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Maritime Perspective of Panama Interoceanic Railway

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ABSTRACT

In 1977, when the American historian David McCullough wrote a book called: "The Path Between the Seas: The Creation of the Panama Canal, 1870-1914", about the social and geographical environment during the Panama Canal construction, he described the transisthmic railway as a complement of the engineering department that French's company did not know how to take advantage of, because with the Californian gold fever decadence and with the Canal works it would not have had any commercial purpose other than the ridiculous price of passenger tickets. He never imagined that 100 years later this complement will be a key fact in the supply chain of the Latin-American and worldwide trade.

In this paper, we will focus in the logistical map of America, where Panama is the centre. Being the way to connect Asia and America, also both coasts of the American Continent, and the begin/end place of four of the five Feeders highways of Latin America, it turns in the link with the others and with the rest of the world. But they are separated by 76 kilometres that a logistical system converts this distance into a one-hour travel to the next connection.

The challenges of this system are raising everyday as result of different regional trade facts. The Panamanian complex is playing an important role with the trade balances, the growing economies and transoceanic services with stop in Panama, generating disequilibrium (empty containers problem). The empty containers must follow the empty container cycle since the container is emptied and the customer returns it to the owner, it's taken to the depot for maintenance, step that is mandatory in order to return to the cycle of export.

1. Introduction

Shipping alone is not sufficient, as it is known, it is necessary for interconnection with other modes of transport to carry the goods to the final customer or end consumer sites, hence the importance of strengthening the supply chain (Jackoby 2014). Starting by the Panama Canal, usually there is not any reference to the railway that connects both sides of the Panama's Coasts, using a daily railway (Hansen, 2014) (see the Figure 1), the Panama Railway. Mostly, the container shipping industry in Latin America is based in regular liner routes that calls the ports of almost all the countries of the continent (Bolivia is the only one without water gateway) linking them with the others (McCullough 2001).

Historically these countries were natural producers and they supplied themselves their basic requirements and only traded with their traditional partners some things that they did not have naturally (Mills, 2014). But with a globalized world these re-

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Figure 1: The Panama Railway.

Source: Panama Q Magazine.

Figure 2: AWY All Water East Coast Service III of Hanjin Shipping

Source: Hanjin Shipping.

quirements changed and the auto-supply traditional trade changed too, to be world suppliers in specific markets (Sigler 2014). They offered good trade opportunities to the developed countries but them had not the appropriate gateways to support all their export capacity. In 1995 all the Latin American and Caribbean ports only moved 5.18 million TEU's and there were only a few ports (no terminals) with infrastructure and efficiency tools (e.g.: gantry cranes) to handle all this cargo (Mills 2014).

With the proper govern policies to promote international trade the way to link these producers with their consuming markets started to change with construction of basic facilities were this exchange from their inland to the sea could be possible. With this came the liners interest to develop their services and caught this potential market initially linking it with the North American (Figure 2). Nevertheless, volumes were increasing year by year over their capacity planning. The services had a lot of problems like long standings in most of the ports, non guaranteed volumes in all the calls (depending of the season and the country), non regularity in the schedules, congestions in ports with low capacity (one vessel at the time), high transport costs (even with all the described issues), etc. The planned system needed a change to improve it in efficiency and global networking (Gilbert, 2010).

There appeared the logistics and ports operators who viewing the increasing indexes and forecasts for the region wanted the way to be invited in the party. With common agreements with the governments and ports authorities they planned the easiest way to arrange the problems of the region foreign trade. They focused to do a hub in the middle to reach equally all the countries and where they could offer a good connectivity with the rest of the world. They decided to do it in the geographical middle that was also the mandatory pass for the trans-American oceanic routes, Panama. From there liners are able to plan different services to cover all regions of the area with shortest trips, with vessels capacities according to their trades, connections with the rest of the world, lowest final costs, etc. The basic concept was already developed, but there was something that they had to improve before it would have had turned into a bigger problem. For example from 1999 to 2010, countries like Chile increased their exports in 49 billion USD, Brazil 152 billion USD, Mexico 167 billion USD and Peru 29 billion USD. Also, port efficiency in these origin ports was increasing and the connectivity was not enough, the market required faster connections to supply their demands. Panama took advantage of that and basing in the "trans-oceanic" Panama Canal concept they improved their services from hub ports on both sides of the isthmus into an intermodal logistical complex with gateways in both oceans. The main object of this idea is that the cargo that is in the Pacific side can be in the Atlantic side in one hour and backwards.

