carried out and where conflicts arise would, in turn, facilitate better utilisation of resources (Subsidiarity Principle). A central agency could take on planning on a national level and design a general policy, thus maintaining the coherence of port development while delegating administration to those who are more involved with the local reality.

1.1.9.2. DEREGULATION.

The interest in deregulating port systems is understandable since it aims at enhancing productivity so as to minimize cargo or vessel transfer costs. The main idea is to detain the cargo and the vessel for the least possible amount of time.

Deregulation does not mean a total loss of control of operations. Even from the State do not mean the safety, security and protection of the marine environment is not control even regulated, the State keep the control of those matters which represent the "General Common Interest". Rather, it implies a reasonable application of regulations in view of the demands of international trade and the need to speed up the passage of cargo through ports. Inspection of documents and paperwork pertaining to the vessel and its cargo should be prioritized on the basis of operational needs; thus, procedures could be adapted and work schedules co-ordinated.

In other words, focus the government action on those aspects where the State has a role to play and leave the commercial issues to the professionals of the private sector and companies.

Labour regulations, both on board the vessel and on land, are another important issue. In Latin America, powerful syndicates have historically been over protective of port labour. Labour has transferred cargo at the pace it finds convenient, negatively affecting port performance. Deregulation of port labour, however, should not leave workers totally unprotected and exposed to sporadic work once again, as this could be a source of conflicts which would in no way benefit international trade.

1.1.9.3. PRIVATISATION.

The idea of handing State companies over to the private sector, either by sale or concession, has gained significant popularity in the world and in Latin America over the past few decades. Privatisation advocates argue that the private sector would be a better administrator and manager, provide better services or products, and be more capable of modernising certain industries. In turn, the State would receive a considerable amount of funds which, in several cases, would allow them to reduce their high fiscal deficits.

There is no general consensus about which State companies should be privatised. Some say the State should restrict its scope of action to social concerns and national regulation, and leave economic development initiatives to the private sector. Others maintain that the State should privatise only the unproductive companies and that nothing would justify the sale of those which are earning a significant profit. Another approach promotes the concept of strategic companies which, from an economic point of view, would be vital for national security.

All of these are defensible positions. Thus, any effort to reach a unanimous agreement on which companies should or should not be privatised would be in vain.

Nevertheless, there is little question that some of the business sectors in which the State is heavily involved are already obsolete or soon will be. As their competitiveness falls, significant investments are required to catch up with modern standards; however, the State may not have the necessary means or the will to make such investments. The private sector, on the other hand, could make these investments, given or not certain favourable economic conditions. Private entities could purchase such companies entirely or in part, or operate them under a concession-type program or PPP.

As a final observation, people often think privatisation can solve all problems. This is not so, however, because privatisation is only a means of improving efficiency in industrial and business processes in general.

1.1.9.4. COMPETITION.

The free market economy is, without doubt, an important motivator for producers. Each company must struggle to provide a better product or service than the competitor. Naturally, consumers are the usual beneficiaries of this struggle. Further, competition is a significant catalyst to modernisation, since it obliges companies to constantly maintain product quality and to promote innovation, creativity and flexibility

in order to adapt themselves to an ever-changing environment. There are examples in Latin-America, where privatization was established in some sectors, without promoting competition, which resulted in bad services (private monopoly), increase in tariffs and no technical improvement.

Generally speaking, the companies that form a part of the port system are not excluded from this construct; that is, a competitive scheme should be developed within the ports and also between them. There are several successful examples of both cases. However, we have to be prudent about drawing on any experiences that are based on other realities, even though we may be tempted to try to replicate them.

Competition among ports will compel them to continually improve their services in order to develop better solutions and achieve a lower total cost for goods distribution. Though these facts of competition are hard to deny, they may nonetheless have limited application for some Latin American countries due to their geographical location and specialisation. Likewise, we have to remember that ports are a source of development for the region. When the time comes for a country to evaluate their positioning-related benefits compared with State investments, they may decide in favour of State control. In addition, competitiveness will also depend on the quality of land transport to and from consumption and production centres.

The situation regarding competition within ports is simpler. In this case, free market competition among private companies will improve cargo transfer services, storage, etc., relieving the State of this burden and directly benefiting consumers.

1.2. ANALISIS OF PORT RESTRUCTURE AND ITS SOCIAL IMPACT. PORT OF VALPARAÍSO, CHILE.

1.2.1. GENERAL ASPECTS.

The objective of the following analysis is to describe and evaluate the process of changes which have been implemented in the Chilean port system since 1981, focusing specially on the social/economic effects on the port of Valparaíso. The structural reforms taken place in the later 70's and early 80's in Chile, were against the normal trend in the other Latin-American countries lead by the ECLA's substitution of import policy. This place Chile as the pioneer in Latin-America on regards to structural reforms and port privatization.

In order to achieve the objective this analysis has been divided into several sections using papers prepared since 1981 by the Chilean Maritime Chamber. Also included are interviews of people from both the public and private sectors that have been involved in the development and implementation of these changes or are currently part of the modernizing process.

The technical data, the statistics and the comparative tables have been put together with official information from the Maritime Authority (DIRECTEMAR), the Chilean Port Company (EMPORCHI), the Maritime and Port Chamber (Cámara Marítima y Portuaria de Chile A.G.), studies by ECLAC, and trade union organizations grouped together in the Maritime Confederation of Chile COMACH.

1.2.2. HISTORIC BACKGROUND OF THE PORT OF VALPARAISO.

The Port of Valparaíso is situated at Latitude 33° 01' 33" South and Longitude 71° 38' 22" West, it has a Mediterranean mild climate and is 110 Km. from the city of Santiago, the country's Capital city.

It is of particular interest that this port was not founded as a city by the Spanish conquerors. It was born essentially as a Port, with the arrival of maritime expeditions of the Spanish Navy loaded with supplies for the Army forces lead by Don Diego de Almagro. The first of these arrivals was the Santiaguillo vessel in 1536.

Following that date, commercial and maritime activity began to grow around the port, bit by bit the town took shape and the port infrastructure emerged. Some important landmarks in the development of the port must be mentioned:

1600 - Port Fortification and first costal support constructions.

1791 - Construction of customs buildings where port administration took place.

1810 - Construction of private VillaUrrutia pier.

1825 - Construction of the port's second private pier.

1832 - Construction of the port's Duty Free Warehouses.

1866 - Construction of the Public Pier (first major work undertaken).

1883 - Construction of the passenger Pier, the Prat Pier of today.

1910 -Beginning of the mayor construction work of the port and harbour breakwater.

1930 - Conclusion of all the main port structures that are currently in use.

The port is state property and administered by the "Valparaiso Port Enterprise" (previously EMPORCHI), it is a multipurpose port that has an operative surface of 20 hectares, with 9 berthing sites suitable for vessels up to 11.5 meters of draft.

1.2.3. FACTS WHICH HAVE SUGGESTED THE NEED FOR STRUCTURAL ADJUSTMENT WITHIN THE PORT INDUSTRY.

During 1973, Chile suffered a huge structural change when the Military Regime took over the Government from the socialist regime that had been in power since 1970.

Between 1978 and 1981 the Military Government made a series of basic changes to the country's organization and institutionalisation. It was decided that a Market Economy model should be implemented, for this reason a general reform programme was established that would allow the introduction of new forms of management in the state and private sectors. The Market Economy model is still, successfully, in place.

These reforms were introduced to all the Government institutions which resulted in new policies being applied to state, economic and social management. The repercussions affected all areas including both the government and the private sectors, applying concepts which now are know as, downsizing, reengineering, outsourcing, etc.

Under these circumstances, the changes applied to the port-maritime sector were framed within the country's general reforms, all of which were aimed at putting an end to monopolies and subsidies, reduce the State Entrepreneur and bring the private sector

into all the economic activities that were not directly involved with national security matters.

The labour structure of this new economic model offered free access to any type of work without the need to sign up with any trade union organization in order to carry out an activity creating unionism liberalization.

In the same way, collective negotiations by economic activities (industrial sectors) were ended, as were tri-party Commissions. Negotiations were limited exclusively within each business unit or enterprise.

Also, this model forbid productive sector negotiations (national port sector) the setting up work gangs and the signing of exclusive contracts with trade unions and generally eliminated any rule that tended to reduce or restrict the use of the labour force.

In this framework it is the employer who keeps complete control over the selection or dismissal of personnel.

These general regulations, applicable to all economic activity, were incorporated into the national legislation through a special law program called the Labour Plan. These new laws came into effect in 1978 and were applied to all the country's work force, except the maritime workers, to whom, as we will look into later, were only applied in 1981.

It is within this context that the analysis and studies of the port sector have been set, facing a series of inflexibilities and monopolies that made the port system inefficient and costly, added to crossed subsidies and inexact and uncoordinated tariffs, and no competition either within or between ports.

The inexistence of an economic framework that set limits to the increase of loading and unloading costs is a characteristic of this scenario.

Given these reasons, the system was in crisis and was completely incompatible with a market economy, becoming a serious restriction for foreign trade and development of the country.

1.2.4. FOCUS AND METHODOLOGY TO CARRY OUT THE PORT RESTRUCTURE AND LABOUR REFORM.

In 1973 a group of international experts, hired by the Government, concluded that the national ports would be insufficient to cope with the volumes of cargo forecast for a 5 year term, therefore suggested urgent extensions to the physical infrastructure of the ports. As these were situated on an open coast and had deep waters the work involved would be great and very costly.

Faced with this situation the Economic Authority in charge of designating resources, decided not to go ahead with the recommended extensions until the existent infrastructure was used to its optimum capacity.

In view of the crisis affecting the ports, this decision led to the search of a structural solution.

1.2.5. RESTRUCTURING PLANS: POLICIES AND STRATEGIES FOR THE LABOR REFORM WITHIN THE PORT RESTRUCTURING FRAMEWORK.

In order to carry out the structural reform, the Government Authorities concluded that it was necessary to restructure the state ports, establishing each one as autonomous entities, directed, operated, financed and administrated locally, with strong participation of the private sector. The framework of costs should be determined by the market forces after to establish a competitive market within the ports.

To achieve these reforms, it was necessary to choose a model that set out the following parameters:

- Replace the centralized state port company with various local autonomous limited companies. These companies would own the infrastructure and charge vessels for services of berthing at such a rate that would allow them to maintain themselves and reinvest as necessary.
- Reinvestments and extensions should be done guided by a superior body, one that was in charge of implementing the national port policies.
- Each port would allow the existence of various port operators and stevedores companies that would carry out integral port operations of cargo, excluding berthing and stay. The storing of cargo within the port could be done by either the state company or be put out to tender to the private sector.

In order to implement these ideas, profound legal reforms to the complete port system were necessary, reforms that not only affected the Chilean Port Company (EMPORCHI), but also established a work regime that would allow the private companies to compete in a free market system.

1.2.6. RESOURCES AND BASIS FOR THE DESIGN AND SUPPORT OF THE LABOR REFORM.

To implement these reforms, the state would take on the costs implied. For this reason the National Port Commission was created, with representatives of the public sector together with representatives of the private companies, shipowners, importers, exporters and work force.

1.2.7. THE ROLE OF THE GOVERNMENT, EMPLOYERS AND EMPLOYEES IN THE RESTRUCTURING OF THE LABOR MARKET.

The National Port Commission began an analysis on the legal framework and its adjustments, and over a long period held an open debate on the issues, all of which resulted in the reforms that were started in 1978, and were only finally applied completely during the last term of 1981.

The truth is that the Commission sought to find consensus within its members, who had serious problems in reaching an agreement and finally the military government decided to apply a format/model that was not entirely agreed by all members of the Commission.

1.2.8. TENDENCIES AND WORK CONDITIONS AND FORMATION. LABOR FRAMEWORK BEFORE THE REFORMS.

Maritime Personnel.

The private port sector was only permitted duties of loading and unloading the vessels, for which they used part time and casual workers that only carried out such duties.

These workers were grouped together in trade unions and required a registration in order to carry out their work. This registration was managed by the Maritime Authority and was limited in number by specialty and by port.

To set the number of workers there were tripartite employment offices that established the number of workers by specialty and by port. The maritime authority granted a licence (registration) and only these personnel were authorized to work in port activities, in this way establishing a monopolistic condition.

The sector had a structure that was established by special norms, of varied hierarchy, set out in laws, rules and administrative decrees generated since 1945, also, national compulsory collective labour conventions, that applied to all employees and employers of the sector.

EMPORCHI Personnel.

All the functions of assigning berths, designating storage areas, cargo transfer operations to and from vessels and quay, movement of cargo between quay and warehouse, stowage, reception and release of merchandise within port warehouses, etc. were all carried out by EMPORCHI (state enterprise) using their own personnel, equipment and machinery.

EMPORCHI personnel were guided by the general regulations applied to all state employees (general rules of the Administrative Statute), they had fixed jobs and timetables, work conditions and remunerations fixed by the government through supreme decrees.

The Port Labour System.

The configuration of this complex system with a varied legal structure tied to strict sector rules, gave a monopolist situation of port labour to the labour sector, where by law, the maritime trade unions could take on the work and the private companies could only use the workers named by the trade unions from the registered list held by the Maritime Authority.

Under these circumstances the port labour system consisted of two groups of workers, those belonging to the Chilean Port Company, EMPORCHI, who were employed by the state, guided by the Administrative Statute that ruled all public operations, and were responsible for moving cargo to and from the quay and the warehouses and within them, including delivering to consignees; and the other group, called the Maritime Personnel, that worked on board the ships only loading and unloading cargo, and were ruled by special regulations written exclusively for them in various laws and decrees.

With this structure the EMPORCHI workers had different rules and a different work timetable to the other port workers thus leading to hold-ups and wasted time.

On the other hand the Maritime Workers were bound by special private sector rules and they also had to fulfil a series of requirements like having to be registered with one of the authorized trade unions and be registered with the maritime authority.

Within this group of workers, the maritime authorities recognized five specialties:

- Bay Employees, Tallymen and supervisors;
- Stevedores;
- Bay Auxiliary Seafarers;
- Carpenters and Packers;
- Watchmen.

Port operators, Shipping agents and companies had to work exclusively with the registered personnel with whom they were forced to agree collective work bargains.

The collective agreements were applicable nationwide, and underwritten by the Chilean Maritime Confederation in representation of the workers and by the Maritime Chamber in representation of the Employers.

The day to day personnel hiring was done by the Shipping Agents but the collective agreements were handled by the Chilean Maritime Chamber in representation of more than 50 shipping agents. Equally, the labour sector was represented by the Chilean Maritime Confederation, COMACH, to which 5 federations and 52 syndicates were subscribed.

These bargains or agreements established a national tariff of more than 160 items for different cargoes and designated fixed gangs with a set number of men who would work as a non-dividing team on different jobs. The employer could neither reduce the number of men per gang or the number of gangs agreed for each type of cargo, nor was he allowed to select workers as these were appointed by the syndicates.

The Maritime Chamber was the body in charge of maintaining working relations with the workers and obtaining their training on safety and occupational health.

As a result, the work force was limited, the tariffs were expensive and were not related to productivity and work could not be rationalized by the employer.

With this system, the ports only worked a total of 11.5 hours a day, divided in two shifts and usually only 230 days per year were worked due to the pre-established shifts.

Under this scheme, the 10 state owned commercial ports for public use, managed by EMPORCHI, had 5,117 permanent workers, and the private companies had 3,500 workers with collective bargains but not permanent, registered with the Maritime Authority and a further 2,500 men as replacement workers. In addition, 19,000 workers called "pincheros" casual workers (occasional) were used to replace the registered and replacement workers when they did not turn up for work or when a larger number of workers were required. These workers, however, were designated by the syndicates from their own lists held for this effect.

EMPORCHI personnel evolution, in the 10 state owned ports.

1960	Year EMPORCHI was formed	3.034
1978	Beginning of reform process	5.117
1981	Implementation of reforms	3.492
1982	First year of model	1.396
1991	Tenth year of model	1.750
1997	Beginning of 2nd phase of reforms	1.500
1998	First year of new model	654
2003	After 5 year of the new model (Emporchi-Valparaiso)	148

Source: EMPORCHI, 2004

Evolution of Maritime Personnel at national level.

	1960	1981	1998
Registered	2.350	3.500	-
Replacement	700	2.500	-
Occasional "Pincheros"	-	19.000	-
Permanent Workers	-	-	1.200
Occasional Workers	-	-	3.370

Source: Chilean Maritime Chamber 2000

Occasional workers in Valparaiso:

	1981	1985	1998
Registered	856	-	-
Supply	233	-	-

Occasional "Pincheros"	8.338	-	-
Registered Workers	-	10.146	-
Permanent Workers	-	-	850
Occasional Workers	-	-	1.175

Source: Chilean Maritime Chamber 2000

Evolution of Social Benefits:

Under the national collective bargains regime that was abolished in 1981, the occasional workers had the following benefits:

Benefits that meant additional remuneration:

Holiday	7,46%
Productivity bonus	5.00%

Source: Chilean Maritime Chamber 2000

Direct Monetary Benefits.

Special Allowance	4,0%
Schooling Benefit	4,15 %
Home Allowance	7,76 %
Death Allowance	0,09 %
Retirement Payment	0,13 %

Source: Chilean Maritime Chamber 2000

Other Benefits.

Clinic Contribution	1,58%
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Cooperative Contribution	1,14%
Federation Contribution	1,0%
Benefits Department	5,0%
Social Club	1,37%
Syndicate Contribution	1,0%
Housing Foundation	5,0%
Assistance Fund	1,0%
Paid Leaders	6.0%
Total Benefits	46,68%

Source: Chilean Maritime Chamber 2000

Currently, only the permanent workers have the right to collective bargains and enjoy a few benefits.

The rest of the Occasional Workers only have the additional benefit of a guaranteed minimal wage every three months (Approximately US\$34 per month).

These workers are hired and dismissed with each 7.5 hour shift and their wages are not increased either by bank holidays, Sundays or night work. Social benefits that amount to 17.5% are discounted from their day/wage.

In the Port of Valparaiso, the wage in 2005 for these workers for a 7.5 hour shift was on average as follows:

	In \$	In US\$
Stevedores	17.200.-	36,6
Fork lift operators	19.800.-	42,1
Foreman	21.000.-	44,7
Supervisor	28.000.-	59,6

Source: Chilean Maritime Chamber 2005

1.2.9. RULES FRAMEWORK, LEGISLATION FOR THE NEW LABOR ORDER.

1.2.9.1. General Legal Framework of the Port Model 1960-1981.

The legal framework of the Chilean port system between 1960 and 1981 must be divided into an Institutional ruling, that set the models for state ports with commercial use and controlled their personnel; and a labour ruling, that set out the regulations for the stevedore workers of the private sector.

For this reason the analysis of the different rulings are not carried out in chronological order but by sectors, in order to provide a better understanding of the evolution of the process.

Institutional Framework.

Between 1960 and 1981, the Chilean State Ports, of public use, were under the 1960 D.F.L. 290, Organic Statute of the Chilean Port Enterprise EMPORCHI.

In fact, during 1960 public administration in Chile was restructured and a series of Autonomous State Enterprises were created. In order to put these actions into effect, the National Congress delegated the corresponding faculties to the President of the Republic through Law No.13305.

With the faculty of dictating decrees on various issues, the President created in 1960 the Chilean Port Enterprise, EMPORCHI through D.F.L. N° 290, an autonomous state company that was under the Ministry for Public Works and Transport.

This legal body restructured the national port system and made it into a unitary system, solely dependant on EMPORCHI, which was entrusted with the commercial exploitation, the management and the conservation of the 10 main commercial ports of public use and also with functions as the National Port Administration.

The law also gave EMPORCHI, the sole right to cargo transfer, movement, reception and storage and the faculty to set tariffs through supreme decrees.

In 1975 the Ministry for Transport and Telecommunications was created and EMPORCHI was placed under this governing body.

EMPORCHI personnel were guided by the general regulations applied to all state employees, they are the general rulings of the Administrative Statute, they had fixed jobs and timetables, work conditions and remunerations fixed by the government through supreme decrees.

Given the circumstances, the Government had to prepare the grounds for the application of the new rulings and so put EMPORCHI through a severe personnel reduction plan. Various incentive schemes were used, such as early retirements, voluntary redundancy plans and indemnity benefits, etc.

By means of these schemes EMPORCHI reduced its personnel from 5117 workers in 1978 to 1625 over a three year period.

These actions enabled the Shipping Agents to supply private personnel outside the syndicate system and to fulfil the lack of workers in port operations on a temporary and exceptional basis, during the process prior to the reform law.

This situation led to a stream of public opinion favourable to the changes that were about to be implemented.

Framework of the private port sector work force.

The private sector, on the other hand, was guided by special rulings, included in more than 13 laws and 27 Supreme Decrees, among them the following should be highlighted:

Law N° 10.988/52	Establishes Bank holidays for Port Workers;
Law N° 16.372/65	Establishes Exclusive Maritime Work for Workers Unions;
Law N° 16.724/67	Establishes Exclusive Maritime Work for Employee Unions;
Law N° 17.260/69	Incorporates New Unions in the Register;
Law N° 17.816/72	Set up the Employment Office for Maritime Employees;
D.L. N° 168/73	Gives Extraordinary Faculties to the Maritime Authority on Labour Matters;
Law N° 18.032/81	Establishes New Port Work System;
D.S.(M) N° 1340/41	Order, Security and Discipline Ruling;
D.S.(M) N° 100/48	Ruling that sets attributes of the Maritime Authority and Work Directorate;
D.S.(M) N° 861/58	Establishes Permanent Commission of Maritime Employees;
D.S.(M) N° 312/65	Establishes Rules of Employment for Maritime Workers;
D.S.(M) N° 153/66	Establishes General Rules for Registers;
D.S.(M) N° 1.080/67	Establishes the National Port-Maritime Commission;

PORT INSTITUTIONAL REFORM.

Institutional Reform.

Law N° 18.042 of 1981.

In 1981, Law N° 18.042 was passed, which established a new port model that would completely change the state system that had been in place since 1960.

This model ordered the liquidation of EMPORCHI and suggested the creation of 10 Limited Port Enterprises that were independent from each other but grouped together under a holding that would administrate a National Port Corporation, this legal body set up specially for the purpose, would be situated in the City of Valparaiso.

The general principle behind this model was the privatization of the system, including both the port operations of transfer, movement and storage and also the infrastructure. Though the infrastructure was not to be sold, it was to be given in concession, enabling the berthing sites and the port warehouses to be franchised, thus the private sector would manage the ports on the basis of free competition.

However, this rather liberal legal ruling, with not many regulations, could not be implemented due to the fact that it was open to a series of interpretations and

eventualities that could lead to some powerful economic sectors setting up a private monopoly by obtaining the franchise of all the main ports and berthing sites.

All of the above opened a strong internal debate within the Military Government, and in the end only one article of the new law was applied, allowing the private sector access to port operations, so although the law is still valid it has not been applied in the practice.

It is worth mentioning that soon after the law was in force, the Military Government created an Interdisciplinary Commission, which worked for four years in search of an alternative solution to the loopholes of the law and thus avoiding the setting up of private monopolies to manage the ports and organized unions or federations handling the transport of cargo.

Unfortunately, a compromise was not reached by the various public and private organisms involved and the law had to be abolished by the same Military Government that had approved it, because it was inapplicable.

Nevertheless, this legal ruling was the central basis of the complete process of changes, as it eliminated the exclusive monopoly held by the State, through EMPORCHI, to manage all cargo transfers and handling within the ports, it gave access to private companies to become involved in port operations, cargo transfer and handling within the port premises.

The model worked for nine years with problems of unclear definitions and finally had to be adjusted by abolishing the original law and establishing an intermediate system. This occurred in 1990, just one day before the Military Government handed over power to the new democratic Government.

Modifications to the EMPORCHI Law.

Law N° 18.966 of 1990.

Due to the special circumstances arising from the impossibility of applying the 1981 model, the Law N°18.966 was passed in 1990, through which judicial validity was restored to the port system and the D.F.L. N°290 was reformed so that the law confirmed what in practice had been applied for almost 10 years.

With these modifications, a mixed system was defiantly in place, through which the Autonomous Company EMPORCHI, on behalf of the State, administrates the infrastructure and offers storage services within the port premises, and the private sector offers services of cargo transfer, handling and movement on a competitive basis.

The model comprises one state company, EMPORCHI, which manages the 10 principal state ports of public use. In effect, it owns the infrastructure, maintains and administrates it, assigns berthing sites, storage areas and offers storage services within the port premises. However, it does not carry out operative functions of cargo loading and unloading, transfer and movement; these duties are done by the private sector through shipping companies duly registered with the Maritime Authority.

Within this format, EMPORCHI charges the vessels a tariff by the hour/meter/length and the shipping company or the ship-owners, according to the transport agreement, for the transfer rights and use of the quay; for example, if the transport agreement is under FIO

conditions, the transfer tariff is charged to the shipping company but if the transport agreement is under LINER conditions, the transfer tariff is charged to the ship-owner.

On the other hand, the shipping companies do not pay a special or additional tariff to the port and are completely free to set their own tariffs for services rendered, these are only regulated by the market.

This new model opened up the system allowing an important number of private companies to enter and therefore a high level of competition, this quickly led to important reductions of tariffs applied to these operations, which, as mentioned before, had been left to free competition without limits or rules of any nature, just dependant on market laws.

1.2.9.2. Second Stage of Port Modernization in Chile.

Notwithstanding the success of the privatization process of port operations, as has been mentioned before, the opening up of the Chilean economy has meant an important increase in port activity during the last few years, in fact the total cargo moved by ports of public use was practically tripled.

This growth has been absorbed, up till now, with the introduction of competitors within state ports, in the mixed system that has been described, with multi-operator operations. There is not doubt, however, that the development of the sector is also due to the existence of 22 new private ports.

The continuing growth process does, never the less, pose the challenge of increasing the physical and operative capacity of the national port system, requiring new space, which is scarce, used in alternative ways, and puts pressure on the existing transport networks and their access; therefore, the Government decided to embark on a second stage of port modernization.

For this second stage it was decided to incorporate a decentralization system, which, as previously shown, cannot be conceived in a radical way without running the risk of going from a centralized administration to a fragmented one. It is important to bear in mind that the implementation of a decentralized model should not affect the adequate conditions of competitiveness between ports and within them, central objectives of the new institution.

With this orientation, the Government began the second stage of port modernization destined to attract investment in infrastructure increase, new technologies and more modern management methods, with a view to using the ports more efficiently, assigning an adequate amount of resources and creating appropriate conditions for the private sector to take on an active role.

Within this context, it became necessary to apply a new reform to the legal framework, with an aim at putting a new format into action and with the outlook of propelling a competitive and sustainable development in the long term, making the most of the positive elements which were in place, as is the competitiveness within the ports administrated by EMPORCHI.

Having the parameters well established, this second stage was initiated on the 1st September 1995 when the State Port Modernization law was sent to parliament, and was later approved as Law 19.542 of State Port Modernization on 19th December 1997.

This law created 10 State Port Enterprises, with a view to guaranteeing competition between ports and encouraging the maximum number of port operators to offer their services, as an essential tool for improving the efficiency now required. It is also considered indispensable that by the development of their activities, the companies promote competition within the ports, seeking non discriminating dealings with all port users, keeping a lookout for possible expansion and preserving and strengthening productivity, efficiency and competitive levels.

In this structure, the new companies have started their operations on a scaled basis on 31st January 1998. They are guided by the Limited Company rulings and each has their corresponding board of directors formed by persons designated by the President of the Republic. These directors must guarantee their professional qualities and independence with regards to corporative interests; they may not be associated with any company related to the maritime port business, nor have political or public duties.

Also, the structure that puts them under the same rulings as limited companies, allows them to function within a similar framework as the private companies, but without losing their characteristics as a public company and working independently of intermediate government issues.

The law considers decentralization and autonomy of these companies which are compatible with the principle of financial, tributary, labour, auditing and control equality with regards to the private ports, in such a way that the management be transparent and allows a healthy and loyal competition between the two sectors.

In order to fulfil their social objectives, the autonomous state companies should favour the participation of the private sector and therefore may delegate functions to third parties by means of a variety of instruments created for these purposes, such as port franchises, hiring of space or forming of limited companies with natural persons or legal entities, be they Chilean or foreign.

With this model, the port companies will have within reach a series of practical tools that can be used according to their individual needs and their development plans.

The essential element of modernization was the change of the labour regime. It was established that it should be under the general ruling of the Labour Code; this ruling would give the necessary flexibility to select personnel and react by results of all citizens. They would be able to evaluate performance not only based on their own results but also comparing them with other economic sectors of the country.

In any case, the Government thought it necessary and indispensable not only to consider the rights of the EMPORCHI workers, but also promote a series of incentives destined for indemnities and early retirements and, further more, as a principle of acknowledgment and justice, make them participate of the process by designating a representative to the board of directors of each of the autonomous companies.

During this second stage, from the current 1500 EMPORCHI workers, 850 took on retirement, early retirement and voluntary redundancy.

Investment in the Chilean Ports:

	1991	1992	1993	1994	1997	>2003
Valparaiso	711,900	1,545,500	554,080	396,167	2,458,333	27,000,000
National	5,610,000	5,810,715	4,765,456	4,086,000	9,443,000	400,000,000

Source: DIRECTEMAR 2005, expressed in US \$ (1 \$ Chilean peso = US\$ 500)

1.2.10. PORT LABOR SITUATION REFORMS.

Law N° 18.032 of 1981 Private Port Sector.

The legal rulings for the private labour sector, as was previously mentioned, was made up by a series of laws, supreme decrees, Maritime Authority rulings and resolutions, and the Obligatory Collective Labour Bargains, applied nationwide. From all this tangle of laws and regulations a new reformed Law N°18.032 of 1981 was passed. This law eliminated the syndicate monopoly for port work and put an end to the registration system by paying 50 million dollars in compensation to the registered and replacement workers. The law also stated the freedom of the labour system and terminated all the previous collective bargains and restrictions of labour force in the ports.

These changes marked the freedom of work in the sector and facilitated direct negotiations by businesses and by ports, also allowing the shipping agents to operate the complete process from the ship holds to the final destination of the cargo and vice versa, thus putting an end to interrupted operations due to different gangs of workers on board and on land.

On the other hand, as indicated, EMPORCHI no longer offered the services of cargo movement and dismissed a large number of state employees that carried out this work, most of whom were re-employed by the private sector.

Law N° 18.462 of 1985.

The free employment regime together with the lack of control of the inspection authorities and new labour problems that arose, led the Military Government to introduce more modifications to the labour laws in 1985. For this reason, Law 18.462 was passed where by minimal conditions were set for port workers and the responsibility of control was delegated to the Ministry of Employment and Social Security, which was given the faculty to create a set of rules for the purpose.

To this effect, in May 1986 the Ruling for Port Workers was passed by means of the Supreme Decree (T) N°48.

This legal text established special registers and conditions to be met by port operating companies.

The concept of Private Port Operator, of Shipping Company or Shipping Agents was born from these rulings.

The Ruling stated that only the national companies that were registered with the Maritime Authority could carry out these functions, they should also fulfil all the requirements set out in the same legal document. The Maritime, Customs, Port and Employment Authorities were given the faculty to inspect these companies.

The system began to restructure itself under these rulings and operations became more orderly giving a transparency to the labour market and to the services.

