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North Adriatic Ports: A More Efficient And Greener Gateway For The European-Far East Trade

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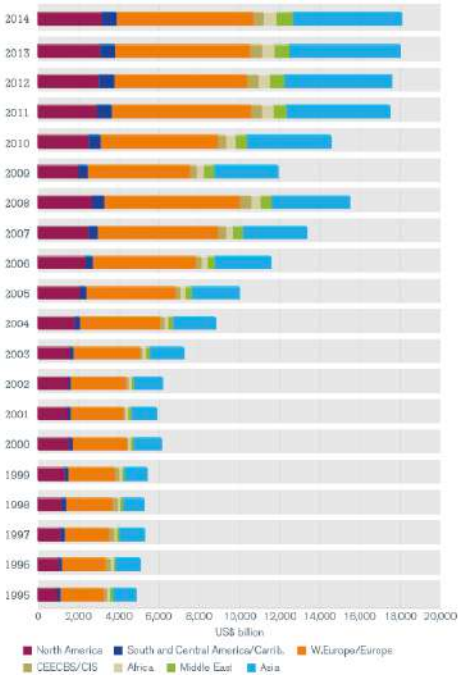
INTRODUCTION

During the last two decades, international trade has faced significant changes in terms of fluctuations and leading partners.

The growth of trade flows during the 1990s has been slow, even if after 1995 statistics highlight an acceleration. The change of pace in goods and services traded became overwhelming during the six years between 2002 and 2008. Trade crashed its growth dramatically after the financial crisis of 2009, but it rebounded strongly in 2010 and 2011. After these years, the trend started some fluctuations and the average growth has settled at 3 percent.

Figure I.1 shows the growth of trade during the last twenty years and it explains also the destinations by region. The world merchandise exports reached US$ 5,018 in 1995, which is less than world merchandise exports to Asia in 2014. The growth in absolute values has been impressive and it reached US$ 18,494 billion in 2014. The Figure I.1 shows also the arise of Asia as destination of exports with a great acceleration after 2004, while Europe still has the scepter among all the other areas.

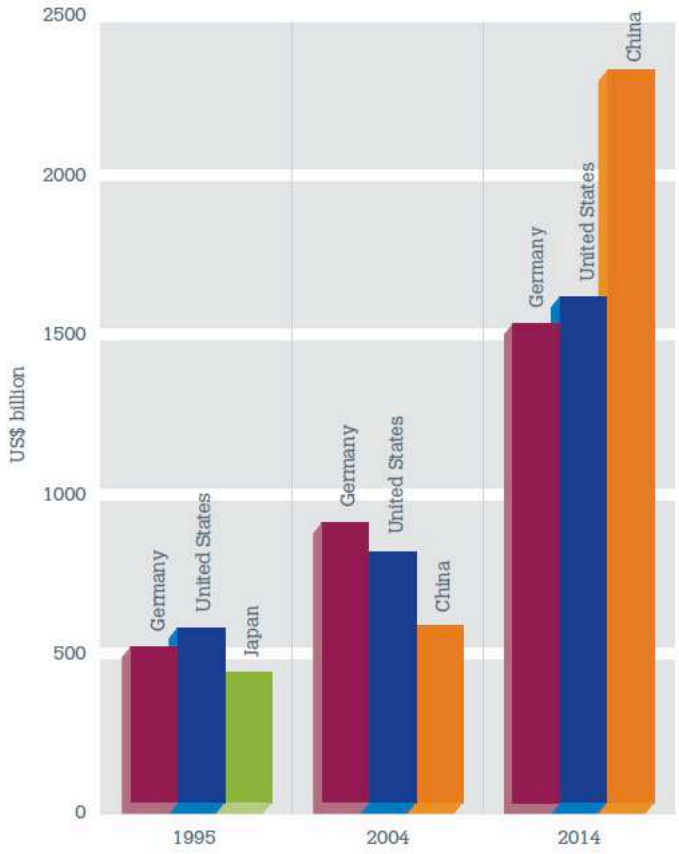
Figure I.1 – Destination of world merchandise exports by region, 1995-2014



Source: World Trade Organization, International Trade Statistics 2015

The game changing factor for trade in the last thirty years is represented by the entrance of China in the World Trade Organization in 2001 and in eight years time it has been able to become the leading World exporter. China surpassed Japan just three years after its entrance, establishing itself as the leading Asian-Region exporter. The leading role in the global scenario became effective in 2009 when China overtook Germany after passing United States in 2007.

Figure I.2 – World's top exporters, 1995-2014

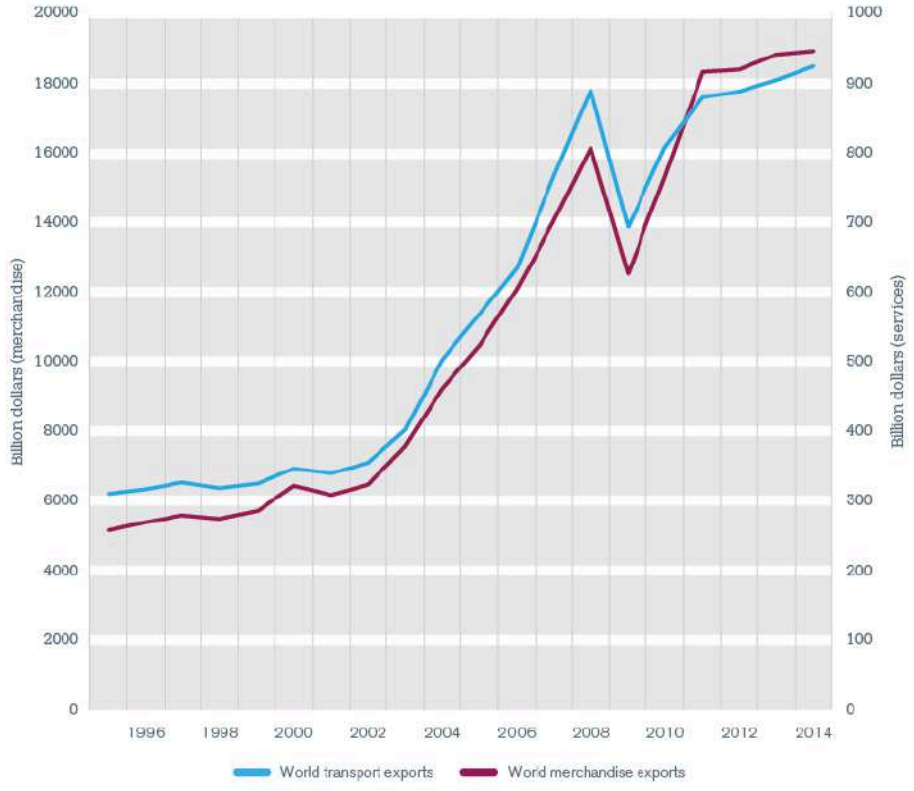


Source: World Trade Organization, International Trade Statistics 2015

In this framework, transport has always played a key role allowing countries to increase their relationships. As for trade, during the last three decades also transport services have experienced a constant growth. Figure I.2 shows the compared trends for world transport exports and world merchandise exports for the period between 1995 and 2014. In this period, the growth for transport exports has been a bit on the bottom of the total merchandise exports, especially for the period between 1995 and

2000. Transport sector collapsed in 2009 due to the global economic crisis and as result of the diminished demand for freight transport. It is worth to note that the major affected area in transport exports has been Asia, which recorded -28 percent in 2009 while globally the average decline has been of -22 percent. The upswing in 2010 has been of the 16 percent and three years after the level of world transport exports has totaled US$ 906 billion reaching the pre-crisis level.

Figure I.3 – World transport exports, 1995-2014

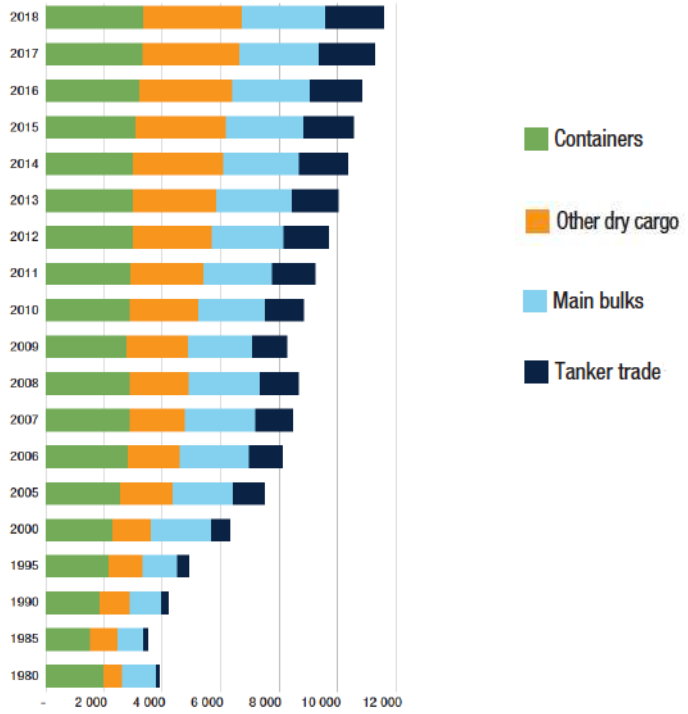


Source: World Trade Organization, International Trade Statistics 2015

At the global level, maritime trade is the more important way of transportation and it represents in volume more than the four fifths of the world merchandise trade. It is of interest for this work to note the structure of the international maritime trade and how it has changed over the years. In 2018, total volume of international maritime trade reached the milestone of 11 billion tons which represents the highest value recorded in history. This goal has been achieved mostly with the contribution of containerized cargos and other dry cargo. As can be seen in Figure I.4, these two types of cargo have grown impressively in the last decades. Especially containerized trade accounted an

8.0 percent average growth between 1980 and 2018. The reasons of the arise of containers in sea trade must be sought in the international division of labor and the ongoing rise of manufactures trade.

Figure I.4 – International maritime trade by cargo type, selected years (million tons loaded)



Source: UNCTAD - Review of Maritime Transport 2019

Forecasting for 2020 have been biased by Covid-19. Even if clear scenarios of what can precisely happen in international containerized trade are not available, many Institutions have worked to depict a plain picture of what is and will going on in the foreseeable future. The European Maritime Safety Agency in July 2020 published the report "Covid-19 Impact on Shipping" based on vessel movements statistics. Looking at container ships calling at EU ports, weekly data of 2020 compared with 2019 highlight a reduction of an average 9% between weeks 18 and 30, showing container trade as the less affected maritime trade together with bulk carrier and oil tanker. Looking specifically at the container trade between China and EU, containerships calling at EU's ports in weeks 1 to 30 have reduced from 29.720 to 22.407 which is equal to -24.6%, while container vessels landing in China from Europe reduced up to 51.5%. Even if ports calls do not represent a trustworthy index to make inference, it gives an overall idea of what is happening in container trade between Europe and

China. To go in deep in the analysis, there is the need to delve into reports and articles that scholars have provided in the last months. And this is what the thesis will do later.

This briefly introduction highlighted the main concerns of this work. First, the changes during the last decades of the geography of trade. The main occurrence is represented by the access of China in the World Trade Organization and the resulting consequences for the geography of trade and for the global economy. It has then pointed out that the backbone for the global trade which is represented by transports and the prevalence of the maritime trade. Finally, the introduction emphasized the changes in the cargo trade. This last observation will be better understood in the next steps, when the work explains how this new trends have influenced ships and ports.

The thesis is composed of three sections. The first starts with an analysis of the evolution of the containers trade, giving an overview of the implications in their trade and the adjustments needed by ports to support their spread in the last decades. This will allow to understand what are the actual main routes for the Far East – European trade and if and how they have changed in time.

The second section makes evidence of the geographic advantage of the Adriatic ports in the trade patterns with the Far East. Moreover, it explains the new International Maritime Office regulations about CO_2 emissions, the European Green Deal and the opportunities that the Ten-T initiative could bring to countries with underdeveloped infrastructures. This analysis will be useful to understand that the Adriatic ports could play a key role in a more sustainable and efficient future for the European Union trades.

The third part aims to demonstrate how a collaboration between the ports of the North Adriatic arch could be the turning point to achieve the goals of a greener and efficient way of reaching Europe by sea.

The whole work has been wrote before and during the Covid-19 pandemic. Literature has started to arise in order to describe how the maritime shipping scenario will be affected. The thesis will look at available data to make some considerations on how container trade will change in the next years and how this can influence the North Adriatic ports scheme.

1

The introduction has been useful to framing the key starting points for the whole work. As said, during the last years the geography of trade has been changing. At the same time, another turning point for the sea trade has been the containerization.

Analyzing the dynamics of containerization is useful because this phenomenon could be seen as one of the most important physical components of the globalization. Since their introduction on a large scale during the 1970s, containers have been able to overwhelmingly drop down shipping costs and due to this their expansion have followed a growth trend that exceed GDP and total exports patterns. Back in the days when containers have been introduced in the shipping world, both ports and ships needed some new requirements. Ports equipped for handling containers since the early stages have been able to gain an impressive quantity of market share and they are now capable of influencing sea trade from many perspectives. Moreover, containers are responsible of new trends in the shipping companies.

The waves of containerization and key drivers of ports competition

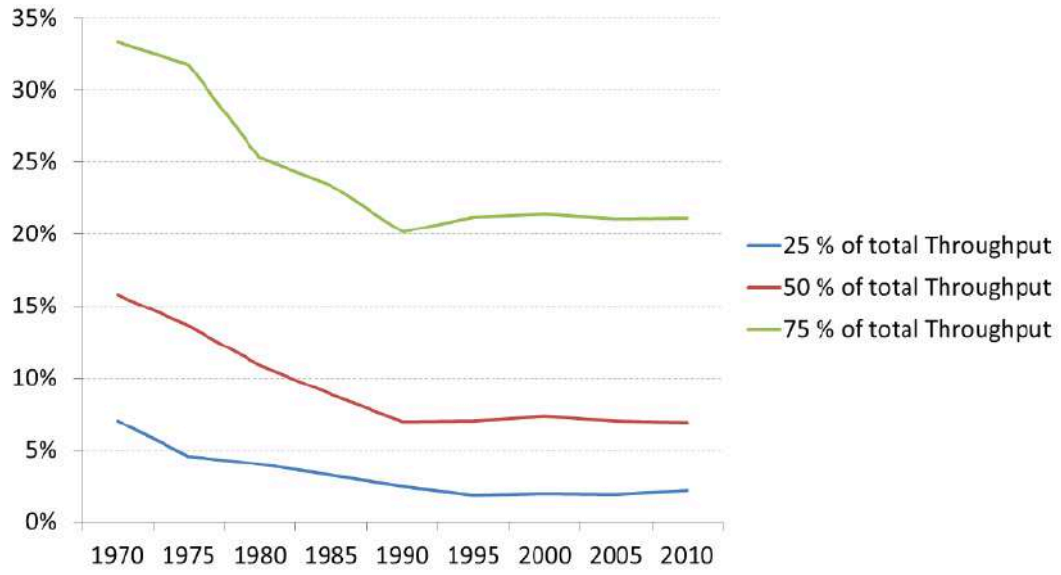
Containers have started their diffusion during the 1950s, when the American shipper McLean found out ports which supported his new idea of shipping. McLean, as a shipper, was bored with the long amount of time needed to load and unload goods and so tried to find a solution to handle freights without the need to process them multiple times during the transportation.

The firsts ten metal boxes left the port of Newark in New Jersey in 1956, onboard the vessel Ideal X reaching Bremen and Rotterdam. Since then, containers trade started to grow and in 1967 they have been standardized according to ISO standards. There are two types of containers: 20 feet and 40 feet. This standardization has also introduced a new measure of the transports called TEU, meaning Twenty Feet Equivalent Unit.

A study based on the concentration of cargos around ports made by Guerrero and Rodrigue[1] identifies the evolution of the containers trade, detecting the geography of ports and how they have been reached during time. The research used the Gini coefficient to compare the growth of the TEU transported and the number of ports needed to handle the increasing amount of containers throughput. Two different phases can be distinguished, from 1970 to 1990 and from 1990 to 2010. In the first phase the two trends followed a constant growth, meaning that the expansion of the containers was widely accompanied by the growth of the number of ports that handled them. From 1990 on, the number of ports handling the still increasing amount of containers traded started to diminishing. Little exception is represented by Chinese ports, which started to arise between 1990 and 1995 without influencing the global ratio.

This means that after the 1990 the containers trade relies on those ports able to be part of a well-established system. Figure 1.1 shows the percentage of ports needed to handle the 25 percent, 50 percent and 75 percent of the total containers throughput between 1970 and 2010.

Figure 1.1 – Percentage of ports needed to handle 25%, 50% and 75% of total container throughput between 1970 and 2010



Source: "The Waves of Containerization", D. Guerrero, J.P. Rodrigue , HALSH 2012

[1] David Guerrero, Jean-Paul Rodrigue. The Waves of Containerization: Shift in Global Maritime Transportation. 2012. Halsh-00725078

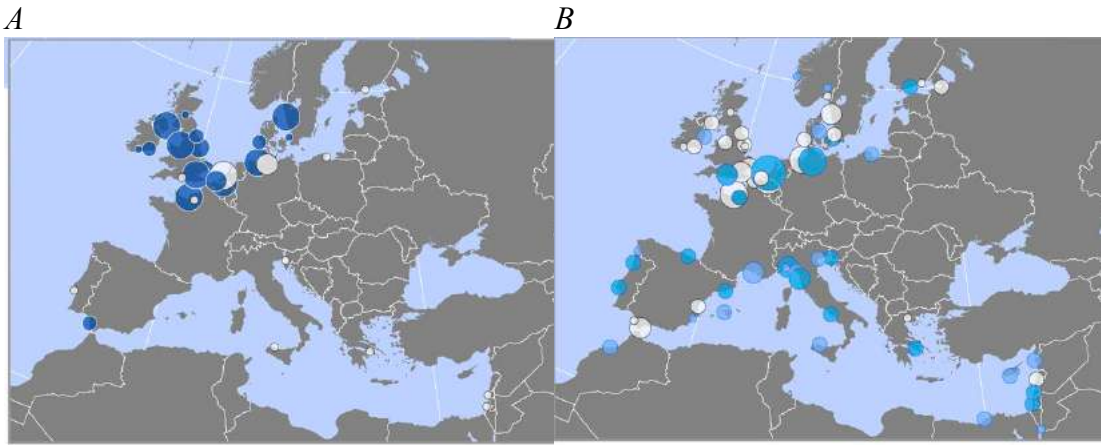
The evidence is that during time less ports are needed to handle bigger amounts of containers.

