2000

Hispaniola : a maritime city for the next century : a feasibility economic study for the construction of a container terminal in the south part of the island

Pedro Jeremias Vega Medina
WMU

WORLD MARITIME UNIVERSITY

Malmö, Sweden

HISPANIOLA A MARITIME CITY FOR THE NEXT CENTURY

A Feasibility Economic Study of the Construction of a Container Terminal in the South Part of the Island

By

PEDRO JEREMIAS VEGA MEDINA

Dominican Republic

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

in

PORT MANAGEMENT

2000

DECLARATION

I certify that all material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

……

……August 2000…….

Supervised by:
Dr. Bernard Francou
Associated Professor, Port Management
World Maritime University

Assessor:
Captain Jan Hork
Lecturer, Port and Shipping Management
World Maritime University

Co-assessor:
Carlos Cañamero
Senior Economic Affairs Officer
UNCTAD, Geneva

ACKNOWLEDGMENTS

"I can do all things through Christ who strengthens me. Philippans 4:13"

First of all I want to thank the Lord Jesus Christ for giving me the strength I needded to finish this document.

Thanks to my lovely family. Mabel and Annie Mabel, the women of my life, for your support during this time. Thank you for being my source of inspiration.

Thanks to my family back home. I know that the Lord heard their prayers and this dissertation is partly an answer to them.

I also want to thank my friend Ildefonso Guemez for his support and assistance.

I want to express my gratitude to World Maritime University for providing my scholarship and giving me this unforgettable opportunity.

Finally, I would like to thanks World Maritime University staff for all the assistance and to my professors for sharing their experience.

ABSTRACT

Dissertation title: "**Hispaniola a Maritime City for the next century" A feasibility economic study for the construction of a container terminal in the South part of the island.**

Degree: **MSc.**

The paper proposes the construction of a new container terminal that could cope with the future growth of the container traffic in the country. In order to determine the new terminal feasibility an analysis of the future container traffic within the entire Caribbean region is carried out. Besides a forecast of the perspective container traffic in the Dominican Republic is carried out evaluating the possibility of achieving certain amount of traffic for the new terminal resulting from the imminent traffic increase.

Furthermore, this document analyses the performance of the most important container terminal in the country to determine its ability to attract more traffic and its capacity to handle the existing one. In addition, the capacity of one of the most efficient ports in the Caribbean region is analyzed as well.

The strategies used by the new port in order to attract and retain customers are determined after analyzing the most containerized exported and imported products to and from the country. This strategy is a new marketing philosophy "Customer Relationship Management" that makes the port be customer oriented providing the customers with tailor made services.

The paper concludes by explaining the expected consequences of the new port in the south of the country, where it will be built. Moreover, these consequences are the direct and indirect economic impacts of the port.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACS	Association of Caribbean States
APORDOM	Dominican Port Authority
CAF	Currency adjustment factor
CARICOM	Caribbean Community and Common Market
CBERA	Caribbean basin economic recovery act
CBI	Caribbean basin initiative
CI	Containerization international
CTI	Computer telephone integrated
FOB	Free on board
Ft	Feet
GDP	Gross domestic product
ILO	International Labor Organization
IT	Information technology
LOA	Length over all
OA	Office automation
SFA	Sales force automation
TEU	Twenty equipment unit
UNCTAD	United Nations Co-operation Trade and Development
US	United States
USD	United States Dollar
WMU	World Maritime University
WSTS	World Sea Trade services
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

There are three definitions for the word feasibility. The first is "capable of being done or carried out", the second "capable of being used or dealt with successfully" and the third is "REASONABLE, LIKELY"(Webster's third international dictionary ,1981).

Within the context of this paper, "feasibility" is related to the justification of the project for its location, economic growth of the country, social impact and market development.

Today in a globalize world, countries have to search for any opportunity which may contribute to an increase in competitive advantages.

Development depends on the performance a country is able to achieve through world trade. At the same time, there are two vital elements in achieving a good performance in world trade. These two elements are the maritime transport and the ports. However, this paper is going to deal only with ports.

Ports are a great source of regional development inside a country and it could be sought as centers of the macroeconomics development. It means that when making arrangements for the construction of a port, the feasibility study has to take into account that the port may be a center from which the country not only will draw opportunities from the international trade, but also will offer a great variety of opportunities towards the national region in which it is built.

The Dominican Republic has a keen interest in becoming a major transshipment hub in the Caribbean region. It would like to handle the ships sailing on the main sea trade routes. Containers coming from such ships would be distributed to the region by feeder ships, and this would result in additional throughput and possibilities for value added services. However, most of the Caribbean Islands are willing to become a hub port in the region. Therefore, it is necessary to study and analyze the conditions given within the Dominican Republic in order to achieve this goal.

This document gives an idea of the perspective development of the container traffic within the country and the capacity of the country to deal with it. It also, provides an overview of the containerization in the Caribbean region. The purpose of covering the former issues is to analyze them in order to determine if the construction of a new terminal is feasible.

The paper is organized in three sections covered by four chapters. The first section covers the description of the project and the traffic of containers in transit in the country. The second section covers the strategic position of the Caribbean for international trade. The third section explains the economic impact of the port in the western part of the country.

The first section is divided in two parts. Chapter 2, which is the first part, establishes the model of a port that can add handling capacity to the country. It aims at constructing a port with characteristics, equipment and space that is lacking in the existing ports in the Dominican Republic. Moreover, the project is conceived taking into account future development of the country regarding the container traffic and population growth which are factors affecting the performance of the existing ports.

Chapter 3, is the second part of the section, introduces the trend followed by the container in transit in the country. The purpose of this chapter is to draw a picture of the actual capacity of the country to handle container in transit. Moreover, this chapter gives an idea of the handling capacity of a neighbor port to be used as an example.

The second section analyzes the trade of the Caribbean region aiming at evaluate the perspective of the container traffic in the region and the advantages of the region given the economic developments of South America and North America. Further, it also analyses the perspective of the container traffic in the Dominican Republic.

Finally, section three, which is comprised by chapter 5; point out the future impact of the project in the Western part of the island. The purpose of this chapter is to explain the direct and indirect impacts of the project in the country.

CHAPTER 2

PROJECT DESCRIPTION

This chapter aims at presenting the main purpose of the construction of a container terminal in the South part of the island. The Dominican Republic's economic background and the definition of the problem will be introduced first, followed by the description of the project, prices of the services to be offered in the port, container traffic in the country and at last the privatization process in the country.

2.1 Dominican Republic Economic Background

The Dominican Republic is a developing country which depends mainly on agriculture, trade, and services, especially tourism. Agriculture and mining are two of the most important sectors of the country. The former because is the sector with the highest consumption within the country and the latter because is the sector which generate more exportations. However, tourism and Free Trade Zone have become very important to the economic of the country since they create a big amount of employment and earnings.

During the past 15 years the country has shown its ability to compete effectively in the international market. Also tourism and the free trade zones alone has shown its ability to revive sustainable growth. The growth of the country will continue to depend on the tourism and free trade zones while private-sector starts to have more participation in the economy. The sectors with the highest expectancy of growth are commerce, construction, telecommunications, industrial sector (excluding sugar industry) and tourism. The latter sector will experience the opening of the Barahona International Airport in the pristine Southwest Coast (which is approximately sixty-five kilometers from the place where the new port will be constructed).

Economic growth during 2000 is forecasted to end at around 6% to 6.5%. The inflation rate in 2000 will be around 4% to 4.5%, which is an inferior level to 1999. This percent of growth and an inflation rate of 4.5% are indicators of good economic development in the country. It is relevant to mention that in 1999 the Dominican Republic experienced an economic growth of 8%, which was the largest economic growth in the world.

Since 1992, the Dominican Republic has achieved an extended period of GDP growth and low inflation by implementing sound macroeconomic policies, adopting important structural reforms, and normalizing relations with external creditors. Annual real GDP growth has averaged over 6 percent; inflation has been held to single digits; and the consolidated public sector and external current account deficits have narrowed substantially. The current account deficit was more than financed by foreign direct investment, allowing for a gradual buildup in official international reserves in recent years. Importantly, external public sector debt fell from 72 percent of GDP at end-1990 to 22 percent of GDP at end-1998, and all external arrears were normalized.

The Dominican Republic is member of a group of trade agreements, which will enhance the container traffic in the country. The most important agreements are the World Trade Organization (WTO), The Caribbean Basin Initiative (CBI), The Association of Caribbean States (ACS) and The CARICOM. The Dominican Republic is a member of the World Trade Organization. At the Summit of the Americas in December 1994, the Dominican Republic joined with other Western Hemisphere governments in committing itself to a free trade agreement for the Western Hemisphere by the year 2005.

The Caribbean Basin Initiative, which is a program designed to expand foreign and domestic investment in non-traditional sectors of Caribbean Basin countries, diversifying their economies and expanding their exports. The most relevant part of the CBI is the CBERA (Caribbean Basin Economic Recovery Act). It consists of a one way trade preference program that allows duty-free access to the U.S. market of eligible

products for designated beneficiary countries, provided that at least 35 percent of their value is added in a participating Caribbean Basin country. In addition to the CBERA, other elements of the CBI program include increased U.S. economic assistance to the region to aid private sector development, a deduction on U.S. taxes for companies that hold business conventions in the CBERA-eligible countries to increase tourism, a wide range of U.S. government, State and private sector promotion programs, and support from other trading partners and multinational development institutions such as the Inter-American Development Bank and the World Bank.

The Association of Caribbean States (ACS) is a political and economic cooperation signed in July 1994 with 25 signatories. The first ACS-wide summit was held in August 1995 to promote cooperation in tourism, trade, and transportation. Signatories include: Antigua and Barbuda, The Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Venezuela. The association accounts for around US$8 billion in intra-group trade. Approximately US$70 billion, or 54 percent, of ACS imports come from the U.S. The CARICOM aims at modernize and harmonize national laws for trade, finance and investment as well as the larger macro-economic policy framework for its members.

2.2 Definition of the Problem

As a consequence of the increasing congestion of Dominican's ports the traffic of transit cargoes had declined a lot, and now most of these cargoes are moved through the Free Port of Bahamas and Kingston, Jamaica. The construction of a new container terminal in the South part of the island which aims to create a new economic zone (at the same time the investment will take into account the conditions that a port should have for the next

20 to 30 years since development in the maritime industry will be faster than in the last 50 years).

It is relevant to analyze the conditions and historical background of the existing ports of the country in order to understand the importance of the project. The Dominican Republic has 13 ports which has specific function and low possibilities of expansion these are Boca Chica, Barahona, Haina, San Juan de la Maguana, San Pedro de Macoris, La Romana, Samana, Manzanillo, Sabana de la Mar, Santo Domingo, Puerto Plata, Palenque y Cabo Rojo. Of all these ports the most profiTable are Puerto Plata, Boca Chica and Rio Hania.

The Port of Puerto Plata is the main commercial port on the North Coast of the Dominican Republic, and is the only one in this area receiving both general and bulk cargoes, and also exporting tobacco, agricultural commodities and the like. The maximum size of vessel is LOA 680 ft.; BEAM 100 ft.; DRAFT 29'ft. S.W.

The port of Boca Chica is one of three ports serving the capital city of Santo Domingo, and is situated about 20 miles east of the city, but scarcely 5 miles east of the international airport. Although this port was built in the 1950's to serve the Boca Chica sugar mill and was meant to be used to export sugar, it is now almost exclusively used for import cargoes, mainly trailers, containers and some lumber, newsprint, and homogeneous cargoes. Berths are L shaped pier 615 metres in length and 12 metres in width about 1 metre above the water levee at high tide. Two or more vessels may occupy the berth, depending on their size and characteristics; but not more than 475 ft. LOA; BEAM 70 ft. ;Draft 24 ft S.W.