2. The Panamanian intermodal connectivity

Taking a look on the Panamanian intermodal connectivity role in the supply chain of the Latin American trade and analysing who serves this system, which are the main benefiters and how it affects the trade of its zones served, it must be understood the feeder's route on the area. There are the five main Short Sea Shipping routes where four of them have Panama as final destination and/or starting point to be linked with the other ones and the oceanic routes that pass through Panama. This is an important point for the logistics value chain in Panama. According to Martinez and Eguren (2013), the value chain of a company, includes a series of activities, process, resources and objectives that related to each other generate "value" for the company.

First of all, there is the called "Andean" route that covers all the South American and Pacific coast with divided services or seasonal ports schedules of these countries. Within this zone there are producing countries with highly positive numbers of their trade balances with products well situated in North American and European markets (see Figure 3).

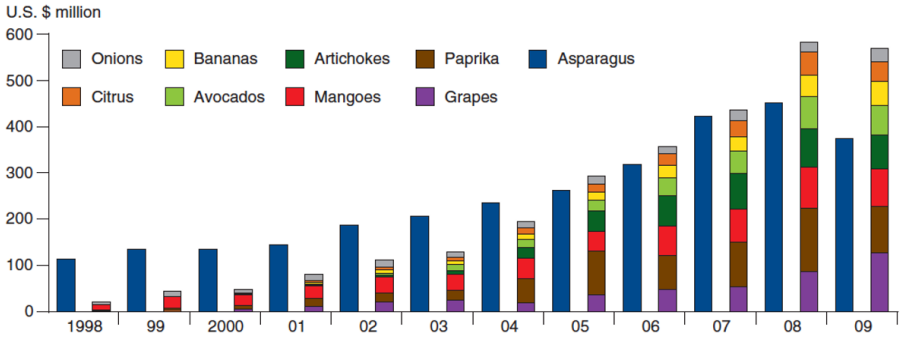
The Colombian's Pacific ports are the main exit for the traditional product (coffee) and the industrial complex of Valle del Cauca. Then other important country is Ecuador exporting bananas (number one worldwide), cacao and seafood. Peru with the highest GDP percent increase of South America and introducing itself in the non-traditional products exports for Europe.

Finally the main actress of the zone, Chile with the best GDP per capita of South America and strong exports of fruits, seafood and wines but without a big percent difference (as the others) what increases the imports too. All the countries where these services are working had been well valued in the "developing countries" index and all of them have green numbers of theirs GDP forecasts for the future. If the shipping business is the thermometer of the trade it seems that this area is very healthy actually and it will be like that at least for the next year what makes more sense to the wave of the main liners who combines a service picking cargo in the main ports and carrying it

Figure 3: Weekly America's Service of CSAV shipping company.

Source: CSAV.

Figure 4: Growt in the value of selected Peruvian fruit and vegetable exports, 1998-2009.



Source: Authors based in Global Trade Information Services, Inc.

directly to the main market (Europe and USA East coast) with different feeders, with a round trip finishing in Panama (Pacific side), who calls the different zones (separately) carrying the gross of their exports (normally non-priorities) and feeding back their markets with empties (Carse 2013).

