https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

Comparative Examples of Logistic Platforms (LP) in the World

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Abstract *— This article deals with the main characteristics of interest in the research, emphasizing the types of infrastructure, the intermodal logistics platforms (LPs) and their LP expansion plans located in the three most important continents of the world, by volume of cargo handling and geographical situation: the American, the European and the Asian. The objective of the paper is to address the selection criteria of LPs whose importance is to note that most platforms in the world are linked to seaports, because of their importance in global trade relations. The methodology applied for the study was the analysis of infrastructures of the ILPs: Rotterdam, Barcelona - ZAL (Spain), Le Havre (France), United States of America: Long Beach, Los Angeles, New York and in Asia, as well as in Hong Kong (China), Singapore (Singapore) and Tokyo (Japan), data collection and analysis have made it possible to understand the importance of these ILPs for the movement of loads to various parts of the world. The comparative results evidenced the importance in the economic strategy of these ILPs such as: types of infrastructure, intermodality systems and expansion plans space productivity, vehicle traffic limitation, economic performance, size and classification. The types of infrastructure mainly characterize the main terminals of dry and liquid loads. The intermodality system reinforces the integration of transport modes, increasing the synergy required for the movement of cargoes in these LPs.*

Keywords *— **Comparative Examples, Logistic Platforms in the World, Intermodal Logistics Platform.***

I. INTRODUCTION

This article intends to address the main characteristics of interest in the research, emphasizing the types of infrastructure, intermodality systems and plans to expand Logistics Platforms (LPs) located in the three most important continents of the world, in volume of handling of load and geographical situation: the American, the European and the Asian [1] [2].

Before addressing the choice criteria of LPs it is important to note that most platforms in the world are linked to seaports, because of their importance in global trade relations [3] [4].

Indispensable for a port are [5] [6]:

• Presence of deep water channels (ideal depth varies with the draft of the vessels);
• Protection against wind and waves;
• Access to roads and / or railways.

Handled cargo ports should have access to a vast rail network linking the port to other agricultural and / or industrial regions, thus allowing the disposal of various products to other regions of the country and the world [7-9].

The choice of LPs in the world was based on two important criteria: the annual movement of containers and the strategic geographical position of the platform. Regarding the annual movement of containers, the choice was based on the ranking presented by AAPA World Port Rankings, based on 2005 [10-12]. Regarding the second criterion, the strategic geographical position, the choice was divided into continents, ie three platforms in the European, three in the American and three in the Asian, all related to its strategic geographical position in each chosen country. The continents were chosen taking into account the movement of cargo distributed in the world, that is, the largest cargo volumes are operationalized in the Asian, American and European continents, according to the ranking presented previously [13-15].

The three ports chosen from the European Logistics Platform were: the port of Rotterdam in the Netherlands, the port of Barcelona (ZAL) in Spain and the port of Le Havre in France [16-18]. Already the three ports chosen from the American Logistics Platform were: the port of Los Angeles, the port of Long Beach and the port of New York / Jersey all in the United States [17] [19].

The three ports chosen for Asian LP were: the Singapore port in Singapore, the Hong Kong port in China and the port of Tokyo, Japan. Table 1 summarizes

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

the UEOs (unit equivalent to one containers of 20 feet) in the years 2002 and 2005 and their respective variations in the world ranking taking into account the nine LPs chosen in the study.

Table 1 - Summary of the UEOs (container) movements.

Logistics Platforms	Year	UEOs (millions)	Position Ranking	Year	UEOs (millions)	Position Ranking
Rotterdam	2002	6,5	7°	2005	9,2	8°
ZAL	2002	1,46	44°	2005	2,07	45°
Le Havre	2002	1,72	37°	2005	2,10	38°
Los Angeles	2002	6,10	8°	2005	7,48	10°
Long Beach	2002	4,52	11°	2005	6,71	12°
New York	2002	3,74	15°	2005	4,78	17°
Hong Kong	2002	19,14	1°	2005	22,42	2°
Singapure	2002	16,94	2°	2005	23,19	1°
Tokyo	2002	2,71	20°	2005	3,59	22°

Source: [20].

Table 2 presents the ranking of the fifty largest Logistics Platforms in the world, based on the year of 2005, in order to improve the contextualization of the arguments mentioned above.

Table 2 - Handling of container base year 2005

RANKING	PLATFORMS	COUNTRY	TEUs Millions
1	*Singapore*	*Singapore*	23,192
2	*Hong Kong*	*People's Republic of China*	22,427
3	*Shanghai*	*People's Republic of China*	18,084
4	*Shenzhen*	*People's Republic of China*	16,197
5	*Busan*	*South Korea*	11,843
6	*Kaohsiung*	*Taiwan (Republic of China)*	9,471
7	*Rotterdam*	*Netherlands*	9,287
8	*Hamburg*	*Germany*	8,088
9	*Dubai*	*United Arab Emirates*	7,619
10	*Los Angeles*	*United States of America*	7,485
11	*Long Beach*	*United States of America*	6,710
12	*Antwerp*	*Belgium*	6,482
13	*Qingdao*	*People's Republic of China*	6,307
14	*Klang*	*Malaysia*	5,544
15	*Ningbo*	*People's Republic of China*	5,208
16	*Tianjin*	*People's Republic of China*	4,801
17	*New York/New Jersey*	*United States of America*	4,785
18	*Guangzhou*	*People's Republic of China*	4,685
19	*Tanjung Pelepas*	*Malaysia*	4,177
20	*Laem Chabang*	*Thailand*	3,834
21	*Bremen/Bremerhaven*	*Germany*	3,736
22	*Tokyo*	*Japan*	3,593
23	*Xiamen*	*People's Republic of China*	3,342
24	*Tanjung Priok*	*Indonesia*	3,282
25	*Algeciras*	*Spain*	3,180