The legal ruling, which is currently in place, established the following requirements:

- Formation as a Chilean Company. For which it is necessary to have 51% of real and effective capital in the hands of Chilean people or companies.
- National Directive Personnel. It was established that the President, General Manager and most of the Directors should be Chilean.
- Registered with the Maritime Authority.
- Setting up of premises and office in each port where activities were carried out.
- Designation of authorized representatives before the Maritime Authority, the Port Authority and the Customs and Labour Authority.
- Declaring Capital to the Maritime Authority.
- Give the Labour Authority a guarantee of keeping to work contract obligations.

Control Organism:

Before 1981, the Maritime Authority, represented by the General Directorate of Maritime Territory and Merchant Marine on national basis and its Maritime Governors and Port Captains at local level, controlled all the functions of maritime traffic, piloting and general safety and security both physical and industrial; it registered and granted license to port workers, stevedores, auxiliary seafarers, carpenters and watchmen, it applied the rulings of order, security and discipline, and controlled the fulfilling of the collective agreements.

With the new model, the Maritime Authority continues to regulate all functions of maritime traffic, piloting and general security both physical and industrial, having only ceased in its responsibility for port labour aspects, which are now under the tuition of inspection organisms of the Labour Ministry.

These conditions are applied until today.

1.2.11. MODIFICATIONS TO THE CODE OF COMMERCE.

In order to have the complete picture of the legal framework of the port business sector, Book III of the Code of Commerce was modified in 1988, including in its rulings a special chapter on Shipping Agents, Quay or Port Operators where the afore mentioned general rules were incorporated, defining their scope of action, setting out the legal framework through which the private port operators can carry out their functions in Chile.

The code also established that in order to act as Port Operator or Stevedoring Company, they would require a written mandate by a Ship-owner, Consignor, Shipper, General Agent or Shipping Agent expressly stating that this mandate could be made by public or private writing, telex, fax or any other means of writing.

In the same manner, the Code stated that relations between the Operator and its clients would be ruled by the corresponding service agreements and only as a substitute or in the absence of these, would the merchant mandate rulings set out in the same Code for commercial acts be applied.

In these matters it is important to highlight that under the current ruling the Port Operators are defined as Shipping Companies, Quay Companies or Shipping Agents, and states that they are the Chilean natural persons or legal bodies who will carry out the total or partial work of cargo movement between vessels and port premises or land transport and vice versa.

It is also set out that these Agents represent their clients before the maritime authority and port administrations and can offer services of loading and unloading and all the other duties connected to the loading and unloading of ships and naval artefacts, including the functions of consolidating and deconsolidating containers within port premises and generally carrying out all the actions related to cargo movement between ships and land transport, including intermediate operations that must be carried out in the ports and on the ships, either while docked or in the bay, such as piling, stacking, horizontal and vertical movements, deposits, storing, etc.

In general, these Agents, apart from being registered with the Maritime Authority, must declare their capital and give a guarantee, even though these requirements which were expressly detailed have been difficult to verify in the practice. This has allowed them to be substituted by nominal capital declarations as the law does not require a set amount of capital in order to operate. On the other hand, the guarantees that can be quantified by a calculating table, which depends of the average number of workers used on the jobs, are allowed to be substituted by insurance policies. All of these, facilitate the access to the sector to any interested person and leaves an opening for inexperienced, unprepared companies with no financial backup or human resources to offer services; such would be unscrupulous people operating with a fictitious office and nominal capital and were commonly called "Briefcase Enterprises"; they were liable to disappear from the market as and when their proprietor desired, generally after some disloyal competitive act that only brought disrepute to the system and mistrust among users.

1.2.11. OPTIONS POSED AND APPLIED IN THE LABOR REFORM.

In the development of the port modernization process in Chile one of the most delicate aspects to be covered has been the problem of work relationship, not only due to the social and political effects, but also because specialized human resources are basic elements of any port system.

It is clear that we can have a port with modern infrastructure and equipment and state of the art technology, but if we don't have adequate personnel, technically trained to operate it, nothing will be gained from such installations and the port will continue to be inefficient and of no interest to the users.

This is, no doubt, a critical point in all modernizing process, and in the Chilean case it certainly was and what is more important, it continues to be so.

The main criticism to the system was not only centred on the proliferation of the port labour rules, but also on the inflexibility of the collective bargains, negotiated by the Maritime Chamber and the COMACH

1.2.12.SUCCESS AND MAIN DIFFICULTY FACTORS IN THE LABOR REFORM.

The First Stage of the reform (1981-1985).

The monopolistic rulings, formally mentioned, were ended by the passing of Law 18.032 that was put into force in September of 1981, resulting in the following immediate effects:

The Government cancelled the registration of 3,500 workers and 2,400 supply workers with a compensation of 50 million US dollars put an end to the collective bargains and to restrictions on the use of work force in the ports.

The new labour scheme permitted the following:

- a) That the employer could choose personnel freely.
- b) That the employer could send the actual number of men required for the job in hand.
- c) That the registration system was abolished and work opportunities were opened to anyone.
- d) That the employer ceased to be obliged to request personnel from the authorized syndicates and was able to hire non syndicate employees.
- e) That wages ceased to be fixed by the National Labour Conventions and were freely agreed between each company and its workers.
- f) A triple shift system of 7.5 hours each was set up and hence working the ports for 22.5 hours a day and 365 days a year.

Moreover, the reduction of the EMPORCHI personnel was carried out through a series of incentives of voluntary redundancy, early retirement and justified dismissal with a right to special compensation.

Once these changes were in place, a free hiring and free work planning stage was initiated bringing with it a significant increase of port efficiency based principally on the freedom of employment between employers and workers, who would negotiate their work conditions, wages, benefits, etc.

Unfortunately, this employment freedom soon turned into licentiousness, with no minimal wage limits or basic work conditions, this generated a system with a serious social problem and the port workers wages were substantially reduced to less than 20% of what they received with the old system.

This situation produced serious difficulties, and four years later, in 1985, there was a violent reaction on behalf of the workers that almost left the Chilean ports at a standstill.

The Second Stage. (1986-1989).

Since the standstill in November 1985, part of the business sector, basically the traditional established companies with largest turnovers, changed the labour rulings conventionally

and agreed a new system with groups of workers based on the setting up of so called Work Pools.

This system comprised the unification of the personnel administration departments of groups of shipping companies, and then the selection of a certain number of workers that would offer joint services under pre-established work and wage conditions, giving certain work stability to about 40% of the casual port workers.

However, the other 60% of workers could only get a few work shifts a month, working occasionally for smaller companies of the sector, and continued to insist on the need of work protection rules.

Unfortunately, during the length of this period, the Authority did not apply its inspection faculties and the system continued with evident abuse of the workers by many employers.

The Third Stage (1989-1990).

This unstable situation continued for two years during which the difficulties continued due to an excessive offer of work force and a merciless competition between Shipping Companies, all of which was worsened by the lack of supervision on behalf of the Government Authorities.

During this period, the companies with larger turnover, aware of the system's lack of stability, began perfecting their employment mechanisms and started to substitute the Work Loads with other employment forms by creating their own Work Force Providing Companies that were separate from the Shipping Companies.

Within this scheme, the new work force providing companies selected casual workers who were given a long term contract, with a fixed basic wage and an additional productivity bonus for each shift worked.

This system began working quite well and certain stability was achieved, the workers began once again to form syndicates but this time, within each company. This allowed them to negotiate collective bargains; however, they were now separated by companies and by ports.

Despite this improvement, the medium and smaller companies continued employing casual workers per shift and continued to bring new workers to the sector, with a lack of control and benefits for the workers and the system, in such a way that the excess in work force offer was maintained.

This system began a new competition between the large and medium companies, as the latter were able to reduce costs due to their mechanism of only employing casual workers by shift and not offering them any access to collective bargaining, thus securing the bids of various cargoes that were given to the best bidder by the users who sought to reduce the costs of integral port services.

This was the situation in March 1990, when full democracy was reassumed by the new Government.

The Fourth Stage (1990-1993).

In view of this new scenario, the workers began to request changes in the labour legislation to the democratic government, and bipartite commissions of businesses and worker began studying a Frame Agreement of new employment relations.

The major companies, through the Maritime and Port Chamber, joined the workers and began to stress the need for change and presented a model based on a system called "Work Place Provision Agreement", which would have a minimum number of permanent job places paid by port operators and thus reduce the possibility of individual casual workers, therefore giving the system more stability.

This model would benefit the companies directly, with larger turnover of ships per month and reduced competition from the medium and smaller companies which could not absorb the higher cost of the work force.

In February 1991, the Frame Agreement was endorsed by the labour sector, the great majority of the companies, the trade unions and the Labour Ministry of President Aylwin's government.

The basic lines of the new system were confirmed in this document, where the Government agreed to pass a bill before Congress that would turn the conditions of this agreement into a law.

The Agreement set out the model which guaranteed workers selected by an employer, a certain number of working shifts. These shifts should be agreed between the companies and the workers selected, either members or not of a port syndicate.

These agreements could be renewed every three months and thanks to them a national training and work retraining programme was given, and precise means of inspection introduced to avoid disloyal competition.

The objective of the Agreement was to promote a more stable system for the workers and reduce the number of workers, and therefore the work force offer. These aims would be reached only as a result of the labour market rather than by enforcing legal rulings or other artificial administrative measures.

Moreover, the upper end of the business sector agreed to increase the number of permanently employed workers and reduce the casual workers that were used in the work loads.

This scheme was supported by all parties, workers and businesses; however, the bill was delayed for a long period in the National Congress and was only passed and put in force in December 1993 as Law N°19.250 that introduced reforms to the Labour Code, including the port sector.

It is worth highlighting that although the law set out clear rulings; the shift guarantee wage was set very low, only giving a legal minimal wage every three months that only amounted to approximately US\$34 per month, in current terms.

On top of this modification to the Agreement, was the added fact that the employers, who had verbally agreed to increase the permanent workers, changed their position and did not employ more workers and finally the Government, which had set strict inspection

rules, never passed the corresponding ruling nor made sure that the inspecting organisms applied them.

The Fifth Stage (1993 to date).

As can be seen, the labour problem has not been solved, and what is worse, the business sector that promoted the law and did not fulfil its promise of increasing permanent work places is currently dismissing permanent workers and substituting them with casual workers with “Work Place Provision Conventions” that due to the low minimal wage set by the Government, are cheaper than workers with fixed basic wages, production bonuses and access to collective negotiations.

This makes the process to continue to be uncertain and leads to a high spirited work force that can bring serious complications, as has been seen during mobilizations and standstills by port workers in the ports of Valparaiso, San Antonio and Talcahuano, following the implementation of the second stage of state port company modernization; this included the concession to the private sector of the berthing sites under a mono operator concessionary agent system, allowing all operations to be carried out and the infrastructure managed by a sole company.

1.2.13. ACHIVEMENTS AND RESULTS REACHED.

As can be appreciated by the information described, the Chilean modernization process in its first stage since 1981 to date, has mainly consisted of the incorporation of the private sector into port operations, opening the possibility of free competition within the ports, where shipping companies must adjust to market rules and where performance has increased and costs have decreased, all of which have been of substantial benefit to the country.

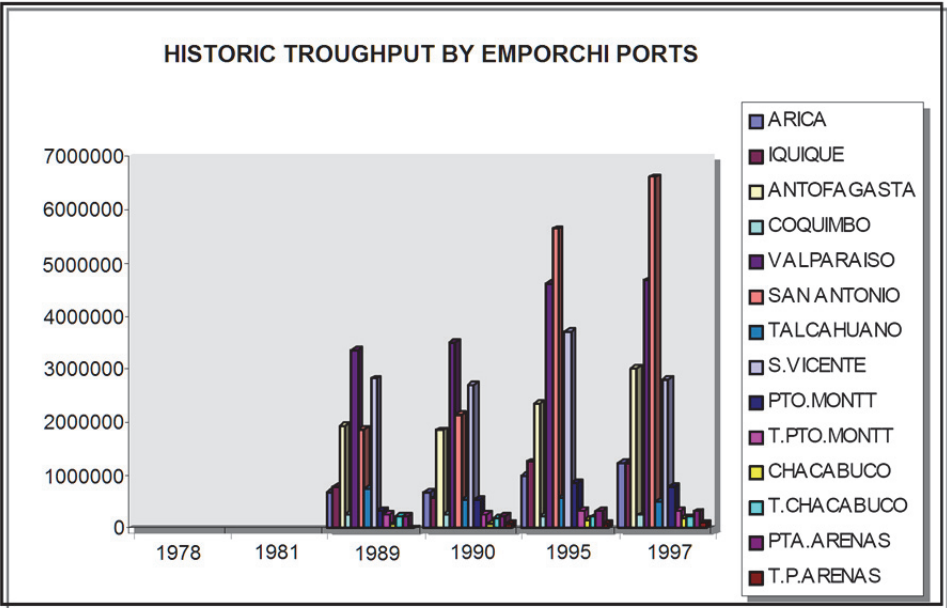
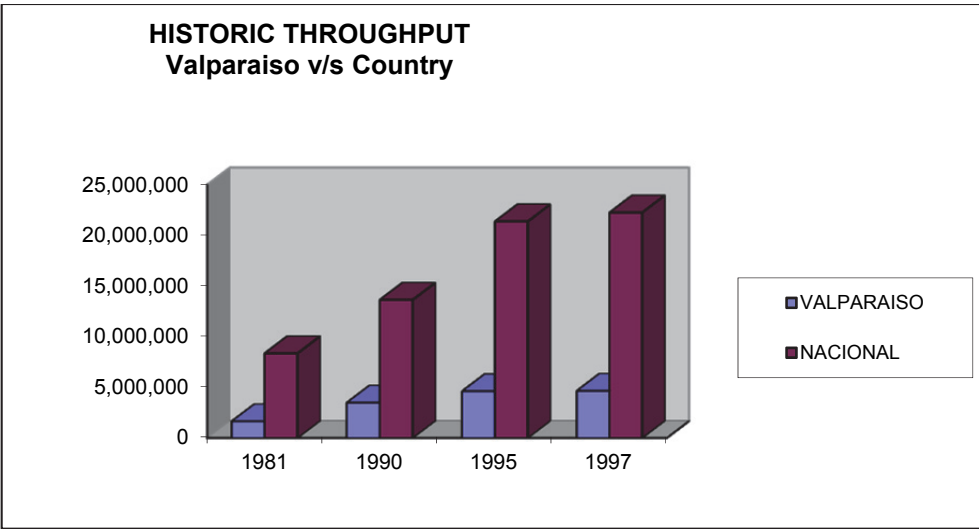
In this section are highlighted the cargo movement and performance indicators.

A. Cargo movement in the Port of Valparaiso.

In order to make some comparative analysis, it is important to show the evolution of cargo movement in the port, with before and after indicators regarding reforms on imports, exports, traffic and coasting trade:

Movement of cargo before reforms:

1960	887.343 Tons
1978	1.658.163 Tons



Source: EMPORCHI, 1999

B. Performance:

In the same manner, the performance of the most relevant cargos in 1980 was at the following levels:

Copper Bars	80 Ton/hour/hatch
Fruit	20 Ton/hour/hatch

General Cargo	30 Ton/hour/hatch
General Container Cargo	73 Ton/hour/hatch
Fishmeal in bags	18 Ton/hour/hatch

C. Costs:

The port costs of these same cargos were as follows:

Copper Bars	9,00 US\$ by ton
Fruit	0,62 US\$ by ton
General Cargo	8,00 US\$ by ton
Fishmeal in bags	16,00 US\$ by ton

Cargo movement and performance indicators after the reforms:

Cargo movement in ports sustained a permanent growth with the implementation of the explained reforms. This has reinforced the openness of the economic model to foreign trade and increased competition between shipping companies.

It is of interest to highlight some key years in cargo movement in the analysed ports, reflected in the first year of the reforms, the first year of the return to democracy and some years after:

1981	2.188.793 tons
1990	3.501.447 tons
1995	4.621.730 tons
1997	4.666.812 tons
2003	5,103,507 tons

With regards to container movement, this reached the following numbers:

1981	87.274 TEU's
1990	130.753 TEU's
1995	241.910 TEU's

1997	271.730 TEU's
2003	319,368 TEU's

Source: Valparaiso Port Enterprise.

Indicator	North America	Europe	LA	World	Valparaiso	San Antonio
TEU/mtberth line	639	868	907	1,109	1,500	1,389
TEU/Gantry	82,476	111,048	124,521	129,295	186,035	177,974
TEU/Hectare	10,774	21,150	31,638	26,015	63,754	36,950

Source: Global Container Terminal Operator, 2012, Drewry

Regarding performance and the significant increase in port efficiency, for the first 5 years, since 1986, the following data of the most significant foreign trade cargoes stand out:

Copper Bars	From 80 increased to 100 Tons/hour/hatch
Fruit	From 20 increased to 30 Tons/hour/hatch
General Cargo	From 30 increased to 35 Tons/hour/hatch
General Containerized Cargo	From 73 increased to 140 Tons/hour/hatch
Fishmeal in bags	From 18 increased to 21 Tons/hour/hatch
Copper Bars	From 80 increased to 100 Tons/hour/hatch
Fruit	From 20 increased to 30 Tons/hour/hatch
General Cargo	From 30 increased to 35 Tons/hour/hatch
General Containerized Cargo	From 73 increased to 140 Tons/hour/hatch
Fishmeal in bags	From 18 increased to 21

	Tons/hour/hatch
--	-----------------

On the other hand, the port costs for those same cargos decreased by 1986 to the following:

Copper Bars	From 9,00 US\$ per ton down to US\$ 5,5
Fruit	From 0,62 US\$ per ton down to US\$ 0,23
General Cargo	From 8,00 US\$ per ton down to US\$2,50
Fishmeal in bags	From 16,00 US\$ per ton down to US\$9,20

With regards to performance and the increase of port efficiency on 2000was:

Copper Bars	120 Tons/hour/hatch
Fruit	62 Tons/hour/hatch
General Loose Cargo	40 Tons/hour/hatch
General Containerized Cargo	220 Tons/hour/hatch
Fishmeal in bags	30 Tons/hour/hatch

Moreover the port costs of those same cargos decreased and are currently the following:

Copper Bars	3,51 US\$ per ton
Fruit	0,22 US\$ per ton
General Loose Cargo	2,30 US\$ per ton
Fishmeal in bags	8,02 US\$ per ton

General performance in cargo/fruit, currently:

Fruit season time	90 days
Berth occupation rate	70%
Performance in 1980	800/tons/day/berth
Performance in 1997	2.000/tons/day/berth
Tons of fruit in 1997	1.170.000 tons

With these performance parameters in 1980, 24 berths would be needed to move the fruit.

With the 1997 performance, only 10 berths were needed.

Also, if we apply to the foreign trade data moved by sea in 1997 (excluding bulk liquids), the cost savings per ton that have been indicated, the results are the following benefits to the country by means of annual port cost savings:

PRODUCT	THOUSANDS TONS	SAVINGS x TON	SAVINGS x YEAR
FISHMEAL	663	5,8	3.671.000
FRUIT	1.298	26,0	33.748.000
WOOD	2.898	3,0	8.694.000
PULP/PAPER	2.110	5,5	11.605.000
SEMI ELAB COPPER	2.189	3,5	7.592.000
OTHER GENERAL CARGO	7.595	7,1	54.456.000
SOLID BULK	25.123	1,4	35.926.000
TOTALS	41.826	3,05	155.692.000

Source: Chilean Maritime Chamber (1997).

These figures show that the country has reduced its costs by more than US\$155 million per year that no doubt has opened the way for new export products that were not cost effective due to high port costs.

1.3. SOCIAL IMPACT OF PORT RESTRUCTURING. SITUATION IN THE PORT OF VALPARAISO.

Most of the state ports do not operate in a competitive climate, because they have been isolated from market forces, either by means of decrees, government policies or rulings. The possibilities of progressive improvement in productivity and efficiency regarding costs through adopting new technologies, better work rules and money incentive plans, are at best limited, which has a negative effect on productivity, costs, work relations and operation levels and has caused market benefits and disadvantages not to be taken into consideration at decision making time. However, the historic justifications of state control and ownership of the ports have been so solid that the participation of the private sector in installations and port services has encountered strong resistance from the port administrators and workers, the military sector and other superior groups, which consider that state port monopolies are necessary and desirable, and they consider that such participation in the public ports would not only alter the balance of economic, political and social privileges, but also would become a serious threat to the benefits they receive and to their own professional targets.

The main consequence of the restructuring of the Port of Valparaíso reflected in the social aspect is on the companies that offer services within the ports. Although they are private and can enter and leave at will, according to the type of work offered, if concessions are given, the port would be mono-operated and therefore the other private port operators would not have access to the concession terminal. This brings direct consequences to the port workers.

The advantages of carrying out a franchising are many. The main ones being the benefits in installations and port services: they are a source of additional funds to finance port projects, and a means of reducing exploitation costs and incrementing productivity; the development of technology, the innovation and investment in this area; the commercial advantages and the competition generated in relation to other ports of Latin America are indisputable.

The protest of the port workers in view of the possible redundancy this would provoke have has taken the workers to suggest to the Government the need of finding agreements that will not be detrimental for them in the franchising process.

Port Workers Petition.

The points considered by the workers as undividable are grouped in a technical area and an economic one. The first concerns the port credential, the inspection according to the new system in place in the ports because of the modernization, and a modern and equal training scheme for all port workers left within the system. The other is related to compensations and early retirement for those who will be forced to leave the port work.

Only one of these points was accepted by the Government Commission. This was in article 133 that states that in order to carry out maritime port work, it is necessary to go through a training course given by any recognized training institute. In this aspect, the leaders of the sector identified a serious deficiency, as they were only fulfilling part of the law.

Due to the fact that the negotiations and petitions with the Government have not lead to agreements with the port workers, the latter have carried out total and partial stoppages (respecting shifts), in protest and for national and international recognition of their situation if the franchising were to occur. The workers are supported by the Central Workers Union (CUT), and the International Transport Federation (ITF).

The costs of these stoppages are economic, but not tangible; moreover, they can be associated with Chilean ports and give an international impression of unstable ports, thus generating considerable damage to foreign trade.

The Government and the workers must find a way of minimizing the consequences of this change, which is inevitable, in lieu of economic and technological development for the country. Should this change not come into effect, the Chilean maritime sector would be at a commercial and technological disadvantage with regards to similar Latin American ports.

Social Costs

Notwithstanding the excellent economic results mentioned above, the workers have suffered a high social cost, which can be quantified by the following results:

From a total of 25,000 Permanent, Supply and Pinchero workers through out the country in 1981, today near 5,000 currently work in the ports.

The average wage per man/shift was US\$188.04 in 1981, today's average wage is only US\$45.75

From a total of social benefits that increased the workers wages by 46.68%, today only a few workers with permanent employment have additional benefits that do not amount to more than 16%.

The Government paid the supply workers in 1981 a total of US\$50 million in compensation.

In the same way, during the second stage in 1998, the Government paid the State workers from EMPORCHI compensation amounting to US\$84.16 million.

CHAPTER II. POLITICAL AND STRATEGIC ANALYSIS.

2.1. IMPORTANCE OF CREATING AN ADECUATE POLICY FOR THE COUNTRY'S OBJECTIVE.

2.1.2.MARITIME TRANSPORT AND BALANCE OF PAYMENTS.

An important obstacle exists when trying to determine the total contribution of maritime transport on the Balance of Payment. About one third of the world's tonnage is transported under flags of convenience. The services that this tonnage lends to international trade are registered as debit in the balance of payments statistics in the countries that use them. On the other hand, corresponding credit is not allocated, because the flag of the State considers the companies that possess and manage these fleets as extraterritorial entities.

Consequently, by comparing the maritime trade contribution to the balance of payments of both developed and developing countries to the gains of developed countries, unallocated credits must be added, because it is the citizens of these countries that are the principal owners and beneficiaries of open license tonnage.

In 2000, the payments for freight were approximately \$155 billion dollars compared with US\$ 45 billion dollars in 1980, and contributed to the present disequilibrium of the trade balance and, as a consequence, to the debt problems of developing countries. However, when the potential contribution of a national fleet to the balance of payments is evaluated, one should bear in mind that, although the total freight paid to the national company in the country's foreign trade represents a gross savings (earnings) in foreign currency, its overall effect on the balance of payments will be considerably inferior and will depend on the amount of services rendered by the national company, both national cargo services or as a cross trader. The most important expenditures of foreign currency that result from maritime transport activities are the financing costs of ships bought abroad, fuel expenses and port costs.

As a result, the saving of foreign currency varies from country to country, and available figures oscillate between 10% and 70% of net earnings as a result of various factors. Therefore, even beginning with a prudent calculation in which only 30% of gross foreign currency savings represent an effective net savings, developing countries could reduce their foreign currency outflows by approximately \$7 billion dollars, if they could divert towards national carriers half of those resources that are set aside for paying foreign carrier companies.

Nonetheless, there are some examples like the Chilean case, where the economic deregulation of the shipping sector in 1980 (i.e. abolishing the fiscal exemption to national or Chilean owned companies and opening the trade to foreign ship-owners) opened the national shipping market to free competition and therefore permitted the entrance of international competitors. The main effect of this was a 55% reduction of the Chilean flag fleet, and because of this and other reasons, in the next decade the freight rate was reduced up to 50 % in southbound and up to 65 % in northbound trips.

Comparative freight rate between 1992 and 2015:

<i>TEU Container Freight Rate in a Liner Ship</i>	<i>Distance</i>	<i>1992</i>	<i>2004</i>	<i>2015</i>
Hamburg to Valparaiso (with households)	7,831	US\$ 3,400	US\$ 1,500	US\$ 1,385
Hamburg to Cartagena de Indias	4,943	US\$ 4,500	US\$ 1,650	US\$ 1,300

Source: Information from Chilean port operator AGUNSA and Schenker Logistic Operator 2015.

In order to maintain and, if possible, improve their position in world maritime transport, developing countries should plan a coherent maritime transport policy, not only at a national level, but also at a sub-regional or regional level. This policy should aim towards establishing cooperation bases at an operational level and towards assuring competition, in the long term, to developing country carrier companies and avoid wasteful spending of resources that are in short supply. However, in that which refers to planning and application strategy of this coherent policy, it is recommended that a relatively prudent focus be adopted.

According to past experience (70's to 90's) in shipping and ports, most of International Organization recommendations on economic matters have been impracticable in the long run; this, because of their orientation towards state control of economic and operational issues when world business was moving towards deregulation and leaving such issues to the private sector. Policy makers must be in contact with the industry day to day and work close to the industry sectors. An imposed policy could result in being impracticable.

What really is imperative is the need to improve national plans and policies in order to create necessary liaisons. The institutional requirements needed to formulate and apply these policies have been complied with, to a certain extent, in developing countries.

2.1.3. DEVELOPING COUNTRY PROBLEMS IN THE CREATION OF A MARITIME TRANSPORT POLICY.

2.1.3.1. Distribution of world trade and maritime transport.

The distribution among groups of countries of world maritime transport activities continues to be unequal and notably contrasts with the respective participation of these countries in world trade. The important participation of developing countries as a group in world trade has made it so that, due to its access to independence, these countries follow an active maritime transport policy.

This policy can be summarized into two objectives: firstly, protect national cargo owners by creating a fair balance between their interests and those of the ship-owners; and

secondly, encourage the establishment and expansion of national merchant fleets. These two objectives were not followed simultaneously.

In the beginning, maritime transport policy was directed in a general manner to commercial aspects; for example, the protection of ship-owners interests. Later, a second element was added, the matter of development, as the answer to structural problems that came about from industry, as well as comprehension that a policy that does not try to establish a minimum of direct control over maritime transport services cannot render satisfactory results.

2.1.3.2. Commercial practices.

The commercial conditions convened in a sales contract determine the rights of the buyer or seller to carry out necessary transport arrangements. The most frequent arrangements are: "Free on Board"(FOB) or similar which estipulate that the buyer is responsible for organizing the transport and "Cost and Freight" (CFR) or similar where the seller undertakes the task of organizing transport.

The election of commercial terms influences in a decisive manner, the capacity of any country to participate in the transport of their foreign trade merchandise. Although it is not possible to define the customary guidelines of the conditions applied in maritime trade generally, there is no doubt that in bulk trade, whether it be liquid or dry cargo, it is possible to observe a systematic tendency in which developing countries are obliged to accept the FOB conditions for their exports and the CFR for their imports. This situation impedes them from initiating export activities of raw materials that could allow them to diversify their economic ventures and thereby reduce their dependence on the exclusive production of raw materials.

This tendency of imposing unfavourable trade conditions which result from power differences between businessmen of developed countries and those of developing countries, as well as from the considerable participation of trans-national companies in bulk trade, has frequently being doubted. This was largely confirmed by research carried out on a worldwide scale concerning dry cargo trading during the beginning of the eighties (UNCTAD, Review on Maritime Transport, 1992-1997).

According to information received from the importers of nearly 80% of the world trade flow of crude oil, a group of experts in the transport of liquid hydrocarbons determined that, according to available data, 76% of the volume of these currents was under FOB conditions, where transport was the responsibility of the buyers, and that, in general, originated from developed countries. Additionally, according to available data, 47% of imports resulted to be operations between affiliated companies. Another group of experts of the UNCTAD pointed out a similar tendency in the application of FOB conditions in the principal markets of dry bulk cargo (i.e., iron ore, phosphates, bauxite, aluminium) of interest for developing countries that export such cargo. In these markets, the percentage of FOB contracts fluctuate between 80% and 94%, corresponding to phosphates and bauxite respectively.

2.1.2.4. Customizing services.

In order for any type of maritime transport service, particularly a regular shipping line, to be adequate for maintaining and/or developing relevant trade, it is imperative that some

minimum requirements be met that pertain to transit time, frequency and regularity of trips, the type of vessel being used and the availability of services for all the cargo that is being transported. Even though it is logical that differences of opinions exist between the providers and the users of maritime transport services in that which constitutes "adequate service", in general terms, one must suppose that "adequate service" can only be the one whose quality assures an orderly development of trade between concerned countries. This level of quality should be decided for each commercial route after rigorous and effective consultation between ship-owners and users.

In practice, however, shipping conferences, acting as monopolistic factions for each trade in discussion, have frequently refused to hold meetings concerning these matters and have arbitrarily and unilaterally decided on types of services, frequency of trips, etc. In developing countries, in particular, no prior effort was made to discuss matters concerning service characteristics, because, among other reasons, the Maritime Administration is not strong, giving way to inadequate services and therefore worsening port congestion problems.

2.1.2.5. Transport costs, included are the level and structure of freights.

In addition to the considerations regarding the quality of services, the level and structure of freight also have crucial importance on trade. In international trade, transport costs basically have the same protection effect as customs tariffs and constitute a decisive factor in determining a country's export potential. In view that the principal export merchandise of developing countries is transported in regular shipping liners, the relationship between the freight of these liners and the prices of determined products constitute a representative sample of freight expenses that developing countries face and, as a consequence, indicate the repercussions of these expenses in the competition of developing country exports in foreign markets.

The cost of maritime transport services also has a very important effect on the industry of developing countries, particularly in the recently formed manufacturing industries established for elaborating imported raw materials with the object of producing manufactured or partially manufactured export products by taking advantage of relatively low costs for labour and fiscal policies. Such industries are only viable whilst the costs and transport difficulties do not have an adverse effect on the economic advantages of using local labour force.

In addition to the effects of maritime transport on trade and industry, developing countries are affected by the level of freight rates, since they are accustomed to having to pay the cost of freights for their imports as well as their exports. If the level of freight rates increases, generally these countries will have to pay more for their imports and their manufacturers usually receive less for merchandise that is sold in foreign markets. In the case of Latin America, this situation is very clear in Central American countries, where its predominant market is USA and the freight rate of a TEU from USA to Central America, sometimes could be more or at least similar to one coming from USA to Chile (three time distance) generating competitive advantages for those cargoes coming from countries with lower freight rates.

