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The Economic Effects of the Expansion of the Panama Canal on Maritime Trade

maritime economy

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"The Economic Effects of the Expansion of the Panama Canal on Maritime Trade"

Is a study carried out by Srm within a broader research project named

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that also led to the creation of a specialized portal www.srm-maritimeconomy.com

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We would also like to highlight that this research carries significant added value. In fact, visits of the locks and infrastructure of both the new and the pre-existing canals were carried out in Panama at two observation points: Agua Clara on the Atlantic and Miraflores on the Pacific Ocean.

We are grateful also for the interviews and the material provided by; Mr Oscar BAZAN (Executive Vice President Planning and Business Development, Panama Canal Authority), Mr Alessandro CASSINELLI (General Manager PSA Panama), Mr Juan Carlos CROSTON (Vice President Marketing & Corporate Affairs, Manzanillo Internazioneal Terminal), Mr Jovani GONZALEZ (Deputy Director General Directorate of Seafarers, Panama Maritime Authority), Ms Silvia DE MARUCCI (Executive Manager, Vice Presidency for Planning and Business Development, Panama Canal Authority), Mr Edgar PINEDA (CCO, HPH Panama), Mr Londor RANKIN (Panama Canal Pilots Association, President), Mr Gerardo VARELA (General Director, Ports and Maritime Ancillary Industries General Directorate, Panama Maritime Authority), Mr Nicolas VUKELJA DUQUE (First Vice President, Panama Maritime Chamber), Mr Ricardo UNGO (Manager Business Development Section, Executive Vice Presidency for Planning and Business Development, Panama Canal Authority).

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EXECUTIVE SUMMARY

The inauguration of the expansion of the Panama Canal is scheduled for June 26th, 2016.

The main data on the Panama Canal before the expansion

- Between **3% and 4% of world trade** travels through the Panama Canal; as well as **14.3% of grains globally traded, 5.6% of the chemical commodities and 3.7% of containers**.
- **144 routes, 1,700 ports and countries in the world** are involved in the passage through the Canal.
- The annual traffic counted almost 14,000 **ships**; the delivered goods were about **230 million tons**, 138 million **(60%) of which were bound for the Atlantic-Pacific direction** while 92 million **(40%) for the Pacific-Atlantic direction**.
- In the Atlantic-Pacific direction, the role of **Far East** countries was major while, in the opposite direction, traffic was mainly bound for the **East coast of the US** and towards Europe. Between 2001 and 2015, the traffic bound for Asia grew by +2.4% while that of the East Coast of the USA grew by +17%.
- The countries which mostly used the Canal were the **United States, China, Chile, Japan and Peru. Amongst the first 20 countries also rank: Spain (13th), Netherlands (14th), United Kingdom (17th), Belgium (19th) and Italy (20th)**.
- The 4 busiest routes were: **East Coast of the United States – Asia** with a total transit of goods amounted to 35.8% of the total; **US East Coast – West Coast South America** with 16%; **US East Coast – West Coast of Central America** with 7% and the route **Europe - West Coast South America** with 5.9%.
- The Panama Canal generated an **annual revenue** for the country of **$2.7 billion** and a **managing cost** of $1.25.
- The **direct contribution to the GDP of the country accounts for 6%, and adding the indirect contribution the percentage becomes 25%**;
- The average **transit time** of the Panama Canal is slightly above **12 hours** in one direction. The total average time (**transit + wait time**) is almost **31 hours**.
- Panama also has an important Free-Zone near the Canal: **the Colon Free Zone which numbers about 2,600 companies. Its trade amounts to $21.6 billion $11.4 billion of which are export**; the **Free Zone imports mainly from China** ($3.5 billion), followed by Singapore ($1.9 billion) and the United States ($922 million). Among the top 10 countries there is also Belgium ($236 million); the United Kingdom ($ 166 million) and Germany ($ 165 million). **Italy accounts for $157 million**.
- It is expected that the Free-Zone will be enhanced with the expansion of the Panama Canal.

The characteristics of the expansion work and its impact

- **The new Canal, which adds to the previous one, has provided for the realization of two locks**, one the Atlantic Ocean and the other on the Pacific. Each is composed of **three chambers** 55 meters large, 427 meters long and 18.3 meters deep. They are equipped with horizontally sliding sluice systems which **can overcome the existing difference in level between the oceans and Lake Gatun**.
- The realization of the project, started in 2007, was assigned to an **international consortium** "Grupo Unidos por el Canal" which includes the Italian Salini Impregilo SpA (consortium leader), the Spanish company Sacyr Vallhermoso SA, the Belgian Jan de Nul and the Panamanian CUSA.
- The **costs of expansion** of the Canal in the initial phase amounted to **$5.2 billion. It is estimated that the costs reached $6.2 billion in phase of realization**.
- The Canal employs **9,925 employees and over 30,000 jobs** have been created since the work of expansion have begun.
- **The revenues deriving from the annual management of the Canal** as a result of the expansion will rise potentially up to **$4 billion**.

The three main effects which the expansion of the Canal will have

- **The new Canal allows the passage of larger vessels**. The new locks will allow the passage of container ships **up to 13,000/14,000 TEUs**; the limit of the existing Canal is of 4,500-5,000 TEU; **the transit of the Canal will allow the passage of a greater load capacity (the Megaships)**; in 2019, **more than 95% of the container fleet will be able to pass through the Panama Canal**.
- **A new type of vessel will also be able to pass.** A new market segment **will expand the offer of Panama: this is the LNG (Liquified Natural Gas) and LPG (Liquified Petroleum Gas)**.
- **The number of transits in the medium to long term will increase**. The passage will potentially allow the **simultaneous transit of 3 ships**: 2 of smaller size in the old locks, and 1 through the new ones; potentially, the passage of **further 12 daily vessels** will be made possible, adding to the pre-existing 38 for a **potential total maximum of 50 transits per day**.

Main evidence on the impact of the Canal on the routes and on ports

IMPACT ON PORT FACILITIES IN PANAMA

- Today, the **Panamanian ports** are home to the world's major shipping companies including **Maersk, CMA-CGM, MSC, APL / MOL, Hapag Lloyd, Evergreen**. The expansion will likely extend the Canal's relationships to other leading global carriers.

- The Panamanian ports are handled by the **main terminal companies (e.g. Hutchinson Port Holdings, PSA, Evergreen)** that, in view of the expansion, **are making major investments**. As proof of the interest toward the area for the new terminal of **Corozal**, on the Pacific, 4 terminal operators of global significance came forward: APM (Holland), Terminal Link (France), PSA (Singapore) and Terminal Investment Limited (Belgium).

EVIDENCE OF THE IMPACT ON THE PORT AND MARITIME TRAFFIC TOWARD THE NORTH AMERICA

- **The expansion of the Canal will help broaden the strategic dimension of Panama allowing it to become an international maritime hub, especially for the USA**. Most of the cargo in transit will have as destination the main ports on the east coast of the United States; there are numerous expansion projects of **US ports** in progress: the ports of **New York** and **New Jersey** have completed the dredging operations that will allow the landing of larger vessels, as well as the ports of **Savannah and Charleston**.
- Between 2009 and 2014 **the US Federal Government allocated $320 million** for infrastructure projects along the East and Gulf Coasts. These investments will allow the **interception** the **new Post-Panamax** ships which will be now able to circulate in the Canal.
- With the expansion, **Panama will increase its potential as a hub and logistics port of reference with Latin America and the Caribbean**.

Panama-Suez comparison and respective interdependencies

- **On some international routes, the main competitor of Panama is Suez.** The extension of the Canal aims not to lose market share; an example of competition is represented by the Far East-US East Coast route which is one of the most travelled in the world (7.4 million TEUs per year): in 2010, 15 vessels passed weekly via Panama and 4 via Suez, in 2015, 16 ships travelled via Panama and 9 via Suez; an increase for both Canals, but higher for Suez.
- On the basis of a simulation carried out in a study on ships of 12,000 TEUs which will be able to pass through the new Canal, in terms of time and costs, Panama remains competitive on some strategic routes. Panama competes with Suez both on the **Shanghai-New York** route where estimates say that the cost to transit per TEU is $820 (to and fro), against the $830 of Suez, both on the route **Hong Kong-New York** where the cost of the trip per TEU is $830 against the $855 of Suez; **on the routes Shanghai-Rotterdam and Yokohama (JAP)-Rotterdam**, instead, more **competitive remains the transit through Suez**.

- However, a measure of the Suez Canal Authority of very recent approval (6th June 2016) launched **a tariff line that provides a discount of up to 65% on some container routes coming from the American ports on the East Coast and bound toward the ports of South and South East Asia**. This decision may be a strong incentive to intensify the passages through Suez, increase their competitiveness against Panama (which will probably be urged to review its tariff's strategies) and discourage the routes that circumnavigate the Cape of Good Hope also as a result of the decrease in the price of oil. All this will contribute to increasing the centrality of the Mediterranean and to strengthening the routes of traffic coming from the Atlantic, which enters the Mediterranean and after Suez, continuing towards the Far East.
- At the same time, **China** also is actively working to open a maritime "Silk Road" of immediate interest for its Mediterranean trades; in relation to this strategy there is a strengthening of the routes which from the Far East are directed toward the *Mediterranean*.

The possible impacts on world trade, and on the Euro-Mediterranean Area

- The widening of the Panama Canal **will have a direct impact on the economies of scale of the shipping companies**; an estimated overall increase in the volumes of goods transported by **15% in 2020 equal to 3% per year, has been calculated**.
- As a result of the expansion of the Canal the **traffic coming and bound for the following four macro-areas will grow more**: Asia (mainly China, Taiwan, Japan) with a potential increase of 4.3 % per year; South America (Chile, Colombia, Ecuador, Venezuela and Peru) with 4%; Central America (Guatemala, Mexico, Panama and Trinidad & Tobago) with 3.7%; North America (USA, Canada) with 3.5%;
- **Even Europe** (represented by Belgium, Netherlands, Italy, Spain and the United Kingdom) and **Italy will benefit from the expansion of the Panama Canal**. In particular, it evaluates an average annual increase of the tons exchanged by 2.2%.

The expansion of the Panama Canal is an engineering work of great importance and will have a strong impact in the short and long term on the routes and on the port facilities worldwide, in particular, on that of the American continent, with potential direct and indirect effects on Europe and the Mediterranean.

Introduction

The purpose of the paper is to highlight the perspectives and the economic benefits that the expansion of the Panama Canal will entail for the transport and the logistics industry at world level and in the Mediterranean. The consequences linked to this expansion will in fact be considerable. The paper also proposes a cost comparison between the main competing routes, the implications for cargo and trades and the composition of the global market. From North America, Latin America, Europe to Asia in fact, suddenly many nations will see the opening of alternative naval routes to access the markets.

The paper shows how the expansion of the Canal will allow the potential transit of over 95% of the world fleet of existing container vessels, while previously passage was allowed only to 73% of container ships[1].

The expansion will allow the passage of large ships, the so called "post-panamax" whose transit was previously impossible. Before the expansion, the Canal could contain up to 4,400 TEUs[2]. The new passage will allow the transit of 13,000/14,000 TEUs ships[3] (a three times larger size). The new Canal will also allow the flow of a new class of ships, the LPG (Liquefied Petroleum Gas) and the LNG (Liquefied Natural Gas).

Between 2008 and 2015 the Canal's traffic increased by 9.6%, reaching 230 million tons approximately[4]. A limited increase with respect to the real potential. However, the increase of traffic, the competitive pressure and the tendency to naval gigantism pushed the Panamanian government to invest in one of the largest maritime infrastructure projects in the world[5].

The Panama Canal is 81 km long, and thanks to its unique geographical position, located in the in the narrowest point separating the Atlantic (Colòn side) from the Pacific Ocean (Miraflores side), is an important connection for maritime trade lines on the East-West and North-South routes of the American continent. Panama also is a central hub for the connection with Asia and Europe.

Taking into account the strategic positioning of the Canal and of the inclusion of the project in the framework of a long-term approach, in the course of the paper, it will be shown that Panama will be able

[1] Oscar Bazán, Vice President Panama Canal Authority, "Panama Canal Expansion: implications and Opportunities", in *Trade Links with the New Latin America*, Panama, 25th June 2015.

[2] Ibidem.

[3] Ibidem.

[4] Long Tons.

[5] The old Panama Canal was built in two separate phases. In the first, between 1881 and 1888, the work was carried out by a French company led by Ferdinand Marie de Lesseps, who had instigated the Suez Canal. Later, the Canal was completed by an American company. The major technical problem, that is the overcoming of the internal plateau, was solved by creating three locks and a dam on the Rio Chagres river which gave origin to the Gatun Lake, the second largest artificial lake in the world. It is a system of 6 large basins linked to each other through sets of double locks. A pumping stations' net divided into two subsystems – that of Gatun on the Atlantic side and that of Miraflores on the Pacific side. Ships are "lifted up" by about 10 metres a time and trailed along the basins by powerful locomotives called "mules" from the input lock to the next and so on. The first ship which travelled the Canal was the Ancon, a 9000-ton ship. The realization of the Canal by the US was ratified by the US government and by the newborn state of Panama (once a Columbian territory) with the Hay-Bunau-Varilla treaty of 1904. The Canal was managed exclusively by the United States for 85 years, not without consequences to the relationship between the two countries. On 31st of December 1999, with the signature of another landmark treaty, the Carter-Torrijos, the Canal has become the property of Panama which now, through the "Autoridad del Canal de Panamá" (ACP) manages its organization, maintenance and the revenues it generates.

to transform itself from a transit point for ships of limited size in the new logistics hub of the American continent and the paper also will highlight how the market is reorganising itself in order to exploit this new waterway. In particular, the focus of the analysis will lay on the impact that the expansion of the Panama Canal may determine on world trades and on the Mediterranean.

The strategic relevance of the work will involve significant repercussions also for some European countries which are among Panama's main partners including Italy that is ranked among the top 20 countries with an inbound and outbound cargo traffic which exceeds 3 million tons. The interests of Italy on the ground are also linked to the commercial business and in particular to trade with the Free-zone of Colón toward which Italy export $157 million of goods. A value which could increase though, if Panama becomes a hub of the Americas, is that of the USA as the 1st sea trading partner of our country.

To give an idea of the degree of complexity and the new functionalities of the Panama Canal, the paper has been structured in 7 paragraphs. After the initial introduction, the second paragraph deals with the analysis of the trend of traffic between 2001 and 2015. The study of the main routes and major countries involved is provided at the end with a brief description of the free-zone of Colón. The third paragraph emphasizes the role and the potential developments of the new Panama Canal connected to infrastructural growth in the United States and in particular of the East Coast.

An extensive field investigation contained in the fourth paragraph gives the analysis strength and thoroughness. It consists of a set of interviews with key players in the Panamanian maritime cluster and opinion leaders as the Italian Embassy in Panama, Panama Canal Authority (ACP), Panama Maritime Authority (AMP), Panama Chamber of Shipping (CMP), Panama Canal Pilots Association. The study also includes some of the major terminal companies in the world: Hutchinson Port Holding Panama known as Panama Ports; PSA Panama and Manzanillo International Terminal. The voice of the port cluster's entrepreneurs is entrusted to Panama Tugs Group (PTG).

The fifth paragraph shows an analysis of competitiveness and offers a comparison between the Panama and Suez Canal and the main access points in the world with a thorough investigation on the times and costs of crossings, in order to provide an immediate picture of the competitiveness of traffic on the main world routes. The sixth paragraph estimates the expected impacts of the new Canal on the main geographical areas in the world and on Italy to 2020.

In the last paragraph, some conclusive remarks are provided, which concern policies related to the relationship between Panama and the Mediterranean which could further intensify thanks to the expansion of the Canal.

Trends and trade characteristics

On 26th June 2016 the new Panama Canal was inaugurated. A ship of the Chinese company Cosco, the 9,400-TEU container ship"Andronikos", 300 meters long, 48 wide and with a draft of 12.6 meters to cross the new locks first[6]. The Canal expansion project included the construction of a new set of locks and some ancillary projects of dredging and expansion with an estimated cost of 6.2 billion dollars[7], a cost rise compared to the 5.2 billion dollars initially estimated[8]. The new passage will run parallel to the previous one in two new sections of the new Canal which is much larger than the old one. New data already shows the demand potential; until September the passage of 4 ships a day will be possible alternating one-way but for the first day 25 reservations have already arrived[9] from shipping companies.

The route through the Canal accounts for 3-4% of world trade, 14.3% of grain trade, 5.6% of chemical trade, 3.7% of containers[10]. 144 routes pass through the Canal, these involve 1,700 ports and 160 countries[11]. The average transit time of the Panama Canal is 12.26 hours[12] in one direction.

The overall transit of goods in 2015 amounted to 229.1 million tons (equal to approximately 28% of the annual transits through Suez), of which 137.3 million (approximately 60%) in the Atlantic-Pacific route (Southbound) and 91.3 million (approximately 40%) in Pacific-Atlantic route (Northbound).

As can be inferred from the graph, the trend of the sector between 2008 and 2015 shows:

- a slight decrease in the number of ships in transit which in 2015 totalled about 13,874 units;
- a decline in the number of container ships, closes 2015 with the passage of 3,067 ships;
- a growth in the amount of cargo passed through Panama which in 2015 exceeded 229 million tonnes;
- the effects of 2009 global economic crisis and the obvious decline recorded in 2013 for the difficulties experienced by the US economy in that period.

Last year data, shows an increase of all three indicators analysed and in particular, an increase of 2.9% in the number of ships in transit, an increase of 6.6% of container ships and an increase of 0.7 % of the cargo. All in all, the traffic between 2008 and 2015 grew by 9.6%, that is 20 million tonnes of cargo.

[6] Port Technology (2016), *Panama Canal Unveil Winner for First Expansion Transit*, 3rd May 2016. https://www.porttechnology.org/panama_canal_unveil_winner_for_first_expansion_transit.

[7] Rodrigue, J.P. & Notteboom, T. (2015). *The Legacy and Future of the Panama Canal*.

[8] The Economist (2014). *What's going on with the world's canals*, 13th August 2014. http://www.economist.com/blogs/economist-explains/2014/08/economist-explains-9

[9] Norton Lilly International (2016). *Panama Canal Begins to Take Transit Reservations for Expanded Canal*, 20th April 2016.

[10] Oscar Bazán, Vice President Panama Canal Authority, "Panama Canal Expansion: implications and Opportunities", in *Trade Links with the New Latin America*, Panama, 25th June 2015.

[11] Oscar Bazán, Vice President Panama Canal Authority, 2016.

[12] Panama Canal Authority (2015). *Annual Report*.