The port of Haina has become the busiest of the three ports handling cargo for metropolitan Santo Domingo. It is situated to the west of the center of the city on the Haina River (Río Haina), within the modern city limits. There are port facilities on both banks of the river. The port of Haina mostly handles bulk, containers and trailers and homogeneous breakbulk cargoes; general breakbulk has not been handled in great volume due to the lack of sheds at the piers for storage, hence mostly homogeneous breakbulk such as steel products not requiring covered storage and bagged cargoes that are hauled away in trucks directly from the discharging vessel. The maximum size of vessel is LOA 700; BEAM 100 ft.; DRAFT: 32 ft. Further, Rio Haina handled 80 percent of the container traffic within the country.

Figure 1
Ports of the Dominican Republic

Source: http://www.fschad.com/html/ports.html

Today Dominican ports are becoming congested and the expansion that could be carried out would be enough until 2010 (http://dr1.com/news/WR/WR1353A.html). In this context, the project to develop a new port arose to cope with the projected trade increase. Most of the time projects carried out in the Dominican Republic lacks of future vision an long term planning.

These facts justified the construction of a new container terminal in order to add additional capacity, improve the level of service and develop a new economic zone, which is in the South part of the island, between the provinces of Azua and Barahona. This area is ideally suiTable for a new container facility. The area has excellent water depth and enough land. Besides, more facts that justify the construction of a new container terminal will be given in a following chapter, where the performance of the most important port of the country is discussed.

2.3 Project Description

The project's designated area is approximately 600,000 square meters with about 900 meters of shoreline.

The following actions are required in order to develop the construction of the new terminal.

- creation of access road from the existing highway to the project site
- construction of 3 berths of 250 meters each
- installation of 5 gantry cranes and other equipment required for container handling and storage.

- construction and installation of administrative and operational buildings, systems and support infrastructure
- develop the facilities for a future rail line linked to the terminal

2.3.1. Cost of the Infrastructure and Superstructure

The cost of the project is around USD 150 million. The Gantry 5 cranes will be 3 Post Panamax Gantry cranes and 2 Panamax Gantry cranes. This terminal will be set to operate 3 vessels (2 mother ships and 1 feeder) simultaneously. A relevant issue of this terminal is that the project takes into account the future development of the maritime industry in terms of shipbuilding and trade development.

Table 1
Cost of the project

ITEMS	**INVESTMENT REQUIREMENT (US$MILLIONS)**
INFRASTRUCTURE	102.440
EQUIPMENT	47.560
TOTAL	150.0

Source: compiled

2.3.2. Equipment

The choice of equipment is a relevant factor determining efficiency and cost-effectiveness of container terminal operations. This section aim at presenting the different types o equipment used in container terminal handling and how to combine them to make the terminal efficient.

According to UNCTAD there are four main types of equipment used in container handling:

- tractor/chassis sets
- straddle carriers
- yard gantry cranes
- front -end loaders

However, it is more useful to talk about container handling system, rather than specific equipment types as in practice specific terminal operations can be arranged using combinations of these equipment types.

There are six categories of container handling systems:

- The Tractor-trailer System
- The Straddle Carrier Direct System
- The Straddle Carrier Relay System
- The Yard Gantry System
- The Front-end Loader System
- Combination Systems.

The handling system is chosen after examining the stacking capability, space needed for operating equipment, as well as cost of purchasing and running it.

The most suitable system is the Yard Gantry System, using rubber tired cranes. This equipment has the ability to stack containers up to 5 high, I.E. (one-over-four). The operation of moving containers in the container yard is carried out by trailer-tractor sets, which move containers from the ship-side to the container Yard and vice-versa. For receipt/delivery, road vehicles are allowed into the terminal and along the truck lane to the appropriate row. Thus, the yard gantry crane is used solely for stacking/unstacking and moving between positions within the rows in the block (Container terminal development, UNCTAD 1986).

The most relevant issue of Yard Gantry System is the excellent deployment of the land, because its high stacking capability. It is also a relevant issue the fact that no wide aisleways are needed and therefore it can span a number of containers rows.

Two disadvantages of this system are its high cost and the lack of flexibility in comparison with other systems, for instance, The Straddle Carrier System. However, it has a good maintenance record with low Downtime.

The Gantry Crane System is the most suiTable as the inflexibility of this system is not a problem when exports and transshipment cargo predominates as is the case of Hispaniola.

Table 2 shows the equipment that will be used in the port.

Table 2 Equipment purchase

Item	Purchase price (US$)	Quantity	Total
Gantry crane	**7,200,000**	**5**	**36,000,000**
Rubber tire gantry (RTG)	**1,500,000**	**11**	**6,500,000**
Yard trailer	**50,000**	**30**	**1,500,000**
Yard trailers	**22,000**	**22**	**484,000**
Miscellaneous vehicles	**22,000**	**8**	**176,000**
Generator	**450,000**	**2**	**900,000**
EDI computer system	**2,000,000**	**1**	**2,000,000**
Total			**47,560,000**

Source: compiled

Once the handling system is determined to implement in the new terminal so that it could be estimated the expected capacity of the port. The following section gives an illustration of this topic.

2.3.3 Terminal Capacity

One of the most influencing factors determining the capacity of a container terminal is the space allocated for the container yard. Similarly the use of the equipment of the terminal play an important role.

The container yard will have a space of 350,000 square meters. Furthermore, there is more space available that will be use for the development of new container yard when the traffic exceed the current capacity.

The efficiency of the stevedoring operation, the size and type of vessels, the equipment that is used and the length of the berths are main factor determining the capacity of the berth operation. The capacity of yard operations is driven principally by the area that is available for container handling and storage, the system of stacking that is adopted, the

equipment that is utilized for handling and the average dwell time of cargo. Often times, the lack of available back-up area forces ports to be limited by its yard operations, despite the ability to increase berth capacity through the use of better equipment.

The terminal will have an expected capacity of 300,000 containers per year. Last year the whole container traffic was 623,654 containers. With this expected capacity as a goal, the Dominican Republic is getting more participation in the container traffic within the Caribbean region.

2.4 Prices of the Services to be Offered in the Port

Setting the prices for the service offer in the new terminal requires the collection of information related to different areas such as financial, operational and marketing. This section offer an idea of the possible prices since there is a lack of information regarding the above mention areas. However, a further chapter intends to get this information from other ports in order to use them as guidance.

Average tariffs in the Dominican Republic are currently estimated to vary between US$200 and US$250 per container, including all services provided by the Port Authority, stevedoring companies/agents, and others. Slightly more than half of this amount corresponds to the services provided by licensed stevedoring firms.

Potential revenues to the concessionaire are determined by multiplying the average tariff by the forecast volume of cargo handled by the new terminal. Growth in revenues, in turn, is a function of the forecast growth in demand and annual increases in average tariff levels. Under the base analysis, it is assumed that tariff levels grow over time at the same rate as operating costs, which are assumed to be at the US dollar inflation rate of 3% per year that has been assumed.

As it was mention in the former paragraph a forecast of the demand is required to get an idea of the possible tariff. However, in order to carry out this forecast it is necessary to know the trend of the container traffic in the country in the last years, which is the purpose of the following sub-chapter.

2.5 Container traffic at the Dominican Republic.

The container traffic analyze in this section not only shows the trend follow by the traffic for the Dominican Republic it also shows the trend follow by the Caribbean Island, Port of Kingston and Free port Bahamas. Furthermore, this section discusses the traffic growth rate and the market share for the Dominican Republic.

Container traffic in the Dominican Republic has grown over recent years. However, in terms of the traffic growth rate the Dominican Republic has declined in contrast with the rest of the Caribbean Islands, as a direct result of the substantial investment in port facilities and infrastructure in other ports in the region.

Table 3
Container traffic in the Caribbean Islands '000 TEUs

	1995	1996	1997	1998
Caribbean Islands	3341.9	3617.1	4177.4	4586.8
Dominican Republic	451.6	483.5	634.2	532.6
Jamaica (Kingston)	487.1	594.2	654.7	670.9
Bahamas (Freeport)	26.5	29.6	148.8	420.0

Source: Compiled from Ocean shipping Consultants Ltd./ Containerization International and Pedro Vega

Table 3 summarizes the growth of the container traffic in the Caribbean Islands, Dominican Republic, Kingston and Freeport. It is relevant to mention that the figures showing the traffic growth in the Dominican Republic include all the ports handling containers in the country dislike Jamaica and Bahamas which figures are showing only

the traffic of container of their most important ports i.e. port of Kingston and Free port respectively. It is also relevant to mention that the rapid and steady growth of the container traffic in the ports of Kingston and Freeport is due to substantial investment in port facilities and infrastructure carried out in 1996.

Over the recent years, container traffic has experienced a significant expansion in Rio Haina, the main port in the Dominican Republic. This port handled approximately 0.63m TEU in 1997. The former Sea Land terminal (now CSX terminal) is dominant within this market, but had suffered from increasing congestion and many services have been redirected to other ports. In 1998 a contraction of some 16 per cent was recorded as shown is Table 4. Due to the port's congestion Maersk/Sea Land is Freeport's biggest customer.

Table 4
Container traffic growth rate

	1996	1997	1998
Caribbean Islands	8.2%	15.5%	9.8%
Dominican Republic	7.1%	31.2%	-16.0%
Jamaica (Kingston)	22.0%	10.2%	2.5%
Bahamas (Freeport)	11.7%	402.7%	182.3%

Source: Pedro Vega

Table 5
Container traffic market share

	1995	1996	1997	1998
Dominican Republic	13.5%	13.4%	15.2%	11.6%
Jamaica (Kingston)	14.6%	16.4%	15.7%	14.6%
Bahamas (Freeport)	0.8%	0.8%	3.6%	9%
Total	28.9%	30.6%	34.5%	35.2%

Source: Pedro Vega

Table 5 summarizes the market share of the Dominican Republic in comparison with the two most important ports in the Caribbean. With this indicator it can be appreciated that Dominican ports are not growing as fast as Kingston and Freeport. Thus, every year Kingston and Freeport are increasing their market share showing in this way that they are becoming more efficient in the area. Furthermore, as market share is a comparative concept the consequence of Kingston and Freeport market's gain is a loss in Dominican Ports.

However, there are no signs that in the Dominican Republic the container traffic growth could slowdown, as containerization is well established in the region as a whole. Further, other factors such as continued sustained pace of economic growth of the country, regional trade groupings, rapid expansion in transshipment and relay operations and port privatization ensures that demand will continued to expand very rapidly.

This project will be implemented in the framework of the new privatization policy in the country and also in other country in the area.

2.6 Privatization Process in the Dominican Republic

It is obvious that the privatization process varies from country to country. Therefore, a successful privatization project in one country could prove to be inadequate in another country. However, in the case of Latin America and the Caribbean port privatization has resulted in a better performance of the operation and thus an increase in traffic. For instance, the 11% growth in the Argentinean port of Buenos Aires is healthy enough but is dwarfed by the 92% jump reported by the Panamanian port of Manzanillo (another transshipment hub success story). The growth at Santos was rather more modest at 3.6%, as was Puerto Limon's 4.9%, but Puerto Cabello's 35.1% jump, San Antonio's 30.2% increase and Callao's and Puerto Cortes's surges of 17.6% and 17.1%

respectively good indications of the overall growth trend in this region (Top 100 containers ports 1999).

The Dominican Port Authority (APORDOM) controls only a small part of the entire operation of ports. Its function is mainly to set the tariff concerning storage and port dues. The remaining activities such as loading and discharging, cargo handling in the yard and the like are carried out by the shipping agencies. Thus, Dominican ports are practically private ports.

All Dominican ports are owned by the State, I.E. service ports with the exemption of Rio Haina, where is the CSX terminal settled. In the latter case the State only own the land and the entire superstructure is owned by CSX; therefore, this terminal is a landlord terminal.

The new terminal is financed exclusively with private capital becoming in this way the first private port in the Dominican Republic. It means that a private port will have control of all activities carried out in the port including the settlement of storage and port charges tariff.