The problems developing countries have had by the level and structure of freight rates are closely related to the existence and mechanisms of the maritime conference

system. This system (created to eliminate price competition among its members), taking advantage of its monopolistic power, has adopted unilateral procedures and determination of freight rates. In various international meetings, developing countries have manifested their opinion that some of the practices adopted by the maritime transport conferences have resulted in being damaging to trade and for their development. The grievances of developing countries concerning the conference system in that which refers to the level and structure of freight rates has been concentrated in the following aspects:

- a) Arbitrary imposition of freight rates, for example:
 - i) General increases and the level of freight rates;
 - ii) Fixation of determined freight rates;
 - iii) Absence of freight rates and promotion, and
- b) Loyalty agreements and unfairness of obligations.

The scepticism of developing countries towards the conference system, which has continuously stirred up complaints, is also largely due to the secret that surrounds the establishment of freight rates by the conferences and other policies. Undoubtedly, the mysteriousness in which the system has worked has given way to a considerable amount of alienation. However, the majority of the users and ship-owners of developing countries look at the conference system as a necessity or at least the lesser of two evils where instability of freight rates and irregularity of services are concerned.

The problem of unilateralism and the lack of transparency in the determination of freight rates was hoped to be overcome, or at least appeased, by institutionalizing the consultation procedures between ship-owners and users. However, the users of developing countries complain that the "meetings" held by the shipping conferences are of a superficial character. One of the complaints is that the conferences hold their "real" negotiations with trade spokespersons of developed countries, and elude the consultation procedures concerning basic freight rates as that this is the reason for increasing surcharges on the prices of fuel and for adjustment factors in exchange rates, where they frequently apply formulas, that according to the users, are incomprehensible.

2.2. FORMULATION OF MARITIME POLICY IN EMERGENT ECONOMIES.

2.2.1. OUTLINE FOR A MARITIME TRANSPORT POLICY.

2.2.1.1. Theoretic outline and definitions.

A policy is a group of definitions formulated by the government of a nation in order to explicitly express the government's field of action in specific matters, in conformity to philosophic concepts which is inspired in a political, economic and social model.

Maritime transport policies are therefore the application of these philosophical concepts to water transport activities with the purpose of regulating their operation, economic efficiency and harmonic development, in national as well as international settings, considering the present external realities and its foreseeable trends.

The maritime transport policy should be the government's formulation of the course of action to be taken by the State and its institutions in the area of maritime, fluvial and lacustrine transport, as well as the necessary guideline for private sector participation.

2.2.1.2. General considerations.

Even though historically maritime transport has not been completely free of government regulation, in the past, interventions by important maritime nations largely limited national policy measures in order to maintain trade and military power structures. Due to technological and organizational development of maritime transport in the past decades and the process of decolonizing, these national policies of maritime transport based on considerations of power have become less evident. The growing structural and geographic segmentation of the maritime transport market has made it more difficult, if not impossible, that isolated countries be able to formulate ample regulatory policies.

At the same time, the mobility of their own vessels, the internationalization of market segments and the growing of multinational crews, has necessarily presented implementation problems of national policies, even in cases in which these policies were formulated for isolated sections of the market.

Another important change that has characterized the evolution of the maritime transport policy refers to the actual contents of this maritime policy. Traditionally, the development of an active maritime transport policy has been the prerogative of the important maritime States and only in the past decades has the concept of maritime transport policy lost its unique significance as the promoter of the national maritime fleet and has expanded in order to take in two elements of equal importance: the already mentioned promotion of national maritime transport and, secondly, the protection of the user's interests in the most ample possible way. Thus, countries that are basically users of shipping services now have ambitions in maritime transport policy matters, a fact that has influenced policy considerations at both a national as well as international level.

These elements inevitably influence the contents of the policies. The principal objective of the policies is to allow the industry to carry out its corresponding role in the international maritime trade and to encourage international trade and economic integration. Therefore, a maritime transport policy's end result should be the establishment of a framework which allows the industry to reach a balance between real costs and the economic benefits it hopes for, establishing in this way the bases so that maritime transport services may respond to the necessities of trade and offer efficient services and at low cost. When these policies do not exist, trade can remain subordinate to transport, which introduces the danger of limiting access of national products to foreign markets.

Policy considerations are not limited to maritime transport commercial aspects only, but also include development matters, and they should not be completely separated from one another. An international maritime transport policy should also allow or actively encourage international participation in the maritime transport sector. Bearing in mind existing policy limitations, both economic as well as social, the ideal objective would be that this policy should allow maritime transport activities to spread to those countries that enjoy a comparative advantage for the lending of services.

As an example, until 1978 Chile had a Merchant Marine Development Law, whose main objective was to promote a bigger national fleet passing from 400,000 GRT to 1 Million GRT no objective was considered on relation to cargo transported by those companies. After 1979 this Law changed, permitting international shipping to serve Chilean ports (inverse objective to the previous law). The main effect that occurred was, as indicated previously, a decrease of the national fleet and the re-flagging of almost 50 % of the Chilean owned ships into Open Registers. The most important impact though (real objective of the new de-regulation), was the impressive improvement of their cargo transport efficiency under competition, rising from 1,000,000 tons transported in Chilean owned ship was in 1978 to 2,000,000 tons in 1982, and 4,000,000 tons in the year 2000, thus favourably reducing the freight rates of the country's imports and exports (enormous benefit for the competitiveness of exports and lower price for the nation last consumer of imports). The lesson learned was that a country must be coherent and consistent with its own national economic policy and strategy, deregulating all those sectors which could help the national economy and the external trade and therefore allowing for competitive exports.

Promotion policies and regulatory policies complement each other, even though their objectives are different. Exclusively applied national promotion policies assume the acceptance of existing market structures and are basically limited to improving the competitive situation of the national fleet in regard to its foreign competitors. On the other hand, with ample regulatory policies, the idea is to place influence on market structures in order to obtain a desired level of competition. In practice, it is not always possible to clearly distinguish between these policies. The type of policy combination chosen for each country depends fundamentally on two factors: the political framework established by the general economic policy and the capacity of each country in applying the formulated normative principles.

One of the most important promotion measures that is presently applied, which also contains elements of protectionist policy, is the concession of direct or indirect subsidies to national ship-owners, fundamentally in developed countries. Even though it is undeniable that these normative options are justifiable by some policy considerations in reference to the maintenance of a minimum national fleet, the generalized concession of subsidies has considerable negative effects on international maritime transport markets creating or promoting inefficiency. This policy not only does not serve to correct the distortions of the maritime transport markets, but contributes considerably to maintain or even worsen the actual structural disproportion, because it maintains at an artificially high level the offer of shipping services and impedes the spreading of capital to other countries that enjoy a comparative and or competitive advantage in the sector. Additionally, it has been shown that this type of policy liberates a slew of subsidies that place the countries at a disadvantage, particularly in developing countries that cannot or do not want to participate in it.

Other types of promotion policies exist that do not present the same prejudicial effects, but by all means are convenient to combine with a coherent regulatory policy, because a promotion measure results all the more efficient when the development of an entire section of maritime transport or the participation in it of a specific national fleet of the

actual market structures are limited. Structural problems can not be resolved by way of promotion policies.

Promotion policies are frequently applied indifferently in all sectors of maritime transport, but regulatory policies are necessarily more selective and their applications have been largely limited to maritime transport by shipping liners. The mechanisms of the market, particularly in linershipping, has resulted to be only partially adequate for permitting the industry to carry out its role in the orderly development of world commerce. The existence of shipping conferences is usually accepted as a beneficial factor for trade and development, but ample consensus exists in that the system is open to abuse, by which it is necessary to establish a multilateral regulatory structure that guarantees beneficial development of trade and maritime transport services. Whatever policy measures are applied, the fundamental objective is to regulate two crucial aspects of the shipping conference system: the admission of shipping lines and the relationships between conferences and users.

The basic concept underlying maritime transport regulation for shipping liners consists in reducing the concentration of power stimulated by the actual structure of the market, whether establishing the necessary framework so that it develops a counteracting power within the market or by way of an institutional neutralization of power exercised by the cartels of maritime transport. An example of the first method would be a greater control of the user's suggestions, and the second, the creation of a supervising body that would specifically see to the conferences. Consequently, the fundamental objective of a regulatory policy should not be to reduce or eliminate competition, but to assure a minimum level of loyal competition when the actual forces of the market cannot generate it.

The concrete objectives of the regulatory policy, also urgently makes it necessary to apply explicit normative measures. Bearing in mind the structural differences of the maritime transport market sectors, these measures have to be conceived in such a way that they allow the undertaking of specific problems. This necessary selectivity would make any attempt to introduce wide-open regulation that covers the entirety of maritime transport markets impracticable. There is no doubt that, both nationally and internationally, promotion and regulatory measures can be applied simultaneously; what is needed is to know at what level they can be applied more efficiently. In that which concerns concrete promotion policies, the answer largely depends on the exact formulation. On the other hand, the situation is very different in that which refers to the policies of regulation. As has been pointed out, their goal is to correct market mechanisms which are, naturally, international. As a consequence, the application of unilateral and uncoordinated regulatory measures will lead to new distortions in the market instead of a utilization of the market structures. To design the above policy, it is recommended to use a strategic planning methodology and model (see Picture No. 1). Even though, the Chilean maritime transport policy case present undoubtedly success, because of the specific cultural characteristics in the country, it is not wise to be used by other countries. Chile apply an implicit maritime transport commercial policy (no written, but derived and coherent with country's macro-economic policy) and an explicit one in regards to maritime safety, security and marine environmental matters model which works very efficiently for the Chilean market culture.

Currently, most of the port and maritime transport policies in the region, show deficiency on the evaluation in issues like: institutional, logistics, labour, port networks and IT, infrastructure development, competitiveness, sustainable development and economic regulation (Doerr et al 2011)

2.2.3. SPECIFIC CONSIDERATIONS.

2.2.3.1. Diagnostic evaluation of the country regarding immediate maritime surroundings.

This evaluation will consider an analysis of the following subjects:

- Position and geographic condition of the country;
- Political-institutional structure;
- Comparative advantages in regard to the resource availability and productive factors;
- The country's role within the scheme of transport, user or provider of services;
- State's level of participation in the administration of the transport chain;
- Economic policy;
- Tradition and knowledge of the maritime transport market, (know how);
- Business culture;
- Market ethic (level of corruption at private and public sectors);
- Level and philosophy of investment in the country;
- Predictions of events, forecasts;
- Independence for decision-making;
- Country's capacity to participate with other nations;
- Public and private collaboration in the rendering of services;
- International agreements and standards prevailing in maritime transport, ratified by the country;
- Market participation;
- Maritime Governance (rule of law, accountability, commitment, institutionalism, etc.).

2.2.3.2. Evaluation and analysis of the international maritime setting.

This study should at least consider the following material:

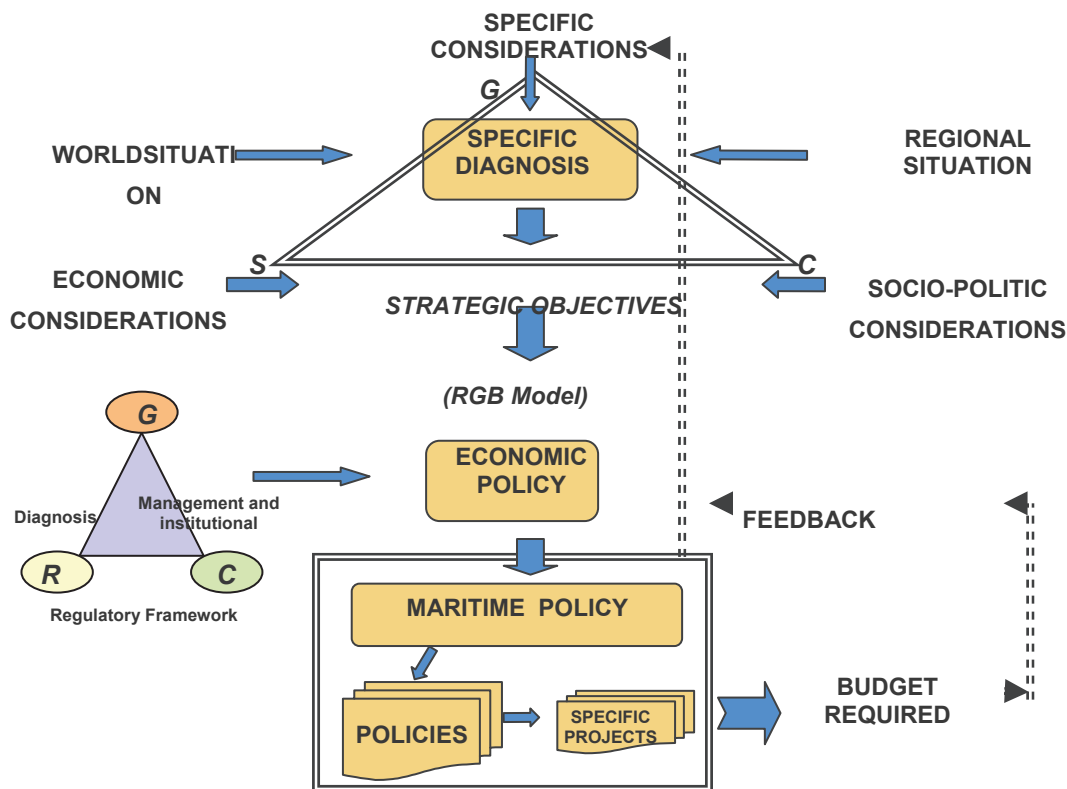
- World practices of maritime transport;
- The world trend regarding this topic;
- The phenomenon of regional integration and globalization;
- Technological innovation;

- Ecological consciousness;
- International regulations;
- Market conditions (level of perfection).

2.2.3.3. Requirements for the establishment of modern policies.

- Political and institutional stability;
- Institutional flexibility when faced with changes;
- Knowledge improvement;
- Legal framework that guarantees the competitive conditions of the market (rule of law);
- Consistency with other policies (economic, labour, etc.);
- Access to financing of investments in terms of agility and reasonable interest rates.

Picture No. 1. RGB Model of Strategic Planning



Source: RGB Model, own design.

2.3. COMMERCIAL POLICY.THE CHILEAN CASE.

During the nineties, some complementary actions to the open economy strategy, which had been in force since the middle of the seventies, were introduced to the Chilean commercial agenda. Among the new measures, the main ones were the celebration of commercial agreements, initially with Latin American countries, in the context of international regionalization and more recently, a series of negotiations and agreements with countries outside the region, currently more than 63 FTA have been signed mostly in all continents with the exemption of Africa and Russian Federation (source: Ministry of Foreign Affairs of Chile, 2015).

Throughout the last 30 years Chile has gone through a series of structural changes, such as an important increase in openness to and value of exports, market and product diversification, increase in number of exporters and decrease of the relative weight of the principal products, especially copper, although it still represents more than a third of the sales.

With regards to the exporters, although there has been an increase in the number of agents participating in the process, the bulk of the activity is still concentrated in a few of them and the annual rates of income and expenditure of the exporting companies show that the continuity and consolidation of these companies is still very weak (Silva, 2001¹⁵). In the same way, though there has been a diversification of markets, there is still a high concentration in certain geographical areas; this makes it susceptible to the closing of markets as currently almost 50% of all Chilean exports are concentrated in only 5 countries.

Exports to Latin America have shown an important activity that can be explained both by the unilateral liberalization assumed by these countries, and by the bilateral agreements reached with them.

	1970	1985	1990	1995	2000	2014
Exports (US\$ Millions)	1,112	3,804	8,620	15,680	19,210	76,648
Copper %	76	47	46	41	34	47
Markets						
Asia (ex. China)	12	19	26	35	27	25
Europe	61	33	37	28	29	18
Latin America	12	17	13	19	20	16

¹⁵ Silva, Verónica: "Estrategia y Agenda comercial chilena en los años noventa" Serie Comercio Internacional, Número 11, CEPAL, 2001

NAFTA	15	24	18	16	22	15
CHINA	0	0	0	0	2	24

Source: Central Bank of Chile, 2015

On the other hand, even though there is no systematic information sufficiently detailed on exports of services, the available indicators show a significant increase and diversification, and also an incipient export activity in more sophisticated areas that require qualified work such as data processing, telecommunications, engineering or health and safety services (Prieto, 1999¹⁶). The investment process towards other countries, especially within the region, where the internationalization of local companies is reflected, has increased steadily since the beginning of the nineteen nineties, meaning that in the medium term, Chile could become an expansion platform for the markets of other countries.

During the restructuring process of the last 30 years, it is possible to appreciate a reorientation of exports, from the natural resources towards more manufactured products and a very clear export diversification strategy, which during the 90's was only reaching 30% to US, 25 % to Japan, 25 % to some countries in EU and rest to LA, in 2014 almost 49% of the exports are with Asia including 24% of it with China, mainly covering 5 different continents.

2.4. CHILEAN PORT MODEL.

The importance of port, road and telecommunications infrastructure for the economies that take part in the globalized trade is fundamental. In Chile's particular case it takes on an even greater importance, not only due to the distance of the export markets (NA, EU, Asia and Australasia) for its products, but also due to its particular geography of the country.

Chile has 91 ports, of which 77 are in the hands of private investors and 14 are autonomous state owned¹⁷. The volume of cargo transported has increased by 63% between 1991 and 2001, when a total of 55.9 million of metric tons were transported through Chilean ports, this represented nearly 85% of Chilean foreign trade. Investment in infrastructure has increased from US\$270 million in 1990 to more than US\$1500 million in 2002, including the contribution of the concessionary system.

¹⁶Prieto, Francisco (1999), *Chile y el GATS 2000, hacia la liberalización efectiva del comercio servicios. Propuestas para la acción*. DIRECON/ Ministerio de Relaciones Exteriores, Santiago, Diciembre 1999.

¹⁷DIRECTEMAR, Boletín Estadístico Marítimo, 2015

Table1: Table - TEU Throughput by Area of Influence, data period 2012 - 2014

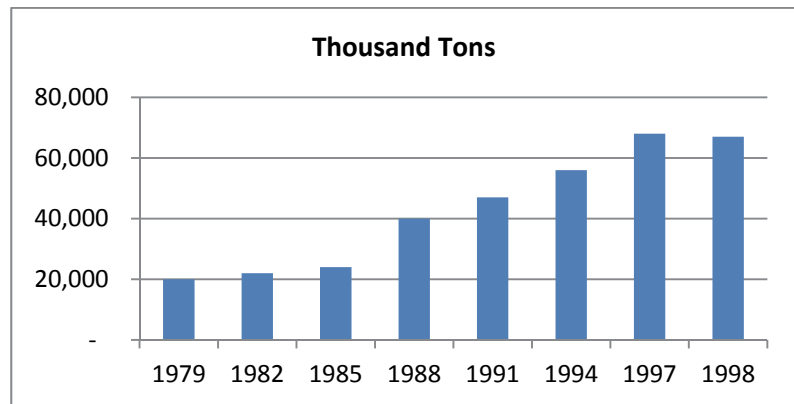
Ports	2012	2013	2014
Arica	182,039	204,174	216,392
Iquique	245,290	244,565	240,823
Antofagasta	134,162	148,973	167,266
Valparaiso	942,647	910,780	1,010,202
San Antonio	1,069,271	1,196,844	1,093,625
Lirquen	143,635	126,244	106,438
Coronel	167,682	394,070	521,527
San Vicente	585,280	453,174	475,164

Source: ECLAC, Maritime Profile, 2015.

Beginning of the Chilean Port Model

Up until 1981, the Chilean state administrated and operated all the public ports of the country through the Chilean Ports Enterprise (EMPORCHI). The high port costs and the inefficiency of the system led to the abolition, in 1981, of the monopoly held by EMPORCHI for the unloading of merchandise, and also the special licenses held by the shipping companies. A multi-operator system was introduced to the ports and licenses were given to private companies to carry out their services in public ports, subject to meeting minimal standards of quality, also trade union pressures and abuses were eliminated that affected port competitiveness. The changes were such that the cargo handled by the public ports increased from 22 million tons in 1979 to 66 million in 1998, without significant infrastructure investments during this time, demonstrated by the following graph. Together with the improvements in efficiency, the reforms brought reductions in port costs and these continued to be low and competitive to the end of the nineteen nineties.

Graph 1: Movement in Chilean ports, 1979 – 1998



Fuente: BID, Estudio sobre reestructuración portuaria - Impacto Social, 2002 http://www.iadb.org/res/publications/pubfiles/pubB-2001S_1684.pdf

Notwithstanding the initial success of these measures, the scheme did not encourage investment in equipment; neither did it set the conditions for maintaining and construction of new port infrastructure, this continued to be the responsibility of the state that didn't have the necessary resources to invest in such ventures. The need grew considerably due to the enormous increase of foreign trade during the export boom of the eighties and nineties. As a result, in 1997 Law 19,542 on Port Modernization was passed, through which the 10 state owned ports managed by EMPORCHI were transformed into autonomous enterprises. This measure was aimed at incorporating an active participation of the private sector in operations, cargo transfer and investment in berthing sites, allowing a reduction in port costs and improvement of the precarious existing infrastructure. By means of the same law, the state and the port concessionaries have generated new public areas for recreational, tourist and commercial activities, leading to new integration opportunities with the city, the sea front and the port activity.

The concessions are given for a period of 15 to 20 years, with the possibility of extending them to a maximum of 30 years. The concessions in the ports of San Vicente, San Antonio, Valparaíso and Iquique began functioning in the year 2000. The simultaneous franchising of the three main ports turned out to be so attractive that four of the five largest companies in the world, including Hamburger Hafen und Lagerhaus (HHLA); SSA Holding International, Mersey Docks and Harbour Company, International Container Terminal Services, Hutchinson International Port Holding Ltd, P&O Australia Ports.

The criteria for choosing a winning consortium was to select the participant with the lowest minimal tariff and if there was a draw amongst them, as in fact occurred, the one with the highest bid, giving the government an extra income of US\$300 million, that was used to compensate 50% of the port workers who did not continue work under the new concessionary scheme, through a series of provisional, training and work reinsertion measures. If these measures were fully carried out the cost would amount to approximately US\$30 million. In addition, the government receives US\$16.3 million

annually from tax and the concessionaries hold US\$380 million in assets most of which would be handed over to the Chilean State once the concession ended.

In general terms, the franchising of the Chilean ports left three main lessons (BID, 2002):

- a) An increase in efficiency does not necessarily require additional investments in physical infrastructure;
- b) Even when a multi-operator system is successful, it may not offer good incentives for infrastructure investment;
- c) Concessions can provide a good level of service, without incurring in huge investments.

THE RESULTS.

During the first years of running, the terminal concession to the private operators duplicated the transfer capacity of the traditional public ports, as shown in Table 1. It also changed the form of management in the autonomous public port enterprises, placing them under a Board of Directors, which in turn was ruled by Limited Company Laws. Therefore, they became liable, together with their assets, to negative results attributed to management. The state port administration was reoriented exclusively to marketing, concession control and landlord functions.

Between the years 2000 and 2002 cargo transfer in the ports grew by 4.97%, confirming an increase in efficiency by the concessionaries.

Table2: Transference Capacity, 1999 - 2002

Concessionaire	Container Transfer rate (Box/Hour)		
	1999	2001	2002
TPS Valparaiso	26	43	68
STI San Antonio	26	53	75
SVTI San Vicente	18	31	36
ITI Iquique	18	33	36

Source: Revista Chile Portuario, Número 13 - 2003.

Table 3: Top 5 TEU Ranking per LA Country

Country	Years			
	2000	2005	2010	2013
Brazil	2,474,127	5,608,035	6,815,554	8,683,379
Panama	1,357,464	2,774,579	5,593,179	6,561,396
Mexico	1,313,580	2,133,476	3,691,616	4,892,881
Chile	1,082,359	1,854,958	3,149,300	3,821,999
Colombia	673,461	1,198,756	2,054,894	3,124,903
Argentina	1,189,732	1,362,739	1,992,900	2,055,489

Source: CEPAL, Perfil Marítimo, 2014

2.5. PORT NODES IN CHILE.

2.5.1. GREATER-ANTOFAGASTA PORT SYSTEM.

Port of Arica.

The port of Arica is managed by the Arica Port Enterprise; it is located in the 1st Region, in the province of Tarapacá, which borders with Peru to the North. It has a multipurpose site (Berth Site 5) with an annual transfer capacity of 3,346,000 tons and berth 4 with 610,000 tons. It has rail links for the transport of cargoes to and from Bolivia, also serving neighbouring Peruvian cities.

The port provides services with following cargo handling equipment:

Crane Type	Quantity	Capacity	Owner
Mobile Gottwald	2	100	Concessionaire

Source: www.epa.cl

Picture 1: Arica port terminals



Source: Puerto de Arica: <http://www.puertoarica.cl>

Port of Iquique.

The port of Iquique is situated on the Northern coast of Chile, in the First Region of Tarapacá. The exact location is Latitude 20°11,35' S and Longitude 70°09,5' W. It covers 33 hectares for loading and unloading operations, storage, cargo stacking and all other complementary activities carried out within a port zone. It also has warehouses for bulk and general cargo.

It has two terminals known as Front N°1 “Molo” and Front N°2 “Espigón”, each of which has two berthing sites with their corresponding backup areas. The main characteristic of the current berths is that their water depth is similar, allowing vessels of up to 9.3 meters draught.

Regarding the services offered by the port, although the State owns the port infrastructure, both fronts are run by the private sector, servicing the vessels and the cargo. The Molo terminal has a multi-operator system whilst the Espigón terminal, has a mono-operator concession held by Iquique Terminal International (ITI).

Berth site N°1 has a crane capacity of 12 tons with a 38 m outreach (50 tons at 13 m) and an electrical sub-station of 100 KVA, which provides the power for refrigerated containers, conveyor belts, pumps for loading liquid bulk, tugs, lighting and others. It also has 2 warehouses with 9,680 m² and open areas of 5,980 m². Front number 2 of the Iquique Terminal International S.A. (ITI) has 2 berthing sites that are separated by 100 meters of backup grounds. The Espigón terminal has two state of the art quay cranes (Gottwald) and three conveyor belts for bulk loads. The total backup area of the concession to ITI covers approximately 85,000 m².

Crane	Quantity	Capacity	Owner
Mobile Gottwald	5	100	Concessionaire
Mobile Demag	1	50	Concessionaire

Source: www.iti.cl

Picture 2: Port of Iquique



Source: Puerto de Iquique; <http://www.epi.cl>

Port of Antofagasta.

The port of Antofagasta is situated in the Second Region and apart from dealing with cargo directly related to this region, it also serves the Mediterranean areas of North-western Argentina by the border passes of Jama and Sico for road transport and by rail connections of the Antofagasta – Bolivia Railways (F.C.A.B), and Argentinean FERRONOR and FC BELGRANO. In the same manner, the branch-line Salta – Antofagasta, shared by three different companies, F.C.A.B., FERRONOR (Chilean) and FC BELGRANO (Argentinean), is capable of moving 200.000 tons per year.

The Antofagasta port has an outer harbour called Portezuelo, situated 33 kms.to the northeast of the city of Antofagasta, designed for the collection and storage of bulk minerals, this cargo is then transported in hooded lorries to the port for loading. Portezuelo has a direct railway access to and from Bolivia, and direct rail and road links to the Port of Antofagasta.

Crane Type	Quantity	Capacity	Owner
Mobile Gottwald	3	100	Concessionaire

Source: www.anfport.cl

Picture 3: Port of Antofagasta



Picture 4: Port Complex Mejillones



2.5.2. GRAND-VALPARAISO PORT SYSTEM.

Port of Valparaíso.

The Valparaíso Port Enterprise (EPV) has 8 berthing sites, covering approximately 50 hectares of protected waters. The first five berths make up Terminal 1, which is operated under concession for a period of 20 years, extendable to 30, by a Chilean German Consortium made up by Inversiones Cosmos that belongs to the Von Appen shipping group, and Hamburger Hafen und Lagerhaus Aktiengesellschaft (HHLA). The consortium operates under the name of South Pacific Terminal Valparaiso (TPSV). Terminals 2 and 3 are managed directly by EPV through a multi-operator system.

Berthing sites 9 and 10 were transformed into Muelle Barón Promenade according to the tourist infrastructure development model being led by EPV. Additionally, the concession of the passenger terminal of the Port of Valparaiso is now in force, providing the necessary infrastructure required to handle the growing demand of cruises that is expected to triplicate to 70.000 tourists during 2003-2004.

Table4: Physical characteristics of the Port of Valparaíso

Terminal	TPS					Terminal 2		
	Berth Site	1	2	3	4	5	6	7
Length(Mts)	142	200	229.5	230.5	107	245	125	240
Depth(Mts)	11.4	11.4	11.4	9.39	9.39	8.5	6.19	8.80

Source: Puerto de Valparaíso; <http://www.valparaisoport.cl>

Berthing sites 1,2 and 3 have five Gantry cranes (2 Panamax and 3 Post-panamax) for Panamax vessels and 1 mobile crane Gottwald of 100 tons capacity. Berth 4 has a Hitachicrane capable of lifting 36 tons and an outreach of 34.4 meters.

Berth 8 has two MAN cranes, with a 5 ton lifting capacity and a 15.4 – 19.4 meters outreach. The mobile equipment comprises 2 Gottwald cranes, with 100 ton capacity and 50 meters outreach, 7 container park Top-Lifters and 12 Reach-Stacker's.

Picture 3: Terminals in the Port of Valparaíso



Source: Puerto de Valparaíso; <http://www.portvalparaiso.cl>

The operators working in the port of Valparaíso are:

1. Terminal 1 is operated by South Pacific Terminal Valparaíso (TPSV) in a mono-operator scheme.
2. Terminal 2 is multi-operator scheme managed by the Valparaíso Port Enterprise.
3. Terminal 3 is a passenger terminal, given in concession to the Valparaiso Passenger Terminal (VTP) Company.

Picture 4: Valparaiso Development Plan



Port of San Antonio.

The port of San Antonio is situated in the country's central zone, and is the port terminal nearest to Santiago, the capital of Chile. It serves the central zone of Chile and the province of Mendoza in Argentina.

The total area covered is 271 hectares, 189 of which correspond to maritime areas and 82 hectares to land areas. Moreover, 4.4 hectares were added in November 1999, with a surface regained from the sea. The maximum water depth is 12 meters. It has six Gantry Cranes, besides other cargo transfer equipment: two Gottwald cranes, two Demag cranes, one Level Luffing crane, specialized in moving solid bulk, 14 Reach Stacker cranes and 12 specialized container movers.

Table3: Physical characteristics of the San Antonio Port

	South Molo	Espigón		Northern Terminal	Policarpo Toro
Berth Site	1-2-3	4-5	6-7	8	9
Length (Mts)	537	341	321	200	190
Draft (Mts)	10.3	9.2	7.1	10.4	10.1

Source: Puerto de San Antonio; <http://www.saiport.cl>

The San Antonio Port Enterprise is an autonomous State company, created by the 1997 law, its aim is to administrate, conserve and develop the port-maritime activity of the San Antonio Port. It is governed by a board of Directors, named by the President of the Republic, and managed by a General Manager and five area managers.