To understand the development of the port geography determined by containerization again the study made by Guerrero and Rodrigue in 2014 will help. They used the Hierarchical Cluster Analysis (HCA) with data taken from Containerization International (CI) to "*identify homogenous clusters of ports based on the evolution of their share of global container throughput between 1970 and 2010*". The result determined five waves of containerization.

The first wave can be located between early 1960s and 1970s and it has seen the arise of the Sea-Land services of many ports in the Transatlantic and Transpacific route. Arise means especially the increasing Sea-Land networks and the expansion of containers trade between those pioneers. The remarkable ports in this decade are located between North America, Western Europe and Japan. Focusing in the European scenario, the Figure 1.2 A highlights in blue the key ports that pulled on the change in the containerization and gained immediately great market share such as Antwerp, New York and Los Angeles. The white dots underline ports with limited container traffics.

The Second wave underline a wide diffusion of containers in the world. This wave can be divided in two different phases. Between them, the common factor is an expansion of the ports along the Triad's routes of trade. During the wave B1, occurred in early 1970s, the Pioneer ports increased their market share and they started to be the point of reference for containers trade. Representation ports are Rotterdam, Tokyo and Hong Kong. At the end of 1970s started the wave B.2, with the growth of ports that act as additional port calls in the Europe - Asia routes. Great examples are the Mediterranean ports and in Italy the arise of hubs in the Adriatic and Tyrrhenian seas.

Figure 1.2 – The First and Second Wave of Containerization, 1970 – Pioneers and Adoption in the European Scenario



Source: "The Waves of Containerization", D. Guerrero, J.P. Rodrigue, HALSH 2012

The Third wave happened between 1980 and 1990 and it laid the foundations of the modern sea trade. The arise of the offshoring to East and Southeast Asia[2] and the increasingly diffusion of containerization had let a largest number of ports to be part of the containers trade. This decade is of particular importance due to the arise of a completely new function in sea trade: ports with a transshipments-hub function. Namely, this means that these ports act like an intermediary location along major shipping corridors. Pillars in this decade are the ports of Singapore and Algeciras.

The global standard has been finally reached with the Fourth wave, with the entrance of Chinese ports in the world sea trade scenario. Between 1995 and 2005, containers became the standard support for the global trade and due to this shipping companies started to introduce bigger ships. In this wave, the ports which grew the most are those serving as transshipment hubs for the new interconnections of the continents. The perfect European example is represented by the port of Gioia Tauro. Moreover, in this wave new ports in China has been established and had risen in order to improve export capabilities.

The Fifth wave concerns some "niche" ports that have the function to decongest the classic sea routes. In this phase, started in 2005, the perfect example is the port of Tangier Med.

[2] Excluding China at this specific step

This overview points out the multitude of ports that facilitate the containers trade. Changes in the world trade are reflected also in ports, but some of the pioneers have been able to adapt and improve their infrastructures to gain relevant amounts of traffic despite those changes. It is useful to understand what allows ports to compete in order to understand the relevant aspects that must be developed to gain higher consideration in world trade.

It is good to admit that ports have many different commercial functions and some of these functions are almost entirely protected from competition due to their nature. Great examples are freights needed by industries nearby the port, energies supply whose competition depends mainly on national governments policies. For the sake of this thesis, it is useful to go in deep on the functions carried out by ports in the containers trade.

Theory has widely demonstrated the complexity of port competition. Referring to containers trade, the first thing to consider is the role of the port in the trade scenario, it could be a gateway, a transshipment or a local port. Van de Voorde and Winkelmans (2002) suggested three levels of container port competition. The first is the intra-port competition which involves terminal operators of the same port and it is important because shippers are used to choose the logistic chains of a place more than a port per se. The second level concerns the competition coming from terminal operators of other ports placed nearby the port considered. Finally, the inter-port competition developed between terminal operators located in different port ranges. This last level concerns the ability of a port to gain increasingly kilometers of hinterland to serve a largest territory.

Evidence is that even if the immediate hinterland still act as the backbone of a container port[3], the most relevant competition must be seen with ports located in broader regions. The larger the hinterland covered, the more attractive a port will be for shippers and carriers.

The competitive position of a port is "determined by the range of competitive

[3] Notteboom (2009b)

advantages that are acquired or created by the port over time"[4]. Literature has done many efforts to cover adequately ports competition and the common key drivers are resumed below:

Port costs, referring to costs afforded by the customers and including direct costs and indirect costs. The former includes port charges, storage and stevedoring while the latter refer to those costs due to long port stops.

Hinterland proximity, meaning the distance between port of arrival and final destinations of freights.

1. Hinterland connectivity, which is related to the efficiency of transport networks serving the port.
2. Port geographical location, concerning the spatial position of the port mainly in respect to shipping routes and inland market areas.
3. Port infrastructures, able to determine the attractiveness of the port itself.
4. Operational efficiency, referring to the ability of a port to operate efficiently and on time.
5. Nautical accessibility, one of the main issues of the recent maritime trade era. Ports have to care more and more about their ability to welcome large vessels and
6. Maritime connectivity, which relates to the efficiency of the port's networks accounting number of destinations logistic costs to reach them.
7. Port service quality, meaning not only the quality of port facilities but also the ability of a port to offer services which are not provided by competitors.
8. Port site, refers to the port area. Its extension, terminals and quality of its spaces.

Looking at the characteristics of these drivers, it can be noted that scholars have concentrated their efforts on studying the characteristics of ports competitiveness focusing on the maritime, hinterland and infrastructures features. Because of these aspects, the develop of port competitiveness theory in time concerned the port its self with particular care to operational, strategic and organizational dimensions.

[4] Haezendonck and Notteboom (2002)

As highlighted by Parola et al.[5] this way of looking at port competitiveness and its drivers lack of a wider consideration of the industry changes. There is the need to re-interpret these drivers to enable them to include the impact of the major industry trends. In this major trends are included governance changes, inter-firm networks, economies of scale in shipping, coopetition among ports and green and sustainability challenges.

The governance changes refer mostly to the increasing tendency in nations to switch from the public to the landlord model. This shift help Port Authorities to introduce advantages typically found in the private sector, such as a more efficient management with faster decision-making processes and with a more innovative vision. Moreover, the reform of port governance has encouraged private investments and has drawn the attention of firms inclined to commercial risk. The positive impact on the above-mentioned drivers can be seen particularly on the port infrastructures, on the port site and on the hinterland connectivity.

The inter-firm networks have influenced the key drivers of port competition since there is a notable increase of bargaining power of customers and users of the ports. Port Authorities must deal with private pressures deriving from alliances in shipping and they have to accommodate the needs of these alliances in order to protect traffics from competitors. Those pressures weaken the executive decisions of Port Authorities and led them to accommodate the needs of the container port multinational enterprises (MNEs) despite the public interests.

For the sake of this thesis it is relevant to go in deep in the analysis of the economies of scale in shipping and the coopetition between ports which are geographically located in proximity. The green and sustainability implications on ports will be widely taken in consideration in chapter 2.

[5] Francesco Parola, Marcello Risitano, Marco Ferretti & Eva Panetti (2016): The drivers of port competitiveness: a critical review, Transport Reviews, DOI: 10.1080/01441647.2016.1231232

How economies of scale in shipping shaped and influence European ports scenario

During the last decades, in maritime shipping there have been a huge run-up towards economies of scale and the iconic and most important trend is represented by the increasingly size of vessels.

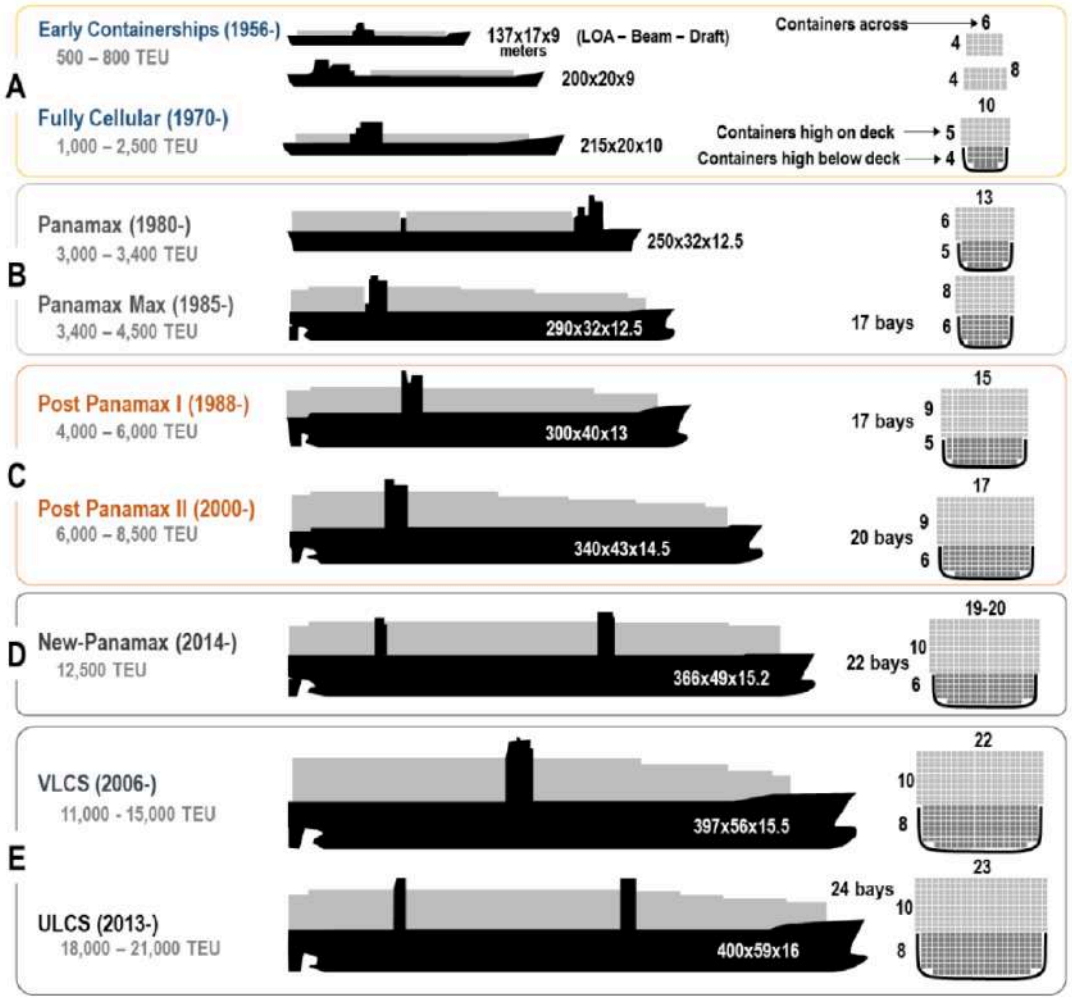
Since the diffusion of containers trade during the 1950s, also containerships have experienced many waves of changes and each wave is characterized by a step forward on the size of the vessels. As soon as containers started to spread their influence in world trade, carriers used to load modified bulk vessels or cargos up to 1,000 TEUs noting immediately a huge save in costs and risk. The firsts ships must have been equipped also with cranes because at the time many ports were not ready to handle containers. The so-called second generation of container ships were those fully piled with container and they began to sail the seas around the 1970s. After about ten years since the introduction of containerized freights, many port terminals were ready to embrace cargos ships through specialized container terminals. Thus, vessels could load more containers in the blank given by the dismissal of cranes from board. Those vessels fully loaded of containers were named cellular containerships and they were faster than ancestors with speeds of 20-24 knots which became the speed of reference for containerized freights.

A turning point in the economies of scale in shipping is represented by the 1980s. During this years, carriers have seen in bigger ships the opportunity to decrease costs and increase volumes. The virtuous spiral was (and still is) characterized of higher volumes decreasing fixed costs per TEU and it helped the wider diffusion of containerized freights. Higher volumes required bigger vessels and this has led to the so-called Panamax, which are ships with about 4,000 TEUs capacity and designed to respect the limit imposed by the Panama Canal. Due to the so-called Panamax standard, during the 1980s ships' sizes remain unchanged but efforts were concentrated to maximize their load capacity.

To overcome the limit imposed by the Panamax standard was risky due to the deficiency in alternative trade networks which would have required additional

handling infrastructures and higher drafts in ports. Anyway, in 1988 the APL C10 vessels were introduced with 4,00 TEUs capacity and in eight years they reached their maximum load capacity of 6,000 TEUs. This increased load power was obtained at first just widening the vessels with Post Panamax I then Post Panamax II set a new length standard of 340 m and reaching the 8,500 TEUs capacity. Those fast changes in vessels had put heavy pressures on ports especially on dredging to accommodate deeper drafts.

Figure 1.3 – Evolution of Containerships



Source: *The Geography of Transport Systems, Jean-Paul Rodrigue, New York: Routledge*

The augmented capacity of Panama Canal since June 2016 has been exploited immediately by the New-Panamax (NPX) vessels. These ships can transport until 12,500 TEUs and their structures has been modified both in width and length in respect to the Post Panamax II.

Ships are getting bigger and bigger in time; the last waves of innovation are represented by the Very Large Containership (VLCS) and Ultra Large Containership (ULCV). Maersk introduced the first in 2006 with up to 15,000 TEUs capacity and the latter in 2013 able to welcome up to 21,000 TEUs. Both exceed the limits imposed by the extended Panama Canal and the last generation of Ultra Large Containerships is reaching also the technical limits of Suez Canal. Due to this they are almost limited to maritime trades between Asia and Europe. Anyway, larger ships are already designed and their production is ready to be set off as soon as there will be sufficient volumes demand.

The acceleration in containers trade helped to increase the trend of bigger ships. From an economic point of view, the maritime trade is characterized by organizational models in which fixed costs represent the highest percentage of total costs. Because those fixed costs increase less than proportionally in respect to ships' sizes, carriers are inclined to look for economies of scale in bigger vessels especially in busier routes. Moreover, carriers exploited the decrease in costs of production of new vessels resulting from the over capacity of Chinese naval yards after the crises in 2008 and the result has been a wide spread of a new generation of container ships denoted as eco ships. New vessels represent an overwhelming step forward for carriers especially in bunker savings. Since bunker accounts for about 55-60% of total operational costs[6], the new generation of vessels are designed to be more efficient at low speeds than the previous container ships which engine features were designed for higher speed capacity. In order to save fuel costs, slow steaming has become an essential standard in new generation ships and made a significant change in the modus operandi of the industry. Considering an average main engine fuel prices of US$ 600, lower operation speeds allow savings between 55 and 63 percent per TEU when upgrading from 15,000 TEU ship to 19,000 TEU ship[7].

The ongoing ladder to economies of scale has led to many acquisitions and mergers in the shipping sector, operated mainly by leading actors such as Maersk, MSC and CMA CGM. Anyway, to benefit from economies of scale there are also collaborations

[6] Italian Maritime Economy, Nuove rotte per la crescita, Osservatorio Permanente di SRM, 2014

[7] The Impact of Mega-Ships, International Transport Forum – OECD, 2015

between actors in the shipping industry. There are three main types of collaboration:

- Vessel Sharing Agreement, with the purpose of split onboard spaces based on the different load needs.
- Slot Charter Agreement, which works with rents by a carrier of one or more slots in a ship of a different carrier.
- Joint Services, aiming at the coordination between carriers of departures from the main ports to lower the risk of empty ships and to guarantee a market efficiency.

Since gigantism of ships started, fast changes in dimensions has represented a tough challenge for ports due to the many adaptations that new vessels require. Those requirements can be seen both in points of access outside ports and in infrastructures inside ports.

The main issue in access a port with a new generation ship is represented by the depth of its waters and this is probably the main issue for those ports that are not deep-sea ports. Larger ships need about 17 meters of draft, obliging ports to constant dredging measures for their points of access. The depth of draft varied when a ship is not fully loaded and when tides allow the entrance even if the access point is not deep enough[8]. In many places dredging represents an issue since it has seen as dangerous for environment and eco-system. Another possible hitch corresponds to locks which regulate the entrance to ports. These locks must be of the adequate size to guarantee accesses to container terminals. In many cases, locks have been substituted or supplemented by bigger ones to allow the entrance of the new vessels[9]. Moreover, bridges could represent an issue since the increasing trend in big vessels is to stack containers on top of each other. This could be a limit for those terminals whom access requires ships to go behind bridges. In contrast with locks, to replace or to lift a bridge

[8] A great example is represented by the port of Hamburg, in which ships can entry the port only during specific tidal windows or when ships are not fully loaded due to the actual depth of Elbe River. To manage this issue, Hamburg Port Authority invested in a IT system to beforehand planning its port traffic.

[9] Amsterdam made many investments on locks to attract new container traffic in the foreseeable future. Antwerp moved the PSA/MSC terminal to let ships avoid a lock that could have represented a bottleneck.

is much more difficult and expensive.

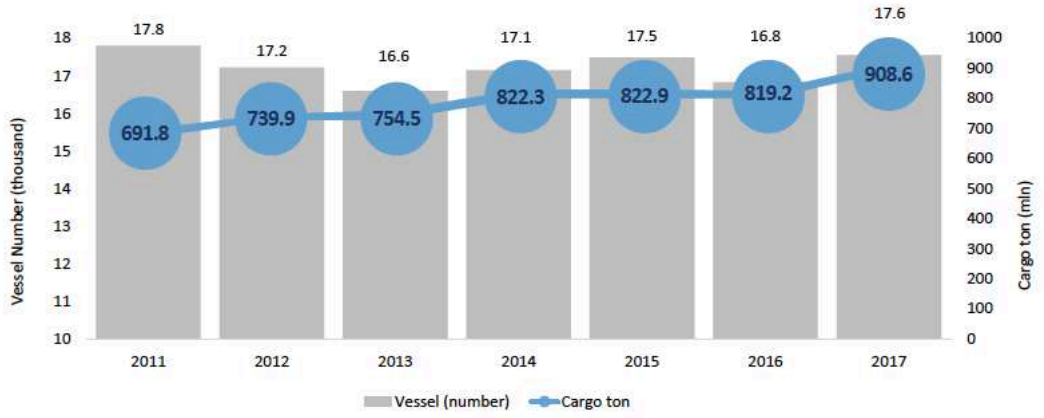
Bigger ships require adaptations inside ports as well. Most of the existing terminals have not been built with easy-modifiable features. Due to this, carriers are putting many pressures on them to obtain fast adaptations to mega vessels. One of the main concern is represented by quays which in most cases are not long and strong enough so they cannot guarantee full-safety calls for terminals. Further, cranes are key players for terminals and carriers. Due to the extended capacity of new vessels, cranes' jibs must be long enough to reach the 23rd row and high enough to arrive at the row number 11. Many terminals have not well-equipped cranes and they provide temporary solutions which are sometimes risky. Port workers are also required to be more efficient in all the load and unload operations so that gates result efficient. Port Authorities must implement new IT solutions to manage ships and terminal planning.