Ships and cargo passing through the Panama Canal

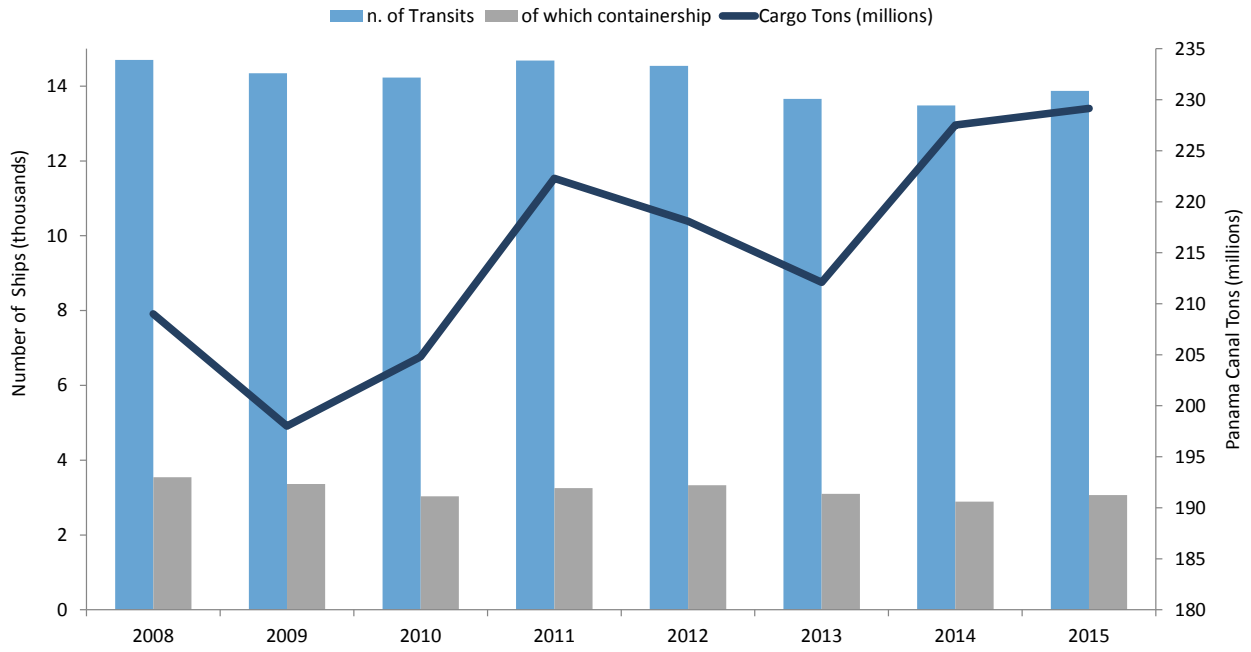


Figure 1 - Source: Panama Canal Authority

Of total trades by market segment, about 50% consists of dry bulk cargo, followed by Container (17%), then by Chemical Tankers[13] (14.7%) and Crude Tankers (8.3%). The Ro-Ro represents 2.2% of the market share.

Even if one considers the number of ships, the biggest market share is made up of dry bulk cargo (26.3%) and containers (24.8%), followed by the sector of refrigerated[14] goods (7.8%) which is likely to increase after the Canal's expansion and the growth of Ro-Ro (6.8%).

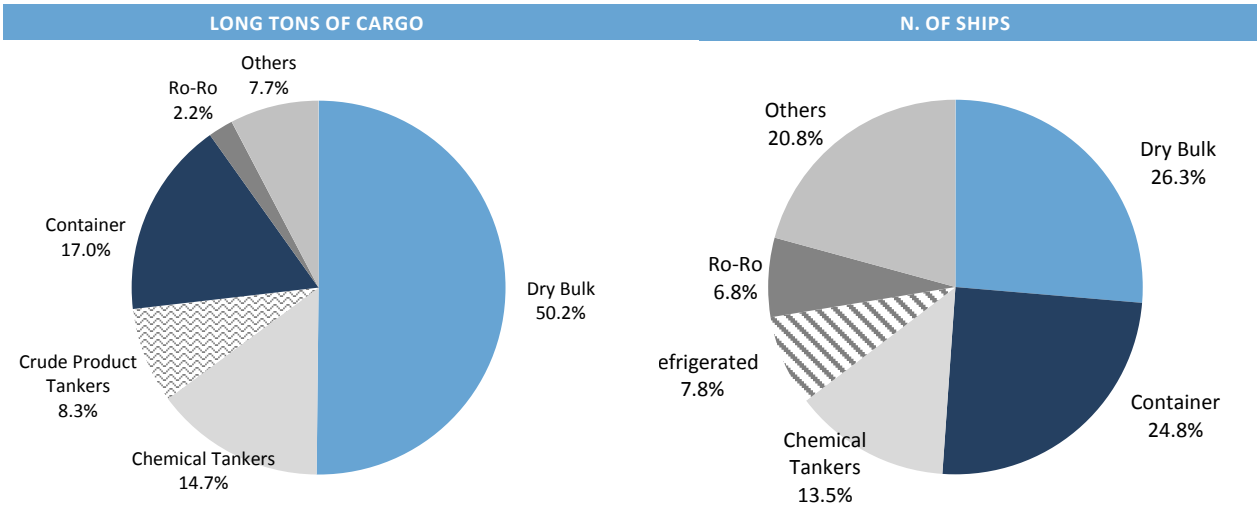
In terms of type of cargo [15], along with container ships (17%) grains (23%) and oil products have a significant weight. The three types cover 60% of the total amount transported.

[13] Included in this graph but non included in the first 6 positions by number of ships.

[14] Included in this graph but non included in the first 6 positions by tons.

[15] In Long Tons.

Traffic in the Panama Canal – number of ships and cargo in 2015



N.B. The % has been calculated on the total amount of tonnes.

Figure 2 - Source: Panama Canal Authority 2016

Traffic in Panama Canal by type of commodities in both directions to 2015

Commodity	Atlantic to Pacific	Pacific to Atlantic	Total	%
Grains	49084	2939	52023	23%
Oil	36722	9713	46435	20%
Container Cargo	18418	21594	40012	17%
Ores and Metals	2001	12313	14314	6%
Chemicals	8608	5117	13725	6%
Mineral miscellaneous	172	11299	11471	5%
Coal and Coke	7499	2526	10025	4%
Nitrates, Phosphates and Potash	3958	3581	7539	3%
Manufactures of Iron and Steel	539	6378	6917	3%
Miscellaneous	2736	3913	6649	3%
Machinery and Equipment	1800	3382	5182	2%
Other Agricultural commodities	992	2102	3094	1%
Unclassified	2148	799	2947	1%
Animal oil and Fats	418	2216	2634	1%
Lumber and Products	935	1554	2489	1%
Canned and refrigerates Food	145	2332	2477	1%
Miscellaneous Hazardous Cargo	1035	132	1167	1%
TOTAL	**137210**	**91890**	**229100**	**100%**

Table 1 - Source: elaborations of Panama Canal Authority data

To 2015, the main routes which passed through the Canal were:

- Us East Coast - Asia which covers 35.8% of the total amount of the cargo in transit;
- Us East Coast - West Coast of South America with 16%;

- Us East Coast - West Coast Central America with 7%;
- Europe - West Coast of South America with 5.9%.

The total percentage of these routes to the Canal's traffic accounts for 64.8%. The East Coast of the US appears as the main reference basin of the traffic passing through Panama from which 60% of the total amount originates. Panama is an important reference point for the USA. Furthermore, most of the traffic crossing the Canal goes between Asia and the East Coast of North America.

Data clearly shows the Panama Canal's role as a crossroad of the traffic between the east and west coast of the United States as much as the traffic with South and Central America. Panama's traffic includes Europe as well – especially on the Europe-South America route – which ranks 4th as for route importance.

Maritime trade lines passing through the Panama Canal

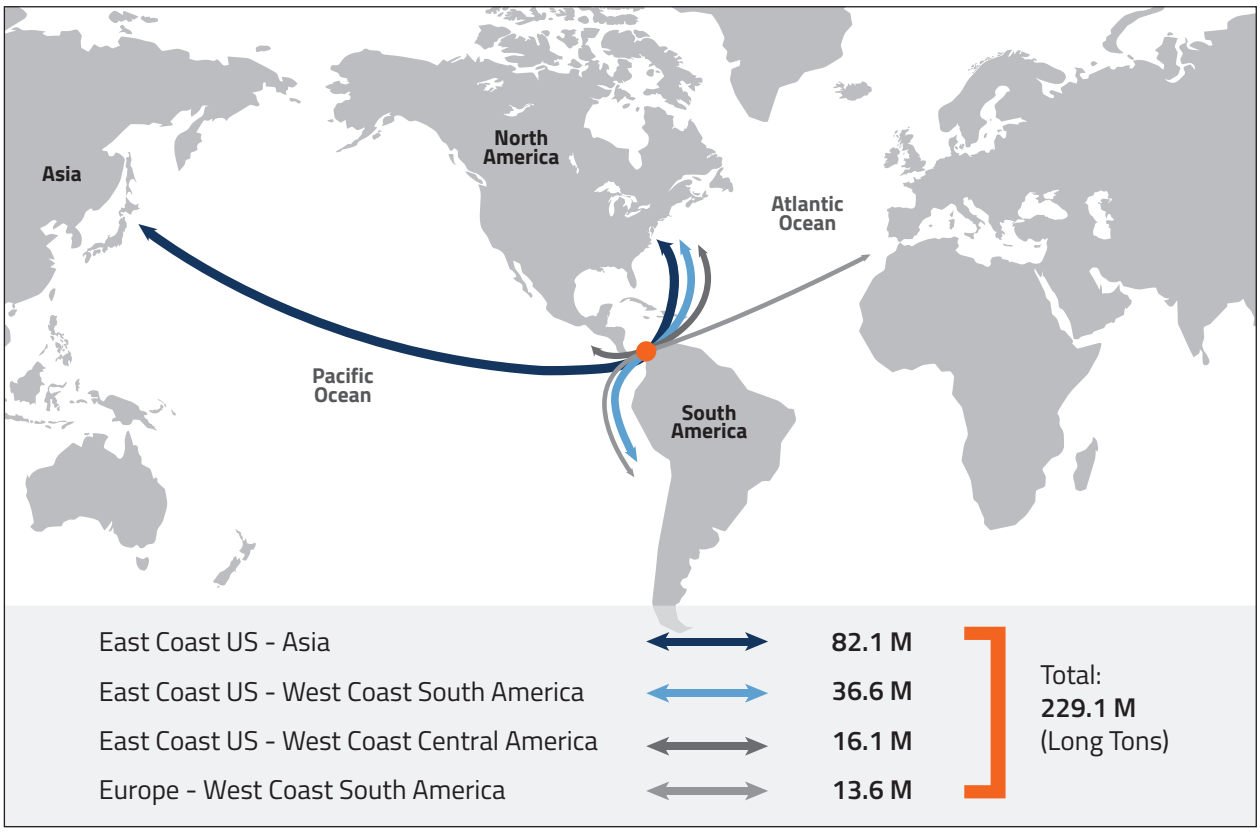


Figure 3 - Source: SRM's elaborations on Panama Canal Authority data

The analysis of the first 4 routes operated in 2011 and in 2015, shows a change in the impact of routes and traffic paths. Compared to 2011, the routes between the East Coast of the US and Central America have become more considerable. This phenomenon will presumably increase with the opening of the new Panama Canal and with the possibility that the advocated suspension of the embargo to Cuba is realized. The European route seems to be strategic as well, in fact, the route Europe-West coast of South America comes in 4th, while the route Europe-West coast of the US/Canada has lost a position compared to 2011 but remains influential and therefore ranks 5th.

Traffic in the Panama Canal – Main route up to 2015

Rank	Vessel trade Route	Long tons Cargo	
1	**East Coast US - Asia**	**82144**	**35.8%**
2	**East Coast US - West Coast South America**	**36618**	**16.0%**
3	East Coast Us - West Coast Central America	16091	7.0%
4	**Europe - West Coast South America**	**13630**	**5.9%**
	4 Routes on total	148483	64.8%
	Total	229149	100.0%

Table 2 - Source: Panama Canal Authority

Traffic in the Panama Canal – Main route up to 2011

Rank	Vessel trade Route	Long tons Cargo	
1	**East Coast US - Asia**	**87286**	**39.2%**
2	**East Coast US - West Coast South America**	**26202**	**11.8%**
3	**Europe - West Coast South America**	**15175**	**6.8%**
4	Europe - West Coast U.S./Canada	11742	5.3%
	4 Routes on total	140405	63.1%
	Total	222433	100.0%

Table 3 - Source: Panama Canal Authority

The analysis by country shows that the Panama Canal has become an essential logistics hub between the East coast of the US and the growing Asian market. However, the list of the user countries does not end here: The Canal is a fundamental piece for the export of some South American States – Chile, Peru, Colombia, Mexico, Ecuador and Guatemala. At the same time, the Canal also is looking with interest to the European shores in particular those of Northern Europe (with the ports of Rotterdam and Antwerp in the lead) but also Southern Europe (Spain and even Italy) thus confirming its status as a vital macroeconomic asset. The United States is the first placed country to pass through the Panama Canal with 160.7 million of tons[16]. In second place there is China with 48.4 million tons. Significant, is also the presence of Spain, Netherlands, U.K. Belgium and Italy amongst the first 20 countries although with meagre amounts.

[16] By origin and destination.

The 2015 top 20 countries by total traffic (origin and destination) – data in millions of tons

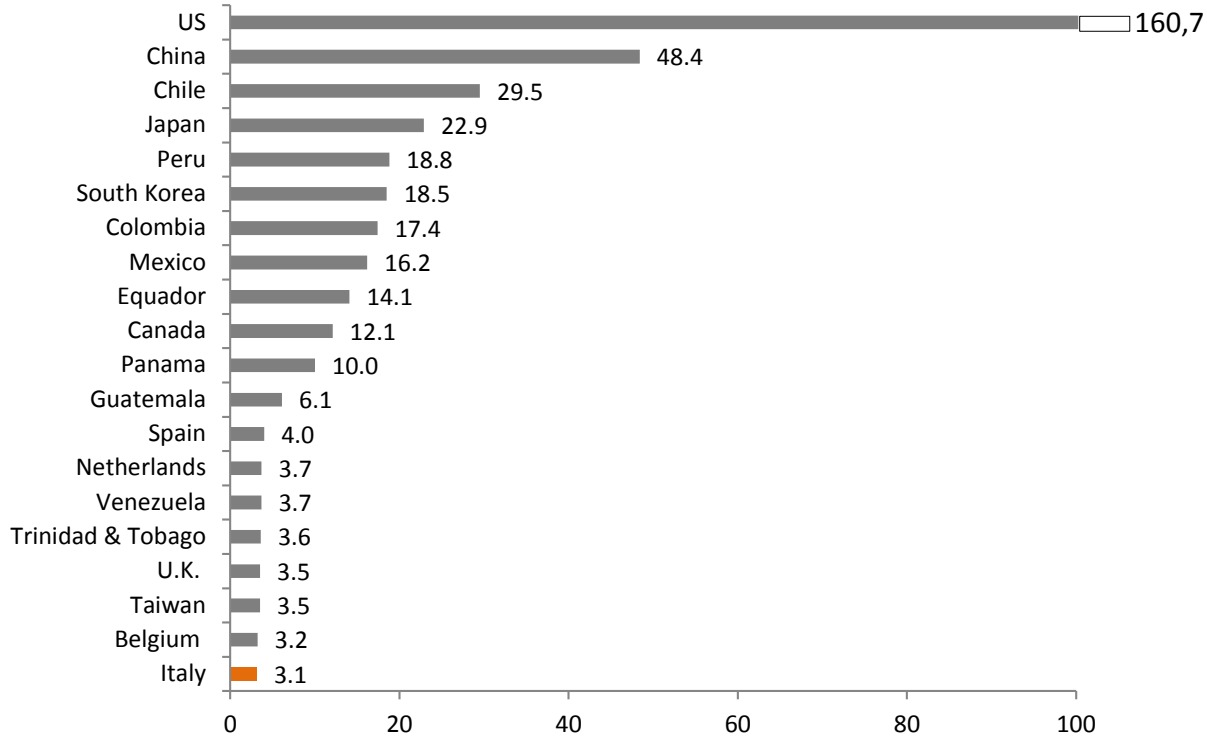


Figure 4 - Source: Panama Canal Authority

Italy and the top 10 coutries by origin and destination of cargo (long tons)

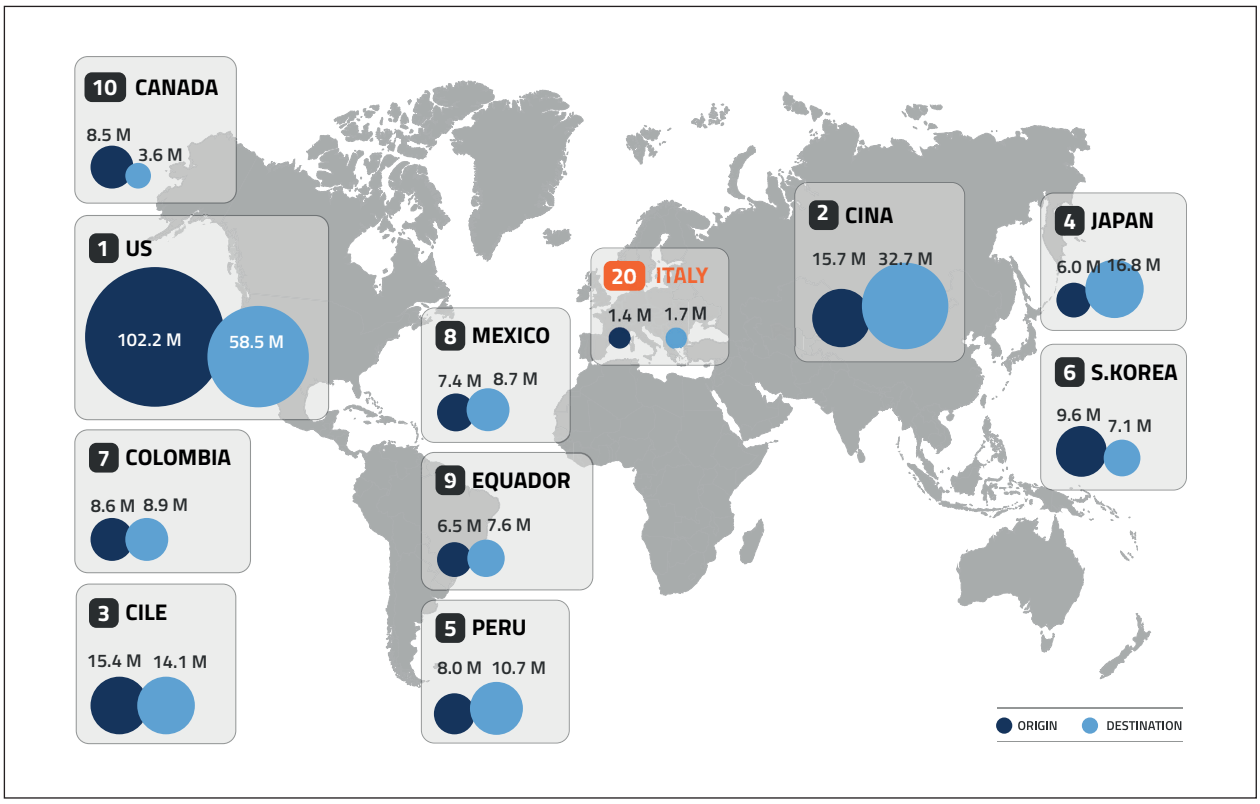


Figure 5 - Source: SRM's elaborations on Allianz Global Corporate & Specialty / Panama Canal Authority data

Trade by origin and destination

The study of the traffic direction reveals a prevalence of the Atlantic-Pacific flows which, in 2015 accounted for 59%. Along this route, the main region of destination was Asia, towards which 59 million tons of goods, accounting for 44% of all the total transits from the Atlantic to the Pacific were directed, however, it records -10 b.p. compared to 2001. Asian trade is followed by those involving the South American West Coast (26%) which, conversely, grew by more than 10 b.p. and by Central America (11%) about -1%. The trade with the West coast of the USA is half that.