The other route includes all the Pacific side of Central America and Mexico and sometimes it reaches up to the Californian ports. It uses to be called as "Camex" (abbreviating Central America and Mexico). For these services the main ports are the Mexican, even when the Central American ports are more, because they move more than two thirds parts of the cargo. Focusing us in the Central American ports they are main sea gateways for all the countries (except Belize) because, even when some ones have coast in both sides, their capitals and industrialized areas are close to the pacific side. Mexico is a different case because it has a growing port infrastructures according to their trade demands because they have a direct link with the main routes coming from Asia and the USA west coast. With four main terminals located to supply the different industrialized zones of a country with a GDP of 1,658 USD billions and the second economy of Latin America. Depending of the season and the liner these round trip routes could reaches the Californian ports in order to link them with the oceanic routes who normally call there to or/and to call this ports with a higher frequency (two or three times per week). There are some oceanic routes with USA east coast and European destinations that are starting with smalls calls in the Mexican pacific ports to handle the cargo that normally was handled by the Gulf routes because the traffic, low volumes and seasonal weather problems (hurricanes).

The next one is very similar than the last one but in the Atlantic side, covering the Central American east side, the Mexican Atlantic coast and some liners reaches USA too but the ports of Texas, the Mississippi basin and Florida. It uses to be called the "Gulf" route because the main ports of these routes are in the Gulf of Mexico. The main ports of Central America countries are in the Pacific side but the other ones that are in the Caribbean are the exits for specific producing provinces that have their customers in USA and Mexico. Then there are the Mexican Atlantic ports with Veracruz as the east gateway of Mexico City and other ports in the North side as Altamira. The Texan and Mississippian ports are the main calls of this route because they supply one of the biggest trades of USA (Southeast). The difference of this service against the others is that they pass through two hubs (USA and Panama) and they have a pause of two months (some years three) due the hurricanes season. Another problem of this service is that the volumes in the Central American ports are not guaranteed the whole year maybe some calls are seasonal. All this instability cause that the schedules cannot be planned for a long while, the liners do not put more than two vessels and when they omit some calls they introduces the Mexicans and USA's ports into the oceanic routes from Panama to the East coast (Carse 2013).

The Caribbean services cover all the islands and the Atlantic coast of Colombia and Venezuela. The islands have a special fact that they have a highly intra islands traffic to reach all the islands of the plate (more than 7000) and it makes that this route has two types of services the land to island ones and the island to island. It makes that the bigger ports of the Antilles became in mini hubs that link the island to island with the land to island services. Also this is the only route where the countries have a negative trade balance and them depends more of the imports, it means that this traffic needs different conditions that guarantee the schedules. But to cover all the traffic of the islands is very difficult with multi-calls services that reaches the main islands every week, by these reason the liners planned routes that's groups different big islands close together geographically. Normally with three or four as much the liners covers appropriately the main markets of the Antilles that guarantee these schedules with a weekly call, besides sometimes they mix one port with two different services to divide the volumes and have two calls per week in determinate islands. But how to satisfy these schedules historical cliché of the terminal of the islands means inefficient operations, non prepared personal and poor infrastructures; but today it changed due to global operators interested in this market build little, but efficient, terminals that can handle appropriately the volume demand of the area (Sigler 2014). For the Colombian and Venezuelan the scene is different because they are exporting economies that need different treatment than the islands. On 2010 they exported more than 100 billion USD what makes them an appreciate market for the liners. The Colombian Atlantic coast, at least, requires alone a weekly service to supply correctly the demands of this market linking it with Colon; but in the last years due to the good terminals developed by their new administrators and the volumes the liners included are including them slowly into the oceanic routes. Venezuela has more volume than Colombia individually but some governmental measures have declined the logistical power that it should have according with their numbers. The nationalization of the main terminals, a lot of custom controls and the foreign investment polities (as principals) are the reasons why these ports needs and exclusively service with normally two vessels to link it with Panama as their gateway to the world, even when due to the distance it is necessary only one vessel to a weekly schedule but the poor efficiency of the Venezuelan ports make the operations eternal.

The fifth route is the South Atlantic route that covers Brazil and the Plate River basin. Argentina and Brazil, owners of the 90% (approximate) of the volumes of the route, are the two first economies of South America. That's the reason why the connection with the Latin American hub is only to satisfy their markets of the others routes who meet there. They have their own oceanic routes designed to communicate their markets with their main customers (USA and Europe). With Brazil converting into a developed country (the first of Latin America) and sixth economy in the world their demands became into have gateways in several points in the coast connected with the different producers areas with good inland facilities against have Santos as their main international port. The probably issue will be that the forecasts are so goods that the trade could increase faster than the volume capacity handling of their terminals what can affect this forecasts. The Plate River basin is composed by Uruguay, Argentina and the waterway to Paraguay. It has an intra traffic due to Uruguay and Paraguay don't have enough

volume and terminals for the oceanic routes and all their cargo has to pass trough Argentina to travel to other places.