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

26	*Gioia Tauro*	*Italy*	3,161
27	*Yokohama*	*Japan*	2,873
28	*Jeddah*	*Saudi Arabia*	2,836
29	*Felixstowe*	*United Kingdom*	2,700
30	*Jawaharlal Nehru*	*India*	2,667
31	*Manila*	*Philippines*	2,665
32	*Dalian*	*People's Republic of China*	2,665
33	*Salalah*	*Oman*	2,492
34	*Nagoya*	*Japan*	2,491
35	*Colombo*	*Sri Lanka*	2,455
36	*Valencia*	*Spain*	2,410
37	*Oakland*	*United States*	2,273
38	*Santos*	*Brazil*	2,268
39	*Kobe*	*Japan*	2,262
40	*Le Havre*	*France*	2,119
41	*Keelung*	*Taiwan (Republic of China)*	2,091
42	*Seattle*	*United States*	2,088
43	*Barcelona (ZAL)*	*Spain*	2,071
44	*Tacoma*	*United States*	2,066
45	*Charleston*	*United States*	1,987
46	*Hampton Roads*	*United States*	1,982
47	*Khor Fakkan*	*United Arab Emirates*	1,930
48	*Ho Chi Minh City*	*Vietnam*	1,911
49	*Savannah*	*United States*	1,902
50	*Melbourne*	*Australia*	1,863

Source: [20].

II. APPLIED METHODOLOGY

In the description of the nine PLs selected in this study, the main aspects will be considered: types of infrastructure, intermodality systems and expansion plans. These conditions may justify or subsidize a procedure for the design of a model, taking into account mainly the size and classification of the selected Platforms.

2.1 STUDY STEP 1: ROTTERDAM INTERMODAL LOGISTIC PLATFORM, IN THE NETHERLANDS

Currently, the port of Rotterdam is the most influential logistics and industrial complex in Europe. Existing since the 14th century, when it was still a small fishing port on the river Rotte, its great rise from the 19th century, when a connection with the North Sea, called the Nieuwe Waterweg, was established, establishing an important communications with the great German industry. Over the years, thousands of tons of goods transit through it daily [21].

The Port of Rotterdam and the industrial area of the port belong to the municipality of Rotterdam, whose City Hall has delegated to the Port Administration (RMPM) the responsibility for its development, management and operation. The law establishes management by private initiative, development, construction, port administration and nautical management [22].

This Administration has two operational directorates and corporate support departments to manage a wide variety of operations performed in the port. Nautical Management is the responsibility of the Navigation Board. The Commercial Development Board is responsible for the management and generation of new businesses [23].

The main movements of the port of Rotterdam are linked to the loads: chemical, mineral, liquid, dry, neo-bulk (vehicles), general, refrigerated and foodstuffs. The port operates with exceptional facilities, know-how, experience and expertise providing a better level of service and customized solutions.

The port of Rotterdam offers a variety of facilities for operating door-to-door intermodal transport through a sophisticated combination of transport modes. It offers pre-transport and post-transport services. The main types of intermodality offered are: long-distance transport through railways, pipelines, waterways, always focusing

https://dx.doi.org/10.22161/ijaers.6749 ISSN: 2349-6495(P) | 2456-1908(O)

on quality, time and low cost, taking into account environmental requirements [24].

The European Union supports the use of intermodal transport, intelligently interconnecting the most diverse modes of transport, in order to improve quality and reduce the costs of logistics operations. It ends up favoring in a positive way the reduction of road congestion, reducing bid prices to all parties interested in the logistics process.

The port of Rotterdam maintains daily connections to dozens of European terminals, responsible for the transit of the goods, and can change modes of transport with ease.

Water transport along the Rhine River has become a low-cost alternative for containers destined for countries cut by the Rhine River itself - via the Rhine-Main-Danube Canal - and the Danube River. Due to the regular services connected to numerous German domestic terminals, water transport contributes 22% of the total number of containers transported internally and externally to Rotterdam. Due to the growth in the number of home terminals, this movement tends to grow in the coming years [25].

Rail transport is ideal for transporting large quantities of cargo over long distances in all parts of the European continent. The port of Rotterdam offers excellent 24-hour rail connections to most of Europe's major industrial areas. The transit times are short and shorter than 12 hours to meet the market of Belgium and Germany. Already to meet Italy and Poland takes an average of 48 hours. The port is being set up to handle rail freight from Rotterdam to Germany in 2007 [26].

Road transport will always be a great alternative to connect the main European regions. The port is also directly connected to Europe's extensive road network, which is constantly expanding, where thousands of trucks depart daily or arrive from these destinations. The Rotterdam port pipeline system moves about 60 million tonnes of various petroleum products (naphtha, kerosene, petrol and ethylene) and chemicals.

The port of Rotterdam continues to invest in pipeline systems. Since 2003, the port authority has been carrying out its expansion works. With these investments, the port intends to increase its operations in this mode of transport. The port is approximately one hour away from Amsterdam Airport Schiphol, the main international airport in the country. Schiphol is one of Europe's most important freight airports, airfreight is moving to all locations around the globe [27].

The strategic plan for 2020 at the port of Rotterdam indicates that port operations will be highly competitive. This is what the port authority has been seeking with the new infrastructures planned for the next 20 years. One of the key projects of the 2020 strategic plan is the expansion of the Maasvlakte 2 port. With the construction of Maasvlakte 2, the port of Rotterdam will achieve a high performance and productivity position in the European market. The future of the Maasvlakte 2 port will depend not only on expansion projects, but on associated quality of life and environment projects. For this reason, the joint projects will meet the concept of sustainable development. The projects will address two major environmental issues: controlling the amount of pollution in the air and the nuisance of noise caused by companies operating in the port [28].

2.2 STUDY STEP 2: INTERMODAL LOGISTICAL PLATFORM OF BARCELONA - ZAL, IN SPAIN

The port authority is represented by administrations (local, autonomous and central), trade, industry and shipping chambers, the most representative trade unions of employers and relevant organizations and economic sectors related to port activity in the port [29].

The port authority uses the Master Plan to manage the port of Barcelona, directing its actions in the objectives of fortifying the port position throughout Europe. Through the Director Plan it is possible to modify the infrastructure of the port. Some examples are: the bridge between Adossat and Ponent, the replacement of terminal spaces, the extension of the ZAL (Zone Activities Logistic) to the south, and the new cruise terminals [24].