Destination of trade from the Atlantic to the Pacific Ocean 2001-2015

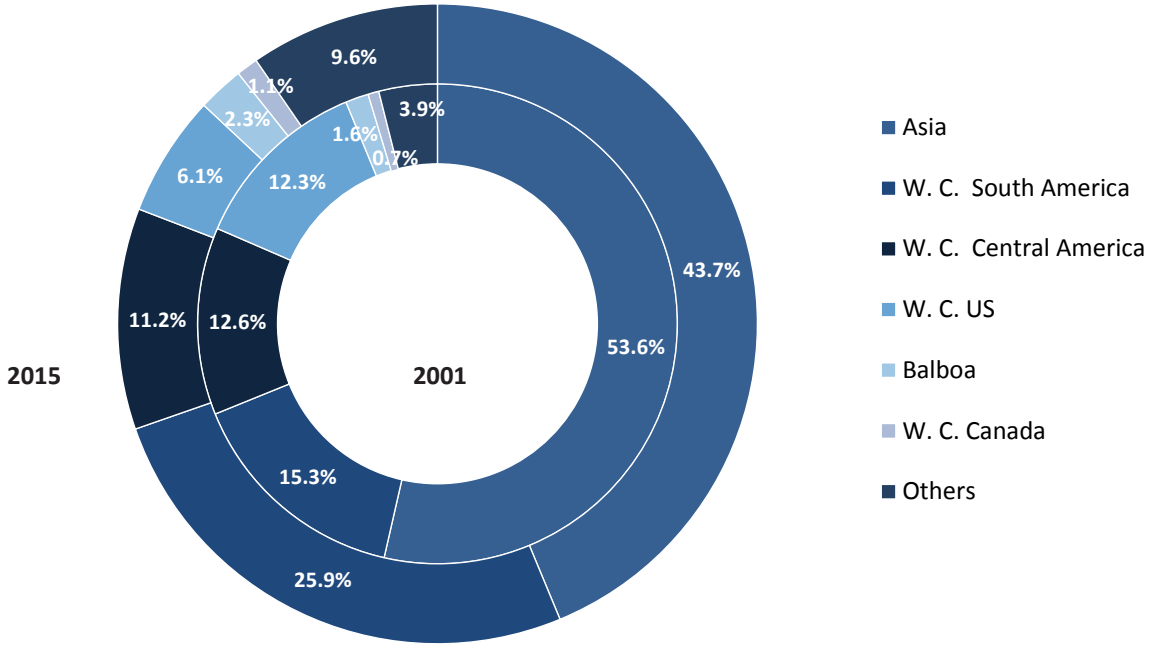


Figure6 - Source: elaborations on Panama Canal Authority data

The focus on the origin of the traffic from the Atlantic to the Pacific shows a predominant role of traffic originating from the East coast of the United States from which it receives more than 70% of traffic. The data also grew by 5 b.p. over the 2001-2015 period. The trade from the US is followed by that originating in Europe which amounts to about 10%. The East coast of South America shrank by 4.5 b.p. between 2001 and 2015.

From the Pacific to the Atlantic there is a high prevalence of trade towards the East Coast of the United States and Europe as traffic's destinations. Until 2015, over 47.7 million tons of cargo, equal to more than half of the increase in traffic (about 4 b.p. between 2001 and 2005), were directed towards these regions through Panama. More than 16 million tons, corresponding to approximately 18% of the total traffic in this direction head to Europe; down by more than 9 b.p.

2015 trades on the Atlantic-Pacific route mainly originates from Asia (38%); these flows also are on the rise from the west coast of South America. The west coast of Central America which covers about 10% of the market share

Origin of trade from the Atlantic to the Pacific Ocean 2001-2015

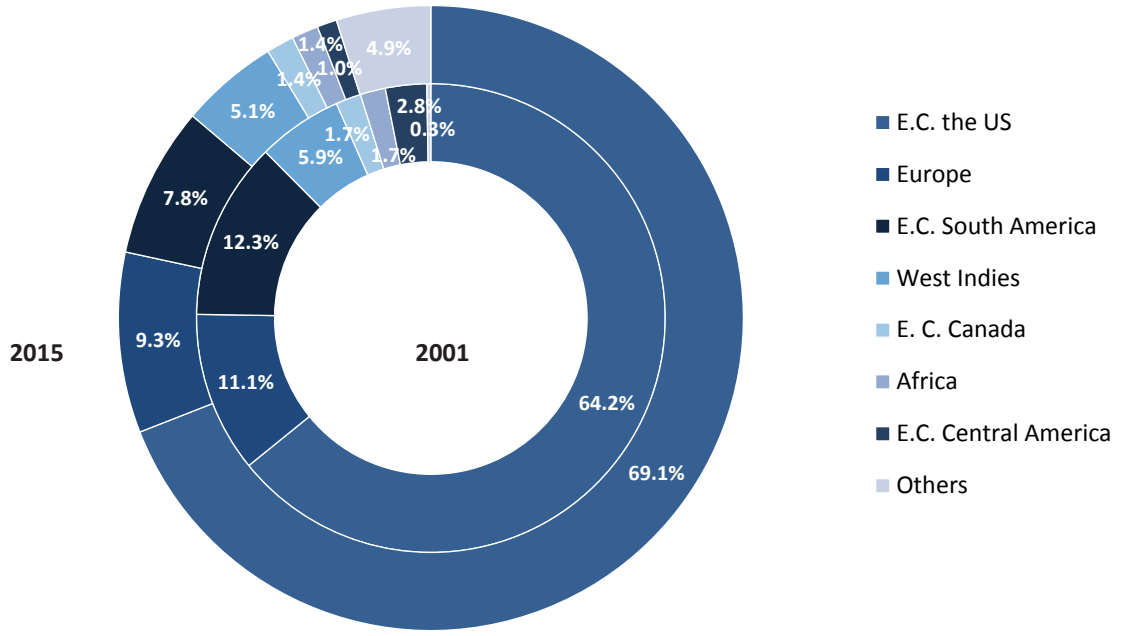


Figure 7 - Source: elaborations on Panama Canal Authority data

Destination of trade from the Pacific to the Atlantic 2001-2015

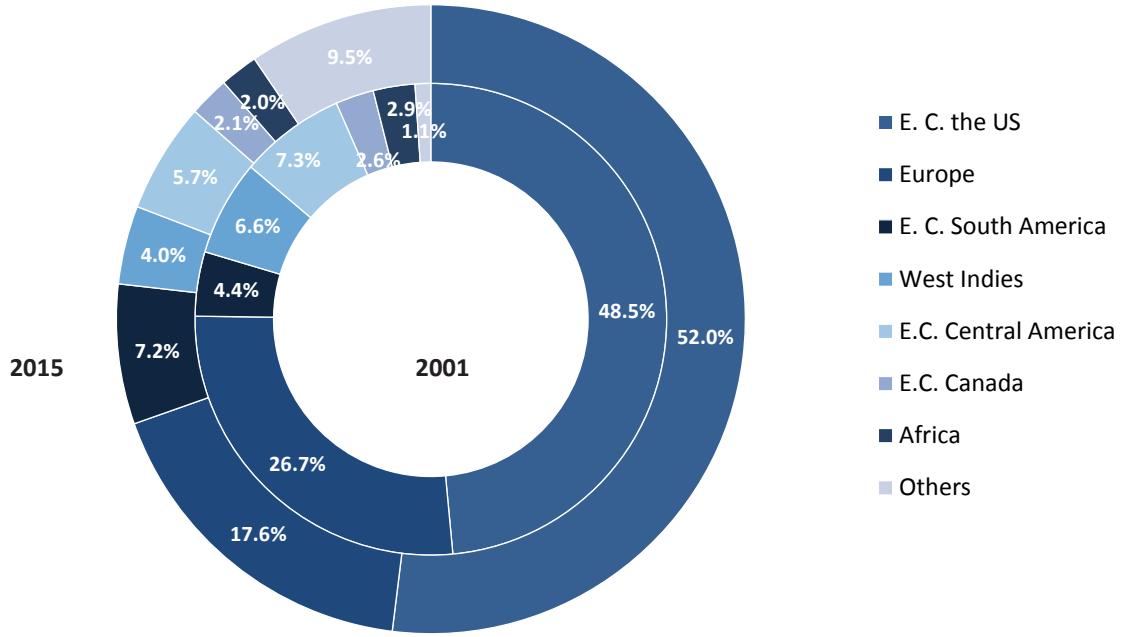


Figure 8 - Source: elaborations on Panama Canal Authority data

Origin of trade from the Pacific to the Atlantic 2001-2015

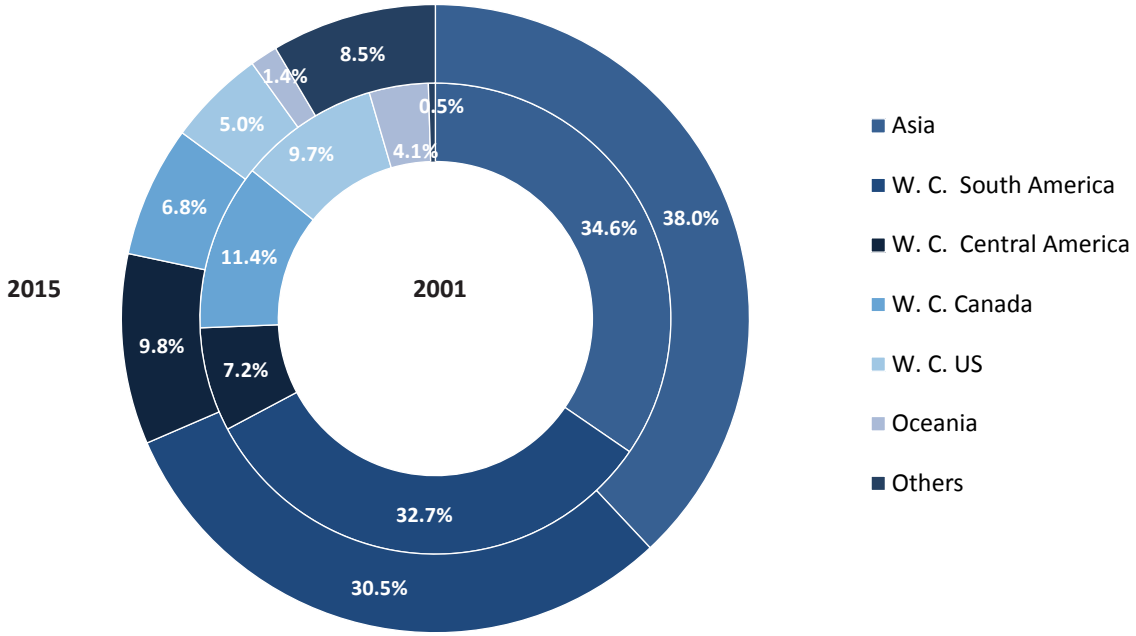


Figure 9 - Source: elaborations on Panama Canal Authority data

Some of the principal elements of Panama's maritime offer: ports, terminal and free zones

Seaports in the Panamanian port system (NPS) are divided into two groups: state ports and private ports. The private ports have been assigned to terminal operators, after a privatization process and granting of former state ports. The state ports are still managed by the Government under the leadership of the Maritime Authority.

The ports of Balboa and Colón ranked 42 and 47 respectively in the 2015 world ranking of Top 50 Container Port, realizing 3.47 and 3.29 million TEUs respectively[17].

The port of Balboa is located at the entrance of the Pacific side of the Canal. It covers a total area of 30 hectares for container storage and has 5 specialized docks. It operates with quay cranes for 25 Panamax, Post Panamax and Super Post Panamax. Transshipment operations account for 92.8% of the total container traffic, while the rest the port serves the local market. The presence of the nearby railway allows the container transshipment with Colón. Balboa receives and ships dry and liquid bulk and refrigerated goods[18].

The port of Colón corresponds to the Colón Container Terminal[19] (CCT) which is part of the Evergreen Group and is located in the province of Colón on the Atlantic entrance of the Panama Canal. The port serves the regional markets of the Caribbean, North, South and Central America, with shipments mainly

[17] Joc.com (2015). *Top 50 Container Ports*.

[18] Georgia Tech (2016). *Logistic Innovation and research Center.*

[19] www.cct-pa.com

originating in the Far East. It is becoming an ideal location for transshipment and inbound/outbound goods to the Colón Free Zone.

This terminal covers a total area of 74.33 hectares, and has an access channel with a 14-meter draft and a 600-meter radius to allow the steering of ships. The port has an access road to the Colón Free Zone and the railway. Three container docks, ten quay cranes and other yard tools allow CCT a handling capacity of 1.3 million TEUs.

In the same area another container terminal is being projected to accommodate post-panamax ships. According to local media[20], the Panama Maritime Authority (AMP) and the Chinese consortium Panama Colón Container Port (PCCP), reached an agreement on the facilities. Under the agreement, estimated to be worth around $900 million, the Chinese giant China Communications Construction Company (CCCC) is expected to build the terminal and the Beijing-based Port Design Institute (PDI) is set to design the piers.

The first phase of the project is the construction of a container terminal with a capacity of up to 2.5 million TEUs and the additional private lands with multipurpose possibilities, including LNG facilities or energy projects.

Today, the Panamanian ports are home to the world's major shipping companies including Maersk, CMA CGM, MSC, APL / MOL, Hapag Lloyd, Evergreen. The impact of the expansion will extend the Canal's relationships with the leading global carriers.

In Panama there are large private terminal operators and 6 port facilities dedicated to container traffic, two are in the province of Panama[21], four in the province of Colón[22]. In 2015, container traffic amounted to 6.9 million TEUs, up by 1.77% compared to 2014[23].

In 1999, the terminal operator in Hong Kong, Hutchison Port Holdings (HPH), obtained a 25-year concession for the management of port terminals on both the Atlantic side (Port of Cristobal) and the Pacific side (Port of Balboa). The operator uses the railway line between the Atlantic and Pacific that was reopened in 2002 to handle a growing container traffic. The Panama Canal Railway Company (concession to the KCS and Mi-Jack Products), offers an alternative to the current limited size of the Canal and supports transshipment between the Atlantic and the Pacific through Double Stack services.

In addition to Hutchison Port Holdings (HPH) and Colón Container Terminal, CCT (Evergreen), there are two other major terminal operators in Panama: PSA - Panama International Terminal and Manzanillo International Terminal (MIT).

PSA is a subsidiary of PSA International (Singapore), which began operating in Panama in 2010. It is located at the entrance to the Panama Canal on the Pacific side. In 2015 the terminal handled 450 thousand TEUs with a single quay. The expansion work will bring its capacity to 2 million TEUs in 2016.

[20] worldmaritimenews.com

[21] Where there are the terminals of PSA and Panama Ports Company.

[22] Where there are the terminals of Panama Ports Company (Cristobal) and Manzanillo International Terminal, Colón Container Terminal, CCT (Evergreen) and Colón Port Terminal serves smaller ships.

[23] Panama Maritime Authority.

The other important terminal is the Panamanian Manzanillo International terminal (MIT) located on the Atlantic coast and featuring a direct access to the Colón Free Zone. The terminal covers an area of 52 hectares, it has 5 container docks, a Ro-Ro dock and a multipurpose dock. The terminal handled over 2 million TEUs in 2015. The container docks are able to accommodate 17 Panamax, but they are equipped to accommodate Post-Panamax and Super-Post Panamax.

In Panama there is also the first Free Zone for size in the Americas and the second in the world: the Colón Free Zone. Located on the Atlantic near the Colón port area, it covers an area of about 2.4 square kilometres. The re-export activities concern chemical pharmaceutical products, machinery, electrical services, textiles and clothing. These products were mainly imported from China, Singapore, the United States, Taiwan and Mexico. These same products are then re-exported to the markets of Latin America, especially in Venezuela, Colombia, Puerto Rico, Panama and the Dominican Republic[24].

The Colon Free Zone grew steadily in terms of trade until 2012 only to suffer a progressive decline until 2015. Currently, the export value of imports amounts to $21.6 billion, $ 11.4 billion of which are export. The Free Zone of Colón mainly imports from China ($ 3.5 billion), followed by Singapore ($ 1.9 billion) and the US ($ 922 million). Among the top ten countries there is also Belgium ($ 236 million dollars); the United Kingdom ($ 166 million) and Germany ($ 165 million). Italy accounts for $157 million dollars. The Colon Free Zone mainly exports to Puerto Rico, where, in 2015, $1.9 billion were directed, followed by Colombia (1.5 billion) and Panama (1 billion). The most substantial decrease (-45% compared to 2012) concerns Puerto Rico. Despite being very active on the trading front the Free Zone of Colón is not equally active on the processing and manufacturing. The estimations say that there are 2,600 enterprises located in the area.

The import-export activities of the Free Zone of Colón 2001-2015 - in millions of dollars

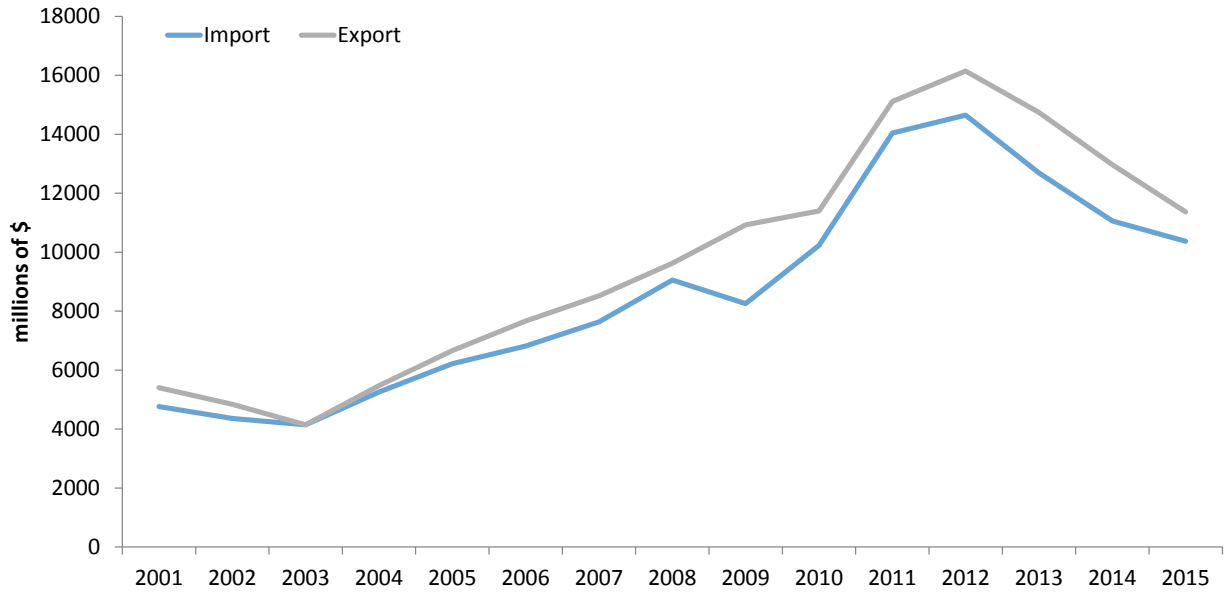


Figure 10 - Source: Georgia Tech

[24] Georgia Tech (2016). *Logistic Innovation and research Center.*

The various elements mentioned above in the field analysis show that Panama seems to have the basic characteristics necessary to establish itself as a logistics hub of the Americas. As stated by Notteboom & Rodrigue[25], "The scenario that is emerging increases the potential of Panama to become a functional logistics platform for global and regional supply chains." This transition is, as observed with the on-site investigation, still in progress, and Panama will face different challenges in order to develop its logistics capabilities needed to compete at the world level. As much as it will have to increase the capacity of its port, in particular on the Pacific side (v. Corozal), as well as the functional logistics to the port and a wider road and rail system to improve and enhance its internal links. The economic development and the expansion of trade relations will lead to an advantage for Panama through transshipment, the growth of trade and a larger number of transits through the Canal.

