**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics**


**Bachelor Thesis**

# Panama Canal and the arise of a potential competitor

**Madellen Denisse Barrios Espino**

# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

# BACHELOR THESIS ASSIGNMENT

Madellen Denisse Barrios Espino

Business Administration

Thesis title

**Panama Canal and the arise of a potential competitor**

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**Objectives of thesis**

This study seeks to reflect the changes described and help to analyze and understand as a whole the mentioned variables, which are particularly complex, and that can only be understood in their interaction; as well as contribution to understanding the magnitude and complexity of the Canal expansion, given the uncertainty and fears that this process generated among various sectors of the navigation and trade in La n America. Moreover, the objective of this study of Nicaragua Canal is quantify and explain the impact about existed Panamanian Canal, the economical risks for Panama and Nicaragua during the first three years of opening and incidence of the maritime and international trade.

**Methodology**

In order to get clear understand on Panama Canal and the arise potential competitor, all the key players and their responsibilities. Most of data and information will be collected from books, articles, reports, case studies as secondary data; mainly in theoretical part and discussion. Then, an in-depth multiple case study methodology underpinned by ethnographic data collection methods will be used for the study; to see economic benefits from the canal and the effects of new competitors. Moreover, short interview will be conducted with local community near by the canal to see their opinions about canal as well as the new competitors.

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**The proposed extent of the thesis**

40 pages

**Keywords**
Panama, Panama Canal, Geography, Investment, Foreign Trade.

**Recommended information sources**

Panama Canal by Cruise Ship: The Complete Guide to Cruising the Panama
Canal The Nicaragua Canal
The Nicaragua Canal (1900)
The Path Between the Seas: The Creation of the Panama Canal, 1870-1914
World Bank Group. 2015. Doing Business Economy Profile 2016 : Panama. World Bank, Washington, DC. © World Bank.
World Bank Group. 2016. Doing Business Economy Profile 2017 : Panama. World Bank, Washington, DC. © World Bank

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**The Bachelor Thesis Supervisor**
Ing. Petr Procházka, Ph.D., MSc

**Supervising department**
Department of Economics

Electronic approval: 11. 5. 2017

**prof. Ing. Miroslav Svatoš, CSc.**
Head of department

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**Ing. Martin Pelikán, Ph.D.**
Dean

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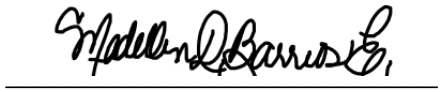
**Declaration**

I declare that I have worked on my bachelor thesis titled "Panama Canal and the arise of a potential competitor" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague, 27.02.2018 

Madellen D. Barrios E.

**Acknowledgement**

First of all, I thank eternally God for having put the willpower to take of each of these steps and bring me to where I am.

Thanks to my thesis tutor, who directed this work and reinforced my knowledge not only for my professional career but also with life.

To this country that welcomed me for five beautiful years, and its wonderful people that I will always carry in my heart.

Last but not least, I would like to thank my mother who gave me the wings to fly and face with courage a strange and new world, full of experiences that left me with only another message: Where there's a will, there's a way.

**Abstract**

Is not a secret the positive impact that Panama Canal has being executing not only during the last years but for more than hundred years in the world's economy building the best plan, shortening a way between two oceans, promoting the commercial and economic trade. People who have visited Panama are surprised to see that small country, geographically next to an impoverished Central America and the impenetrable Colombian jungle has become a country with the greater economic growth, average of 5.4 % according the World Bank. Today Panama has per capita the highest foreign investment in Latin America. Panama being one of the smallest countries in the world with less population, but its behavior and decisions of their people are those of a giant. Since the beginning of our Republican history, the Interoceanic highway is a symbol and stamp by virtue of struggles and sacrifices.

For most of its history, the Panama Canal was under the American administration, with operating criteria and services, different from those of international commercial maritime transport. However, since 2000, the Canal under Panamanian administration began to design and operate a different profile, which occurred at a time when operating limitations for the original design capacity began to approach its highs.

At the same time, International maritime transport, logistics of production and trade, port services, etc., experienced a spectacular change both in its conditions of that time, as in the projected, turning to a previously unknown perspective.

For the above reasons mentioned, come together in the time three main factors: a profound change in the global maritime activity; a paradigm shift services and operations of the Panama Canal and the need for a change in its operational capacity.

Keywords: Panama, Panama Canal, Geography, Investment, Foreign Trade.

**Abstrakt**

Není tajemstvím, že Panamský průplav má pozitivní dopad na vytváření nejlepších projektů, zkracování cesty mezi dvěma oceány, podporování komerčního a ekonomického obchodu, a to nejen v poslední době, ale i ve více než stoleté historii světové ekonomik. Lidé, kteří navštívili Panamu, jsou překvapeni, že tato malá země, geograficky vedle chudé střední Ameriky a neproniknutelné kolumbijské džungle, se stala zemí s větším ekonomickým růstem, s průměrem 5,4% podle Světové banky. Dnes má Panama nejvyšší zahraniční investice v Latinské Americe v přepočtu na jednoho obyvatele. Panama je jednou z nejmenších zemí světa s menším počtem obyvatel, ale její chování a rozhodnutí jejich lidí jsou obří. Od počátku historie naší republiky je Mezioceánská dálnice symbolem a známkou ctnosti bojů a obětí.

Po většinu své historie byl Panamský průplav pod americkou správou, s provozními kriterii a službami odlišnými od služeb mezinárodní komerční námořní dopravy. Nicméně v roce 2000, průplav pod panamskou administrativou začal navrhovat a provozovat jiný profil, který existoval v čase, kdy se provozní omezení pro původní navrženou kapacitu, začaly přibližovat k nejvyšším hodnotám.

Ve stejnou dobu mezinárodní námořní doprava, logistika výroby a obchodu, přístavní služby apod. zaznamenala velkolepou změnu, a to jak ve svých podmínkách, tak v projektech, které se změnily na dosud neznámou perspektivu.

Z výše uvedených důvodů se v té době setkávají tři hlavní faktory: hluboká změna globální námořní aktivity; služeb a operací Panamského průplavu a nutnosti změny jejich provozních kapacit.

klíčová slova: Panama, Panamský průplav, geografie, investice, zahraniční obchod.

**INDEX**

# 1 Introduction

The objective of this work is the analysis and evaluation of two big construction projects, the Interoceanic Nicaragua and Panama Canal, through the application of cost analysis and projections, which is complemented with the qualitative analysis, Panama and Nicaragua. The first topics presents the theoretical framework, the history of the Panama Canal and the explanation of the Interoceanic Canal project in Nicaragua. Subsequently, the problem is presented, which consists in knowing if there is viability and economic benefits with the construction of the Nicaragua Canal and how will this affect the Panama Canal. The general objective is stated: "To establish conceptual, analytical and projection criteria to carry out the comparative analysis of the Panama Canal and the Nicaragua Canal. Then we will discuss the methodology, which explains in detail the research plan that determines that to support the problem, we use the quantitative method.

Likewise, the use of the quantitative method is required through the cost - benefit analysis of the container demand projections in the ports of Panama and Nicaragua, the projections of the maritime freight costs and tolls of the Panama and Nicaragua canal and subsequently of this investigation, the qualitative analysis of the matrices that were carried out on the relationship between the opinions (benefits of the Panama and Nicaragua canal) of the representatives of the shipping companies, with the specific objectives will be carried out. Likewise, the quantitative analysis of the projections of demand, supply, and income of contenders of the two study canals is carried out. In last topic, conclusions are made through qualitative and quantitative research of what was developed in previous chapters, the general objective is answered. Then, the respective recommendations on the construction project of the Nicaragua Canal are elaborated.

# 2 Objectives and Methodology

## 2.1 General objectives

Establish conceptual, analytical and projection criteria to perform the comparative analysis of the Panama Canal and the Nicaragua Canal regarding the economic and social benefits.

### 2.1.1 Specific objectives

- Compare the tolls for The Nicaragua Canal and the Panama Canal projected for 2019.
- Analyze the status of freight rates with the expansion of the Panama Canal.
- Analyze freight costs per container transported in Panama and the advantages for international trade.
- Analyze freight costs per container transported in Nicaragua and advantages for international trade.

## 2.2 Methodology

The present investigation used a quantitative methodology. Quantitative research collects and analyzes data on variables and studies properties and quantifiable phenomena. This study is descriptive and analytical because it establishes comparisons of variables. Describe facts of the phenomenon and contrast relationships between two variables or data.

The strategy used for the collection and analysis of the data consisted in the revision of text and works related to the study phenomenon. In addition, the design of the structured interview was used to confirm and provide new data.

The interview made by the World Maritime News to the representative of the ACP, *Argelis Moreno De Ducreux* (Executive Vice-president of Planning and Business Development) who responds to the different unknowns of social and economic interest. Ms. *Ducreux* assesses the interest of transit of the new expanded locks and says that reservation requests have been exceeded which means there has been great interest. Ms. *Decreaux* tells that at the time that the additional demand is captured due to the different ship sizes, Panama would be preparing for a fourth set of locks for which there is already an established route.

### 2.3 Importance of the research

The importance of the research lies, The Panama Canal, through which transit in about a third part of the global trade between America and Asia has had no choice but to expand. The reason is that the world industry is undergoing a radical change, the shipping companies are optimizing the resources to be more efficient using a smaller number of boats, but you are being much bigger.

Globally, there will be a reduction in prices in international trade due to lower costs and transport times, which will lead to an increase in global maritime trade and an increase in maritime activity. The number of ships that touch a country's ports will vary, their capacity to transport containers will increase, as well as the average size and maximum size of vessels.

These advances in maritime connectivity generate more transport options for different users, greater access to international markets at lower costs, greater competitiveness in exports, direct revenues from services to vessels and greater opportunities for international trade.

### 2.4 Background of the investigation

This work is presented in a context of global openness to international trade, which will increase the simplification of the international logistics chain for all countries, with Panama being one

of the main beneficiaries of this, given its excellent geographical location to become a Hub. Logistic of all America.

Over time, from the Spanish Colonization it was thought to find a route that has geographical connection between the Atlantic Ocean and the Pacific Ocean, being more appropriate Panama for its geography. It was then that King Charles V, in the year 1534, decided to build a canal, but by that time it was impossible to carry it out due to the inhospitable nature of the territory and the many diseases that were suffered in that area. Its definitive construction began before the end of the 19th century and was inaugurated on August 15, 1914. Conte, J., & Castillero, E. (2006).