To understand which are the ports that adapted better to the gigantism of ships, the first thing to point out is that mega-vessels are used mainly on the routes between Europe and Asia and more properly in the Far East-North Europe trade route. Between 2007 and 2014 the average increase of ships' size in this route was 79%[10].

As evidence of this, it is useful to look at data of the Suez Canal Authority. Suez Canal is an artificial waterway which crosses the Isthmus of Suez and allows connection between Mediterranean Sea and Red Sea. Built in 1869, it has been enlarged in 2015 to grants flows to ships with 20.12 meters of draught. Containerships are the most numerous vessels that undergo the Suez Canal, with a share of 32 percent of the total.

[10] The cascade effect of a wider usage of big vessels in the Asia-Europe route is the augmented capacity in all the other maritime patterns. In the Far East-North American East Coast route the average increase in vessels' size between 2007-2015 was 31%. Usage limitations in Transpacific routes is due to the choke point represented by the Panama Canal which cannot be crossed by VLCS and ULCS.

Figure 1.4 – Ships and cargo through the Suez Canal. Trend 2011-2017



Source: SRM on Suez Canal Authority (SCA)

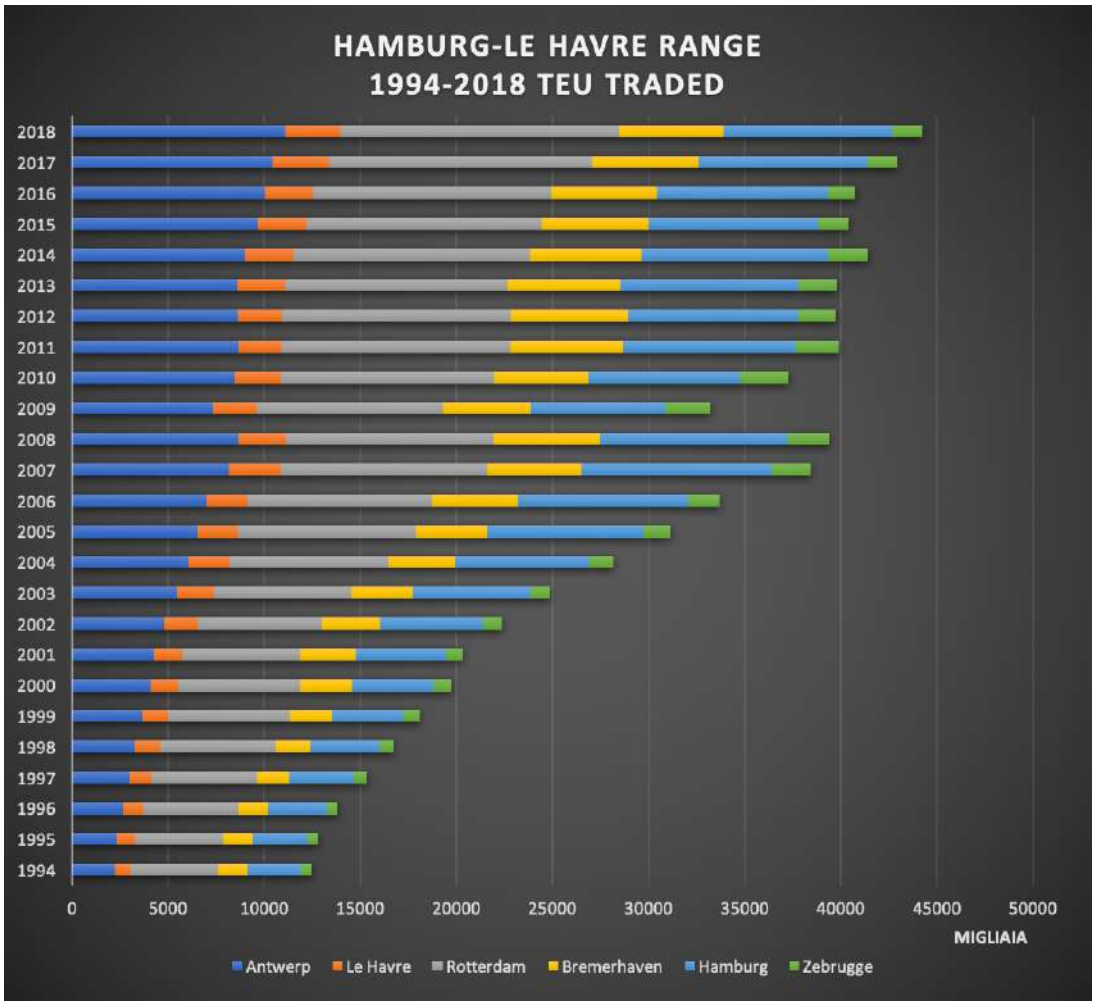
Before the enlargement in 2015, the number of vessels going through the Suez Canal decreased but the total net tonnage increased. This is shown in Figure 1.4, which demonstrates how the spread of gigantism in shipping is clearly reflected in this routes. Moreover, after the enlargement the two trends started a similar pattern of growth and in containers trade the average net tonnage difference between 2014 and 2017 is +21 percent.

As can be easily guessed, ports need time to adapt and to enforce requirements needed by bigger ships. Therefore, one of the main effects of gigantism in containers trade has been the prioritization of ports. This means that carriers choose terminals ensuring high-level standards to take advantages from ports efficiency. Due to this, the increasing tendency is the arise of the Hub & Spoke port system which allow a reduced number of calls in selected big ports and the wide utilization of transshipment ports. By transshipment system, big ships denoted as mother unload freights in the hub port and smaller ships referred to as feeder are loaded. Loaded feeder ships have the task to reach final destinations. Thus, the amount of calls for the mother ships is centered in a small number of ports.

In this scenario, main ports called in the Far East-North Europe route are in the North Sea and in the Baltic Sea. As evidence of this, Figure 1.5 shows the overwhelming growth in containers trade in the ports in Hamburg-Le Havre range. Ports like Rotterdam, Hamburg and Antwerp have been able to exploit the advantage in

welcoming bigger ships and so to attract increasing amounts of containers coming from mother ships. The Hamburg-Le Havre range has gone from 12.435.713 TEU in 1994 to 44.250.897 TEU in 2018. The average growth for this port system between 1994 and 2018 accounted an average growth of about 6 percent per year, helped by the impressive trend of the Antwerp port which recorded in the same period an average growth per year of 7,19 percent. Moreover, ports of the Baltic Sea gained momentum during the last decade. It is particularly noteworthy the arise of the port in Gdansk, established in 1998 and able to start from 2.321.910 TEU in 2009 to the 20.904.638 TEU recorded in 2019.

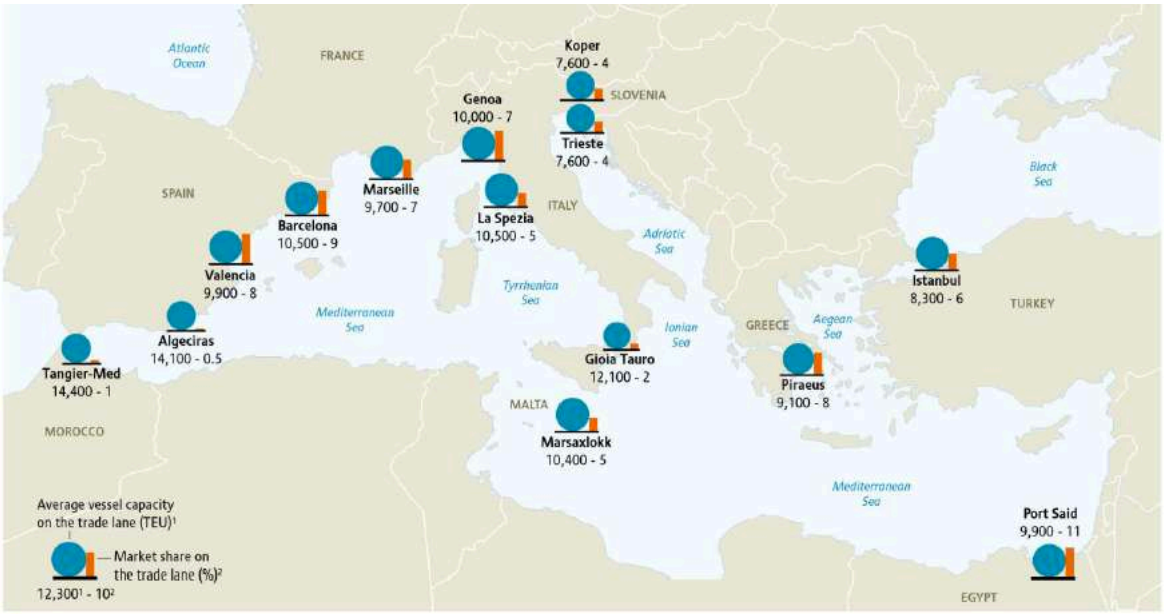
Figure 1.5 – Containers trade trend in the Hamburg-Le Havre Range 1994-2018



Source: own elaboration based on data taken from Assoporti

Due to the increase in ship size and the on-growing usage of the hub and spoke system, the Mediterranean Sea is living a changing scenario. Looking at the map in Figure 1.6, the main ports called in the Mediterranean area are those having a high-depth standard in their seafloors. Moreover, the slow-steaming impact on routes is gaining importance because carriers are moving towards the decision to choose their calls in ports located in the strategic path to the Northern Range in order to waste less time as possible.

Figure 1.6 – Main Mediterranean ports called on the Far East-Mediterranean route



Source: The impact of mega ships, OECD/ITF 2015

There are many ports that benefit from this mechanism. Port Said reached 3.000.000 TEUs in 2016, following an average growth ratio of 8,57 percent per year between 2005 and 2016. After the acquisition by Chinese shipping company Cosco in 2011, the Port of Piraeus is living an incredible path of growth and in 2017 it has handled over 4.000.000 TEUs with an average growth of 27,90 percent per year since the acquisition. Due to their strategic position, also ports of Barcelona and Algeciras are gaining momentum. The former has increased its traffics between 2011 and 2017 with an average of 7,36 percent per year, while the latter has been able to handle 4.380.849 TEUs in 2017 but with an average increase of 5,23 percent per year in the same period. Outstanding performances need to be recognized to Tangier-Med, which almost doubled its handle capacity in the years between 2010 and 2019 and it recorded an

average growth of almost 20 percent per year of in this time frame.

To suffer of those growth paths are especially Italian ports. Even if the port of Gioia Tauro is in the south Mediterranean Basin and it could be in a strategic position, it followed a path of average growth of only 1,79 percent per year during the last ten years. In 2019 it handled 2.522.874 TEUs, far from the 3.467.824 TEUs recorded in 2008. Genoa and La Spezia considered as a single recorded an average growth of 3,60 percent per year between 2001 and 2018 but taken together they handled just 4.094.761 TEUs in 2018[11]. Ports in the Adriatic Sea tried to adapt themselves to the new tendency in maritime trade, but they probably lack in long-term strategies to attract traffics. Venice and Trieste have followed a similar path in last ten years and taken together they grew at an average rate of 8,93 percent per year, while ports of Koper and Rijeka in the same period accounted an average growth rate of 7,77 percent per year. It may seem like a good growth, but the TEUs transiting in these ports are less than 3.000.000 TEUs in 2018. This means that the total amount of containers arriving e departing from these ports are approximatively one-twelfth of the TEUs attracted by the ports in the Hamburg-Le Havre range.

Even if stocks are still arising in many Italian ports, it appears clear that flows of containers are going away from Italian ports. There is the need to find a way to change those flows and make sure that growth paths follow better percentage of increase. Next subsection will point out the definition of coopetition among ports and how this could be a useful tool for Italian ports to try to be competitive in the new scenario.

[11] Even if at the time of writing data for both Genoa and La Spezia in 2019 are not available, there is already the news that Genoa and La Spezia will lose Maersk's AE20 direct calls. According to the article published on 20/04/20 in Ship2Shore, containers will reach Ligurian harbours via feeder from Barcelona.

The coopetition between ports and geographical opportunity of the Adriatic Arch

So far, the thesis introduced containerization and its implications on ports from the maritime haul perspective. Anyway, there is much more to be considered. Together with the diffusion of containers, hinterland have started to play a key role and port players and port authorities have focused their attention on many aspects related to hinterland.

It has been clearly pointed out the existence of different types of ports in the containerized cargos trade, but they can be swiftly divided in gateway ports and transshipment ports. The former are those having a direct connection with their hinterland, while the latter act like an interchange between deep-sea routings. The increasing changes imposed by the still increasing sizes of vessels have made the demand of port calls dependent on the services offered by ports and time demonstrated a consolidation of those ports able to complements each other. On the other side, ports that adapted slowly to changes are being bypassed by shipping lines and the result is a decade on the competitive potential with even stops in former calling ports. This paragraph will show that a coopetition between ports in the same area could guarantee more efficiency and more reliable services, which lead to a more competitive port community.

Port competition can be briefly summarized by competitive offering in accommodating shippers and shipping lines and at a broader dimension by the variety of competitive advantages created or acquired by a container port during the time. Literature shows a wide range of methods that allow for the calculation of the magnitude of container port competitiveness. The one that follows take into consideration the ASC method and it has been developed by Theo Notteboom and Wei Yim Yap. As previously demonstrated, container shipping services affect competitiveness between containers ports and the ASC method has been thought to better understand the way in which container shipping lines tend to choose service routes. ASC stands for annualized slot capacity and it can be derived from the actual

vessel capacity deployed in liner services of a port.

The formula developed is the following:

$$T_{xt}^{k} = 2G_{xt}^{k}F_{xt}^{k}\ \frac{\sum_{h=1}^{n} V_{xt}^{kh}}{n} = \ 2G_{xt}^{k}F_{xt}^{k}W_{xt}^{k}$$

where:

T is the annual slot capacity measured in TEU that called at port "X" for a particular service "k" in time period "t";

G is the number of calls made at port "X" for the whole service loop;

F is the frequency of call in a year;

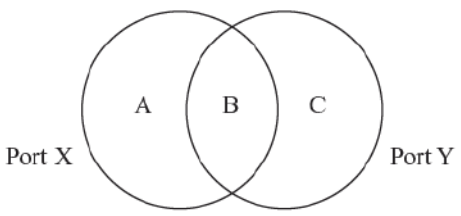
V_h is the capacity of vessels deployed;

W is the average capacity of vessels deployed for $W_{xt}^{k} = \frac{\sum_{h=1}^{n} V_{xt}^{kh}}{n}$

The usage of a multiplication by a factor of 2 is needed if vessels are completely loaded and unloaded and then completely reloaded to their maximum capacity. Other factors affecting the actual number of containers handled at the port are the number of ports of call on the trade route considered, the liner service network structure and the cargo-generating effect of the port calls. The aim is to recognize changes in liner service routings and to infer their impact on port competition. Figure 1.7 shows the method of analysis. ASC which calls at two ports will be divided in three categories:

- category A calls only at port "X"
- category B calls at both ports
- category C calls only at port "Y"

Figure 1.7 – The ASC analysis framework

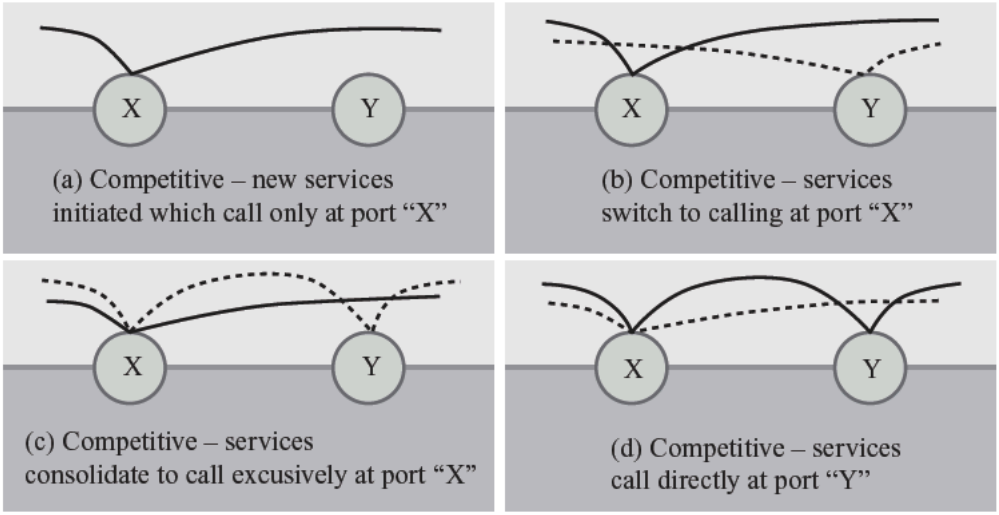


Source: Port Competition and Competitiveness, T. Notteboom – W. Y. Yap

The development of port competition can be estimated by the variation of ASC handled in each category and it leads to Figure 1.8.

In the first case, new container services delivered by the shipping line will result in an improvement in the ASC deployed for the category "A" and it indicates a competition between the two ports. The second and third cases indicate scenarios in which category "A" gains a higher share of ASC deployed at the expenses of categories "B" and "C". In the last part of the picture the scenario depicted will drive an increase in the ASC deployed for category "B".

Figure 1.8 – Two ports scenarios in the analysis of changes in container shipping services



Source: Port Competition and Competitiveness, T. Notteboom – W. Y. Yap

This analysis is useful to understand that container port relationships must account for changes in the ASC deployed and for changes in market share undergone by the three categories. Evidence is that the more competitive port between the two will gain more market share, meaning that container shipping services roll out inter-container port competition.

Anyway, this scheme does not consider the chance to see ports cooperating with each other. To introduce cooperation between ports it is necessary to underline the

increasing importance of hinterland, which has been categorized as the most important field of competition. Hinterland competition overlapped during the containerization phase and has been able to make ports to compete with those which are not located in close proximity. Data demonstrate that the increased competition for traffics and lowered generalized costs lead to the prove that investments in hinterland make a port more competitive. The counter side is of course represented by bottlenecks created by the increased traffic and by the higher costs that a more attractive port have to face.

In this scenario, competition between ports must be read in a different way as opposed to this work have done previously. There could be a new way of doing business for ports located in the nearby and which serve mostly the same hinterland and it takes the name of port coopetition. The concept have been introduced by Song in 2003, who described an advantageous new behavior mainly to be intended for port and terminal operators rather than port authorities. Song sees coopetition as a possible contrast to the increasing bargaining power of shipping lines, because it can lead to exploit economies of scale and additional sales for increasing services given by ports and so to being able to attract more customers.

For the sake of this work it is important to underline the relevance of coopetition between adjacent ports and to do so it must be clear that a port should see as a triptych: this means that a port is composed by the foreland, the port and the hinterland.