Panama, hub of the transort and logistics of the Americas

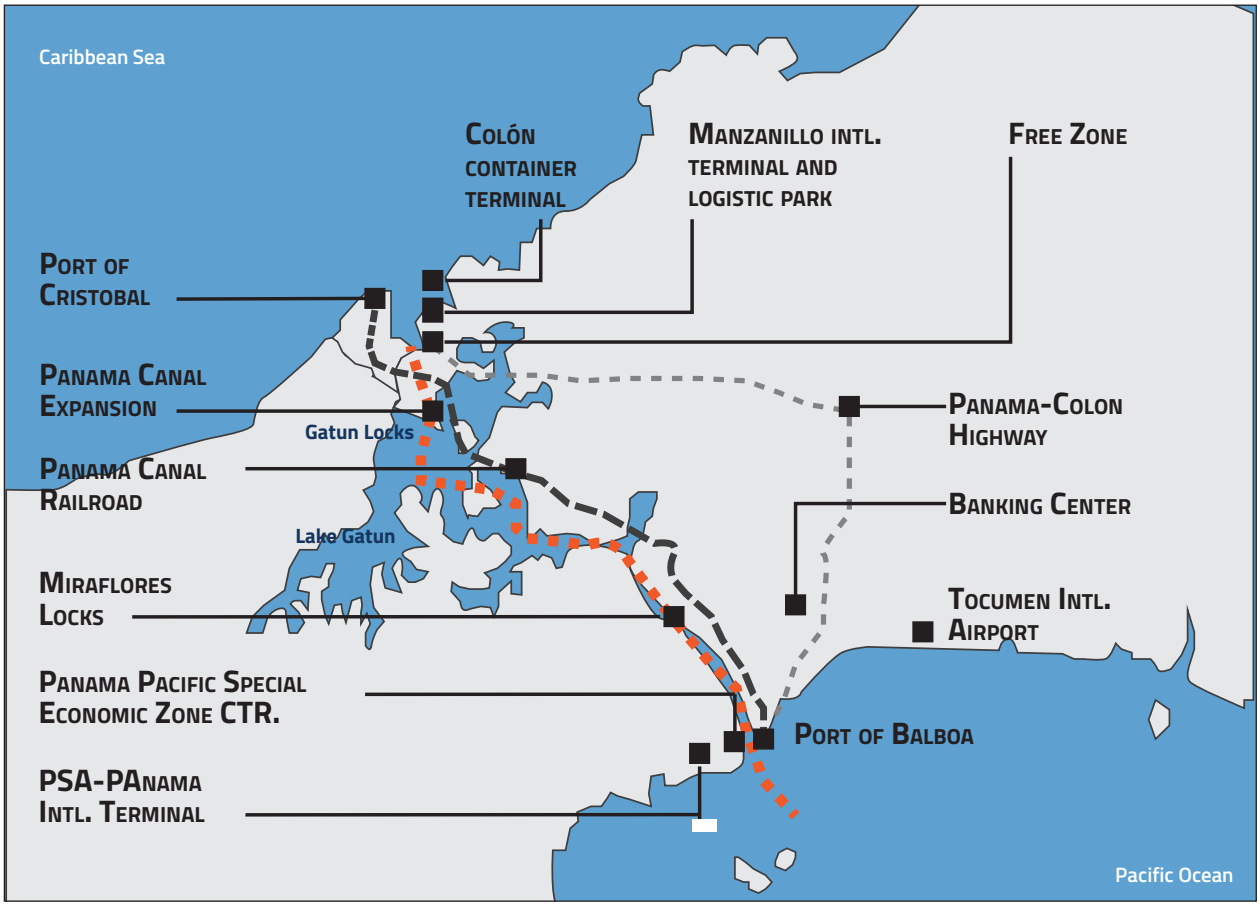


Figure 11 - Source: SRM's elabrations on Panama Canal Authority data

[25] Rodrigue, J.P. & Notteboom, T. (2015). *The Legancy and Future of the Panama Canal.*

The new Panama Canal

In June 2006, the Panama Canal Authority released a document entitled Master Plan 2005-2025. It outlined the long-term strategy for the Canal, in which principles, actions and measures to be implemented until 2025 are proposed.

The economic and strategic importance of the Canal emerges clearly which is still an integral part of the national maritime strategy and is fully identified with the state policy of national development.

The new Panama Canal, which will complement the previous one, is a massive work begun in September 2007 and completed in 2016; It covers a distance of about 81 Km from ocean to ocean and was built by creating two waterways. In fact, two branches that run almost parallel to the existing ones have been built and, as in the past, they are connected to the artificial Gatun Lake at 26.7 meters above sea level. The lake covers about 2/3 of the entire path. The passage allows the transit of one ship at a time and there will probably be one in tandem or a group of ships coming in the direction from the Atlantic locks and another group that enters the Pacific locks at the same time in order to gather in Lake Gatun and then converge towards the target to reduce waiting times[26].

Panama Canal – Structure of the new and of the pre-existing Canal

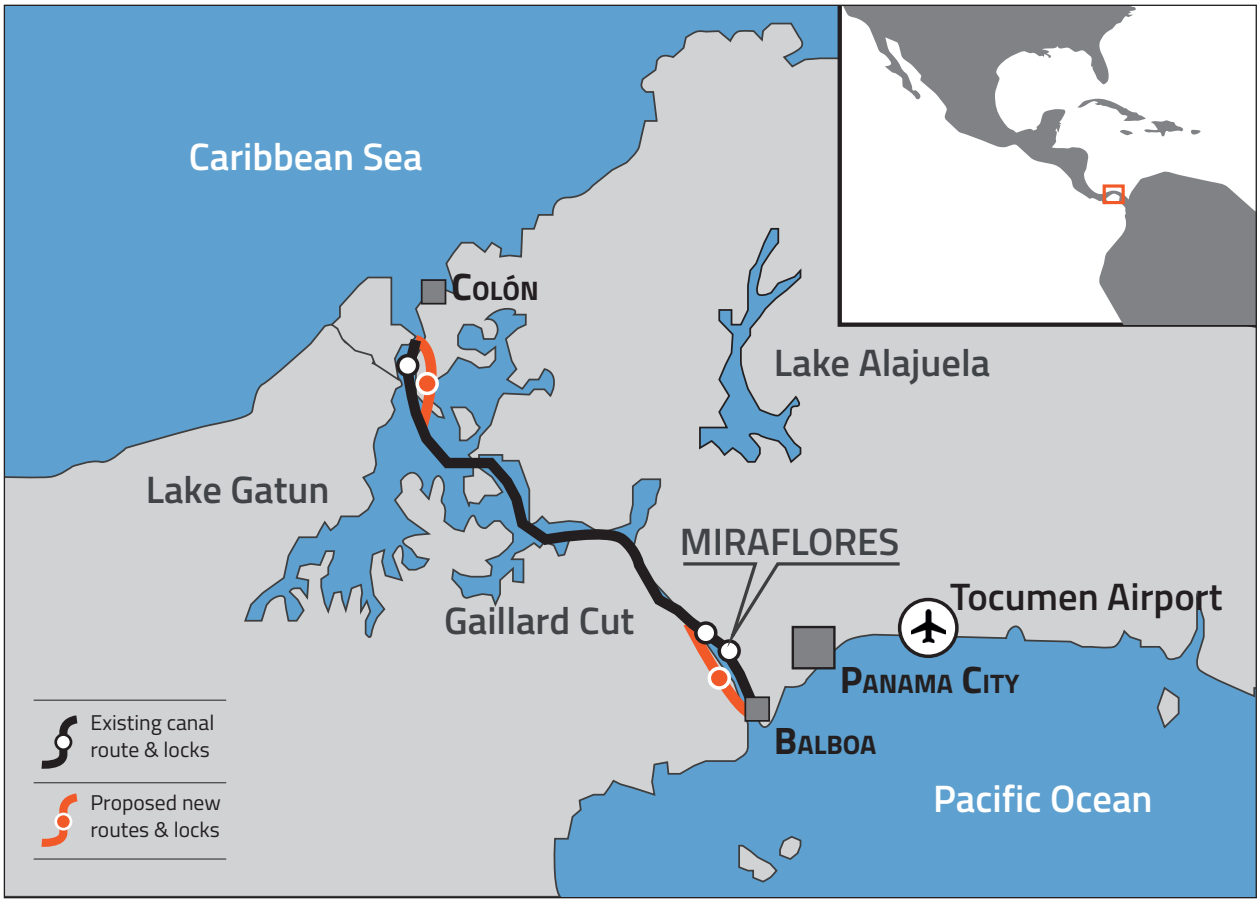


Figure 12 - Source: SRM on The Economist

[26] Panama Canal Authority (2016).

Thanks to the expansion of the Canal, a high percentage of the world fleet will be able to pass through it, thus obtaining a compression of time. It is estimated that in 2019, 95.4%[27] of the world container fleet will be able to cross the Panama Canal.

As a matter of fact, the project will create a new lane of traffic along the Canal that will allow the passage of container ships; from the current 4,400 TEUs (called Panamax) to larger ships. When open, the new locks will allow the transit of 12,000 TEU ships and then in the future accommodate ships with a capacity of 13,000/14,000 TEUs (post-Panamax) which is three times more capacious than the current ones, while in the transport of liquid, not only the biggest oil tankers, but also ships for liquefied natural gas will be able to pass, thus opening up new prospects. In addition to the transit of container ships, also the passage of bulk carriers up to 170 thousand DWT[28] able, for example, to carry a greater quantity of coal from Colombia and ores from Brazil, as well as the transit of up to 150 thousand DWT oil tankers, and also of Very Large Gas Carrier (LNG / LPG) up to 177 thousand cubic meters will be possible.

The realization of the project was assigned to an international consortium "Grupo Unidos por el Canal" which includes the Spanish company Sacyr Vallhermoso SA, the Italian Salini Impregilo the Belgian Jan de Nul and the Panamanian CUSA. The current team leader of the project is the Italian Salini Impregilo. The new transit system in the Canal's channels provided for the construction of "triple step locks": both the Cocoli (Pacific) lock and the Agua Clara (Atlantic) lock will have three chambers: a top, a middle and a bottom chamber. These locks will allow ships to be raised from the level of the oceans to the Gatun Lake (midway between the two oceans) and vice versa[29].

The ships' towing system will be completely different. Large ships will enter the Canal moving from lock to lock accompanied by 4 tugs. It is something new, in fact ships in parallel channels were pulled by small locomotives called "mules".

The work had a total estimated cost of $6.2 billion[30] (against the $8.2 billion of Suez). The starting value of the contract amounted to $3.78 billion[31]. The government of Panama could afford it thanks to international loans worth $2.3 billion incurred with several international financial institutions including the European Investment Bank (EIB).

The Canal, in fact, is an important driver of the Panamanian economy; in 2014, it ensured a direct contribution of $2.7 billion to the Panama GDP, equal to 6% of the overall country's GDP. The total contribution (direct and indirect) is estimated at 25% of GDP by the Panama Canal Authority[32].

[27] Oscar Bazán, Vice President Panama Canal Authority, in *48th Annual Georgia Foreign trade Conference*, Panama, 8th February 2016.

[28] Deadweight tonnage.

[29] Each of the three chambers which make up each lock is 55 metres wide, 427 metres long and 18.3 metres deep, and they are equipped with horizontally sliding sluice systems which can overcome the existing difference in level between the oceans and Lake Gatun. Source: Salini Impregilo.

[30] Rodrigue, J.P. & Notteboom, T. (2015). *The Legancy and Future of the Panama Canal.*

[31] €3,356 million - share of the work covered by Impregilo: €1,288 million (www.salini-impregilo.com).

[32] Panama Canal Authority Interview.

Some funders of the expansion of the Panama Canal

Financial Agencies	Amount
European Investment Bank (BEI)	$ 500 million
Japan Bank for International Cooperation (JBIC)	$ 800 million
Inter-American Development Bank (BID)	$ 400 million
International Financial Corporation (CFI)	$ 300 million
Andean Development Corporation (CAF)	$ 300 million
Total	**$ 2,300 million**

Table 4 - Source: Panama Canal Authority

Data to 2015 shows that the Canal employs 9,925 employees[33] and over 30,000 jobs have been created ever since the expansion work began[34].

In addition, the Panama Canal generated revenues for the country amounting to $2.7 billion in the fiscal year 2015 (against $5.5 million of Suez) but a slight decrease (-0.71%) compared to 2014[35] and generated a cost of about $1.25 million[36]. The average toll per ship in 2015 was $188,121[37] With the additional path, revenue, according to estimates[38], will rise to $ 4 billion by 2025 while Suez estimated revenue is of $ 13 billion by 2023[39].

The new Canal will allow economies of scale, greater efficiency of the international supply chain and better connectivity. The forthcoming opening is connected to a series of expansion projects of US ports to facilitate the landing of larger vessels.

Norfolk US., Portsmouth USA., Miami and Baltimore are currently the ports with the deepest waters of the East Coast of the United States: to about 50 feet (15.24 meters). The Port Authority of New York and New Jersey completed the dredging of bed of the port of New York to 50 feet with a cost of $1.3 billion to increase the height of the Bayonne Bridge allowing higher ships to pass. Savannah, is dredging to 47 feet (14.3 meters) from the previous 42 (12.8 meters), and Charleston, to 52 feet (15.8 meters) from 45 (13.7 meters). Between 2009 and 2014 the US Federal Government allocated $320 million for infrastructure projects along the East and Gulf Coasts[40].

[33] Bazàn O. (2016).

[34] Oxford Business Group (2015).

[35] www.efe.com

[36] Panama Canal Authority, *Annual Report 2015*.

[37] Whereas the transiting ships in 2015 were 13,874.

[38] Panama Canal Administrator Jorge Quijano in Wall Street Journal (2015). "Panama Canal Administrator Expects New Locks to Open on Time" (http://www.wsj.com/articles/panama-canal-administrator-expects-new-locks-to-open-on-time-1444653273).

[39] For further readings on the New Suez Canal see also SRM (2015). *Economic relations between Italy and the Mediterranean. 5th Annual report*. Naples: Giannini Editore.

[40] Rodrigue, J.P. & Notteboom, T. (2015). "The Legacy and Future of the Panama Canal" in *TR News,* No. 296, January-February.

As pointed out by Rodrigue and Notteboom[41] the expansion clearly will serve as a driver for many East and Gulf Coast ports to improve their infrastructure to a post-Panamax standard for port access and operations. Which of these investments will prove speculative depends on the canal expansion's impact on port calls and traffic volumes.

Impact of the new Panama Canal on US infrastructure

Port	Plans	Port Infrastructure	Hinterland Access
Boston, Massachusetts	Plans to dredge the channel depth from 40 to 48 feet under study (no specific timeline)		
New York	Harbor channels dredged to 50 feet (completed in 2014); clearance improvements to the Bayone Bridge (to be completed in 2017)	Expansion of Global Terminal (completed in 2014)	ExpressRail Improvements (south Hudson Intermodal Facility); Crescent Corridor (CSX)
Philadelphia, Pennsylvania	Plans to dredge the Delaware River channel fron 40 to 45 feet (to be completed in 2017)		
Baltimore, Maryland	No plans (currently at 50 feet)	4 super-post-Panamax creanes installed at Seagirt Marine Terminal (completed in 2013)	National Gateway Project (CSX)
Hampton Roads, Virginia	Discussion to dredge from the current draft of 50 feet to 55 feet (no specific timeline)	Craney Island Eastward Expansion Project	National Gateway Project (CSX); Heartland Corridor (Norfolk Southern)
Wilmington, North Carolina	Plans to dredge the port channel from 42 to 44 feet (to start in 2019)		National Gateway Project (CSX)
Charleston, South Carolina	Plans to dredge the port channel from 45 to 52 feet (to be completed in 2018 or 2019)		
Savannah, Georgia	Plans to dredge the port channel from 42 to 47 feet (to be completed in 2016)		
Jacksonville, Florida	Plans to dredge from current draft of 40 to 47 feet (expected to start in 2016, subject to funding)	New container facility at Dames Point (Opened in 2009)	Intermodal Container Transfer (CSX; completed in 2015)
Miami, Florida	Harbor channels dredged from 42 to 50 feet (completed in 2014)	7 super-post-Panamax cranex (installed in 2013)	PortMiami Tunnel (completed in 2014); PortMiami-Florida East Coast Railway connection (completed in 2014)
Mobile, Alabama	Plans to dredge harbor channel from 45 to 50 feet (no timeline specified)		Plans for intermodal rail terminal adjacent to port (no specific timeline)
New Orleans, Lousiana	Plans to dredge harbor channel from 45 to 50 feet (no timeline specified)	New Louisiana International Gulf Transfer Terminal (no specific timeline)	Crescent Corridor (CSX)
Houston, Texsas	Plans to dredge harbor channel from 40 to 45 feet (to be completed in 2016)	Bayport and Barbour Cuts terminal improvements	

Table 5 - Source: Rodrigue & Notteboom

[41] Idem.

The Panamanian authorities have given strong impetus to the expansion project for the Canal and to the implementation of an overall project which gives more capacity to the existing stream bed. Along with the new Canal, the government, through the Panama Canal Authority, is planning the construction of an LNG terminal on the west side of the Pacific; a logistics park in the west bank of the Canal to be enhanced, a Ro-Ro terminal on the west side, bio-fuel related activities in the west dock. They are also planning an industrial park for components business; the idea is to have various value-added services for cars, making Panama a real logistics park in the Pacific. A food processing area is also being designed.

To expand the container activities, the Panama Canal Authority has recently[42] declared its intention to build a new transshipment port in Corozal, on the Pacific side of the Canal, because it expects an increase in traffic after the completion of the Canal expansion project.

The realization of the Corozal terminal represents the attempt of the Canal Authority to further develop transshipment especially from the Pacific side.

Development of Corozal area

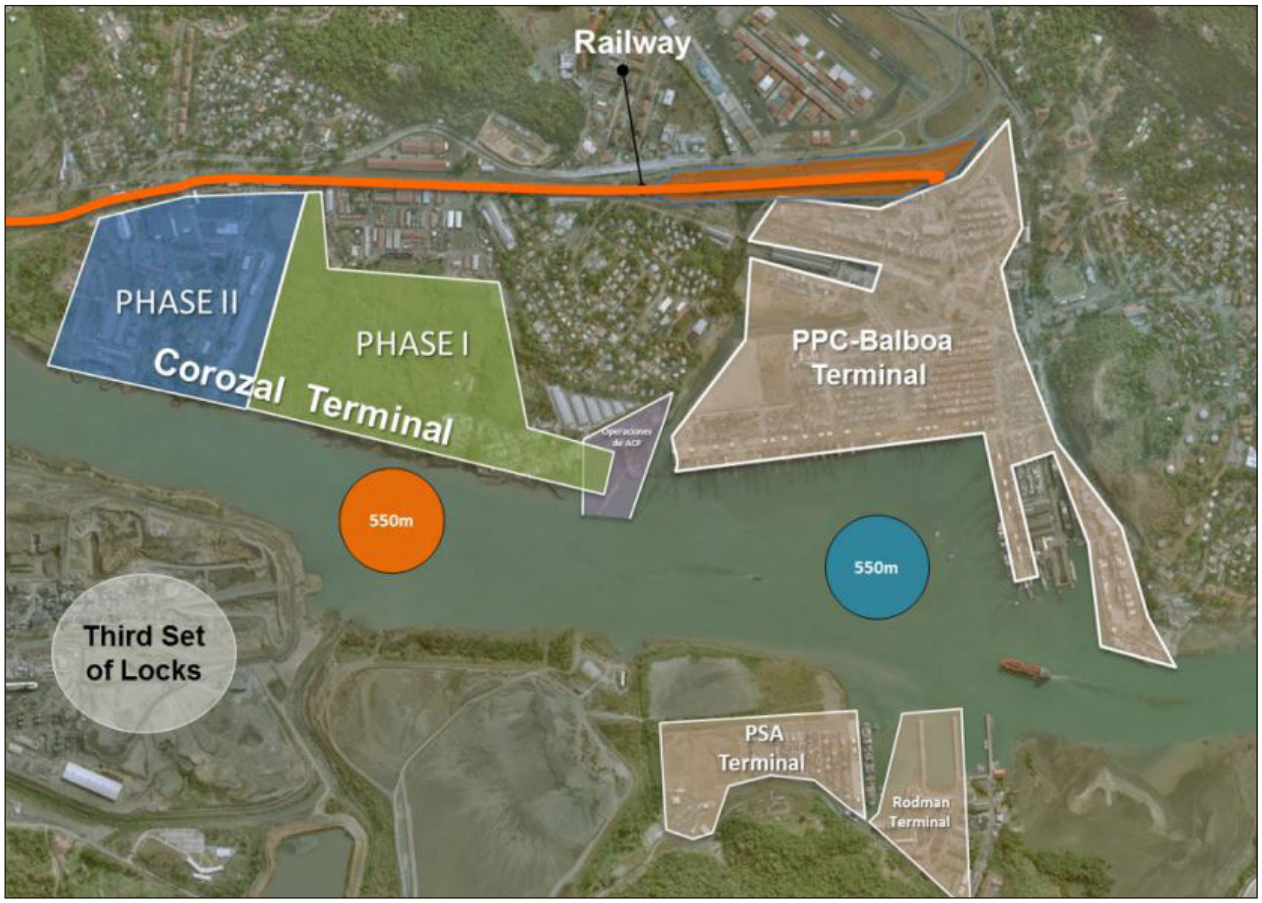


Figure 13 - Source: Panama Port Authority

[42] Joc.com, 5 January 2015

The project is part of a long-term strategy to build a revenue base beyond the canal tolls implementing transshipment, logistics and light assembly. Recently[43] four port operators were pre-qualified during the Request for Qualifications (RFQ) for companies interested in competing to design, develop, finance, construct, operate and maintain the Corozal Container Terminal: the APM Terminals B.V. (Netherlands), Terminal Link (France), PSA International Pte., Ltd (Singapore) and Terminal Investment Limited, S.A. (Belgium).