The increase in international trade and the signing of multiple international treaties between countries, generates a great commercial demand, which causes the expansion of the Canal de Panama to try to calm this demand. However, the current growth of the Asian markets, especially China and India, means that freight transport is increasing, creating the need to build larger vessels, which contain more containers and the need for an alternative route for their transit. That is why, in 2014, the construction of the Nicaragua Canal began, a canal much larger and deeper than the recently expanded Panama Canal. Given this, the following question is asked: The construction of the Nicaragua Canal VS the Panama Canal, how would this impact the current Panama Canal? To answer that question a comparative analysis was developed on the project of the Nicaragua Canal, measuring the possible economic benefit and impact of the international logistics chain.

Panama already presented its newly expanded canal, the largest engineering work of the 21st century to date. The extension in question refers to a third lane, whose works have been extended during the last nine years, so that Neopanamax-type vessels, containing up to 13,000 containers, can pass, practically three times more than what happened in the canal before its expansion.

In this extension there have been difficulties in carrying it out due to its cost. In 2007, 5,250 million dollars were estimated for its construction, however, it rose to 5,450 million and even this amount could have increased due to the international consortium United for the Canal (GUPC), led by the Spanish company Sacyr, which claims an extra cost valued at 3,400 million dollars.

According to Escobar, E. (2005), in his master's thesis:

> *El Canal de Panamá, viabilidad en la construcción del tercer juego de esclusas y su impacto en el comercio marítimo nacional* says that the Panama Canal has contributed significantly to the progress of international maritime trade and stands as an exceptional achievement, since it provides a short and relatively cheap transit route between these two great oceans.

# 3 Literature Review

## 3.1 Panama

The Republic of Panama is named after the city of Panama, where the town hall was held and the jurisdiction of the Royal Court of Panama, which included the entire Isthmus of Panama, was established. Conte J., & Castillero, E. (2006). The name of Panama prevailed during the territory belonging to the viceroyalties of Peru and New Granada, during the Spanish colonial period, and finally it was made official after the signature of the Act of Separation of Panama of Colombia. There are several meanings and references assigned to the name Panama, however, the meaning "abundance of fish and butterflies" is commonly accepted.

The following data was provided by the national Government of the Republic of Panama, given in the ensuing order:

### 3.1.1 Location

The Republic of Panama is located between the following coordinates: 7º12'07 "and 9º38'46" of North Latitude and 77º09'24 "and 83º03'07" of West Longitude. It limits to the North with the Caribbean Sea, to the East with the Republic of Colombia, to the South with the Pacific Ocean and to the West with the Republic of Costa Rica.

### 3.1.2 Organization of the Panamanian State

The Panamanian Nation is organized in Sovereign and Independent State, whose denomination is Republic of Panama; his government is unitary, republican, democratic and representative.

The Public Power only emanates from the people, it is exercised by the State as established

by the Constitution, through the Legislative, Executive and Judicial Bodies, which act limited and separately, but in harmonious collaboration.

The territory of the Republic of Panama includes the land surface, the territorial sea, the submarine continental shelf, the subsoil and the airspace between Colombia and Costa Rica, in accordance with the boundary treaties concluded by Panama with those States. Spanish is the official language of the Republic. [1]

### 3.1.3 Currency

The balboa is the monetary unit of the country; It is subdivided into 100 hundredths and is equivalent to the United States of America dollar.

### 3.1.4 Politic and administration division

It includes 9 provinces, 75 districts or municipalities, 3 indigenous counties (*Kuna Yala, Emberá, Ngöbe Buglé*), which have provincial level, since they have a county governor; 2 counties *(Kuna de Madungandí* and *Kuna de Wargandí*) with level of district, with which they complete a total of 621 districts throughout the country. [2]

### 3.1.5 Surface

Total of the Republic: 75,517km2. Metropolitan Region: 16,777.5 km2 and Rest of the Country: 58,739.5 km2. [3]

[1] Constitución Política de la República de Panamá, extracto del Título I.
[2] To see details about the politic and administration division of 1988-2003, see previous editions
[3] The surface data in km2 are subject to revision by the national geographic institute "Tommy Guardia"

### 3.1.6 Territorial Sea

It extends to an area of 12 nautical miles in width over which the Republic of Panama exercises its sovereignty, subsoil and over its airspace, whose area is 319.823.9 km2., Which exceeds its continental and insular territory.

### 3.1.7 Shore length

Panama has a considerable length of coasts, totaling 2,988.3 kilometers, of which 1,700.6 correspond to the Pacific coast; and 1,287.7 to the Caribbean.

### 3.1.8 Weather

The geographical situation in the low intertropical latitudes determines that the climate and vegetation are typically tropical. The maritime tropical climate, influenced by the two seas, is characterized by moderately high and constant temperatures throughout the year, with weak daily and annual oscillation, abundant rainfall and high relative humidity. There are two well-defined annual seasons: the dry and the rainy. The dry season runs from mid-December to April; and the rainy, from May to December.

### 3.1.9 Composition of the Panamanian population

As a consequence of the geographic position of the Isthmus and of a series of historical circumstances, the population is constituted by diverse human groups:

#### 3.1.9.1 Non-indigenous groups:

- **Hispanic-indigenous group**

It is one of the most important human groups of miscegenation. It is located on the Pacific coast, in the lowlands that run between the central highway and the coast of the provinces of *Chiriquí, Veraguas, Coclé, Herrera, Los Santos* and West of the province of Panama. Its economic activity is developed in all areas, with special emphasis on agriculture, livestock and trade. It is characterized by the conservation and promotion of the traditions and customs of the country.

- **Afro-colonial population**

They are the descendants of the African slaves brought to the Isthmus during the Spanish colonization. Some, when rebelling and flee from slavery, populated the Atlantic coast, jungle regions of the *Bayano, Darién* and the Archipelago of *Las Perlas*. Those who remained as servants, acquired their freedom by abolishing slavery and mixed with the other groups that interacted on the Isthmus, which is why they are found in all areas of economic activity and social strata of Panama. Even so, the descendants of the latter can be identified in the central provinces, in areas such as *Natá, Parita and Monagrillo*; and in *Chiriquí*, in areas such as *Puerto Armuelles* and *Alanje.* And of the first ones, in areas such as the *Costa Arriba* and *the Costa Abajo* of the province of *Colón; Pacora, San Miguel and Chepo*, in the province of Panama.

- **Afro-Antillean population**

They are the descendants of French or English-speaking Antillean workers who came to Panama mainly during the construction of the Canal, first brought by the French and then by the Americans. They are mostly located in the transit areas (cities of Panama and Colon) and in the province of *Bocas del Toro*. Their descendants, at present, interact in all the branches of the economic, scientific and cultural activity; and in the social strata of the Panamanian nation.

- **Other ethnic groups**

They are constituted by small groups that, by their number, only allow their classification as "*Colonia*". Of these, the oldest is the Chinese, which reached the Isthmus during the construction of the Transisthmian Railway in 1850. Other groups are the Hindus, the Jews,

Central Europeans and Central Americans, who came to the Isthmus attracted by the commercial peak during the era of construction of the Canal and later, by the works undertaken for its defense, operation and maintenance. They are engaged in economic activities related to trade and services

**6.1.9.2 Indigenous groups:** They represent approximately 10.1 percent of the total population of the Republic; They are constituted by eight clearly defined groups:

- ***Kuna***

Located mainly in the insular and coastal region of the *San Blas Archipelago,* as well as, in the continental region of rainforests of the *Bayano* River; in the District of *Madungandí,* constituted by a geographic area of the district of *Chepo* (province of Panama); in the upper course of the *Chucunaque* River and the tributaries of the *Tuira* River.

- **Embera-Wounaan**

Originating from the Colombian *Chocó,* they are concentrated in the margins of the *Darienitas* rivers and in the *Emberá* county. They present the typical characteristics of a rain forest culture. Its economy is based on subsistence agriculture, with secondary hunting and fishing.

- **Ngöbe-Buglé**

Formerly called "*guaymies*", it is composed of two groups: the *Ngöbe* and the *Buglé*. They are located mainly in the Comarca *Ngöbe-Buglé,* formed by the segregation of lands in the provinces of *Chiriquí, Bocas del Toro* and *Veraguas*.

- **Bokota**

It is one of the smallest and less known groups. They were identified two in 1927; they live in the east of the province of *Bocas del Toro* and in the neighboring regions of the northwest of the province of *Veraguas*.

- **Teribe**

Located in the district of *Teribe* (province of *Bocas del Toro*). According to the 2000 Census, they represent approximately 1.2 percent of the total indigenous population (3,805 people). It was determined that 15.2 percent of the population aged 10 years and over is illiterate. Its median age was established at 19 years.

- **Bri-bri**

It is located on the banks of the *Yorkín* River in Bocas del Toro. In 1911 it was planned that, because of its small number in the national territory, it should be considered as Costa Ricans, since in Panama it did not have the tribal or numerical status of the other indigenous groups. However, the last Census (2000) reported a population of 2,521 inhabitants, with a median age of 23 years. As for the illiterate population, the Census reveals that it represents 6.7 percent of the population of 10 years and over.

### 3.2 Discovery of the South Sea

In 1513, Vasco Nunez de Balboa undertook the conquest of the territories of the *Caciques Careta, Ponca* and *Comagre,* where he first heard of the existence of another sea on the part of Indigene *Panquiaco, Comagre's* eldest son, where he recounted a kingdom to the south of a population so rich that it used tableware and utensils in gold to eat and drink. The unexpected news of a new sea full of riches was taken very much into account by *Vasco Núñez de Balboa*, who organizes an expedition that departs from *Santa María La Antigua* on September 1, 1513. On September 25, *Nunez de Balboa* advances to the rest of the expedition and goes into the *Chucunaque* river range, and before noon he reaches the top of the mountain range from where he manages to see the waters of the new sea on the horizon.

*Vasco Nunez de Balboa* baptized the gulf where the expedition arrived as *San Miguel*, because it was discovered the day of *San Miguel Arcangel,* September 29 and the new sea as *Mar del Sur* for the route taken by the exploration of the isthmus course to the south. This fact is

considered by the history of Panama, as the most important chapter of the conquest after the discovery of America.

### 3.3 Economy

Over the years the Panamanian economy and its banking system have been known internationally as one of the most solid in the continent, an important component for this economic solidity, has been the stable growth of GDP, which on average advanced by 6.3% from the mid-1990s until the beginning of the decade of 2010, in addition to not having suffered contractions since 1988.

According to the world ranking of competitiveness of the World Economic Forum, Panama is after Chile the most competitive economy, and consolidates its position as the maximum of Central America. Besides, according to data from the World Bank, Panama has the highest per capita GDP in the Central American region, being approximately 16.993.82 for 2013, surpassing the per capita GDP of countries such as Mexico, Venezuela, Brazil and Peru PPA. According to different financial organizations, the Panamanian economy is considered of medium-high income.