The foreland can be defined by the nautical access, which is the source or destination of the flow of goods, and by a closer sector representing the access zone to the port. Both can be implemented thanks to coopetition, but it is well to note that when ports coopeting are sharing a common geographical area port authorities could work on the access zone to make it more attractive and reducing costs needed to do so. So, the consequence is that to ship and to receive goods from this implemented zone will be less expensive for all port clients.

The port is referred to many aspects, including licenses, training, security and so on. In this field cooperation, more than coopetition, could increase economies of scale from ports aspects especially when two or more ports share the same cultural background. This economies of scale can be achieve also thanks to the creation of a so-called Port Community System.

As previously sawn, hinterland is the battlefield of competition in the modern port era and it is by far the most important for which Port Authorities should coopeting. The reason lies beyond the fact that through out coopetition Pas can combine their flows of traffic, increase volumes and find a common strategy to avoid bottlenecks deriving from this augmented traffic. To achieve this goals, of course there will be the need of new infrastructures, which can be financed from a national and a supranational level and/or by private investors that are attracted from the lobbying power if the coopeting ports. Investments on hinterland infrastructures is one of the priorities of ports, in order to avoid inefficiencies and to guarantee savings in direct and external costs.

Coopetition can be pursued for both profit and non-profit reasons. Profit reasons are simple to identify because every project needs investments and there is the need to gain results in order to legitimize costs. The simple concept behind coopetition is the saving of total costs faced by Port Authorities which must be reflected in a considerable higher profitability of participating in the investments. Profitability in the short term is represented by the cost savings, but it can last in the long period if investments are made in infrastructures able to generate both new offerings for port stakeholders and to reach new markets. Moreover, through long period investments coopeting ports are able to increase their market power because they can impose themselves as a shared battlefield against, for instance, shipping lines and at the same time guaranteeing efficient doors and corridors for their traffics. Infact, the most important aspect of coopetition between ports is the ability of gaining hinterland and efficient connectivity with a reduction of transport costs. As stated by Van de Voorde "by facilitating the bundling of cargo, PAs can make the cargo flow achieve a critical mass that allows a modal shift to a more efficient and more sustainable transport mode".

Ports can cooperate at different levels, and these levels can vary from a simple collaboration for ad-hoc projects even up to real mergers.

As said, there are also non-profit scopes for coopetition and they fall into the deep hole of port regulations which will not be taken in account in this work.

An example of coopetition in the European framework is the merger of the Port of

Ghent and the Zeeland Seaports, which are located respectively in Belgium and Holland. Hintjens[12] demonstrated the benefits of this merger through data highlighting the savings of direct, generalized and external costs.

Another case of coopetition is in Poland and is composed by the Port of Gdansk, Port of Gdynia and two ports which share the port authority, Swinoujscie and Szczecin. Since the start of this collaboration, all ports started a process of growth even if not all ports accounted a likewise increase in their traffic. They share a common hinterland, which have been developed and increased during the last years.

But the most representative example of coopetition is the one between the Port of Rotterdam and the Port of Antwerp. They have been competing each other all the way through the development of containerization, but since 1969 they have also cooperate on project basis. They share a common hinterland in which there is probably the highest level of competition in Europe and thanks to their coopetition they are able to form the main gateway to the EU. One of the most important thing to highlight is that the collaboration between the two ports of Antwerp and Rotterdam have genuinely fighted the shift to South Europe of cargo flows which was (and maybe still is) a key turning point in many strategies developed by governments and institutions to make more efficient and sustainable the Far East - Europe trade. This represents the turning point for the whole work. In fact, the collaboration between the so-called NAPA (North Adriatic Port Association) ports could drastically change the actual European port scenario and make it more efficient and sustainable.

The North Adriatic Ports Association is composed by the Italian ports of Ravenna, Venice and Trieste, by the Slovenian Port of Koper and the Croatian Port of Rijeka. The Association was established in March 2010 without the Port of Rijeka which joined the partnership in November 2010. In 2012 the Port of Ravenna leaved the Association but then rejoined in 2017. All five ports are located in the northern part of Adriatic sea and the Association had firstly the aim to collaborate in order to develop

[12] J. Hintjens, Cooperation between seaports concerning hinterland transport, PhD dissertation supervised by E. Van de Voorde and T. Vanelslander, 2019

common maritime and hinterland connections and put efforts in environmental protection, safety and information technology.

Figure 1.9 – Location of the NAPA ports

Source: Port of Venice, 2015

In contrast to other European proximity ports such as the French Marseilles - Le Havre or the German Hamburg-Bremerhaven, NAPA ports are not surrounded by industries generating shipping demand and due to this they have always had the focus on serving the contestable hinterlands of the Central and Eastern Europe. In the actual scenario, these hinterlands are mostly served by the Hamburg-Le Havre ports and in addition to this fierce competition they are self-loathing themselves with mutual concurrency. Moreover, Acciaro13 state that another obstacle for the NAPA ports is represented by the distorted perception of potential stakeholders which seem to judge the Adriatic

[13] Acciaro et al., Contested port hinterlanda: and empirical survey on Adriatic seaports, Case Studies on Transport Policy, 5, 342-350, 2017

gateway as inefficient and unreliable. Another limit to the develop of the NAPA ports is connectivity. This is demonstrated comparing the liner shipping connectivity indexes: taking into account, for instance, those of Rotterdam and Koper there is a gap of almost 60 points of index. Things do not improve comparing the indexes of the other NAPA ports with the Northern Range ports and this represent one of the most important problems also for the cooperation between the Adriatic port gateways.

Since its establishment, the North Adriatic Port Association tries to draw attention about its chance to be an efficient and sustainable gateway for the Europe – Far East trade[14] . But this is the only level of cooperation between these ports, because evidence is that until today no commercial cooperation has been developed.

Chapter 2 will aim to understand how important could be the collaboration between these ports and the tools that are at their disposal to achieve attention and then generate growth for all the NAPA entities.

[14] It must be said that the Far East – Europe route is the only route that can be served efficiently in respect to the Northern Range ports, which could count also on the North Atlantic trade route.

2

The first chapter has been useful to introduce the containers trade, underlying how much it influenced (and still do) the maritime sector. Moreover, the commencement ended considering the cooperation between the five NAPA ports. The aim of the second chapter is to demonstrate the geographical and environmental advantages that the Southern Europe ports side can guarantee for the Europe – Far East trade.

The starting point is a study on the most efficient maritime point of access in terms of distances and emissions from Port Said. The step after is represented by the description of the practicable strategies on infrastructures that would allow a logistical change in the actual European port scenario. Then, the focus will shift to the field of emissions and the thesis will describe two key initiatives, one conceived by the International Maritime Forum and the other by the European Union. The aim is to demonstrate the need of a change on the structure of the Far East – European trade and the environmental and infrastructural tools to be follow and exploited to achieve this development.

Impact of the Far East - European trade

As seen in Chapter 1, shipping companies choose which ports have to be called considering mainly seabed depth, hinterland connections and technical facilities. At the European level, the Northern Range ports are dominating traffics since they are able to guarantee the most efficient way for carriers to reach Europe from the Far East. Anyway, this route must be called into question because is not the most efficient at the European Union level. This could be easily proven by looking at transit-times, energy consumptions and consequently carbon emissions.

A study made at IUAV University of Venice by A. Cappelli, A. Libardo, E. Fornasiero[15] looks at the maritime-rail intermodal transportation in order to identify which are the European best routes in terms of transit-time and emissions. To do so,

[15] A. Cappelli, A. Libardo, E. Fornasiero, L'Impatto Del Trasporto Intercontinentale Di Merci: Modelli per la misura degli effetti delle scelte, University IUAV of Venice, 2011

the study takes into consideration the port of Port Said as starting point and then it identifies isochronous, isoergon and isocarbon curves. Scholars used data on most widely used means of transportation and data on European network conditions.

They considered maximum speed, fuel consumption and emissions of container ships, classified by their TEU capacity, finding suitable 7.500 TEU vessel for Meditarranean destinations, 9.000 TEU ships for Atlantic port calls and for call in Valencia.

On the rail side, speed, consumptions and load capacity of freight trains made possible to determine 1000 Tons freight train as the most trustable species for making inference. Finally, also railway standards influence the way Europe is reached. This happens because different countries have for instance different speeds allowed, or different rules on train length. Figure 2.1 shows maritime nodes and rail and road arches depicted by the investigations.

Figure 2.1 – Ports and railways of reference for the study

Source: Modelli di analisi delle emissioni e del bacino economico e ambientale dei porti del nord Italia nel trasporto intercontinentale di merci

Starting from these considerations, the three scholars determines isochronous, isoergon and isocarbon curves.

The aim to identify isochronous curves is to understand which port nodes and

consequently which network allow a faster access to the European strategical markets when container vessels come from Port Said. As said, the intermodal shipping structure considered is composed of sea and railway. The speed of vessels has been identified and set to 25,6 knots for 7.500 TEU vessels and 25 knots for 9.000 TEU ships while for railways single valuation on infrastructures have been made. In this framework, isochronous curves derived directly from combining sea and rail times and confronting and overlapping these curves allowed to identify areas of competition and areas of indifference between ports. Areas of competition can be reached only through a unique and specific port, while areas of indifference are characterized by equal transit time for two or more ports.

Isoergon curves measure energy consumption. To define the measure of each sea-route consumption the ratio *marine diesel oil/per-day* has been used and it has been compared for each vessel type. The 7.500 TEU and 9.000 TEU vessels have respectively a ratio of 37,49 g/km TEU and 36,82 g/km TEU. Railways' consumptions and emissions depend on many factors. To standardize the research, scholars have chosen the indications of the Italian Authority for Electric Energy. Consumptions for each sea-route summed with the respective railway line built up the isoergon curves.

Isocarbon curves are useful to identify transport emissions. Emissions are proportional to the distance that both vessels and trains must cover. For this study they have been identify as follows: 117,3 CO_2/TEU-km for 9.000 TEU vessel and 119,4 CO_2/TEU-km for 7.500 TEU ship, while for the railway route the result is 284 CO_2/TEU-km. Based on this value, Figure 2.3 reports the CO_2 emissions.

Looking at the results, coming from Port Said the most rapid European port to reach is Venice. To reach the Northern Range ports, vessels need from seven to eight days of navigation since they have to cover 6.000 km (Rotterdam) or 6.500 km (Hamburg). Venice can be reached by ships in less than three days of navigation, since it distances just 2.400 km from Port Said.

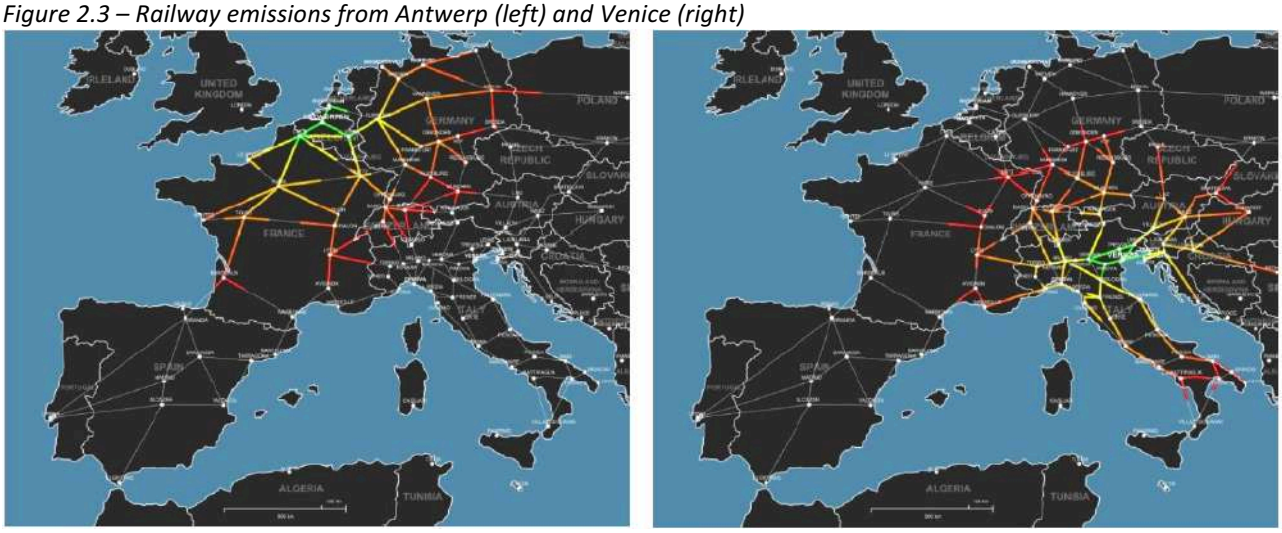
Figure 2.2 – Maritime freight network from Port Said

Source: Studio SoNoRa, New UE Freight Corridors in the area of central Europe, Research Unit TTL University IUAV of Venice, 2019

So, the port of Venice allows carriers to save at least five days of navigation in respect to the Northern Range ports. Considering the railways' connections, Venice can also guarantee a faster access to German and Austrian markets and could guarantee access to the increasingly prosperous markets of the Eastern Europe.

As can be easily guessed, saving days of navigation and allowing trains to cover less kilometres mean also saving energy consumptions. Figure 2.3 compares railways emissions between Antwerp and Venice. It is interesting to note how Venice allows to reach many countries with less impacts on emissions. The only indifference area is the central Europe one, which can be indifferently entered from Antwerp or Venice.

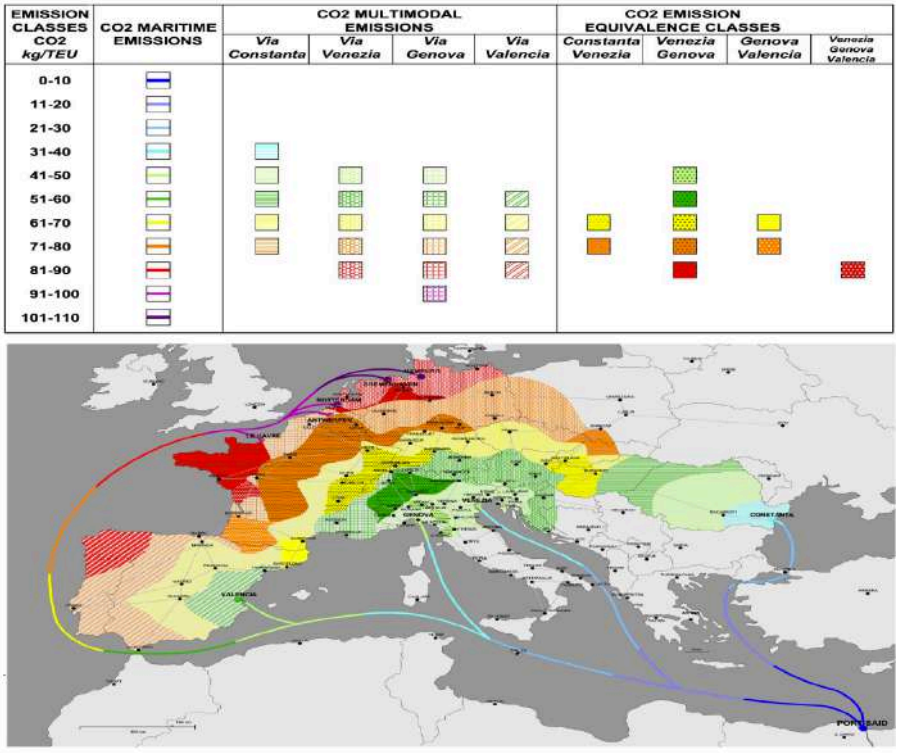
Figure 2.3 – Railway emissions from Antwerp (left) and Venice (right)



Source: Studio SoNoRa, New UE Freight Corridors in the area of central Europe, Research Unit TTL University IUAV of Venice, 2019

Taking into consideration the overall European ports and railways scenario allow to have a better idea of the opportunity that the port of Venice represents for the Far East – European containers trade. Figure 2.4 resumes the multimodal emissions from Port Said to the main Europe's port nodes.

Figure 2.4 – CO_2 Multimodal emissions from Port Said



Source: Studio SoNoRa, New UE Freight Corridors in the area of central Europe, Research Unit TTL University IUAV of Venice, 2019

From the CO2 emissions point of view, the picture is impressive because demonstrate the absolute inefficiency of the Northern Range ports to reach any inland European destination. For example, let's considere a container coming from Port Said and destined to Munich. If the container reach Munich from Hamburg, it needs to sail five to eight days more in respect to reach Venice and it would stay on a railway for at least two days more to arrive at destination. The eight to ten days of emissions savings correspond to reduce 135 Kg of CO_2 for each TEU transported.

Of course, there are also areas of indifference which can be reached by alternative ports with approximately the same amount of emissions. Port of Valencia results more convenient for Portuguese and Spanish territories, while Genova gives access to the area between Le Havre and Antwerp and for almost all the French markets. But the most impressive indication is given looking at Venice: its port is a door to the whole German and Austrian markets, to Switzerland and moreover it gives access to many Eastern European areas competing in just some territories with Constanta.

At this point, it will be clear that the North Adriatic Sea could represent a strategic node for many markets and areas that are currently served by the Northern Range ports.

The crucial point is that Venice as the other NAPA ports are not able to accommodate big vessels, each port for reasons going from seabed depth to inadequate facilities. Moreover, the actual infrastructural connections from the port to the potential markets are outdated or even inexistent.

Anyway, there are many chances to be exploited to improve their actual ports features and connectivity, especially from the infrastructural perspectives. Moreover, there are also environmental constrains that can be used as strengths in order to increase chances to negotiate investments at the European and World level.

What follow are firstly infrastructural opportunities that Venice and the other NAPA ports can exploit to give a boost to their attractiveness and then there are at least two regulations that will help to reinforce their position as game-changer nodes for the European trades.

Infrastructural chances to be exploited

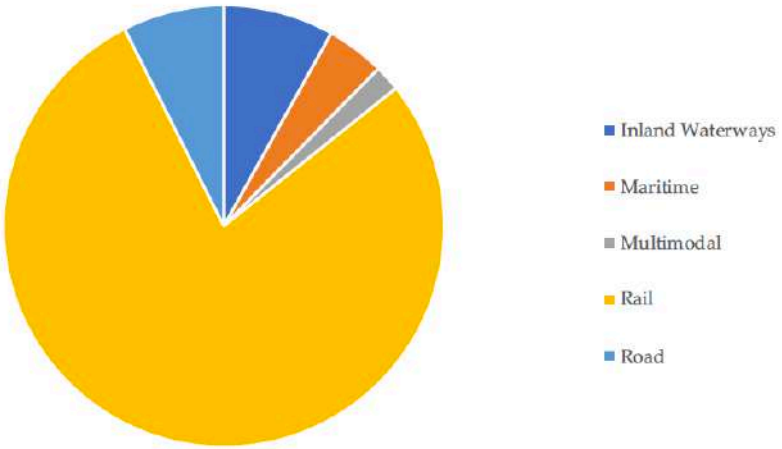
As seen, ports are the doors for the Far East – Europe trade but the actual port scenario is unbalanced. Together with the reasons that this work showed, there are other grounds linked to the power exerted by the Northern Range ports and one of these is represented by the networks developed in time for European ports.