The Corozal terminal would be the second Panamanian terminal at the Pacific entrance of the Canal, in addition to the existing two-berth container terminal in Balboa operated by Hutchison Ports (Panama Ports Company).

Other ways to expand business, according to our interviewees – and particularly to the Panama Canal Authority[44], are related to the oil market because the ships carrying this product are expected to increase.

Moreover, according to the Authority[45], the export from Peru which currently makes its way to Europe, especially to Spain, via Cape Horn is expected to pass through the route of the new Panama Canal becoming a better and safer alternative for those shipments. In addition, shipments from the Gulf of Mexico and Trinidad (Cuba) are expected to move through the Canal to reach Chile. Therefore, a considerable growth of the LNG sector is estimated. Recently, the US has begun to export crude oil, and some of these shipments are made through large-crude-carriers. For example, from Mexico through the Panama Canal to Central America, South America, and more recently to Asia, the traffic of petroleum products is intensifying. The LPG traffic has more than doubled in the Canal over the past three years, and this is mainly due to the growing demand of China for oil and chemical products. If China's demand continues to increase, as it is currently estimated[46], there will be a surge in the demand for LPG and LNG, and consequently more transits of ships carrying such products through the new locks in Panama.

[43] Dredging Today (2016). *Four Port Operators Pre-Qualified for Corozal Port*, 1st May 2016.

[44] SRM's interviews .

[45] Interview given by the Panama Canal Authority exclusively to SRM

[46] Idem.

The players' vision: the results of an ad hoc mission of SRM

The economic analysis on the Panama Canal and its growth prospects in connection with the upcoming expansion, pointed out the significant role which this infrastructural work plays in the global economy and how it may be able to modify the evolutionary scenario of international trade. It will not only facilitate and hopefully increase the existing traffic, but it will also open the door to new trade, mainly energetic, which previously was not included.

As explained above, there are numerous factors that might affect the design of world routes chosen by the carrier, not least, the price of oil, but it is clear that this great new Canal will hold a crucial role in shipping.

When talking about "shipping" we mean a broader sense which includes infrastructure, that is ports but also the intermodal structures connected to them. We also include companies, not only the big players such as carriers and terminal operators, but also a dense network of players operating in larger businesses of the maritime industry.

The analysis offers an overview of the current situation of the industry and its possible evolution, in the light of the continuing effects of the global economic crisis still affecting the demand of world consumption, in which the operating efficiency of the carrier has acquired a growing relevance. The impact of the expansion of the Panama Canal will depend on many factors, affecting, among others, the capacity of ports and inland infrastructure to manage the increasing flow of traffic, the carriers' responses, the adjustment of the supply-chain management to take advantage of the economies of scale offered by the expansion of the Canal, and the cost savings distribution among domestic and foreign players.

Based on this background knowledge – which is in the style of research of SRM – we derived the choice to integrate and refine the economic analysis of the sector with a "territorial" evaluation in order to track down information, testimonies and first-hand considerations of the great players involved in various capacities in the Panamanian maritime cluster. The analytical tool used in this stage of the paper consists of meetings and interviews with opinion leaders in Panama to gauge the mood and explore the risks on the potentiality of this new large infrastructural project.

In this regard, a specific mission took place in Panama in April 2016. It involved researchers from SRM who directly witnessed the Canal's important new state-of-the-art infrastructure, the secondary activities already carried out or being realized, and they also verified the model of the Panamanian maritime cluster.

It is not limited only to the Canal and authorities that represent it, but includes all the companies of the maritime industry and support the activities of transport and logistics, free zones, as well as the associations category and also universities and training centers that deal with transportation and logistics. According to estimates released by the Panama Canal Authority and by the Panama Maritime Authority (Autoritad Maritima de Panama) the entire cluster is worth 25%-30% of GDP.

Outlining a unitary and systematic picture of shipping from the analysis provided by companies and institutions – which, though operating in the same sector, represent strong global interests that are very dissimilar, – proved complex, but allows an interpretation of the sector, in its various current and prospective aspects, which can really be defined as innovative and comprehensive.

The institutions related to the Panama Canal are:

- The **Panama Canal Authority (ACP)**: it is an autonomous, public agency of the Republic of Panama, established under Title XIV of the National Constitution, and has exclusive responsibility for the operation, administration, management, preservation, maintenance, and modernization of the canal. It also manages its activities and services and is responsible for the operation of the canal in a safe, continuous, efficient, and profitable manner. Because of its importance and unique nature, the ACP has financial autonomy, it has its own assets which it is entitled to administer.
- The **Panama Maritime Authority (AMP):** : it has the supreme maritime authority of the Republic of Panama to exercise the rights and fulfil the responsibilities of the State of Panama, within the framework of the United Nations Convention on the Law of the Sea of 1982 and other laws and regulations. It manages, promotes, regulates, plans and implements strategies, policies, plans and programs that are related to the operation and development of the maritime sector. It works to promote, coordinate and implement the national maritime strategy. It manages the registration of ships in Panama. It proposes and coordinates the development plans of the national port system, and enhances and manages the port services monitoring those who do not work directly. It deals with the protection of national interests in maritime areas and inland waters and to apply existing rules on staffing, training, certification and watch keeping for seafarers. It ensures strict compliance with the treaties, international conventions and instruments in maritime matters ratified by Panama. It is responsible for updating the signalling and navigation aids system for the safety of ships in the maritime area of Panama.
- The **Panama Maritime Chamber** is the reference of the maritime and logistics sector of the Panama Republic which, through proactive measures, involves private and state enterprises in the constant quest for the growth of this important sector of the economy. It gathers more than 200 companies of the maritime industry, including the world's major carriers (among others Maersk, Evergreen, COSCO, MOL, APL), port terminals, railways, companies that handle barges, tugs, ship repairers, and maritime lawyers. The ports and transportation agencies are also important members of the Chamber, as well as the auxiliary maritime companies, which have been fully integrated in the Chamber in recent years. These companies offer a selection of traditional services and new technologies which include "Shipchandlers" provisioning services, ship and maintenance equipment repair and training.

The players which gave an interview in order to illustrate the criteria that guide the operational and strategic management of the entire maritime cluster, were:

- **Marcello Apicella**, Italian Ambassador to Panama.
- **Oscar E. Bazàn V.**, **Ricardo Ungo**, **Silvia De Marucci**, Panama Canal Authority – respectively: Executive Vice President Planning and Business Development; Manager Business Development Section Executive Vice Presidency for Planning and Business Development; Executive Manager Economic Analysis and Market Research Division Executive Vice Presidency for Planning and Business Development.
- **Alessandro Cassinelli**, PSA Panama – General Manager.
- **Gianni Compiani**, Panama Tugs Group - Director.
- **Juan Carlos Croston**, Manzanillo International Terminal – Vice President Marketing & Corporate Affairs.
- **Edgar A. Pineda**, Hutchinson Port Holdings Panama – Chief Commercial Officer.
- **Londor A. Rankin**, Panama Canal Pilots Association – President.
- **Gerardo Varela**, **Jovani Gonzales**, Panama Maritime Authority – respectively: General Director Ports and Maritime Ancillary Industries General Directorate; Deputy Director General Directorate of Seafares.
- **Nicolas Vukelja Duque**, Panama Maritime Chamber – First Vice President.

Our desire is to represent the common interests of the entire sector – as much as possible given the number and the momentousness of the changes that are affecting the economy and global trade, and which are beginning to produce their effects on the industry. The result was a product that pointed out the driving forces, the critical issues, the problems and the strategies of a maritime cluster that despite geographically gravitating in a limited area of a country in Central America, has what it takes to play a crucial role in global shipping.

The interviews obviously started from the considerations and expectations pertaining to the expansion of the Panama Canal.

From this observation arises the cognizance that this great infrastructure paves the way for a new unique global landscape of economy and trade, which has no similarities with other great infrastructural works, at least in this historical context. For this reason, it is not very easy to make defined estimates of the impacts in terms of commercial and also economic traffic.

There are great expectations for the positive repercussion on the Panamanian economy for the attractiveness exerted by the Canal on maritime cargo. These favourable prospects relate primarily to container ships and were already partly confirmed by the demands already made by many carriers. Now that also ships up to 13,000 to 14,000 TEUs can pass through, they should cross the Canal for many of the routes connecting the East with the West in the world, especially in a cost efficiency and time reducing perspective. As regards port and maritime industry, Panama is already showing a prominent role as a transshipment hub platform which affects the continent. The meetings revealed that three of the largest container terminal in the Central American Republic, Manzanillo (Manzanillo International Terminal), the Panama Ports Company terminal in Balboa and Cristobal and the PSA in Balboa, are already equipped to receive ships up to 13,000 TEUs, in terms of skills, infrastructure and equipment, and they continue to invest in upgrading ports. In particular, the PSA terminal, under a forty-year concession, is making an investment of $451 million which will lead, by 2017, the terminal capacity from the current 450,000 to 1 million TEUs and the possibility of accommodating at the dock, ships up to 20,000 TEUs. This is just in anticipation of the increase in activity expected from the expansion of the Canal.

In addition, important investments in human capital have been made; targeted training for pilots who have completed the training in a Simulation Center have been provided for, because with the opening of the new Canal for the first time the ships will be guided by tugs (in the old Canal they were towed by trains) that will have a crucial role in making the traffic efficient.

The growth prospects prompted the Panamanian institutions to plan other large infrastructure in support of container traffic. In particular, the subject of the new terminal of Corozal, on the Pacific side was addressed during all the meetings. The Panama Canal Authority and Panama Maritime Authority emphasized the opportunities that a new container terminal could offer to increase the transshipment business and manage the surplus of cargo transits through the Canal with operations and activities which could bring about revenues and employment opportunities in the country. Some fears for the construction of this infrastructure also emerged from the meetings with Panama Ports, PSA and the Panama Canal Pilots Association. They had the opportunity to show that there are good rail and road links between the Atlantic and Pacific side of the country and also the efficient capacity of the existing facilities. They are afraid that the terminal which has been planned can face technical complications, meaning that it could generate access and manoeuvring problems for large ships. They also fear the economic implications which could create a situation of oversupply thus endangering the current operators' profit margins.

Most interviews reveal the sense of urgency felt by the players to enhance not only the infrastructure but also the cargo services because, although one cannot predict the size of commercial traffic that will come as a result of the expansion yet, the neighbouring countries are pushing hard on this point and therefore the competition in the area is very intense.

The improvement of the whole network of existing services is therefore another important goal that interviews revealed, and not just for large ships and their unitized traffics but also for the other categories, in particular energy and dry bulk. In this respect, the Panama Maritime Authority illustrated the project and its cost of approximately €5 million for the construction of a new pier where ships can dock in order to receive all the services they need.

Now instead, they are provided by a system of speed boats that is efficient but quite expensive for customers. But the impact of the expansion of the Canal will not affect only container traffic: as repeatedly mentioned by the Panama Canal Authority, the country can play a role as energy hub because it will be allowed access to the LNG and LPG vessels, whose market has grown much in recent years. In order to diversify the Canal's activities a terminal for LNG on the Pacific side is being designed.

The meetings also outlined the importance of the bunkering business for Panama: it is currently worth between $2 and $2.5 billion a year, but the growth prospects are very high. According to data from Panama Maritime Chamber, only 1/3 of ships passing daily through the Canal refuels and, in this regard, it shows the need to improve services. Currently, the bunker is transported by barges, which are also owned by some tugs companies, which go back and forth between the terminals and the ships to refuel. Therefore, factors such as weather conditions or other activities that tugs must perform, can affect these operations. The cost of bunkering in Panama in fact is the sum of the barges' tariffs and fuel costs. The goal to set, is to make off-shore bunkering outside the anchorage area.

Investments of private companies have been made on the Pacific side for the construction of bunker facilities, which will be opening soon, aimed to offer services to the large ships that cross the Canal.

However, already in 2015 there was an increase in bunker sales, although the related revenues did not increase proportionally, due to the low cost of oil.

Ro-Ro traffic is also very popular: in order to diversify its portfolio of activities the Manzanillo terminal began in around 2002, to carry out this activity in partnership with Wallenius Wilhelmsen Logistics, among the world's leading players in the sector, which has dedicated spaces for this business segment. Related to this activity, the terminal also provided for the construction of a Logistic Park, which was completed five years in advance, just to meet the needs of value-added services on the cargo in transit in the country: in this regard, partnership with 3 PL[47] logistics operators were made.

A significant element of the Panama Canal that boosts the offer, in terms of infrastructure and services, is the rail link between the two banks, which guarantees a constant connection, also by land, for cargo transportation. Panama Ports which runs the Balboa terminal on the Pacific side and to the Cristobal terminal on the Atlantic side, conducted a study that identified 40% of the cargo of a 5,000-TEU ship as being the threshold for deciding the mode of transportation: It is specified that the operation on the train has an average daily cost of $200 per TEU, with a daily movement of 800 TEUs on the route Pacific/Atlantic (16% of a 5,000-TEU vessel) and 350 TEUs on the Atlantic/Pacific route (7% of a 5,000-TEU vessel) then:

- if less than 40% of cargo has to go the other way: then it should travel by railway because the cost of the container unload is lower than that of the vessel;[48]
- conversely, if more than 40% of cargo has to go the other way: crossing the Canal is more convenient.

[47] 3PL Logistics suppliers (Third Party Logistic Service Provider) are companies that offer integrated logistics services. They differ from simple service providers (or LSP, logistic service providers) because it offers an integrated set of activities (handling, storage and distribution of goods). The 3PL company makes their expertise and industry best practices available to their clients, effectively integrating within the existing Supply Chain. 3 PL are usually specialized for different market sectors and geographical areas.

[48] The cost of a TEU from the ship, according to the study, ranges from a maximum value of $778 per TEU to unload the 10% from a ship with a capacity of 1,000 TEU at the break-even point of $200 by 40% and up.

After the expansion for container vessels from 6,000 to 10,000 TEUs, the detected threshold is 20% of the cargo, in both directions, in order to have a profitable operation.

The railway is an important part of the transhipment model for Panama, also for the activities of the Manzanillo terminal: 25% of transhipped cargo in Panama travels by rail. This connection will essentially serve the entire American continent and in Panama will have the role of the distribution hub for multinational companies.

The function of the Colon Free Zone has been much discussed. This area, in fact, is considered a lever for foreign capital, but its potential to date, has not completely being exploited because the area is characterized mainly by small family businesses whose activities are limited to the sale with a range limited, at most, to the American continent. There is, at present, no manufacturing activity in the area.

The impact of the Panama Canal's expansion should also be considered in conjunction with the discourse on the tariff rate that will have an important weight on its attractive force. The fact that tariffs are calculated on the cargo in transit instead of ships, has given rise to some concerns about the future revenue because if the amount of goods were to remain the same with the difference of travelling on larger ships, this would not bring about the desired greater gain for the Panamanian government.

In fact, all the meetings did not reveal a particular concern about the possible effects of the implementation of the "Grand Interoceanic Canal of Nicaragua" which is considered a too expensive project compared to the benefits that it could bring about. The Suez Canal is instead considered the real competitor for global trade.

As part of the carriers' quest for cost saving, the decision of the Suez Canal Authority to approve a tariff line with the 45-55-65% discounts on some container routes from the East Coast ports of the Americas and directed to the South and South East Asia, might force companies to choose to lengthen journey times in order to achieve savings.

A summary of the highlights emerged from the interviews was noted in the following SWOT table:

Strengths	**Weaknesses**
• Infrastructure, skills, equipment ready to handle ships up to 14,000 TEUs • Efficient rail link between the two shores • Diversification of activities also with Ro-Ro • Planning of major investments in private infrastructure, and in services in support of cargo and human capital	• Services to ships and cargo still to be improved • Services for bunkering to be speeded up • Lack of manufacturing activity in the Colon Free Zone
Threats	**Opportunities**
• Risk reduction in profit margins in case of oversupply of infrastructure • Suez policies adopted by the Egyptian government with the reduction of tariffs	• Container traffic growth • Development of activities related to the transshipment which originates revenues and creation of new jobs • Development of new trade, especially in the energetic field • Business of bunkering • Hub role for the Americas

Competitiveness of maritime traffic

Maritime competitiveness is based on the quality of the services offered and on basic infrastructure which allows the accommodation of ships; infrastructures that gradually are adapting to the global level, but it also takes into account times and costs. To compare the convenience of Panama with respect to Suez, Cape Horn and the Cape of Good Hope, the main times and costs incurred for travelling on certain strategic routes, have been estimated and compared.

The analysis wants to be a quick comparison snapshot of the routes and on the strengths and weaknesses of the passage through the Panama Canal. The paper wants to, in fact, provide a key of instant reading to sector operators and investors, opinion leaders and those who are directly and/or indirectly involved in the governance of the maritime sector at the various levels; from the local to that of central government and at national and/or international level.

Analysis of competitiveness

For the importance, the strategic value of the sector, and the comparability of data, the analysis made reference to the container segment. Given the fact that the expansion of the Canal was crucial in allowing the passage of large ships, the analysis refers to a container ship of 12,000 TEUs, loaded at 80% travelling at a speed of 15 knots.

The analysis allows to highlight the cost of the trip per TEU to be compared for time and cost of the Panama Canal with the passages through Suez, Cape Horn and the Cape of Good Hope on the routes for Panama. So, as previously noted in the paragraph “the trend of traffic”, is the US East Coast-Asia (as benchmark route the Shanghai-New York, Hong Kong-New York were considered), the Us Coast-West East Coast of South and Central America (as benchmark route the New York-Callao (Peru) was chosen, the Europe - West Coast of South America (as benchmark route Rotterdam-Callao was chosen) the Europe-Asia (as benchmark route Rotterdam-Yokohama was chosen).

In addition to journey times that were considered in the analysis, there are some main types of cost that must be considered in the comparison: the cost of capital and in particular the amortization cost; the overall cost of the journey made up of fuel price, operating costs and the Cana fees. In total, 4 cost variables were analysed.[49]

[49] In the calculation the average cost of the goods in stock was already considered.

Cost of capital's amortization. The cost of capital depreciation of a container ship of 12,000 TEU[50] annualized at 6% discount[51] on a period of an average life of 30 years[52] is equal to $8.717.869[53] i.e. $23.982 per day.