With the whole Latin American shipping map completed it follows that the hub has an essential role into the exporting and importing flow with all their markets. Even when they have oceanic routes that call their ports there isn't any Latin American country, except Panama, who is directly connected to all the main markets around the world. According to Martell, Martínez and Martínez de Osés (2013) to define the most competitive line of short sea shipping, we cannot forget the handicap caused by lack of flexibility; so, the congestion on railways is a point that must be considered due to its effects on the transport's chain (Hansen 2014).

3. The preponderance of the Railway

Having in mind the well-known geographical situation, the next fact is to see how the shipping industry manages their resources to satisfy the time and costs requirements that are the main demands of the worldwide markets and what makes them competitive, considering the different factors that affect intermodal system in any place.

In this way the Panamanian intermodal complex planned their operational procedures with the schedules of the vessels and their connectivity (Jackoby 2014). The principal tool to achieve this goal is a close communication and information interchange between liners, terminals and railway operators when the first's ones gives their instructions about their connections and with this data the terminals and railways operators plans their daily programs. If this information of berthing schedules and volumes to move in both sides has a regular behaviour it becomes into a weekly work program with small changes depending of the circumstances happened every hour (Hansen 2014). But without this regularity the planning has to be daily with the information or instruction received by the liners and with a strongly coordination train by train between the two terminals involved and the railway operation. The planning for both cases depends on the berthing schedules of the receiving side, with this information, each terminal evacuate the boxes in the priorities order that the other side requires to have their vessel cargo ready before the operation although some cases during the operations. But sometimes due to the priorities system the berthing schedules in both sides suffer continuously changes; example situation: the vessel A in the Atlantic side has to send cargo to the vessel B in the Pacific (planned to work at the same time) and B vessel has to send cargo for the vessel C who is scheduled immediately after the A departure. If the A vessel suffers a delay during its trip and the vessels B and C are already their basins they cannot work even with available berth because without the A the B cannot work because it does not have cargo to load and if it does not work the vessel C does not have anything to load.

It is a common case that uses to happen in Panama. As well the berthing schedules of the liners "could be" the main tool of the intermodal system. But that is the reason why the Panamanian connectivity is a "dynamic" concept with a basic

Figure 5: Panama Railway together with the Panama Canal.

Source: wwwmicanaldepanama.com

planning where the daily circumstances tests every day the capacity to solve in an efficient way the problems that could happens to keep the pass opened trough the hub because if it gets obstructed it could affect in different magnitudes the trade of a specific are or the regional. The example above shows the importance of the departing or origin ports to complete accordingly the schedules due to their delays affect not only their route but it probably also reaches other routes of the continent. With a 24/7 communication between the liners and the operators the intermodal system find the ways to solve or keep operating with the last affectation possible. This immediately measurements sometimes can affect one or more parts of the logistic chain but the big priorities volumes are the key fact in these decisions.

4. The impact of the railway congestion

Regarding the container's movements on the Panama Railway, the external facts must be taken in to consideration, but the internal facts are completely responsibility of the operators with the instructions already done under their control (Hansen 2014). The main one is the train with a double stack bulkhead type rail every train can reaches (maximums) 100 full units and 150 empties and 10 daily trips in each direction. The result of this can reaches a daily productivity of 2000 full moves and 3000 empties. But by tonnage, manoeuvrability, safety, or ports handling convenience or other reasons this maximums are in counted times, the rail operation uses to work between 75% and 85% of their maximum (Hansen 2014). The average quantity per trip is around 75 units and an average productivity of 8 daily trains in each direction although in peak season is normal to see 10 trains each direction.