Since the Treaty of Rome in 1957, the need to transform Europe in a single market has been identified and many policies have been developed to achieve this result. From the networks and infrastructural points of view, which are of relevance for this work, to guarantee a common market have always been a matter of connectivity between Member States. The mission has been to identify and to eliminate missing links and bottlenecks that hinder connections within the Union.

In the Maastricht Treaty in 1992 formally appeared the Trans-European Transport Network, which is a huge plan of investment funded both publically by the EU and the Member States and privately and that still must be improved and completed until the end of 2023.

Since its born, the Ten-T has had the objective of reducing transport costs and so costs of production with the purpose of a major competitiveness of EU productions. This goal is still central, but it has been also flanked by the aim of achieving energy and environmental sustainability. Looking at Figure 2.5, it is easy to understand strategic sectors preferred by the European Union to achieve the goals above mentioned. Rail transports sector will be the most privileged, since seen as perfect to suit the need of a "modal split" able to guarantee efficiency for a sustainable transport demand.

Figure 2.5 – Distribution of EU Ten-T funds by transport mode



Source: P. Costa, H. Haralambides, R. Roson, "From Trans-European (Ten-T) to Trans-Global (Twn T) Transport Infrastructure Network. A Conceptual Framework", A European Public Investment Outlook, 2020

Since its first disclosure, the Ten-T project evolved in order to include changes in nodes and links becoming or outdated and useless or highly-demanded. Anyway, in the actual outlook there have been little account for the exponential growth of Asia and the consequently high volumes of trade coming from East.

There are two deadlines which depends on the importance of the project considered: main projects (i.e. core networks, *see below*) must be ready by 2030 while

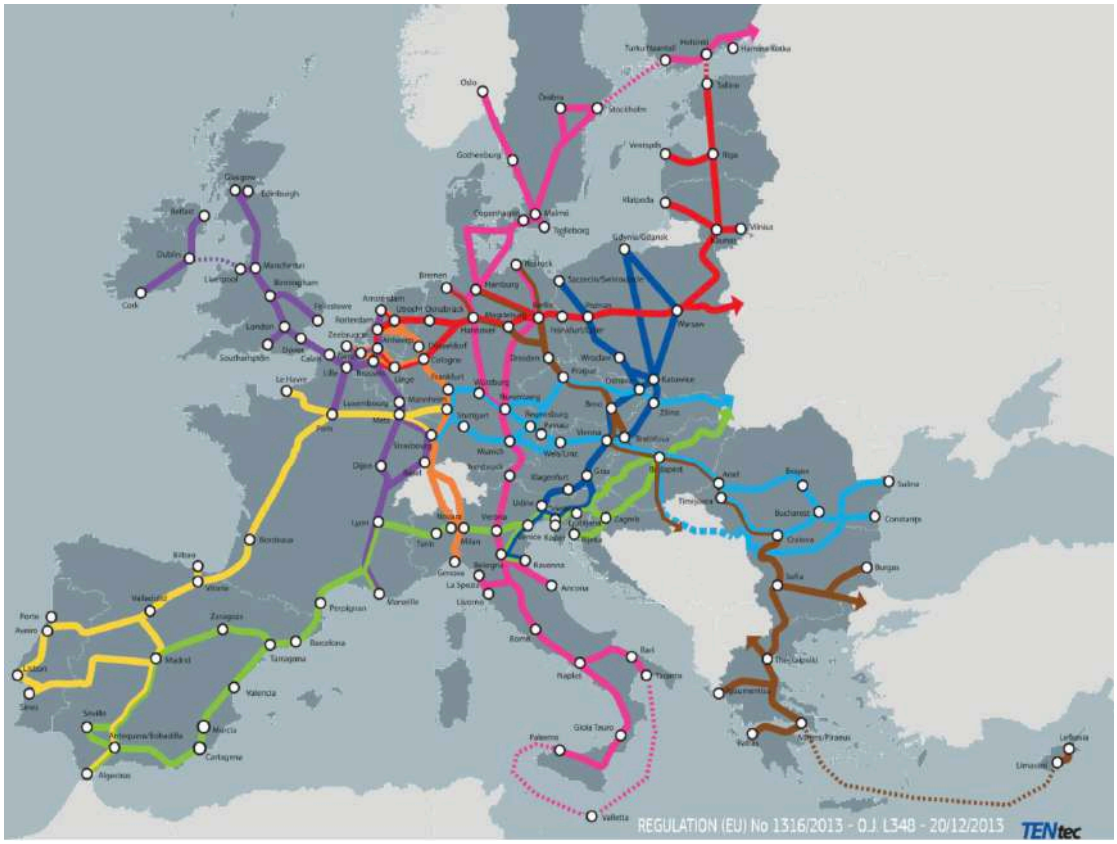
The Ten-T has a double layer structure, composed by nine core networks and the comprehensive network formed by the peripheral areas. The former aims to link strategic urban nodes with each other and with ports, airports and rail-road terminals while the latter wants to connect all the other European strategic and productive centres.

In a context where emerging economies and generally globalization play an increasing role, ports and airports must be enhanced to be ready for major traffics and they should be have priority in projects because infrastructures have a take time to be developed. Ten-T considers both aspects and it have comprehended at least ports in the core networks.

Anyway, there is still the need to make adjustments to the actual outcome of the

European initiative. The matter at the basis of the actual Ten-T revised in 2013 is that it still looks inside the boundaries of the EU and it demonstrates a lazy behave on adapting to the future flows of trade. This can be an issue because to ensure a minimum cost path, Ten-T must now look widely to the global level to guarantee minimum costs paths and to avoid a rapid obsolescence of designed framework.

Figure 2.6 – Ten-T core corridors as revised in 2013



Source: European Commission

The reference is clearly to the increasing importance of Asian countries, which are vital for European trade, and to the need of rebalancing the actual ports scenario with increasing importance that must be given to the Mediterranean and Adriatic sides which need to be linked properly to European relevant markets. Moreover, implementing these areas with adequate infrastructures will give almost certain future pay-offs since the great arise of nations like Turkey and more generally the African region.

With respect to ports, they would probably deserve more attention since they are crucial gateways. As highlighted previously, most of the European ports need modernizations to be able to compete at a global level. Ten-T policy seems blind when looking at the ports side and unable to recognize the need of a transition to achieve a minimum cost path in the main European-trade concerns and if the policy would not be revised, the geography of European ports will probably remain unvaried due also to the fact that historical ports are able to attract traffics thanks to their quantitative and qualitative services. Without a tough and decisive external intervention, ports scenario will be unprepared for future developments as well as still inefficient like previously demonstrated.

It is clear that in this framework NAPA ports could play an important role, since its strategic position and its demonstrated efficiency to be a perfect suitable door for traffics coming from Suez. H. Haralambides[16] points out the need of adequate nautical accessibility, spaces in land for storages and sustainable connections to guarantee bright future to European ports handling mega ships in the next decades. Sea and land infrastructures are the missing factors in the actual North Adriatic arch scenario, but Ten-T could be the perfect game-changing factor if exploited properly. Moreover, due to the increasing importance of the Mediterranean areas and intra-Suez trades NAPA ports could almost certainly avoid problems pointed out by Haralambides[17] and becoming doors for the eastern and central Europe markets.

From an infrastructural point of view, another great help could be represented by the investments programmed by the Belt and Road Initiative.

If the Ten-T promoted by the European Union can be seen as a regional project, the firstly named One Belt One Road initiative has a wider scope and it recalls back the

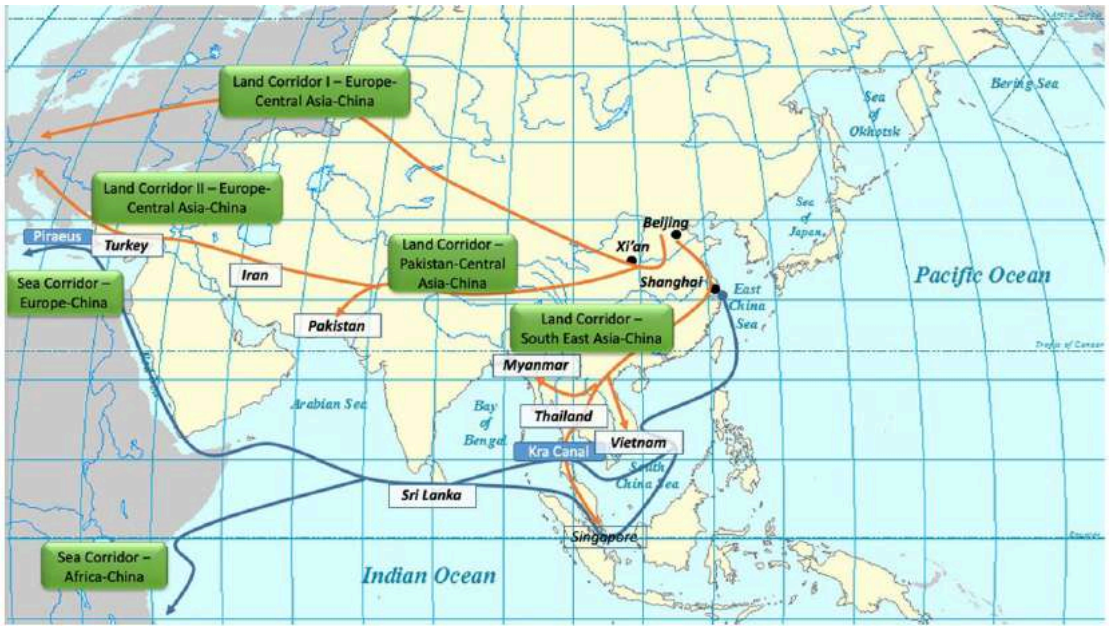
[16] P. Costa, H. Haralambides, R. Roson, "From Trans-European (Ten-T) to Trans-Global (Twn-T) Transport Infrastructure Network. A Conceptual Framework", A European Public Investment Outlook, 2020

[17] The scholar highlights also the risk of port overcapacity and/or under-usage of land infrastructures if a port is not able to handle sufficient traffics.

Silk Road which connected China to its world major partners. BRI is a program of the Chinese government which wants to enlarge economic integration of China through a vast program of connectivity. Of course, the main recipients are Chinese companies which can exploit this augmented connectivity to achieve competitive advantages and it is important to underline the centrality of Europe for this scope. A strength but also a threat of this initiative is the lack of a proper project. President Xi defined ideal Countries to be included and become partners but the fact is that BRI depends on bilateral – rarely multilateral – agreements between a Country and Chinese institutions. This could be seen as a strength due to the chances that every State could have, but the lack of an institution acting as one such as the European Union could easily lead to lost bargaining power and so to accept unfavourable conditions of development.

From a more technical perspective, Europe is interested by BRI mainly from two land corridors and a maritime route. Figure 2.7 denote the former in orange and the latter in blue.

Fig. 2.7 – Belt and Road corridors



Source: Effects of BRI strategy on Mediterranean shipping, Ferrari and Tei, Journal of Shipping and Trade, 2020

The first land corridor serves as a connection between the main production clusters in China and West European countries and it is important because it enables fluent trade flows. The second corridor is under development and will interest countries like Iran and Turkey and will be a strategic connection for China with Central Asian countries and then with Europe.

The maritime corridor is probably the more strategic one, since it will allow China to increase trade flows with Europe by leveraging on strategic investments that have already be incurred by the Chinese government. The greatest example is represented by the Piraeus port, which has been bought by COSCO before the development of the BRI strategy and that allow a strategic hub for all the containers coming from East.

Even if it is possible to identify corridors, BRI is an initiative which has not fixed locations but only strategic nodes which must be ready enough to exploit opportunities. In this sense, BRI should be seen as a chance for the North Adriatic ports. A clearer view of how important are ports forming a hub will be given by the Liner Shipping Connectivity Index. The LSCI is calculated by UNCTAD and it indicates how well a country is connected to global shipping networks. There are five elements considered, which are the number of ships, country's container capacity, maximum vessel size, number of services and number of companies that enter country's ports. These elements enable to understand that the aim of LSCI is to give an overview of the integration of a nation in the global liner shipping networks, by considering a country's ports, roads and rails as key points of access for trade. In particular, ports have their own index called Port Liner Index which aims to depict the connections of a port in respect to its maritime services and hinterland interconnections. To give an idea of benefits coming from Chinese investments, after the acquisition of Piraeus port by COSCO the connectivity of the Greek port has increased of about the 50% in just five years becoming the highest rated hub in the Mediterranean area.

Favorable environmental regulations

The emissions savings that have been previously discussed are probably one of the main strength to be leveraged by NAPA ports. Environmental concerns gained increasing attention especially in the last two decades and people are more and more aware of the importance of sustainable ways of transport. From trade point of view there are at least two main new regulations that have been planned and designed by different Regulators in the last years. As one could expect, environmental strategies and actions have been developed by European Union which lead directly to regulations. Also at the international level there are provisions which have been enforced and especially the more recent ones can highly-impact trade flows.

Maritime trade has now the bound of respect different regulation constrains, especially in terms of emissions, and what follow is a briefly analysis of the two that have and will have an important impact on the actual scenario.

IMO 2020

The International Maritime Organization is a specialized agency of the United Nations which aims to guarantee safety and security in the shipping sector and to limit marine atmospheric pollution. To do so, IMO provides a regulatory framework in shipping industry which is universally adopted and implemented and it covers all aspects of international shipping.

It must be said that IMO efforts on environmental have a long history, since the Marine Environment Protection Committee implementing rules on marine pollution occurred in 1973 and have been effective since 1983. As part of the MEPC there was the Annex VI whom starting role was addressing air pollution from shipping and it took effect in May 2005 and then revised in 2008 including requirements on reduction of marine fuel maximum sulphur content. To be more effective, IMO identifies Emission Control Area (ECAs) in which the resolutions are more stringent and immediately in force due to the high ship traffic characterizing these zones. The 2008 revision required a review and decision until 2018 on whether to implement the marine fuel sulphur content

reduction outside ECAs. This decision has been publicly revealed on October 27, 2016 and imposed to all the maritime routes to adapt to the Revised Annex VI. The regulations have been effective since January 1, 2020 and this is why the Revised Annex VI is best known as IMO2020. The aim is a reduction of about the 77% of the sulphur emissions deriving from ships, with a direct advantage on air pollution estimated in 68% at a global level.

The statement imposes that all ships must reduce sulphur emissions by the 85% in order to prevent public safety and environment. Moreover, vessels must use fuels with a maximum 0.5% of sulphur outside ECAs, an enormous step forward in respect to the previous 3.5%, and 0.1% in ECAs. To adapt to this constrain marine carriers should install on ships scrubbers[18] to clean their emissions, use the so-called LNG (Liquid Natural Gas) or using fuels with reduced content of sulphur, namely MGO (Marine Gas Oil) and VLSF (Very Low Sulphur Fuel).

Failure to comply with the IMO2020 have many implications including fines, vessels seizure and in some cases, even imprisonments.

Consequences are many and affecting almost all the players in the game. On the merely ships' adaptation, installing scrubbers is costly, time-demanding and requires space for their storage inside the vessel while switching to LNG means equip a ship with a different ship engine, devoting storage spaces in the ship and to train staff. So, it seems that ships owners prefer to adopt the alternative fuel strategy which leads directly to the demand of VLSF and MGO that must be supplied by ports. But ports are profit and market share oriented, so it is likely to be that marine carriers will spend more money in fuelling their fleet.

Anyway, for the purpose of this work it is important to note that the proportion of whichever fuel emission is dependent on the days at sea spent by a vessel, so the proximity is one of the most important key of reading to help the compliant of such an important provision. And it is precisely where NAPA ports could have a leading role

[18] Scrubbers clean exhaust gas and are technically called Exhaust Gas Cleaning System

for the Far East – Europe trade, simply because reaching ports of Hamburg or Rotterdam from Shanghai implicates about 11.000 nautical miles, while between NAPA ports and Shanghai there approximatively 8.600 nautical miles. This implies that reaching Europe via the Adriatic Sea requires almost eight days less than the Northern Range. Moreover, Libardo and Fornasiero[19] have calculated that a TEU coming from China and reaching Munich would produce approximatively 135 kg less CO_2 emissions coming from the Adriatic in respect to arrive from the North Sea.

European Green Deal

The European Green Deal is a set of rules and actions taken by the European Union for making its economy sustainable. The goals are of many but they can be resume in elimination of greenhouse gases emissions by 2050, decoupling resource use in pursuing economic growth and do it at the wider range possible and the European Union wants to achieve these goals through a new growth strategy. To reach its goals, European Union will invest in environmentally-friendly technologies, support industry innovation, guarantee cleaner private and public transports, decarbonise energy sector and improve stringent environmental standards at all levels. Moreover, this transition will be helped by financial and technical assistance with the so-called Just Transition Mechanism.

Of course, fields of application are many and the one that interests this work is the one denominated by the EU Commission Sustainable Mobility. Transport sector accounts for almost a quarter of the Union's greenhouse gas emissions and the Green Deal aims at a reduction of 90% that have to be achieved by 2050. Of the total amount of pollution coming from transport, more than 70% derives from road transport, waterborne transport accounts for 13.5% and railways only for 0.5% and due to this share of the total Green Deal pursue its goals looking at a freight mobility based on rail and/or water. The procedures to pursue objectives in all fields will each be composed by strategical plans followed by concrete decisions, which will be of legislative nature

[19] A. Cappelli, A. Libardo, E. Fornasiero, L'Impatto Del Trasporto Intercontinentale Di Merci: Modelli per la misura degli effetti delle scelte, University IUAV of Venice, 2011

and will comprehend both directives and regulations. Measures that are now discussed are the European Climate Law, the base on which built up all the other legislative provisions, and the Just Transition Mechanism that will provide financial assistance and have been already allocated for 100€ billion over the period 2021-2027.

Also in this case, Europe should look at the impressive amount of emissions savings that the North Adriatic could guarantee. It has been demonstrated [20] that one million of TEU more than nowadays transiting from the NAPA ports in one year will worth 125.000 CO_2 tons per year of savings.

It appears clear that NAPA ports can play a very important role in all the contexts described above. Investments in this Area for scenario-changing infrastructures would guarantee not only the minimum time and costs for reaching Europe from the Far East, but it would also mean pursuing environmental efficiency, which is not only a goal but also a constrain coming directly from institutions and that will produce positive outcomes for society.