Daily rate of capital's amortization

Vessel Capacity (TEU)	12,000
Vessel Purchase cost ($)	120,000,000
Discount Rate (%)	6
Vessel Lifespan (years)	30
Daily Capital Cost ($)	23,982

Table 6 - Source: OECD, North Carolina Maritime Strategy, eboatloans

The cost of fuel. Typically, fuel is considered the greatest cost category because the traffic through the Canal also depends on the dynamics linked to the price of oil[54]. This value varies considerably over time, as noted also by Notteboom and Rodrigue. In fact, it should be considered that the low prices of bunker also correspond to a greater willingness to lengthen the routes[55]. Overall, a New-Post-Panamax consumes approximately twice as much fuel as a Panamax, but provides 3 times more capacity, thus obtaining a greater efficiency.

Below are the details of the cost of fuel per day. The cost of the bunker per ton is estimated on the basis of the prices of April 2016 of $236 per metric ton[56] on a daily consumption of 415 tons[57].

Daily cost of fuel

Fuel consumption per day at sea (metric tons)	415
Fuel unit cost per metric ton	$ 236
Fuel cost per day ($)	97,940

Table 7 - Source: Bunkerworld North Carolina Maritime Strategy

[50] The cost of a 12,000 TEU ship is $120 million, as OECD estimates in 2015 in "The impact of mega-ships"

[51] Source: Inland Revenue.

[52] North Carolina Maritime Strategy (2012). *Final Report*.

[53] North Carolina Maritime Strategy (2012). *Final Report* and http://www.eboatloans.com/amortizationcalculator.php

[54] On this topic, see also SRM-Alexbank (in collaboration with)(2015), *The economic effects of the Suez Canal on the Mediterranean trades*.

[55] Rodrigue, J.P. & Notteboom, T. (2011). "Challenges to and challengers of the Suez Canal" in *Port Technology International*, Bernard Henry: London.

[56] Index BW380 Bunkerworld.com.

[57] For estimates of fuel consumption see North Carolina Maritime Strategy (2012).

The other cost variable which has been considered is the operating costs. These are the costs and expenses incurred on a daily basis by a ship and include the crew, insurance, spare parts, repairs and maintenance costs. Wishing to arrive at an estimate of the costs of the trip, the average value for a container ship from 10.000-12.000 in 2014 is assumed[58].

As regards the tariff for crossing the Canal, i.e. the fees paid when crossing the Canal, they are the key endogenous variable to the respective authorities of Panama Canal and Suez on which they are competing for volume of traffic. In fact, on the other variables, they may have a very minor impact.

The authority of the Panama Canal is constantly changing the rates for crossing the Canal, in order to compete at global level. The Council of Ministers of Panama approved the new plan of tolls for the transit of ships in the Canal of the central American Republic.

The new tariff system, which entered into force on 1st April 2016, was presented at the beginning of this year by the authority of the Panama Canal and has considerable differences compared to the previous year.

Almost all segments of maritime traffic will have a tariff system based on different units of measurement[59].

A new loyalty program for the segment of container ships will also be implemented, which provides for the application of reduced rates once it has reached a certain level of the container volume transported through the Panama Canal.

The new tariffs for Panama will determine increased costs for container traffic – compared to the previous year – estimated at between 4 and 10%[60] depending on the size of the ships. Currently, for a container ship greater or equal to 12,000 TEUs which travels at 80% load, rates are $50 of total allowance (TTA) plus 35 dollars for each container loaded on board[61]. For the calculation of the tariffs, reference is made to the calculator developed by the Panama Canal Authority that gives a fee equal to $936,000[62].

As mentioned, certain reductions are foreseen in case it reaches a certain threshold of capacity in the course of the year[63].

[58] Drewry (2016).

[59] For example, rates for bulk carriers will be based on the dead weight tonnage of the ship and on the weight in tons of the transported load. The rates for gas tankers carrying liquefied natural gas and liquefied petroleum gas will be based on cubic meters, while for oil tankers rates will be measured and based on the PC/UMS (Panama Canal Universal Measurement System) tonnage The rates relating to container ships will continue to be based on containers transported (measured in 20-TEU boxes) and those for passenger ships on the number of beds or on PC/UMS tonne. Furthermore, the new plan includes the new Intra Maritime cluster tariff segment that includes the local maritime traffic and whose entry into force is immediate.

[60] Rates to 2014 were of $74 per TEU of its total capacity, and for each container which was loaded there was an additional toll of $8. Hypothetically, although the passage of a 12,000 TEUs was not possible, we calculated the estimated cost of a 12,000 TEUs and a 5,000 TEUs as of 2014 tariffs and compared it with the current rates.

[61] While for a Panamax between 3500 and 5100 TEUs are respectively equal to $60 and $30. For fares see Panama Canal Authority, *Toll Tariffs approved by the Cabinet Council and published on the Official Gazette Implementation*, 1st April 2016.

[62] As confirmed by the Panama Canal Authority tolls estimated by the computer on the site Http://www.pancanal.com/peajes/ are for a single transit and are based on the toll tables that appear in http://www.pancanal.com/peajes /ApprovedTollsTables-v2.pdf

[63] In particular, if in the course of the year the capacity of TEUs reached is Category 3 tariff (from 450,001 to 999,999 TEUs) the fare will be $924,000, Category 2 tariff (from 1,000,000 to 1,499,999 TEU) the fare will be $912,000, Category 1 tariff (from 1,500,000 or more TEU) the rate would be $900,000.

Panama Canal Toll per Passage

Panama Canal Tariff for TTA	$ 50
Tariff for Loaded containers on board	$ 35
Average vessel Capacity Utilization	80%
Panama Canal toll per Passage	$ 936,000

Table 8 - Source: https://peajes.panama-canal.com/wcportacontenedores.aspx rate refers to 1 passage therefore to Category 4 tariff (from 0 to 450,000 TEU) http://www.pancanal.com/peajes/ApprovedTollsTables-v2.pdf

Transit fees for Suez, instead, are based on the tonnage transported more than on the TEU transported[64] The estimate is relative to the passage of a vessel of12,000 TEU[65].

The Suez Canal Authority has recently approved a tariff line with discounts of 45-55-65% on some container routes originating from the ports on the East Coast of the American continent and directed toward the South and South East Asia[66] It is specified that in the calculation this further reduction has not been taken into account. The average rate of transit northbound and southbound was equal to $454,465.5.

Suez Canal Toll per Passage

TEU Capacity	12,000
Tipical SCNT (Suez Canal Net Tonnage)	120,000.00
Tipical SCGT (Suez Canal Gross Tonnage)	135,212
Suez Canal toll Northbound	463,894
Suez Canal toll Southbound	445,037
Suez Canal Average toll	454,466

Table 9 - Source: Source: http://www.suezcanal.gov.eg/calc.aspx

All in all, it must be said that the costs of capital are fixed costs while the operating costs are variables that change daily and are related to the daily activity being linked to the operation of the ship. The costs relating to the price of fuel and the rates for crossing the Canal are related to a single journey. While the first three variables are exogenous to the Authority of the Canals, the last variable relating to the transit toll represents the key element on which the competitiveness between Suez and Panama is based.

Below a summary table of the days and the distances of the strategic routes for Panama is provided with respect to the four crucial global maritime routes.

[64] The Authority of the Suez Canal in the calculation of the transit fees for container ships also considers the tonnage.

[65] A 12000-TEU ship on average transports 135,212 gross tons (Suez Canal Gross Tonnage), and net 125,000 (Suez Canal Net Tonnage) with a depth of 49.9 feet and a width of 160.7 feet and 7 levels of containers on the deck Source: estimates on proportion with Emma Maersk http://www.naviecapitani.it/Navi%20e%20Capitani/gallerie%20navi/Containers/schede%20navi/M/MAERSK%20LINE/Emma%20Maersk.htm

[66] Circular 2/2016 Suez Canal Authority.

In bold, the routes where Panama is more competitive in terms of time are highlighted with respect to the others while the route where the competitiveness with Suez is significant is underlined. As highlighted in the table, Panama is competitive in terms of time and distance, on almost all routes analysed.

Obviously, the smaller distance and minor times are related to the routes East Coast of the United States and the West Coast of Central and South America, where the comparison with the Suez Canal and with the other transits, is highlighted for mere statistical completeness and analysis but there is no doubt about the competitiveness of Panama on this route. It is recalled that the United States East Coast and Central and South America's route covers 23%[67]. of the total number of trades (see paragraph the trend of traffic). We must however, say that the effects of the reduction in the transit times via Suez, which will increase the competitiveness, are expected[68]. Also on the route Europe-West coast of South America, Panama is strategically placed better because it is nearer. And also this route is significant for Panama covering approximately 6% of its traffic.

Panama, however, is competitive by share of traffic (with 35.8% of the total see paragraph the trend of traffic), especially on the route Asia-East coast of the United States. Competitiveness in fact, as highlighted in a previous study,[69] cannot be measured by considering only the distance. Among the strategic elements systematically taken into account by the shipping companies, there are a multiplicity of factors. Actually, over the years, the choices of shipping companies showed that there are a wide range of countries in South-east Asia comprising of China, Vietnam, Malaysia, Indonesia, Singapore and South Korea where the competition between the two routes takes into account many other factors rather than nautical distance alone. In fact, among the aspects the shipping companies consider in deciding the routes, there are the following:

- The maximum capacity of the new Panama Canal that will be able to accommodate 95% of the ships of next generation up to the limit of 13,000/14,000 TEUs;
- The ancillary services offered such as logistic parks and/or free zones;
- The ability to create a "critical mass" on the volumes transported by maritime shipping companies, by reaching different hubs such as Dubai, apart from Asia, departing from Panama or from the west coast of the US and heading toward Europe with stopovers in Gioia Tauro, Malta and then in North Africa; or departing from Europe and then touching the various ports of Central and South America;
- The ability to maximize the economies of scale in the consumption of the bunker using vessels of larger size (the so-called post-Panamax);
- And above all, the cost of transit in the Canal and all the costs previously highlighted.

In order to provide an intuitive cross-section on competitiveness in terms of times and costs, in the following figure the data of a container ship from 12,000 TEU on all routes are compared. The element of comparison is the cost per TEU per trip (considered as round trip).

[67] Given by the sum of the East Coast of the US-West Coast of South America with the 16% and the East Coast of the US-West Coast of Central America with 7%.

[68] On this topic see also SRM-Alexbank (in collaboration with)(2015). *The economic effects of the Suez Canal on the trade of the Mediterranean*.

[69] Ibidem.

Analysis of the days and of the distances of some strategic routes between Asia - Europe and the Americas

Route	Distance (nautical miles)	Days	
NEW YORK- SHANGHAI			
Panama	**10582**	**30**	
Cape of Good Hope	14468	40	
Cape Horn	16746	46	
Suez	12370	34	
NEW YORK- HONG KONG			
Panama	**11207**	**31**	
Cape of Good Hope	13686	38	
Cape Horn	16684	46	
Suez	11593	32	
ROTTERDAM- SHANGHAI			
Panama	**13411**	**37**	
Cape of Good Hope	13843	38	
Cape Horn	17246	47	
Suez	10525	29	
ROTTERDAM-YOKOHAMA			
Panama	**12527**	**34**	▲
Cape of Good Hope	14495	40	
Cape Horn	16740	46	
Suez	11180	31	
NEW YORK-CALLAO (PERÙ)			
Panama	**3351**	**9**	
Cape of Good Hope	19693	54	
Cape Horn	9753	27	
Suez	19776	54	
ROTTERDAM-CALLAO (PERÙ)			
Panama	**6180**	**17**	
Cape of Good Hope	19068	52	
Cape Horn	10253	28	
Suez	17931	49	

Impatto del nuovo Canale di Panama

▬ Route where Panama is more competitive in terms of time

▲ Route where the competitiveness with Suez is significant

Table 10 - Source: SRM on Sea-distances.org

As shown by the figure, Panama has a comparative advantage compared to Suez, both on the Shanghai-New York route where the cost to transit per TEU is $821.9 against the $830.4 of Suez, and on the Hong Kong-New York route where the cost of the trip per TEU is $829.4 against the $855.1 of Suez. It must be emphasized that this advantage continues due to the new tariffs and with the expansion of the Panama Canal but the pressing competition continues on those routes as results from the almost aligned data of Panama and Suez alike.

The competitiveness on the routes of Panama compared to other canals per TEU per trip (round trip) in $

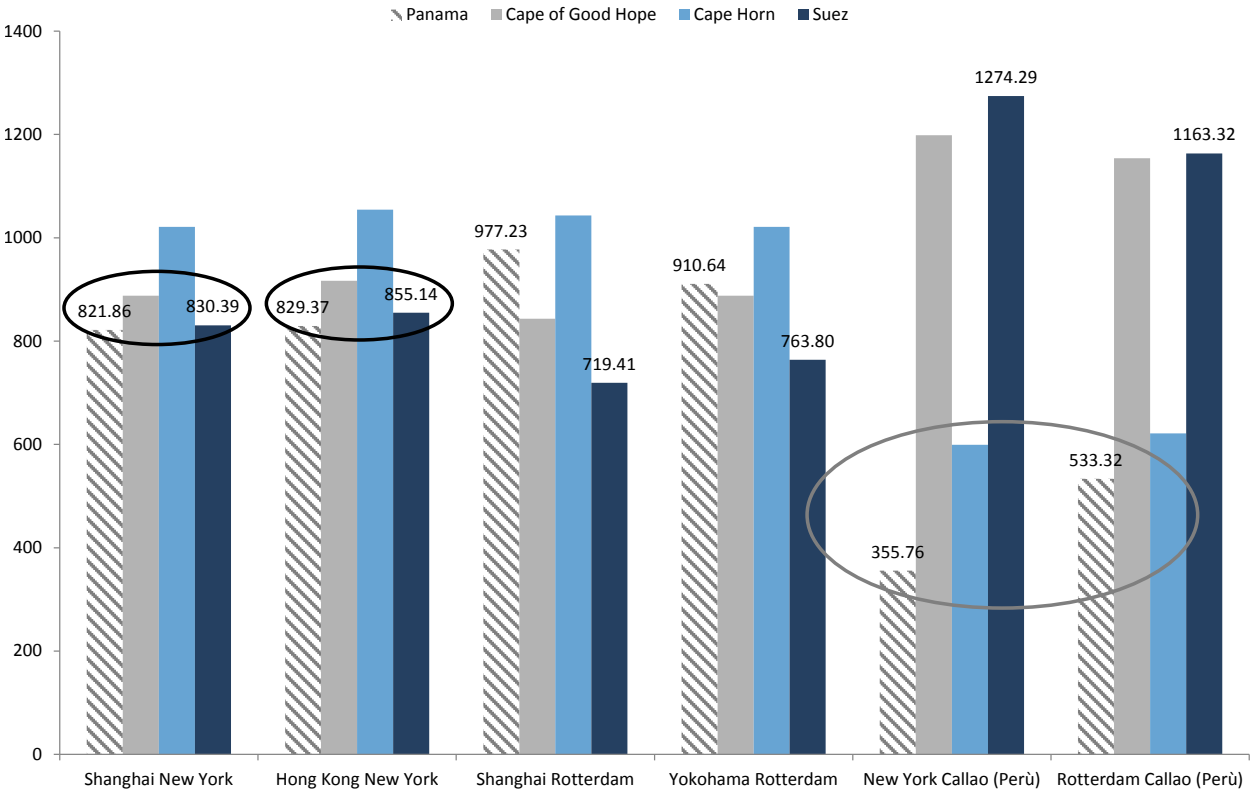


Figure 14 - Source: SRM on Panama Canal Authority, Suez Canal Authority, Bunker Sea-distances.org, bunkerworld.com, Drewry 's data

However, the ability to accommodate larger ships will allow Panama to be inserted in a market segment that was previously precluded; the segment of ships ranging between 4,500 TEUs and larger ships (13,000/14,000). This means competing in a market once inaccessible with a slight advantage in terms of distance and costs. It follows that the competitiveness between Panama and Suez will continue and will be on the rates but also on the related services. Services ranging from any hinterland railway connection, proximity to free-zones, logistic parks lined to them. As highlighted by an Alphaliner[70] study, although there is a balance between the two guidelines in terms of supply capacity, of the 25 services offered by the maritime shipping companies on the route Asia - East Coast of the United States 16 pass through Panama.

[70] Alphaliner (2015). *Weekly Newsletter*, No. 28.

However, the Alphaliner study detects a strong rebalancing on the routes thanks to the passage of the mega ships through Suez. The Egyptian is the passage for the Med and the Gulf and will maintain its leadership on these routes despite Panama. Indeed, with the expansion of Panama the Med-USA relations may grow.

The competitive advantage of Panama on the route New York-Callao instead, appears undeniable, confirming the role of central maritime hub in the American continent. The cost of the trip per TEU through Panama is in fact $355.7 and has a duration of only 9 days (on a direction).

There is no comparison as for duration and cost with other strategic crossings. For completeness of study though, the results for all four routes are reported. Also on the Rotterdam - Callao route, Panama has a considerable competitive advantage with a travel cost per TEU of $533.3; competitive advantage that it also preserves against Cape Horn $621.4 with respect to which it maintains a distance of 9 days in terms of travel.

Expected impact and effects of the new Canal

According to the Canal authorities, taking into account the current developments in the world economy, at least initially there will be an increase in the number of vessels that will pass through the Canal[71] because the large vessels will partly replace the smaller ones. However, potentially, the daily passage of 12[72] ships, that are to be added to the pre-existing 38, will now be possible.

A reduction of the transit time in the short term, has not been provided yet; the total average[73] time for crossing the Canal (journey time+waiting time) in 2015 was 30,58 hours (56 minutes less than in the previous year)[74]. The average transit time was 12.26 hours. The situation is also linked to environmental issues such as fog, the passage of deeper and larger vessels.

However, as fully explained, in the near future the Panama Canal will be able to manage 95% of the global container fleet. As global logistics intermediary, Panama is transforming itself from a transit point into a logistical cluster and commercial platform of the Americas[75].

The real challenge for Panama is therefore not only based on the reduction of the times or on the possibility of transit for larger ships through the new locks in two directions, but also on the possibility of attracting a new market segment.

At this point, a hypothetical estimation of traffic through the Panama Canal to 2020 was made. In accordance with the authority of the Panama Canal[76], in 2020 the extension of the Canal should lead to a widening of traffics, of approximately 25% of the overall traffic, accounting for an annual 5%. These values were revised downwards in the light of the data of the world trades[77] bringing the growth at 15%.

On the basis of these estimates, we assess the overall economic impact to 2020 on some regions, in particular on the United States, Asia[78], Europe (UE5)[79] and Italy. The countries analysed were the first 20 which had the greatest relations with Panama in 2015[80]. Considered the overall estimate to 2020, revised in the light of the evolution of world trade[81], in order to calculate the regional repercussion, we used as the ave-

[71] SRM's interviews.

[72] Rodrigue, J.P. & Notteboom, T. - *Strategic Maritime Passages* (https://people.hofstra.edu/geotrans/)

[73] The total average time varies also because in Panama a system of pre-booking of the transits was adopted. The ships which have booked have the right of precedence in the traffic, while the others must wait. Source: Panama Canal Authority, *Annual Report 2015*.

[74] Therefore, the average time is also influenced by the presence of ships with bookings and ships with no booking.

[75] On this subject see also Rodrigue, J.P. & Notteboom, T. - *Strategic Maritime Passages* (https://people.hofstra.edu/geotrans/) Annual Report 2014.

[76] Oscar Bazán, Vice President Panama Canal Authority, in *48th Annual Georgia Foreign trade Conference*, Panama, 8th February 2016.

[77] The average annual rate of growth of world trade between 2015 and 2020 is 3.75%. Source: IMF.