2.7 Conclusion

A number of analyses related to the Dominican Republic were done in this chapter, including:
Dominican Republic economic background
Dominican Republic container traffic and market share
Privatization process in the Dominican Republic
Future capacity of the container terminal

The figures shown in this chapter for the GDP and the economic of the country are indicators of a good development of the economic. Further, the Dominican Republic is searching into new reforms that will boost the exportation of goods manufactured in the country. This is a way to reinforce and strength the economy that even though have experienced and extraordinary economic growth for the last four years is relying on Tourism and Free Trade Zone. Moreover, these economic factors are relevant to attract foreign capital to be invested in the settlement of an industrial zone as well as in the port construction.

The growth of the container traffic in the Dominican Republic and its market share shows that containerization in the country is well established. However, the decrease of the traffic in the year 1997 is a signal that there is a fierce competition in the region. Further, the construction of a new container terminal that adds more capacity to the country will allow the country to achieve a sustainable traffic growth and market share.

CHAPTER 3

ANALYSIS OF THE TRAFFIC OF CONTAINERS IN TRANSIT IN THE DOMINICAN REPUBLIC

The main purpose of this chapter is to draw a clear picture of the actual and potential numbers of containers in transit in the Dominican Republic. In the first place, the transit cargo traffic in the country will be analyzed as an introduction, followed by background of facilities and efficiency of Dominican ports. Next, a comparison of the facilities and equipment used in the most efficient ports in the Caribbean will be given. Finally, the port activities and industrial zone participation to increase the container traffic will be analyzed.

3.1 Containers in Transit in the Dominican Republic.

The Dominican Republic has gained from its geographical location, being at the crossroads of expanding trade between North America and South America. In addition, the expansion of the more established ports in the U.S. Southeast, which would normally have benefited from the increase in trade in the hemisphere, has caused a demand for increased transshipment facilities not only in the country but in the entire region.

The Dominican Republic ports are benefiting from an increase in trade between North America and South America, and between the Americas and Europe. However, the container traffic has decreased in the last two years. This decrease is mainly due to reduction of containers in transit in the country.

There is a huge difference between the data collected from the Dominican Port Authority (DPA), regarding the container traffic in the country, and that collected from other sources. Thus it becomes harder to determine which is the percentage of transshipment containers.

Table 6 shows the traffic of container in the country from 1995 to 1999 and the percentage of container in transit, according to the Dominican Port Authority.

Table 6
Percentage of container in transit in the Dominican Republic

Year	1995	1996	1997	1998	1999
TEUS	259,765	277,520	363,674	305,282	223,654
% transit	29%	27%	24%	8%	6%

Source: Dominican Port Authority

According to the book World Container Port Markets to 2012 the traffic of containers in the country from 1995 to 1998 was as follows:

Table 7
Container traffic in the Dominican Republic

Year	1995	1996	1997	1998
TEUS	451,600	483,500	634,200	532,600

Source: World Container Port Markets to 2012

Another source used to estimate the amount of transshipment containers is the data collected from Containerization International (CI) in their section Regional Focus, in March 1996. The third 'island major' is Sea Land's facility at Rio Haina, in the Dominican Republic. This handled 198,000 TEU (of which 51% was transshipment) in 1994 and a hugely impressive 294,000 TEU (61% transshipment) in 1995.

After comparing the figures from the different sources it is considered that the data from the Dominican Port Authority is not reliable, as the amount of containers handled by the Sea Land Terminal, in 1995, is larger than the amount of containers handled for the entire nation in this year. Even though the information from DPA is not reliable the percentage of growth follow by the figures shown in Table 6 is the same growth follow by the data collected from the book "World Container Market to 2012"shown in Table 7. Both Tables show an increase of 7%, 24%, -19% and -36% for the years 95, 96, 97 and 98 respectively.

As it has been mentioned Rio Haina Port is the most important port in the Dominican Republic handling 80% of the vessel traffic of the country. However, according to the figures shown by CI, the former Sea Land container terminal handled 60% of the total container traffic of the country, in 1995. Further, it shows how relevant the performance of the CSX terminal is for the entire container traffic within the country and thus it will be impossible to make any further analysis without taking it into account. Table 8 shows the container throughput and the percentage of containers in transit in the CSX terminal for the years 1994 to 1998.

Table 8
Container throughput and percentage transshipment in CSX terminal Rio Haina (TEUs)

	1994	1995	1996	1997	1998
Throughput	198,000	294,000	255,000	312,900	195,000
% of transit	51%	61%	47%	48%	22%

Source: Containerization international and compiled

The amount of transshipments handled in the country each year will be estimated by choosing the means of ranges between the two percentages of transshipment handled according to the DPA and the CSX terminals. The results are shown in Table 9.

Table 9
Percentage transshipment handled Dominican Republic

Year	1995	1996	1997	1998
% of transit	45%	37%	36%	15%

Source: compiled

From the above figures it can be appreciated that there was a high percentage of transshipment container traffic handled in the country. However, it is also appreciated that transshipment is not the main business of the ports, as is the case of the most efficient ports in the region, of which 80% to 90% of the total traffic is transshipment. Therefore, the port is not relying on its performance in transshipment and thus exportation and importation play and important role.

In conclusion, the fact that the performances of the ports are not relying on transshipment containers is relevant, since other ports in the region are oriented to this business, as is the case of the port of Kingston and Bahamas Freeport. However, according to Boseman a company can not waste resources where there are no opportunities, and also the company can not waste time trying to take advantages of opportunities when the resources are not enough to do it. The following sub-chapters will describe the facilities and efficiency of Rio Haina and one of the most efficient ports in the region. It will make it possible to estimate what type of equipment and facilities could be used in order to have a good performance for the handling transshipment containers, at the same time as it will evaluate if the country is losing a good opportunity or the existing resources are not adequate for this business.

3.2 Background of Facilities and Efficiency of Dominican Ports

This sub-chapter aims at drawing a picture of the performance and efficiency of the most important port of the country. It will also describe its facilities and equipment. The main purpose of this sub-chapter is to compare this result with future sub-chapters related with the comparison of facilities and efficiency of another port of the Caribbean region.

As mentioned in the previous chapter, the most profiTable ports in the Dominican Republic are Santo Domingo, Palenque and Rio Haina. Rio Haina handles 80% of maritime traffic within the country. In addition, most of the container traffic for the country is handled in that port. Therefore for these purposes only, the facilities of this port will be described.

Rio Haina Port

Figure 2
Source: http://www.fschad.com/html/ports.html

Rio Haina is divided in West and East Side. The West Side is comprise of six berths only one berths is dedicated for handling containers. This is berth number five West (SEALAND). This berth is called the SeaLand berth because this company has a portainer crane and leases a 3800 m^2 of warehouse and open container terminal from the Port Authority, and by contract has preferential berthing at this pier for its own vessels. The berth is 171 metres long. The pier is about 2.75 metres above the water line. Today it is not the SeaLand terminal but CSX. Moreover, CSX also uses berth number four West but is not owned by them and thus is shares it with a company that generates electric power for the capital city.

The East Side is comprised of seven berths and two of them, berth number five and berth number six, are used for the handling containers. Berth number five East is 241 metres long and has an apron of 12 metres. The pier is about 1.8 metres above the water line. This berth is used primarily for the handling of containers and general breakbulk cargo. Maximum draft is 32ft. brackish water. In terms of storage facilities the port authority shed No.1 with 2,855 M^2 capacity is located nearby and can accommodate general cargo and is used for stripping containers and the like. Open yard can accommodate containers and trailers. Further, motorcranes, spreaders, forklifts and other types of equipment may be hired for operations, although most vessels using this berth are self-sustaining. Berth number six East is 765 metres long and the apron is 10 metres wide. The pier is approximately 2.0 metres above the water line. This berth was intended for handling containers, but due to the frequent congestion of other berths, this pier is sometimes used for bulk cargoes, steel, scrap and almost any other vessel with deep drafts including passenger cruise ships. Due to its length the pier is divided into A, B, C AND D sections. The maximum draft for section A of the pier (down river), the end nearest the port entrance, has a draft of 31ft. brackish water. This draft gradually diminishes upriver and section D, which measures about 150 metres, only has a maximum draft of 14 feet.

In terms of storage facilities a large open yard for containers and trailers with modern lighting and other facilities is available.

The nearest warehouse is the port authority shed No.1 with 2855 m^2 storage capacity. Furthermore, the Port Authority owns it and the Shipping Association operates a large overhead gantry crane on rails that can handle containers. However, many vessels use their own gear. There are also several large hoppers on the pier, which are used to discharge bulk cargoes (coal, clinker and grain) into trucks. Other pieces of equipment, such as payloarders, forklifts and motorcranes, are also available for hire.

In this port it is suggested that vessels anchor off the port of Santo Domingo which is only 4 miles away. Anchorage at Haina is considered unsafe and only to be used in case of emergency. There are four tugs available and towage is compulsory; tugs are 1200HP and 850HP. Moreover, poTable water is available at a rate of about 5 tons/hour from the pipeline alongside. Water may also be delivered by truck at additional cost.

In summary, from the previous information regarding the facilities of the port of Rio Haina it could be said that the only berth dedicated for the handling of container is berth number five West (CSX terminal). Therefore, this terminal is dominant in the handling of containers in the Dominican Republic. It explains and supports the previous analysis made on the above sub-chapter, where the percentage of containers handled by CSX is very high in relation with the total traffic of containers in the country. However, in 1997 this terminal was suffering from increasing congestion due to the insufficient capacity of the port while increasing traffic of containers in transit. Thus, the policy implemented by Sealand was to provide a good and efficient service to their customers by reducing the traffic of containers in transit at a level that worked allow the terminal to have a good performance. It implied that Rio Haina was not longer Sea Land's hub port in the Caribbean, this policy is the same used by Maersk/SeaLand, nowadays.

The former situation explains part of the decrease of the container traffic in the Dominican Republic. In addition, the other terminals, in Rio Haina, used for the handling of containers are not dedicated terminals, so other activities are carried out there. Further, there is only one gantry crane which is not working; thus operations are carried out with the ships' crane which lead to low productivity and congestion.

Regarding the rest of the Dominican ports even when some of them handle certain numbers of containers the traffic is very low. Moreover, most of them are dedicated to other activities, namely: exportation of sugar, tobacco and agricultural commodities. For instance, the sugar industry in the Dominican Republic has high expectancy of growth in the future as it is in the process of privatization. Therefore, there are no possibilities of using these ports for the handling containers since the sugar industry is planning to invest in the installation of new equipment to improve the operations.

In addition, the population surrounding the Dominican ports dislikes its activities and would like those ports to be moved to other areas instead of being expanded**.**

The following sub-chapter gives an overview of the facilities of the port of Kingston. More details regarding its facilities, performance and productivity will be shown in other sub-chapter where a comparison will be carried out.

3.3 Port of Kingston Facilities and Equipment

The Port of Kingston is divided in the North and South Sides. In the North Side there are four berths (berths 8-9-10 and 11) dedicated to container handling. These berths have 640.50 meters long in length. Berths 8-9 have 11.58 meters in depth alongside and berths 10 and 11 have 12.81 meters alongside.

The South Side has 2 berths (berths 12 and 13) dedicated for handling containers. These berths are 610 meters long in length and 12.81 meters depths alongside.

The size of the terminal is approximately 55.44 hectares (137 acres). The capacity of the terminal is 16,050 TEUs (Stacked 1 over 1).

3.4 Comparison of Facilities and Equipment Used in the Most Efficient Ports in the Caribbean

According to Shou Ma, port comparison is more significant when considering the ever increasing degree of inter port competition and the port clients – shippers and ship owners – on more and more occasions to compare different port before deciding which one to use. Before the comparison is done, it is important to specify the objective of the comparison and what to compare.