Following the process of concessions in the year 2000, the San Antonio port comprised four terminals and a total of nine berthing sites. Two of the terminals are under a mono-operator system, with exclusive management and operation by the concessionary, also including responsibility for maintenance and development. The remaining two kept the multi-operator system of 1981, where a number of private shipping companies have access to the port offering cargo movement services. The management of these sites corresponds to the San Antonio Port Enterprise.

Picture 5: Hinterland of the San Antonio Port



Source: Puerto de San Antonio, <http://www.saiport.cl>

The operators of the San Antonio port are:

- 1) The South Molo Terminal (berths 1,2,3) given in concession to the San Antonio International Terminal (STI), Works under the mono-operator system.
- 2) The Espigón Terminal (berths 4, 5, 6 and 7) operated by many companies under the multi-operator system.
- 3) The Northern Terminal (berth 8) specialized in solid bulk imports, is concessioned by Puerto Panul with a mono-operator system and Policarpo Toro Terminal (berth 9) specialized in liquids, has an operational contract held by Vopak Terminal San Antonio Ltda.

Picture 6. Terminals in the Port of San Antonio



Source: Puerto de San Antonio, <http://www.sanantonioport.cc.cl>

2.5.3. GREATER- CONCEPCION PORT SYSTEM.

Talcahuano Port/ San Vicente.

The Talcahuano San Vicente Port Enterprise, operates the port of Talcahuano, which has two berthing sites and various installations that allow timely and efficient services to be given to national and international clients. It also controls the concession of the San Vicente International Terminal S.A. (SVTI).

Picture 7: Geographical distribution of the Talcahuano/ San Vicente Complex



Source: Puerto Talcahuano/ San Vicente; <http://www.ptotalsve.cl>

Port of Talcahuano.

The Talcahuano port has two berthing sites and covers an area of 110,850 mts², of which 92,350 mts² correspond to the primary zone and the other 18,500 mts² belong to the Malecon Blanco. This area holds installations of the Industrial Fishing Association (Asipes), of the Talcahuano Maritime Government and a private warehouse, all by means of land concessions.

The areas destined to specific use are the following: Transference 17,750 m²; Conveyance 10,000 m²; Storage (2 covered warehouses) 5,267 m²; Stacking, consolidation/deconsolidation (parks) 33,220 m²; among other areas destined to services, maintenance and operation.

Port of San Vicente.

Set among a series of privileged natural conditions, it is only two kilometres from the Talcahuano Terminal. The San Vicente Terminal has three berthing sites. Its position as a marginal quay, allows it to offer independent attention to vessels free of interference from the arrival and departure, this represents an advantage with regards to the other ports of the area.

The San Vicente Terminal was given in concession to San Vicente International Terminal S.A. (SVTI), a consortium formed by SudamericanaAgenciasAéreas y Marítimas and SSA Holdings International, the main port operator in the USA. The port and containers operation is provided with 9 mobile craneGottwald with a capacity of 100 tons each.

Lirquen Port.

Lirquén port is a multipurpose terminal, located in the Concepción bay, VIII Region of Chile and has road and rail access that link it to the various production centres between the Seventh and Tenth regions, principally related to timber, agro industrial and salmon industries. It covers a total area of 415,000 m² destined to collection and storage parks, warehouses, workshops, administration buildings and common areas among others.

Table4: Physical characteristics of Lirquen Port

Pier	Pier 1			Pier 2		
	1	2	3	4	5	6
Berthing Site						
Length (mts)	220	210	200	160	200	200
Draft (feet)	39.0	37.3	29.4	24.3	50.8	42.3

Source: Puerto Lirquen; <http://www.puerto.cl>

It has four mobile Liebherr cranes model LHM 400, with 100 ton capacity, which are used mainly for loading and unloading containers. In addition, it has three Bromma spreaders, model EH-5 with a 35 ton capacity.

For the unloading of bulk, Lirquen port has a conveyor belt with a 7,200 tons/day capacity that is complemented by a trimmer within the hold, making efficient use of available space. Also, 13 bulk spades with a capacity of between 5 and 8 m³ and 11 hoppers of 8 to 26 m³ capacity and 3 sacking plants and a fertilizer mixer plant with a 10 to 12 fifty kilo sack per minute capacity.

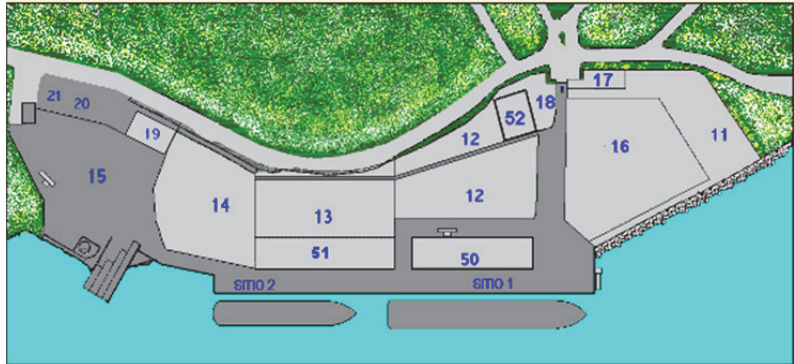
The port also has 11,448 line meters of rail sidings that link the regional rail network to its installations.

Puerto Montt.

Puerto Montt is located in the X region, in the city of the same name. It has a total area of 9 hectares and berthing length of 385 m divided into: Berth 1, 240 m long with a 9.30 m depth; Berth 2, 145 m long and 7.50 m deep.

A capacity of 80 Reefer containers, 2 quay cranes with a 5 ton capacity, three with 3 ton capacity and one mobile crane of 23 ton and a forklift of 7.5 tons. Also, 5 ramps at different levels according to tidal changes and 2 buoys in the ferry terminal, 2 warehouses of 30X125 m, Container Park, paved and unpaved collection areas, parking.

Picture 4: Puerto Montt Terminals



Source: Puerto Montt; <http://www.empormontt.cl>

Picture 8: Chilean Commercial Ports

Public Use		Private Use	
State Port Enterprises	Private Ports	Dry Bulk Ports	Liquid Bulk Ports
10	14	15	17

Source: Own design with information from DIRECTEMAR, 2014

CHAPTER III REGIONAL LOGISTICS.

3.1. GENERAL CONCEPT.

The Council of Logistics Management (CLM), define Business Logistics as the following:

“ Logistics is the process of planning, implementing and controlling the efficient, effective, flow and storage of raw material, in-process inventory, finished goods, service, and related information from point of origin to point of consumption (including inbound, outbound, internal, and external movements) for the purpose of conforming to customer requirements”.

It is possible to derive that Maritime Transport Logistics is the process of planning, implementing, and controlling the efficient and effective flow, information, and storage of cargoes, going from point of origin to point of destination, for the purpose of fulfilling the clients' requirements.

3.2. THE LOGISTICS SYSTEM AND THE GRAPH THEORY.

For the purpose of this research and because of the huge area covered (the Southern Cone, see figure 1) the author considers it is required to focus the area of study. According with the above a “Graph” has been designed and showed as figure 2.

Therefore, the figures were based on the logistics system of nodes and links. The first represents mainly logistics at origin or destination. Consequently, those are the ports, hinterlands, industrial sites, cargo depots, and their related places. In the case of the links, they represent the roads, railways and shipping systems involved. All of them have to be analysed considering the restrictions of the problem presented and the target area predetermined.

It is also important to have in mind that nodes can be simple or complex depending on their composition.

Figure No .1.Routes and Connections.



Likewise, complex nodes represent port conglomerates and regional hinterlands, when simple nodes are hinterlands or single ports.

3.3. THE INDUSTRIAL BANANA OF THE SOUTH CONE.

Having constructed the “System Graph”, there is a demand derived from the industry located in the target area. From that, a survey been done for the researcher determined there is a physical relation between the industrial zones of the different countries involved in the Graph.

Furthermore, it can be said that the industrial site for the South Cone of Latin-America forms a line coming from Santos (Brazil), crossing through Uruguay, Argentine, to arrive to the Central Region of Chile and the Pacific Ocean.

This industrial zone, formed by the countries mentioned above, is the conglomerate the author has named the “*Industrial Banana*”. This area is going to generate a great demand for maritime transport, to and from the products final destinations.

Considering Latin-America surplus production is being exported as part of the new economic policy enforced on the majority of the “industrial banana” countries, there is a need for export diversification in terms of searching for new market possibilities.

So, the huge market located in the Pacific Ocean basin, represents a real incentive for exporters of the South Cone. Chilean ports could be the communicating gates between South Atlantic countries and the Asian-Pacific emerging economies.

It is important to have in mind that the facts that show freight rate fluctuation are related, among other parameters, not only with port efficiency but also with economies of scale which are reached depending on the quantities, connectivity and periodicity of the cargoes shipments.

Figure No. 3. Industrial Zones Nodes and Links.



3.4. THE BIOCEANIC CORRIDORS OR CORRIDORS OF TERRITORIAL INTEGRATION.

Using both, the land bridging concept and the design of the above logistics graph, the links connecting nodes which, depending on the case, represent a national or international hinterland, and communicate ports belonging to different Oceans, should be either land bridges or micro bridges, depending of the cargo destination.

Likewise, in both cases they establish a system and represent a multimodal corridor connecting both Oceans. From that, and hereinafter the author will name the multimodal corridor as “Bioceanic corridors”.

Considering most of the corridors are not implemented with the adequate infrastructure to fulfil the requirements needed for international multimodal transport, there is a need to revise their condition, characteristics and physical capacities.

Moreover, the acceptance of these corridors depends not only on their infrastructure but also on political and strategic decisions.

Therefore, the Bioceanic corridors actually represent a greater advantage for the integration of the related zones to their national and external markets that is why the author named them as “Integration Corridors”.

3.5. SURVEY OF THE LOGISTIC TRANSPORT SYSTEM IN THE SOUTHERN CONE OF SOUTH AMERICA.

3.5.1. OPERATIVE ASPECTS OF INTERNATIONAL LOGISTICS WITHIN MERCOSUR.

As a result of the integration policies carried out by South American countries within each of their regional commercial blocks, the Inter-regional commerce has seen a considerable increase during the last decades.

In order to maintain the current economic openness in the region and produce the desired effects by the participating countries, it is fundamental to deepen and perfect the current economic agreements until they reach a real Common Market level, where goods, services, capitals and work can circulate freely between member countries, with no obstacles regarding nationality or citizenship. Even though Mercosur has advanced considerably in commercial matters, an agreement has not been reached on other joint matters that are just as important, such as employment and tax legislation, monetary handling and macroeconomic coordination between member countries. This subject will be clearly seen in this part of the document as there is an analysis of the operative aspects of MERCOSUR, where even the established agreements for the commercial promotion and transport infrastructure integration are not put into practice in the day to day reality.

However, the adjustment of the regulation framework does not only make the countries more competitive, it also requires the optimization of the different production phases, the integral and synergic improvement of the logistic chain and the infrastructure that supports it, allowing the transformation of the development poles in sustainable development areas.

Recent studies have highlighted the importance of adequate consideration of the concepts of **economic distance** over and above **physical distance** in global environments; this leads to a discussion over how to analyse the logistic chain of each product adequately and competitively.

It is not only necessary to have the sufficient infrastructure to dispatch products, it is also important to optimize the different factors that are part of the process (packing, transport, insurance, bank transactions, customs operations, dispatch costs, delivery, etc.). It can be seen that in a large proportion of cases, the differentiation of the competition and the better returns obtained, are due to the integration of activities, through the propagation of up to date and equal information of the process to the rest of the components of the productive chain and the introduction of improvements – operative, organizational and technological – that lead to substantial savings in both time and resources.

It should be of no surprise that the businesses work in an environment with very favourable conditions, either due to the availability of workforce, tax exemptions or their closeness to large markets, where they make up real development poles, requiring intricate logistic and transport networks that connect the production centres with storage areas and sale points.

The opening of free market economies forces a continual optimization of the participants of the logistic chain process, seeking savings that can be passed on to the final consumer and therefore making the products more competitive. This concept is not shared by some governments, where the savings are not passed on to the final consumer, increasing the state income.

Aware of the fact that transport makes up a significant part of the final cost of the product, the companies have taken on board the issues of:

- i) Optimizing transport, selecting the adequate mode of transport according to the type of cargo and privileging the multimodal transport schemes.
- ii) A larger and better planning of the position of the warehouses and logistic centres that provide services to the cargo.

3.5.2. MODAL CHOICE IN THE MERCOSUR (SOUTH CONE).

In theory, experience shows that the more the distance increases, the land transport mode (by road in the first instance and then by rail) loses competitiveness against the maritime mode. However, the analysis of the particular situation for the MERCOSUR region, shows an overuse of road transport in some sections mainly due to the lack of rail infrastructure capable of satisfying the demand for transport services within Mercosur and the legal framework established on the use of coastal shipping (countries protection of the short sea shipping/regional cabotage) that impedes the use of complementing schemes between modes, as shown on Table 1.

Table 1: Competition and Complementation between modes of transport

Transport Mode	Competition	Complementing sequence with other modes
Rail	Road Maritime	Road Maritime
Road	Rail Maritime (Cabotage)	Rail Maritime Internal water lanes Air
Maritime	Road (Short distances)	Rail Air Maritime (Cabotage) Internal water lanes
Air	Rail (short distances) Road (short distances)	Rail Road Maritime Air (domestic services)

Source: Ruibal, Alberto, 1994

Although 67% of cargo exported within the Mercosur, use maritime transport and only 24% use the road, the maritime mode is only dominant for the bilateral traffic between Argentina and Brazil, and also between Brazil and Uruguay. While for the rest of the commercial flow, the main transport mode is by road, especially for cargos to and from Chile.

The use of air freight within the block for inter-regional commerce, although currently in the process of expansion, is still low, mainly due to the lack of rulings and common policies (for example open sky treaties) and the lack of minimal aeronautical infrastructure in most of the regions.

River navigation, on the other hand, although an economic means of transport and of low environmental impact, is only used intensively by Paraguay on the Paraná –

Paraguay Waterway, and by Brazil on the Madeira, San Francisco, Tocantins and Araguaia rivers and the Tiete – Parana Waterway (Sánchez, et al, 2003).

Multimodal transport is precarious and only present in particular cases or as a result of artificial bureaucratic obstacles, forcing cargoes to be transferred at the border, bringing forward structural differences. The advantages of multimodal transport are diluted by inefficiencies in the procedures that add no value to the final process.

This lack of optimization in the modal choice means that, in order to satisfy the returns of transport companies that cover the MERCOSUR, the final users must pay overprices on the products due to an inadequate modal choice. This is clearly reflected in the high rate of empty return journeys that occur by road transport through the border passes of the Mercosur countries (see Table 2), although this has improved considerably in the last years, around 40% reduction of border transfers in some passages and between 20% and 35% reduction of empty journeys, they continue to be important factors that affect the competitiveness of the MERCOSUR products.

Table 2: Frontier transfers and ballast returns, in MERCOSUR land lanes, 1999

Land Lanes	Frontier transfers	Empty Legs
São Paulo – Buenos Aires	67%	37%
Buenos Aires – Valparaíso	23%	42%
São Paulo – Montevideo	57%	44%
Paranaguá – Asunción	5%	38%
Montevideo – Buenos Aires	0	28%
Buenos Aires – Santa Cruz de la Sierra	0	N/d
Río de Janeiro – Valparaíso	74%	40%
Buenos Aires – Asunción	0	23%
São Paulo – La Paz	69%	0
Valparaíso – Asunción	0	0

Source: Elaborated based on ALADI (2000); “DITIAS”

3.5.3. SPATIAL PLANNING FOR LOWER COSTS.

The need for logistic nodules capable of transporting merchandise at the lowest possible costs with high levels of quality and security, have led to search for organized ways of making the costs structures flexible, reducing fixed costs and empty returns and optimizing the logistic process in terms of time and service quality.

One of the schemes that has taken on some strength is the logistic platforms, this was based on EUROPLATFORMS in 1992 as limited geographical zones, within which

different operators carry out all the activities related to transport, logistics and distribution of merchandize, both for national and international transport.

Depending on the size of the market and the level of competition and service ruling the market, different types of logistic platforms can be set up, as shown by the following table:

Table 3: Types of Logistic Platforms

Logistic Platforms	
With only one transport mode	With more than one transport mode
Road Centres Transport service Centres	Port Logisticactivity Zones (ZAL/LSA)
Urban distribution or city-logistic Centres	Air cargo Centres Dry Ports
Distriparks Transport Centres	Multimodal Logistic Platforms

Source: Ministerio de Fomento de España, September de 1999

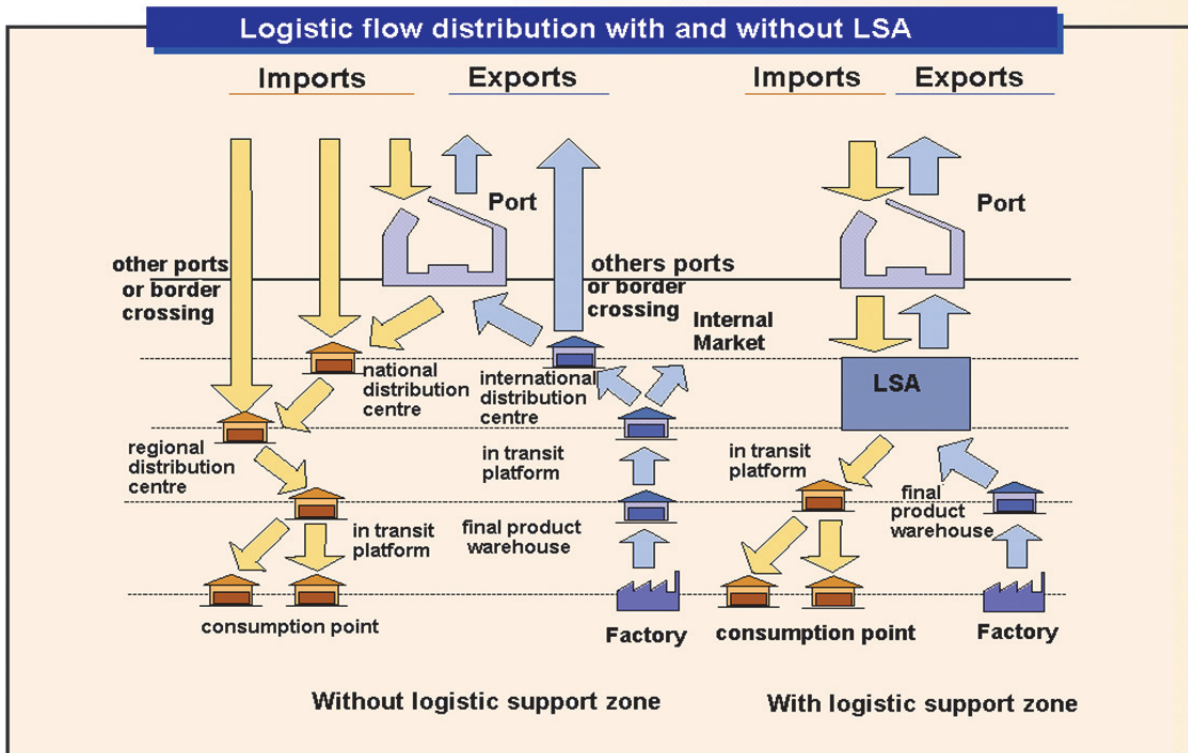
The logistic platforms have a geographical situation that allows the communication and integration of the urban and international distribution of merchandise, resulting in important savings for the companies that participate in them due to the concentration of services and large volumes.

In the case of logistic platforms where more than one mode of transport operates, especially the multimodal and the port ZAL's, the concentration of logistic activities in the same environment – mainly port – allows important scale savings due to handling large volumes of cargo and the correct integration of transport modes. At the same time, they enable optimization of working times and the use of the available physical infrastructure, technology and telecommunications. If in addition there are tax benefits or customs facilities, as is the case in some platforms, it is highly favourable to the competitiveness of the country to have such platforms.

The setting up of logistic platforms in the ports presents advantages as they are traditional points of modal change and traffic concentration, offering privileged characteristics to house added value functions, although it is necessary to have the correct integration of land logistics (second port line) with first line operations (port – maritime logistics). With the understanding that all logistic operations (static and dynamic) in the port nodule ambit, including those of Logistic Zones, should be integrally optimized in order to increase global competitiveness with regards to other alternatives of transport and logistic chains.

The following picture shows the reduction of the logistic flows in a Port Logistic Activity Zone, which finally reverberate in a reduction of logistic costs and an improved service regarding quality and time.

Picture 5: Logistic Flows in LSA



Source: Manchon, F. RevistaPuertos; Número 97 Julio-Agosto, 2002.

3.6. LOGISTIC PLATFORMS IN MERCOSUR.

Although Latin America has not been an outsider to structural changes that have occurred in the production, commercialization and distribution of goods in the new economic globalization context, the development of logistic organizations is still in its early stages, mainly connecting origin with destination of goods, and not using a concept of logistic services or a logistic operator from holistic point of view. However, the number of integral logistic operators is small in most countries and even non-existent in others.

In the MERCOSUR region, there are no undertakings of logistic platforms to the level that the commercial block suggests. The reason for this, according to some

logisticenterprises, is the existence of some regional rulings¹⁸ that put restrictions of the services that can be offered on the logistic platforms, restrictions they hope will be abolished soon in order to increase the commercial exchange within the region. Nevertheless, in the last few years there has been an increasing interest on behalf of the regional ports in transforming into logistic platforms as part of their master plans. These initiatives are presented below, stressing that the level of advancement in each case is relative and many are still only projects.

In Latin America, the multimodal transport, according to UNCTAD definition, has not come into effect due to the non-existence of a regulatory framework that would allow it to work as an efficient system. However, transport users have developed a logistic system that is not necessarily dependant on a complex and bureaucratic legal framework, therefore its implementation is more operational than regulatory. Nevertheless, it is necessary to establish some sort of regulation regarding civil responsibilities and insurance.

3.6.1. LOGISTIC PLATFORMS IN ARGENTINA.

BUENOS AIRES: EXOLGÁN.

The ITL (International Trade Logistics) group, proprietor of the Exolgán terminal in the port of Buenos Aires, has implemented a multimodal logistic platform called PLS: Southern Logistic Park, with a view of integrating its related business to the port and logistic operations, thereby increasing the efficiency of the process, eliminating intermediate costs and increasing the speed of the operation.

PLS has 22 has. situated at 400 mts from the Exolgán Container Terminal. It has 110,000 m² of depots for IMO cargo storage and refrigerator chambers, a container stacking park and a pier for loading and unloading barges. In order to facilitate the movement of large volumes of cargo, the logistic zone has an internal connection with the Ferrosur Roca rail network, this provides a connection with the centre and south of the Buenos Aires province, the high valley of Rio Negro, Neuquén, Plaza Huincul and Zapala, reaching as far as Bariloche and Esquel; by connecting with other railway networks it is in effect linked to the rest of the country.

It also has a pier on the River, which helps with the connection to the navigable estuaries and the main maritime points of the country, such as: Mesopotamia, the Paraná River estuary and Uruguay River (Paraná – Paraguay Waterway) and other ports that allow the connection of the Buenos Aires Province with Paraguay and southern Brazil.

¹⁸ The resolution 252 of 1999, of the originating regime of the ALADI, establishes, among other dispositions, restrictions on the operations that can be carried out with the cargo and disallows the division of the certificates of origin in the countries where depots are installed; this restricts the services to the cargo that logistic platforms can offer. It has been requested that logistic platforms be considered an exception to the rule, which would favor the free circulation of the merchandise in transit within the ALADI and allow the distribution of products with certificates of origin, according to the quantities required by the importing companies. (Chile Portuario, 2003)

In addition, the ITL group owns the Zárate Distribution Center, one hundred kilometres from the city of Buenos Aires, where 15,000 m² of depots and container parks operate, with future plans for dangerous goods installations, such as chemicals with IMO classification. It has close access to rail side-tracks to the north of the country and also to Puente ZárateBrazo Largo, the main highway between Argentina and Brazil.

ROSARIO PORT.

The Rosario region follows the length of the southwest bank of the Paraná River, with 4,200 km of coast between Argentina and Brazil, covering an area of three million square kilometres and a population of around 72 million inhabitants. The link of the Paraná River with the Rio de la Plata guarantees an opening to the sea through the Ing. Emilio Mitre Canal at about 550 km distance with an effective depth of 32 feet.

After the failure of the port's concession process, the strategic aim was set to convert it into a Multipurpose Terminal, capable of complementing with the regional port system and position itself as a multimodal cargo centre for the Mercosur. For this reason, together with the port of Rosario, there are many terminals and private ports and, by working jointly with the Tax Free Zone of Santa Fe, (whose port is also going through the process of logistic transformation, as will be seen) they make up a modern complex with state of the art technologies.

The existing transport network in the area has road and rail lanes that connect by land with the whole of the country and adjoining countries, the rail networks of Nuevo Cen Argentino S.A., Ferro ExpresoPampeano S.A. and Belgrano enter the port directly, giving easy access to the centre and north of the country.

Parallel to this, they are near the access to the Highways Tte. Gral.Aramburu, AutopistaBrg. E. López, National Route N° 9, National Route N°11, National Route N°33, National Route N° 34, this last one connects Rosario with the northeast of Argentina and reaches the Republic of Bolivia. The Rosario – Victoria Bridge and the Rosario – Cordoba Highway connections are under construction. The Fisherton International Airport is situated 15 km from the centre of the city of Rosario and has a direct access route to the port.

SAN LUIS: MULTIMODAL DRY PORT

The San Luis province is in the centre of Argentina, where all the routes meet that connect Buenos Aires, Rosario, Mendoza with Santiago and Valparaiso in Chile as can be seen in the following picture.

Picture 1: Dry Port in San Luis



Source: Gobierno de San Luis, <http://www.sanluis.gov.ar/>

The region has the Justo Daract Duty Free Zone covering an area of 42 hectares, providing industrial, commercial and logistic services with customs advantages that give preferential treatment to investments, merchandise, operational expenses and provision of goods and services, enabling commercialization, deposits, storage, conditioning, selection, division and return of merchandise without having nationalized the merchandise.

The setting allows road connections with ports both on the Pacific and the Atlantic coast, and the Waterway by means of the Route 7 (Bi-oceanic corridor Buenos Aires – Pacific), Route 8 (Mercosur corridor Santiago of Chile, Santa Fe, San Pablo of Brazil). Route 36, connected to Bahía Blanca and southern Argentina and 36 linked to Cordoba and the northeast of Argentina.

The rail network is connected to Mendoza, San Luis, Buenos Aires and the Port of Rosario. Finally, at a distance of 26 km is the Villa Reynolds airport, with sufficient infrastructure for loading large airplanes.

To complement these activities, a logistic activity zone is under construction and so is an inter-modal cargo transfer station in San Luis, aimed at consolidating the province as a centre of basic services in the Mercosur. For this, the provincial government expropriated 90 hectares adjacent to the Bi-oceanic Corridor (Provincial Highway N°7) where the logistic centre will work as a platform for freight or merchandise station, and where all the activities related to transport, logistics and goods distribution will be carried out.

PORT OF SANTA FE.

The Santa Fe port is set in the Heart of the Paraguay – Paraná Waterway (Km 584 of the Paraná River) being the highest up river port suitable for ocean liner operations.

Making the most of its strategic location, it stands as a strong candidate to become a multimodal node, to develop regional trade operations and be the cargo transfer centre for the waterway. For this, within the “Port Reverting Process” that is being carried out, is the change of location of the port itself and the creation of logistic activity zones

and the possibility of adapting existing structures for intermodal transport. All this with a view to modernizing and adapting its infrastructure to face the growing needs of commercial cargo exchange in their captive and potential hinterland.

The road network that links the Port of Santa Fe with the main areas of the province and the regions of its hinterland, is made up by the National Route N°11, connecting with the city of Clorinda, opposite Asunción in Paraguay, the National Route N°19 – bioceanic – that followed by N°20 leads to Cordoba, San Juan, San Luis, Mendoza and Chile; towards the Northeast, by National Route N°34 it links with Santiago del Estero and Tucuman.

The railway connections that converge to the Port, are the Belgrano Railway and the Nuevo Central Argentino, linking it with the provinces of Cordoba, San Juan, La Rioja, Tucumán, Salta, Catamarca, Jujuy, Chaco, Santiago del Estero and Formosa.

3.6.2. LOGISTIC PLATFORMS IN BRAZIL.

With the objective of transforming the Paraná state into a network of logistic platforms, which on the one hand, would adequately organize and supply the Brazilian industries present in the area, and on the other, would attend the production and consumer markets of the southeast of Brazil and the whole of MERCOSUR, the “Paraná Logistic Platform” project was set up, this intends to make the most of the location and economic importance of the area within the block, develop the economic activities in Paraná through establishing a network of Logistic Platforms that act as centres for consolidation, transfer and distribution of cargos.

Some of the main points of this project are the following:

- Logistic Director Plan: will encourage a harmonious economic development of the state, setting priorities according to efficiency and interaction of economic activities. Custom aspects are fundamental for this, therefore Interior Custom Stations (EADI) will be created in Curitiba, Foz do Iguaçu, Maringá and Paranaguá.
- Paraná port system: through strategic expansion plans, an integral analysis of expansion and extension will be made on the Paraná port system: Paranaguá and Antonina Ports, adapting the port authority and integrating attached agents (importers, exporters, dispatchers, operators and public authorities) into its mandate.
- Western Multimodal Pole: The Paraná government wishes to integrate the existing transport systems of the region, like the waterways, in order to ease the passage of cargo through the triple frontier.
- Logistic Institute: Pretends to establish a centre capable of generating and storing logistic information about the region, and then train the workforce according to the new needs of the region.

A series of complementary and other measures being development in other areas of Brazil are shown below:

INLAND CUSTOMS STATIONS (EADI).

Since 1996, a Project has been analysed in the federal congress of Brazil, to simplify the creation of inland customs stations (EADI) also known as dry ports. These are located near production or merchandise unloading centres and have the same bureaucratic and inspection structure as the ports, airports or frontier passes, in addition to other logistic services offered.

The location of the first EADI, was chosen according to geo-economic criteria linked to the concentration of both exporting and importing cargos, these were: Santo André e Campinas (SP), Brasília (DF), Cascavel (PR), Caxias do Sul (RS), Anápolis (GO), Manaus (AM), Salvador (BA), Juiz de Fora (MG), Recife (PE) and Resende (RJ). Other inland Customs Stations that are important due to their location or cargo movement are (Patricia Coast, 1999):

MARINGÁ EADI (PR).

Administrated under the name IngáArmazénsGerais, it is located north of Paraná and is a low cost alternative for the transit of cargos using the triple frontier (Brazil – Paraguay – Argentina). Given its location it also provides support for operations of the Paranaguá Port, storing and helping with the customs process of cargos destined to or originating from the north/western markets of Paraná, Mato Grosso do Sul and the south of São Paulo.

ITAJAI EADI (SC).

Administrated by Portobello ArmazénsGerais, it offers a series of services such as ship hiring, port operations, customs advisor, merchandise storage and distribution to final clients, in addition to speeding up the services and operations of foreign exchange, it also reduces the costs, offers fiscal advantages and a better level of services to the clients that move cargos in the areas of Paraná, São Paulo, Rio Grande do Sul and Minas Gerais. It is located at a distance of 14 km from the Itajaí port and from the highways BR 101 and SC 486.

JUIZ DE FORA EADI (MG).