[78] For Asia the three countries with which Panama has major exchange: China, Taiwan and Japan, were considered.

[79] Belgium, Holland, Spain, the United Kingdom and Italy were considered for Europe.

[80] Total traffic (origin and destination) - data in million tons.

[81] Ibid.

rage rate[82] of growth of GDP of these countries. The motivation that is at the basis of this choice is the fact that the traffic trend was towed by the increase in demand.

The average growth rate in 2015-2020 of GDP was attributed to a subdivision into quartiles calculated on the 20 countries. Extreme values of quartiles were then given a further value of scale, in such a way as to create six classes. This breakdown corresponded to an estimated percentage increase in traffic with an overall growth of 15% of traffics to 2020, according to the following table:

Estimates of the percentage increase of traffic linked to rates of average GDP growth

Gdp growth rate (%)	Overall increase in % of traffics
Greater than 6.2%	30%
Between 3.08 and 6.2%	25%
Between 2.14 and 3.08%	15%
Between 1.19 and 2.13%	10%
Between 0 and 2.12%	5%
lower than 0	2-3%

Table 11 - Source: SRM's elaborations on IMF

The processing of data according to the forecasts highlights that the United States will maintain their primacy for volume of trade also to 2020, with a total traffic (for both origin and destination) that is forecast to rise almost to 190 million tons. However, China will grow the most but with an average annual rate of 6%. In this context, Italy will remain in the Top 20 countries with trade flows toward Panama, thus benefiting from the expansion of the Canal and its traffic through Panama will grow by 1% per year on average.

By integrating the data of each country by geographical area, we are able to estimate the growth of traffic for geographical area. According to these estimates, Asia (3 countries) will grow more[83] and will achieve an overall increase of traffic of 4.3% per year on average, followed by South America[84] with 4%, Central America[85] with 3.7%, North America[86] with 3.5%, and finally Europe[87] with 2.2%. The major traffic will originate in North America (US & Canada) with which they will exchange (as the origin and destination) probably over 200 million tons as compared to the current 172.8 million tons. It should be noted that such growth targets will be possible if some of the important ongoing projects of infrastructure development arecarried out[88].

[82] The average rate of growth of GDP between 2015 and 2020 Source: IMF April 2016.

[83] China, Taiwan and Japan.

[84] Chile, Colombia, Ecuador, Venezuela and Peru.

[85] Guatemala, Mexico, Panama and Trinidad & Tobago.

[86] US, Canada.

[87] Belgium, The Netherlands, Italy, Spain and the United Kingdom.

[88] The new projects already planned are: a pier for the lances service in Balboa (as resulting from the interview of SRM to the Maritime Authority of Panama), in addition to the above mentioned development of the port of Corozal, as well as the project for the expansion of the bridge of the Americas that crosses the Canal from the Pacific side, that will allow the passage of large ships. Expansion project announced on 24 February 2015 (La Prensa, 2015).

Growth forecasts for 2020 of Top Countries for total traffic (origin and destination) - data in million tons

Country	2015	Forecast 2020	average annual growth (2015-2020)
US	160.7	189.6	3.6%
China	48.4	62.9	6.0%
Chile	29.5	36.9	5.0%
Peru	18.8	24.0	1.0%
Japan	22.9	23.5	5.0%
Colombia	17.4	21.8	5.0%
Mexico	16.2	18.6	3.0%
Equador	14.1	14.4	0.4%
Panama	10.0	13.3	2.0%
Canada	12.1	12.5	5.0%
Guatemala	6.1	7.6	5.0%
Spain	4.0	4.6	3.0%
U.K.	3.5	4.1	2.0%
Netherlands	3.7	4.0	3.0%
Taiwan	3.5	3.9	2.0%
Trinidad & Tobago	3.6	3.8	1.0%
Venezuela	3.7	3.8	0.4%
Belgium	3.2	3.5	2.0%
Italy	3.1	3.3	1.0%

Table 12 - Source:SRM's estimates

Estimates for 2020 by geographical area, by the source and destination of the Cargo (data in tons)

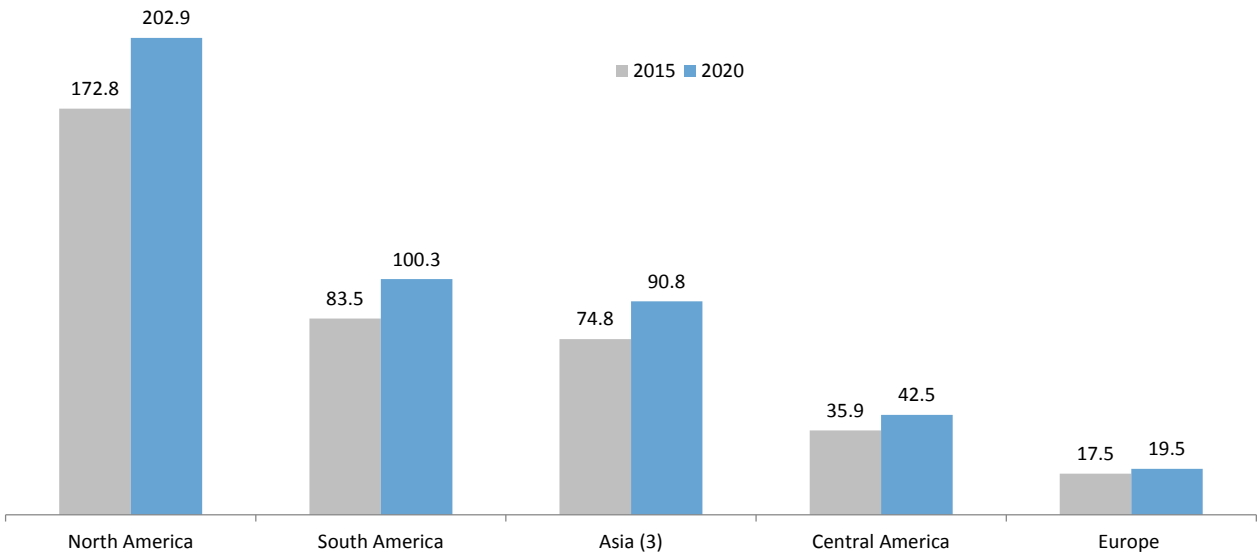


Figure 15 - Source: SRM's elaborations

Conclusions: Suez, Panama and the relations with the Mediterranean

With the paper on the Panama Canal, SRM wanted to show that our maritime economy has been characterized by two major events in two years: the expansion of the Suez Canal and the opening of the new Central American hub.

The expansion, and hence the enhancement of these two major infrastructures immediately draws attention to the fact that we are facing a turning point: firstly, there will be new mega ships crossing our seas, creating the need to have larger and more functional access; secondly, international maritime trade that is increasingly growing. Unctad confirms that 70% of world trade is carried by sea, and the data of containerized goods increases every year, albeit at a slower pace compared to pre-crisis periods.

But this is not all. Large carriers are entering into alliances that will rationalize routes and vehicles, increasing the competitiveness between ports and, as the laws of the market dictate, the strongest will survive. Last but not least, the new agreements which are being signed between Europe and America that, along with the expected easing of the embargo in Iran, will generate new economies, new business relationships and, predictably, new traffic. The Transatlantic Trade and Investment Partnership (TTIP) free trade agreement for example, could increase by €120 billion the European GDP, by €90 billion the GDP of the US and by €100 billion that of the rest of world, for a total value of €310 billion of GDP[89].

The competition between Panama and Suez on the Far East-US East Coast route - weekly capacity 2010-2015

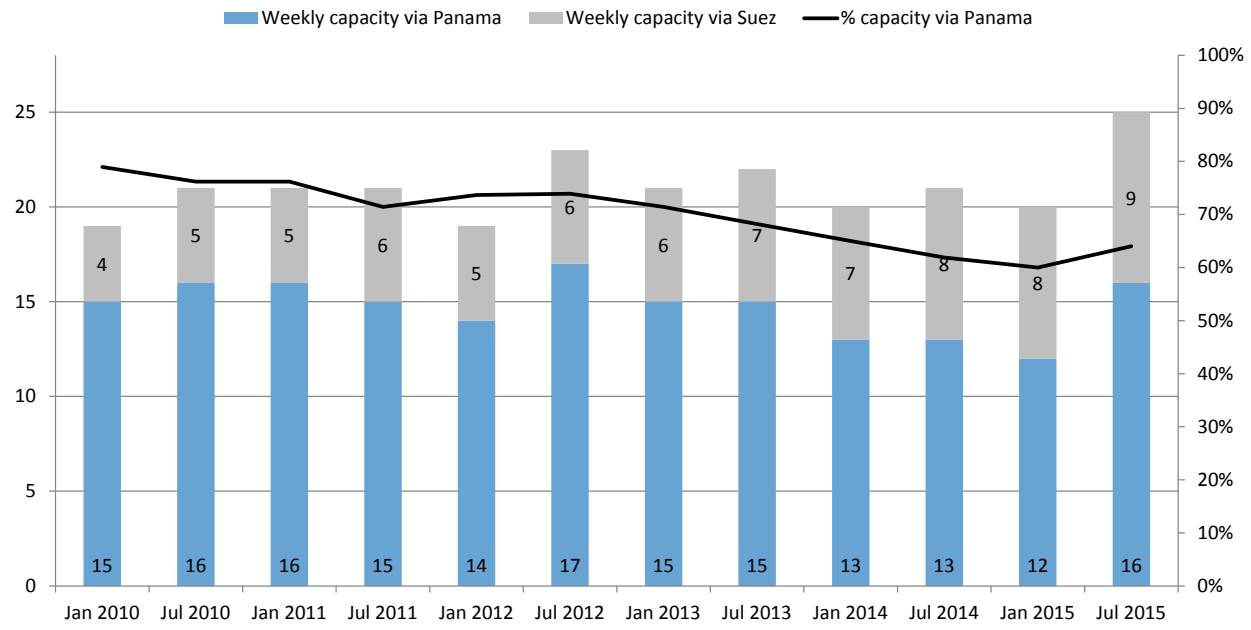


Figure 16 - Source: SRM su Alphaliner 2015

[89] www.geopoliticalcenter.com

These challenges put Panama and Suez in the forefront; apparently these two canals have no relations at all, because the first serves, a “regional market” and the other a more “global market”, but actually, it is not so, they are often competing and often closely related.

Alphaliner states that on the only Far East-US East Coast route (where about 7.5 million TEUs per year pass), in 2015 there were over 25 routes, 9 via Suez and 16 via Panama. The first reflection that immediately catches the eye is that in 2010 there were only19 routes. Therefore, there was a need to increase the supply of an additional 6 “strings”. The second reflection is that almost all the big carriers have ships of various sizes and from various sources which cross this route and so they recognize its strategic importance and value in terms of business.

The third consideration is the increase of the Suez weight between 2010 and 2015. In 2010, the weekly travels on this route passed through the Panama Canal for 15 times while through Suez only for 4 times. Today instead, Panama is chosen 16 times a week, while Suez increased to 9. These are the effects of the need by large ships from the Far East to make multiple stopovers in multiple ports, therefore preferring the Suez route in order to maximize the loads.

It is no coincidence that China has renewed its interest in building and strengthening logistics and maritime bases in the Mediterranean. The phenomenon can be observed especially in connection with various events such as the acquisition of 67% of the Port of Piraeus by Cosco, the Chinese operator partly owned by the Government and which recently merged with another Chinese mega operator CSCL (China Shipping Container Lines). Cosco (named Coscocs after the merger) will ensure further investment in the Greek port for €350 million in ten years.

This operation should also be read together with other elements: in fact, China already owns 20% of the Suez Canal Container Terminal which operates one of the largest terminal in Port Said, at the entrance of Suez.

In addition to the aforementioned merger of the Chinese Cosco and CSCL (China Shipping Container Lines) which gave birth to Coscocs, a memorandum was signed that will see the birth of the Ocean Alliance (formerly Ocean Three) which will include the French CMA CGM, the Chinese Coscon, the Taiwanese Evergreen and OOCL - Orient Overseas Container Line of Hong Kong. Therefore, a maritime alliance between France and the countries of the Far East is taking shape. It is intended to affect in an important way the world order of freight and probably the trade relations between the two areas involved. And this alliance will also imply the expansion of trade routes from Europe towards the United States.

For its part, Panama will lead a reorganization of the traffic from Central American ports, especially those of the Atlantic coast which have strengthened and will strengthen their logistics systems, to offer mega-ships more competitive and better services.

The infrastructure works to enlarge the Panama Canal and of US ports (as well as the expansion of Suez) aim to ensure greater smoothness of trade and that, in time, will affect the global geo-economic order.

Geo-economic order which sees as its reference points the richer, more productive and of higher consumption areas in the world (the US, China, Japan and the EU in the lead).

Even the renowned ports of Northern Europe understood what it means to prepare for the new challenges that the changes will bring. As part of the main supply chain and traffic routes, it is worth highlighting that Europe, especially central and northern Europe, has a key role.

The area of the Mediterranean, on the other hand, is trying to get connected to global supply networks also making investment in infrastructure. An example is Turkey with Ambarli and also Egypt with Port Said and Suez, not to mention Morocco with Tanger Med.

In this context, also Italy, the natural logistics platform and second manufacturing country after Germany, is also trying to adapt to the changing needs of the market. The proof of which is the project for the on-going port authorities' reform.

The reform is expected to bring that operational efficiency and organizational structure of our ports that, together with the necessary infrastructure adjustments should make our port facilities more competitive, in order to cope with the challenges of the Mediterranean and of the new impacts that Panama will bring. Doing so, Italy will be able to seize the opportunities that arise from the increase of traffic envisaged that will be from China and from the United States' routes.

STATISTICAL APPENDIX

CONTENTS

Panama and Suez: 2 Channels in comparison

	Panama Canal	Suez Canal
Peso nel commercio marittimo mondiale	3%	8-10%
Aree maggiormente utilizzatrici	East Asia, East Coast US	West Europe, South-East Asia
Lunghezza (Km)	81	193.30
Water depth (m)	18.3	24
Tempo di transito	12	11
Vessel capacity (containerships)	13,000/14,000 TEU	No limits
Numero navi 2015	13,874	17,483
Incidenza delle navi portacontainer	22.1%	34%
Cargo 2015 (milioni di tonnellate)	229.1	822.9
Costo espansione (stima)	6.2 $bn	8.2 $bn
Ricavi da tariffe(2015)	6.1	7.6
Ricavi da tariffe (stimati)	2.61 $bn	4.6

Source: SRM on Panama Canal Authority and Suez Canal Authority data

Panama Canal Authority's main customers

American President Line	Hanjin Shipping Company Limited	Nippon Yusen Kaisha (NYK)
CMA CGM	Hapag-Lloyd	Seatrade Reefer Chartering NV
China Ocean Shipping (Group) Company	Kawasaki Kisen Kaisha Ltd (K-Line)	STX Pan Ocean Company LTD
Compañía SudAmericana de Vapores (CSAV)	Maersk	Wallenius Wilhelmsen Lines AS
Evergreen Marine	Mediterranean Shipping Co.	Yanming Marine Trans
Hamburg-Sud	Mitsui O.S.K.	Zim Israel Compañía de Navegación

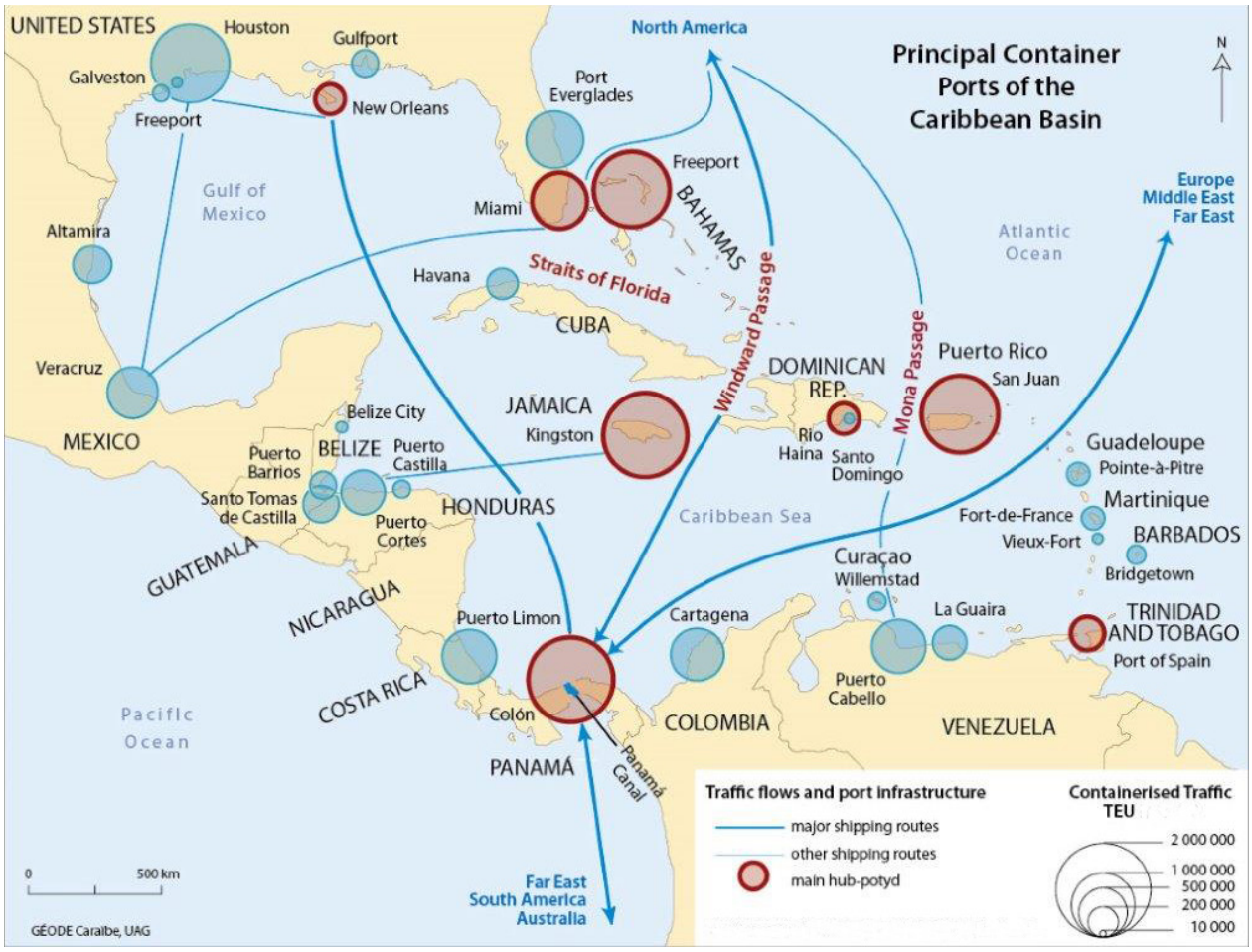
Source: Panama Canal Authority

Panama's main terminal operators

MANZANILLO INTERNATIONAL TERMINAL | joint-venture between Carrix, Inc. and the Motta and Heilbron families of Panama / Atlantic Coast
COLON CONTAINER TERMINAL (CCT) | part of the Evergreen Group / Atlantic Coast
CRISTOBAL | operated by Panama Ports Company (PPC), member of Hutchison Ports Holdings, on the Pacific Coast / Atlantic Coast
BALBOA | operated by Panama Ports Company (PPC), member of Hutchison Ports Holdings / Pacific Coast
PSA PANAMA INTERNATIONAL TERMINAL | Pacific Coast