Due to the sustained growth of the GDP during recent years, organizations such as the IMF project that by 2016 the country will reach $ 17,516 per capita, approaching slightly more than the income threshold of the developed economies, which stands at around US $ 20,000 per capita. The country is classified in the investment grade category by risk rating companies: Standard & Poor's, Moody's and Fitch Ratings. The Index of Economic Freedom of Panama in 2012 was 65.2 Points, placing it in the 55th world position.

### 3.4 Nicaragua

The general profile of Nicaragua according to the Food and Agriculture organization of the United Nations given in the following order:

### 3.4.1 Geographical coordinates

The Republic of Nicaragua is located geographically between 10 ° 45' and 15 ° 15 'north latitude and between 83 ° 00' 88 ° 00 'west longitude.

### 3.4.2 Surface

Nicaragua has a total area of 130,700 km2, of which 121,428 km2 correspond to the surface of the mainland and 10,384 km2 to bodies of water.

### 3.4.3 Location

Nicaragua is located in the center of the Central American isthmus, between the Republics of Honduras and Costa Rica, and the Pacific and Atlantic Oceans. It is bordered on the north by Honduras, on the east by the Caribbean Sea or the Antilles Sea, on the south by Costa Rica, and on the west by the Pacific Ocean.

### 3.4.4 Length of the Coastline

The coast of the Caribbean Sea has a length of 541 km and the coast of the Pacific Ocean of 352 km.

### 3.4.5 Maritime limits

The continental shelf has a depth of 200 m, the territorial sea extends to an area of 12 nautical miles with an exclusive economic zone of 200 nautical miles.

### 3.4.6 Climate, Soils and Topography

Nicaragua is physiographical divided into three large regions that have well defined characteristics of climate, soils and topography.

### 3.4.7 Elevations

The lowest point is located at 0 sea level in the Pacific Ocean and the highest point at 2107 sea level in *Mogoton*. Natural Hazards. Numerous volcanoes in the mountainous lands with violent occasional earthquakes.

Recent disasters: Hurricane Mitch.

### 3.4.8 Population

It is estimated a total of 4,632 million inhabitants (1997) in the country, of which 49.43% are women and 50.57% are men. It is expected that, if the current growth rate continues, the population will double within two decades. The total fertility rate in Nicaragua is one of the highest in Latin America. Nicaraguan women have between 4 and 5 children during their reproductive life, reaching 6 children in rural areas and only 3 children in urban areas.

### 3.4.9 Religion

Article 14 of the Political Constitution establishes that the state has no official religion. However, the population is mostly Catholic. According to studies of 1991 the evangelical population reached approximately 22% of the national population. However, it is an "atomized" congregation in more than 120 denominations according to CEPAD data.

### 3.4.10 Ethnic groups

In Nicaragua, seven ethnic groups live. Three are indigenous of ancestral origin in the national territory (*Mayangnas, Miskitos and Ramas*). Three other ethnic groups are immigrants, one from Europe (Spaniards) and two from the Caribbean islands, originating in Africa (*Garífunas* and *Creole*). The ethnic group of local development (*Mestizos "Güegüense*) is the result of an active genetic and cultural mixture in the last five centuries.

### 3.4.11 Language

The article 10 of the Political Constitution establishes that Spanish is the official language but also indicates that the languages of the indigenous communities of the Atlantic coast will have an official use in the cases contemplated by law. 96% of the population speaks Spanish. The remaining population corresponds to 3% of indigenous languages and 1% African-American.

### 3.4.12 Political Administrative Data

The capital of Nicaragua is the city of *Managua;* The official name of the country is the Republic of Nicaragua and the short conventional name is Nicaragua. The type of government is Republican, democratic and representative. It is divided into three powers: Legislative, Executive and Judicial.

The country is administratively divided into 15 departments and two regions that have autonomous status due to their ethnic and sociocultural characteristics. The departments are: *Chinandega, León, Managua, Masaya, Carazo, Granada, Rivas, Nueva Segovia, Madriz, Esteli, Jinotega, Matagalpa, Boaco, Chontales, San Juan* River and, the regions correspond to: Autonomous Region of the North Atlantic (RAAN) and the South Atlantic Autonomous Region (RAAS). Nicaragua becomes independent from Spain on September 15, 1821. The age of suffrage is 18 years.

Nicaragua has demonstrated its hospitable vocation. History tells that in September of 1502, the ships of the Admiral were shaken by a terrible tempest whose outcome seemed to be the

shipwreck. However, the storm stopped when turning at a point, and the time was completely transformed. Grateful the Admiral called "Thank God" to that corporal who still retains that name, and who became that way, point of reference of the national territory, and unmistakable sign of the cordiality that characterizes the inhabitants of our country.

Many surprises awaited the first conquerors who penetrated the newly discovered territory: an educated people descended from the *Nahuas*; dozens of lagoons of volcanic origin, large rivers and the possibility of establishing communication between both oceans via the wild and mighty *San Juan* River and Lake *Cocibolca*, called "Sweet Sea" for its 8,000 square kilometers of extension.

*Gil González Dávila* and *Cacique Nicarao*, lord of the Isthmus of Rivas, were the protagonists of a transcendental dialogue that showed to the Spanish the level of knowledge that the men had, whom from then on, he would call *Nicaraguas* or *Niquiranos*, a name that would be awarded by extension. to the rest of the inhabitants of the country, which began to be called Nicaragua.

According to the scholars, the word Nicaragua comes from the *náhualt "nic-atl-nahuac*", which would be translated "here beside the lake", or "*nic-Anahuac*" which means "Here the Anahuac", as reminiscence of the old "*Teotihuacán*" where they came from.

According to the tradition of those men, their ancestors came from the North, from where they had emigrated with the instruction not to stop until they found a lake with two volcanoes emerging from the waters (*Concepcion and Maderas*). That place was Nicaragua, and the volcanic island is still there, inviting foreigners to stay.

Five centuries have passed since then, and Nicaragua keeps alive its indigenous traditions, which are manifested daily in the words with which they call their places and cities, *flora* and *fauna*, medicines and food. For example, the name "*Ometepe*", the island of two volcanoes in Lake *Cocibolca*, means in *Nahualt* "*Dos Cerros*".

According to Hochleitner, A., (2015), in her analysis *La construcción del Canal Interocéanico en Nicaragua: situación de partida y efectos en el desarrollo nacional*, the Government of Nicaragua guarantee that the canal is an opportunity to promote development and improve

living conditions in Nicaragua. Thanks to the generation of new jobs, the expansion of infrastructure and an increase in direct foreign investments; a doubling of the gross domestic product (GDP) is expected. This would allow the second poorest country in Central America to solve many of its social and economic problems.

### 3.5 History of the interoceanic Panama and Nicaragua Canal

In this section, the history of the Panama Canal and its expansion will be detailed; In addition, the development of the Nicaragua Canal project will be explained, which allows us to give a bigger picture about the context of our research topic. Finally, a comparative table is made about the characteristics of each canal, to analyze the positive aspects of the canals. The Panama Canal was built in the early twentieth century, with the signing of a treaty between Panama and the United States, this construction had an investment of approximately 3 billion dollars to solve the problems of engineering, sanitation and organization. Conte. J., & Castillero, E. (2006).

These 15 problems were solved with the excavation through the Continental Mountain Range and the construction of a dam. In addition to designing and building the lock canal; and build the big floodgates. The first plans for the construction of the canal arise in the year 1513, when the explorer, Spanish conqueror *Vasco Núñez de Balboa*, crosses the Isthmus of Panama, which has a length of 700 kilometers in width and is located between the Pacific oceans and Atlantic. Conte, J., & Castillero, E. (2006).


*Figure 1:* Geographic Location of the Panama Canal.

Source*:* Chamber of Commerce Panama. Portal of the Government of Panama.

The geographical location of the Panama Canal is observed, which gives a broad view of the passage of ships through the Canal and how it connects with all the countries of the world.

Because of the discovery of *Vasco Núñez*, the emperor of that time *Carlos V*, initiates a movement to build a canal, through the Isthmus of Panama, by means of a decree issued in the year 1534. In the *Historia de Panama y sus protagonistas*, Porras say the King of Spain *Carlos V*, ordered to the regional governor of Panama, carrying out studies and plans to build the canal, following the route of the *Chagres* River, which will allow the ships to cross from the Atlantic Ocean to the Pacific Ocean and vice versa, however, when the studies were completed the governor He felt that such construction was impossible.

Later, in the year 1869, the French *Ferdinand de Lesseps*, granted 60 million dollars, for the construction of the Panama Canal, which begins with large-scale excavations, starting from the *Limón* Bay in the Atlantic; However, the continental mountain range obstructs the passage to the Pacific Ocean, this is how Ferdinand's critics advise him to build locks to take the ships

over the mountain range (mountains), but he did not accept it. At the end of 1885, only one-tenth of the canal had been excavated, tropical diseases caused the death of 6 million workers in the excavations and financial difficulties led to the decline of the Panama Canal project. After 17 years, the president of EE. UU., Theodore Roosevelt, in 1909 wanted to restart the studies of the construction of the canal, by what it designates to John Stevens, engineer and railway impresario, head of the project of the Panama Canal and buys the route of the Panama Canal for 10 million Dollars. Stevens, builds 3 locks in Lake *Gatún* 25 meters high and a dam, for the Panama Canal to connect the Atlantic and Pacific Oceans. Conte, J., & Castillero, E. (2006).

The 15 of August of 1914, the official transit of the ships begins, with the passage of the *SS Ancón*, the first ship that happened through the canal of Panama and consequently, the country of becomes the main place of transit of merchant ships from different parts of the world. The sustainable growth of the port logistics sector began in 1993, when the ports were granted by private companies. Today, the container terminals operating in the country are managed by three of the ten main global container terminal operators called *Neptunia, Ransa and Alconsa*. i. Expansion of the Panama Canal Expansion of the Panama Canal increased its capacity, the study of the infrastructure development was carried out by the Panama Canal Authority (ACP), the project includes the construction of the third set of locks, necessary for two factors:

First, the increasing number of vessels of 32 meters wide (Neopanamax or Postpanamax type ships), which are larger than Panamax vessels (smaller vessels) to cross the current locks and the second factor is the increase in Eastern economies such as China and India that increase maritime traffic. Conte, J., & Castillero, E. (2006).