Evidence is that the North Adriatic Sea is the faster and greener way to reach Europe for containers coming from the Far East. Since none of the NAPA ports can accommodate big-sizes ships, there is the need to understand if and how a breakthrough of the European maritime trade scenario is possible.

Chapter 3 of the thesis will discuss the off-shore port of call in Venice, focusing on technical aspects and implications of such an important infrastructure which have the aim of serving the NAPA ports. Since this project has not been developed yet, the work will also take into consideration other alternatives that have arisen in more recent times.

[20] P. Costa, Politiche per ridurre le inefficienze e aumentare la sostenibilità da Green Deal europeo della portualità e della logistica italiane, Porti e Catene Logistiche, March 2020

3

Chapter 2 highlighted the geographical advantage of the North Adriatic ports. They represent the closest gateways for vessels coming from the Far East and they are able to guarantee a save in terms of both transit-time and gas emissions. This geographical advantage can be transformed in economic advantage if these ports would be able to gain traffics and to subtract market shares from the Northern Range ports.

The work has widely demonstrated how coopetition between ports could boost attractiveness. For NAPA ports one of the main strongpoint is their proximity: for instance, the port of Ravenna is just 200 kilometres far from the Rijeka's port as the crow flies. Each of the five NAPA ports already serves many hinterland areas fairly efficiently. Ravenna and Venice can give access to Centre Italy, Switzerland, Austria, Germany and Slovakia; from Venice, Trieste and Koper there are accesses to Croatia, Hungary, Serbia, Bosnia and Herzegovina. The five ports are therefore windows to established European markets but also to the emerging East European economies, if vessels dock in almost two sides of the North Adriatic arch.

The work has already highlight the predominance of the Northern Range. It arises for many reasons, but it must be said that probably the most important is the absence of alternatives. Shipping companies can count on infrastructures, services and hinterland connections that are not available elsewhere in Europe. Chapter 3 aims to understand what is needed by North Adriatic ports to become game-changer in the European scenario and transform their geographic advantage also in economic and advantages for the whole European Union.

Coopetition as fundamental condition to gain traffics

The fundamental idea of the thesis is to demonstrate how the North Adriatic Sea must be the new gateway for Europe. This is not just a matter of efficiency in terms of logistic connectivity, but must be also a cardinal turning point to support environmental policies acting as future savers from increasing pollution coming from

trade. To achieve these objectives, none of the five ports of the North Adriatic arch on its own could be able to subtract enough traffics from the Norther Range. Therefore, the key point to allow a revolution in the European containerized trade is the coopetition between the NAPA ports.

As previously saw, the North Adriatic Ports Authority was founded in 2010. The aim of the Association is to protect the actual traffics for all the ports of the three European countries and to guarantee a common strategy of development to achieve sustainable growth goals. Behind the choice of the constitution there is the need to act as one unique Authority, able to gain reliability at the European and Global level based on the clear opportunities that the Five can guarantee. Moreover, back in the days of the agreement was clear to all the single Port Authorities that the success of a single port would be a success for the entire Association because it would guarantee a step forward in the development of new common opportunities. Therefore, the common thread is coopetition, with Ports collaborating internationally but competing internally.

Until more recent times, none of the NAPA ports has been able to reach great market share in the container traffics for different reasons. Looking at the Western side of the Adriatic sea, the ports find themselves included in the border of the Iron Curtain until 1989 and in the years after developments and growth were curbed by the political environment. The situation changed only in 2004, after their entrance in the European Union. Since the dramatic flood in 1966, Venice has struggled with its canal-dredging. This resulted in limited chances of deepen its seafloor in times when deep sea container vessels started to dominate the trade scenario. All these limitations have increased the attractiveness of the Norther Range ports, which have made investments constantly through times and so adaptation to new market trends have been faster. But the foresight behind a unique Authority is that only working together as a whole can guarantee a chance to subvert the long-period domination of Northern Range ports. To demonstrate the actual imbalance of European containerized trade, will now take into consideration a work made in 2012 by MDS Transmodal Limited[21].

[21] MDS Transmodal Limited, NAPA: Market study on the potential cargo capacity of the North Adriatic ports system in the container sector - Final Report, January 2012

The starting point are NAPA ports' hinterland connections. Looking at each port, Rijeka is able to cover Croatia, Serbia and Bosnia and Herzegovina mainly by road thanks to the direct port connection of the E70 road towards Zagreb and the coastal motorway to Split. Rail connections are guaranteed by the electrified route going to Ljubljana and to Zagreb, city that allows direct rail links to Hungary and Serbia.

Port of Koper is a key gateway able to give connections by road with Slovenia, Croatia and part of Italy and it is an international hub because it has electrified rail services from Divaca capable to link Hungary, Slovakia, Czech Republic, Serbia and southern Germany.

Trieste provides great access by road to North Italian markets with the A4 motorway and to Slovenia with E70 motorway. From the rail point view, Trieste Port Authority has planned investments estimated in 200 million of euro with a project named Trihub which aims to include the stations Cervignano and Villa Opicina to allow better container flows. In this way, Trieste will provide more efficient rail connection towards Austria, Southern Germany, Hungary and Czech Republic. More over, Trieste can count on funds of European Union for the TriesteRailProject and for the CEU (Connecting Europe Facility) project which aims to improve efficiency in ports connections.

Venice dominate the road scenario, providing rapid links to all the Northern Italy with A4 motorway, Southern Germany, Austria and Switzerland. The enlargement of the A4 from two to three lanes allows also a better road connection with all the East European markets. From the rail point of view, there are two electrified routes on to Padua and the other to Verona. The former guarantee an efficient link to the Central Italy while the latter improve links with the North-West side. Moreover, Venice could count on its inland waterway, able to give access to Marghera and Mantua with the Fissero-Tartaro-Canal Bianco which has been positively tested years ago by the Venice Port Authority.

Ravenna covers the national territory, giving links to Italian regions like Marche, Emilia Romagna and Piemonte. The main issue is that the port has not good rail connections and the road links are often congested during peak times and this limit the

great opportunity to reach Bologna where there would be access to the A1 motorway. The port has a double-electrified rail connection with Bologna and Ferrara, the former linking the port with Modena and Milano while the latter gives access to Verona and Veneto region.

The main problem for each port is represented by the depth of seabed. None of the five is able to guarantee access to the big vessels dominating the container trade and this is the main issue that does not allow NAPA ports to compete equally with the Northern Range ports. The deepen seabed can be found in Trieste which can count on 17.4 meters, followed by Rijeka and Koper which have 11.7 meters and 11.4 meters respectively. The Western side of the Adriatic Sea is less has less profound backdrops: port of Ravenna can guarantee 9.6 meters while Venice without dredging has 10.6 meters. The actual biggest container vessels need at least 18 meters of dredging and this highlight the inadequacy of NAPA ports to welcome them.

The study made by MDS Transmodal Limited used an origin-destination (OD) matrix as key input for a demand simulation model, which aims to describe the pattern of containerized trade between Europe and the rest of the world via port groupings. The results consider door-to-door costs of maritime trade flows in light of 31 Millions TEU of containerised traffic, including only containers distributed inland and so excluding transhipment traffic. The allocation resume can be seen in Table 1.

Table 1: Containerized traffic by port grouping.

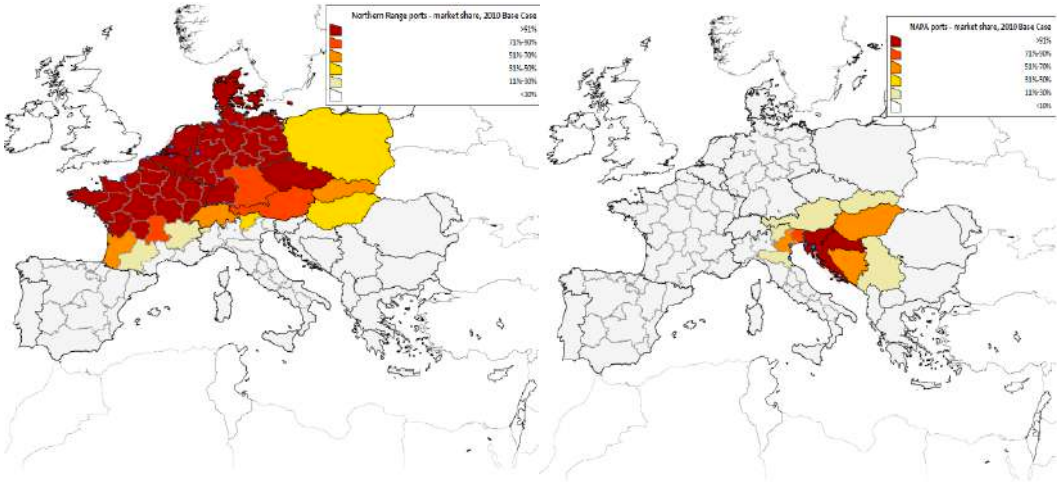
Port grouping	Allocated traffic from model (MTEU)
North Adriatic	1.49
Northern Range	20.4
Tyrrhenian	3.6
Greece	0.8
Black Sea	0.3
West Mediterranean	2.6
Atlantic	1.7
Total	31.0

Source: MDST European Container Market Demand Model

The result is impressive. About the 66% of the total container traffics are managed by the Northern Range ports, while only the 5% going through the NAPA ports. Looking at Figure 3.1 could be even more astonishing. The confrontation between the

hinterland served by the Northern Range and the one served by NAPA demonstrates even more the imbalance of the actual trade flows. The researchers charge the results to the efficiency guaranteed by large container vessels and rail freight services. In time this efficiency has improved in the Norther Range ports giving them the benefits of inertia, caused also by developments deriving from serving North American sea routes.

Figure 3.1 – Confrontation between hinterlands served by Northern Range (left) and Napa ports (right)

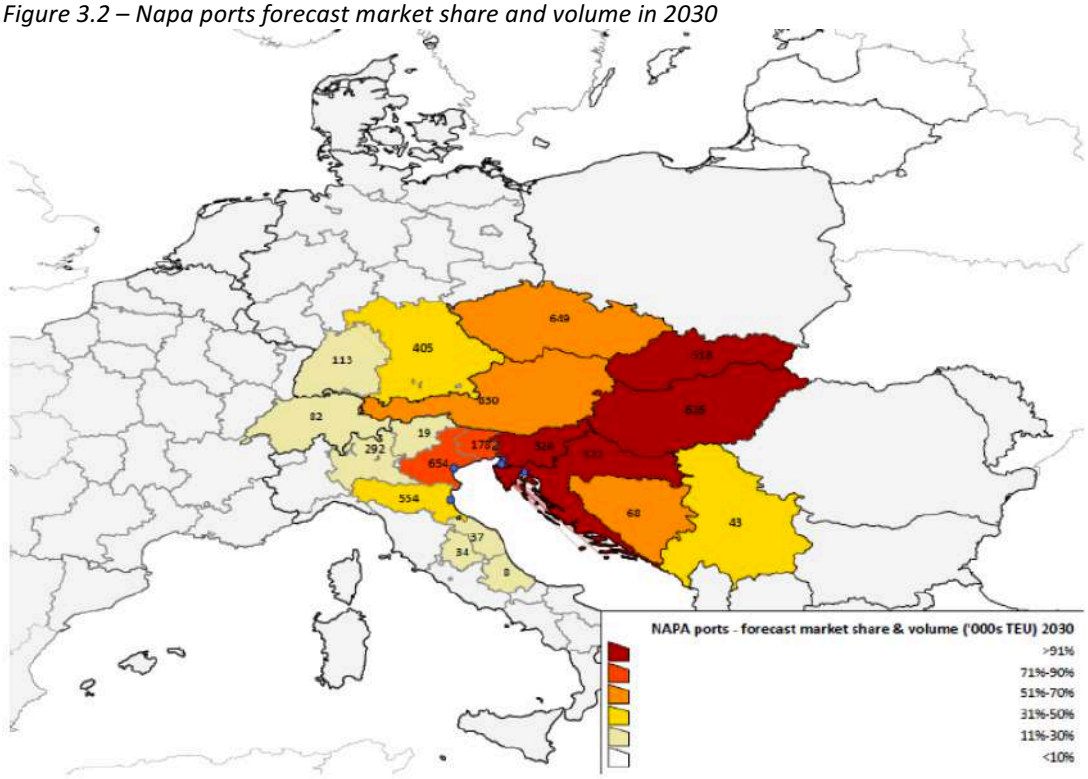


Source: MDST European Container Market Demand Model

Using the same matrix and model, the survey made a forecast up to 2030 to determine the minimum scale activity needed by ports in North Adriatic Sea to rebalance the container trade traffics between North and South Europe. To do so, some assumptions have been made about the economic drivers which have been detected in trends in the oil price, free rail movements for trans-alpine flows, on-going rail freight liberalization, length of freight trains from ports, increasing shipping economies of scale resulting in bigger vessels, internationalization of external costs for global container shipping. The outcomes see as major economic drivers of both demand and attractiveness for Napa ports are the introduction of ships of at least 11.000 TEU from 2030 coupled with efficient rail freight services. In this way, the North Adriatic Sea's ports would lead to growth in their market share. Another result is that in 2030 grouping of ports closer to inland origins and inland destinations will be favored by the internalization of external costs. The overall outcome is that Napa ports would need to gain traffics for a share equal to 11.3% of the total market, tantamount to 6.0

million TEU22, to subvert the Northern Range domination. The forecasted framework for 2030 of the hinterland served efficiently by Napa ports is depicted by Figure 3.2. It appears clear that in twenty years Napa ports would be able to serve efficiently many areas, but the most important surface that would be covered is Germany and its lead-productive markets able to guarantee increasing numbers of traffics.

Figure 3.2 – Napa ports forecast market share and volume in 2030



Source: MDST European Container Market Demand Model

Evidence is that the failure on operating at bigger scales gives less attractiveness to Napa ports, which are now nothing more than isolated hubs in the Far East-Europe maritime scenario. The goal of 6-8 million TEUs is essential to achieve more charm at the eye of shipping companies and to the infrastructural policies put in place by the European Union and at the international level. North Adriatic ports must so organize themselves as one unique force to exploit their opportunities and achieve their growth path. To do so there is also the need to have infrastructures able to attract traffics and boost their strategic position: in this way, geographic position advantage can be

[22] A similar analysis asked by the Slovenian Ministry of Transportation indicates that 8.0 million TEUs are needed.

transformed both in economic advantage thanks to reduction in transit-time and in environmental advantage due to fuel and emissions savings.

VOOPS: Venice Offshore Onshore Port System as main opportunity for coopetition

In the previous paragraph, it has been demonstrated the need for Napa ports to increase traffics to allow to exploit their potential. The increase of traffics would turn in more reliability both from shipping companies' perspective and at the institutional level. Especially the latter, namely European Union, could help to gain an even more predominant position among the other ports if the North Adriatic Sea would be linked to the Baltic-Adriatic, Mediterranean and Scandinavian-Mediterranean core corridors of the Ten-T initiative. The main outcome that all this work tried to underline is that all these goals can be achieved only through coopetition among the five ports, since strengths of one port would turn in strengths of all the system and weaknesses of a Member can be compensated easier by the others or, even better, could lead to investments needed to improve their position.

In this framework is contextualized the Offshore-Onshore project of the Venice Port Authority. This project concerns the realization of a Multi-modal Offshore Terminal located to the wide of Venice, which would like to achieve the double goal of exclude oil-traffics from the Lagoon and to develop the commercial port.

The Multi-modal Offshore Terminal is composed of three main elements, which are the oil-terminal and its ancillary works, the container terminal and the services' platform. The off-shore platform would be located in correspondence of the Mouth of Malamocco about 16 kilometers from the coast, while the onshore commercial terminal should be in Porto Marghera in the Montesyndial area, which faces to the West Industrial Canal and which will be linked to ships' access by the Malamocco-Marghera Canal. The outstanding advantage of this platform is that it would be in a strategic position in the North Adriatic context, since it would distance 55 nautical miles from the Port of Trieste, 18 nautical miles from the Port of Marghera, 12 from the Chioggia's Port and 23.5 nautical miles from Porto Viro Ca' Cappello. Its central

position represents an advantage since it allows to feed traffics to all nearby ports.

Figure 3.3 – Maritime strategic accesses from and to the Offshore platform

Source: Ministro delle Infrastrutture e dei Trasporti-Magistrato alle Acque di Venezia, Terminal Plurimodale Off-shore al largo della costa di Venezia, May 2012

Looking only at the commercial port, civil works required are mainly three: the container dock, the dock for services and tunnels devoted to general services lines.

The container dock will be one kilometer long and 200 meters large. The southern side is destined to ocean vessels' approach and will be equipped with gantry cranes, while the northern side has been developed for barges and so equipped with barge cranes. The platform will be 3 meters over the sea-level and the perimeter will be made of multi-cellular caissons. It will grant enough spaces for transshipment of oceanic vessels, yards for container handlings which allow to reach feeder vessels for other ports and inland distribution.

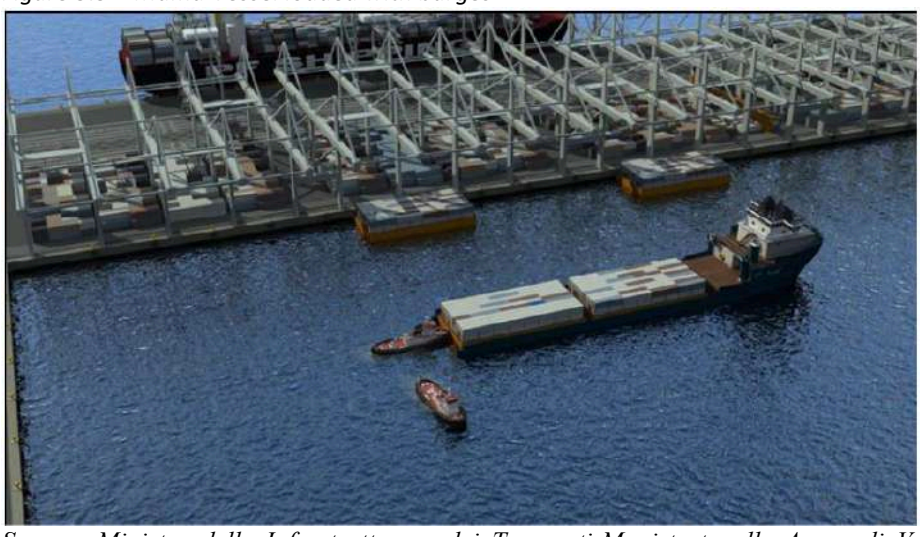
The dock of services is ancillary to the container dock. And likewise composed of multi-cellular caissons. It will be 920 meters long and 120 meters large, posed at 3 meters on the sea-level. On this area all the logistic infrastructures for container traffics will be placed, namely inspections and customs buildings, workrooms and warehouses. Adjacent to the heliport provided for the oil-terminal, there will be the Terminal offices, a canteen and staff accommodation.