ZAL is a multimodal distribution and supply logistics center located in the Port of Barcelona, Spain, one of the main ports for container traffic in the Mediterranean Sea. It was specially developed for the Port of Barcelona by offering several maritime connections that connect to more than 400 ports worldwide. Due to its excellent strategic location, ZAL has benefits for distribution by sea, between Europe and the Far East; between Europe, America and West Africa, and between the Mediterranean Region and North Africa [30].

The city of Barcelona is surrounded by the largest European cities, being a strategic location for a Logistics Distribution Center by highway to all of southern Europe. ZAL has a project to improve the quality of life guaranteeing people respect, inspection, security and customs costs. With this project, it carries out its logistics flow with agility, speed and reliability, obtaining low costs [31].

https://dx.doi.org/10.22161/ijaers.6749 ISSN: 2349-6495(P) | 2456-1908(O)

The port of Barcelona has in its terminals the specialization of handling almost all types of products, as well as multipurpose terminals that can carry different types of products.

There are four container terminals for international traffic, two terminals for domestic traffic, two car terminals, a fruit terminal, two specialized terminals (coffee, cocoa and metals), a terminal for refrigerated loads, nine terminals for other liquid cargoes and six terminals for solid loads [32].

ZAL offers several advantages to the companies installed in your area, enjoying speed and cost savings, aiming to reach the optimum point in intermodality. And for this intermodality, a single warehouse will be offered in ZAL with several types of connections. The Barcelona rail system offers an extensive and efficient rail connection to national and international destinations. This connection is achieved through the combination of public and private railway operators, ensuring the integration of rail services.

The road system offers overland connections with the European road network, connecting points between the Iberian Peninsula and the rest of Europe.

The duct system installed in the Port of Barcelona has more than 250 regular connections, simultaneously connecting more than 400 ports worldwide. It is offered international ship driver, inspection, security, customs and transitional costs included whenever necessary, speed and agility, obtaining low traffic costs [33].

While the Barcelona air system offers a total of 25 air connections in Europe and 28 intercontinental flights. It is offered by brokers, high quality services and competitive costs.

In 1997, the Port Authority of Barcelona (PAB) updated the Port Master Plan of ZAL. This plan has been guiding the development of the port in recent years. This updating was necessary due to traffic growth and modernization of the port infrastructure. The PAB is updating the Master Plan in order to seek new financing up to 2011, as well as the limitations in its execution. The plan foresees the participation of the private sector in the financing of the infrastructure necessary for the modernization of Oporto. Meanwhile, the PAB has been working with the European Union Cohesion fund to make the funding feasible in order to reduce the differences between the social and economic aspects of the territories and the citizens that are part of that region.

2.3 STUDY STEP 3: LE HAVRE INTERMODAL LOGISTICS PLATFORM, IN FRANCE

The Port of Le Havre is located on the banks of the English Channel, at the mouth of the River Seine, where it connects to the largest consumer market in the country, the Paris Metropolitan Region, the complex presents one of the continent's most intense ship traffic. Last year alone, 7,459 vessels climbed at their terminals, with an average of more than 20 freighters arriving each day [35].

The port of Le Havre handled approximately 80 million tons per year, with 2.11 million TEUs (unit equivalent to a 20-foot container) in 2005, noting that this move classifies the Port of Le Havre with the largest port in France . The port of Le Havre is also considered the fifth largest port in Northern Europe, where a quarter of the world's maritime trade passes. As far as exports are concerned, the port of Le Havre is the first port to be reached by ships when they arrive in Europe from North America or the Far East [36].

Given this scenario and container handling that has grown at an average of 8% to 10% a year, the French government and the port authority of Havre have signed a program to re-equip their ship repair facilities, replacing old cranes with new equipment . According to the port administration, with the increase in cargo volume, maritime traffic and cargo repair requests increased, business opportunities increased among the region's businessmen.

The port of Le Havre has 10 mooring points to carry out the most varied types of services, heavy reforms and "jumborizations" (the physical expansion of the vessel to increase its transport capacity), to underwater works and installations of electronic equipment . All the infrastructure is public, being used only by companies for the works [35].

The terminals of the port of Le Havre are grouped in two areas of the complex, both near the exit of the port. The Eure pier has three "dry docks", capable of receiving ships of up to 18,000 gross tons, and four repair berths for vessels up to 150 meters long.

In the dry dock, the ship enters a narrow channel with gates, until it is positioned on a base. At this point, the floodgates close and all water is pumped out, allowing jobs - such as hull or "jumborization" - to be done "in the dry". In the repair cradle, the vessel remains floating in the water [37].

The advantages of the geographical location of the port of Le Havre allow logistics operators to set up Distribution Centers for Western Europe. The port favors cabotage and transhipment operations for ports that are not on the main transoceanic regular shipping lines. The

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

port also makes it easier to reach remote regions more quickly, an effective alternative to northern European ports. The port of Le Havre serves as an advantageous hub for Great Britain and the Iberian Peninsula, Central Europe (Switzerland and Hungary) and Southern Europe (Italy and the Iberian Peninsula). Thus, the port of Le Havre has as its policy the massification of traffic and is concerned with the implementation of effective solutions for intermodal connections, in order to speed up pre-shipment and post-shipment of goods [38].

The pipeline system holds about 40% of French oil-related imports through the Le Havre port terminals, accounting for a total of 37 million tonnes. This oil is carried by refinery pipelines located in the Seine valley. The port of Le Havre has two distinct locations, which can accommodate all the ships that bring in the port, as well as two giant tanks that serve as a storage area [39].

The road system connects directly the port of Le Havre with the A13 and A14 motorways to the Paris region. The road system efficiently serves cargo movements from the Port of Le Havre to various regions of France and to some of the ports considered as competitors in northern Europe that are often saturated.

In 2004, the rail system handled about 5% more of the container movement in previous years, excluding transhipment traffic, rail traffic decreased by 8%, with 127,400 TEUs, representing 8.8% of freight port. The company Le Havre Shuttles - LHS created in 1998, is the main responsible for the consolidation of rail freight, besides offering services dedicated to the agents of load and shipowners.

The airport system is serviced by Le Havre-Octeville airport which is situated 5 km northeast of the city of Havre in the community of Octeville. The airport serves Havre's commerce and industry as well as being a major hub for Lyon airport, facilitating freight flights from France to Europe [40].