One of the main problems is that the terminals rails to port productivities are different depending of the terminal. First at all note that these operations are done by the terminals, the rail operator only coordinates the traffics and manage the railways for all the terminals (Hansen 2014). There are three terminals where the rail park operations done by the rail operator; there is only one terminal that does the complete operation in the rail park and the rail to yard. Also the productivity is affected in the different terminals due to the distance from the rail park the terminals yards.

The terminal that does the whole operations has a productivity of 80 moves per hour what supposes that in a discharge and

load operation, of a complete full boxes train, could be done in two hours and a half. The others do 60 moves per hour. These productivities are improved in special operations with a priority where both operators add more resources than the regulars and they can discharge and load at the same time reducing a 40% these times. But the main delays reasons in the operations are usually because of terminals yard congestions that could convert it into a bottleneck for both sides impacting the day plan. Another issue is that the rail doesn't have capacity for oversized units and these units are normally moved by vessel or by land that is the other alternative to the train for counted situations by the highway that communicates both side of the isthmus.

The distance between the two sides is 76 kilometres and the average time of the transit is 50 minutes. The last year crossed this railway more than 315,000 units and this year, in the first quart (low season), they moved over 96,000 units.

The big challenges that this system has to face are external due to the international trade is who rises or decreases the volumes, who demand lower costs and who need fastest transports. With this over the desk the intermodal complex has to deal and optimize their resources to keep being a highway that connects different regions and to don't be an obstructed bottleneck where everybody has to pass.

5. The weather effects.

Taking the role of the weatherman, to do the future forecasts in a medium and long term. But the variants only can have two options the success or stagnation of the intermodal system. The decrease of the Latin American trade that could leave Panama without enough volume to keep profitable the intermodaly for all the parties or otherwise an increase of this trade could collapse it or rise until this volume gets enough cargo to sustain oceanic routes to be connected directly to their markets. With the economic trade prevision for the next years the decrease option is very improbable although it's into the probabilities. Contrary there will be a big increase that, as minimums will hold the average numbers that the system does today. With this information studying the other two options where Panama have, each one with different probably results:

- Raise the volumes until it exceeds the actual capacity and until it is needed an expansion of their capacity to handle efficiently the volumes and time demands. For that the terminals are already in expanding programs like amplifying their facilities, buying equipment and hiring/training programs. The rail operator has his expansion program parallel with the terminals upgrading their information systems, equipment and facilities. However a second track on the whole railway is a very difficult option due the construction difficulties and its costs that don't support the expected profits. In other words the most convenient way to expand in a short term the daily train's capacity is to optimize their resources.

- The other possibility is that exporting and importing volumes of different Latin American countries raises up to levels that the demand supports a direct route to between them and it supposes that this cargo do not has to pass through Panama. Today there are three countries (Brazil, Mexico and Chile) that are linked to their main markets and the forecasts preview a positive rush of these ones and other ones that joined the emerging equity markets group, the Caribbean export indexes that will rise with a probably opening of the Cuban market and reaches enough volumes to support this idea. Additionally the terminals upgrading in these countries may do stronger this option.

6. Discussion

Some countries of Central America, are on the route to open strong competitions against the Panama Canal, i.e. Nicaragua has the most advanced project to open a new navigation canal between the two oceans, nowadays, while the Panama Canal is growing for receive new sizes of vessels, this will change completely the actual scene of the maritime business, but the train, will continues being a very important support for the feeder's connections and local services, also for the shipping lines that have the structure of its service on both side of the canal.

The train is not only historical revenue, is also part of the heritage of the Panama Society. Usually global logistics (Sigler 2014) growth is back to society (Martinez, 2011), and even approaching it from the standpoint of preserving the environment, society has every interest in preserving it, because the survival of the species depends mainly on the existence of the planet, yet to see major projects logistics group takes into account the income, technological improvements, technical advances, but no, at least to the extent that they should always do the fact that the development is "sustainable" and ensure that growth is not detrimental to the environment, so, Panama has the opportunity to achieve one of the better grown of the Spanish American region.

7. Conclusions

Panama is also known as the Singapore of Latin America. The economy and the development of its society, is one of the best in the Iberoamerican region, and it is also a good example for the countries who want to meets a better conditions of social progress.