It is consider that currently the two most efficient ports in the Caribbean are Kingston and Freeport. Those two ports are attracting more cargoes than any other ports in the region. Moreover, in the three past years both ports have made investments that have allowed them to take a bigger market share of the container traffic. However, the comparison will be done between Kingston, in Jamaica and the CSX terminal in the port of Rio Haina, in the Dominican Republic because this terminal is to be considered the best representation of Dominican ports since it handles a high percent of the container traffic in the country. Moreover, there are no data available for the other terminals used for handling containers in the Dominican Republic and neither for Bahamas Freeport in the Caribbean region.

To set objectives, to undertake marketing and to do academic research are the main objectives for the comparison of the facilities and equipment used in these two ports.

The indicators to compare will be physical (nautical access and port facilities) and operational (output and productivity).

Although the comparison carried out in this sub-chapter is between the port of Kingston and the terminal CSX of the port of Rio Haina the Table 10 shows the throughput of containers and the percentage of domestic and transshipment in the Dominican Republic and Kingston in 1998. This Table aim at introducing the differences between the port activities carried out in Dominican ports and the port of Kingston.

Table 10
Comparison of percentage of container traffic handle (year 1998)

	TOTAL	DOMESTIC	TRANSSHIPMENT
Kingston	**670,900** TEUS	114,834 TEUS 17%	556,065 TEUS 83%
All ports Dominican Republic	532,600 TEUS	**452,710** TEUS **85**%	**79,890** TEUS **15**%

Source: Compiled

Table 10 shows that most of the activities performed in the port of Kingston are related to transshipment of containers, while the activities of the Dominican ports are oriented to domestic (export and import) containers.

It is understandable that the business of transshipment containers is very lucrative because they are charge double movement. However, it is obvious that this business requires of a lot of space for the container yard if the domestic traffic is equal to or bigger than the transshipment traffic.

Table 11
Port facilities comparison

	Kingston	CSX
NUMBER OF BERTHS	6	2
DEPTH ALONGSIDE	12.81 meters	16 meters
LENGTH	400.4 meters	479 meters
REEFER PLUGS	462 - (440 -480 V, universal type)	201
WAREHOUSES	25,200 square meters	18,845.43 cubic meters

Source: compiled

Table 11 shows the facilities of the ports. It is relevant to mention that the length and depth presented in Table 11 are an average of the total number of berths.

It can be appreciated that in terms of number of berths Kingston is double than the Dominican Republic. Having more berths allows the port to serve more vessels and reduce the ship turn-around time. This is of course supposing that the services to the cargo and to the vessel are efficient. However, the two berths, which belong to CSX are longer and deeper than the Kingston and this allows that more than two ships to be accommodated depending on the ship's length. In addition, Kingston has to spend more money on dredging, which could be considered as a disadvantage.

Table 11 also shows that the port of Kingston has more capacity to allocate refrigerated container and that there is more space available in the warehouses.

Table 12
Physical plant comparison

	SIZE OF THE TERMINAL
Kingston	Approximately 55.44 Hectares (137 Acres)
CSX	Approximately 17.30 Hectares (7 Acres)
	CAPACITY
Kingston	16,050 TEUs (Stacked 1 over 1)
CSX	6,500 TEUs (Stacked 4 high)

Source: compiled

Performance indicators for the berth

Table 13
Berths service and output indicator comparison (in hours) (year 1996)

	Kingston	CSX
Worked hours	8,760	8,760
Ship idle time	1	1.5
Ship service time	10	7.8
Ship waiting time	1	0.5
Turn around time	12	9.8
Container throughput	327,727	157,554
Ship calls	957	415
Handling rate	25 TEU/crane/hour	27 TEU/crane/hour

Source: compiled

Table 13 shows the throughput of each port for the year 1996. Kingston had an average shipload of 342 TEUs. By using the date shown in this Table with a simple calculation, it can be estimated that ship output is 50TEU/ship/worked hour. The average number of cranes per ship is 2 cranes. While the Dominican Republic had an average shipload of 379 TEUs and a ship output of 54TEU/ship/worked hour. Most of the time 2 cranes per ship per worked hour were used. Table 13 also indicates that both terminals work 24 hours during 365 days. The rest of the figures are indicated per ship. The waiting time shown for both ports are considered reasonable as ship-owners consider it accepTable when it is a 10% rate; beyond this rate, they consider the port as a low quality port. Ship-owners compare the waiting time with the service time in order to get the rate. The waiting time for the CSX terminal is not one hundred percent accurate, as most of the time vessels do not have to wait because there are berths for the exclusive use of their vessels. It is consider that the ship idle time for the port of Kingston is accepTable given the amount of equipment and berth. However, the idle time for the CSX terminal is relatively high, as there are only two cranes for the operation. Finally, the waiting time in both ports is also due to rain.

Table 14 shows the amount and type of gantry cranes used in the two ports. It is understandable that the amount of equipment for the port of Kingston is bigger than the amount of CSX because there are more berths and thus more vessels call. Moreover the type of equipment shows the capacity, for instance there are no post Panamax crane at the CSX terminal. However, as the CSX terminal in the Dominican Republic only operates Maersk/SeaLand vessels the liner shipping does not use post Panamax vessels to serve this port because it is not consider a hub port, while Kingston has two post Panamax cranes that allow the port to operate shipping lines' mother ships.

Table 14 Equipment comparison

Kingston	**GANTRY CRANES**
	2- 40 Ton Paceco, Vickers
	2-40 Ton Paceco, Dominion bridge
	5-40 Ton Mitsubischi, post Panamax
	5-40 Ton Mitsubischi, Post Panamax
	1- L.S. 140 Ton linkbelt crawler
	1- L.S. 165 Ton linkbelt crawler
CSX	**GANTRY CRANES**
	1- LHM Leibherr Mobil crane
	1- 354 Paceco crane

Source: compiled

Table 15
Container handling equipment comparison

Kingston	**HANDLING EQUIPMENT**
	38 - Valmet narrow span straddle carriers
	38 - Stevedoring chassis
	32 - Stevedorig yard tractors
CSX	**HANDLING EQUIPMENT**
	36- Trucks
	32- Chassis
	16- Boom cards
	11- Front end loaders
	3- Power boxes

Source: compiled

Table 15 shows the type and amount of equipment used in both terminals. The type of equipment used varies depending on the operations of the terminal. It can be seen that the port of Kingston uses straddle carriers in its operations while CSX uses front-end loaders. UNCTAD recommends straddle carriers be used as this will give flexibility. However, according to UNCTAD the most suiTable equipment for container terminals dealing with a high percentage of transshipment is the yard gantry crane. Furthermore, each port will develop its own capacity in order to improve operations.

Table 16
Storage operation comparison

CONTAINER DWELLING TIME	Kingston	CSX
	Empties 4 days	Empties 2 days
	Inbound 10 days	Inbound 11 days
	Outbound 4 days	Outbound 2 days

Source: compiled

Table 16 shows the storage operation of both ports. Though the length of the area of the container yard is not available for any of the ports, it is obvious that the port of Kingston's container yard is longer than CSX as it is shown in Table 12. Even though the port of Kingston has a longer dwelling time, there is a lot of space in their yard because they stack 1 over 1 as it is shown in Table 12. Therefore, if there were any

unexpected traffic growth, congestion could be avoided by increasing the stacking factor. Whoever, for CSX terminal the scenario is totally different because their containers are smaller and they stack 4 high (Table 12). In this case, if there were any unexpected traffic increase they could avoid congestion by reducing the dwelling time rather than increasing the stacking factor.

Table 17
Container movement per crane tariff in US$

	Kingston	CSX
Empties	105.00	96.00
Inbound	120.00	96.00
Outbound	120.00	96.00
Transshipment	90.00	80.00
Shifting on board	65.00	55.00

Source: complied

Table 17 shows the tariff for each type of container. It can be seen that each container tariff for the port of Kingston is higher than the tariff for CSX. Once again it is relevant to mention that CSX was an exclusive terminal but today they are only providing the service to Maersk/SeaLand's ships. An interesting data is that for both terminals transshipment is one of the lower prices. However, it is important to bear in mind that transshipment containers are charged double.

In conclusion, the data used is more or less reliable and suiTable although it does lack some information, for instance, quality indicators, grace period, stowage factor, container yard space, manpower and management policy.

Though some information is missing the previous comparison was carried out taking into account the two principles of port comparison "like to like" and "single standard or indicator". The first principle states that when a port comparison is carried out similar things or items of service should be compared, and the second states that a single indicator should be found in order to make a meaningful comparison.

Therefore, even though the port of Kingston is a hub port providing port services to every shipping line willing to establish a service in the Caribbean and CSX was an exclusive terminal that today only provides services to Maersk/SeaLand, the previous port comparison could be affected.

From the information it can be concluded that both ports are efficient. The percentage of domestic and transshipment containers handled in each port shows that both terminals have difference purposes. Thus, there is a big difference in the type of equipment, container handling equipment and terminal space. However, these terminals have a very good performance.

Considering the trend of the container traffic shown in Table 3 on the one hand it can be said that port of Kingston has several solutions to handle the future traffic without suffering from congestion. These solutions do not consider any new investment. For instance, the dwell time and stacking factor could be rearranged to get more space in the container yard. For instance, reducing the dwell time for import and export containers and increasing the stacking factor. The latter is the most relevant, as import and export containers represent only 20 percent of the container traffic. However, the dwell time data is not an accurate reflection of the true scenario for any of the ports because this information does not give details regarding a free grace period, which exists in both ports. On the other hand the CSX terminal does not have so many solutions to handle the future traffic. As mentioned in the sub-chapter 3.1 a policy adopted by them was to reduce the traffic of transshipment to keep good performance. In other words, if the traffic of container in exportation and importation increases, they will have to look for new solutions that allow them to keep their good performance. For instance, reduction of dwelling time by imposing some charges after a specific number of days. However, there are not many things to do regarding the stacking of container as the type of equipment they use do not allow them to stack higher than 4.

In regards to the berth service indicators both terminals have good performance because they have a low ship waiting time and thus provide the ships a fast turn-around time. Though there is no information regarding the equipment and berths maintenance, it could be said that it is good because the idle time for both terminals is very low and this factor plays an important role in reducing the equipment failure which increases the idle time. However, it is considered that the condition of CSX, being an exclusive terminal, is an advantage because their ships do not have to wait for berth availability.

As mentioned, the difference in the type of equipment shows the purpose of each terminal. In the case of Kingston, which is a hub port, they have two post Panamax cranes that allow them operate mother vessels. Moreover, Kingston port has to spend certain amounts of money on dredging, so these vessels could call to the port because they require deeper water alongside their berths. In the case of CSX the cranes they use are not post Panamax but that is not a problem because no mother vessels are calling this terminal because Maersk/SeaLand uses Bahamas Freeport as Hub port in the Caribbean.

The berth output is very good for both terminals. The number of movements per crane assures fast discharging and loading operation of the vessels.

3.5 Conclusion

The traffic of containers in transit has decreased in the last four years. However, the CSX terminal in the country is being dealing with a considerable amount of transshipment in the past years as is shown in Table 8 and this shows that the country has the potential of becoming a transshipment center. In that case the country is losing a great opportunity that could become a threat, as there is a high competition for transshipment traffic in the Caribbean area.

Further, the port of Hispaniola knows what type of equipment should be used to handle either domestic or transshipment traffic. A port oriented to handle transshipment traffic being a hub port (Kingston) and a port handling mostly domestic cargo and lower traffic of transshipment are good examples.

Considering that there is a good opportunity for the Dominican Republic to become a Hub port, the following chapter analyzes the advantages of the Caribbean region in order to develop such a project and the pro and constraints of being a hub port.

CHAPTER 4

ANALYSIS OF THE TRADE IN THE CARIBBEAN

This chapter provides an overview of the importance of the geographical position of the Caribbean in terms of trade and cargo flow. It also analyzes the development of hub ports in the area in order to take advantage of the strategic position.