Administrated by MilteterminaisAlfandegados, this EADI serves the South-eastern region of Brazil, connecting via the TEF railway – Express Rail Transport, to the ports of Rio de Janeiro, Santos and Vitória. It is mainly aimed at offering logistic services from production centres to the departure port or airport; it also has technologies for electronic marking and tracing of cargo.

PORTO ALEGRE LOGISTIC CENTER.

Aimed at satisfying the demand generated within the MERCOSUR, the Logistic Center of Eichenberg&Transeich, in Porto Alegre (RS) was set up close to the Salgado Filho airport, having also five additional operational units in the ports of Rio Grande (RS), Paranaguá (PR) and Imbituba (SC), and in the cities of Novo Hamburgo and Santa Cruz do Sul.

The main objective is to speed up the movements and transport of cargo, optimizing the time and cost of the logistic chain, in order to accomplish this, it has an operational and

data processing structure capable of dealing with the requirements of the clients in the fastest and safest way possible.

GLOBAL TRANSPARK BRAZIL – GTPB.

Global Transpark is a multimodal industrial infrastructure that provides an advanced logistic environment for the production and distribution of merchandise in a competitive environment; it has installations in USA, Asia and Europe providing a global logistic network.

One of the cities interested in developing the project is Uberlândia in Minas Gerais, this region concentrates 75% of the Brazilian GNP, principally through the pharmaceutical and automobile industries.

The Transpark infrastructure is made up by a combination of the concepts of Just in time, multimodal transport and advanced electronic information systems, such as EDI; satellite navigation systems, and electronic information systems in general, which permit the acceleration of production and distribution of products throughout the world.

3.6.3. LOGISTIC PLATFORMS IN CHILE.

PORT OF VALPARAÍSO: EXTRA-PORT LOGISTIC ACTIVITY ZONE (ZEAL/ELAZ)

The Valparaíso Port Enterprise (EPV) is in the process of building on 90 hectares of land in the high sector of Valparaíso an Extra-port Logistic Activity Zone (ZEAL), the idea was conceived as a place to concentrate operations such as customs control, SAG (Agricultural and Animal Services), parking and selection of lorries before loading. Other associated activities could also be carried out like storage of loaded or empty containers, container consolidation and deconsolidation, storage of loose cargo, reefer containers and other services associated to cargo, transport and personnel.

Initially, the area used has been distributed in the following way:

- Lorry parking 10.0 hectares;
- Operational support areas 14.3 hectares;
- Cargo and Transport services 5.5 hectares;
- Inspection Control Services 1.3 hectares;
- Handling and operational terminal 12.3 hectares.

The terminal's operation will be shared between the Valparaiso Port Enterprise (EPV) and various private operators. The latter will concentrate on Operational Zones destined to offer services to the cargo. It is planned to implement four Operational Zones. The rest of the activities, shared by all the operational zones will be developed and implemented directly by EPV.

This undertaking is complemented by the implementation of the Technological Platform carried out by the VLT (Valparaíso Logistic Trade), capable of speeding up the customs procedures and operations, facilitating the transfer of information, communication and electronic commerce between the different members of the Valparaiso Port Community. Opening the possibilities for exporters, importers and transporters, shipping agents, customs agents and shippers to obtain information associated to the cargo and the

vessels through the web, simplifying in this way the foreign exchange, the efficiency and competitiveness of the transactions used.

Table 4: Logistic Services Given by VLT of Valparaiso

Information System	Target Groups
Lorry dispatch (DESCAM)	Exporters and shippers
Lorry and cargo location (UBICAM)	Transporters, Exporters and shippers
Lorry request (SOLCAM)	Ship or cargo agents.
Personnel traffic Control	Custom agents and ship or cargo agents
Fruit services	Shippers

Source: EPV, <http://www.portvalparaiso.cl/>

PORT OF TALCAHUANO: TRIPORT OF THE BÍO - BÍO

This initiative is set out over 900 hectares situated in the bay of Concepcion and contemplates the establishing of a triport and a logistic platform, where the production process of various goods can be finished, services offered and goods distributed.

In order to achieve this, it is planned to construct an infrastructure suitable for interport services such as storage, container and stacking parks, and also for a series of productive processes that could be carried out within the premises.

The project also considers the total integration of the different transport modes that are present in this area: 3 air terminals, Carriel Sur among them; seven ports, an important road network, permitting easy and fast transport of cargos almost to the port zones themselves, connecting with two of the main bi-oceanic corridors by the boarder pass of Pehuenche (in the Maule Region) and PinoHachado in the Araucanía Region.

The rail connection is going through an expansion process, allowing a future link of Central and Southern Chile with Bahia Blanca in Argentina (Transandino Sur project).

Recently the authorities of Incheon Metropolitan City, one of the six Metropolitan Zones of Korea, have shown an interest in the development, in conjunction with Chile, of this triport in the Talcahuano area, with similar characteristics to Incheon, that is, an integral combination of port, airport and telecommunications complex. Their main interest is based on the fact that geographically, Talcahuano is opposite Incheon, and this could offer comparative advantages with regards to other ports of the area that would like to take part in the trade with Pacific Asia.

Picture 2: Road System in the Bio- Bio Region.



Source: COMEXI, consultoría de empresas

Other comparative advantages of this project in the Bio-Bio region with regards to similar initiatives, including Valparaíso, are:

- i) The availability of sufficient land to expand the port and construct a logistic platform, immediately adjacent. It is worth highlighting that the land is currently owned by two companies: ASMAR and FORESA, both of which would participate in the project, therefore facilitating its implementation.
- ii) It has the complete backing of the regional government that placed it at the centre of its Regional Development Strategy.
- iii) It has the particularity of having the four transport modes in the same area (air, sea and land).
- iv) It is part of the regional integration to the bi-oceanic corridors and would give between 6 and 7 days advantage, for the Asian market, compared to the Atlantic ports.
- v) The existence of the ASMAR zone, the only shipyard in Chile, capable of offering services to all types of vessels.
- vi) The capacity of the “Greater Port of Concepcion”, made up by 7 commercial terminals situated between Coronel and Lirquen (see Picture 2n), is of 15 million tons, with the possibility of increasing this by up to 50% with sufficient technological investment. The area also has unlimited potential for the construction of new terminals in the Concepcion bay.

- vii) The Bio-Bio region has an important scientific potential and qualified workforce; this is reflected by the existence of 9 universities and around 90 technical-professional institutions.

LOS ANDES INLAND DEPOT.

Covering an area of 24 hectares approximately, the Inland Depot/Port of Los Andes, was given in concession to the private sector, will have the design, construction and operation of a Port Area capable of offering complete services, both public and private, to the transport, storage, customs and agricultural control of cargos that enter and leave the country through the border pass Los Libertadores.

The dry port will be located in the area of El Sauce, near the Los Andes County and will have an estimated annual demand of 135,000 lorries transporting around two and a half million tons a year, easing the passage of international cargo going to the Atlantic countries and also the products coming directly to the Valparaíso and San Antonio ports by the bi-oceanic corridor.

Picture 3a: Location of the Los Andes Land Port



Source: <http://www.ptla.cl>

Picture 4b: Layout of Los Andes Land Port



Source: <http://www.ptla.cl>

PORT OF SAN ANTONIO.

The San Antonio Port System has begun the modernization of its logistic platform. In order to accomplish this, technological innovations have been introduced, destined to support the cargo transport chain; the information flow has been optimized in common areas, together with the different terminal operators; and improvements have been made both to the physical and the documentary coordination. These changes have resulted in an increase of port productivity, a reduction in congestion and a considerable decrease in contamination levels.

The destination of new areas for port activities and new technological investments for flow control and information exchange, are also planned.

3.6.4. LOGISTIC PLATFORMS IN URUGUAY.

PORT OF MONTEVIDEO.

Located in Rio de la Plata, it is geographically outlined as one of the main routes for cargo movement of the MERCOSUR, becoming its hub. It is immersed in an influential area of nearly 200 million inhabitants with the highest economic average per capita in Latin America. However, due to the low volume of cargo belonging to the port of Montevideo, it is mainly focused on being a logistic port, serving the extended hinterland. The area it covers ranges from the south of Santos, Porto Alegre, and Rio Grande to the centre of Argentina.

Its transport links are varied, connecting the Uruguay national road network with the network that joins Chile to Brazil, through Argentina. The Paraná-Paraguay Waterway permits the connection with the landlocked countries of Bolivia and Paraguay. Lastly, the International Airport of Carrasco, is only 18 Km from the Montevideo Port.

By authorizing the operation of Montevideo under the Free Port¹⁹ regime, a series of rulings were established that gave the port a higher level of competitiveness and also benefited the companies that operated through it, for example with free circulation of merchandise in Montevideo, without the need of authorizations and formal procedures, and the added value services – within the port premises – to cargo, without modifying its nature, such as dividing, repackaging, re-labelling, consolidation and deconsolidation of merchandise according to logistic and commercial requirements.

3.7. ORGANISATIONAL ASPECTS IN THE PUBLIC AND PRIVATE SECTOR.

The market globalization has had a strong impact on the logistic systems, demanding a higher level of management in order to ensure the sending of merchandise to any destination in the quickest and safest way at a cost that will keep them competitive.

In spite of what could be thought, operational aspects within businesses, as with the organizations linked with foreign trade (customs, sanitary controls, customs agents, etc), have a fundamental and distinguishing importance for the country's foreign trade. Becoming either intentionally or unintentionally, important obstructions to the commerce and integration of countries, turning into real bottlenecks for the logistics of the products.

A recent study by ECLAC (Sánchez et al, 2003) states that a large proportion of physical chokes in the road and frontier infrastructure, are due to organizational faults of these organisms, although the main responsibility falls on the national public sector at local or national level because of not carrying out agreements; the main problems being:

- i) Bureaucratic obstacles resulting in delays and uncertainties in the international authorizations to the transporters;
- ii) Discontinuity in the public organisms and their functions;
- iii) Multiplicity and superposing of national rulings;
- iv) Non-fulfilment and ignorance of sub-regional rulings (especially regarding the application of the MERCOSUR rulings).

With regards to this last point, the need for a unified and coherent ruling for transport is obvious, especially for land transport (road and rail) and also for multimodal transport as will be seen further on. Although partial agreements exist, they are not applied completely or are incompatible with national rulings (ALADI, 2001). Also, tax legislations need to be standardized, being the transport sector the highest taxed at world level, this becoming a disincentive for the sector to acquire new technological equipment.

3.7.1. PROBLEMS IN THE BORDER CROSSING POINTS.

The border crossing points (BCP) are an important link in the integration process between countries and a source of operational inefficiencies, reflected mainly by the excessive delay times at the border; this has been considered in an analysis regarding frontier passes integration by IIRSA, where it also states that “there is a general consensus, both in the government and private sectors, that part of the inefficiencies

¹⁹ Ley de Puertos N° 16.246 de mayo de 1992

that are suffered by the international cargo transport are rooted in the ineffective operations and lack of adequate equipment and infrastructure, especially in frontier passes”.

Within the Mercosur, the situation is maintained, registering an extremely high level of dead time at the border for road transport, where for example, 65% of lorries covering Argentina, Brazil and Uruguay, suffer delays of 30 to 36 hours, whereas in Europe, considering there are 51 frontier passes, the average delay is 2 hours and twenty minutes; and at the border between USA and Canada, even after the 11 September attacks, there is only one hour delay, the timings being similar at the Mexican border. (Sánchez et al, 2003)

Table 5: Dead Times in MERCOSUR corridors, 1999

Corridor	Dead Times at border
São Paulo – Buenos Aires	Over 24 hours
Buenos Aires – Valparaíso	Over 24 hours
São Paulo – Montevideo	Between 6 and 24 hours
Paranaguá – Asunción	Between 6 and 24 hours
Montevideo – Buenos Aires	Up to 6 hours
Buenos Aires – Santa Cruz de la Sierra	Up to 6 hours
Río de Janeiro – Valparaíso	Over 24 hours
Buenos Aires – Asunción	Between 6 and 24 hours
São Paulo – La Paz	Between 6 and 24 hours
Valparaíso – Asunción	Between 6 and 24 hours

Source: Elaborado sobre la base de ALADI (2000); “DITIAS”

The ECLAC study previously referred to, based on consultations and estimates for the three countries, stated that the cost of the delays at the three frontiers imply an inefficiency cost²⁰ of 32,28 million dollars per year calculated at 2002 values. Considering the delays at each frontier, 80% of the mentioned value was generated between Argentina and Brazil and only 6,50% between Uruguay and Argentina, by averaging the number of lorries that operate between Argentina and Brazil, leaves a loss of 170 dollars per trip per lorry. This amounts to more than 10% of the cost of a typical freight between Buenos Aires and São Paulo or Porto Alegre. In a similar way,

²⁰ Considering the market values of a semi-trailer with tractor, paid off in 7,5 years, with 50% of residual value at five years, discounted at 10% per year, see document for further methodological details.

the extra costs between Uruguay and Brazil amount to 70.65 dollars per lorry and 38.27 dollars per unit between Uruguay and Argentina.

Regarding opening hours, there are only a few border passes in the MERCOSUR open 24 hours a day for customs duties; these are an exception in the South American region, as usually, opening hours are restricted to 12 hours daily, even when passenger transit is continual. The rest of the participating organisms in the customs process are totally uncoordinated, with more restrictive timetables than customs, this forces the transporters to adjust their schedules according to the opening times or the additional delays.

3.7.2. INCORPORATION OF TECHNOLOGY AT BORDER CROSSING POINTS.

Another source of inefficiency and loss of time at the frontier, in some cases is due to poor integration of computer data between national organisms that are part of the clearance process, as to the non-existent connection between the information systems of the countries customs services; this not only impairs operative improvements in terms of time but also diminishes and complicates the state protection of the nations. (IIRSA, no date)

It is therefore necessary to incorporate information technologies and optimized procedures allowing the customs services at the frontiers to operate by means integrated IT systems, leaving the tiresome paperwork behind; and taking on a 24/7 working scheme (24 hours a day, 7 days a week). A pioneer on the use of IT platform is the Chilean Customs Services incorporating (earlier 2000) the authorization of electronic signature on the custom declarations.

3.7.3. PROBLEMS WITHIN THE PRIVATE COMPANIES.

Added to the delays at the border, are those produced by organizational inefficiencies of the transport companies themselves, mainly related to:

- i) Lack of professionalism on behalf of the private transport sector, reflected in some cases in the absence of complete documentation required at the border and lack of knowledge of the current rulings
- ii) Inadequate structure of routes and driving itineraries, often pressured by customs restrictions.
- iii) Uneven distribution of freight direction, high seasonal traffic and high levels of empty returns.

It is estimated that all these factors together can result in an additional delay of 8 hours per transport section on average (Sánchez et al, 2003).

3.7.4. INCORPORATION OF TECHNOLOGY WITHIN THE PRIVATE COMPANIES.

Notwithstanding the important changes that have been made to logistics and transport, these have suffered with the market globalization, where management information and other added value services are fundamental to clients that are working with global markets. There are no initiatives on behalf of the transport companies to invest in information technologies, even when such equipment could bring more favourable contracts and for a longer term. Moreover, the few companies that have satellite

tracking of their fleets do not use them as a means of management efficiency, but only motivated by the security this gives in cases of total loss due to robbery and fuel consumption.

Although the transport companies able to operate internationally are less atomized than the national ones, with an average of 20 lorries, most of the vehicles have reached or are about to reach the end of their serviceable life (IIRSA, no date). This aspect prevents strong investments in information technology for management, even though they could provide important returns to the companies that incorporated them.

All these inefficiencies, some of the sector itself, others due to institutional faults, result in a high rotation of road transport companies and a disincentive to enter the sector, based on the fact that the average monthly run of a vehicle transporting cargo within the Mercosur, is 30% less than in 1970, this implies that the lorry spends more time stopped, waiting for cargo or to pass the border, than circulating with the cargo (Sánchez et al, 2003).

CHAPTER IV DATA COLLECTION

4.1. DISTINCTION OF INTEROCEANIC CORRIDORS.

4.1.1 ZONE ESTABLISHMENT IN THE SOUTHERN TIP OF AMERICA (SOUTHERN CONE)

As a general rule, the **Northern, Central, Southern, and Southernmost Zones** are very easy to distinguish. Not only do they differ in the characteristics observed in their frontier paths, but also in the activities carried out in each of them which depict well-defined areas.

The **Northern Zone** is understood to include the Greater Northern Region Bolivia and the northeast and northwest provinces of Argentina: Salta, Jujuy, Tucumán, Santiago del Estero, Formosa, Misiones, Chacao, and Corrientes.

The most important axis that links Argentina to Antofagasta is Salta, which is connected by the crossings Sico-Huaytiquina, and Jama-Jujuy. On the other hand, the importance of Arica and Iquique in the northern zone must also be emphasized because of its significance in relation to the integration with Bolivia.

The **Central Zone** is understood to be made up of the Minor Northern Region and the Chilean Central Zone, i.e, from the third to the Seventh Region, and the Argentinean provinces of Mendoza, San Juan, La Rioja, Córdoba, San Luis, Buenos Aires, Santa Fe, La Pampa, and Entre Ríos.

The Cristo Redentor border crossing is the main transit route for this zone, approximately 55% of all commodities transported to Argentina are taken over this border (source: Customs). However, on an average of 35 to 40 days yearly, this crossing remains impassable, just as others located in the northern region, due to topographical and weather conditions. The Cristo Redentor crossing roughly registers one million tons annually; such figure is not comparable to those registered by other crossings among which the Concordia crossing - created for local transportation purposes between Arica-Tacna - and the San Sebastián-Integración Austral crossings, which connect Chile and Argentina - are the most important.

The **Southern Zone** is mainly made up of two secondary road systems. The first is limited to the Chilean Eighth and Seventh Region and in Argentina to the provinces of Neuquén and Río Negro. These crossings are characterized by having a low trade exchange mainly due to the asymmetry in population; the Chilean side has around 4 million inhabitants, whereas the Argentinean side has merely one million. In this zone, the same poor infrastructural conditions are as present as they are in the northern zone; the most important crossing is Puyehue, which is also an alternative route when the Cristo Redentor crossing is closed off.

The second road system of the southern zone establishes the link between the XI Chilean Region and the province of Chubut in Argentina through the use of the Coihaique-Huemules crossings which end in Comodoro Rivadavia in Argentina and in Coihaique, Chile respectively. The high traffic flow is due to the fact that Chilean traffic must travel through Argentina towards Osorno, then pass through the Puyehue crossing to be able to reach any other northern area.

Picture 1: South America General Map



Finally, across the San Sebastián-Integración Austral border crossings, which connect Punta Arenas and the southern part of Santa Cruz province in Argentina to enter into the Patagonia Region. These crossings establish obligatory binding points for incoming or outgoing traffic from Argentina; since, the highway system is interrupted by the Magellan Strait. As a result, the traffic between these two countries is minimal.

Table5: Comercio Intra Mercosur+ 2000, toneladas métricas.

	Export	Argentina	Brazil	Chile	Paraguay	Uruguay	Imports from MERCOSUR
Import							
Argentina			12.499.171	1.165.038	564.538	935.485	15.164.233
Brazil		19.057.249		1.614.161	1.621.038	1.074.228	23.366.676
Chile		7.449.886	2.397.506		47.334	127.309	10.022.035
Paraguay		1.086.749	963.246	95.777		66.538	2.212.310
Uruguay		1.325.676	751.874	91.405	16.193		2.185.147
Exports to MERCOSUR		28.919.562	16.611.797	2.966.381	2.249.102	2.203.560	52.950.401

Source: BTI, International Transport DataBase, 2003, Transport Unit, ECLAC, United Nations.

4.1.2 HIGHWAY INFRASTRUCTURE.

In the light of the current study, the highway network is defined on global terms. Further details will be provided in relation to ports and border crossings which may be considered the critical points in the system.

Next, an overall description of the highway system and its main features, per country will be presented:

Brazil.

There are mainly three roads taken into account:

- The first one connects Santa Cruz - Campo Grande - Puerto de Santos;
- The second route is longitudinal and connects Porto Alegre - Paranagua - Santos; finally,
- A route that connects Argentina and Brazil through the Los Libres border crossing: Uruguiana - Porto Alegre is also taken into account. Roadways are paved and in fair conditions, with an average width of 7 meters. Moreover, they are characterized on having a flat course and a plain surface.

Paraguay.

The main road is:

- The route that connects Asunción to Ciudad del Este (bordering with Brazil) with a trunk road between Asunción and Resistencia (Argentina). Both roads are paved and are in fair conditions, the average roadway width is 7 meters. It also has a flat course and a plain surface.

Uruguay.

In Uruguay, there are two main routes:

- One connect Brazil with Argentina: from Paisandú to Rivera through Tacuarembó, and
- Connect Fray Bentos to Chui passing by Montevideo. Basically, these roads which are 7 meters wide are covered with asphalt and are in a fair condition, have an undulating course and a plain surface

Perú.

The network concerned comprises the following link:

- Port of Ilo and Matarani and their link to Desaguadero (border with Bolivia). These roads are of an average condition, they are fairly paved with low slopes, a slight-curved surface and generally a flat course.

Bolivia.

It comprises of one route:

- That connects Desaguadero (border with Perú) to Puerto Suarez in Bolivia, which runs along La Paz and Santa Cruz. The mentioned route links up with a highway that runs lengthwise, including Oruro and Potosí, then joins Uyuni and continues towards the Argentinean border. The road conditions are usually fair, with steep slopes, a slight curved surface, and a partially mountainous course.

Argentina.

The Argentinean system consists mainly of three main longitudinal highways and a transversal one:

- Route 9 which crosses from Buenos Aires to Córdoba, running north along Salta and Jujuy until the border of Bolivia (La Quiaca). It is in fair condition and, on average, 7 meters wide; except in the section between Buenos Aires and Santa Fe where the width increases to 14 meters. This route, like the majority of the Argentinean highway system has a flat course and a plain surface.
- Route 3, thoroughfare from Buenos Aires to Bahía Blanca runs south along the coast, passing Antonio Oeste, Comodoro Rivadavia, and Río Gallegos up to the Integración Austral border crossing. This road has the same condition as route 9.
- Route 40, longitudinal road which connects the border crossings with Chile, and links up, in the south, with route 3 in Río Gallegos. With regard to its features, they are of inferior standard compared to the above-mentioned routes, since they are mainly unpaved with a plain surface and a 2% slope average.

- Route 7. It is the most important transversal road which links Buenos Aires and Valparaíso passing along the Cristo Redentor border crossing. This road is paved, in good condition and presents a flat course.

Chile:

The highway system is mainly comprised by:

- Route 5 represents the main road starting from the Concordia borderline (border with Perú) and ending in Puerto Montt. It exhibits homogeneous features, is thoroughly paved and 7 mts wide, its surface is in fair conditions, excepting the La Serena – Puerto Montt stretch with four lanes. It has a plain surface and a flat course, excepting the Vallenar – La Serena stretch and the Arica - Iquique stretch.
- Route 16, towards Iquique is well-paved.
- Route 26, towards Antofagasta is well-paved.
- Route 68 from Santiago to Valparaíso has a four lane roadway and a flat to undulating course.
- Route 60 CH, towards the Cristo Redentor border crossing is a fair road with a flat course which becomes mountainous near the borderline. It presents an undulating surface.
- Generally, the access roads to the border crossings in the north of the Cristo Redentor present a fair condition; its surface is a 7mts. wide, an undulating course and stretches over 4,000 m high above sea level.
- Route 60, Calera - Valparaíso, it is fair condition, with a surface width of 14 meters, four lanes and a flat course.
- Route 78, Santiago – San Antonio has four lane roadway and a flat course.
- Route 148, Bulnes - Concepción, is 10 mts wide with a roadway in fair conditions. It has a flat course and a plain surface.
- Route Itata, Bulnes – Concepción, is a four lane roadway and a flat to undulating course.
- Most access roads to the border crossings in the south of the Cristo Redentor crossing do not present any altitude problems; however they have constructional problems, this makes some sectors impassable for heavy duty vehicles. The Puyehue border crossing is the exception since it is in fair condition and does not restrict traffic of any sort. (see picture 2)

Picture 2: General Road Map



4.1.3. PROGRAMMED INVESTMENTS

Northern Zone:

Route 27, San Pedro Atacama – Jama (border with Argentina) was paved in 2000. Estimated Investments US \$ 40 million.

Route 1, Antofagasta – Iquique, was finished in 1998. No available information regarding investments.

Paving access road Arica - Santa Cruz. Work completion was in 1996. No available information on investments .

Central Zone: (Concessions)

Route 78, highway Santiago - San Antonio. Estimated investment of US\$120 millions. It was finish in year 2000.

Route La Dormida. Programmed Investment of US\$ 120 million. Has been completed.

Route 68, construction of two four lane tunnels 68. Programmed investments of US\$ 60 million. Has been completed.

Route 60, expanding Route Los Andes - La Calera to a four lane roadway. No available information regarding its completion.

Route 71, Santiago - Los Andes, expansions to a four lane roadway. Programmed investments of US\$ 36 million. Has been finished.

Route Las Palmas, Rodelillo and El Salto (Viña de Mar) . Programmed investment of US\$120 millions Route was complete and finished in 1998.

Paving completion of Cardenal Samore crossing in 1997. Programmed investment for US\$ 5 million.

Route La Pólvora. South access to Port of Valparaiso (including a tunnel) ended in 2005.

Route Troncal Sur, Viña del Mar – Limache. Highway with four lanes. Investment was US\$ 120 million.

Final stage study for the expansion of Route 60 La Calera - Con-Con to a four lane roadway.

Southern Zone.

Paving agreement for the Pino Hachado crossing. Estimated investments was US\$ 25 million.

Paving completion of the Cardenal Samore crossing. Estimated investments was US\$ 5 million. Was finished in 1997.

Route 180, paving Camino de la Madera. Estimated investments for US\$ 21 million.

Austral Zone.

Pavement of Integración Austral crossing. Estimated investments was US\$ 6 million. Completed in 1997.

San Sebastián crossing, paving KimireAike - Punta Delgada stretch. Completed in 1997. Investment was US\$ 6 million.

4.2. RAILWAY INFRASTRUCTURE.

The Southern Region railways, other than Brazil, have been on a decline for more than 25 years. Thus, the infrastructure and the equipment of the Bolivian, Argentinean, and Chilean systems are far from reaching a high standard.

Today, there are only three Chilean international connections still working mainly with private investment:

Arica - La Paz and Antofagasta - La Paz, between Chile and Bolivia, and Antofagasta - Salta between Chile and Argentina.

At present, there is a general commitment among private parties in studying the feasibility of the Lonquimay- Zapala railroad project.

4.3. SPECIFICATION OF LOGISTIC CORRIDORS.

Next, details of the railway and road corridors will be presented.

4.3.1. RAILROAD CORRIDORS.

These are those through which whole or part of the journey is linked to two or more ports located in different oceans is made by the railroad system. FERRONOR (North railroad) connection to the ports of Iquique, Tocopilla, Antofagasta, and Mejillones is an excellent alternative for MERCOSUR parties to access the Pacific.

4.3.1.1. Iquique Antofagasta-Buenos Aires Connection.

Nowadays, there is an interoceanic railroad corridor underway starting from the port of Iquique. It is connected through the main north road to the ports of Tocopilla, Mejillones and Antofagasta passing over the border with Argentina at the Socompa crossing which forms an interoceanic corridor. At that point, it is connected to the Argentinean railway system, and thus, linking the Chilean northern territories and their ports with the Argentinean provinces of Jujuy, Salta, Santiago del Estero, Santa Fé, Entre Ríos and the northern part of the Buenos Aires province.

Through the international trunk road to Socompa, agricultural products from the northeast of Argentina are transported to the First and Second Region of Chile for local consumption and export purposes. Since 1994, Argentinean minerals headed for the external market have been transported for their shipment in the ports in Antofagasta and Iquique.

Mineral copper and saltpetre products and especially goods from the duty-free area in Iquique are transported from Chile to Argentina.

This railway has the potential of connecting the Paraguay - Paraná waterway at Barranquera fluvial port (Argentina), where the load is then shipped on barges to the fluvial port of Villetas (Paraguay).

This combination can attend the needs of Paraguay and the north of Argentina resulting from the waterway expansion. It gives an alternative to using the Barranquera - Buenos Aires stretch.

This system offers a large scale shipping option for grains, woods, ores, and others.

4.3.1.2. Iquique - Antofagasta - Porto Alegre O Rio Grande Do Sul Connection.

At present, a railway corridor starting from the port of Iquique is serviceable. It is connected through the main north road to the Chilean ports of Tocopilla, Mejillones, and Antofagasta. It passes over the Socompa crossing and runs through the Argentinean system to the Brazilian ports of Puerto Alegre, and Río Grande do Sul; thus, it bridges the frontier between these two countries in Sao Borja.

This railway corridor can meet the needs of the First and the Second Region of Chile; the northern provinces of Argentina: Jujuy, Salta, Formosa, Chaco, and Corrientes; and the province of Río Grande do Sul, in Brazil.

4.3.1.3. Iquique - Antofagasta - Santos Connection.

This railway corridor starts from the Port of Iquique connecting Antofagasta through the north trunk line which runs to Argentina. It passes over the Socompa crossing. From the Argentinean province of Salta, it goes to Santa Cruz (Bolivia) extending over the Argentinean - Bolivian boundary in the province of Tarija in Bolivia. From Santa Cruz, it runs to port of Santos in Brazil crossing the boundary at the Suarez port.

This passage can meet the needs of the First and Second Regions of Chile; the Argentinean provinces Salta and Jujuy; the Bolivian provinces Tarija, Chuquisago and the southern centre of Santa Cruz; and the Brazilian provinces of Matto Grosso do Sul, north of Paraná and Sao Paulo.

4.3.1.4. Arica - Santos Connection.

There is also a possibility in connecting up the railway of Arica - La Paz with the Brazilian railways. It may even be possible to link up Port Santos, passing along Sao Paulo; thus an inter-oceanic railway corridor will be formed.

This combination can meet the needs of northern Bolivia, the central south of Brazil, and the north of Chile.

4.4. ROAD CORRIDORS.

The governments' delegate members of Brazil, Paraguay, Perú, Bolivia, and Chile gathered in Santiago de Chile on August 16, 17, and 18, 1996. As agreed upon Brazil and Bolivia's Minister of Transport, the Paraguayan Vice Minister of Public Works and the Chilean of Minister of Public Works under the Cuiba Declaration dated July 14, 1996 and within the Multilateral Task Interoceanic working Group created during the conference held in Arica, April 28 1995, the following corridors were defined:

Corridor N°1: Santos (Brazil) - Buenos Aires (Argentina) - Valparaíso (Chile).

Corridor N°2: Santos (Brazil) - Antofagasta (Chile). Passing along Paraguay and Argentina.

Corridor N° 3: Santos (Brazil) - Matarani (Perú) - Ilo (Perú) - Arica (Chile) - Iquique (Chile) passing along Paraguay and Bolivia).

4.4.1. CORRIDOR No.1.

We have to point out that this is the only corridor which adjusts to the bi-dimensional use for transportation and trade.

As far as Chilean imports and exports are concerned, Santiago is the main centre of the international commercial corridor as Buenos Aires is for Argentina. For this reason, it is not uncommon that this corridor be mainly used for bilateral trade and exclusively for incoming and outgoing international traffic from Argentina.

In Picture No. 5, which depicts the corridor of Santos-Buenos Aires-Valparaíso, we may observe that it runs through Brazilian and Argentinean territory and ends in the Chilean port of Valparaíso. However, it may be extended to the port of San Antonio through the regional network.