Figure 3.4 – Overview of the Offshore Multi-modal Terminal

Source: Ministro delle Infrastrutture e dei Trasporti-Magistrato alle Acque di Venezia, Terminal Plurimodale Off-shore al largo della costa di Venezia, May 2012

Once the containers have reached the Offshore terminal, they will be loaded on barges of 26.5 x 58 meters size which allow to transport 216 TEU. Two barges are then transported on the so-called "Mama Vessel" which allow to transfer 432 TEU per time. This solution has been chosen since it minimized transfer-time between the offshore platform and the inland, but also because Mama Vessels can be loaded with fluvial barges and reach strategic fluvial points from where fluvial barges can be unloaded and leaved for their trip through canals.

Figure 3.5 – Mama Vessel loaded with barges



Source: Ministro delle Infrastrutture e dei Trasporti-Magistrato alle Acque di Venezia, Terminal Plurimodale Off-shore al largo della costa di Venezia, May 2012

The On-shore terminal will be located in the Montesyndial area and it will be dedicated to the 80.000 TEU containers handling that the Off-shore terminal can guarantee.

The Montesyndial area covers 82 hectares and on the its northern side opens on the Industrial Canal which has 12 meters of draught and it guarantee direct nautical access to the sea. This area is already well equipped for the container handling and it can also ensure links with nodes of both roads and rails. Since the great width of the area, the project provides docks and equipment able to welcome and handling containers loaded in big size vessels coming directly and the Mama Vessels coming from the Off-shore. The On-shore terminal would also have a dedicated area for containers inspection and a double track rail-park to serve the terminal.

Looking at hinterland links, they can be resume in three main steps. The first step is composed by all the port areas covered by the Off-shore platform, which allow great connections with crucial logistic areas of Verona, Padua, Bologna and Cervignano. From each of these places it is guaranteed reliable connections with the third-step-hinterland that have been identified as in different consolidation hubs composed of the Italian, Austrian, German, Swiss territories but also the Eastern Europe from Trieste or Koper.

The objective of the paragraph is not the mere description of the technical functioning of the platform, rather the benefits that such infrastructure can lead to trades at European, Italian and Regional level. To do so, it is important to highlight that the aims are many and each of them would lead to positive outcomes for all the players involved.

From the European point of view, there is the need to rebalance maritime traffics to guarantee a more efficient trade with the Far East. As widely demonstrated by the thesis, the actual European port scenario does not guarantee efficiency in the maritime traffics both in terms of transit-time and emissions. A cooperation in the North Adriatic Sea would place at the European disposal an infrastructure able to assure efficient and safely maritime trade but also a clever utilization of all the other rail and road routes that the Ten-T initiative have planned.

At the Italian level, there are even more benefits. First, the offshore-onshore platform would guarantee a modern infrastructure with a high level of innovation that would help to catch up the delay in development that Italy has accumulated in time and that allow to compete at the international level. Moreover, the Italian internal trade is imbalanced because it is alimented mainly by Northern Range ports and by Tyrrhenian ports; this lead to a logistical tax paid by all the productivity system but mostly in the areas of Lombardy, Venetian and Trentino Alto Adige. This logistical tax can be avoid using Verona and Padua as logistical base for the traffics coming from the Far East. Another positive outcome is to assure increasing revenues deriving from custom duties that will be paid in the Italian area and not in Holland. Another benefit can be seen in the exploitation of the fluvial potential of the Po river through the ports of Levante, Rovigo and Mantua, which have been involved also in the Ten-T's Mediterranean essential corridor. This will allow the industrial productivity systems between Lombardy and Venetian Regions to be alimented through fluvial routes, making them the only South European regions to be reached in this way.

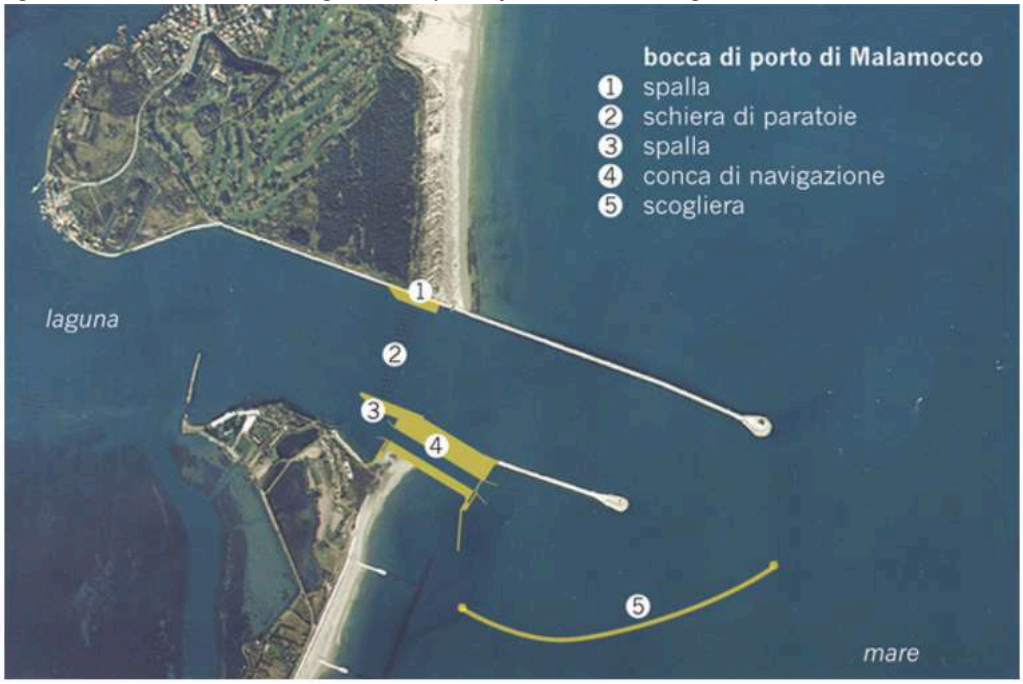
At the North Adriatic level, the platform will guarantee to exploit its geographical advantage and being the point of reference for the maritime trade between the Far East and the major productions areas in Europe, such as Germany and Northern Italy. The offshore-onshore infrastructures allow Napa ports to reach the goal of the 6-8 million TEUs that allow to subvert the actual European ports scenario.

The offshore platform could be important for the city of Venice. The basic idea behind this project is that the city has a historically problem related to the dredging of its key points of access for the commercial port[23]. As said, the development of the commercial port has been braked in time due to the limit of environmental sustainability imposed by the so-called Piano Regolatore Portuale of 1965 which foresees a limit of access to ships with more than twelve meters of dredging. This limit provides protection to hydraulic and morphological equilibrium of the Lagoon. The measure of twelve meters is related to the MoSE's bulkhead which will protect Venice from sea storms and high

[23] The port of Venice has two different sections: the passenger terminal located in the city lagoon -San Basilio and Stazione Marittima – and the commercial port in Marghera. They welcome ships from two different accesses, the forme from the so-called "bocca di Lido" while the latter from "bocca di Malamocco".

water phenomenon.

Figure 3.3 – Malamocco dock gate and spaces for MoSE's sluice gates



Source: www.mosevenezia.eu

The offshore platform will end the trade-off between City protection and full commercial port exploitation since it will allow full accessibility to ships with a hull deeper than twelve meters, allowing a combined safeguard and economic revitalization of Venice. In a nutshell, as soon as weather conditions will require the lifting up MoSE's sluice gates the vessels with more than twelve meters draft will be discharged in the offshore platform and the onshore terminal can still be alimented through the navigation lock aside the Malamocco dock gate through which can go ships with less than twelve meters draft.

The most important aspect is that all ports would rely on an infrastructure able to guarantee stocks of traffics and not only flows. This is the key point to understand why there is the need of a cooperation between Napa ports, mainly because acting as one and not investing would turn in losing attractiveness and reliability in the global maritime trade scenario in a very little time.

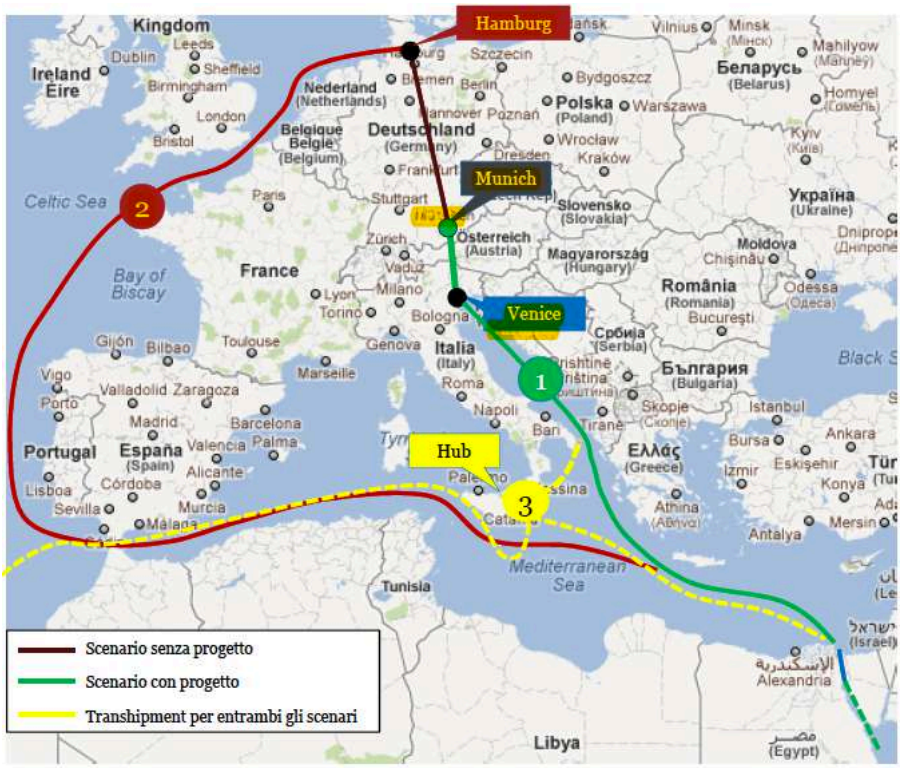
Along this line must be read the cost-benefit analysis made in 2015[24]. It highlights two different scenarios for the North Adriatic ports screened at 2023, 2030 and 2045, namely with and without the Offshore platform. The costs-benefits analysis has been wrote on the basis of the guide lines emanated by the European Commission in 2014 and it represents the tool eligible to understand what are the outcomes for both investors and collectivity. The inputs take into consideration are all macro-economic variable, which take into consideration the actual and future level of traffics:

- investments costs; such as infrastructures, installations and so on.
- internal transport costs; maritime, road and rail.
- External costs; representing emissions, accidents, traffics congestion, noises and so on.

The outputs are economic indicators that allow public Institutions to understand feasibility and benefits of the investment. The difference between benefits and costs has been evaluated for the two scenarios, with and without the Offshore platform. The project is so evaluated on net terms as difference between increments of the two scenarios. Figure 3.4 shows a map of the traffics scenarios assumed for the analysis. The green line explains the scenario with the project, for which the hypothesis is of three direct calls in North Adriatic Sea and an efficient rail route between Venice and Germany. The red line depicts the scenario without the project. With the Offshore platform, the markets considered are the Italian and European, while without the project the market of reference is mainly the national one and the European markets are served through the Northern Range and North Tyrrhenian ports. The yellow represents the transshipment function that would stand in both scenarios.

[24] PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici – Report finale, August 2015

Figure 3.4 – Traffics scenarios considered in the costs-benefits analysis



Source: PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici - Report finale, August 2015

Table 2 underline the results of the analysis, showing the distribution of traffics for both scenarios.

Table 2 – Cost-benefits analysis with the platform (left) and without the infrastructure (right)

Traffics ('000 TEU)	2023	2030	2045
Montesyndial	419	537	5.77
Offshore	1.353	1.348	1.355
Other Venice container terminal	322	117	115
Total	2.094	2.002	2.007

Traffics ('000 TEU)	2023	2030	2045
Venice Onshore	445	376	497
Northern Range	915	403	271
North Adriatic	308	137	136
North Tyrrenian	402	963	990
Black Sea	24	124	113
Total	2.094	2.002	2.007

Source: PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici - Report finale, August 2015

As can be easily noted, the infrastructure can attract potential maritime traffics which would otherwise be attracted by Northern Range or North Tyrrhenian ports. Of course, this analysis should be up-to-dated with the five years that have been already lost but back in 2015 forecasts for 2030 showed that with the Offshore platform the amount of traffic drawn would be equal to 2.00 million TEU while without only 0.37 would transit through the North Adriatic Sea. The difference is equal to 1.63 million TEU, which is equal to a reduction of 4.16 million TEU*km on the rail routes and a decrease on maritime routes equal to 15.724 Tons*km. Figure 3.5 shows the origin/destination of the additional traffic, which would have come mainly from and to Central and Eastern Europe.

Figure 3.5 – Origin/destination of traffic gained by the Offshore platform

Source: PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici - Report finale, August 2015

The costs-benefits analysis considered also the negative externalities for society coming from the Offshore platform, such as pollutant emissions, greenhouse gasses and bottlenecks. This impacts can be transformed in economic values in order to understand the impact of investments on population. To do so, authors used the Handbook on External Cost of Transport published by DG Movenel on January 2014 which allows to highlights the advantages and disadvantages on maritime, ports and road and rail scenarios. Confronting the presence of the platform with its absence, on the navigation side people would increase their wellness thanks to a reduction in kilometers and days in the sea paths by ships. The port di per se would increase emissions for the nearby population, but the overall savings on emissions are incredible when also rail and road impacts are considered. Table 3 considered the impacts of the different ways of transportation obtain as suggested by the Handbook previously mentioned. The Table shows that positive outcomes for society would have been exploited immediately and that they would be continuous in time.

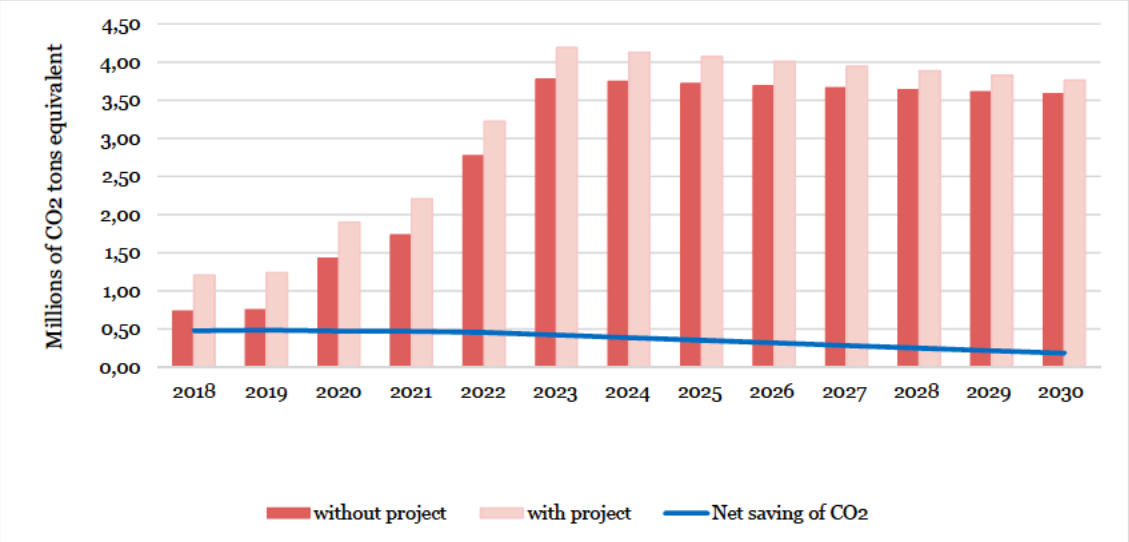
Table 3 – External costs with and without the Offshore platform

External costs ('000€)	Type of cost	2023	2030	2045
With Platform	*Congestions*	(9.146)	(7.145)	(8.861)
	Accidents	(611)	(440)	(605)
	Emissions	(427.452)	(403.775)	(404.120)
	Greenhouses gasses	(339.367)	(322.373)	(323.550)
	Noise	(704)	(472)	(417)
	Total	**(777.280)**	**(734.206)**	**(737.553)**
Without Platform	*Congestions*	(20.427)	(6.994)	(7.271)
	Accidents	(1.510)	(383)	(419)
	Emissions	(471.158)	(425.185)	(430.522)
	Greenhouses gasses	(377.073)	(338.568)	(343.466)
	Noise	(715)	(598)	(561)
	Total	**(870.883)**	**(771.746)**	**(782.240)**
Difference Between Two scenarios	*Congestions*	11.281	(151)	(1.589)
	Accidents	899	(57)	(185)
	Emissions	43.706	21.410	26.402
	Greenhouses gasses	37.706	16.213	19.915
	Noise	11	127	144144
	Total	**93.603**	**37.540**	**44.687**

Source: PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici - Report finale, August 2015

Major benefits come from the reduction of the maritime routes. The following graph shows the environmental savings expressed in tons of CO_2 in the two scenarios considered. The net saving is denoted in blue and is obtained as difference from the two total emissions.

Figure 3.6 – CO_2 emissions savings in the two scenarios considered



Source: PWC – MDS Transmodal – Venice Port Authority, Venice Offshore Onshore Terminal – Analisi costi benefici - Report finale, August 2015

Another great outcome highlighted by the analysis are the government transfers. To sum up the results in a time framework between 2018 and 2055, ports charges will guarantee about 110€ million, anchor duties about 76€ million and most of all the Offshore platform could guarantee revenues from VAT of about 720€ million.

Despite the positive judgment received from the Ministry of Environment, the Offshore-Onshore project has been frozen, especially due to the change of presidency in the Venice Port Authority.

The basic idea behind all the proposal is a revolution in the European traffics. And revolutions need determination, hard work and high costs. Moreover, back at the time when the project has been developed not all the single Port Authorities were well inclined to such a change. It is sufficient to look at newspapers, articles, letters and other testimony to understand that probably the main issue was the parochialism and the pride of each single port that did not allow to pursue a common goal. Sadly, negative and higher consequences are paid by society which would have had benefits from a new way of maritime trade.

In the years after, other minor projects have been put on the table. The next paragraph will show two proposal and describe if and how they could change the European maritime trade pattern.