4.1 Strategic Position of the Caribbean for International Trade

The Caribbean islands are in an advantageous geographical position, as major sea routes have to cross through them and because they are close to the United States market. They also have an adequate telecommunications infrastructure.

The deepwater ports of the Caribbean are in a position to increase their activities as goods transshipment and load partition centres for trade flows to and from Latin America. In general, the advantages of the Caribbean should be exploited to develop services, which complement the commercial linkages between the two sub-regions.

4.2 Caribbean International Trade Analysis

In the last ten years the Caribbean has experienced positive economic growth rates. The reduction of annual fluctuations and inflation rates, the high foreign direct investment, the political stability, the privatization and the open-market economic policies indicates that this growth rate will continue.

These positive indicators have lead to an increase in imports and exports.

Most of the Caribbean trade is carried out by ship. It makes the Caribbean countries highly dependent on foreign trade.

The Caribbean countries' dependency on foreign trade includes imports and exports. Caribbean importation is mostly higher than exportation. Furthermore, importation consist of high value cargoes, which creates a deficit in the balance trade as exportation mainly consists of low value agricultural raw material.

Despite this, in 1995 Latin America and the Caribbean exceeded Europe for the first time as the second most important market after Asia for containerized United States exports with about 1.5 million TEUs (The Journal of Commerce, 8 July 1996, pp. 1C and 12C). The region is expected to account for 19% of the United States container trade by 2005, compared with 13% currently, while Europe is expected to decrease from 23% to 18%. (http://www.eclac.org/English/research/dcitf/lcg2027/focus.htm).

The latter figures show the importance of the commercial relationship between the United States and South America and the Caribbean. Even though a specific percentage for the Caribbean is not shown, it is relevant to mention that the Caribbean countries take advantages of this commercial relationship of South America and the United States, as most of the containers trade are transshipped in the Caribbean.

Furthermore, it is expected that by 2004 the volume of container moves for the entire East Coast of south America reach 7.7 million TEUs (Lloyd's List, 19 July 1996, p.7). In 1995 the East Coast of South America, the second largest north-south market in the world, moved an estimated 2.1 million TEUs. Therefore, this increasing trade volume makes the Caribbean an attractive region for the major liner companies.

The use of the Panama Canal confirms the growth of South American trade volume. The most important source of container traffic through the canal is the trade between the Far East and the United States East and Gulf coast, followed by the trade between the United States East and Gulf coast and the West Coast of South America.

From 1980 to 1996 the TEUs of port container throughput accounted for South America and the Caribbean grew from 1.34 million TEUs to 10.04 million TEUs. It implies a 6.4% of the world total. Central America and the Caribbean make up 63% of the region's total due to a higher containerization rate and transshipment. Between 1991 and 1996, South American port throughput grew by 122%. In Central America and the Caribbean, accumulated growth was 61%, which is roughly parallel to the growth of world port throughput. For the period 1997-2000. Ocean Shipping Consultants Ltd. forecasts port throughput to grow by 53% in South America and by 45% in Central America and the Caribbean (International Container Review, Autumn/Winter 1996, pp. 128-142)

According to a forecast made by the World Sea Trade Service (WSTS) South America and the Caribbean economies will generate significant additional containerized traffic in the future.

Inbound container traffic forecasts for Latin America and the Caribbean.

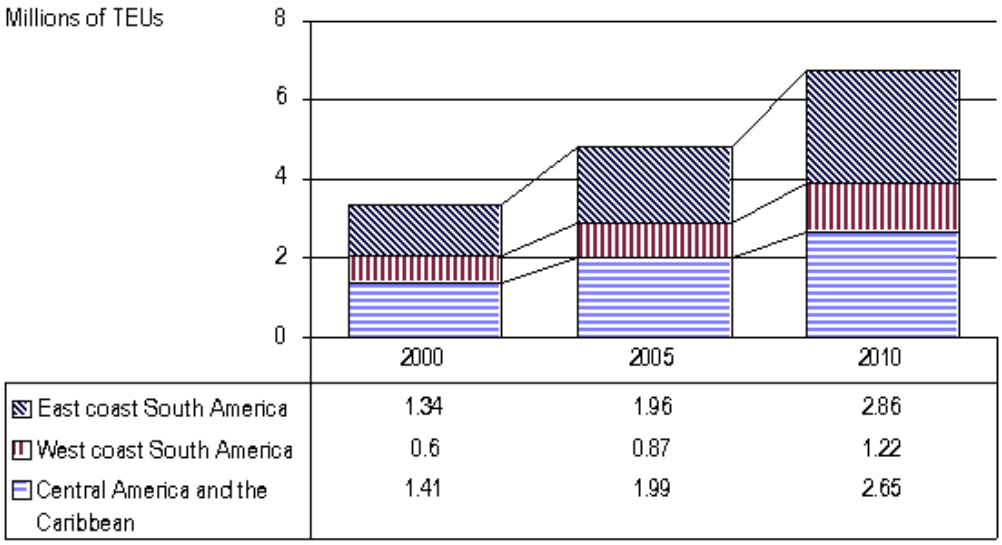

Figure 3
Source: DRI/McGraw-Hill and Mercer Management Consulting, World Sea Trade Service Review, Fourth Quarter 1997.

Outbound container traffic forecasts for Latin America and the Caribbean

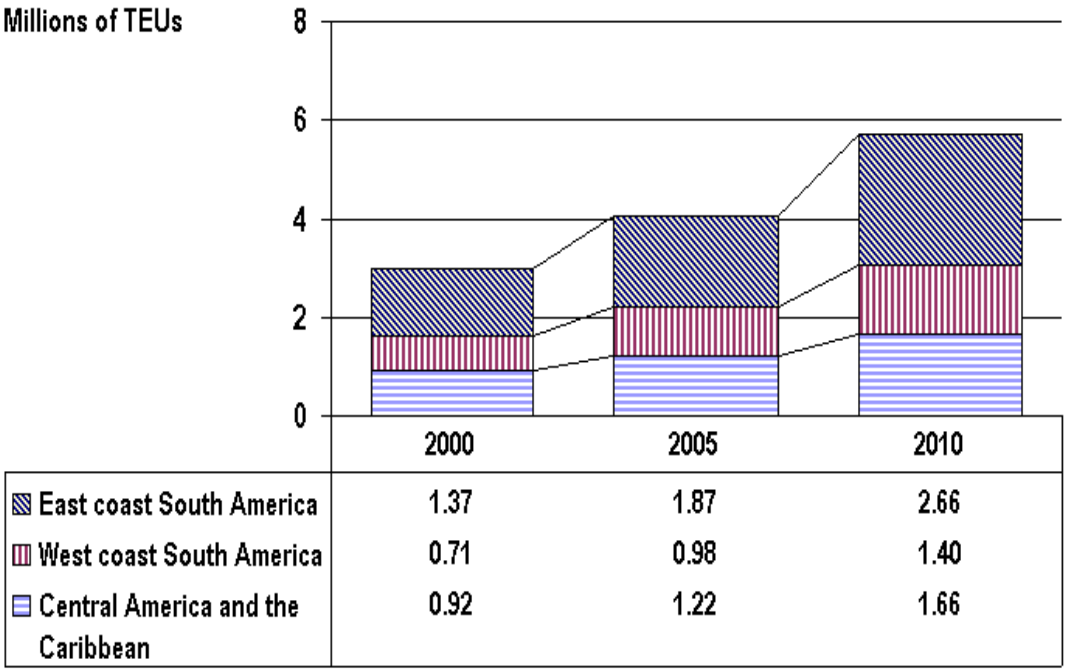

Figure 4
Source: DRI/McGraw-Hill and Mercer Management Consulting, World Sea Trade Service Review, Fourth Quarter 1997.

According to WSTS an increase of 7.0% of the total containerized trade movements in South America is expected between 1997 and 2010. It is also expected that the exportation of the region climb 6.2% annually in the short term, however this pace should increase slightly after 2000. Inbound shipments will also remain strong, with annual growth rates of 8.4% in the short term.

For the next 10 years the highest growth rates in the trade is expected between South America and Asia. Despite that there will be a decline to less than 37% of all deep-sea shipments in the trade between South America and the United States; the latter will remain South America's largest single market. Similarly, shipments to and from Europe

should continue to grow, although Europe's share of the South American market will probably fall to about 28%.

In summary, the Caribbean has its own market established with North America and Europe, which according with WSTS's forecast will continue increasing for the next ten years. Moreover, the Caribbean is taking advantage of the increasing trade between South America and North America and Europe. Once again it shows the importance of the traffic of containers in transit in the region**.** The following sub-chapter aims at drawing a clear picture of the future container traffic of the Dominican Republic in order to analyze how the future container traffic increases in the region will affect the country.

4.3 Dominican Republic Container Traffic Forecast

Though the above factors give a favorable environment for the growth of the container traffic in the Caribbean region, the performance of a forecast is relevant in order to minimize risk. Moreover, a traffic forecast has many negative influences, which makes it uncertain. For instance, rapid changes in maritime trade and long port planning time.

Risk is reduced by constructing possible scenarios to describe different alternatives. The port management can reduce the risk further by introducing an operational system which can respond to changes in traffic, together with an information system which gives a clear signal when the response is needed (UNCTAD).

Further, in this chapter forecasting of container traffic in the Dominican Republic will be examined. As a result, it will be possible to calculate which could be the market share of the traffic for a new port. Appendix 1 shows the forecasting procedure according to UNCTAD.

Table 18
Container traffic in the Dominican Republic
'000 TEUs

Year	1991	1992	1993	1994	1995	1996	1997	1998
Dominican Republic	226.2	227.9	291	372.9	451.6	483.5	634.2	532.6
Growth rate	13%	1%	28%	28%	21%	7%	31%	-16%

Source: compile

Table 18 shows the container traffic in the Dominican Republic from 1991 to 1998. It also shows the growth rate for these years. These figures will be used as a reference to draw three scenarios (pessimistic, realistic and optimistic) for the traffic forecast.

Container traffic in the Dominican Republic in TEUs

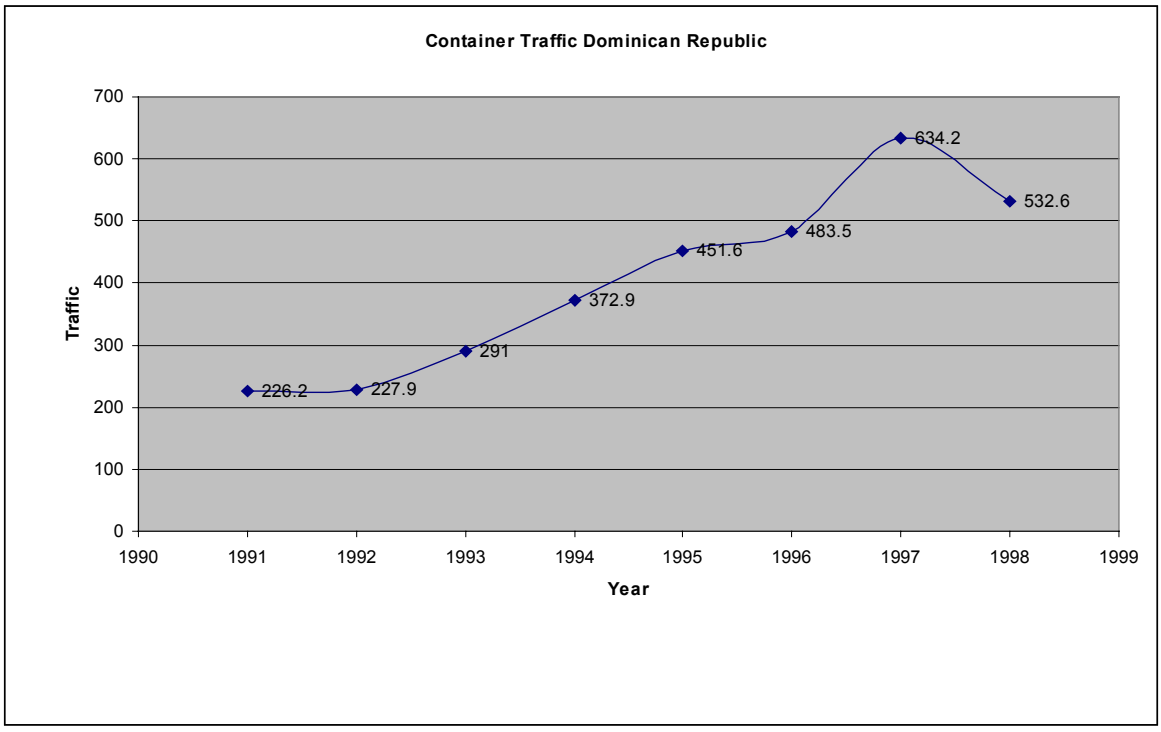

Figure 5
Source: compiled

The criteria used to draw the three scenario are based on the GDP trend and the container traffic of the country. It is possible to do that because there is correlation between the container traffic trend and the GDP growth trend. This shown in the appendix 2. The means of the growth rates will be used as a realistic scenario. For the pessimistic and optimistic scenario the standard deviation will be used. Other issues that will be used in order to build the three scenarios are the political, technological and economic development.