France's main port, Le Havre, has entered into an agreement with the federal government to modernize its ship repair facilities. The measure is part of a public investment program in the complex that exceeds 360 million euros (the exchange used 1 Euro = R $ 2.42238, about R $ 872.05 million - 08/04/2008 - BANCO CENTRAL DO BRASIL), aims to prepare the region to meet the demands of the growing foreign trade and consolidate it as one of the main cargo handling platforms in Europe [41].

Figure 1 shows the geographical location of the three selected ports on the European continent. The port Le Havre is located on the banks of the English Channel, at the mouth of the Seine, is the first port to be reached by ships when they arrive in Europe from North America or the Far East. On the other hand, the port of Barcelona - ZAL has its privileged location, that is, it serves mainly the connections via the Mediterranean Sea. Finally, the port of Rotterdam is considered to be the most important port complex in Europe, responsible for most cargo movements in the European community.

Fig.1 - Location Map of Logistics Platforms in Europe.
Source: Google Maps, adapted by the authors, (2019).

2.4 STUDY STEP 4: IN THE UNITED STATES OF AMERICA

2.4.1 LONG BEACH INTERMODAL LOGISTICAL PLATFORM

The port of Long Beach was founded on June 24, 1911. After approximately 11 decades the port has undergone several expansions, creation of new cargo terminals, road connections among other important works carried out in the port. Today, the port of Long Beach is considered one of the most important ports in the US and the world [36].

In 1911 the State of California granted areas for expansion of the port of Long Beach to port operations. The ceded areas were lands along the coast of the Pacific Ocean lined up a distance of three miles. This type of concession ends up restricting the revenues generated through the businesses and the activities conducted by them. In 1916 the Los Angeles dock became a port project for the city of Long Beach. In 1917, the first port authority was created, aimed at supervising port operations.

In Long Beach the port infrastructure generates approximately 30,000 jobs, with the following ratio being

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

one job for every eight jobs generated in the city of Long Beach. Approximately R$ 2.96 billion (the exchange used 1US $ = R$ 1.5620 - 04/08/2008 - BANCO CENTRAL DO BRASIL) is spent annually on port services.

Los Angeles County retailers spend approximately R$ 6.40 billion a year, selling durable goods and other imported products through marketing via port. In the region of the five counties (Los Angeles, Orange, Ventura, San Bernardino and Riverside counties), the port generates approximately 315,000 jobs, one job out of 29 jobs generated in the five boroughs. Some R$ 22.33 billion are spent to pay the salaries of employees involved in port operations, which accounts for approximately 4% of all salaries paid in the five counties. [33]

In California port activities generate approximately 371,000 jobs. Port operations generate approximately R$ 8.74 billion of tax payments. In the United States port operations generate approximately 1.4 million jobs. Approximately R$ 6.24 billion are spent on port-industry services. Exports of manufactured goods in the United States generate approximately R$ 28.11 billion per year. With the internal physical distribution in the United States is spent about R$ 49.98 billion per year. The retail market in the country spends approximately R$ 39.05 billion annually with sales in the American domestic market [42].

Rail accesses to the Los Angeles and Long Beach complex, responsible for most cargo transportation between the port area and the region served by the terminals, will also receive investments in the coming years. Strategic projects of more than R$ 893.49 million are planned, as well as changes in train operations.

Changes are also being negotiated in the operations of Alameda Corredor, the express rail link that connects the region of the Los Angeles terminals to the center of the city. The port authority is calling for daily departures from the wharf to Colton, a city located in the vicinity of Los Angeles that houses several warehouses and distribution centers. With the service, the agency estimates the elimination of 2 million truck trips per year [43].

Alameda Corridor was the main logistics project of the region in the last decade, representing an investment of R$ 3.74 billion. R$ 1.71 billion came from the railway operators and R$ 2.03 billion from the port authorities of the complex.

Long Beach also has projects, although much more modest, when compared to those of its port-brother Los Angeles, for the improvement of rail transport. According to its administration, the construction of a railway branch is being negotiated in the Matson Terminal, of SSA Marine, installed in the internal area of the port (the Inner Harbor) [44].

2.4.2 LOS ANGELES INTERMODAL LOGISTIC PLATFORM

The Port of Los Angeles, Southern California is situated in St. Peter's Bay just 20 miles south of Los Angeles. This port has been growing and sustaining not only its area with port operations, but also with revolutionary environmental initiatives, security measures and social programs. The port is operated and controlled by the state Tideland that encourages the marketing, navigation and fishing in the municipalities [44].

The port is not supported by taxes, but rather by revenues derived from the rates of transport services, such as: port charges, accommodation, storage, rental of properties and other port services. The port covers 7,500 acres, has about 27 cargo terminals including infrastructure for dry and liquid cargoes, containers, bulk and automobiles. The port contributes directly and indirectly to the tens of billions of dollars handled by industrial segments. Together these terminals move more than 162 million tons per year, in addition to moving annually around 7.3 million UEOs, establishing a national record of container handling.

Its port administration is composed of five members who are: President, Vice President and Directors, appointed by the Mayor and confirmed by the City Council of Los Angeles [45].

The basic concept of intermodality has been evolving much in the port of Los Angeles, the great example is the movement of marine cargo containers today that are being made by several different modes of transportation: road, rail and maritime. Today, modern trains represent an essential link in the transportation and delivery of transcontinental container freight. The railway structure includes wagons specially designed to load the containers one on top of the other (doublestack).

With capacity to operate 150 trips per day (carrying 36 million TEUs per year), the railway has three lines. It began to be built in April 1997 and went into operation five years later in April 2002. Its service was able to speed up train travel between the dock and downtown Los Angeles, which took about two hours and is now done in just 40 minutes. As there are no crossings and they do not pass through urban areas, the trains do not need to maintain speeds at 16 km/h, and can accelerate up to 65 km / h.