Source: Georgia Tech Panama Logistics Innovation and Research Center

Traffic flows and ports related to Panama Canal



Source: ECLAC, American Association of Port Authorities

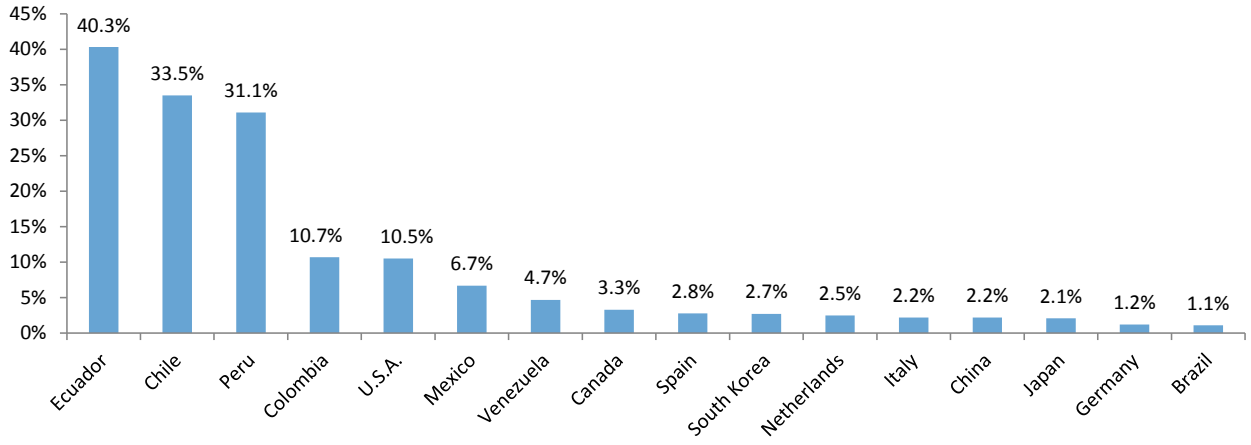
The role of the Panama Canal in the global maritime transport scenario

The value of the Panama Canal in global maritime trade

3% OF WORLD MARITIME TRADE
14.3% OF GRAINS
10.3% OF MINERALS AND METALS
5.6% OF CHEMICALS
3.7% OF CONTAINERS

Source: Panama Canal Authority, 2015

The importance of the Panama Canal to the maritime transport of specific countries
(% maritime import-export transiting the Canal on the total)



Source: Panama Canal Authority su IHS, October 2012

Top 20 countries using the Panama Canal for cargo transit
Fiscal years 2007, 2014, 2015. Data in long tons

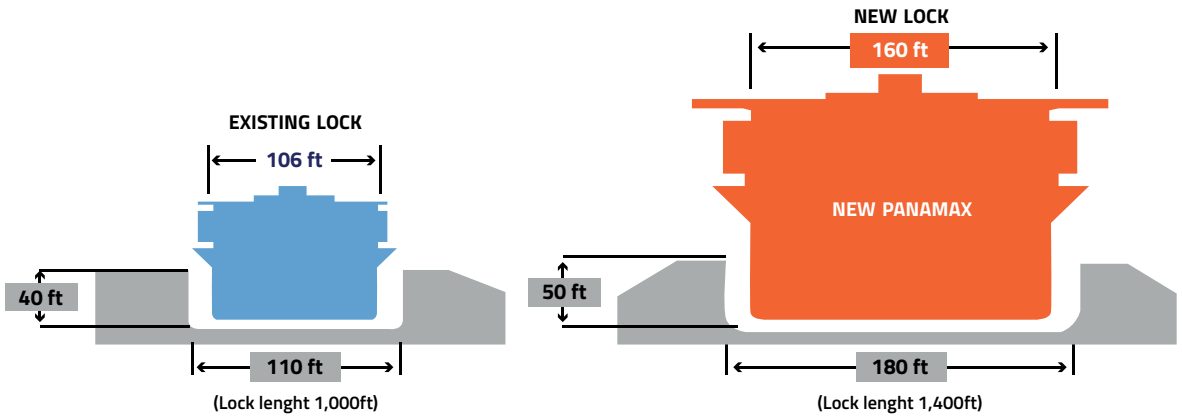
Rank	Country	2007	2014	2015
1	United States	136,889,079	154,143,266	160,780,317
2	China	43,698,902	51,510,238	48,419,974
3	Chile	21,985,543	29,454,182	29,538,448
4	Japan	29,201,165	21,674,701	22,862,207
5	Peru	13,066,742	16,535,905	18,793,667
6	South Korea	17,284,222	19,184,523	18,501,258
7	Colombia	10,115,659	19,232,770	17,419,628
8	Mexico	10,712,654	14,629,733	16,218,681
9	Ecuador	13,571,137	13,980,046	14,137,370
10	Canada	10,082,979	10,303,448	12,094,934
11	Panama	12,178,120	9,231,690	10,022,375
12	Guatemala	3,857,419	5,429,986	6,054,698
13	Spain	4,352,115	5,358,781	4,007,710
14	Netherlands	4,568,353	3,866,754	3,708,597
15	Venezuela	6,688,432	4,333,756	3,683,613
16	Trinidad and Tobago	n.a.	3,579,374	3,602,028
17	United Kingdom	3,037,027	3,123,617	3,507,371
18	Taiwan	7,155,996	3,718,048	3,505,619
19	Belgium	4,047,875	3,059,661	3,226,570
20	Italy	3,377,805	3,271,514	3,121,761

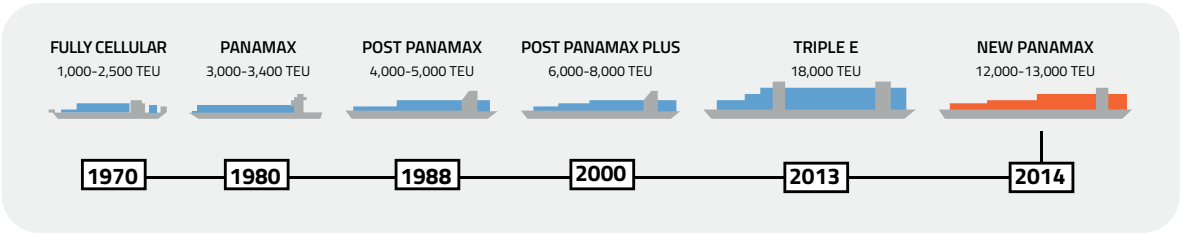
* Total Excluding Intercoastal traffic.

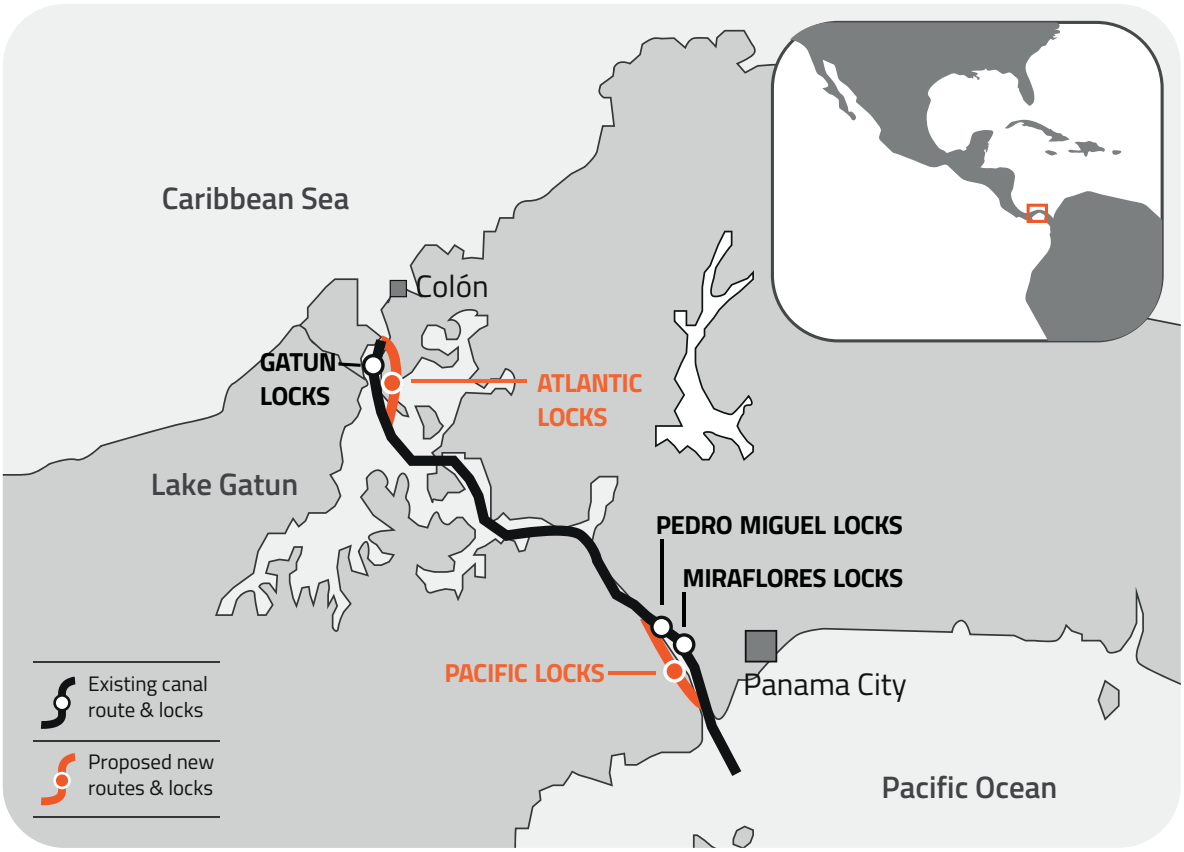
Source: Panama Canal Authority, 2016

Figures of the New Canal

Sizes and vessel capacity of the New Canal: comparison between the old and the new locks







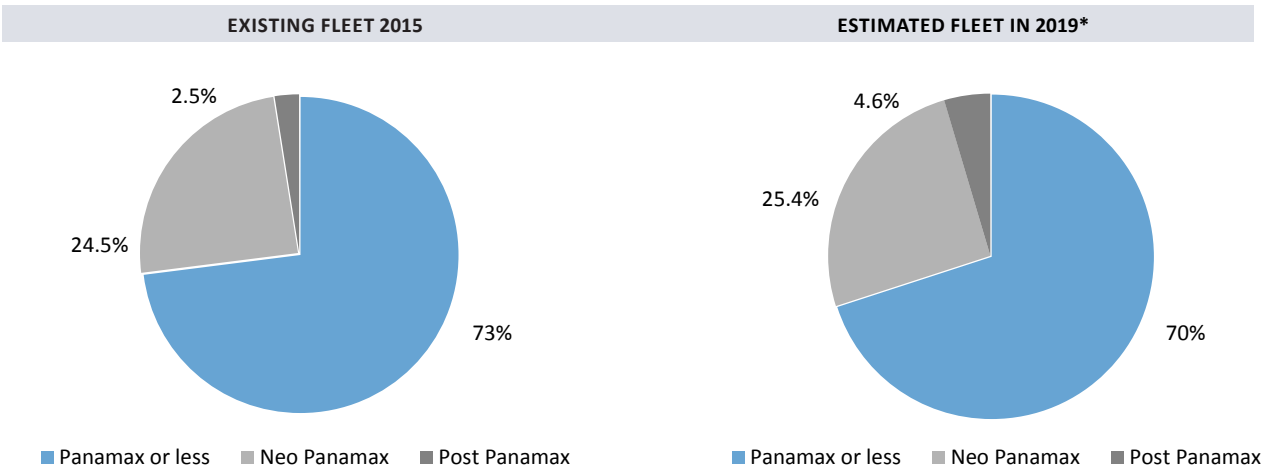
Source: SRM's elabrations on Panama Canal Authority data

In detail:

	Original Canal (1914-)	Expanded Canal (2016-)
Locks beam	Current Locks: 33.5 m (110 feet)	New Locks: 55 m (180 feet)
Depth	12.8 m (42 feet)	18.3 m (60 feet)
Ship standard	Panamax	New Panamax
Beam	*32 m (106 feet)*	*49m (160 feet)*
Lenght	*294.1 m (965 feet)*	*366 m (1,200 feet)*
Draft	*12.04 m (39.5 feet)*	*15.2 m (50 feet)*
Vessel capacity	4,400 TEU	13,000 - 14,000 TEU
Bulk Carrier capacity	52,000 DWT	119,000 DWT
Locks	Miter gates Three lock systems: 1. Gatun Locks (3 stages; 85 feet) 2. Pedro Miguel Lock (1 stage; 31 feet) 3. Miraflores Locks (2 stages; 54 feet)	Rolling gates (dual locks) Two lock systems: 1. Atlantic Locks (3 stages) 2. Pacific Locks (3 stages)
Construction cost	$ 387 million	$5.25 billion
Annual capacity (number of ships)	16,500 - 14,000	16,000

Source: Panama Canal Authority

Existing fleet as of 2015 and estimated as of 2019



*In 2019, 95.4% of the containership fleet will be able to transit the Panama Canal.

Source: Panama Canal Authority, 2015

Traffic data

Ships (number) and cargo (long tons) transiting the Panama Canal. Years 2008-2015

Year	n. of Transits	Cargo Tons (millions)
2008	14,702	209
2009	14,342	198
2010	14,230	204.8
2011	14,685	222.3
2012	14,544	218.1
2013	13,660	212.1
2014	13,481	227.5
2015	13,874	229.1

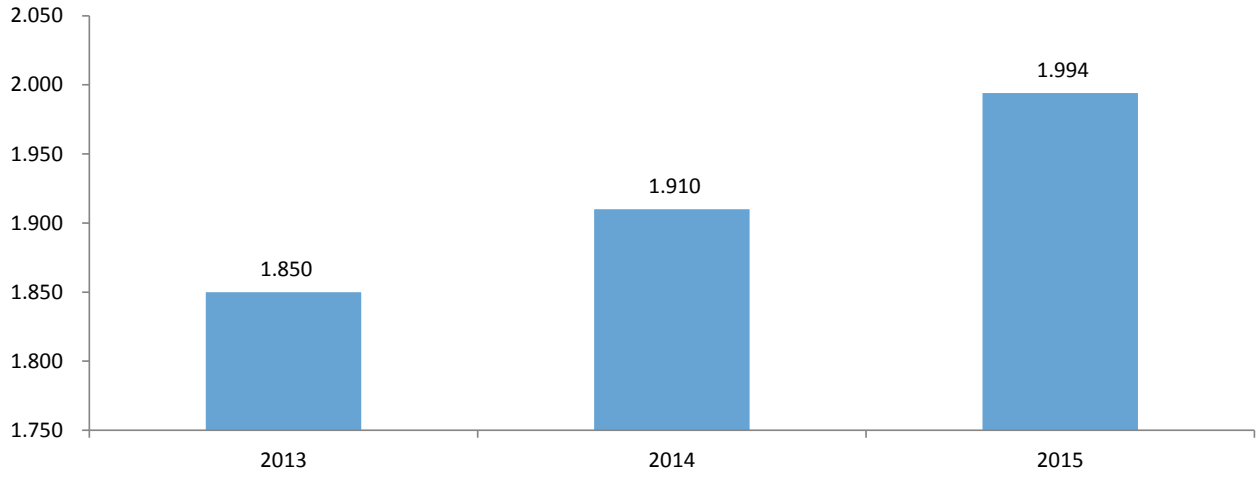
Source: Panama Canal Authority, 2016

TEU handled in the Panamanian port system. Years 2013-2015

Year	Bocas Fruit	CCT	MIT	Balboa	Cristóbal	PSA (Panama International Terminal)	Total	Var. %
2013	17,949	608,471	2,025,904	3,063,579	721,685	123,808	6,561,396	
2014	19,046	502,706	2,071,342	3,236,355	712,688	231,928	6,774,065	3.2%
2015	22,346	789,663	1,974,981	3,078,101	812,783	216,012	6,893,886	1.8%

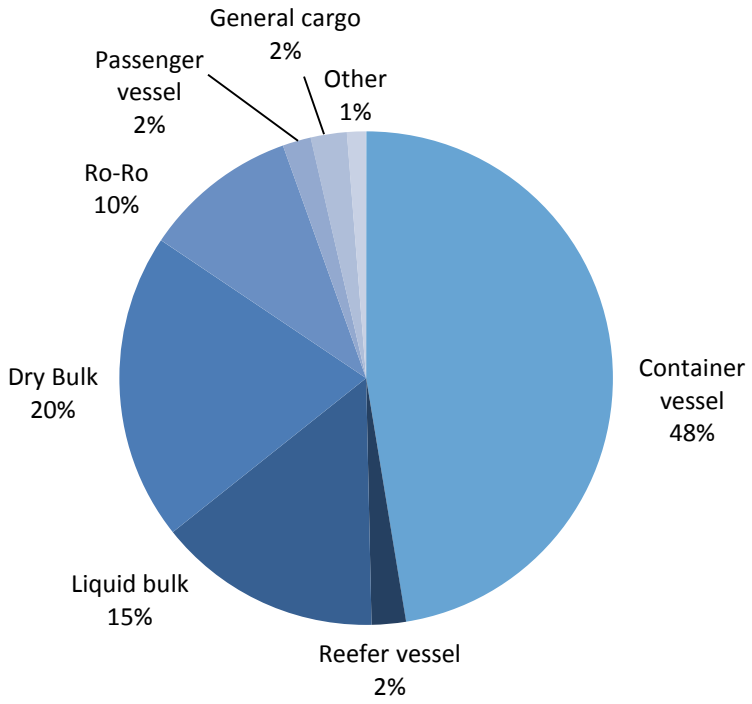
Source: Panama Canal Authority, 2016

Revenues from tolls (billions of US$). Years 2013-2015



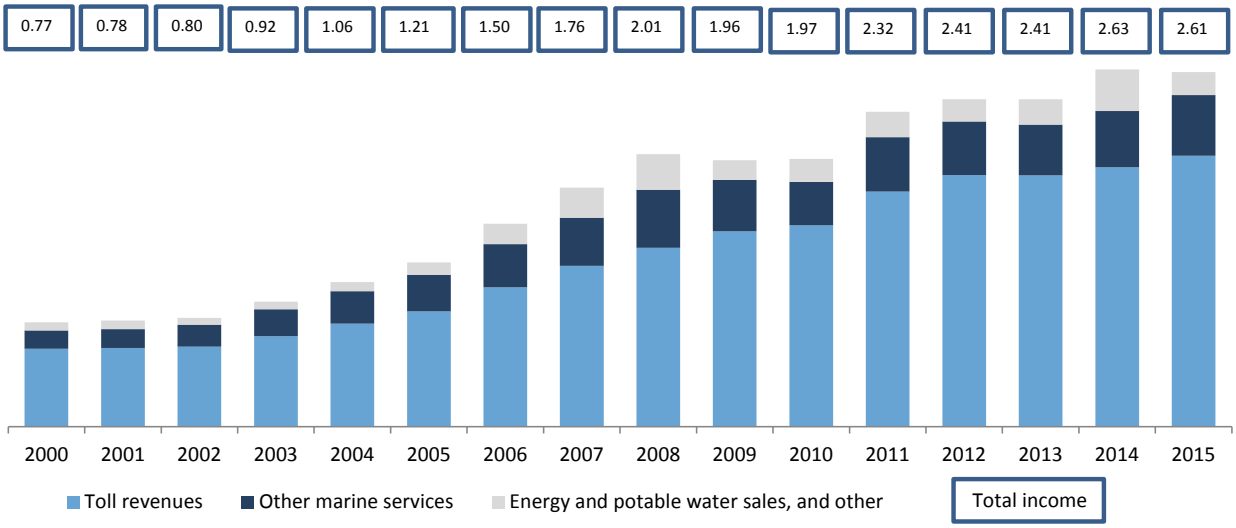
Source: Panama Canal Authority, 2016

Revenues from tolls (billions of US$) by market segment. 2015



Source: Panama Canal Authority, 2016

Growth in revenues (billions of US$). Years 2000-2015



Source: Panama Canal Authority, 2016

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