The project includes the construction of two complexes of rolling locks, unlike the hinged locks as they are today, the first complex will be located in the Atlantic Ocean and another complex of locks will be located in the Pacific Ocean, three levels every 18 one, thus creating a line of traffic for transit Neopanamax or Postpanamax ships.

The Expansion had a cost of approximately 5,250 million dollars and the advantages that the Panama Canal has after the expansion are: Reduction of costs per transport unit, since more products can be transported in less time; greater efficiency through economies of scale; the increase of ships that transport dry grains such as corn, soybeans, wheat, mineral fertilizers,

coal and liquids such as liquefied gas, crude oil and petroleum products that have generated the most income.


*Figure 2:* Expansion of the Panama Canal.

Source: canal de panama (2017).

The third set of locks measuring 320.04 m was implemented. long, 33.53 m. of width and 12.81 m. of depth.

### 3.6 Expansion of the Panama Canal: Third Set of Locks

As a result of the expansion of the canal, Neopanamax vessels will be allowed to pass, which are larger than Panamax vessels. 19 finally, the expanded Panama Canal was inaugurated on June 26, 2016 and is 80 km long and has ports in the Atlantic and Pacific Oceans, ports that provide transshipment services, handling and distribution of cargo.

Moreover, the expansion of the Panama Canal is the catalyst for the development of the logistics and transportation conglomerate; likewise, it increases the movement of regional and global cargo offered by a wide variety of shipping services; and suppliers of supply chains.

Nicaragua Canal Project: The Nicaraguan government began construction of the canal in 2004 with an approximate cost of 50 million dollars, later in July 2012, the National Assembly of Nicaragua approved the 800 law "Special Law for the development of infrastructure and transportation in Nicaragua, related to the canal, free trade zones and associated infrastructures ". This law is approved to start up the Nicaragua Interoceanic Canal project and the Interoceanic Canal Commission is established, thus providing a solid legal basis for the construction of the interoceanic canal. Later, on September 6, 2012, Nicaragua's Interoceanic Grand Canal Authority signed a memorandum of understanding with HKND Group, a Chinese company to establish the scope of the project. HKND, (2014).

On June 13, 2013, the Nicaraguan National Assembly approved the construction of the Nicaragua Canal and granted the HKND Group the concession and exploitation for 50 years, extendable for another 50 years. Therefore, since December 22, 2014, the construction of the Nicaragua Canal begins, which crosses Lake *Cocibolca* (Lake Nicaragua) and its tributaries; the free trade zone of Brito, the Tourist Complex of San Lorenzo and the Rivas Airport. This canal covers 270 km2 that would connect the Caribbean Sea, in the Atlantic Ocean with the Pacific Ocean. HKND, (2014).

The Nicaragua Canal project is presumed to alleviate the heavy traffic of the Panama Canal and will also offer complementary routes for trade between Asia and the East Coast of North America, as well as decrease the time it takes the ships to pass through the canal, especially ships from Latin America (Brazil) to Asia, since they are ships that are too big. The construction of new ports, roads, tourist complexes and free trade zone will make it possible to take advantage of the changes in the international logistics chains, thanks to the low labor costs and the proximity to the large markets of the US, Mexico and South America. In this way, Nicaragua would become a regional production and distribution center.

One of the difficulties that the HKND group in China must face is the environmental factor, about the contamination of Lake *Cocibolca*, since it is a great concern for the population since

it is the primary source of drinking water in the region. As a result, HKND has already submitted to the Project Commission the study of the social and environmental impact that is under review. Within the commercial and economic perspectives of this great project, is that product of the construction of the airport, will receive large aircraft: The Airbus 380 or Boeing 777 that are cargo and passengers, even more the airport will have a capacity for 1 million of people and 22 thousand tons of goods. Within the investigations carried out by the company HKND, for the construction of the interoceanic canal, it proposed four alternative routes through which the locks will pass.


*Figure 3:* Considered routes for the Interoceanic Canal

Source: BID. By *Jean-Paul Rodrigue,* (2013).

Alternative routes for the construction of the Nicaragua Canal Source: HKND website. The Firm in charge of the construction of the Interoceanic canal, chooses the route four that begins in the southwestern coast of *Rivas*, from the south of the estuary of the *Brito* river, where an exclusive 33 m high will be placed. Finally, the Nicaragua Canal culminates in the Atlantic

Ocean on *Isla del Venado,* and the total route of the canal would be 278 km long, within which 105 km flows through the lake of Nicaragua. Said the canal would also pass through the *Cocibolca* river, being this route 4 the most economical, preventing environmental and social damages.

### 3.7 History of Hong Kong Nicaragua Canal Development Group

The Hong Kong Nicaragua Canal Development Group, is a Chinese firm with headquarters in Hong Kong and offices in Managua capital of Nicaragua, whose president is Wang Ming, an Asian billionaire, who was born in Beijing in 1972. Wang Ming is president and CEO of *Beijing Xinwei*, a technology and telecommunications firm. Later Wang Ming, is interested in HKND Group, which is in charge of the project of the Nicaragua Canal. HKND group, (2014).


*Figure 4:* Nicaragua proposed route

Source: Smithsonian magazine (2014).

The firm oversees the design, construction, operation and maintenance of the new Nicaragua Canal. In 2014, the company HKND receives the concession of the 50-year-old Nicaragua Canal for rights to build the canal and another 50 years to manage it, said canal is longer, deeper and wider than the Panama Canal. However, a critical point that makes it difficult is that the Company in charge will have to adjust so as not to harm the local population and the environment. HKND adjusted the design of the canal so as not to affect the inhabitants of *El Tule*, an agricultural district through which the highway passes between the lake ports of *San Miguelito* and *San Carlos*. In addition, the Chinese firm plans to build roads, 2 ports, an artificial lake, an airport, a tourist complex and a free trade zone, as well as steel and cement factories. Comparative characteristics of the Panama Canal and Nicaragua in the following comparative table, the vessels that will transit through the Nicaragua Canal will be of greater capacity and the locks will be longer and wider, which will allow a greater transport of cargo (products). Consulting with the research project of the Commission appointed by the government of Nicaragua, there are data on the projections of world traffic, expressed in metric ton, which by 2025 is estimated at 12.572 million tons.

### 3.8 Plans of The Nicaragua Canal

A 40,000-million-dollar plan to build a huge interoceanic canal that crosses Nicaragua and that rivals the Panama Canal was approved by the National Assembly of Nicaragua, dominated by the left political party.

The legislature dominated by the Sandinista Front of President Daniel Ortega approved to grant a 50-year concession to design and build the canal -with the option of another 50- to a company based in Hong Kong that seems to have experience only in telecommunications.


*Figure 5:* Nicaraguan President Daniel Ortega and Wang Jing

Source: Havana Times (2017).

For hundreds of years, explorers and governments have dreamed of a path that links the Atlantic with the Pacific. The proposed routes have gone from Mexico to Colombia, but many have focused on Nicaragua. Highlights:

- 1524: Spanish conquistador Hernan Cortes writes that a canal through Central America "would be worth more than the conquest of Mexico."

- 1825: The Central American Republic asks for help from the United States to build a canal that crosses Nicaragua and signs a deal with a businessman from New York. The project quickly failed.

- 1849: Nicaragua gives the Accessory Transit Company of Cornelius Vanderbilt the right to build a canal within 12 years. It builds a ground transit route but abandons it after years of local political turmoil.

- 1872: The government of the United States begins another survey on the route of the Nicaragua canal.

- 1881: A French company starts the construction of a rival route that crosses from Panama. Bankruptcy in 1889.

- 1885: Nicaragua once again grants the canal rights to the United States, which sends inspectors to study a possible route.

- 1887: American companies are created to build a canal in Nicaragua. Construction begins, but the project collapses in 1893.

- 1897: US President William McKinley appoints the Canal Commission of Nicaragua, which conducts a 20-month study throughout the country and recommends a route.

- 1904: The United States begins construction of the Panama Canal after buying the French concession.

- 1914: Inauguration of the Panama Canal, which allowed the ships to cross 80 kilometers (50 miles) between the Atlantic and the Pacific in 10 hours. At the same time, the United States pays Nicaragua $ 3 million for the option to build and operate a canal there.

- 1928: The United States Congress authorizes a new study of the Nicaragua canal route. The study lasted until 1931.

- 1989: The government of Nicaragua forms a commission to study the viability of a canal. Japanese experts come to the consultations on the idea.

- 1995: Investors from the United States, Asia and Europe plan a high-speed railroad of 400 kilometers (250 miles) and a cost of 1,400 million dollars, a "dry canal". The president of Nicaragua, Arnoldo Aleman, dismisses that plan two years later, citing possible negative environmental effects.

- 1999: German appoints a commission to study a maritime canal.

- 2006: The government of Nicaragua proposes a 280 kilometer (173 miles) and 18 billion dollars canal between points near Rivas in the Pacific and Bluefields in the Atlantic.

It is estimated that the construction will take between 11 and 12 years and that in the long run it will handle 4.5% of the world's maritime transport, with ships of up to 250,000 deadweight tons, almost double the capacity of the expansion of the Panama Canal.  scheduled to open in 2014.

- 2008: Russian President Dmitry Medvedev proposes the idea of his country building the Nicaragua canal.

- 2012: The Congress of Nicaragua approves a law to build a 30,000-million-dollar canal. Two Dutch companies receive a contract to study their viability.

- June 2013: Nicaragua approves the proposal of a canal project that will cost 40,000 million dollars and will be built by a consortium based in China.

# 4 Practical part

## 4.1 Benefit cost of The Panama Canal

The Panama Canal expansion project would largely decrease the instances of bottlenecks, lower the average transit times by rendering raised capacity and allow for transit of Post-Panamax vessels. The proposed plan for widening and deepening and excavating is supposed to increase the capacity to 42 vessels per day, which could even be extended to 51 vessels per day by 2020. By widening the Gaillard Cut, increasing the locomotive fleet from 80 to 100 units, and acquiring more robust tugs the average canal waters time could be significantly reduced. Increased daily transits, faster transit times and allowance of more tonnage would also make way for increasing toll revenue.

Given its level of cost effectiveness, international shippers and traders would be more enthusiastic about choosing the Panama Canal instead of the multimodal route, the Cape Horn Route, or the Suez Canal for transporting goods by large cargo vessels. With an estimated annual growth of container cargo commerce of 8.4%, the Panama Canal expansion and its augmented demand for the trade route, would inevitably contribute to the increased economic activity.