In 2005, the Port Authority of Los Angeles adopted a green port policy that sought to position the port as a leader in the environmental area. In June 2006, the ports of Long Beach and Los Angeles jointly

https://dx.doi.org/10.22161/ijaers.6749 ISSN: 2349-6495(P) | 2456-1908(O)

introduced the "clean air" action plan at the San Pedro Bay port, a project aimed at reducing health risks caused by air pollution from ships, trains, trucks, among others. The port has been investing around R $ 265.86 million in the last five years.

Rail accesses to the Los Angeles and Long Beach complex, responsible for most cargo transportation between the port area and the region served by the terminals, will also receive investments in the coming years. Strategic projects of more than R$ 893.49 million are planned, as well as changes in train operations.

At the port of Los Angeles, one of the first measures to be taken will be the construction of an extension at the Transpacific Container Service Corporation (Trapac) terminal, which occupies the 135 to 139 berths in the inner harbor. The executive plan and the environmental impact studies of the enterprise, valued at R$ 39.05 million [45].

2.4.3 INTERMODAL LOGISTIC PLATFORM OF NEW YORK

The Port of New York and New Jersey (NY & NJ) has about seven cargo terminals, each terminal offering customized transportation services with a highly productive infrastructure. It is included in the New York / New Jersey Port Area: Newark / Elizabeth Port Authority Marine Terminal Complex, Port Authority Industrial Park in Elizabeth, Global Maritime Terminal and Greenville Industrial Park, both in the city of New Jersey, occupying a 23-acre site on Route 169 on Pulaski Street in Bayonne, an additional 40 acres at Newark International Airport covering the fuel storage and distribution system, and a 407-acre industrial area in Kearny South [46].

The Port Authority of New York and New Jersey is able to handle any type of cargo: bulk, liquid and dry. There are about 54 cranes in the port complex ready to move all types of cargo.

Within the New York / New Jersey region, there is a selection of logistics operators with freight expertise. The port is the ideal location for operators specializing in export, which can help with planning and other logistics needs the operations performed at the terminals. These terminals are poised to serve approximately 18 million consumers in the New York / New Jersey metropolitan area, emerging markets of the Midwest, England, eastern Canada.

The New York / New Jersey port has infrastructure to handle 20- and 40-foot containers. The Port of New York / New Jersey annually moves about 12.2% of the containers in the United States. It was in Newark in 1956 that the New York / New Jersey Port Authority built the world's first container terminal [47].

The Port of New York / New Jersey has a mobile identification program called MAR LINK that streamlines the loading process. The companies associated with this port have access to the MAR LINK mobile identification system, which works on road intermodality, the system helps to control the speed of trucks through the maritime terminals, thus allowing trucks to move thousands of containers per day to the domestic markets . With a unique ID card, the truck has access to the entire NY & NJ maritime terminal, where drivers can quickly access their cargo computerized automatically through the terminal system installed in the truck itself.

To help move cargo quickly through the terminals, the port authority is improving cargo movement through the docks through the Express Rail system. The idea is to create a fully integrated intermodal transport system that will provide important terminal operators with facilities that will facilitate and connect to a nationwide system. Three intermodal river lanes have transferred their infrastructure and the necessary support for Express Rail, aiming to save time by transferring cargo from the ship to the train, thus serving a greater variety of destinations, as well as providing reliability in loading loading times.

The first phase of the new Elizabeth Express Rail Terminal is currently operating at Elizabeth Port Authorith Terminal, adjacent to the Maher and APM terminals, these 70 acres will replace the original 32 acres of the rail network. The aerial rails were deployed, greatly improving the flow on the roads. Two more ferrous paths are programmed to contribute to the flow of loads. When all phases of this venture are complete, the port capacity will increase by almost five times the current capacity. Ultimately, the new Elizabeth Express Rail will be able to handle about one million containers annually [48].

The port authority has already invested about R$ 3.12 billion in port infrastructure to maintain competitive advantage, progress continues to accelerate with the completion of the Express Rail system. International cargo volumes at the port of New York and New Jersey in 2006 are at record levels. During a conference held at the Newark port system, New Jersey's president and secretary of commerce and the port director discussed the port's 2006 statistical results and future investments in the port system.

Container cargo volumes in the New York / New Jersey port increased by nearly 8% in 2006, coupled with continued growth in trade with the Far East, Northern Europe and Southeast Asia. It is estimated that the movement of cargo in the year 2006 in the port, exceeded the R$ 232.74 billion for the first time, giving a growth of 13% in relation to 2005. The number of containers loaded

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and empty (unit equivalent to 20 feet) exceeded the mark of 5 million [47].

Figure 2 shows the geographical location of the three ports chosen in the American continent. The Long Beach Port is considered one of the most important ports of the US West Coast and the world. Already the port of Los Angeles is located in San Pedro Bay approximately 36 km south of the city of Los Angeles, also on the west coast. In closing, the New York / Jersey port is considered to be the most important port complex on the US East Coast, this location facilitates business transactions between the United States and Europe.

Fig.2 - Location Map of Logistics Platforms in the United States.
Source: Google Maps, adapted by the authors, (2019).

2.5 STUDY STEP 5: HONG KONG INTERMODAL LOGISTICAL PLATFORM, IN CHINA

The port of Hong Kong, located in the South China Sea, serves predominantly the trade of manufactured goods, raw materials and passenger terminals. The port is considered a key factor in Hong Kong's economic development, the deep waters of Victoria harbor provide ideal infrastructure conditions for operation of any type of vessel. The port of Hong Kong is considered to be one of the world's largest cargo handling ports [49].

In 1966, the port authority decided to build a complex of container terminals at Kwai Chung in Hong Kong. Construction of the first three terminals began in 1970. In 1974, the fourth terminal, known as Hong Kong International Terminals, was built.

After the implementation of the containerization process, the arrival and departure of empty containers considerably reduced, as it was possible to develop a new system of loading and unloading the containers. This was only possible by the increase in information technology and the new container management systems adopted at Kwai Chung terminals, increasing the productivity of port operations.

With China's political and economic opening, the Hong Kong port increased the container movement, strengthening Chinese economic growth by building terminals 4, 6, 7 and 8, increasing cargo productivity at Kwai Chung terminals. In 1987, Hong Kong became the leading container handling company in the world.