The use of the Uruguayan highway system enables that this corridor be connected to both Brazilian and Argentinean routes. This allows full integration of the country to this corridor.

Picture No. 5



This corridor can minister to the needs of the Brazilian provinces to the south east of Sao Paulo, east of Paraná, east of Santa Catalina and Río Grande; as well as the Argentinean provinces of Corrientes, Santa Fé, Córdoba, San Luis, north of Mendoza and north of Buenos Aires; and to the Fifth and Metropolitan Region of Chile.

The condition of the roads in these three countries is good and all of them are paved. The length of this corridor in the Santos - Valparaíso stretch corresponds to 2,533 kms and the road Buenos Aires - Valparaíso stretch is 1,433 kms long.

4.4.3. CORRIDOR No. 3.

It may be noted from Picture N° 4, which represents the first corridor, (Santos-Matarani-Ilo-Arica-Iquique), that this mainly runs through the Brazilian and Bolivian territory into the Peruvian ports of Matarani and Ilo. It can also be noted that the main road links of the zone reach Arica and Iquique, and even Antofagasta. The above mentioned links also permit the connection with the north of Paraguay.

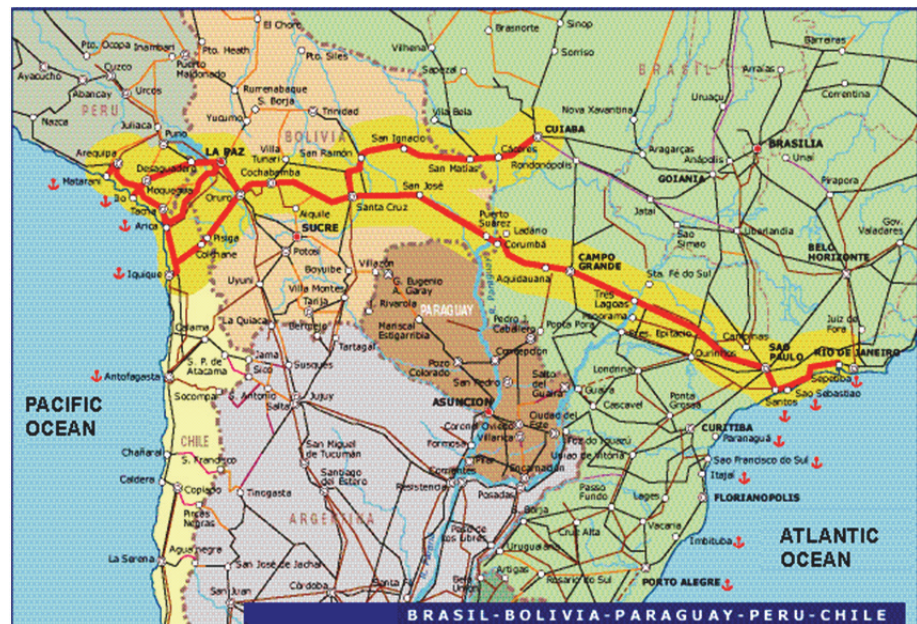
Based on the current condition of the mentioned Peruvian ports, they do not represent a serious competition to those located in the north of Chile. However, they are threat.

This corridor can meet the transportation needs of the Brazilian provinces: Sao Paulo, Paraná, Matto Grosso, Sur de Golas and the province of Matto Grosso. In Bolivia, it would minister to the provinces: Santa Cruz, Beni, and La Paz. Furthermore, through a link with Paraguay, it could minister to the Bolivian provinces of Cochabamba, Chuquisaca and Tarija, continuing to northern Paraguay and finishing in Matarani and Ilo ports in the south of Perú.

In the Brazilian sector, 97% (4,670 km) out of the total length (4,820km) of this corridor is paved and in good condition. Only 3% of the Cáceres-San Matías stretch, which is 150 km long, is only paved with gravel but, it is planned to be completely paved in the future. It should be noted, however, that this section corresponds to the Brazil-Bolivia connection.

In the Bolivian sector, only 31% (1,035km) of the total length (3,301 Km) of the road surface is paved, 67% of this stretch is a dirt road and the remaining 2% (47km) is gravel.

Picture No. 4



The connection towards Paraguay is a trunk road of the corridor which allows the needs of the northernmost region to be met. The total length of all these stretches is 820km of

which 60% is paved (490), and the remaining 40% corresponds to dirt roads. It should be emphasized that 60km out of a total length of the Juan Caballero - Pozo Colorado stretches (350km) are still to be constructed.

In the sector of Peru, 59% (717km out of a total length of 1,224km) is paved; the remaining 41% (507km) are either gravel or dirt.

In the Chilean sector 62% (275km out of a total length of 441km) is paved the remaining 38% (166km) is a mix between concrete, gravel and dirt.

The total length of this corridor is 9,786km.

4.5. TRANSPORTED COMMODITIES THROUGH THE ROAD AND RAILWAY CORRIDORS.

The following table illustrates the amount of commodities transported on the roads and railways through the Chilean - Argentinean border. It may be observed in these tables, that over the last 4 years, more cargo has been transported over roads than by railway.

Table 2: Chile, Main products imports from Mercosur countries by tons, 2000.

Departure Country	SITC	Description	TONS
Argentina	34	GAS, NATURAL AND MANUFACTURED	2.397.327
Brazil	64	PAPER, PAPERBOARD, AND ARTICLES OF PAPER PULP, PAPER OR PAPER BOARD	1.696.101
Argentina	66	NONMETALLIC MINERAL MANUFACTURES, N.E.S.	1.456.531
Argentina	04	CEREALS AND CEREAL PREPARATIONS	1.157.391
Argentina	64	PAPER, PAPERBOARD, AND ARTICLES OF PAPER PULP, PAPER OR PAPER BOARD	899.262
Argentina	27	CRUDE FERTILIZERS (IMPORTS ONLY), EXCEPT THOSE OF DIVISION 56, AND CRUDEMINERALS (EXCLUDING COAL, PETROLEUM AND PRECIOUS STONES)	585.884
Brazil	27	CRUDE FERTILIZERS (IMPORTS ONLY), EXCEPT THOSE OF DIVISION 56, AND CRUDEMINERALS (EXCLUDING COAL, PETROLEUM AND PRECIOUS STONES)	222.450
Brazil	67	IRON AND STEEL	164.094
Argentina	09	MISCELLANEOUS EDIBLE PRODUCTS AND PREPARATIONS	126.755
Argentina	06	SUGARS, SUGAR PREPARATIONS AND HONEY	115.330
Argentina	28	METALLIFEROUS ORES AND METAL SCRAP	107.079
Uruguay	25	PULP AND WASTE PAPER	92.260

Argentina	67	IRON AND STEEL	90.448
Argentina	22	OIL SEEDS AND OLEAGINOUS FRUITS	65.944
Brazil	57	PLASTICS IN PRIMARY FORMS	64.941
Others			780.237
Total Imports from MERCOSUR			10.022.035

Source: BTI, International Transport Database, Transport Unit, 2000, ECLAC.

Table 3: Chile, Main products imports from Mercosur countries by value, 2000

Departure Country	SITC	Description	CIF Value
Argentina	33	PETROLEUM, PETROLEUM PRODUCTS AND RELATED MATERIALS	\$ 1.402.415.745
Argentina	34	GAS, NATURAL AND MANUFACTURED	\$ 290.890.386
Brazil	78	ROAD VEHICLES (INCLUDING AIR-CUSHION VEHICLES)	\$ 267.583.970
Argentina	04	CEREALS AND CEREAL PREPARATIONS	\$ 142.995.312
Brazil	64	PAPER, PAPERBOARD, AND ARTICLES OF PAPER PULP, PAPER OR PAPER BOARD	\$ 80.828.707
Brazil	69	MANUFACTURES OF METALS, N.E.S.	\$ 68.851.199
Argentina	01	MEAT AND MEAT PREPARATIONS	\$ 67.855.911
Brazil	67	IRON AND STEEL	\$ 67.607.659
Brazil	57	PLASTICS IN PRIMARY FORMS	\$ 65.235.896
Argentina	08	FEEDING STUFF FOR ANIMALS (NOT INCLUDING UNMILLED CEREALS)	\$ 62.044.284
Argentina	09	MISCELLANEOUS EDIBLE PRODUCTS AND PREPARATIONS	\$ 60.150.977
Argentina	64	PAPER, PAPERBOARD, AND ARTICLES OF PAPER PULP, PAPER OR PAPER BOARD	\$ 57.458.912
Brazil	74	GENERAL INDUSTRIAL MACHINERY AND EQUIPMENT, N.E.S., AND MACHINE PARTS, N.E.S.	\$ 56.026.342
Brazil	01	MEAT AND MEAT PREPARATIONS	\$ 55.100.228
Brazil	65	TEXTILE YARN, FABRICS, MADE-UP ARTICLES, N.E.S., AND RELATED	\$ 48.787.191

		PRODUCTS	
Others			\$ 1.527.844.404
\$ 4.321.677.123			

Source: BTI, International Transport DataBase, Transport Unit, ECLAC, United Nations.
This figure is foreseen to increase due to the opportunities the country is facing, which derive from the internationalization of markets. The amount of cargo transported by the railway is likewise expected to increase but not to the same proportion as road transport.

Table 4: Intra Mercosur Commerce + 2000 (tons)

	Export	Argentina	Brazil	Chile	Paraguay	Uruguay	Imports from MERCOSUR
Import							
Argentina			12.499.171	1.165.038	564.538	935.485	15.164.233
Brazil		19.057.249		1.614.161	1.621.038	1.074.228	23.366.676
Chile		7.449.886	2.397.506		47.334	127.309	10.022.035
Paraguay		1.086.749	963.246	95.777		66.538	2.212.310
Uruguay		1.325.676	751.874	91.405	16.193		2.185.147
Exports to MERCOSUR		28.919.562	16.611.797	2.966.381	2.249.102	2.203.560	52.950.401

Source: BTI, International Transport Database, Transport Unit, ECLAC, United Nations.
Considering that the major part of the cargo is moved by trucks, this study will limit its evaluation of the road corridors.

Table 6: Chile, Transported imports in tons, 2000

Departure Country	Airborne	Waterborne	Rail	Truck	Others
Argentina	4.678	1.193.522	24.599	3.940.931	2.286.157
Brazil	3.132	480.901		1.913.473	0
Paraguay	209	17.408		29.717	
Uruguay	384	3.344		123.581	
Total Mercosur	8.403	1.695.175	24.599	6.007.701	2.286.157
Percentage of use	0,08%	16,91%	0,25%	59,94%	22,81%

Source: BTI, International Transport Database, Transport Unit, ECLAC, United Nations.

4.6.PORT INFRASTRUCTURE.

It should be noted that the ports are the fundamental element for transport chain development. When a port is unable to deal with the flow of cargo because of a lack of efficiency and capacity, it will cause the chain to weaken and thus the entire process will be held up.

This study does not aim at analysing the ports involved with the above mentioned corridors; therefore, it will only provide an overview.

4.6.1. ARGENTINEAN PORTS.

- The Argentinean ports present better storage capacities than the Chilean ones.
- The port of Buenos Aires after being sold to the private sector, considerably improved its service with a volume increase of 300,000 containers in 1991 to 1,100,000 in 2000, but because of the economic crisis volume decreased to almost 800,000 during the last years. The same may be indicated about port capacity: in 1991 400,000, and in 2013 it has reached 2,055,489. Moreover, the operative surface increased from 65 hectares in 1991 to 95 hectares in 1995. As a result of this, imports and exports costs were reduced as well as the average berthing time span of ships. (see Table 4, page 71)

4.6.2. BRAZILIAN PORTS.

At present, the Brazilian ports are still struggling with over jammed in and outside the port facilities. As an example, the Port of Santos is operating beyond its capacity which is causing cargo to be diverted from maritime transport to overland transport.

4.6.3. PERUVIAN PORTS.

The Peruvian ports still have some organizational problems, however, after the concession of a container terminal of Callao in 2010, DP World started the development of a container terminal state-of-the-art and in 2014 reached an annual throughput of almost 2,000,000 TEUs per year. At this moment, the Matarani and Ilo ports are not a serious competition. However, they could be a threat once the development program designed by the Peruvian government is implemented.

4.6.4 CHILEAN PORTS.

See Chapter 2, section 2.4.

4.7. ORIGIN OF CARGO FLOW.

In general, we may appreciate that in the continent, the industrial centres are located on the coast and around most populated areas. For example, in Bolivia and Paraguay, these areas are situated around the capital city of each country (La Paz and Asunción, respectively).

Only countries agricultural and livestock raising activities tend to be found inland.

Mining activities are located in those areas where mineral deposits are found.

Based on the above, within the continent, six zones of origin of cargo flows can be recognized for both imported and exported goods which are required for production. These areas are:

Zone N° 1

It comprises the northern part of the province of Buenos Aires, Entre Ríos, Córdoba, south of Santa Fe and San Luis (Argentina). In this zone, the main industrial activities are concentrated around the city of Buenos Aires (chemical, fishing and canning, textile, metal-working, etc.). Throughout the entire area, the agricultural activity is mainly focused on growing corn and wheat.

Zone N° 2

It comprises the provinces of Matto Grosso do Sul, Rio de Janeiro, Sao Paulo, Paraná and Rio Grande do Sul. Industrial activities are concentrated around the cities of Rio de Janeiro and Sao Paulo and are mainly focused on the chemical, textile, applied mechanics, metal-working, paper and shoe making industries.

The major agricultural activities in the provinces of Rio Grande do Sul, Santa Catarina and Paraná are soya, corn and wheat cultivations. In the remaining part of the area, the economic activity is concentrated on the raising of livestock (sheep, cow and pig breeding)

Zone N° 3

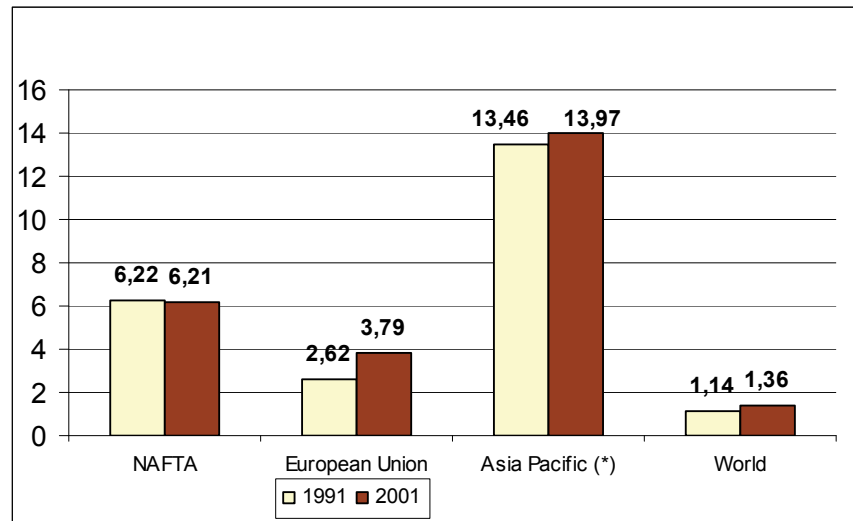
It includes southern Peru and the Bolivian provinces of La Paz, Oruro, Cochabamba and Potosi. The main activity in the Bolivian provinces is mining. The scarce industrial activity of the country (chemical, textile and metal-working) is concentrated around the capital city of La Paz.

The raising of livestock (sheep, cow and pig breeding) is mostly concentrated in the south of Peru

Zone N° 4

It comprises the area located between the Fourth and Tenth Region of Chile. In this zone, we may find a diversified economic activity in which mining and agricultural exports occupy a prime place. The remaining significant activities cover the textile, petrochemical, fisheries, aquaculture products, metal and timber, wood pulp, among others.

Graph 1: Imports within Economic Blocks (1991- 2001)



Note: (*) Korea, Hong-Kong, Malaysia, Singapore and Thailand

4.8. HOW INTEROCEANIC CORRIDORS FOR ROAD TRANSPORT AND LATIN AMERICAN INDUSTRIAL ACTIVITY COMPLEMENT EACH OTHER.

The layout of the corridors for overland transportation has been designed in such a way that it permits the connection of those areas in the Southern Tip of America which embrace most of the economic activity. This situation favours international trade among the countries in this area and their integration to a sole market.

Corridor N° 1:

Santos - Buenos Aires - Valparaíso is the only one that connects the three industrial centres of those countries situated in its system, i.e. the provinces of Rio de Janeiro and Sao Paulo (Brazil), the province of Buenos Aires (Argentina) and the V, VI, and Metropolitan regions of Chile, finally ending up in a port of the V Region.(Chile). It permits the exchange of industrial, agricultural and livestock products among the countries linked by this corridor and it also allows the movement of both transit cargo and cargo that is to be exported or imported.

Corridor N° 2:

Santos - Antofagasta permits the connection of the industrially concentrated area of Rio de Janeiro and Sao Paulo with Paraguay and the agricultural and livestock raising provinces located in the north of Argentina: Formosa, Chaco, Salta and Jujuy. In Chile, this corridor links up with one of the major copper mining areas in the country and ends up in the port of Antofagasta which is the main industrial centre in the north of Chile (chemical, copper, metal-working and fishing or canning industries).

Corridor N° 3:

Santos - Matarani - Arica - Iquique permits the connection of the industrially concentrated area of Santos and Rio de Janeiro (Brazil) with the area of La Paz

(Bolivia) and ends up in the Peruvian ports of Matarani and Ilo and the Chilean ports of Arica and Iquique. This zone (south of Peru and north of Chile) does not represent an industrially concentrated area; therefore, these ports may be used as an entrance or exit gate for exported or imported products from Brazil and/or Bolivia.

Moreover, this corridor could be used for the exchange of agricultural and/or livestock goods from the Matto Grosso do Sul and south of the Matto Grosso province to the provinces of central and southern Bolivia, with the possibility of connecting up with the north of Paraguay.

CHAPTER V DESIGN OF A PARAMERIC MODEL FOR DECISION MAKING IN PORT AND MARITIME LOGISTICS.

5.0. THEORETICAL APPROACH.

5.1. METHODOLOGY TO DETERMINE CAPACITIES OF THE SYSTEMS.

5.1.1. INTRODUCTORY SUMMARY.

This study contains the development of a methodology which permits an analysis of the capacities of a logistic distribution system. During the research, a complete analysis of the system was established with the purpose of determining a model of action in general port operations, as an application of the proposed methodology which transforms into an adequate device to facilitate the study of any type of distribution system.

The design of an evaluation tool for different port systems that present similar characteristics to those presented in this report is sought.

In this study, theoretical principles are presented in order to support the selected evaluation criteria; as well as the determination of parameters based on these criteria that will be considered relevant in order to determine physical capacities.

From this it will be possible to obtain a measuring device that will allow a comparison between the different systems that are of interest.

5.1.2. OBJECTIVES.

To develop a methodology that will determine the physical capacities of a logistic distribution system in response to the ports system's requirements.

Studies can be carried out to determine the port system capacities, that tools are supportive in the decision-making process.

To determine all variables, factors and parameters that make up the distribution system under study, all of those which are in an operational context or those which can produce changes in the port system will be selected in order to obtain faithful representation and study of the distribution system.

5.2. THEORETICAL PRINCIPLES.

5.2.1. METHODOLOGY.

DEFINITION: "A methodology is a system of methods and principles that are followed in an investigation in order to organize the work process and therefore, take the best advantage from the available resources"

Development of the steps to follow: In order to conduct the study of a system through a certain methodology in a clear and precise manner, the following stages should be considered:

Evidence: Determine all those points that make up part of the system, verifying and identifying facts only, and not adding characteristics and variables that do not really exist and which would affect the analysis adversely.

Analysis: First, this step contemplates and supposes that the problem to be resolved is absolutely determined and specified, which is to say that each one of the components and relationships of the system under study have been identified. Secondly, that it is divided into more simple problems, which can be considered on an individual basis so as to achieve a more optimal solution by attacking complications separately.

Synthesis: This includes an orderly procedure for resolving problems. The simpler and easier components should be undertaken first and then gradually increase levels until the more complex sections are reached.

Numbering: This makes it possible to keep a sequence which helps to avoid omission of any important aspect of the system under study.

5.2.2. ELEMENTS OF A SYSTEM.

Different constitutive elements can be identified in a system in accordance with its analysis structure. They are as follows:

- i. **Components:** These are the independently identified constitutive parts of the system.
- ii. **Variables:** These assume distinct values under different operating conditions of the system. These variables can be classified as either endogenous or exogenous.

The latter can be determined by the analyst or by conditions that are external to the system under study. The endogenous variables are determined by the interaction of the components of the system.

- iii. **Parameters:** These do not change during the analysis. The analyst can arbitrarily assign them values.
- iv. **Relationships:** These correspond to the "operative" characteristics of the system under study. This is to say, they are those relationships between the different variables and parameters that determine or condition the performance of the system. The job of the analyst is to identify the relationships that are present in the system with the object of representing them in the study.
- v. **Restrictions:** Refers to the restrictions that are imposed on the values of different variables. These limitations can be imposed by the analyst or naturally by the system under study.
- vi. **Criterion:** Is the manner of explaining the objectives or purpose of the system and how they will be evaluated. They are also known as "performance measures". They allow the identification of the parameters and variables that are relevant to the system under study.

5.2.3. PROPOSED METHODOLOGY.

- i. **Definition of the Problem.**

It is necessary to define the problem in the most precise way possible; this means that each study should begin with a formal presentation of the problem, which contemplates a definition of objectives that explain the reasons for utilizing the

proposed methodology. Along with this, the distribution system that will be utilized as the object of the analysis should be identified.

ii. Global Analysis of the System.

Once the objectives of the study have been defined and the system under analysis has been identified, a complete analysis of the system should be carried out with the purpose of determining its constitutive elements, how it operates, and the different interrelationships that its conforming parts can present.

iii. Analysis of Existing Information.

All data that will be required in order to implement the development of the study should be determined. It is of utmost importance here to resolve the problem of how to get information and where it can be obtained.

It is necessary to warn the analyst that it is most likely that a sizeable amount of time will be consumed in this stage, due to the difficulty in obtaining sufficient and worthwhile information required for the study; and in addition, that this information is available on time and in the desired format.

5.3.DETERMINATION OF THE CONSTITUTIVE ELEMENTS OF A PORT.

All the elements that constitute a cargo logistic distribution system are presented in Annex 1 and its definitions in Appendix 1.1.

5.3.1. DEFINITION OF UTILIZED CRITERION.

Three analytical criterions will be used for the evaluation of the system-relevant parameters and variables, mentioned beforehand.

i. Economic Criterion.

From a maritime carrier point of view, the ideal port is one that can offer a berthing site at the moment of arrival. On the other hand, the port considers that maintaining all berthing sites occupied by vessels that are carrying out cargo transfer operations is ideal.

Nevertheless, both conditions are detrimental to the cost of transport. The former, due to the random character of vessel arrivals, would oblige the port to make unnecessary investments in order to maintain the under-utilized infrastructure and the latter, that by not having sites readily available for the vessels, would oblige these vessels to wait or be rerouted to another port; therefore, originating additional costs for transport.

The amount of time the vessel spends in port is an important factor for determining transport costs. These expenses increase when a prolonged stay is the product of an inefficient port. For this, the cost of time spent waiting will be considered as one of the items that will be evaluated and its relative importance determined.

The costs that are generated due to the actual transfer of the cargo will also be considered. This refers to the utilization of the berthing site and all the necessary equipment for realizing the loading/unloading of the merchandise.

Finally, the port's capital investment costs consider the construction and development of the port infrastructure and its maintenance.

ii. **Social Criterion.**

It is necessary to include this criterion, since the port is an open system situated between the shore and the sea. The port constitutes a very special aspect within human activities and its development decisively influences the lives of all that are within a reasonable proximity.

Due to this, it is convenient to incorporate an analysis that contemplates topics such as the environment, safety, legal, and labour conditions of the persons that participate in the port activity, etc.

iii. **Technical-Logistical Criterion.**

This criterion seeks to evaluate the port system, while bearing in mind its logistic distribution.

Each of the operations configures only one process that should be planned as a unit for all cargoes that the vessel receives in a port or that is destined to a specific port. One must not forget to consider that the main objective of the port is to facilitate the transfer between the maritime and land modes of transport and, therefore, satisfy the requirements of both; this being not only those related to the movements and physical manipulation of the cargoes, but those that would make it possible to comply with contracts and legal regulations.

In this criterion, the elements of distribution such as space, routes, vehicles and the actual cargo will be considered.

5.4. EVALUATION OF PARAMETERS AND VARIABLES IN REGARD TO THE PROPOSED CRITERIA.

In order to realize the value of each one of the parameters/variables that make up the system under study in regard to each item proposed by the analysis criterion, and therefore, determine those of major relative importance, the methodology proposes at this stage to assign a quantitative value of 1 to 3 to each of the parameters, based on the point of view that contemplates the relative importance that each one presents in accordance to the physical capacities of the port system.

For the assignation of this point system, it should be kept in mind how the parameters are affected by each item against that which is being evaluated. Therefore, a value equal to 1 will be given to those parameters that do not affect a criterion item in question. The quantitative value equal to 2 will be assigned to those factors that have a relative incidence over the measurement of effort analysed. Finally, those elements that are assigned 3 points will be considered relevant to the criterion utilized in its evaluation.

After completing the evaluation of the factors, values will be summed and a total obtained for each one. Based on this total, the important parameters for the system under study will be selected.

As election criterion, it is proposed that elements that reach 50 percent or more of the maximum obtainable points in the evaluation should be selected.

In the evaluation regarding the economic criterion, which contemplates three evaluating items, the maximum point value is 9. Therefore, all those parameters that obtain a score of 5 or more will be selected. This is applicable for the evaluation of the social criterion as well.

By using the technical-logistic criterion, which utilizes four items for the evaluation, the highest possible point value is 12. Therefore, those parameters/variables that obtain a score of 6 or more will be selected.

The selected factors will be transferred to a criterion integrated Matrix (main result chart) where they will be listed from the largest to the smallest point value.

The following pages contain the Matrixes (main result charts) where the values that are assigned to each parameter will be registered. Each evaluating criterion has four parts.

Although the analysis and comparison of the time spent by vessels and cargo in the terminal is important, it will not be directly considered as a variable, but as a consequence.

5.4.1. EVALUATION IN REGARD TO ECONOMIC CRITERION.

Part 1: Factors that correspond to the Maritime Transfer Terminal Area:

PARAMETER/VARIABLE	USE COST	WAITING COST	TOTAL COST
From Cargo			
Tonnage for transfer			
Type of merchandise			
Stowing conditions			
Loading and unloading conditions			
From Cranes:			
Types available			
Output			
Quantity available			
Capacity			
Maximum work height			
Maximum reach			

Mobility			
From the Workforce:			
Number of persons			
Output			
Number of effective work hours			
Working conditions			
From the Port:			
Number of sites			
Length			
Depth			
Dock apron			
Safety and Surveillance conditions			
Effect of currents in berthing sites			
From the Pilots:			
Number available			
Skill			
Specialization			
From Towing Vessels:			
Number available			
Characteristics			
Types			
From Berthing Services:			
Aid to Navigation			
Access zone			
Sheltered areas			

Anchorage zones			
Locks			
Inner harbours			
From the Vessel:			
Types			
Length			
Draft			
Beam			
Cargo capacity			
With own cargo gear			
Other equipment for loading/unloading			
Maintenance conditions			
Safety conditions			

Part 2: Factors of shore-based installations of the transferring terminal

PARAMETER/VARIABLE	USE COST	WAITING COST	TOTAL COST
Shore-Based Infrastructure			
Cargo transfer zones			
Consolidation and deconsolidation area			
Inspection area			
Administrative area			
Access area			
Parking area			
Transit area			
Maintenance area			
Emergency area			
Transit warehouses			
Depository warehouses			
Patios/Yards			

Part 3: Physical factors and exogenous political to the transfer terminal

PARAMETER/VARIABLE	USE COST	WAITING COST	TOTAL COST
Physical Conditions of the Port			
Geographic location			
Hydrographical, depth and type of sea bottom			
Oceanographic, tides and swell			
Weather			
From Political			
Economy and finances			
Transport			
Infrastructure			
Labour			
Research and education			
Planning and coordination			
Institutionalism and organization			
Special Customs areas			
Free zone			
Free Port			
Free Industrial Zone			
Outside port area warehouses			
Port technology			
Planning of work projects			
Installation and implementation			
Industrial zones			
Location			

Demand for services and transport			
Other activities			
Fishing			
Military			
Areas of development			
Current facilities			
Surroundings			
Pollution			
Marine			
Air			
Land			
Operational characteristics of the port			
Syndicate organizations			
Labour conditions			
Port management			
Competition			
Productivity			
Ground transportation			
Rail			
Bus			
Air Transport			
Maritime-fluvial Transport			

Part 4: Institutions that participate in maritime activities

PARAMETER/VARIABLE	USE COST	WAITING COST	TOTAL COST
Defence Ministry			
Navy			
National police			
Investigation Service			
DIRECTEMAR			
Meteorological Service			
Hydrographical and Oceanographic Service			
Economy Ministry			
National Fisheries Service			
Fisheries Development Institute			
Finance Ministry			
National Customs Service			
Internal Revenue Service			
Agriculture Ministry			
Agriculture and Livestock Service			
Transport and Communications Ministry			
Public Works Ministry			
Port Works Directorate			
Public Health Ministry			
Environmental Health Service			
Labour Ministry			
Regional Labour Office			

Justice Ministry			
National Port Enterprise			
Central Bank of Chile			
National Congress			
Judicial Power			
Tribunals			
Appeals Court			
Supreme Justice Court			
Customs Tribunal			
Maritime Court			
Private			
Ship-owners			
Companies that own vessels			
Companies that operate vessels			
Shipping agencies			
Stevedoring agencies			
Custom brokers			
Exporters and importers			
Classification societies			
Insurers			
Shipyards			
Shipyards for vessel maintenance			
Associations			
Ship-owners association			
Chilean Shipping Chamber			

Shipping agencies association			
Chilean Customs Chamber			
Chilean Exporters Association			

5.4.2. EVALUATION IN REGARD TO SOCIAL CRITERION.

Part 1: Factors that correspond to the Maritime Transfer Terminal Area

PARAMETER/VARIABLE	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSID.	LABOR CONSID.	TOTAL
From Cargo				
Tonnage for transfer				
Type of merchandise				
Stowing conditions				
Loading and unloading conditions				
From Cranes:				
Types available				
Output				
Quantity available				
Capacity				
Maximum work height				
Maximum reach				
Mobility				
From the Workforce:				
Number of port workers				
Output				
Number of effective work hours				
Working conditions				
From the Port:				
Number of berth				
Length				

Depth				
Dock apron				
Safety and surveillance conditions				
Effect of currents in berths				
From the Pilots:				
Number available				
Skill				
Specialization				
From Tugboats:				
Number available				
Characteristics				
Types				
From Berthing Services:				
Aids to Navigation				
Access zone				
Sheltered areas				
Anchorage zones				
Locks				
Inner harbour				
From the Vessel:				
Types				
Length				
Draft				
Beam				
Cargo capacity				

With own cargo gear				
Other gear for loading/unloading				
Maintenance conditions				
Safety conditions				

Part 2: Factors of shore-based installations of the transferring terminal

PARAMETER/VARIABLE	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSID.	LABOR CONSID.	TOTAL
Cargo transfer zones				
Consolidation and deconsolidation area				
Inspection area				
Administrative area				
Access area				
Parking area				
Transit area				
Maintenance area				
Emergency area				
Transit warehouses				
Depository warehouses				
Yards				