Alternative to the offshore port

Formally, the VOOPS has been set aside by the Ministry of Infrastructures. The Italian government perspective on the North Adriatic has changed and this has actually slowed down the Offshore Onshore project. The decision behind this choice is to leave all the actual and potential maritime traffics for the North Adriatic Ports going through only Trieste. This decision has been proven with the choice of excluding Venice from the Chinese agreements for ports development in the Belt and Road Initiative perspective, allowing investments only for Genoa and Trieste. Anyway, looking at the North Adriatic Ports the thesis demonstrated previously the limited capacity of Trieste in welcome the still increasing size vessels and that the port have limited hinterland links to exploit in the European scenario. Therefore, Venice and an offshore platform are still needed to support the Italian and European maritime trade.

Studies for a Venice's commercial port have then followed different paths. Until now, little has been done but many projects have arisen, both from the Port Authority and from the private sector. In this paragraph, the thesis will take into consideration the main alternatives that are now being evaluated.

In October 2020, a new project for the development of the commercial port has been presented by the actual Extraordinary Commissioner of the Venice Port Authority. Even if the Ministry of Transport set aside the development of the offshore platform, it seems that a "mini-offshore" have been discussed in these recent days. Another key point is that Venice Port Authority have got back in touch with Chinese investors, in this case the CCCC, which would help the development of the high-depths dock. Moreover, as would have been for the VOOPS, the actual project of the commercial port will have a new hub in the Montesyndial area, in which there will be a about 1.700m quay with direct connections to the existing rails and road systems.

The Montesyndial land reclamation should allow Venetian companies to operate in the close proximity of the port, without the need to move their goods from the production points. The intention is to avoid the cost of the so-called last-mile and so to allow companies to increase their added value thanks to logistical cost savings.

Theoretically, this should bring the same benefits of the elimination of the logistical tax that have been described in the previous paragraph. Moreover, all this will be better exploit if Venice would be declared Special Economic Zone, as it seems by recent statements of the Ministry of Infrastructure.

The need of an offshore platform to support the Venice Port activity has been seen also by private investors. In the past years, a group of privates have proposed a reviewed Offshore project, called VGate.

The VGate project is a Deep-Sea Terminal which provides for a realization of an artificial island able to welcome mega-size vessels and to handle containers. Differently from the VOOPS, the platform should be located in Chioggia.

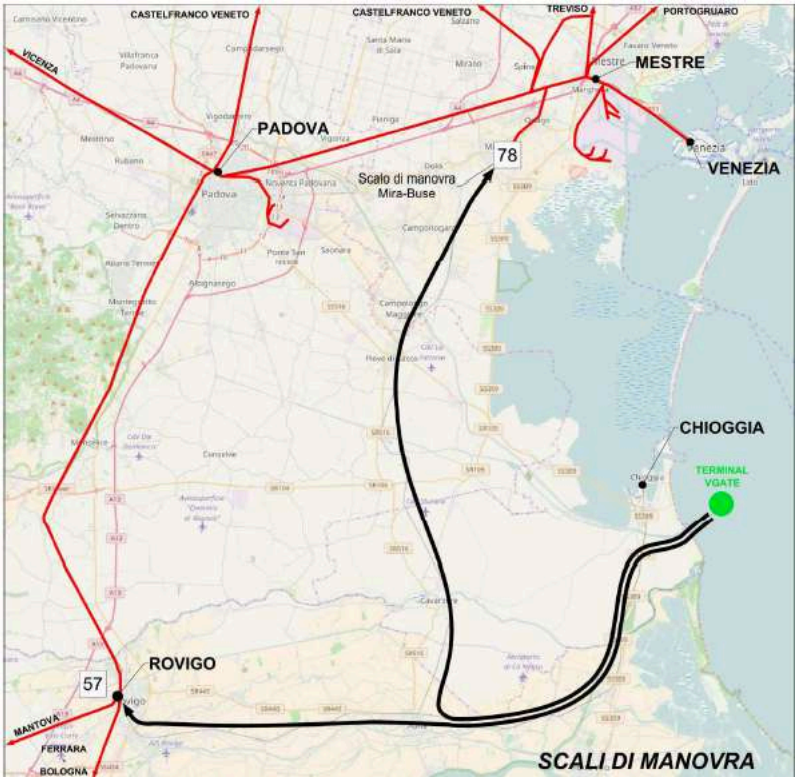
Figure 3.7 –Vgate Deep-Sea Terminal render

Source: VGate Venice Gateway, Scheda Progetto terminal plurimodale d'altura

The Deep-Sea Terminal will be linked to the mainland through a railway which will directly lead to the Rovigo-Chioggia rail system and to the SS E55 Romea highway. As it has been clearly stated in the project presentation, the VGate terminal aims at intercept container traffics that now head to Trieste. This allows to understand how the idea of a cooperation between Napa ports has been deleted and transformed in a competition of traffic flows. Even if the direct-rail connection with the mainland has be presented as a strengthen, without interventions on the rail and road infrastructures the VGate will still represent a bottleneck for the European traffics. The actual infrastructures are already overloaded with the actual amount of traffics and it can be

easily assert that the situation can only be worst with an increase in traffics. Especially the SS E55 Romea highroad is sadly known for its truck queues and a new infrastructure aiming at increasing maritime and consequently road traffics will surely lead to inefficiencies of the system and negative externalities for the population.

Figure 3.8 – Overview of VGate's rail and road connections



Source: Studio P4, TPAV-C Terminal Plurimodale d'Altura VGATE – Relazione tecnica, 2018

The terminal has been designed to accommodate up to 2 million TEU and provides also for the realization of a breakwater at 3,84 kilometers to the wide. As for the Offshore port, the dam would protect the platform and allow it to operate in every weather conditions, especially when the MoSE is operating. Its construction has been thought to be developed in three steps, each of them allowing to expand progressively traffics.

The alternatives take only in consideration the enhancement of the actual markets served by the Venice port, trying to guarantee a better accessibility to the maritime trade and its consolidated dynamics.

A revolution in the European maritime trade can be guarantee only through an ensemble work between the North Adriatic ports. The actual Venice Port Authority's project is designed to maintain traffics, while VGate project aims eventually to cooperate with Trieste.

Evidence is that investments focusing only to local markets have not a long-period life guarantee. Looking at the logistic market dynamics, Northern Range ports attract increasingly amount of traffics in time, subtracting them little by little to the other competitors. Without investments oriented to acquire market share in the containers trade, the best case-scenario will see the Italian ports as hubs in the Far East – North Europe route in the long run. Moreover, the ongoing growth in ships size and the need to low carbon emissions will cause a reduction in intermediate port calls. This is already happening and example are numerous: Venice lost direct calls from the Far East at the end of 2019, while a couple of months later also Trieste and Genova saw reductions in direct ships calls from the Far East. This proven the fact that there is the need of infrastructures able to attract big stocks of trade, otherwise in the long run the flows that new structures may preserve will be gradually lost in favor of better-equipped ports. As will be highlighted in the next chapter, Covid-19 has emphasized this matter due to the phenomenon known as blank sailing.

4

COVID-19 and maritime trade implications

The Coronavirus pandemic vastly spread its effect to the trade scenario. The starting point has been a shock in the supply side, which generated a downtrend in the global demand. Looking at trade statistics, WTO has made early forecasts for 2020 and 2021. In 2020 trade is supposed to decrease by -9.2%, while in 2021 trade should grow of about 7.2%. As said, these estimations are subject to the trend of pandemic and to Governments interventions. The World Trade Organizations made a comparison between trade decline due to the Covid-19 crises and the one happened in 2008 and 2009, assessing many differences in the economic context. The pandemic has put under pressure many sectors especially on the supply side, which has impacted on production and employment. Anyway, monetary and financial politics supported incomes allowing consumption and imports to grow back as soon as it was possible. In this way, the ratio between the world gross domestic product and world trade should be better. In 2009, volume of world trade decrease six time more than the world gross domestic product, while now it should just double the decrease.

Looking at UNCTAD's data, global trade of goods has lived a decrease equal to 5% in the first quarter of 2020 but at the end of the second quarter it has fallen dramatically reaching -27% which is worse than the contraction registered during the 2009 crisis.

Figure 4.1 – Trade contraction from Covid-19

Source: UNCTAD, Covid-19 and maritime transport: Impact and responses, September 2020

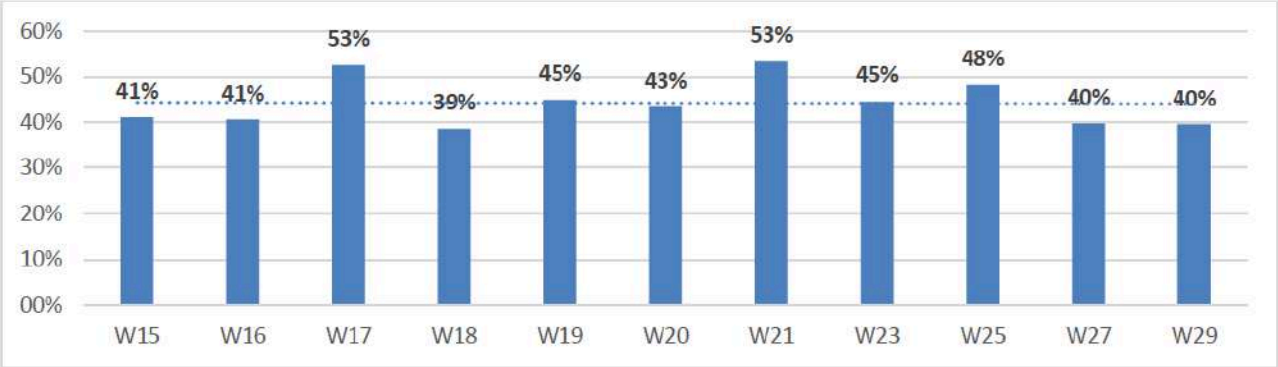
Of course, also maritime trade has been seriously impacted by the pandemic. Since the difference in the time of spread between different world regions, maritime trade has faced also the challenge of guarantee sufficient flows to allow the entire supply and demand chains to survive. To write about the pandemic has been challenging for scholars, since data analysis and statistics are traditionally produced with some delay. To fill this time-gap for maritime trade statistics, the AIS (Automated Identification System) has been used since it provides almost real-time information on maritime transport and trade in motion. AIS looks at ships path to provide early stage trends and to help highlighting short-term changes and then making hypothesis also on a longer run. So, AIS has been used by UNCTAD to understand what has been and is still going on in the maritime trade scenario and the following analysis is based on that.

Effects of Covid-19 on maritime trade has been different at the global level. Considering all kinds of maritime transport, the most affected zones have been Europe and the Mediterranean, with a drop in ship calls of 13.9 per cent in the first quarter of 2020 in respect to the first quarter of 2019. On the other hand, for the same period the Far East experienced minimum declines in respect to 2019 and it is equal to -0.1%. Looking at the number of port calls between EU and China, from Europe to China the decrease in ports call has been important and equal to 51.5% while ships coming from China have reduced calls for an amount equal to 24.6% [25].

Looking only at the container side, it has been influenced by blank sailings, sometimes with just some ports skipped but in other cases entire routes deleted and as consequence in the first half of the year there have been a decline in container ship calls. Figure 4.2 shows the dissemination of the blank sailings globally.

[25] European Maritime Safety Agency, COVID-19 impact on shipping, July 2020

Figure 4.2 – Percentage of ports affected by blank sailings



Source: T. Notteboom – P. A. Athanasios, IAPH-WPSP COVID-19 Port Economic Impact Barometer, 2020

Even if the amount of port calls have diminished in number, the ULCS calling at ports have transported more volumes and in Europe data highlight that ships was charged with an average 10.000 TEUs more than what happened before the pandemic. For ports this was a big issue, since the cascade effects of fuller ships are the creation of peaks in ship-to-ship operations, problems on landside operations and difficulties to efficient hinterland connections. This observation allows to understand that the pandemic have affected port calls which have consequently influenced connectivity. UNCTAD has reported implications for liner shipping connectivity levels of the most important areas, determining also whether this changes could last after the pandemic. For this work, the most important thing to highlight is that during the first two quarters of 2020 carriers has continued to exploit economies of scale derived from increase in ship size. Data demonstrates that the maximum capacity in TEUs increased across all regions, meaning that shipping companies used big ships to transport the maximum quantity allowed. For ports this tendency represented an important challenge, since they have to afford less ships calls but each of them with an increase in quantity loaded averaged at 10% per call worldwide.

To sum-up, Covid-19 ha impacted badly on traded goods. Of course, also maritime trade is living a transition period in which the number of ships calling at ports has reduced in almost all the world areas. The lower amount of port calls can be attributed to the blank sailing phenomenon, which have negative influenced some routes and some ports. Carriers decided to not let all ships start at the time they were supposed to,

preferring to accumulate increasing amount of containers in order to better exploit economies of scale. Moreover, shipping companies are well aware that they have to focus their calls in ports which are able to guarantee efficient services and great hinterland connections, so they started to avoid as much as they can stop in between the point of start and arrival point. Due to this, hub ports are those paying the highest price.

Even in a period of low demand, carriers try to exploit economies of scale through ships sizes. Flow of traffics are ensured to all the ports able to guarantee efficiency in port services and that allow hinterland links able to withstand high numbers of containers in close amount of time. Evidence is that once again the Northern Range ports are those guaranteeing the highest standards and so able to exploit carriers' needs. Italian ports have been seriously affected by Covid-19 and their reaction seems shy. There is the need to attract back flows of traffics from the Far East and to start immediately a revolution that will allow to subvert European maritime flows dynamics. Looking at the North Adriatic ports, they have many opportunities to transform in economic advantages. The following paragraph aim to show the objective and the opportunities of the Recovery Fund, for Venice and the other ports.

Chances to be exploited in the critical framework

The world economic rebound depends on politics that will be adopted by National and Supranational institutions. As said, politics have been oriented to support production and supply side but also incomes to allow the demand to be stable. In the long-run, Governments have planned public expenditures to let countries to recover in a fast path.

Looking at the European Union, in the past months Member States negotiated and agreed a colossal intervention that have been named Recovery Fund and it is also known as Next Generation EU due to its green and digitalize willingness. These European recovery measurers provides 750€ billion and they are built on three pillars: the first is to support Member States to recover, the second aims to kick-starting the economy and to help private investments while the latter is intended to strengthen the single European market and accelerate the green and digital transitions.

Italy will be one of the most helped countries, with 209€ billion bounded to its recovery and future developments. At the end of September, the Italian Minister of Transports and Infrastructures De Micheli announced that her aim is to exploit the Recovery Fund opportunity to achieve 130 infrastructural works. Pillars on which expenditure is based are railways, local mobility, green ports, highway and motorway.

As can be easily guessed, public expenditure in ports aims to improve Italy maritime trade position in the European scenario. Once again, the solution of an Offshore port able to attract stocks of traffics and reach great market share will give boost to the Italian economy and will put at the center of the attention Venice and it coopetitive ports. Moreover, this will allow to increase the green path that the Next Generation EU has put as backbone of the entire initiative. There is the need to urgently find a common point of contact between North Adriatic Ports and to act more than ever as one unique Authority, able to convince Institutions of their geographic, environmental and economic advantages that allow them to be game-changers in the very next European maritime trade scenario. The development of the Offshore port will be accompanied by the implementation of railways and roads, which have the capacity to increase Napa ports' connectivity and to finally avoid actual bottlenecks that slow down their growth path.

To conclude, the critical framework created by the pandemic can be an opportunity for the North Adriatic ports to play a lead role. There is the need to act as one to convince Italian government and the whole European Union about their potential and to start planning their future. This can be a last call, since such a great amount of financial resources will allow to build up infrastructures and links between countries that will hardly be considered again. Of course, there should be a review in the Italian government intentions on the port of Trieste as the only gateway for the North Adriatic Sea.

The financial resources could be exploited to build up a gateway that includes Venice and an offshore terminal able to welcome big size vessels

CONCLUSIONS

The work has followed a path aiming to demonstrate how maritime trade dynamics has led to the actual European scenario, to the un-balance of it and how it can be improved.

Chapter one has been useful to understand how containers spread their usage in time, becoming the most relied way to trade goods all over the world.

This has caused effects both on ports and ships. Ports able to fast adapt to the needs of container handling have gained immediately great market share and have been able to exploit many advantages. Carriers started to rely only on ports that have guaranteed efficient maritime-land services and great hinterland connections. Northern Range ports have been able to adapt faster than the other European ports to this trend, since they have had to manage container coming mainly from the Trans-Atlantic route. As soon as China and the Far East Countries entered in the container trade, they had infrastructures and technical skills able to dominate the European ports scenario and due to this they have guarantee an efficiency point of landing also for the Far East – Europe container trade. The reliability of the Northern Range port system increased when carriers decided to exploit economies of scale in shipping, which led to the need of higher depths and well-proven maritime-hinterland services and links. Another turning point is that these ports closely located are cooperating and competing together at the same time and the thesis proven benefits of this way of acting. The first part ended introducing the opportunity of the North Adriatic ports, which could cooperate and not only compete each other in order to exploit opportunities.

The second chapter focused its attention to the geographical opportunities that North Adriatic ports have, since they are the closest point of access for Europe in its maritime trade with the Far East. This section has also pointed out the need of a revolution in the European ports scenario due to the strict environmental policies arise in recent times. To become game-changer in the European maritime scenario, Napa ports should exploit infrastructure policies such as the Ten-T coming from the European Union and the Belt and Road Initiative proposed by the Chinese Government.

The third chapter pointed out the focus of the thesis. The Offshore-Onshore project

proposed by the Venice Port Authority can be the turning point for the Napa ports in order to become game-changer in the European port scenario. The main idea is that this infrastructure will be able to accommodate big container vessels and du to this it will allow to attract stocks of trade and not only flows. This will end the hub era of the Adriatic Sea and become the main gateway for the European maritime trade. To do so, there is the need that Napa ports start to collaborate since it has been demonstrated that acting alone will not guarantee sufficient bases to exploit their hinterland developed and developing connectivity.

Even if the Covid-19 has forced a maritime trade contraction, forecasts seems to guarantee a rapid recovery for container trade and carriers will pursue increasing economies of scale in shipping. The Recovery Fund could guarantee financial resources to build up revolutionary projects and this is another chance that the North Adriatic ports must be ready to exploit.

To conclude, the main highlight of the work is the un-balance of the EU maritime trade traffics which limit the development of faster and greener point of accesses to Europe from the Far East.

This phenomenon is accentuated by carriers which exploit economies of scale through increasing size in vessels, determining another limit of ports that can be used.

In this framework, the overall idea is that Venice can act a leading role in the maritime trade scenario if only it will be a point of reference for all the North Adriatic ports. The developing idea of Italian government behind the port of Trieste has changed the direction of investments in the Offshore Onshore port of Venice, which is now trying to define a strategy to be at least a coopetitor with the port of Trieste. Financial investments coming from the Recovery Fund could be a chance to be exploited in this sense, since the VOOPS project is still eligible. But there is the need that Institutions at many levels put it again under the lights and give it the priority that it deserves.

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