The port is considered the key factor in Hong Kong's prosperity and economic growth, accounting for about 80% of China's total cargo processing. Container terminals are vital not only to Hong Kong, but also to South China, considered one of the largest industrial areas in the world. The Hong Kong port is also considered a key element in the globalization chain process, as it currently serves 80 international lines to more than 500 destinations around the world.

MTL is the oldest container operator in Hong Kong, started its services in 1972, the first ship to dock in one of the berths of terminal 1 was the ship Tokyo Bay. MTL currently operates terminals 1, 2, 5 and northern part of Terminal 9. In 1999 it reached the mark of 2.6 million TEUs, and continues to grow industrial cargoes. It

https://dx.doi.org/10.22161/ijaers.6749 ISSN: 2349-6495(P) | 2456-1908(O)

invests heavily in infrastructure for both long-haul freight and cargo in cabotage. With a futuristic vision it is already investing in infrastructure to serve larger containers, which are already being built in order to increase cargo capacity [50].

The port of Hong Kong has long assumed the role of a gateway to southern China, as well as serving as an intermodal transportation platform providing connectivity in the Chinese mainland's distribution chain.

Container terminals in Hong Kong compete with each other for efficiency and reliability. For years, the operators of these terminals have been investing continuously in technology, dedicating significant resources, aiming at the continuous improvement of the productivity of the terminals. The performance of the container terminals becomes a differential factor along the logistics network serving South China and the Pierl River Delta, improving the flow of information to its main customers.

Adding the capacity of container terminal 9, the total container capacity at the Kwai Chung port becomes approximately 24 million UEOs, making Hong Kong port one of the largest in the world.

All container terminals were certified in July 2004 by the International Maritime Organization of Ships and Port Facility Security in terms of Port Security, (ISPS) Code. In addition to certification other safety and environmental initiatives are being implemented to maintain the position of Hong Kong Port as China's preferred port.

The Government is developing a master logistics plan for Hong Kong. The Government's intention is to transform Hong Kong into a logistics center. Recently it was established that the Hong Kong Container Terminal Operators Association (HKCTOA) the responsibility to promote the Port of Hong Kong as the most important container port in the region. The commitment of the Government and private industry to the continuous development of logistics services in the port of Hong Kong, is the main factor of the regional trade.

Container terminal operators in Hong Kong will continue to develop information technology to move forward in improving productivity, raising the level of consumer service at low costs. The use of technology via the Internet has made possible new business opportunities.

2.6 STUDY STEP 6: INTERMODAL LOGISTIC PLATFORM OF SINGAPORE, IN SINGAPORE

Singapore is a small and densely populated island city in southwest Asia, located between Malaysia and Indonesia. Singapore's economy is a market economy based on financial and industrial capitalism. As with the other Asian tigers, the main export products are state-of-the-art electronic machines and equipment. It is an extremely small country, with no natural resources and no space for agriculture, but with a growing economy, especially as it is an export platform - a model of development that has placed Singapore at the level of emerging countries [51].

Singapore has excellent port infrastructure and strategic position at the crossroads of major shipping lines, which gives it a reputation as a global hub. The port of Singapore City is one of the busiest in the world, and is also located at a strategic point in the Pacific Ocean, just off the Malacca Strait, allowing for massive entry and exit of products - this is necessary to keep the country functioning, since even food and energy need to be imported.

Singapore uses its port as a point where freighter ships unload their goods for redistribution by other ships in Southeast Asia and also carry goods from Southeast Asia to be taken to the rest of the world. In addition, the port provides a wide range of services, such as cargo handling, warehousing, distribution, shelter and ship supplies. PSA Corporation Ltd. (formerly known as the Port of Singapore Authority - PSA) is responsible for the efficiency of port services and facilities.

There are currently 4 terminals: Tanjong Pagar, Keppel, Brani and Pasir Panjang, which are home to all types of vessels. The four terminals serve 200 transport lines that provide connections to 600 ports in 123 countries. This includes daily departures to all major ports in the world.

The port of Singapore operates the largest container terminal in the world. The modern and sophisticated characteristics of the port make it possible to maintain its position of the busiest port in the world, according to its tonnage of boarding. It has specific facilities at the terminals to accommodate all types of vessels, including tank super-vessels, container ships and freighters. It is also famous for its fast connection and customs clearing facilities.

Singapore is the world's largest re-port port and is the third largest oil refining center after Rotterdam and Houston. With excellent communication facilities and geographical position, Singapore is a major center for the distribution and transfer of goods to the Asia-Pacific region.

The modern and sophisticated port facilities enable Singapore to maintain its position as the busiest port in the world, according to its tonnage of boarding. The cargo handled by sea is 179,571,000 tonnes of entry into

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

Singapore and 134,592,000 tonnes of output. Container processing capacity was 23.19 million UEOs (standard 20-foot container units) in 2005.

The commercial structure is dominated by the private sector, with the state exercising regulatory and control functions. Regulatory controls exist in the form of restricted import / export licenses, as already mentioned. Guidelines and incentives are used to promote certain branches of business, such as the provision of storage space to promote Singapore as a relocation / transhipment center.

In general, there is no fixed commercial structure in Singapore, because of its size. There are about 30,000 establishments in the wholesale trade and 20,000 in the retail trade, including supermarkets, department stores and pharmacies. The average operating income of wholesalers is R$ 15.62 million and that of retailers is R$ 1.56 million.

In the port of Singapore, an average of 100 containers per hour are handled at a cost of R$ 109.34 each. In the port of Santos, for example, the handling is only forty containers per hour, with an average unit cost of R$ 390.51. And the number of employees is eleven times higher than in the port of Singapore.

There are six Free Trade Zones (FTZs) - five for maritime cargo, administered by the Maritime and Port Authority of Singapore, and one for air cargo at the Singapore Changi Airport operated by the Civil Aviation Authority of Singapore ". Such zones provide a wide range of facilities and services for the storage and re-export of taxable and controlled products. The products do not pass through the customs of the country, unless they leave the free trade zone and enter national territory.

To meet the demands demanded in the global market, Singapore's port authority constantly innovates in automating and using intelligence to enhance its operations, (CITOS), they are already building a new container terminal to serve their users.