The container traffic in the Dominican Republic has experienced a dramatical growth with rates of 28 to 31 percent. However, in 1997 there was a decrease in the traffic due to two factors. One of the factors was the substantial investment in port facilities and infrastructure carried out by Jamaica and the Bahamas, in 1996. These two countries experienced a dramatical growth in their container traffic after the investment was made. As mentioned in the sub-chapter 2.5 the consequence of the market gain in Kingston and Freeport is a loss in Dominican ports. The other factor was that due to the insufficient space when increasing container traffic in the Dominican Republic. In addition, from1995 to1997, the CSX terminal, which is dominant in this market, started suffering from increasing congestion and many services were redirected to other ports.

The Dominican Republic container traffic has been growing on an average of 14% for the last 10 years. In the previous paragraph it the traffic decrease in 1998 was explained. As it can be appreciated there, traffic will continue decreasing for the year 1999 but this time only 4%. However, after that it will start increasing at a lower pace than the average i.e. 12%. The calculation of the pessimistic traffic is based on the standard deviation of the traffic growth rate for the last ten years. Moreover in order to build this scenario it should be considered that customs procedures remain as a barrier in the country, information technology rarely used in port operations, private consumption is sluggish and there is reduction of foreign investment. Further, there is steadily growth

in the container traffic for the Caribbean region as shown in the sub-chapter 4.1. This is because containerization is well established in the country.

For the realistic scenario it was considered keeping the same pace of growth of 14%. It is considered that the country could keep this growth rate since containerization is well established in the country. It is also considered that foreign investment will not increase but remain at the same level, production structure remains the same and information technology is applied in port operations. Further, there is steadily growth in the container traffic for the Caribbean region as shown in sub-chapter 4.1. Appendix 2 explains the calculation of this scenario.

For the optimistic scenario it is considered that more cargo handling and storage facilities are provided, information technology is intensively used in port operations, strong private consumption growth exists, foreign investment is increased and there is adoption of highly production structure. Further, the traffic growth rate is increased to a 16%.

Table 19 and graphic 6 show the figures and trend of the three scenarios (pessimistic, realistic and optimistic) respectively.

Table 19
Container traffic forecast (three scenarios)
'000 TEUs

Year	1998	1999	2000	2001	2002	2003	2004	2005
Pessimistic	532.6	510.0	581.4	662.8	755.6	861.4	982.0	1119.5
Realistic	532.6	607.2	692.2	789.1	899.5	1025.5	1169.0	1332.7
Optimistic	532.6	704.3	802.9	915.3	1043.5	1189.6	1356.1	1545.9

Source: Pedro Vega

Container traffic forecast

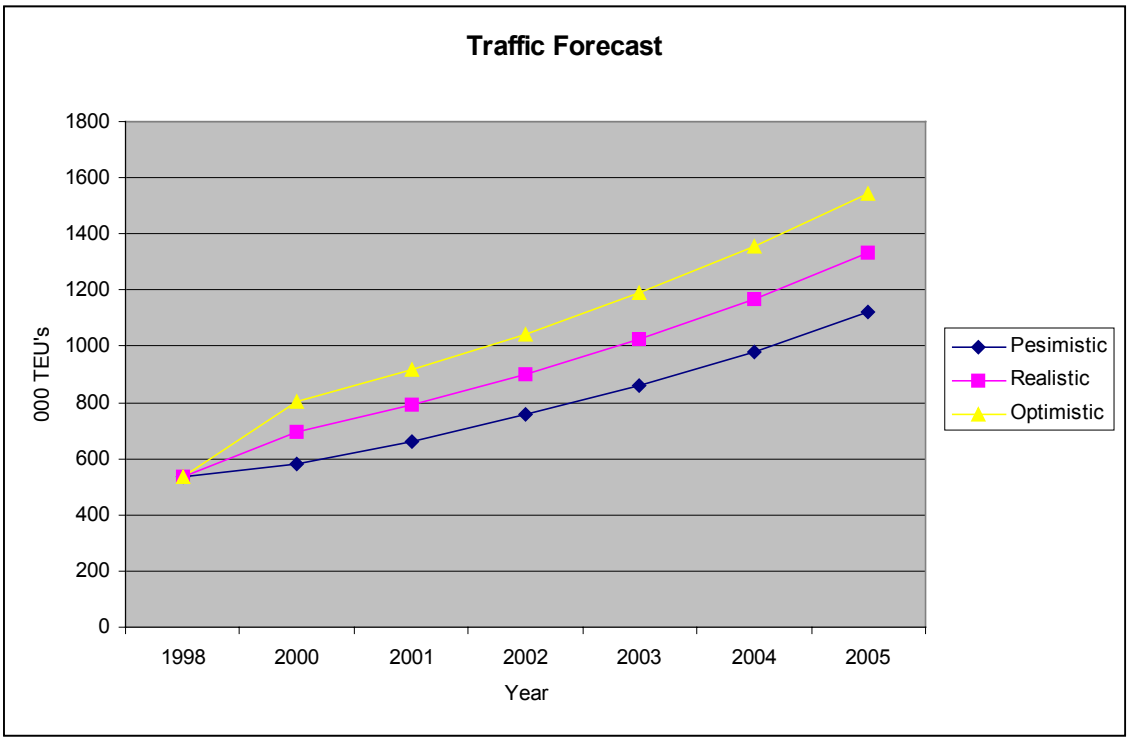

Figure 6
Source: compiled

In summary, the traffic growth of containers in the country is expected to increase for the next year under the three scenarios. This expected growth is mainly because the stable economic and political situation of country since there is a correlation between the growth of the GDP and the container traffic growth of the country. In addition to that containerization is well established in the Caribbean region and a rapid growth is expected in the future.

As the forecast of container traffic of the country promises steady increases, it worth reviewing the necessary conditions to become a hub port in the region; therefore, the next sub-chapter analyses the pro and constrains of being a hub port.

4.4 Hub Ports Importance

A hub port is the port used by ships coming from one region, for instance North America, to discharge all containers for another region in one particular port, e.g. the port of Kingston on the Caribbean Island. This in a way avoids stoppage in many ports thereby saving time, fuel and money.

This means that a hub port takes import, export and transshipment traffic as well. The market for container transshipment is one of the most dynamic ones in liner shipping. With the economies of scale realized by large (up to 8,000 TEU) container vessels deployed on trunk routes worldwide, it is not cost effective for these vessels to make direct calls in many ports. For this reason, lines develop "hub and spoke" systems, in which smaller "feeder" vessels distribute containers to and from smaller ports, whereas larger "mainline" vessels connect only to larger ports ("hub ports").

One of the most important issues to select a port as a hub is to have a strategic location, where trade routes and desired markets meet. It is also relevant that the port be surrounded by a dynamic local economy which provides a balanced cargo base-load.

Further, ports with no hinterland cargo, relying on transshipment business were thought to be vulnerable, but experience in regions such as the Malta Freeport, in the Mediterranean, has shown that this is not always the case. It could be said that Freeport Bahamas is another exemption.

4.4.1 Negative Aspect of Hub Ports

The cost of purchasing multiple container cranes with an extended outreach of 18 to 20

or even 22 containers, dredging entrance channels and harbors, establishing efficient intermodal links, constructing extra docks to avoid vessel delays, training a skilled workforce and offering other auxiliary services should limit the number of contenders for hub port status.

The port's dependency on transshipment traffic makes this business a risky one. When an important customer (who bring a high volume of transshipment traffic) decides not to call the port anymore the fixed costs of the terminal prove to be too high and as a result the rest of the customers do not bring enough traffic to cover them.

Further, if a new terminal is built in order to add more capacity to the Dominican Republic, there are two questions to answer. First, who will bring in enough traffic to fill in the new capacity and second, how will the investment cost be paid off? For instance, it was assumed that the investment cost for this new capacity would be paid off by revenues generated by new local container traffic, and that the tariff structure would remain equal to the competitor's.

In conclusion, a new container terminal has to look for advantages over rivals such as Freeport. For instance, it does not have a serious local market potential. For a shipping line interested in transshipment, having a local market is an incentive, as their costs could be spread over more traffic.

Set competitive transshipment tariffs, i.e. equal or lower than the competitors.
The marginal cost of the terminal should taken into account in order to set the rate structure.

Policies should be created, providing priority and enough equipment to customers who guarantee volume of transshipment traffic.

It is clear that having a good geographical location, some local potential and some spare capacity are not enough.

The location of the Dominican Republic and its increasing market is considered as an incentive for shipping lines. However, the construction of a new port will need to develop strategies that could be competitive advantages over its competitors in the region. The following sub-chapter aims at showing the importation and exportation in the country to develop these strategies.

4.5 Cargo Flow Analysis

The potential market of the Caribbean and its strategic position, allowing it to take advantage of the potential market of South America, it is important to carry out an analysis of the cargo flow of the country. This should be followed by a description of the incentive offer by the government to the Free Trade Zone. The analysis will make it possible to identify the most important export cargoes from the Dominican Republic and what strategy to implement in order to take advantage of them. The description of the incentives for the Free Trade Zone will help to have a clear picture of the possibilities of the settlement of the industrial park in the proximity of the project.

As mentioned in chapter 2, tourism was the principal export, followed by products assembled at industrial free zones. Other products most exported from the Dominican Republic are silver and gold alloy known as doré, ferronickel, sugar and by-products, coffee, cocoa, tobacco, cigars, canned guandules, coconut cream, dry coconuts, bananas, oranges, avocados, macadamia nuts, ice cream, processed fruit pulp, sugar cane rum, beer, flowers, ornamental tropical plants, meat, handicrafts and fertilizers.

Regions importing Dominican products were primarily:

- North America 53%
- European Union 16%
- Caribbean (includes CARICOM, Cuba, Haiti and Puerto
- Rico) 16%
- Asia 7%
- Central America 2%
- South America 1%
- Others 5%

The Dominican Republic is the largest market for exports in the Caribbean and one of the larger markets in the Western hemisphere. The Dominican Republic is the seventh largest market for U.S. products in all of Latin America. Other major exporters to the Dominican Republic include Japan, Spain, Italy, Germany, France, Korea, and Taiwan to varying degrees.

Table 20 shows the most exported products to the United States, European Union and Caribbean in 1998.