## 4.2 Defining a timeline subject to analysis

The Panama Canal expansion utilized the criteria to select an appropriate timeline for the analysis. The timeline chosen for the analysis was based on the estimated length of time the impacts caused by the construction of the project expected to last. While the impacts will extend beyond the construction phase of the project, they will last less time than the useful life of the project. In order to ensure that these impacts were included in the analysis, while not dissipating

them over an excessively long period, 2005 until 2025 was established as the timeline for analysis.

### 4.3 Net Value of investment

The net value for investment in the report provided by URS Holdings Inc. was estimated under two different situations. In the first situation, the net value of the investment was calculated under the assumption that tolls would remain constant over the lifespan of the project. The net value of the investment in the second scenario was calculated under the assumption that tolls would follow their current trend and increase over the lifespan of the project. Under both situations, the initial investment in the project was added to the expected costs over the lifespan of the project. The totals produced by this calculation were then subtracted from the expected net benefits of the project to yield the net value of the Panama Canal expansion project.

### 4.4 Expected costs

While both the net value of investment and expected net benefits of the project were calculated based on two different situations, the expected costs remain constant under either scenario. The expected costs used in the calculation of the NPV were calculated to be $3,624.67 million.

### 4.5 Rescue value

Another relevant consideration in the calculation of the NPV of the expansion project is to determine rescue value. While there are certain infrastructure projects that contain components that can be salvaged and res-old, the Panama Canal expansion project does not. Any potential salvage value for the expansion project would be minimal, and as a result was therefore omitted from the analysis.

### 4.6 Determining the useful life of a project

While the useful life of the Canal is expected to extend into the second half of the twentieth century, the timeline was chosen based on the estimated length of time the impacts caused by construction are estimated to last. As a result, 2007 until 2050 was established as the timeline for analysis.

### 4.7 Discount rate

In order to calculate the NPV of the Panama Canal expansion project a discount rate was constructed by URS Holdings Inc. For the analysis, a 50-50 debt equity ratio was selected to reflect the fact that only half the funds for the project will be borrowed, the remaining funds required for Canal expansion will come from the ACP. The first half of the discount rate was calculated using the reference rate of 6.5 percent (which is the yield of the T-bills or U.S. Treasury Bonds) and the inflation rate of two percent. Based upon these variables the cost of debt Kd is 1.065/1.02, which equals 1.044118 or 4.4118 percent. Equity, the second half of the discount rate, was calculated using the average profitability of national capital for the period 1993-2004. The rate of 9.9 percent was taken as the opportunity cost of for ACP. As a result, the discount rate for the Panama Canal expansion project was obtained through the following operation: dR = 0.5 (4.4118) + 0.5 (9.9) = 7.1559 %. This discount rate is used for all calculations throughout the analysis. URS, (2007).

### 4.8 Economic and Social Net Present Value (NPV)

Based on the criteria for constructing the indicators necessary for economic analysis URS calculated the NPV for the Panama Canal expansion project. To provide a more accurate picture of the impact of the project, the NPV for the expanded Canal was calculated under both constant and increasing tolls.

Under the constant tolls scenario, the sum of benefits between 2007 and 2050 was calculated to be $5,078.47 million while the sum of costs over the same period was calculated to be $3,624.67 million. The resulting NPV of the expanded Canal with constant tolls is $1,452.99 million. Plessix, J. (2011).

Calculation of the NPV with increasing tolls provided an even more favorable conclusion for proponents of the project. Under the increasing tolls situations, the sum of benefits between 2007 and 2050 was calculated to be $8,609.96 million while the sum of cost remained unchanged at $3,624.67 million. The resulting calculation yielded an NPV for an expanded Canal with increasing tolls of $4,984.47 million. Plessix, J. (2011).

### 4.9 Cost benefit of the Nicaragua canal

According to the Government, the Canal is a unique opportunity to promote development in the country and fundamentally improve the living conditions of people in Nicaragua. Thanks to the generation of new jobs, the expansion of infrastructure and an increase in foreign direct investment, a doubling of the national GDP is expected.

That would allow the second poorest country in Central America to solve many of its social and economic problems. The annual revenues of more than one billion US dollars generated by the Panama Canal cause envy and hope at the same time.

However, many economists doubt that only with the Canal the country can escape from its crisis. Due to the lack of interrelations with other economic sectors and their greater capital intensity, the Canal probably could not provide the necessary growth impulses in the long term. It could only increase economic activity in the short term. In addition, Canal revenues will be for 100 years for the HKND group, and not for Nicaragua. HKND, (2014).

Also, the positive effect of the generation of 250,000 new jobs must be relativized because it is mainly about low productivity jobs. Additionally, it is not clear if in fact they are going to generate so many new jobs.

The HKND group has already announced that they also want to employ mainly foreign workers - mainly Chinese. In the end, we cannot forget that about 30,000 people will be expropriated for the construction of the Canal. Most of them peasant families.

Profitability of the project the assumption for the justification of the 50-billion-dollar project is a long-term demand for a second canal in Central America. It is important to consider that Panama is already expanding the Canal to facilitate the passage of larger merchant and oil tankers. Although the Panama Canal was smaller than the Nicaragua Canal, revenues could be reduced for the latter. At the same time, new sea routes could be formed across the North Pole in the coming decades by global warming. Some of these routes are already navigable in summer. Scientists (as) also fear that the construction and maintenance costs will be higher than previously believed.

The first great technical challenge is the geographical situation of Nicaragua. The country of a thousand volcanoes has to face again and again with natural catastrophes such as earthquakes, volcanic eruptions and cyclones. The last ones will increase due to climate change. In addition, the route through Lake *Cocibolca* could present great difficulties. The wind in the lake drives strong currents of water that move a huge amount of sediment every day from one end of the lake to the other. To facilitate the passage of ships in the canal that will be dredged in the lake, it would be necessary to constantly remove the displaced sediments.

This special nature of the lake could then not only lead to much higher maintenance costs, but also cause significant delays in boat traffic and increase the risk of accidents. These insecurities are the reason why there are many people who ask about the profitability of the Canal with a lot of skepticism. There are two theories that try to explain why the HKND group still wants to build a canal in Nicaragua.

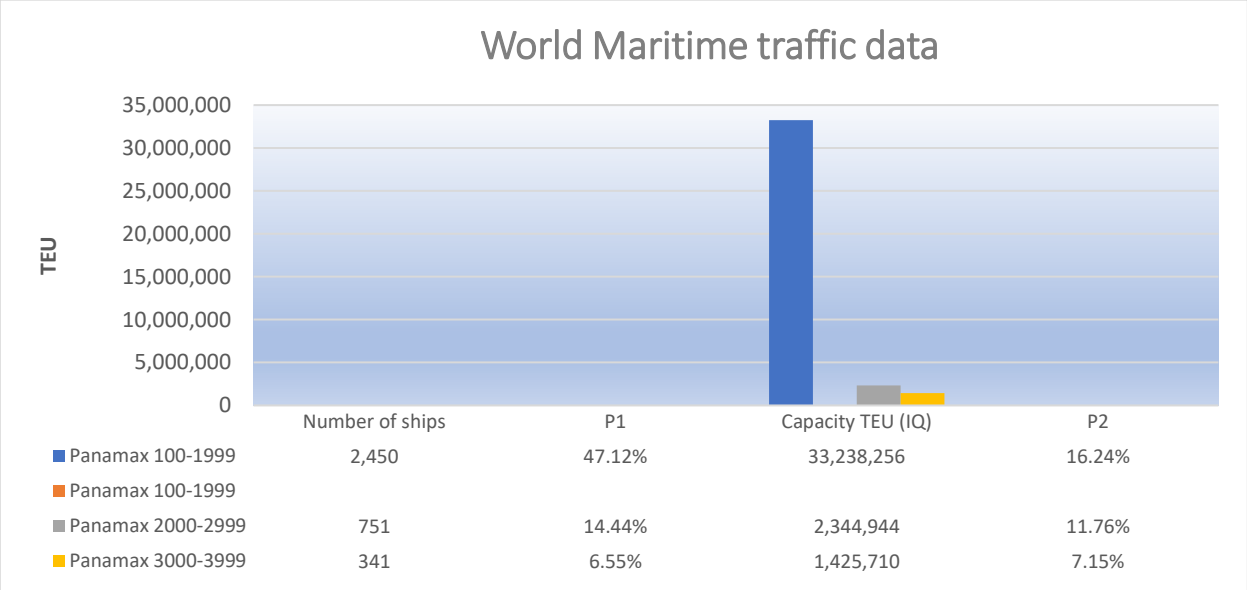
First, there are speculations that behind the plans for the construction of the Canal there is a geopolitical interest of the Chinese Government, with whom Wang Jing has close personal relationships.

Although this theory was denied by the authorities, it could also explain where the economic resources for the realization of the project come from, and why profitability is not the main concern. For the emerging economic power, a second canal in Central America would be very

important to strengthen its influence in the region and to become independent from the Panama Canal, which is still closely interconnected with the US. For example, there is still a right to intervene, so the US could block the Panama Canal in case of conflict.

A second theory proposes that the HKND group would not have concrete plans to build the Nicaragua Canal, but would seek with the concession to secure the exclusive rights in the sub projects, which do seem economically profitable.