The maritime port authority is reviewing the port's maritime plan for improvements in port security and efficiency through the four main categories, namely: transport, port operations, management and customer services.

2.7 STUDY STEP 7: TOKYO INTERMODAL LOGISTIC PLATFORM IN JAPAN

The Tokyo terminal was established by the Metropolitan Government of Tokyo in January 1972, mainly to meet the shipments of vehicles, replacing the port of Balsa (Barcaças) in Tokyo. In March 1982 the corporation assumed responsibility for the Keihin Foreign Trade Terminal Corporation. In April, 1988, he took command of all activities of the Port of Tokyo Service Corporation, which had been established in December 1980.

The port of Tokyo is responsible for the loading and unloading of all the products of the metropolitan area (industrial activities) of Tokyo, including developing programs that favor the quality of life of its inhabitants. The Tokyo terminal handles a variety of goods such as: foodstuffs, dry cargoes, liquids, bulk, among others. The main objectives of the port are: to improve the quality of life of local people, to encourage the development of the regional economy and to contribute to the growth of international trade [52].

In the Toyosu-Harumi complex there is still idle space, even considering the growth of the infrastructure facilities of the port of Tokyo. Aware of this potential, the Tokyo Metropolitan Government is planning the formation of a dynamic urban complex aimed at promoting efforts to transform the area in question for the following industrial, commercial and residential uses, improving the quality of life of its inhabitants. The main objectives of this project are:

• Creation of an urban community that brings the workplace to well-being;

• Formation of harmonizing elements of an urban complex, commercial, residential, among others;

• Creation of a favorable environment for effective cultural exchanges between the various segments of the port complex.

The OI container terminal, which is considered the number one port in Tokyo, is equipped with all the most modern port facilities, can accommodate about eight large container ships, uses in its logistics operations about 18 cranes to streamline the loading and unloading of loads. The OI terminal is one of the most important connections from Tokyo to the world, with priority being given to traffic to North America, Europe, the Mediterranean, Oceania, Southeast Asia and other parts of the world.

The port complex of AOMI is the newest container terminal in the port of Tokyo, has five cabins and eleven container operations cranes along its length of 1,570m. The container terminal of AOMI is a large-scale terminal to operate about 50,000 tons. The cargo distribution center of AOMI is situated in the southern part of the port of Tokyo, it offers handling, storage and transport services for cargoes via containers.

The ODAIBA Port Complex is a terminal that serves the international trade with a 1,800m pier capable of facilitating cargo handling activities. The terminal, basically deals with the steel trade, beneficiated wood, paper, fruit pulps, among other loads.

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

Tokyo's barge complex is a terminal that operates ferries that transport vehicles linking the Tokyo metropolitan area with the locations of Hokkaido, Shikoku, Kyushu and other destinations, there are already four routes currently in use in Kushiro (through the port of Tocachi), Tomakomai (through Oarai), Kochi (through Nachi-Katsuura port) and Shinmoji (through the port of Tokushima). The terminal has an important role in the national economy, promoting energy conservation and great efficiency in the domestic logistics distribution network.

The SHINAGARA container terminal was the first to be built in Japan, unlike the OI terminal, this public container terminal is directly connected to the Tokyo Metropolitan Government.The expansion plan for the port of Tokyo provides for an enhanced study to strengthen domestic terminals, international container and cabotage terminals and other port facilities in relation to resistance to successive earthquakes in Japan, in order to ensure that operations logistic projects carried out in the Tokyo complex have the least impact on earthquakes that may still occur, hampering the continuity of supply and distribution of economic activities related to the port of Tokyo, taking into account the damages of the last earthquake that struck the Hanshin-Awaji complex .

Figure 3 shows the geographical location of the three ports chosen on the Asian continent. The port of Hong Kong is located in the South China Sea, considered one of the world's largest cargo handling ports. Singapore's port is now the largest container port in the world, as well as its strategic position at the intersection of major shipping lines. Finally, the port of Tokyo is Japan's main port complex, contributing to the development of the regional economy and contributing to the growth of international trade.

Fig.3 - Location Map of Logistics Platforms in Asia.
Source: Google Maps, adapted by the authors, (2019).

III. ANALYSIS OF RESULTS

The comparative analysis of the Intermodal Logistic Platforms (ILPs) shows that the great majority of logistics platforms in the world are born due to the existing ports, many of them with a few centuries of existence, that is, the territorial expansions facing the continent or towards the ocean, are made feasible with ports as the center of expansion. Logistics platforms have common characteristics, such as: they are administered by the port authorities; usually the physical space used by the platform was donated by the state; the main cargoes are: chemical, mineral, liquid, dry, bulk, neo-bulk, refrigerated, foodstuff, among others; platforms have more than five terminals operating; the movements of the

https://dx.doi.org/10.22161/ijaers.6749 ISSN: 2349-6495(P) | 2456-1908(O)

containers are automated; the Hong Kong and Singapore platforms serve sixth generation ships, ie the largest ships in the world; offer administrative services, customs, life support, offer maintenance contracts for water vehicles; operate the intermodality of transport (rail, road, air and pipeline); offer door-to-door services, operate the largest refining terminals in the world; have programs of safety, environment and occupational health; have distribution centers on the platform; all platforms function as hubs, that is, as consolidation centers; facilitate cabotage operations; are poles that generate employment and income; its port operations are among the largest in the world in general cargo and container handling and finally have expansion plans.

In the research carried out, once again we did not find a systematic procedure for the implementation of logistics platforms around the world. However, it is clear that Europe presents two non-systematized procedures based on the French and Spanish experiences.

It is important to note that most of the logistics platforms deployed in the world are connected to seaports, not excluding the possibility of PL deployment in inland or inland ports.

Considering the conceptual and theoretical review carried out and the practices available in this chapter, it is observed the need for a systematized methodology the activities required to elaborate a procedure for the design of a model. Table 3 presents in Appendix A a summary of the main aspects such as: types of infrastructure, intermodality systems and expansion plans. The choice of these main aspects is based on the Regional Logistics Platform studies.