Table 20
Most exported products from the Dominican Republic (1998)

PRODUCTS	TONS
Fresh Bananas	71,539
Cocoa	161,034
Green Coffee	61,234
Tobacco	16,870
Dry Coconut	12,358
Coconut products	4,129
Beer	71,660
Guandules canned	155,369
Frozen Guandules	35
Fertilizer	186,210
Ornamental Tropical Plants	59,953
Others	60,000

Source: CEDOPEX

The idea of listing the most exported products from the Dominican Republic is to evaluate the possibility of developing facilities in the port in order to enhance its exportation. The list only shows products that can be put into containers because only those products represent a potential business.

The development of an industrial zone in the proximity of the port comprises the construction of warehouses, which provide the adequate condition and equipment for the process and maintenance of the products to be stored.

For the next years it is expected that exportation from the Dominican Republic will increase, as the government has started to implement reforms that will boost it.

Facilities near the port will be rented out to national exporters for a very low price. The purpose of the facilities is to offer the exporter the opportunity of reducing transport costs and avoid expenditures in construction of buildings or producing plants. At the same time the port is ensuring some traffic.

The settlement of a Free Trade Zone in the proximity of the port is another relevant issue to ensure traffic. The law 8-90 created two different benefit levels, which are granted, based on the geographic location of the company. Basic benefits are available to all companies located in any free zone area. Expanded benefits are available to companies located in certain less industrialized areas.

All free zone companies, regardless of location are exempt from duties and taxes for a renewable 15-year period, counted from the first day of production. In addition to the benefits granted to any free zone company, the free zones located in the Dominican-Haitian border region can also receive special incentives. The new terminal will be the closest container terminal for the Dominican-Haitian border; therefore, it should be able to take advantage not only of the traffic generated in this area but the traffic generated in Haiti.

In summary, the main purpose of analyzing the cargo flow of the country is to evaluate the strategy use in order to attract the customers that could generate more traffic for the port.

Furthermore, Hispaniola aims at being more than a port, a logistic hub in the Caribbean. The distance between the warehousing park and the marine berths will be less than 2 kilometers with an internal road network and transport system in place to facilitate cargo movements. It is relevant to have both modern logistics and distribution companies, such as freight forwarders, and import/export trading companies.

Moreover, the project will be located at only 45 minutes of the Barahona International Airport.

The warehousing park will be commercialized either to dedicate single company accounts and multi-clients. In other words it will be rented out to either national exporters or to develop a Free Trade Zone.

The facilities will be well equipped enabling the installation of high racking systems of pallets. Moreover, the project will offer a comprehensive range of value-added services.

Hispaniola will take advantage of the existing container traffic generated from the Free Trade Zone and industries installed in the South and on the Haiti-Dominican Republic border. Giving the port a local cargo base, the transfer of containers will be more cost-effective from the new port.

The port will apply Customer Relationship Management offering the customers more than simple rental contracts and this takes much of the worry out of their operations.
For many exporters and importers the project will give the opportunity to control the operation effectively allowing them to consolidate their businesses, as it will be possible to save money in transport and avoid investment in production sites.

4.5.1 Definition and Implementation of CRM

CRM is a new marketing philosophy that aims at establishing and maintaining individualized relationships with customers to enhance loyalty and retention. In order to achieve that this philosophy is customer-oriented rather than price or market oriented. The main purpose of CRM is not to just retain customers but to win them. Professor Adrian Payne of Cranefield University explains CRM as: “Being concerned with the creation, development and enhancement of individualized relationships with carefully

targeted customers and customers groups, the desired result being to maximize total customer lifetime value" (Business Guide-Customer Relationship Management).

The most important benefit to be achieved from CRM is the care for customers that it can afford. Ideally any business is generated, driven and sustained by the level of customers. Hispaniola will be able to collect and keep useful information about customers, harnessing their customer knowledge. In this sense customers will receive services suitable to their needs. Hispaniola will also be able to provide the customers instant, accurate and personalized information via the Internet, call centres, the field or through other means.

CRM is built and operated on a database management system. This system allows CRM to identify root causes of defection or failure, and the development of corrective action. The amount of resources spent on marketing and the amount of resources spent on a specific customer can be measured as CRM is a management tool. It will enable Hispaniola to classify and group their customers according to value and volume of cargo they move through the port, and how much revenue each class generates. Therefore, special attention will be given to the most important customers while the rest can be reduced to Internet-communication. This avoids wasting of time and money.

CRM will allow the port to be updated with the evolution in information technology (IT) and thus Hispaniola will be at the right level for international competition. A relevant issue of IT is the sales force automation (SFA), which is a tool for processing information useful to develop direct marketing, advertising efforts for the marketing department, and planning recruitment and training needs for the human resources department, for example.

CRM use databases, data marts, data warehouses, data mining and sales force automation among others. The adoption of marketing strategies is based on the information obtained from the database.

Hispaniola will start its operations with a totally new culture in its internal organization structure, a culture that will be seen by customers at all levels of authority within the port. Customers will be the focus of the employees, and satisfying their expectations will become the main vocation for the organization.

The implementation of CRM will require two steps. The first one is to define the reason for the use of CRM. This needs to be a clearly documented policy statement. This may be well defined by considering the core business of the port to begin with, and how that will evolve in the future. For instance the general commitment to a high level of customer service.

The second step is the organization to set the system, i.e. acquisition of the necessary hardware and software. A relevant issue is the form of CRM that would be appropriate for the port. CRM involves many elements which have to be combined and which are varied from port to port. Many forms of IT are used by CRM to give the organization the desired results. In the case of Hispaniola it will be relevant to provide customers with the Computer-telephony Integration (CTI), automatically links a phone call to the records for the same customers in computer systems data files, without any human intervention. The Office Automation (OA) will enable a written response to be generated by merging the information from the data files related to the call, with a word processing function. These are two examples of this sort of support system that will be used. However, other services will be developed in order to have a closer relationship with customers.

Hispaniola will be able to use the maximum power of internet, which will be very profiTable for the port. The evolution of e-commerce makes internet a relevant tool and the port will use this in order to increase business effectiveness, reduce costs and to extend the port services to the entire market.

CHAPTER 5

EXPECTED ECONOMIC IMPACT OF HISPANIOLA IN THE COUNTRY

There are three environments that can be impacted by the construction of a port in a region. The fist impact is on the physical environment and it can be measured by identifying the consequences of the project in the flora, fauna, landscape, smelling, air pollution and noise. The second impact is on the human environment that can be measured by identifying and analyzing the consequences of the project on the urban elements and the way of living. The last impact is on the economic and social environment and it can be measured by analyzing the balance of payment, trade, efficiency, costs and incomes.

This chapter aims at evaluating the impact of Hispaniola Port in the South of the country. As explained in the above paragraph, there are three areas that could be evaluated. However, only the economic and social point of view will be evaluated.

5.1 Economic and Social Impacts of the Project

In general terms, the impacts of the port on the economy are the changes in the economy as a result of the construction of a port. Therefore, its direct, indirect and finally induced impacts have to be considered. The question is how to measure the impact of a port on the economy of a country if this project has not yet started.

In the case of Hispaniola most of the elements used to measure the impact of the port on the economy have to be work out under speculations since no data regarding employment, profit and taxes exist.

A probable solution could be to extrapolate the data regarding valued added of the existing ports and to estimate what could be the closer figures for the future project (Hispaniola). However, it can be done since this data is not available, as it is common practice, in the Dominican Republic that firms do no give any information, which can make people aware of their level of employment and income. Enterprises usually do not tell the truth in order to pay less tax. Therefore, it is considered better to give just an idea of what could be the economic and social impacts of the port to the region.

The direct impact of the port on the economy will be the effects of the port on the firms or organizations and generally bodies directly linked with the port operations (Francou, 2000). Those activities directly linked to the port are the services to the ship and to the cargo. It is estimated that port of Hispaniola could generate 400 employment opportunities directly linked to the port, for instance, staff management and workers.

The effects of firms and organizations that decided to settle themselves around the port are the indirect impact of the port on the economy. As mentioned in Chapter 4 one of the strategies of the port to attract traffic is to build warehouses that will be rented out to exporters and industries. (national or foreign). These industries will generate employment that will be an indirect impact on the economy of the country. The best way to prove that this is an indirect impact is supposing that the port is close or moves out to other place, thus those factories, industries and distribution centers will not remain there.

Even if the figures regarding the number of employees generated by the port, profit made and taxes paid, were available, it will be almost impossible to calculate the induced impact. This impact is the effect of the direct and indirect activities on the other sectors of the economy (Francou 2000). It is in fact a multiplier effect, which means that

any additional income created by the port professions creates expenses by these professions and revenues in other professions.

The port of Hispaniola will also have an effect on the national economy. The primary impact of port on the economy is its contribution to the equilibrium of the balance of payment. It means that the port contributes to the savings in foreign exchange which port investment can offer. For the Dominican Republic with problems in its balance of payments, where deficits on current account regularly need to be offset by grants and borrowings from abroad, the foreign exchange generated or saved by the port may be worth much more than the official exchange rate implies. Of course any foreign exchange earnings need to be offset against capital cost repayments on port infrastructure and others. For instance port services that can bring foreign currencies are port dues on ships, cargo and containers.

Another area of the national economy affected by the port will be the prices of the import and export goods. Depending on the quality of the services of the port i.e. waiting time of ships, the dwelling time of the containers in the port and the risk of the cargo will increase the FOB of the export price or to increase the CAF price of imports (Francou 2000).

Finally, as Hispaniola is a private port the taxes collected from it is another impact on the national economy.

In conclusion, the port of Hispaniola will have a great impact on the economy of the region and on the country as well. One of the major problems for governments is the creation of new employment and thus developing a new economic zone. The project of Hispaniola offers the government an excellent opportunity to develop a new economic zone in the south of the region.

Even if the contribution of the port to the GDP of the country is not a big issue there are other important reasons to support this project. Further, as the Dominican Republic is an island, where approximately 70% of the importation come by ships, the construction of a port will always be relevant issue.

CHAPTER 6
CONCLUSION

The Dominican Republic is a developing country and an island which is highly depent on the good development of its ports since more than 70 percent of the imports are done through them. Similarly, the economic growth experienced by the country in recent years implies that the container traffic will continue growing because there is a strong correlation between these two variables. This correlation is shown in Chapter 4 and explained in Appendix 1.

The economic of the Dominican Republic is based on the tourism and the free trade zone. These two sectors are the major contributors to the growth of the economy. However, the government is concerned that the economy of the country relies on only two sectors and therefore for the next year the government will implement new reforms aiming at boosting the exportation of the country. In accordance with these reforms the Dominican producers will be receiving special attention from the state to make their products more competitive in the international market and to create incentives for exportation.

Taking into account all these factors regarding the future increase of exportation, importation and the container traffic in the country, there is an imminent necessity of having a good performance of the ports since they have an impact on the prices of the goods imported or exported depending on their efficiency or inefficiency.

In addition to these factors, the inclusion of the Dominican Republic in some international trade agreements, namely, CARICOM, WTO, CBI and ACS, are indicators of an increasing demand of port services.

Another relevant issue is the increase of the trade between North America and South America for the next year according to the forecast shown in Chapter 4. The development of this trade has a great impact on the Caribbean region as there will be a greater demand for ports that could serve as transshipment center for these two markets.

Though the insufficient data to demonstrate the poor performance of Dominican's ports it was appreciated that the country has only one dedicated container terminal i.e. CSX, which handles a very high percent of the container traffic of the country; therefore, the ability of this terminal to attract traffic has a high impact on the container traffic in the Dominican Republic.

The fact that there are no data and indicators available to measure the performance of the rest of the Dominican ports is considered a signal of the poor management and performance as well of the other terminals that handle certain amount of containers.

According to Wold Container Port Markets to 2012, the CSX terminal has redirected some services to other ports in order to avoid congestion. These services redirected to other ports are mainly transshipment container. This policy is used to keep a good performance of the terminal and at the same time to provide a good standard of service to their customers since the terminal does not have enough space to handle all the traffic coming to the country efficiently. Furthermore, this policy could not be implemented given the future increase of the exportation and importation without falling in low productivity and port congestion.