Part 3: Physical factors and exogenous politics to the transfer terminal

PARAMETER/VARIABLE	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSID.	LABOR CONSID.	TOTAL
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Physical Conditions of the Port				
Geographic location				
Hydrographical, depth				
Oceanographic, tides and swell				
Climatologic				
From Political				
Economy and finance				
Transport				
Infrastructure				
Labour				
Research and education				
Planning and coordination				
Institutionalism and organization				
Special Customs areas				
Free Zone				
Free Port				
Industrial Free Zone				
Bond warehouse outside port areas				
Port technology				
Planning of work projects				
Installation and implementation				

Industrial zones				
Location				
Demand for services and transport				
Other activities				
Fishing				
Military				
Areas of development				
Current area				
Surroundings				
Pollution				
Marine				
Air				
Land				
Operational characteristics of the port				
Syndicate organizations				
Labour conditions				
Port management				
Competition				
Productivity				
Ground transportation				
Rail				
Bus				
Air Transport				
Maritime-fluvial Transport				

Part 4: Institutions that participate in maritime activities

PARAMETER/VARIABLE	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSID.	LABOR CONSID.	TOTAL
Defence Ministry				
Navy				
National police				
Investigation Service				
DIRECTEMAR				
Meteorological Service				
Hydrographical and Oceanographic Service				
Economics Ministry				
National Fisheries Service				
Fisheries Development Institute				
Finance Ministry				
National Customs Service				
Internal Revenue Service				
Agriculture Ministry				
Agriculture and Livestock Service				
Transport and Communications Ministry				
Public Works Ministry				
Port Works				

Directorate				
Public Health Ministry				
Environmental Health Service				
Labour Ministry				
Regional Labour Office				
Justice Ministry				
EMPORCHI				
Banco Central de Chile				
National Congress				
Judicial Power				
Tribunals				
Appeals Court				
Supreme Justice Court				
Customs Court				
Maritime Court				
Private				
Ship-owners				
Companies that own vessels				
Companies that operate vessels				
Shipping agencies				
Stevedoring agencies				
Customhouse brokers				
Exporters and				

importers				
Classification societies				
Insurers				
Shipyards				
Shipyards for vessel maintenance				
Associations				
Ship-owners association				
Chilean Shipping Chamber				
Shipping agencies association				
Chilean Customs Chamber				
Chilean Exporters Association				

5.4.3. EVALUATION REGARDING TECHNICAL-LOGISTICAL CRITERION.

Part 1: Factors that correspond to the Maritime Transfer Terminal Area

PARAMETER/VARIABLE	LAND SPACE	ROUTES AND ROADS	VEHICLES	CARGOES	TOTAL
From Cargo					
Tonnage for transfer					
Type of merchandise					
Stowing conditions					
Loading and unloading conditions					
From Cranes:					
Types available					
Output					
Quantity available					
Capacity					
Maximum work height					
Maximum reach					
Mobility					
From the Workforce:					
Number of port workers					
Output					
Number of effective work hours					
Working conditions					
From the Port:					

Number of berth					
Length					
Depth					
Dock apron					
Safety and surveillance conditions					
Effect of currents in berth					
From the Pilots:					
Number available					
Skill					
Specialization					
From Tugboats:					
Number available					
Characteristics					
Types					
From Berthing Services:					
Buoy markings					
Access zone					
Sheltered areas					
Anchorage zones					
Locks					
Inner harbours					
From the Vessel:					
Types					
Length					

Draft					
Beam					
Cargo capacity					
With incorporated cranes					
Other mechanisms for loading/unloading					
Maintenance conditions					
Safety conditions					

Part 2: Factors of shore-based installations of the transferring terminal

PARAMETER/VARIABLE	LAND SPACE	ROUTES AND ROADS	VEHICLES	CARGOES	TOTAL
Cargo transfer zones					
Consolidation and deconsolidation area					
Inspection area					
Administrative area					
Access area					
Parking area					
Transit area					
Maintenance area					
Emergency area					
Transit warehouses					
Depository warehouses					

Patios/Yards					
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Part 3: Physical factors and exogenous politics to the transfer terminal

PARAMETER/VARIABLE	LAND SPACE	ROUTES AND ROADS	VEHICLES	CARGOES	TOTAL
Physical Conditions of the Port					
Geographic location					
Hydrographical, depth					
Oceanographic, tides and surf					
Climatologic					
From Politics					
Economy and finance					
Transport					
Infrastructure					
Labour					
Research and education					
Planning and coordination					
Institutionalism and organization					
Special Customs areas					
Free Zone					
Free Port					
Industrial Free Zone					
Bond warehouses outside					

port areas					
Port technology					
Planning of work projects					
Installation and implementation					
Industrial zones					
Location					
Demand for services and transport					
Other activities					
Fishing					
Military					
Areas of development					
Current facilities					
Surroundings					
Pollution					
Marine					
Air					
Land					
Operational characteristics of the port					
Syndicate organizations					
Labour conditions					
Port management					
Competition					
Productivity					

Ground transportation					
Rail					
Bus					
Air Transport					
Maritime-fluvial Transport					

Part 4: Institutions that participate in maritime activities

PARAMETER/VARIABLE	LAND SPACE	ROUTES AND ROADS	VEHICLES	CARGOES	TOTAL
Defence Ministry					
Navy					
National police					
Investigation Service					
DIRECTEMAR					
Meteorological Service					
Hydrographical and Oceanographic Service					
Economy Ministry					
National Fisheries Service					
Institute of Fishery Development					
Finance Ministry					
National Customs Service					
Internal Revenue Service					

Agriculture Ministry					
Agriculture and Livestock Service					
Transport and Communications Ministry					
Public Works Ministry					
Directorate of Port Works					
Public Health Ministry					
Public Health Service					
Labour Ministry					
Regional Labour Office					
Justice Ministry					
EMPORCHI					
Banco Central de Chile					
National Congress					
Judicial Power					
Tribunals					
Appeals Court					
Supreme Justice Court					
Customs Tribunal					
Maritime Court					
Private					
Ship-owners					
Companies that own vessels					

Companies that operate vessels					
Shipping agencies					
Stevedoring agencies					
Custom brokers					
Exporters and importers					
Classification societies					
Insurers					
Shipyards					
Shipyards for vessel maintenance					
Associations					
Ship-owners association					
Chilean Shipping Chamber					
Shipping agencies association					
Chilean Customs Chamber					
Chilean Exporters Association					
Chilean Maritime League					

5.5. CONSTRUCTION OF MATRIXES WITH RELEVANT PARAMETERS AND VARIABLES.

From the evaluation carried out in accordance to item 5.4, parameters were obtained that will be considered relevant for the analysis of the system under study, bearing in mind the utilized criterions.

In order to obtain the parameters, those that have obtained greater consideration in each one of the four matrixes that make up the criterion analysis will be selected.

As a result, there is a criterion-integrated matrix that contemplates those parameters/variables of major importance and puts in order of relevance the items that were evaluated.

5.5.1. ECONOMIC CRITERION.

The following chart illustrates the matrix that resulted from the economic criterion evaluation that contemplated the valuation that corresponds to the three chosen items; these are utilization cost, the cost for waiting for services and the cost of capital for the port infrastructure.

ECONOMIC CRITERION	
RELEVANT PARAMETER	SCORE OBTAINED
1.-	
2.-	
3.-	
n ⁻¹	

5.5.3. SOCIAL CRITERION.

The following table presents the matrix that resulted from the estimate in accordance to the social criterion that contemplates the evaluation that corresponds to the three selected items; these are the environment, port system safety conditions and labour conditions of personnel that participate in port activities.

SOCIAL CRITERION	
RELEVANT PARAMETER	SCORE OBTAINED
1.-	
2.-	
3.-	
n ⁻¹	

5.5.4. TECHNICAL-LOGISTICAL CRITERION.

The following table presents the matrix that resulted from the evaluation in accordance to the technical criterion that contemplates the value that corresponds to the four selected items; these are space, routes, vehicles, cargo; all of these elements comply with the logistics distribution system.

TECHNICAL-LOGICTICS CRITERION	
RELEVANT PARAMETER	SCORE OBTAINED
1.-	
2.-	
3.-	
n ⁻¹	

5.6. COMPARISON OF RELEVANT PARAMETERS/VARIABLES WITH STANDARDS.

Once the criterion integrated matrixes are obtained, which are formed by the relevant parameters in accordance to the evaluation carried out utilizing the performance measures aforementioned, a comparison should be made with the standards obtained from the United Nations Conference on Trade and Development (UNCTAD), or with other international standards.

By not having the mentioned standards readily available, it is recommended that the historical measures of the system under study be used.

5.7. DETERMINATION OF RESULTS.

The result of the comparison is obtained from the evaluation of the physical capabilities and performance of the distribution system under analysis. This allows the determination of how the available resources are utilized, what their deficiencies are, and in which areas these resources are not being utilized efficiently.

As a result of the application of the proposed methodology, an integrated systemic comprehension is concluded. This means that all the elements that make up the method and the ones which are relevant to the system have been identified.

All the information obtained from the investigation transforms the methodology into a tool which aids the decision-making process, which is a permanent process in a distribution system due to the changes of the requirements that the surroundings impose on it.

5.8. WORK DISCUSSION.

The study of a logistic distribution system, like a port, implies a holistic analysis of all its components and a thorough knowledge of the elements and their interaction.

In order to carry out an analysis, it is necessary to identify all the different sub-systems that allow a deeper knowledge, which would not be possible if a study of the complete system is not undertaken. Additionally, it is essential to contemplate the setting and surroundings of the system under study, since they exert fundamental influences on it, and on the other hand, the system impacts and affects the setting in which it exists.

The suggested methodology is a means for analysing and evaluating the physical capacities of a distribution system, according to the user's preferences. This requires the availability of information that would allow the system under study to be profoundly explained.

It should be mentioned that most of the information required sometimes is not easy to get, and apart from this, the analyst that is responsible for putting the methodology into practice should have very special characteristics. Preferably, he or she should be involved in and be part of the system; and in spite of this, also be objective in the evaluation process.

Together with acquiring certain knowledge of the capacities of the system, an integral knowledge of it should be obtained. This is of vital importance for the management and decision-making process that involves alterations not only to the system but also to its surroundings, which are generally at an elevated cost.

CHAPTER VI CONCLUSIONS.

6.1. CONCLUSIONS.

- I. The process of port reforms initiated in Chile during 1981 did not consider a “Labour Re-conversion Scheme” for the maritime personnel (private companies and unions), leaving the workforce unprotected. Only the workers connected to the Public Port Enterprise (EMPORCHI) were considered in the legislation.
- II. The port restructuring Model that has been taking form during the last 37 years, has shown a sustained improvement in the Chilean port efficiency, giving way to important reductions in operational costs of all companies not only related to the maritime port business, but also exporters and the national economy as a whole.
- III. Rationalization of port work force is a fact, which has favourably affected the operational costs shown in the detail explanation of Chapter I.
- IV. Regarding the legal framework of Chilean ports, it is possible to say, that due to the length of the Chilean Port restructuring process, legislation is extremely abundant although there are still some aspects that have not been covered, leaving some visible holes especially with regards to employment.
- V. The legislation mentioned above is mainly aimed at the state port sector, no provision has been made to date regarding the private port sector, the former being used by adoption (legal framework for State Owned ports exist but not for private ports or a frame law covering all ports).
- VI. The port workers, have only been partially re-employed, mainly those with higher qualifications and operational efficiency.
- VII. Workforce training in the private sector, according to the previous legislation considered their qualification in aspects related to industrial security and hygiene, but not their technical knowledge or skills specific to their activities. The current legislation applies the same rules, but only for the workers with “permanent” employment in one of the shipping companies not for the “casual” workforce which provide services for specific “shift” of 7.5 hrs. The situation of the EMPORCHI workers was different due to the labour conditions and rulings they were governed by.
- VIII. There are no national regulations that take into account the details of the technical-professional qualifications of the port workers. Training depends on particular needs of private companies, some of which have internal training programs.
- IX. Nowadays, the Maritime Authority decree the obligation for any port worker to approve a special course before to enter to the port sector, mainly on occupational safety and health not regarding the full range of “occupational competences” to perform their work.
- X. From the point of view of the Chilean export products, competitiveness of the national port model has undoubtedly benefited and this indirectly affects other workers positively and consequently, the country as a whole.

- XI. The port restructuring process had a high social cost, even though considerable amounts of resources were distributed as compensation, they were not always put to optimum use, from the point of view of economic sustenance for the worker. This was mainly due to the lack of a re-employment scheme.
- XII. The Chilean port re-structuring process was the pioneer on the region and even, in its nature, in the world. No other experience exists on this matter in the late 1970s, "try and error" was the method which rules.
- XIII. The political and social pressures seem to have lessened, but only in the short term, as the real causes have not been eliminated by the current legislation. It is also important to consider that the influence of the port sector on the local economy is of great importance for the geographical and geopolitical reality of a country such as Chile. Therefore, the authorities of this sector should pay special attention to this.
- XIV. The development strategies of third world countries place a strong emphasis on the expansion of their international commercialization processes, which are highly dependent on efficient transport services and reasonable costs. For this, it is a priority that the methodology for the drawing up of a policy presents a correct analysis of the market force, services, technology and rights that govern transport systems in order that these subjects may be adequately included in the strategy.
- XV. Developing countries, the majority of which are users and not providers of transport services, face a world scenario of fierce competition concerning the use of vanguard technology, solid internal legislation and flexible, dynamic and consistent commercial strategies based on the application of economies of scale which are directed towards rendering multi-modal services with computerized processing of information and communications.
- XVI. The abovementioned technologies, legislations and strategies are inherent to and originated in developed countries, obligating these countries to be subject to a prompt adoption of these procedures with the idea of maintaining competition in the market.
- XVII. The actual framework for the drawing up of transport policies in developed countries is characterized by countless factors of an economic, labour, strategic, social, commercial, etc. nature and should be clearly oriented towards the policy's final objective.
- XVIII. It can be concluded that maritime policy models can be as many as the imagination of the policymaker can muster, but the most important thing is that the objectives to be reached must be absolutely clear and in accordance with the national development strategy.
- XIX. The drawing up of a modern and efficient policy in an emerging economy should be coherent, consistent, integral and systemic with regard to the consideration of macroeconomic, political, labour, social and strategic objectives of the particular country.

- XX. In the southern cone of South America, it is possible to identify a series of logistic corridors.
- XXI. The coastal countries have been applying restructuring policies to their port systems which has allowed them to improve the efficiency of their ports. There is a direct relation between the improvement of the port system and the facilitation of a country's external trade.
- XXII. The economic policies of the southern cone countries have been reoriented towards the increase of imports, which makes them dependent on an efficient logistic system which will allow them to place their products in international markets.
- XXIII. The infrastructure of roads and railways in the southern cone are still insufficient.
- XXIV. Only recently has it been possible to detect initiatives for the integration of logistic corridors.
- XXV. The efficiency of the logistic corridors will depend from the facilitation of the bureaucratic processes and paper work, it is require to re-formulate the mandates and processes of the relevant public services like: customs, quarantine, immigration, public health, and even provision of cashier open 24/7.
- XXVI. World tendency is to provide a "single window" approach.
- XXVII. Logistic concepts are new to the southern cone, and therefore the establishment of logistic platforms has only been effectively considered after the year 2000.
- XXVIII. Logistic integration policies are being discussed by governments without any resolution to date.
- XXIX. As there is no legal framework or a specific policy, there are no projects or investments oriented towards the strengthening of logistic corridor infrastructure.
- XXX. The study of a logistic distribution system implies a global analysis of all its components and a thorough knowledge of all the relationships among the elements, whether on an individual basis or together as a whole.
- XXXI. An in-depth analysis also requires identifying and delving into sub-systems. This is not possible to analyse it in a broad study. Additionally, it is essential to consider how the system and its components acts upon and is affected by its surroundings.
- XXXII. The suggested methodology is a means for analysing and evaluating the physical capacities of a distribution system. This requires the availability of detailed information that would facilitate a profound explanation of the system.
- XXXIII. It is worthwhile mentioning the difficulty of obtaining the information presented here. The analyst responsible for putting the methodology into practice must

have particular qualities. Preferably, he or she should be involved in and be part of the system, but nonetheless objective in the evaluation process.

XXXIV. To know the capacities of the system is to understand it as an integrated unit. This is of vital importance for management and decision-making processes which involve changes not only to the system but also to its surroundings,

1.2. RECOMMENDATIONS.

- a) The governments of the southern cone countries should increase their efforts in order to improve the infrastructure of their logistic corridors and its efficient connectivity and integration.
- b) The governments of the southern cone countries should encourage the establishment of logistic platforms that will facilitate the physical and administrative distribution of the cargo.
- c) It is necessary that the persons responsible in each country establish the required technological platforms to allow efficient information management for external trade.
- d) It is necessary to improve the road and rail infrastructure of the logistic corridors.
- e) Countries should sign cooperation agreements to improve physical, technological and administrative infrastructure at the border passes in order to reduce the “dwell time” of cargo and vehicles.
- f) The countries of the region should take into consideration, when designing their maritime transport policies, the changes in the environment and the national strategic objectives, in order that the advantages of the policy may turn into effective benefits for the country’s population.
- g) It is recommended, for the majority of decision making processes, the use of similar methodologies to those developed in this study, in order to be able to identify and correct the deficiencies detected.

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ANNEX 1

ELEMENTS THAT CONSTITUTE A PORT SYSTEM

Part 1: Port and Ships Particulars

Port Particulars	Berths	Quantity	
		Length	
		Maximum draft	
		Swell effect	
		Current effect	
		Pier apron	
	Breakwater		
	Occupational Safety, Health and Environment	Control	
		Certification	
		Insurance	
	Environmental issues	MARPOL PRFs	
		Certification	
		MARPOL Annex VI	
	Port Security	Security controls	
		Surveillance system	
		ISPS compliance	

Safety Navigation Services	Pilotage	Quantity	
		Training and skills	
		Pilot Boat	
	Tugboat	Quantity	
		Type	
		Bollard pull	
	Mooring	Mooring boat	
		Mooring personnel	
	Port entry	Outer anchorage	
		Access channel draft	
		Locks	
		Inner harbours	
		Operational hours to entry or leave port wharf	Day time only
			Day and night
	Support to Navigation	Aids to Navigation	
VTS			
Vessels	Annual traffic		
	Maximum ship allowed		
	Particulars	Type	
		Tonnage	
		Cargo gear	
Nationality			
Compliance with PSC			
Services to Vessels	Bunkering services		

	Fresh water provision			
	Offshore power supply			
	MARPOL PRFs			
Cargo Particulars	Tonnage Transferred			
	Cargo Type			
	Type of Stowing			
	Loading & Unloading Operations			
Cargo Throughput	Crane service	Type		
		Output		
		Quantity		
		Technical Characteristics	Capacity	
	Air Clearance			
	Outreach			
	Mobility-Deployment			
	Work shifts	Number of persons per gang	Number of persons per gang	
			Number Shifts per day	
			Productivity per shift	
		Crane Drivers	Quantity	
			Training	
	Productivity			
		Working Conditions		
Other Cargo	Dry Bulk			

	Handling Equipment	Liquid Bulk	
		Heavy Cargo	

Part 2 – Shore Side Facilities

Port Facilities	Cargo transfer zones	Area
	Container Stuffing and un-stuffing	Number of TEUs
	Cargo inspection areas	Area
	Dangerous cargo zones	Area or TEUs
	Parking areas	Number of truck slots
	Cargo weighing scale	Maximum capacity
	Maintenance and repair port facilities	
	Container yards	TEU ground slots
	Break bulk and over side cargo yards	Area
	Cover areas and warehouses	M ² and or M ³
	Storage Warehouse	M ² and or M ³
	Emergency response services	Type: fire brigade, ambulance, spill response
	Administrative building	
Container freight station (CFS)		

Part 3: General Characteristics

Physical Conditions of Port Area	Geography
	Hydrography
	Oceanography
National Policy	Economic
	Transport

	Infrastructure and investment
	Banking and financial
	Labour
	Research and education
	Planning and coordination
	Public governance
Custom Primary or Special Zones	Free Zone
	Free Port
	Industrial Free Zones
	Bond Yards and Warehouses
Logistic Platform	Multiuser spaces
	Single window concept
	Distribution centres
	Integration of public services
	IT logistic platform
Industrial Zones	Distance from port
	Demand for services and transport
Non-Commercial Activities related to Sea	Nautical sport
	Fishing
	Military
Availability Areas for Development	In current premises
	Surrounding
Environmental Protection	Air
	Sea
	Soil

Labour Environment	Unionism and syndicates		
	Labour conditions		
Port Management	Executives skills		
	Competition		
	Productivity		
	Port commercialization		
	User council		
	Port marketing		
Intermodal transport system	Legal framework		
	Real integration of modes		
	Land transport		
			Railways
			Roads
	Air transport		
	Maritime transport	Connectivity	
		Number of services	
		Inland-transport	



Part 4 Institutional Setup

<u>Stakeholder Map</u>			
Public	Government	Ministry of Defence	Navy
			Coast Guard
			Hydrographical Service
			Meteorological Service
			Antiterrorist Tactical Team
		Interior	Police
			Migration Services
			Antinarcotic Services
		Economy	National Fisheries Services
		Finance	National Customs Services
			Internal Revenue Services
		Agriculture	Quarantine
		Transport	Maritime Transport Directorate
		Public Enterprise System	State Port Enterprises
			Railway State Enterprise
		Public Works	Port Works Directorate

		Health	Public Health
		Labour	Regional Labour Directorate
		Justice	
		Central Bank	
	Legislative Power	Parliament	Working Commissions
	Judicial System	Supreme Court	
		Appeal Court	
		Tribunals	
		Customs Tribunal	
		Maritime Court	
Private	Ship-Owner	Ship Owners	
		Ship Operators	
	Maritime Agents	Shipping Agents	
		Stevedoring Agents	
		Freight Forwarding Agents	
		Custom Agents	
	Classification Societies		

	Insurance Companies		
	Naval Auxiliary Services	Shipyards	
		Ship Maintenance services	
	Associations	Ship-owner Association	
		Maritime and Port Chamber	
		Custom Chamber	
		Export Association	
		Shipping Agent Association	
		Chilean Maritime League	

APPENDIX 1.1 TERMS DEFINITIONS

(Applicable to the present document)

The following definitions are included for better identification and analysis:

Definitions of Part 1.

Factors that correspond to the Maritime Transfer Terminal Area.

1.0. Cargo characteristics and conditions.

1.1. Tonnage to be transferred:

Amount of cargo that requires manipulation, whether it coming from the vessel to the apron of the port or vice versa.

1.2. Type of merchandise:

In accordance to the characteristics of cargo units and methods of operation, classification is as follows:

Cargo by lifting (LoLo): Refers to container cargo by way of special installations. The operative scheme is similar to that of general merchandise.

Cargo by rolling (RoRo): Is the merchandise formed by a series of elements that are susceptible to being loaded or unloaded from the vessel on an individual basis by horizontal deployments. The cargo may include vehicles, containers that are transported by a mobile transport element, etc. In addition, passengers are included in this category.

Cargo by flotation (FloFlo): Refers to the cargo that is directly transferred by way of flotation from the water's berth front to the vessel. There are various types that are differentiated by the shape and size of the barges (by overhead cranes in the stern, LASH system or SEABEE).

Dry Bulk: Within this group are solid products in loose form that can be manipulated by special mechanical means on a continuous basis. Its type will depend on the dimensions of its composition.

Liquid Bulk: We have included in this group those products that can be manipulated in a liquid form without having to be packaged in small capacity recipients. They are easily handled and expediently transported.

1.3. Stowing conditions:

Order that rules the disposition of the vessel's cargo with the objective of rendering safety to the vessel and its crew members, and decrease operation costs and also protect the cargo.

1.4. Loading and unloading conditions:

The conditions of the cargo should be considered not only from the point of view of consolidation but also the manner in which it is removed from Customs. The FCL,

LCL and empty conditions and direct and indirect removal conditions should dominate.

2.0. Cargo Transfer:

All resources that are needed for the transfer of cargo will be utilized for the analysis.

2.1. Crane Service:

Types of Cranes: Cranes are specific equipment for loading and unloading. They are divided into the following categories:

Pelican cranes: A varied range of models are included within this types that, in general, are made up of the following fundamental parts: Boom, the part that supports the weight of its extremity and allows mobility to the desired point. Revolving Part, this supports the boom and allows them to revolve together. Engine room, sustains the revolving part and the superstructure and allows movement and the elevation mechanism, with its key and pulleys.

Mobil cranes: The mobility of this type of cranes is advantageous because it can be located wherever necessary and is able to close in on the cargo whenever necessary. As a result, it has a greater manoeuvring capacity.

Output: It is a measurement of performance that depends on the type of cargo.

Amount of available cranes: number of cranes that are in working condition.

Crane Characteristics:

Lifting capacity: The amount of cargo that can be transported the farthest distance.

Maximum work outreach: It is measured from the revolving axle to the hook; also the average minimum radius is indicated.

Mobility - Displacement: Refers to the flexibility of movement which allows it to get closer to the cargo. Manoeuvre capacity.

2.2. Workforce:

Refers to the organization of personnel directly related to the transfer of cargo.

Number of personnel: Is the number of persons available in the operations department.

Output: Is the measurement of human resource effort that can be expressed as units of transferred cargo for each workforce or work shift.

Number of effective work hours: The number of work shifts should be determined; and the availability of natural light should be considered since it could have an influence.

Crane drivers: Are differentiated from general stevedore personnel, since they possess special training. Number of personnel that are capable of operating a crane.

Specialisation: Requires special courses.

Output: Amount of effort that is directly related and measured through the performance of the crane.

2.3.Equipment for cargo transfer:

Equipment and elements necessary to carry out loading/unloading operations and that constitute those materials that are essential for the movement and transfer of cargo (i.e. grommets, nets, cages, spreaders, palettes, etc.). Also used are such vehicles as the fork lift crane, straddle carrier, top lifter, reach stackers, chassis, etc.

3.Port Characteristics.

3.1.Number of sites: amount of berthing sites available.

3.2.Characteristics of the berths:

Length: Distance measured in longitudinal units between the limiting boundaries of the berth.

Draft:Distance from the water line at zero water level (datum) to the bottom of the sea.

Maximum draft: Maximum permitted depth for the vessel to carry out their manoeuvres with safety.

Apron of the dock: Is the area that projects from the water front to the first warehouse or, to the beginning of the esplanade when there are no warehouses. In this zone cleats, dock cranes, electricity network, etc. can be found. Likewise, it is the place where the direct or indirect transfer arrives or begins at.

3.3.Safety and surveillance conditions in the port:

This is a major problem for the ports, due to the fact that the majority of the installations are located in the middle of the urban nucleus. Within these measures are: the isolation of the operations zone and the prohibition of all unauthorized persons to enter, fire prevention measures, etc.

3.4.Environmental safety and hygiene conditions:

These are all those measures that are adopted in order to avoid contamination and environmental damage in the area where the port operates.

3.5. Effect of currents on the berth:

This is the movement of the vessel due to the effect of currents and tides.

4.Services for vessels

4.1. Pilots: Specialized personnel that carry out the function of receiving the vessel and being in charge of berthing manoeuvres.

4.2.Tug Boats:

Number available: Quantity of towing vessels which are in operating conditions.

Characteristics: The main characteristic of towing vessels is the pushing or towing capability that they possess, by which the unit that measures this condition has been established as HP (horse power) and more used is the bollard pull tons.

Types: Two types of tug boatsexist in the thesis context; those which offer “port”services and those for “oceanic” service.

4.3.Berthing service:

Aids to Navigation: Are made up of all the installations, equipment and infrastructure and navigational aids that signal the navigation channels, canals and pilot areas and anchorage areas, constituting themselves as elements of support and safety.

Access zone: Corresponds to the entrance section of the inner harbour and is made up by the pilot’s waiting area, the weighting anchor area, the access channel and the manoeuvring area within the inner harbour.

Sheltered structures: Are all those constructions whose objective is to render protection to berthed vessels while in transit as well as to protect the installations, the infrastructure and cargo from inclement weather.

Anchorage zone: Is made up of the section designated by the Maritime Authority or the port as the authorized area for vessels to anchor whether they are waiting for authorities, pilots, instructions, etc.

Lock: Is formed by a navigation channel with gates in its extremities which allows vessels to navigate by maintaining two different levels of water in the exterior and interior of the inner harbour or manoeuvring space.

Inner harbour: Is an artificial construction that renders protection and shelter in the berthing areas and in the manoeuvring area that is located in its interior.

5.Vessels:

5.1.Types:

The vessels that make ports-of-call can be differentiated into diverse types in accordance to their characteristics or by the type of cargo that they are transporting.

5.2.Characteristics:

Length: Longitudinal dimension of a vessel which assumes different names depending on where the measurement was taken:

- Between the extreme points (maximum length);
- Its measurement in the maximum draft line (length between perpendiculars).

Draft: Is the vertical dimension of a vessel that is measured from the waterline to the keel or the bottom of the keel. This can be measured in its extremities (bow to stern), as well as in its middle section.

Beam: Transversal dimension of the vessel, which is measured in the master or middle section (the widest part) of the vessel.

Cargo capacity: Space available in the vessel for transporting cargo, whether it is on deck or in the hold, usually is named deadweight (DWT) and it is measure in metric or long tons.

5.3. Quantity:

This is the number of different types of vessels that use the installations and port resources.

5.4. Equipment for cargo handling:

This refers to all the installations that the vessel possesses which are designated for the manipulation of cargo.

Ship Cargo Gear: These can be of boom, pelican or gantry types (specialized for containers), etc.

Other mechanisms for loading and unloading: correspond to diverse systems for the manipulation of cargo as well as the system of vacuum discharge, conveyors systems, etc.

Definitions of Part 2.

Factors of shore-based installations of the transferring terminal.

2. Cargo transfer zone:

Corresponds to that area made up by the berthing site and the apron of the dock, where the cargo is transferred from or to the vessel (for multipurpose ports) and by the mooring and its respective connections in the case of terminals destined for liquids

3. Consolidation and deconsolidation area:

Is the specified section or space in which the loading and unloading of containers is carried out.

4. Inspection areas:

Are constituted by that section or space in which the cargo and the containers are inspected by competent authorities (Fitosanitary control, Customs, etc.)

5. Administrative area:

This is the area designated for the construction of offices buildings and administrative services.

6. Access areas:

These are formed by those sections of access or gates of the port precinct.

6. Parking and detainment area:

This area is made up of two sections:

- Parking that is destined for those vehicles that enter the port precinct whose drivers are carrying out required administrative paperwork.
- Parking for those vehicles that enter the port precinct for delivery or receipt of cargo or containers.

7. Transit areas:

They are spaces that mainly deal with the deployment of vehicles and persons within the port precinct.

8. Maintenance and Revision areas:

In these areas are all the available installations for the maintenance and reparation of port equipment.

9. Emergency areas:

Are those spaces available for emergency equipment and infrastructure, such as fire hydrants, firehouses, ambulances, etc.

10. Transit Warehouses:

Are those enclosed warehouses where transitory merchandise is deposited whether it is going to be embarked or was unloaded from a vessel for indirect transfer.

11. Deposit Warehouses:

Are those enclosed warehouses where merchandise is deposited waiting clearance for its later removal and/or indirect transfer.

12. Yards:

Are those uncovered areas that are used for the deposit of temporary merchandise, as a waiting zone for lorries, vans, etc. for indirect transfer.