Other aspects could be considered, but are considered secondary, such as: space productivity, traffic limitation of vehicles, economic performance, size and classification. The types of infrastructure mainly characterize the main terminals of dry and liquid loads. The intermodality system reinforces the integration of transport modes, increasing the synergy required for the movement of cargo in these logistics platforms. Finally, it is observed that all logistics platforms have expansion plans, reinforced by actors involved in the implementation of short, medium and long-term planning.

IV. CONCLUSION

As answers used in Appendix A between comparisons, this article deals with the relevance of the ILPs in the world for movements in the three most important continents, represented by Le Havre (France), Rotterdam (Netherlands) and ZAL (Spain) in the United States of America. America: represented by Long Beach, Los Angeles and New York / Jersey and Asia represented by Hong Kong (China), Singapore (Singapore) and Tokyo (Japan), ie representatives of the American, European and Asian continents. The objectives were scaled up, because assessing the LPs' choice criteria in the world is linked to sea ports, because of their importance in the global commercial relations where they were the infrastructural analyzes of the ILPs: from in cargo volumes in several continents showing the approaches of the main characteristics of interest, emphasizing the types of infrastructure, the ILP systems and their LPs expansion plans located in Rotterdam (Holland), ZAL (Spain), Le Havre (France), Hong Kong (China), Singapore (Singapore) and Tokyo (Japan), Los Angeles, Long Beach and New York / Jersey (United States). The data collection and analysis allowed to realize the importance of these ILPs for the movement of cargoes to various parts of the world. The comparative results showed the importance in the economic strategies of these ILPs such as: types of infrastructure, intermodality systems and expansion plans, space productivity, traffic limitation of vehicles, economic performance, size and classification. The types of infrastructure mainly characterize the main terminals of dry and liquid loads. The system of intermodalities reinforces the integration of transport modes, increasing the synergy required to move loads in these ILPs.

V. ACKNOWLEDGMENT

The authors are grateful to the Galileo Institute of Technology and Education of the Amazon (ITEGAM), CIESA and the Foundation for Research Support of the State of Amazonas (FAPEAM) for the support to the research.

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APÊNDICE A

Table 3 - Comparative aspects between Logistics Platforms in the world.

Aspects of Research Interest	**Logistics Platforms in the World**								
	Rotterdam	ZAL	Le Havre	Long Beach	Los Angeles	New York	Hong Kong	Singapore	Tokyo
Types of infrastructure	Liquid cargo terminals (chemical and petroleum), dry loads, commodities, containers, and foodstuffs. The port handled around 9.28 million TEUs in 2005.	Container terminals, domestic traffic, automobiles, fruits, coffee, cocoa and metals, refrigerated, liquid cargoes, dry cargo. The port handled about 2.07 million TEUs in 2005.	Liquid cargo terminals, dry loads, containers, Ro-Ro, general cargo, passengers and ship maintenance. The port provides an entire infrastructure for repairing ships. The port handled around 2.11 million TEUs in 2005.	Dry load terminals, liquid loads, containers and general cargo. It moved approximately 80 million tons of cargo. The port handled around 6.71 million TEUs in 2005.	Dry load terminals, liquid loads, containers and distributor warehouses. The port handled around 7.48 TEUs in 2005.	Terminals for dry loads, liquids, containers, breakbulk cars and storage systems. The port handled around 4.78 TEUs in 2005.	Terminals are: Hong Kong International Terminals (HIT), COSCO-HIT terminals (CHT), DP WORD, Modern Terminals LtdaAsia Conteineres Terminals (ACT). The port handled around 22.42 million TEUs in 2005.	Terminals for super vessels tanks, container carriers and freighters. The main terminals are: Tanjong Pagar, Keppel, Pasir Panjang and Brani. It is considered the third refining center in the world. The port handled some 23.19 million TEUs in 2005.	General cargo terminals, trade, exterior, barges, liquids. The main terminals are: OI, AOMI, ODAIBA, SHINAGARA, HARUMI, ARIAKE and TAKESHIBA. The port handled around 3.59 million TEUs in 2005.

https://dx.doi.org/10.22161/ijaers.6749 *ISSN: 2349-6495(P) | 2456-1908(O)*

Intermodality Systems	The port offers a variety of intermodal transport (Door-to-door), as well as pre-transport and post-transport services. It is composed of the modalities of air, rail, road and rail.	The road and rail link connect Penisula Ibérica to the rest of Europe. The pipeline system has more than 250 regular connections. The airway system offers a total of 25 air connections in Europe and 28 intercon-tinental connections.	The port facilitates cabotage and transhipment operations for ports not on the main transoceanic lines. Works as a hub for part of Europe. It offers transport by road, rail and road.	The port offers the following transport modalities: road, railway, pipeline and air. The Alameda Corridor railroad is its main route of freight flow.	The port offers the following transport modalities: road, railway, pipeline and air. The intermodal railway traffic network was planned and designed with the concern of improving Alameda Corridor.	The port has a mobile identification program called MAR LINK that streamlines the road charging process. Regarding the rail mode, it uses the EXPRESS RAIL to move its terminal loads.	The port operates mid-stream systems to load and unload ships and barges at sea. It offers the following modalities of transport: road, railway, pipeline and air. It also offers the ferry service from Hong Kong to Macau.	The port offers the following modalities of transport: road, railway, pipeline and airport. It has six Free Zones, five for maritime cargo (MPAS) and one for air cargo (SCA).	The port offers the following modalities of transport: road, railway, pipeline and airport. The intermodality is ensured by the main expressway (highways) and rail networks connected to the port.
Expansion Plans	The strategic plan of 2020 aims to meet the future expansion of the port.	The Port Master Plan of ZAL is responsible for future expansions.	The PORT 2000 is responsible for the future expansion plan.	The main project of the expansion plan of the port is the construction of the Alameda Corredor underground canal.	The main development planned at the port is the construction of the new backyard patio of Southem California International Gateway.	The main port expansion project is the completion of EXPRESS RAIL.	The Chinese government is implementing a logistics plan for Hong Kong to consolidate the port as the largest in the world.	The main port expansion project is the automation and use of intelligence to streamline port operations.	The expansion plan for the port of Tokyo meets the following objectives: harmonizing elements and cultural exchanges between the people that circulate in the port.

Source: Authors, (2019).