The shipping business world use to know Panama as "the Canal country" but here is explained that Panama is more than this, and is an excellent example of how the intermodality in the shipping transport can improve the global reach of the feeder routes or a network of short travel routes. Thinking in the advantages of the rail transport over the truck's services, the ecological impact is one of the most attractive focus, i.e. regarding the road's transport, it is true that maritime shipping is the cheapest way of transport, it is also true that road transport is the most expensive, thus, the ability of the maritime lines, to negotiate prices based on the high volume of movement, generates to the client attractive offers highly competitive, which affects the final price of the contract of carriage, so, the train in Panama is a privilege that not all the American countries has available.

Panama, for the moment, is the obligated pass for the vessels that wants to cross the continent and also is the connection

point from and to Latin America. With this offer the slogan of "Hub of the Americas" became in the 75% of GDP provided by their tertiary sector, but the ignored importance of the railroad service, is also a very important point keep the business predominant position.

References

Carse, A.D. (2013), The Canal Builders: Making America's Empire at the Panama Canal by Julie Greene (review), *Southeastern Geographer*, vol. 53, no. 1, pp. 123-125.

CEPAL (2008). División de Estadísticas y Proyecciones Económicas - Base de datos estadísticos de comercio exterior. Available from: http://websie.eclac.cl/badecel/badecel_new/index.html [Accessed 2 April 2013]

Economia de Ecuador - Wikipedia. Available from: http://es.wikipedia.org/wiki/Ecuador#Econom.C3.ADa [Accessed 3 May 2013]

Georgia Tech Panama (2010). Logistics Innovation and Research center. Available from: http://logistics.gatech.pa/es [Accessed on April 13]

Gilbert S. J. (2010), Panama Canal: Troubled History, Astounding Turnaround. Harvard Business School Working Knowledge, December 20. Available from: http://hbswk.hbs.edu/item/6402.html. [Accessed 11 May 2013]

Hanjin Shipping Co. Available from: www.hanjin.com [Accessed 5 May 2013]

Hansen, P.A. 2014, The biggest little railroad on earth: how the Panama Canal Railway became incredibly profitable, and why the canal expansion will only help, *Trains (Milwaukee, Wis.: 1954)*, vol. 74, no. 1.

Index Mundi / Online countries statistics. Available from: http://www.indexmundi.com/ [Accessed 11 April 2013]

Jackoby, J.C. 2014, *Panama: owning the canal*, . Latin America Monitor. Available from: http://www.latinamericamonitor.com/file/1/home.html [Accessed 3 April 2013]

Mapa de Rutas - Ferromex / Grupo Mexico. Available from: http://www.ferromex.com.mx/servi/rutas.html

Martell, H.; Martínez J.E.; Martínez F. (2013) Speeds and capacities necessity for improve the competitiveness of Short Sea-Shipping in West Europe respecting the marine Environment. *Journal of Maritime Research*, Vol. X, N. 2, 65-76.

Martínez J.E.; Eguren M.; Lourdes M. (2013) Maritime Transport: A theoretical Analysis under a System's Approach. *Journal of Maritime Research*, Vol. X, N. 3, 61-68.

Martínez J.E.; Eguren, M. (2010) Analytical Review of the Empty container cycle. *Proceeding of the Congress Maritime Transport IV*, Barcelona.

Martínez, J.E. (2011) Impact of logistics and shipping in the sustainable development of societies. *Journal of Marine Technology and Environment*, Vol. II.

McCullough, D. (2001) *The path between the seas: the creation of the Panama Canal*, 1870-1914, Simon and Schuster.

McDonald, D. (2012). Un año movido en Brasil - América Economía feb. 2012. Available from: http://www.americaeconomia.com/revista/un-ano-movido [Accessed on April 2013]

Mills, J.S. (2014) *The Panama canal: a history and description of the enterprise*, Bookpubber.

Sigler, T.J. (2014) Panama as Palimpsest: The Reformulation of the 'Transit Corridor' in a Global Economy", *International Journal of Urban and Regional Research*, vol. 38, no. 3, pp. 886-902.