They also reproach Daniel Ortega, who only wants to be enriched by the expropriations provided for in Law 840. From a legal point of view, the contract between the Nicaraguan Government and the HKND group would remain in effect without the construction of a canal with tax exemptions and all the other benefits. This hypothesis is corroborated by the fact that, months after the inauguration of the project in December 2014, nothing is still seen about the expansion and construction of the access roads.




| | Number of ships | P1 | Capacity TEU (IQ) | P2 |
|---|---|---|---|---|
| Panamax 100-1999 | 2,450 | 47.12% | 33,238,256 | 16.24% |
| Panamax 100-1999 | | | | |
| Panamax 2000-2999 | 751 | 14.44% | 2,344,944 | 11.76% |
| Panamax 3000-3999 | 341 | 6.55% | 1,425,710 | 7.15% |

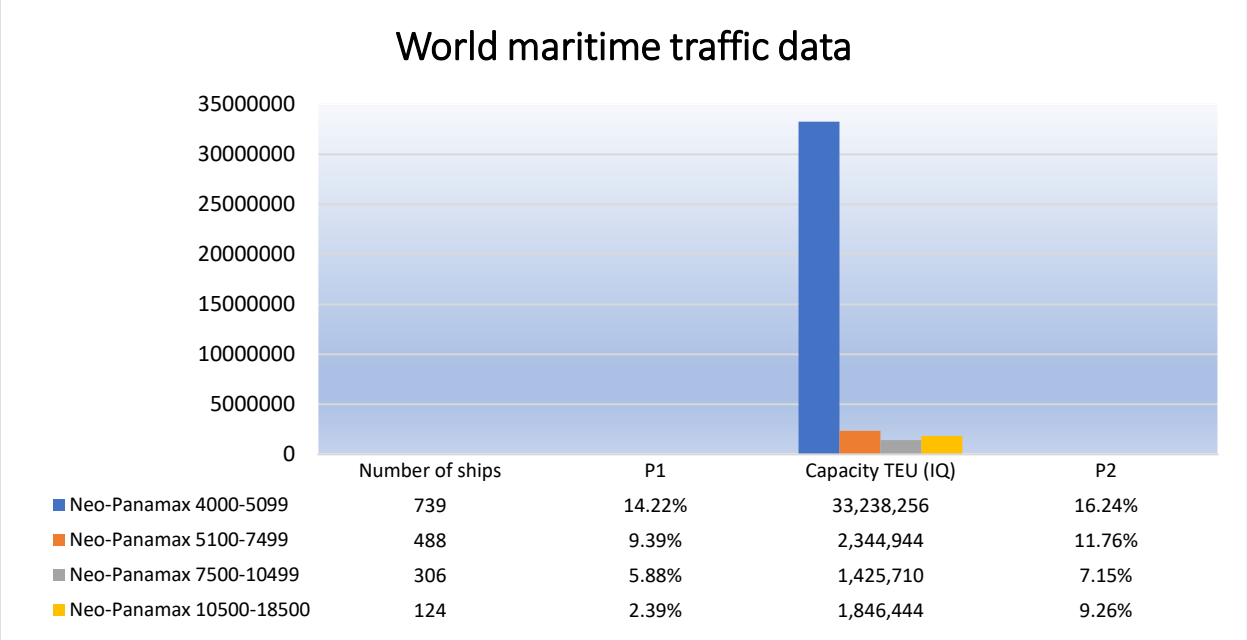
*Graphic 1: Ship Panamax Specifications*

Source: canal de panama (2017).

To create the following table, a classification of the containers was made by type of container ships according to the size and capacity of TEU, the number of ships existing in 2017 was taken

as a reference, then with percentage information of the distribution of the quantity of ships is the capacity of each ship worldwide with its respective percentage distribution, basically to obtain the TEU traffic capacity of each canal to find the projected revenues by 2019.

The growth was taken as reference of maritime traffic and on that the percentage of expected growth due to toll sales for the Panama Canal was applied, which would be 3.9% of maritime traffic according to the government of Nicaragua, an increase of 5.5% in the first five years is expected for the Nicaragua Canal, according to the intendancy of the Panama Canal.

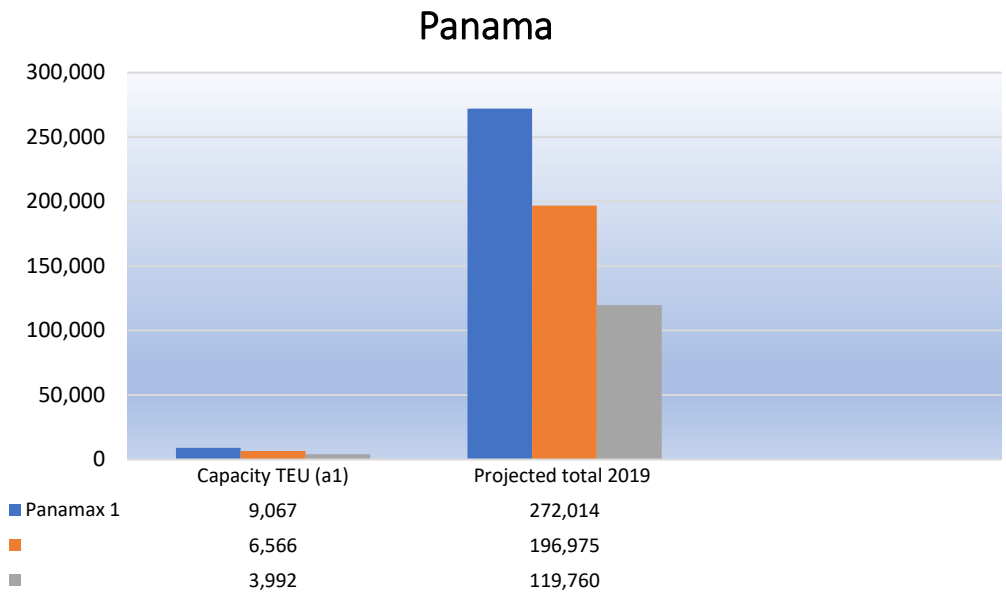


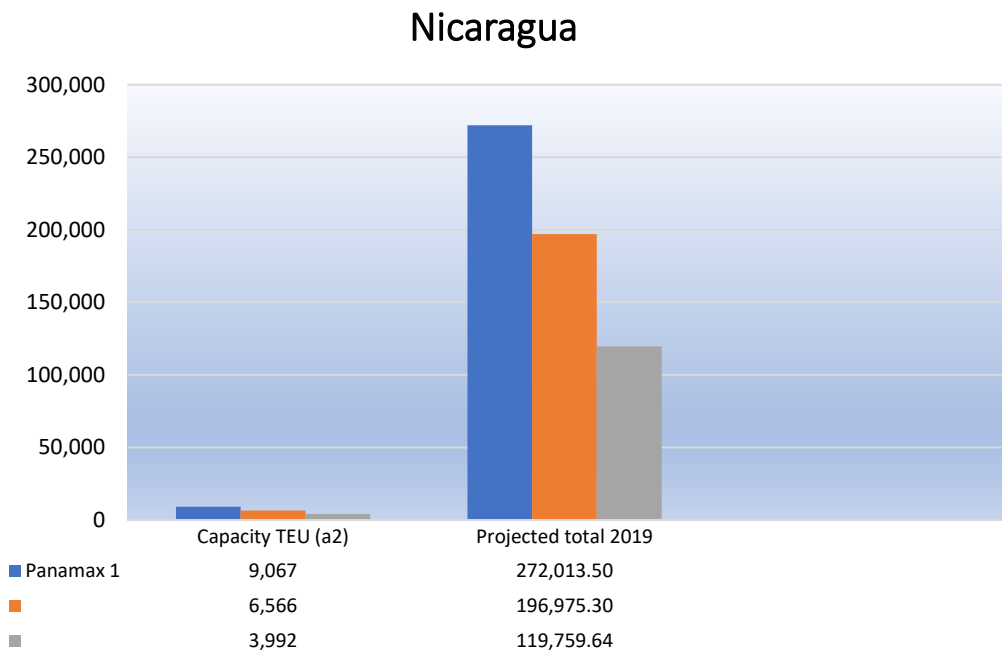

| | Number of ships | P1 | Capacity TEU (IQ) | P2 |
|---|---|---|---|---|
| Neo-Panamax 4000-5099 | 739 | 14.22% | 33,238,256 | 16.24% |
| Neo-Panamax 5100-7499 | 488 | 9.39% | 2,344,944 | 11.76% |
| Neo-Panamax 7500-10499 | 306 | 5.88% | 1,425,710 | 7.15% |
| Neo-Panamax 10500-18500 | 124 | 2.39% | 1,846,444 | 9.26% |

*Graphic 2: Ship Neo Panamax Specifications*

Source: canal de panama (2017).

Currently, the cost of tolling in the Panama Canal is $ 30 per container, the fee. It varies according to the size of the ship. With respect, to the Nicaragua Canal the toll was calculated based on what was indicated in the report of the Chinese company HKNG in 2010 and it would be 25% less, with respect to the current rate of the Panama Canal.




*Graphic 3: Projected revenue of The Panama and Nicaragua Canal.*

Source: canal de panama (2017).

### 4.10 Resolution of objectives

The information of the freight rates of December 2014 and December 2016 of the Hamburg sud line was taken as a basis, as it is one of the main customers of the Panama Canal. With the data obtained, a comparative table was made of the year 2014 with respect to 2016 to verify if there was a decrease or an increase in the prices of the freights of the main routes. For TSP studies, the three most commonly used routes that transit through the Panama Canal are considered, therefore:

- **Route 1:** Coast - East: corresponds to North America and Canada, which disembark the ports of: Everglades, New York, Baltimore and Charleston.

- **Route 2:** North Atlantic Coast: corresponds to the route that disembarks in Brazil and Colombia, the main ports are: *Santos* and *Itapoá* for Brazil and *Cartagena* in Colombia. By last.

- **Route 3:** Europe: the main countries that would use this route would be Germany, Spain and the Netherlands, which disembark in the ports of Barcelona and Valencia in the case of Spain, Hamburg in Germany and Rotterdam in the Netherlands.

*Table 1:* The 6 routes

| Route 1 | East Cost North American and Canada | | | |
|---|---|---|---|---|
| Origin Port | Destination Port | CNT 20 ft. | CNT 40 ft. | D |
| Callao | Port Everglades | $1,700.00 | $2,000.00 | 10 |
| Callao | New York | $1,500.00 | $1,700.00 | 16 |
| Callao | Baltimore | $1,500.00 | $1,700.00 | 13 |
| Callao | Charleston | $1,466.00 | $1,796.00 | 12 |
| Route 2 | North Atlantic Cost | | | |
| Callao | Santos (Brazil) | $1,500.00 | $1,500.00 | 25 |
| Callao | Itapoa (Brazil) | $1,900.00 | $1,900.00 | 30 |
| Callao | Cartagena | $1,200.00 | $1,200.00 | 7 |
| Route 3 | Europe | | | |
| Callao | Rotterdam | $1,500.00 | $1,500.00 | 22 |
| Callao | Hamburg | $1,800.00 | $1,800.00 | 23 |
| Callao | Barcelona | $1,700.00 | $1,700.00 | 25 |
| Callao | Valencia | $1,400.00 | $1,400.00 | 24 |

Source: canal de panama (2017).

### 4.11 Analysis of freight costs per container transported in Panama and the advantages for international trade.

For the next objective, costs were calculated and estimated from the average ship type could go through the Panama Canal (expanded). Based on an average ship, the main cost concepts of the ship are: berth, the towage; the reception and dispatch; headlights; the stowage and unloading; the use of dock; Operator costs represented by the costs of policies to operate in the port DPW and the costs to the user that are the internal costs to the own shipping lines or agents Shipowners as administrative expenses, among others.

In this objective the cost as a total value offered based on the port rate will be analyzed.

DPW of 2015, the final cost of the operation will be expressed by ship.

*Table 2:* The ship Suez Max has the following characteristics

| Ship Suez Max | |
|---|---|
| Eslora (m) | 367.3 |
| Manga (m) | 54 |
| Calado Max (m) | 21.86 |
| Capacity (TEU) | 101.5 |

Source: canal de panama (2017).