According to the analysis carried out in Chapter 4 regarding the importance and negative aspects of being a hub port on the one hand it was determined that it is better if the activities of a port do not rely on transshipment. On the other hand, it was considered

that the handling of transshipment is like a cherry on the cake i.e. extra money. Thus, to attract containers in transit is a profitable business since the location of the Caribbean region is in a favorable position to develop transshipment centers, to illustrate, Port of Kingston and Bahamas Freeport. Moreover, the economic situation of the country will ensure a certain amount of domestic traffic.

Having mentioned all these factors and issues the following recommendations should be considered:

The construction of a new container terminal (Hispaniola) that is provided with equipment and the infrastructure to handle mother vessels and enough space that allow the country to compete efficiently for transshipment containers.

Hispaniola should also build facilities in terms of warehouses and logistics services, which will be an attraction for the Dominican exporters and importers to establish their production sites near the port in order to take advantage of low rent of facilities, transportation costs and services offered by the terminal. At the same time these facilities are a contribution to the government that is willing to boost exportation and to develop a new economic zone. Furthermore, the new terminal will offer tailor made services to the customers installed in the industrial zone through the implementation of Customer Service Management. In that way Hispaniola will be a customer oriented port resulting in a comparative advantage over competitors in the entire region as it will offer more services than the existing Dominican's ports and other ports in the region.

The construction of the new terminal with an industrial zone in it is a way to ensure certain traffic to the port. Furthermore, according to the traffic forecast of the country and the lack of capacity of the existing port to attract and handle more traffic, there will be existing traffic for the Hispaniola container terminal.

The industrial zone, which is part of Hispaniola Port, should be exploited to develop services, which complement the commercial linkages between North and South America.

The performance of the Hispaniola terminal should not be lower than that shown in the comparison of the ports in Chapter 3. In addition to that the new terminal has to be built with all the technological advanced equipment so modern ships could call at this port.

The new port should be able to satisfy trade needs at the neighboring country of Haiti.

Finally, training and education should be a priority all port workers since it is a motivator factor to improve the workers performance. Training in all areas of port and shipping management can be provided by World Maritime University (WMU), United Nations Co-operation Trade and Development (UNCTAD) and Interanational Labour Organization (ILO).

REFERENCES

Alderton, P.M. (1995). Sea transport, (4th ed.). London: Thomas Reed Publications.

Beth, H.L. (1999). The extension of ports services. Lecture handout, World Maritime University, Malmö, Sweden.

Branch, A.E. (1986). Elements of port operation and management. London: Chapman & Hall.

Boseman, F. Phatak, A. & Schellenberger, R. (1986). Strategic management. New York: John Willey & Sons.

Centro Dominicano de Promocion de Exportaciones. (1999). Reporte exportaciones. http://www.cedopex.gov.do/programatico.htm (4th July, 2000).

Concentration in liner shipping. (1997). Focus: Latin America and the Caribbean. Http://www.eclac.org/English/research/dcitf/lcg2027/focus.htm (12th June 2000).

Francou, B. (1999). Basic elements of macro-economics for shipping and ports

Economics. Unpublished lecture handout, World Maritime University, Malmö, Sweden.

Francou, B. (2000). Basic elements of port operations. Unpublished lecture handout, World Maritime University, Malmö, Sweden.

Francou, B. (2000). Impacts of ports and shipping on the national economic.

Unpublished lecture handout, World Maritime University, Malmö, Sweden.

Francou, B (2000). Port performance indicators. Unpublished lecture handout, World Maritime University. Malmö, Sweden.

Gove, P.B. (1981). Webster's third new dictionary of the English language, unabridged. Springfield, Mass.: G. & C. Merrian Co.

Ma, S. (2000). Logistic and supply chain management. Unpublished lecture handout, World Maritime University. Malmö, Sweden.

Ma, S. (1999). Maritime economics II. Unpublished lecture handout, World Maritime University. Malmö, Sweden.

Ma, S. (2000). Port marketing. Unpublished lecture handout, World Maritime University. Malmö, Sweden.

Ma, S. (2000). Quantitative methods for decision makings in ports. Unpublished lecture handout, World Maritime University, Malmö, Sweden.

Ocean Shipping Consultants. (1999). World container port markets to 2012. Chertsey, Surrey: Author.

Phillips, F. (1996, March). The mouse that roared. Containerization International, 109-111.

Schad Shipping Agents. (1998). Dominican Republic. http://www.fschad.com/html/ports.html (June 1st 2000).

Siebel Systems (2000). Customer Relationship Management. Business guide. Millbank, London: Caspian Publishing Ltd.

Stopford, M. (1997). Maritime economics. London: Routledge.

United Nations Conferences on Trade And Development (1993). Strategic planning for port authorities. Geneva: United Nations.

Woodbridge C. (1999, August). Caribbean dreams. Containerization International, 71-73.

World Bank Organization. (1998). Dominican Republic at a glance. http://www.worldbank.org/ (21st June, 2000).

APPENDIX I

Table 21
The forecasting procedure

1. Analysis of past traffic
1.1 Define routes/conferences, etc.
1.2 Choose cargo classification
1.3 Tabulate
1.4 Calculate trends and analyze their causes
1.5 Extract seasonal effects
2. Review market influences on traffic and technological trends
2.1 Survey shippers' opinion (public and private)
2.2 Survey shipping companies'plans
3. Estimate systematic traffic growth rates
3.1 GNP-linked cargoes
3.2 Special cargoes
3.3 Regional/hinterland trends
4. Investigate expected traffic influencing events
4.1 Industry plans
4.2 Agricultural plans
4.3 Transport links/transit policies
5. Combine all information into alternative growth and technology scenarios
5.1 Identify principal scenario themes
5.2 Combine all data for each theme
5.3 Remove numerical inconsistencies
5.4 Write scenarios
6. For each scenario, tabulate annual forecast in each traffic class
6.1 Tonnage (weight tons)
6.2 Numbers/sizes of ships
6.3 Seasonal effects

Source: UNTACD

APPENDIX II

1. Container Traffic forecast for the Dominican Republic

The forecast was done taking into consideration de GDP in million of the country.

Relation between container traffic growth and GDP growth

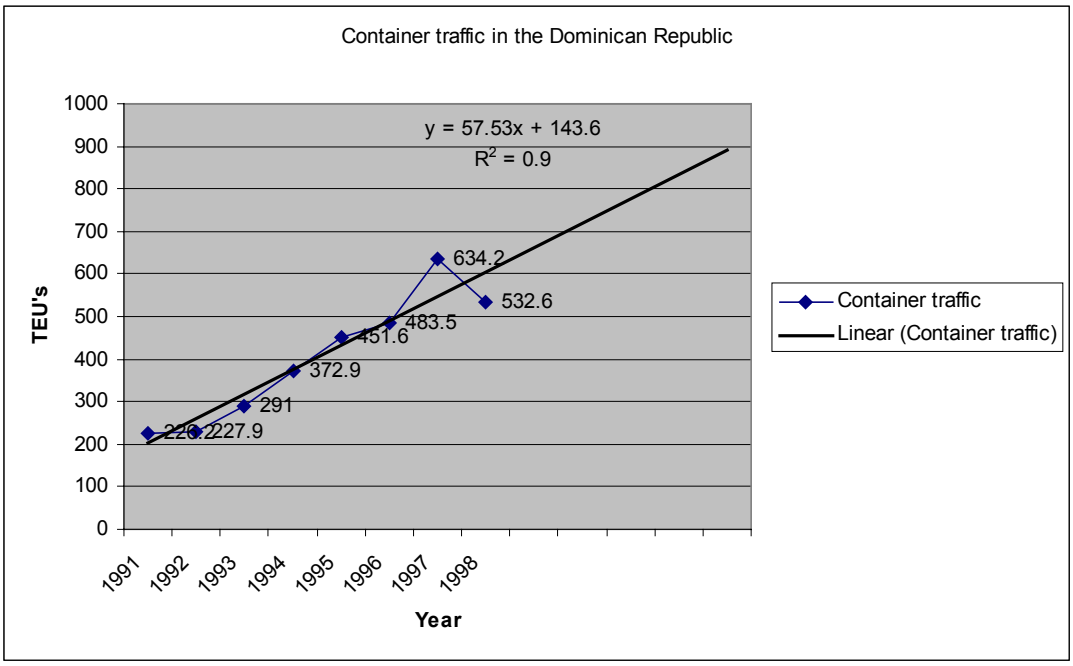

Figure 7
Source: Pedro Vega

Table 22
Dominican Republic GDP (in US$ millions)

	1991	1992	1993	1994	1995	1996	1997	1998
GDP	11.7	12	12.4	13	13.5	14.9	15.1	15.9
Traffic	226.2	227.9	291	372.9	451.6	483.5	634.2	532.6

Source: World Bank and World Container Port Markets to 2012

Strong correlation was founded in between the GDP growth and the increase of container traffic.

Correlation = 0.9

Therefore, it was considered making the forecast of the traffic growth based on the GDP growth.

Table 23
Calculations

	X	Y	XY	X^2	$\hat{y}$	Y-$\hat{y}$	Y-□	$\hat{y}$- □	$(Y-\hat{y})^2$	$(Y-□)^2$	$(\hat{y}-□)^2$
1991	226.2	11.7	2646.5	51166.4	11.8	-0.1	-1.9	-1.7	0.0	3	3.0
1992	227.9	12	2734.8	51938.4	11.9	0.1	-1.6	-1.7	0.0	2	2.9
1993	291	12.4	3608.4	84681.0	12.5	-0.1	-1.2	-1.1	0.0	1	1.2
1994	372.9	13	4847.7	139054.4	13.3	-0.3	-0.6	-0.3	0.1	0	0.1
1995	451.6	13.5	6096.6	203942.6	14.0	-0.5	-0.1	0.5	0.3	0	0.2
1996	483.5	14.9	7204.2	233772.3	14.4	0.5	1.3	0.8	0.3	2	0.6
1997	634.2	15.1	9576.4	402209.6	15.8	-0.7	1.5	2.3	0.5	2	5.2
1998	532.6	15.9	8468.3	283662.8	14.8	1.1	2.3	1.3	1.1	5	1.6
total	3219.9	108.5	45183	1450427	108.5	0.0	0.0	0.0	2.38	17.2	14.8

***n*=**	8
***ΣX*=**	3219.9
***Σ Y*=**	108.5
***ΣXY*=**	45183
***Σ X2*=**	1450427
***Avg X*=**	402.5
□**=**	13.6
***a*=**	9.619627
***b*=**	0.009796
***Ý*=**	108.5
***Syx*=**	0.54509
***r*=**	0.928362
***r2*=**	0.9

Formulas

$$b = \frac{n \quad X_i Y_i - \quad X_i \quad Y_i}{n \quad X^2{}_i - (\quad X_i)^2}$$

$$a = \frac{Y_i \quad X^2{}_i - \quad X_i \quad X_i Y_i}{n \quad X^2{}_i - (\quad X_i)^2}$$

$$\hat{y} = a + bX$$

Standard error

$$S_{yx} = \frac{\sqrt{\quad (y - y)^2}}{n}$$

Coefficient of correlation

$$r = \pm \sqrt{\frac{(Y - Y)^2}{(Y - Y)^2}} =$$

Once the correlation between the GDP and the container traffic growth in the country was determined three scenarios (pessimistic, realistic and optimistic) were built.

Table 24
Traffic growth in percentage

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
TEUs	200.6	226.2	227.9	291	372.9	451.6	483.5	634.2	532.6
Growth		13%	1%	28%	28%	21%	7%	31%	-16%

Source: World container port markets to 2012 and compiled

Mean = 14%

Standard deviation = 16%

Using the yearly container traffic percentage growth, the mean and the standard deviation were calculated. The mean percentage was used as the growth for the realistic scenario. The standard deviation percentage was used as the growth for the optimistic scenario.