Definitions of Part 3.

Physical factors and exogenous policies to the transfer terminal.

1. Physical conditions of the port area.

Refers to the characteristics of the port location site.(e.i.geographic, hydrographical or oceanographic).

2. Special Customs precincts.

Customs exemption zones: are zones that enjoy a series of custom exemptions that could include from total and absolute freedom to some simple tariff reductions or paperwork limitations.

Extra-Port warehouses: correspond to those bond warehouses or precincts that are in or out of the port-city that are authorized by Customs for the collection or storing of cargo that is under conditions of the customs exemption zone.

3. Port technology.

Work planning: this refers to all the general activities of the port, in that which refers to services and operations as well as the planning of work projects and installations; and precisely, all these jobs and studies should try to achieve a port that forms a harmonic and equilibrated conglomerate in order to favour optimal operation.

Installation and implementation: the continuous progress of the transport systems and, aboveall, the increase in vessel dimensions has made it necessary to continually update the ports to the specifications of its users. For this, the

installations and port implementation should follow a modernization rhythm in accordance to the requirements in order to avoid serious problems as a product of not rendering adequate service to the new forms of transport.

4. Industrial zones.

The need to provide sufficient land area in the spaces close to port installations fundamentally predominates. Therefore, it is considered basic to study shore conditions first and then, the possibility of deep water, since more and more massive bulk traffic in specialized large vessels is more important. All of this is the product of industrial zones that generate a constant increase for the demand of transport.

5. Non-commercial activities associated with the sea.

The non-commercial activities associated with the sea (nautical sports, military) also require adequate port installations and that motivate the construction of these installations within the general port and that in some cases, demands the construction of a special port for a specific need.

7. Availability of areas for development.

The availability of areas for future port expansions is an important issue, mainly because that influence the type of port operations and organization, is important for other port related business also.

ANNEX 2

METHODOLOGY TO FORECAST CONTAINER TERMINAL DEMAND.

1. General Aspects.

Generally, the design and development of a container terminal presents problems, mainly in that which refers to efficiency and effectiveness of the utilisation of resources. The mistakes made in its design translate into the causes of deficient operation.

These mistakes generally come about from:

- An underestimation of the area required for the terminal, which results in congestion and inefficient handling or manipulation of the containers.
- Inadequate placing of installations when the layout is first designed, which results in interferences between activities and deficient cargo handling.

Three vital design aspects will be considered for the designing of a terminal:

- Land space requirements,
- Terminal configuration, and
- Layout of the terminal.

The first step in planning should be to determine the total area that is required for the terminal. There are many interrelated factors involved in this, but it is possible to identify two main elements that get the process started: determination of the expected demand and then the calculation of space and location needed to meet this demand.

2. Determination of Demand.

Due to operational and administrative reasons, containers normally are not transferred directly between the pier and internal transport. Therefore, a storage area must be available in the terminal for storing containers that are in transit, meanwhile administrative procedures involved in delivery are carried out.

The container area is the main area of use in the terminal and one of the most subject to demand as approximately 70% of the terminal area is assigned for stacking containers, meanwhile other areas (administrative and control offices, access routes and roads, etc. occupy only 30% of the area).

The amount of space needed for handling and storing is directly related to the number of containers that transit through the terminal and the average stationary time spent by the containers there (Dwell Time).

2.1. Determination of the number of containers.

In order to predict the number of containers that will be utilized and moved through the Port of Valparaiso, a model of multiple calculation was used which carried out projections independently for 20 (TEU) and 40 (FEU) foot containers, where the following results were obtained:

ESTIMATED VALUES TABLE

(Number of TEU containers)

YEAR	ESTIMATED VALUE
1995	121,655
1996	129,943
1997	138,250
1998	141,401
1999	155,004
2000	163,328
2001	171,613
2002	179,975
2003	203,581
2004	196,716
2005	205,092

ESTIMATED VALUES TABLE

(Number of FEU containers)

YEAR	ESTIMATED VALUE
1995	76,894
1996	84,167
1997	91,461
1998	98,771
1999	106,190
2000	113,500

2001	120,772
2002	128,121
2003	135,471
2004	142,837
2005	150,199

By using TEU as the base and considering that FEU containers occupy twice the amount of space as a 20 TEU container, an estimate of the total number of containers can be made from the obtained results.

TABLE OF ESTIMATED TOTAL VALUES

(Number of TEU containers)

YEAR	ESTIMATED VALUE TEU	ESTIMATED VALUE FEU in TEUs	ESTIMATED TOTAL TEU
1995	121,655	153,788	275,443
1996	129,943	168,334	298,277
1997	138,250	182,922	321,172
1998	141,401	197,542	338,943
1999	155,004	212,380	367,384
2000	163,328	227,000	390,328
2001	171,613	241,544	413,157
2002	179,975	256,242	436,217
2003	203,581	270,942	474,523
2004	196,716	285,674	482,390
2005	205,092	300,398	505,490

2.2. Average Dwell Time of Containers.

The average stay of containers in the terminal results from the estimation of dwell time for import, export, LCL, FCL and empty containers. In order to calculate it, the relative weight of each type of container and their particular permanence time should be available.

In this case, the dwell time is considered as a parameter that can be varied in order to carry out sensibility tests based on them. An average container dwell time of 3 to 5 days in the terminal will be used as test values.

2.3. Stacking Height in the Container Yard.

This parameter refers to the maximum amount of containers that can be stacked and directly influences in the space required for storing containers.

The following are the principal factors that determine the possible number of stacked containers:

- **Dimensions:** The physical characteristics of containers are directly related to their handling; above all when handling them at heights, and here it is where 20ft. containers present better manoeuvrability, especially when they have to be stacked.
- **Types:** Some containers have special characteristics which determine that they can't be stacked, or that they require storage spaces with additional equipment which means they have to be stored apart from the others. For example, refrigerated containers need to be connected to electrical outlets.
- **Status:** Special attention must be paid to the classification of the container depending on if it is for export, import or empty etc. For example, empty containers can be stacked up to a height of 5 containers considering that its stay in the terminal is greater.
- **Handling equipment:** Even though in theory containers can be stored 5 containers high, this height is directly related to the equipment that is available for handling.

2.4. Type of System/Equipment used.

In order to define the type of system to be used in the terminal, it is necessary to make a comparison between the different types available, taking into consideration factors such as: area of use, associated costs, necessary manpower, operation factors, etc. Table 1 contains the details of this comparison.

Considering the differential characteristics of each of the systems that were evaluated, they will be used as determining parameters by which a sensibility analysis will be carried out taking into account the total area of the terminal according to the system that is used.

TABLE 1
Comparison between Systems for Handling Containers

System	Tractor / Chassis	Straddle Carrier Direct	Straddle Carrier Relay	Yard Gantry Crane	Front Loader	Reach Stacker
Area Used	180 TEU/He	650 TEU/He.	650 TEU/He	750 TEU/He	275 TUE/He	500 TEU/He
Development Costs	Very Low	Medium	Medium	High	Low	Low
Equipment Costs	Low	High	High	Moderate	Low	Low
Maintenance Costs	Low	High	High	Low	Medium	Medium
Skill	Low	High	High	High	Medium	Medium
Pro and Cons Operational Factors	Good access, Minimum box damage, Higher speed to reach storage area.	Very flexible, Good storage conditions	Very flexible	Good use of area, Restricted flexibility	Versatile equipment, easy movement Middle turning circle	Versatile equipment, easy movement Short turning circle Longer outreach

Source: Prepared by the author with information from UNCTAD, ATAS Container development Course and Kalmar Industries

3.Calculation of Total Area Needed.

In order to calculate in hectares the total space that is needed by the terminal it is contemplated that 30% of the area is designated for administrative and maintenance office installations, accesses, etc. The remainder 70% is the surface area set aside for storing the containers, considering that 10% of this area is for containers with special needs.

In order to select the best possible design, a sensibility analysis should be carried out that considers the following situations:

Situation 1:

In order to make an estimate in hectares of the total space for the terminal, this situation considers:

- Expected demand for the year 2005 being 505,490 20 ft. containers;
- The average dwell time per container is equal to 3 days.

Situation 1.1

- Handling equipment, tractor/chassis type

Situation 1.2

- Handling equipment, Straddle carrier (direct) type

Situation 1.3

- Patio Gantry crane system

Situation 2:

In order to make an estimate in hectares of the total space for the terminal, this situation considers:

- Expected demand for the year 2005 being 505,490 20 ft. containers
- The average dwell time per container is equal to 5 days

Situation 2.1

- Handling equipment, tractor/chassis type

Situation 2.2

- Handling equipment, Straddle carrier (direct) type

Situation 2.3

- Patio Gantry crane system

The steps to follow for calculating the area needed are:

1. Determine the number of "slots" in accordance to the number of 20 ft. containers that will pass through the terminal annually.
2. Consider the average amount of dwell time of the containers.
3. Consider the container handling system.
4. Obtain the total area by using the distribution percentages that were pointed out earlier.

3.1. Calculations for Situation 1.1:

Demand: 505,490 20ft. containers

Dwell time: 3 days

Tractor/chassis equipment: 180 TEU/acre

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 3 = 4155 \text{ slots}$$

3. Incorporating equipment:

$$4155 / 180 = 23.083 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CNT yard} = 23.083 \text{ Hectares}$$

$$\text{special CNT} = 2.308.8 \text{ Hectares}$$

$$\text{general CNT} = 20.775 \text{ Hectares}$$

$$30\% \text{ of general area} = 9.892 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{32.975 Hectares}$$

3.2. Calculations for Situation 1.2:

Demand: 505,490 20ft. containers

Dwell time: 3 days

Direct straddle carrier: 385 TEU/acre

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 3 = 4155 \text{ slots}$$

3. Incorporating equipment:

$$4155 / 385 = 10.7922 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CNT patio} = 10.7922 \text{ Hectares}$$

$$\text{special CNT} = 1.07922 \text{ Hectares}$$

$$\text{general CNT} = 9.71298 \text{ Hectares}$$

$$30\% \text{ of general area} = 4.6252 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{15.4174 Hectares}$$

3.3. Calculations for Situation 1.3:

Demand: 505,490 20ft. containers

Dwell time: 3 days

Yard gantry crane: 750 TEU/acre

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 3 = 4155 \text{ slots}$$

3. Incorporating equipment:

$$4155 / 750 = 5.54 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CY} = 5.54 \text{ Hectares}$$

$$\text{special CNT} = 0.554 \text{ Hectares}$$

$$\text{general CNT} = 4.986 \text{ Hectares}$$

$$30\% \text{ of general area} = 2.3743 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{7.9143 Hectares}$$

3.4. Calculations for Situation 2.1:

Demand: 505,490 20ft. containers

Dwell time: 5 days

Tractor/chassis equipments: 180 TEU/acre

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 5 = 6925 \text{ slots}$$

3. Incorporating equipment:

$$6925 / 180 = 38.4722 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CNT patio} = 38.4722 \text{ Hectares}$$

$$\text{special CNT} = 3.84722 \text{ Hectares}$$

$$\text{general CNT} = 34.62498 \text{ Hectares}$$

$$30\% \text{ of general area} = 16.4881 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{54.9603 Hectares}$$

3.5. Calculations for Situation 2.2:

Demand: 505,490 20ft. containers

Dwell time: 5 days

Direct straddle carrier: 385 TEU/Hectares

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 5 = 6925 \text{ slots}$$

3. Incorporating equipment:

$$6925 / 385 = 17.987 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CNT patio} = 17.987 \text{ Hectares}$$

$$\text{special CNT} = 1.7987 \text{ Hectares}$$

$$\text{general CNT} = 16.1883 \text{ Hectares}$$

$$30\% \text{ of general area} = 7.7087 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{25.6957 Hectares}$$

3.6. Calculations for Situation 2.3:

Demand: 505,490 20ft. containers

Dwell time: 5 days

Yard gantry crane: 750 TEU/Hectares

1. Number of slots:

$$505490 / 365 = 1385 \text{ slots}$$

2. Dwell time consideration:

$$1385 * 5 = 6925 \text{ slots}$$

3. Incorporating equipment:

$$6925 / 750 = 9.2333 \text{ Hectares}$$

4. Total area of the terminal:

$$70\% \text{ of CNT patio} = 9.2333 \text{ Hectares}$$

$$\text{special CNT} = 0.92333 \text{ Hectares}$$

$$\text{general CNT} = 8.30997 \text{ Hectares}$$

$$30\% \text{ of general area} = 3.9571 \text{ Hectares}$$

$$\textbf{Total area of terminal} = \textbf{13.1904 Hectares}$$

The following table (Table 2) demonstrates the calculations carried out for each situation with the idea of comparing the different alternatives.

	STORAGE AREA (Hectares)	GENERAL AREA (Hectares)	TOTAL TERMINAL AREA (Hectares)
SITUATION 1			
SITUATION 1.1	23.0830	9.8927	32.9757

SITUATION 1.2	10.7922	4.6252	15.4174
SITUATION 1.3	5.5400	2.3743	7.9143
SITUATION 2			
SITUATION 2.1	38.4722	16.4881	54.9603
SITUATION 2.2	17.9870	7.7087	25.6957
SITUATION 2.3	9.2333	3.9571	13.1904

4. Alternative Method for Calculating the Terminal Area.

In determining in hectares the total space required for a terminal, equal proportions are utilized for the assignation of spaces than those used in the previous method (30% for general areas and 70% for container storage).

In this methodology, two situations will be used for comparison. They are based on the variation of average container dwell time, maintaining the remaining associated parameters with fixed values.

Situation 1:

In order to make an estimate in hectares of the total space for the terminal, this situation considers the following:

- Expected demand for the year 2005 of 505,490 Teu's;
- Average dwell time per container is equal to 3 days;
- One TEU occupies 15 square meters;
- Each slot contains an average of 2.5 Teu's.

Situation 2:

In order to estimate in hectares the total space for the terminal, this situation considers the following:

- Expected demand for the year 2005 as 505,490 Teu's;
- Average permanence time per container (Dwell Time) is equal to 5 days;
- One TEU occupies 15 square meters;
- Each slot contains an average of 2.5 Teu's.

In order to determine in hectares the total space needed, the following system should be used:

1. Determine the number of slots (TGS's) in accordance to the number of 20ft. containers that pass through the terminal annually.

2. Consider the average dwell time of containers.
3. Consider the average number of containers per slot.
4. Transform the TGS's to hectares.
5. Obtain the total area by using the distribution percentages previously mentioned.

4.1. Calculations for Situation 1:

Demand: 505,490 20 ft. containers.

Dwell Time: 3 days.

Number of CNT slots: an average of 2.5

1. Number of slots

$$505490/365 = 1385 \text{ TEU's}$$

2. Considering Dwell Time

$$1385 * 3 = 4155 \text{ TEU's}$$

3. Numbers of TEU's per slot

$$4155 / 2.5 = 1662 \text{ TGS's}$$

4. Land's requirement

$$1662 * 15) / 1000 = 24.93 \text{ Hectares}$$

5. Total area required by the terminal

70 % for containers yard	=	24.93 Hectares
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special Teu's	=	2.493 Hectares
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normal Teu's	=	22.437 Hectares
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30 % for general purposes	=	10.684
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Total Land Required by the Terminal = 35.614 Hectares

4.2. Calculations for Situation 2:

Demand: 505,490 20 ft. containers.

Dwell Time: 5 days.

Number of CNT slots: an average of 2.5.

1. Number of slots

$$505490/365 = 1385 \text{ TEU's}$$

2. Considering Dwell Time

$$1385 * 5 = 6925 \text{ TEU's}$$

3. Numbers of TEU's per slot

$$6925/2.5 = 2770 \text{ TGS's}$$

4. Land's requirement

$$(2770 * 15) / 1000 = 41.55 \text{ Hectares}$$

5. Total area required by the terminal

70 % for containers yard	=	41.555 Hectares
specialTeu's	=	4.155 Hectares
normalTeu's	=	37.395 Hectares
30 % for general purposes	=	17.807 Hectares

Total Land Required by the Terminal = 59.35 HECTARES

SUMARY TABLE 3

	STORAGE AREA (Hectares)	GENERAL AREA (Hectares)	TOTAL TERMINAL AREA (Hectares)
SITUATION 1	24.93	10.684	35.614
SITUATION 2	41.55	17.807	59.35

ANNEX 3

THE THEORETICAL APPROACH APPLIED TO THE PORT OF VALPARAISO

The proposed methodology will be utilized as an example in order to evaluate the physical capacities of the Port of Valparaiso, with the objective of being able to demonstrate its utilization in placing values on the logistic distribution system.

1. -Defining the problem

The purpose is to carry out an evaluation of the port of Valparaiso's infrastructure capacity and receive an analysis and global knowledge of the port system.

2. -Global analysis and constitutive elements of the Port of Valparaiso

2.1. - Description of the Valparaiso port terminal.

PHYSICAL CHARACTERISTICS

Geographic locations	Latitude: 33°01'22"W Longitude: 71°38'22"W
Climate	Mild
Cloud cover	4.8 at 0800 hours
Predominant winds	Direction: SW and NW Speed: 23 knots
Rain	360.2 mm/year
Temperatures	Maximum average: 19° Minimum average: 11°
Natural protection	Non-existent
Sheltered water areas	50 Hectares
Sediments and dredging	Berths 5 and 6 (twice yearly)
Tide variation	1.66 m
Sheltered pier	1,000 m ²
Buoys	No mooring buoys
Berthing sites	8 berthing sites with a total longitude of 1,750 m.
Warehouses and cargo	14 warehouses with 114,595m ² and
Yards	85,463 He.
Floating dock	"Valparaiso III" with capacity of lifting 10,000 tons and operated by SOCIBER.

2.2. Facilities

Communications

TELEGRAPHS: State Telegraph Company and other commercial ones and also national and international commercial cable companies.

TELEPHONES: 7 operators.

COASTAL RADIO: The Maritime Administration maintains a central station in the Maritime Governor's building that possesses CBV-2 characteristics and renders service to both national and international vessels.

COMPANY TELEPHONE: 257167.

Transport RAILWAYS: The electric train of the State Railroad Company links the port with Limache mainly for passengers. For cargo, Diesel Locomotives from Valparaiso to Santiago are in use.

ROADWAYS: Valparaiso is linked with Santiago by way of a paved motorway (four lanes) that runs for 114 Km. It also connects with the Pan-American Highway that runs length-wise north and south. Regionally, the highway system is good. At 148 Km distance from the port, the international route begins in Los Andes that connects the region with the Argentinean city of Mendoza. The section that pertains to Chile is a distance of 71 Km to the border, which passes through the Bermejo Pass.

The Valparaiso Port Enterprise provide direct access to the port via a special complex of roads and tunnels under the city of Valparaiso, connecting the port facilities with the Economic and Logistic Zone (ZEAL) and main highway to Santiago

AIR: There are three airfields in the area close to Valparaiso; Airforce Base in Quintero, the Viña del Mar airport (Torquemada/Con-Con sector), and the Rodelillo aerodrome belonging to the civil aviation. The latter is managed by the Valparaiso Air Club. Its asphalted runway is 900 m long and 20 m wide. The "Comodoro Arturo Benitez" International Airport is 95 Km from Valparaiso.

Pilots

Pilotage is compulsory for all ships calling. There are pilots that are authorized by the Valparaiso Maritime Authority. The reception of vessels is approximately 2.5 cables from the breakwater. (At 009° and at 456 m from the breakwater).

Tugboats There are 10 private tugboats whose power varies between 40 to 68 BHP

Supplying of Fuel There is an expending pump (DIPEVAL Ltd.) situated in the jetty which is only for supplying fishing schooners and tugboats.

Commercial sites are supplied by way of trucks and 3 small tanker ships to supply fuel to ships.

2.3. Basic Infrastructure

A. Breakwater. The port of Valparaiso formed chiefly by the wharf, sheltered by a breakwater that starts at Punta Duprat, and projects from the north-northeast for a distance of 300 meters and then continues in a south-easterly direction another 700 meters.

The first part of this pier is made up of monolithic blocks of concrete which measure 25 meters in length and 16 meters wide, on top of a base that reaches the height of 14 meters, where the water is more than 18 meters deep. In order to avoid waves passing over the top of this construction, a 6 meter high, 3 meter wide defence rampart was constructed.

In the principal part of the breakwater pier the depth (cota) was elevated to the COTA (elevation reading) by 12 meters, since it is less likely to be exposed to the frontal action of the waves. The structure itself is formed by masonry blocks placed in an inclining position. On top of them a layer of cement was added up to the plus 4. COTA.

The width of this section of the breakwater pier or "Molo" is 12 meters.

B. Berthing Infrastructure. Among the projects that provide shelter, the following berthing projects are being developed:

1. The sea wall was built with masonry blocks weighing 60 tons put on top of a prism of rock and sand, After 1990 the apron and the sea wall for enforced and made aseismic. The sea front has a total length of 1005 meters (berths 1, 2, 3, 4 and 5) up to Muelle Prat.
2. The jetty, which is a solid structure of 240 meters in length and 100 meters wide, is situated across from the actual railroad station terminal and sets out from the Coast way in a north-north-easterly direction. The walls are built with masonry blocks in inclined layers (so as to maintain its arrangement during the settling of the muddy bottom), and are on top of a prism of a section that varies to a 10 meter depth. Behind them is a prism of large cobblestones and stones, the area between them being filled with sand.
3. Muelle Barón was built outside the sheltered wharf towards the east and is oriented to a northerly direction. It is 200 meters long and 30 meters wide. It was built upon concrete columns allows it to be dredged up to 10 meters deep.

2.4. Berthing characteristics

BERTH	1	2	3	4	5	6	7
Length (m)	142	200	230	230	107	245	125
Draft (m)	13.8	13.8	13.8	9.4	9.4	8.5	6.2
Cranes:							
Gantry	2 Pmx	-	3 Post Pmx	-	-	-	-
Multipurpose	-	-	-	1	-	-	-
Mobile Container (Gottwald and Demag)	-	-	1	-	-	1	1
Other equipment:	-	-	-	-	-	-	-
RMG	-	-	12	-	-	-	-
Reach-Stacker	-	-	n/a	-	-	-	-
Predominant cargoes	Containers, general cargo, fresh vegetables and refrigerated cargoes						
Warehouses	2.3 hectares						
Yards and patios	24 hectares						

2.5. Port Statistics.

Cargo throughput in metric tons:

Cargo Type / Year	2000	2001	2002	2003
Break bulk	139,2982	151,2984	160,0546	172,4635
Containerized	253,7436	295,6318	306,4912	337,8872

Various historic figures:

Activity / Year	2000	2001	2002	2003
TEU's	256,386	291,403	300,031	319,368

Cargo Ships	1,353	1,029	1,029	1,016
Cruise Ships	30	41	31	38
Passengers	47,211	70,048	61,353	68,507

2.8. Normal working hours of the port:

VESSEL SERVICE: Daily

1st shift: 0800 to 1530 hours

2nd shift: 1530 to 2300 hours

3rd shift: 2300 to 0600 hours

Extended hours: 0600 to 0800 hours

4. DEDUCTION OF MATRIX WITH PARAMETERS/VARIABLES THAT ARE RELEVANT TO THE PORT OF VALPARAISO.

4.1. Economic Criterion

The following table presents the matrix that was integrated in the evaluation in accordance to the economic criterion applied to the elements that constitute the port terminal of Valparaiso.

ECONOMIC CRITERION:

RELEVANT PARAMETER	POINTS OBTAINED
1.- Weather conditions (effect in the operations)	3
2.- Port management	3
3.- Competition	3
4.- Productivity	3
5.- Railroad transport	2
6.- Work crews, number of persons	3
7.- Number of berthing sites	3
8.- Length of berthing sites	3
9.- Characteristics of pier apron	3
10.- Number of cranes	3
11.- Port access zones	2-3
12.- Maritime-fluvial transport (transshipment)	3
13.- Bus transport	3
14.- Development areas (in surroundings, in site)	2
15.- Oceanographic conditions (tides, swell)	
16.- Cargo transfer zones	3
17.- Temporary storage warehouses	1 - 3(including ZEAL)
18.- Depository warehouses	3
19.- Patios	2

20.- Consolidation/deconsolidation areas	3 (bond yards)
21.- Inspection areas	3 (bond yards)
22.- Outside port area warehouses	3 (custom authorise bond yards)
23.- Economic policy	3
24.- National Transport Policy	3 (implicit policy)
25.- National Infrastructure Policy	2 (base in demand)
26.- National Labour policy	3
27.- Fishing activities	3
28.- Loading and unloading operations	3
29.- Crane output	3
30.- Types of cranes available	3
31.- Output of the work crews	3
32.- Effective work hours	3
33.- Effect of currents in berthing site	2
34.- Vessel lengths	3
35.- DIRECTEMAR	3
36.- National Customs Service	3
37.- National Agriculture and Livestock Service	3
38.- EMPORCHI - EPV	3

39.- Vessel ship-owners and operators	3
40.- Shipping and stevedoring agencies	3
41.- Associations that are related to the Port	3

4.2. - Social Criterion

The following table presents the matrix that resulted from the evaluation in accordance to social criterion.

SOCIAL CRITERION:

RELEVANT PARAMETER	POINTS OBTAINED
1.- Port safety and surveillance conditions	3
2.- Environmental safety conditions	3
3.-Maintenance and vessel maintenance conditions	3
4.- Marine, shore and air pollution	3
5.- Inspection areas	3
6.- Cargo transfer zones	3
7.- Environmental Health Service	3
8.- Working conditions	3
9.- Type of merchandise	3
10.- Effect of currents in berthing sites	2
11.- Maintenance and emergency areas	3
12.- Regional Labour Office	3
13.- Anchoring area	3
14.- Consolidation and deconsolidation areas	3
15.- National Police Force	3
16.- Investigation Service	3
17.- DIRECTEMAR	3
18.- National Customs Service	3
19.- National Agricultural and Livestock Service	3

20.- Directorate of Port Works	3
21.- Vessel owners and operators	3
22.- Shipping and stevedoring agencies	3
23.- Associations related to the Port	3
24.- Hydrographical and oceanographic conditions	3
25.- Transport policy	2
26.- Research and education policy	3
27.- Planning and coordination policy	3
28.- Port technology	3
29.- Development areas (in surroundings, in site)	2
30.- Syndicate organizations	3

4.3. - Technological-logistical Criterion

The following table presents the matrix that resulted from the evaluation in accordance to the technological-logistical criterion.

TECHNICAL-LOGISTICAL CRITERION:

RELEVANT PARAMETER	POINTS OBTAINED
1.- Vessel types	3
2.- Vessel cargo capacity	3
3.- Tonnage to be transferred	3
4.- Type of merchandise	3
5.- Cargo transfer zones	3
6.- EMPORCHI - EPV	3
7.- Type of cranes available	3
8.- Pier apron characteristics	3
9.- Signalling service	3
10.- Transit areas	3
11.-Consolidation and deconsolidation areas	3
12.- Yards	3
13.- Depository warehouses	3
14.- Oceanographic conditions	3
15.- Infrastructure policy	2
16.-Development areas, in surroundings	3
17.- Railway transport	2
18.- Bus transport	2
19.- Maritime-fluvial transport (transshipment)	3

20.- Stevedoring conditions	3
21.- Loading and unloading operations	3
22.- Number of berthing sites	3
23.- Port access zones	2
24.-Transport and Communication Ministry	3
25.-Shipping and stevedoring agencies	3
26.- Chilean Shipping Chamber	3
27.- Public Services availability and services	3
28.- Transport Policy	3

5. DETERMINATION OF THE GLOBAL MATRIX

This matrix is made up those parameters that individually have obtained a larger total number of points after evaluating the three suggested criterion. The minimum score to be included in the matrix corresponds to a third of the maximum total points (30 points) as a result of the sum of the three criterions.

This matrix also contains relevant parameters to determine the physical capacities of the Port of Valparaiso. These parameters should be compared with international standards that are available in order to determine management efficiency and operation of the infrastructure and existing human resources.

The latter will make it possible to determine if the amount of available resources is sufficient and adequate in order to satisfy the requirements of achieving optimal operation. If this is the case, any deficiency in the use of these should be noted.

Whatever the reasons for the deficiencies of the system, these will be detected by the methodology and therefore it will make it possible to focus improvements towards these specific areas.

The following page demonstrates the global matrix that was obtained for the Port of Valparaiso.

5.1. Global Matrix

CRITERION PARAMETERS	ECONOMIC	SOCIAL	TECHNOLOGY AND LOGISTICS	TOTAL RELEVANCE	IMPORTANCE FOR PORT SECTOR
Port Facilities					
Types of vessels	3	3	3	9	H
Number of berthing sites	3	3	3	9	H
Types of available cranes	3	3	3	9	H
Cargo Facilities and Restrictions					
Cargo type	3	3	3	9	H
Loading and unloading operations (cargo throughput)	3	3	3	9	H
Tonnage to be Transferred	3	3	3	9	H
Characteristics of the pier apron	3	3	3	9	H
Cargo transfer zones	3	3	3	9	H
Stacking yards	3	3	3	9	H
Consolidation & deconsolidation area	3	3	3	9	H

Inspection areas	3	3	3	3	9	H
Maritime-fluvial transport (transshipment)	3	3	3	3	9	H
Physical Restriction						
Oceanographic areas	2	3	3	3	9	H
Development areas (in surroundings, in site)	2	2	3	3	7	M
Port access zone	2	3	2	3	7	M
Bond or Depository warehouses	3	3	3	3	9	H
Public Maritime Governance						
Transport policies	2	2	3	3	7	M
Infrastructure policies	2	2	3	3	7	M
EMPORCHI-EPV	3	3	3	3	9	H
Shipping and stevedoring agencies	3	3	3	3	9	H
Ship-owners and ship operators	3	3	3	3	9	H
Associations related to the port	3	3	3	3	9	H
DIRECTEMAR	3	3	3	3	9	H

(licenses and permits)									
National Agriculture and Livestock Service (Quarantine)	3	3	3	3	3	9			H
National Customs Service	3	3	3	3	3	9			H

5.2. Results of the Methodology Application

5.2.1. General Aspects

All relevant parameters respond to the methodology and score higher than 6 are chosen as relevant for the case of Valparaiso – Chilean Case. Eventually in other ports' cases parameters could be included or changed.

Importance indicated as High (H) represent the most relevant parameters, Medium represent the parameters which need to be considered in the case of Valparaiso Port Sector but also it considered matters which are not anymore important for the port sector, because they were solved with a proper “maritime public governance” or State policy already in place.

5.2.2. Recommendations from Matrix Analysis

5.2.2.1. Regarding Institutional Issues and Public Maritime Governance

- a) The Maritime and Port Chamber should promote a strategy on good governance, policies and institutional coordination within the public authorities and government.
- b) To promote public and private stakeholder networking on common matters.
- c) To promote the establishment of a permanent “maritime coordination commission or forum” to discuss complex issues and the identification of measures which provide solutions to the identified constraints.
- d) To promote a secure facilitation of the country international trade.

5.2.2.2. Regarding Cargo Facilities and Constraints

- a) To prepare a Port Master Plan of development.
- b) To prepare prefeasibility studies to evaluate the demand forecasted and propose infrastructure development and investment plans.
- c) To promote and evaluate changes and innovative solutions in cargo technologies with the aim to improve cargo throughput.
- d) To identify and evaluate innovative solutions for the physical restriction of port facilities, promoting solutions like: logistics platforms, dry ports and bond yards outside port premises, coordinating the feasibility of these solutions with public entities and potential private investors.