# 5 Comparison

The population of Panama has been about forty percent lower than the Nicaraguan population and has been disproportionately concentrated in the Panama-Colon Metropolitan Area, at both ends of the Canal, and its average level of schooling is much higher than that of Nicaragua.

Until the entry into force of the *Torrijos-Carter* Treaties, the Canal Zone was an extension of the North American economy and, although Panamanians who worked in the Zone suffered some wage discrimination, the reference salary pattern was that of the North American economy.

This determined that, although this enclave generated only a small percentage of total employment, its share of total income was high. To this was added much later the structure of high salaries of the International Financial Center.

This salary structure had the effect that from the beginning it promoted a hypertrophied growth of trade, to respond to the demand -mainly of imported goods- of the population concentrated in the Metropolitan Area and of the high salaries paid in the Canal Zone. and the Financial Center.

This salary structure, influenced by the comparatively high levels of both enclaves, and the full opening of the economy abroad, reduced competitiveness to domestic production destined for the domestic market or for export.

In Nicaragua, the wages paid to Nicaraguan workers in the Canal Zone will not be based on those of the North American economy: they will be more influenced by the competitive pressure of the Nicaraguan labor market, where most of the employment corresponds to jobs of very low productivity, Under employment is rampant and the rate of pressure on the labor market is very high.

In this context, no enclave that generates only three percent of total employment will be able to increase the level of productivity and per capita income to much higher levels.

On the other hand, although it produced relatively high incomes in the urban population, many decades after the start of the operation, the Panama Canal had not generated any "miracle of development" and eradication of poverty in that country. In the decade of the seventies the level of development of Panama, measured by its GDP per capita, was similar to that of Nicaragua.

The GDP per capita of Nicaragua only began to fall more and more behind due to the drastic reduction that it experienced in the following decade, without it having still managed to recover its maximum levels of the seventies.

Even so, in the decade of the nineties and the first half of the decade of the 2000s -which is when there are comparable figures- Panama, with a population forty percent lower than that of Nicaragua and with a much higher GDP per capita. , according to the World Bank, it showed a percentage of the population that had to survive with less than 1.25 dollars per day (in terms of purchasing power parity) higher than the one observed in Nicaragua, and according to the FAO, the percentage of the population that suffered Hunger in the first half of the decade of the 2000s was very close to that of Nicaragua.

The World Bank's Poverty Report on Panama in 2000 stated that:

> Despite Panama's relatively high per capita income, poverty remains a widespread problem. More than one million people live below the poverty level and, of these, more than half a million live in conditions of extreme poverty, although poverty is not as widespread or is so deep in urban areas, a significant proportion of the poor and almost poor lives in the cities of Panama.

# 6 Conclusion and recommendations

The Panama Canal was a limited transit area for Neo-Panamax and Panamax vessels, it was saturated and did not provide for the transit of vessels according to the analysis carried out in both the qualitative and the quantitative part. As a consequence, the construction of the Interoceanic Canal of Nicaragua to be able to supply the demand of world trade. The Nicaragua Canal will have complementary purposes instead of being competitive with respect to the Panama Canal. The expectation for the new Nicaraguan Canal is that freight costs per TEU will have to decrease since the transit will be more fluid and there will be lower costs in international transit.

In principle, the Panama Canal was a means through which time and money could be saved in transit of ships, with the expansion of the Panama Canal it was possible to save 88 containers of 40, however, with the construction of the Canal in Nicaragua, the freight rates per container would fall further, as analyzed in the qualitative part.

It is convenient, for international trade, the construction of the Nicaragua Canal not only because of, dynamism in the transit of ships, reduction of freight prices, increase of supply and demand of merchandise and reduction of time, but also this new Canal, will bring technological and tourist development, since, in addition, a tourist complex, a new airport and a commercial complex will be built.

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## Figures, graphics and tables

### Figures



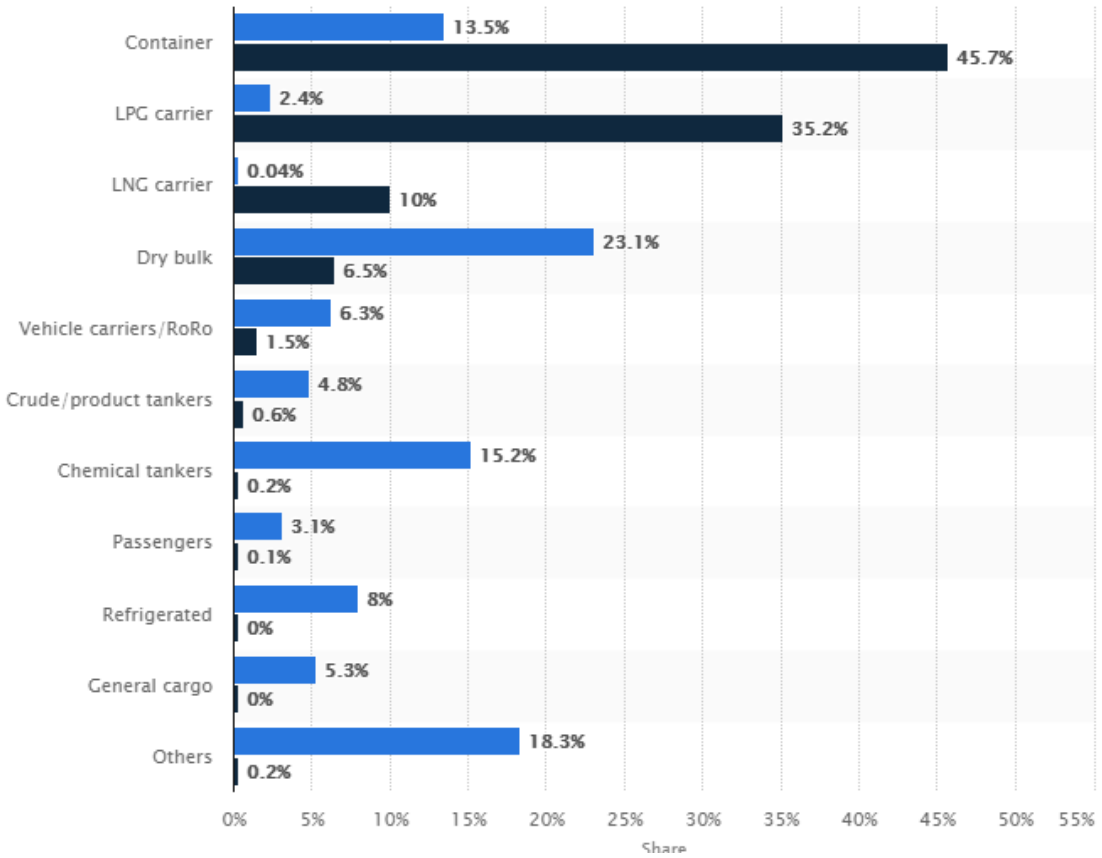
### Graphics



### Tables

**Supplements**

**Distribution of the Panama Canal traffic from October 2016 to April 2017, by ship dimensions and cargo type.**



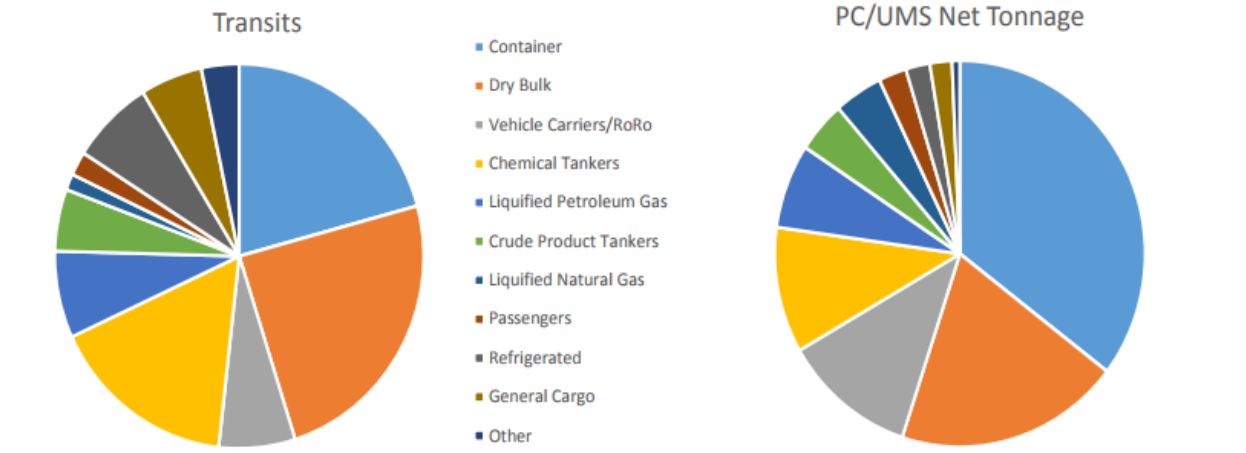

Source: canal de panama (2016)

These statistics shows the distribution of the Panama Canal traffic from October 2016 to April 2017, broken down by ship dimensions and cargo type. During the period of consideration, containers held the biggest share of traffic in the Neopanamax vessel class. To find out more about the number of transits in the Panama Canal from 2014 to 2016. The Panama Canal is an

artificial 48-mile waterway in Panama that connects the Atlantic with the Pacific Ocean. It takes the 7th place as one of the seven wonders of the modern world and is, to this date, the largest man-made structure in the world.

**Panama Canal Traffic by Market Segment**

| Market Segment | Number of Transits | | Panama Canal/UMS Net Tonnage[2] (thousands) | | Long Tons of Cargo (thousands) | | Percent of Increase or Decrease | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2017 | 2016 | 2017 | 2016 | 2017 | 2016 | Transits | CP/SUAB | Cargo |
| Container | 2,493 | 2,977 | 142,614 | 119,800 | 53,656 | 39,651 | (16.3%) | 19.0% | 35.3% |
| Dry Bulk | 2,915 | 2,634 | 79,135 | 65,800 | 96,241 | 89,525 | 10.7% | 20.3% | 7.5% |
| Vehicle Carriers/RoRo | 801 | 809 | 46,806 | 46,759 | 4,791 | 4,824 | (1.0%) | 0.1% | (0.7%) |
| Chemical Tankers | 1,959 | 1,899 | 42,473 | 39,619 | 39,464 | 38,319 | 3.2% | 7.2% | 3.0% |
| Liquified Petroleum Gas | 876 | 449 | 28,498 | 11,542 | 15,319 | 6,234 | 95.1% | 146.9% | 145.7% |
| Crude Product Tankers | 627 | 581 | 17,342 | 15,575 | 14,780 | 15,066 | 7.9% | 11.3% | (1.9%) |
| Liquified Natural Gas | 163 | 17 | 17,092 | 1,507 | 6,360 | 550 | 858.8% | 1034.4% | 1056.7% |
| Passengers | 240 | 213 | 9,812 | 8,185 | - | - | 12.7% | 19.9% | |
| Refrigerated | 868 | 948 | 8,450 | 9,040 | 3,274 | 3,340 | (8.4%) | (6.5%) | (2.0%) |
| General Cargo | 654 | 710 | 7,808 | 8,419 | 5,038 | 4,846 | (7.9%) | (7.3%) | 4.0% |
| Other | 396 | 447 | 2,740 | 3,199 | 2,083 | 2,349 | (11.4%) | (14.4%) | (11.3%) |
| **Total** | **11,992** | **11,684** | **402,770** | **329,445** | **241,007** | **204,704** | 2.6% | 22.3% | 17.7% |




[1] Only includes oceangoing commercial traffic, those paying tolls greater than the minimum tariffs implemented on June 1, 1998. (Small commercial traffic not included)
[2] The tonnage measurement system for Panama Canal tolls assessment, the Panama Canal Universal Measurement System (PC/UMS). This amount also includes the PC/UMS tonnage for full containership and passenger vessels.

Source: pancanal.com

## In an interview with *World Maritime News*, about the expanded Panama Canal they were assured:

Less than a week before the awaited inauguration of the expanded Panama Canal, when the first commercial transit of a Neopanamax vessel will take place, which will take place on June 26, 2016. The Panama Canal Authority said that, until On the date, most of the locks have been tested and have met the performance requirements.

At the beginning of June, the vessel hired by the Panama Canal, the Baroque Neopanamax MN bulk carrier, built in 2011, began to make steps through the expanded locks for testing and training that is expected to last 30 days.

It is expected that the steps through the locks serve to test the integration of the doors, their opening and closing capabilities, as well as the opening of the valve and the closure through the control system.

The inauguration ceremony of the Panama Canal Expansion will serve as the official opening of the two new locks complexes, *Agua Clara* (Atlantic side) and *Cocolí* (Pacific coast), and their access canals.

*World Maritime News* spoke with a representative of the Panama Canal Authority (ACP), ***Argelis Moreno De Ducreux*,** executive vice president of Planning and Business Development, maritime lines segment, to obtain more information about the current situation in the place, as well as the of the expected impact of the new canal on the maritime transport industry.

**How would you evaluate the interest in transit through the new locks since the reservations for passage of Neopanamaxes vessels are open?**

The interest in transit through the new locks can be evaluated in terms of reserves and the expression of interest of the main shipping lines that transit the Panama Canal in all market segments. For the container segment, shipowners have shown interest, and are planning to deploy approximately six to seven Neopanamax services during the first months after the

opening of the new locks. Currently, we have received more than one hundred reservation requests, most of the container ships, for the new locks of the Panama Canal.

**The Panama Canal Authority said the new canal would offer four more spaces per day for ships in this initial period, in addition to the 25 spaces of the current canal. As the authority plans to increase this number in the future, when would we expect to see the opening of more spaces? How many additional vessels could transit in the expanded Canal?**

We are being conservative regarding the number of space quotas offered in the initial stages of the operation until we acquire sufficient experience with respect to the operation of the expanded Canal. Once we are sure that we can handle a higher traffic demand, we will be increasing the number of reservation spaces. We are prepared to handle more than four Neopanamax vessels per day. The maximum will depend on mix of ships and traffic restrictions. We expect that the initial demand for the new locks will be relatively low but will gradually increase as our clients feel confident in the operation of the new canal. We hope to reach our maximum capacity in time with approximately 12-13 transits per day. In addition, depending on the mix of vessels and other variables, we expect to be able to handle between 35 and 38 vessels per day when considering the locks for Panamax and Neopanamax vessels.

**What will be the key impact of the expanded canal in the shipping industry and which shipping sectors / regions will be affected the most and why? What are your key expectations?**

The expansion of the Panama Canal is already having an impact on the maritime industry, and it is expected to change the trade patterns of all nations. Shipping lines, port facilities, roads and distribution centers in different regions are preparing to take advantage of larger and more efficient ships. The shipping companies are making the composition of their fleet bigger and the expansion of the canal will allow them to deploy larger ships through this waterway. Furthermore, the ports of the East and the Gulf Coast of the United States, some of

which serve vessels of up to 9,000 TEUs, are adapting their infrastructures to allow larger ships to reach their terminals. The ports on the east and west coasts of Central and South America are preparing to increase their commercial participation by taking advantage of the expansion of the Panama Canal. In this sense, giant vessels that transport coal from northeastern Colombia and iron ore from Brazil will be able to take the raw material to China through Panama at a lower price. Likewise, for Chilean copper producers it will be easier to export to European markets. The liquefied natural gas (LNG) that leaves Trinidad and Tobago to Chile can pass through the expanded Canal, saving hundreds of miles of maritime traffic.

**Can the expanded Canal compete with the Suez Canal or do we need a fourth series of locks that allows the passage of 18,000 TEU + vessels for real competition? Any plans for this fourth pair of locks?**

The Panama Canal recently implemented a new toll structure specifically designed to attract container ships through our route. The Panama Canal route provides greater time and distance savings, among other competitive advantages, compared to Suez, especially for traffic from Northeast Asia to the East Coast of the United States.

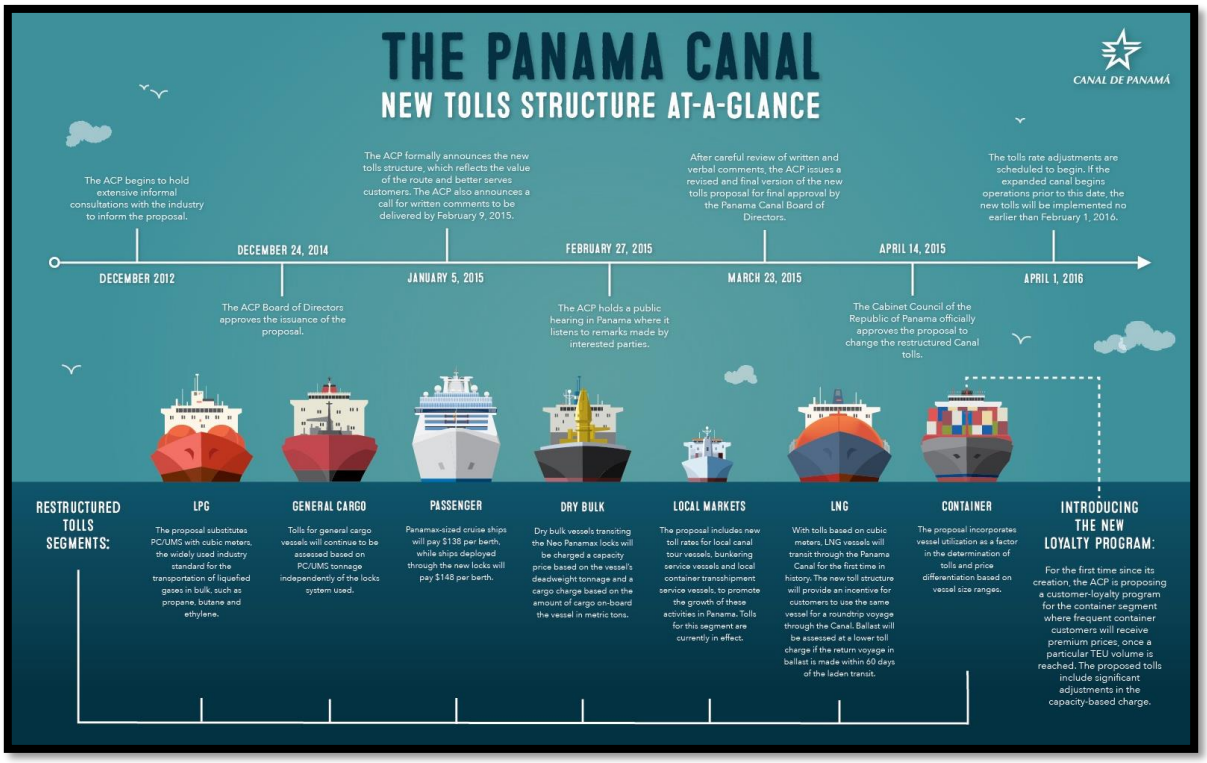
At this time, we do not expect to see the 18,000 TEU vessels arriving at the East Coast ports, as they do not have the infrastructure to handle them at the time. However, if the infrastructure limitations are resolved and there is the possibility of capturing the additional demand due to the increases in ship sizes, we can consider the construction of a fourth set of locks. We have already established the path for this new lane.

**Low fuel prices have prompted the Suez Canal to sacrifice 30% discounts for container ships sailing from the east coast of the United States back to Asia to ensure they do not avoid passage through the canal. Could we expect the Panama Canal to do something similar to increase interest in the new locks?**

On April 1, 2016, the Panama Canal implemented a pricing scheme that, for the first time, includes a customer loyalty program for the container segment. The objective of the

loyalty program is to animate TEU capacity volumes in container vessels that transit through the Panama Canal through the application of a system of tariff preferences. The new tariffs for the container ship segment differentiates TEU's total vessel (TTA) from tariff capacity and TEUs charged with the container ship's cargo rate using Neopanamax locks and / or existing locks. The TEU rate to be charged for container ships depends on the ship's load factor, which is defined as the amount of TEU charged at the time of transit.

*Figure 1:* New tolls structure at a glance




source: Panama Canal

**The Panama Canal Authority rejected the ITF safety study in the new locks and the project itself. Has the authority considered that the studies are wrong, if so, in what way? What would you say are the main conclusions that I disagree with and if there are plans for the discussion of safety issues with the ITF?**

The ACP dismissed the ITF's claims, since they are not based on mathematical models and did not include physical navigation test data as was done in the preparation of operations in the expanded Canal. Therefore, it lacked scientific precision and credibility. In addition, the authors had not traveled through the Panama Canal and are not qualified to do so. The ACP spent almost 10 years evaluating and analyzing the design of the locks, a process that included internal and external studies to determine how the new locks should work methodically and professionally. Moreover, the ACP has invested heavily in the improvement of its Maritime Simulation, Research and Development Center, as well as the construction of training facilities with the new scale maneuvering model for better training of pilots and tug captains.