Logistics Landscapes

Hinterland's dynamics of the Mediterranean

“A map of a seaport can be particularly misleading”.

Bird, 1984.

“Gateways to the world. About 75 % of Europe’s trade with the rest of the world and more than one third of intra-European trade is shipped through its seaports”.

The European Sea Ports Organization, 2020.

“Port competition is competition for trades, with terminals as the competing units, logistics, transport, and industrial enterprises as the chain managers of the respective trades with port authorities and port policymakers as co-developers.”

Theo Notteboom, 2020.

“Hubs of innovation and digitalisation. Ports are at the very centre of the logistic chain, linking maritime transport with the hinterland modes. Ports can therefore play a pivotal role in facilitating the cooperation and coordination between all stakeholders involved in the supply chain. The smart port can play a role in enhancing efficiency, safety, security and environmental performance of the supply chain.”

The European Sea Ports Organization, 2020.

“We have to think about those ‘elsewheres’ upon which cities depend as intrinsic to the urbanization process: They may be distant, in geographical terms, but they are not remote. The so-called hinterlands that are normally rendered invisible, or depicted as if they were empty, are now understood to be the environmental foundations of modern social existence.”

Neil Brenner, 2020.

“Terminals are the major focus of the competitive strategy, not ports. Competition between ports has increasingly been replaced by competition among market players who often are present in more than one port”.

Theo Notteboom, 2020.

“Linking Europe’s peripheral regions and islands to the mainland. Seaports contribute to territorial cohesion. For islands and remote areas, the port is vital to the development of the region and to bring those areas closer to Europe’s mainland and its markets.

The European Sea Ports Organization, 2020.

POLITECNICO
MILANO 1863

Master of Science in Architecture and Urban Design
A.A. 2022-2023

Author:
Dayannara Nohely Giler Vega

Supervising professor:
Simonetta Armondi

May, 2023

ABSTRACT

Globalization has profoundly impacted the development of ports, which are critical nodes in the global economy. Ports have undergone significant spatial, functional, and organizational transformations as they strive to establish themselves within the global capital circulation chains. The arrival of the regionalization phase marked the beginning of a new stage of port development because it involved the relocation of port activities inland, causing the expansion of its Hinterlands. These patterns had evident repercussions in the territories, with emerging geographies being reshaped and remade to meet the demands of logistics chains and external market players. Since then, the structure of the current port network has relied on two fundamental components: inland terminals and territorial distribution.

This thesis examines the spatial configurations of inland terminals in the extended urbanization process of ports. The study focuses on two port regions, Genova and Valencia. Besides standing out among the most competitive in the region, they are linked by one of the most dominant corridors of the European TEN-T network: The Mediterranean corridor. Using a critical approach that views urbanization as a historical, geographical, and multi-scale process, the thesis explores how geographies are being transformed, evolving, and building the logistics landscape of the Mediterranean.

Keywords: *hinterland, extended urbanization, port development, inland terminal, territorial distribution.*

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Figure 1. Hupac intermodal terminal.
From HUPAC

PREFACE

INTRODUCTION, METHODOLOGY AND RESEARCH MAP

INTRODUCTION

Ports have undergone significant spatial, functional, and organizational transformations as they strive to establish themselves within the global capital circulation chains. This transformation has not only shown the spatial expansion influenced by the port at the local scale but also the multiple ways in which the port interacts with the built and non-built environment in the construction of heterogeneous networks of logistics at macro scales.

A long literature on the port's growth in relation to its hosting city has been reported. Indeed, through the study of these models, it has been possible to identify the current stage of port development, regionalization. The emergence of regionalization has marked a new phase in port development, as port activities have shifted inland, expanding their hinterlands. These changes have had evident repercussions in the territories, reshaping geographies, with new logistics chains and external market players driving their development. With an emerging structure based on inland terminals and territorial distribution, there is a strand of investigation that still needs to be explored, which precisely refers to the dynamics of urbanization of the port's hinterland within the complex network of global connections.

This thesis is driven by exploring the urbanization dynamics of Port's hinterlands and how agglomeration and expansion processes are building port networks. The Mediterranean region has been chosen as a case study since it is a key operational area of one of the most representative large infrastructure projects, The TEN-T European core network. Two ports have been selected to analyze from a local to a regional extent, Valencia's Port in Spain and Genova's Port in Italy. Each of them, characterized by being promoters of extensive logistics networks woven beyond the cities' political boundaries, grouping several regions under the same approach, serve the Mediterranean corridor. With these considerations in mind, this thesis addresses three research questions:

What is the pattern of transformation of port regions in the Mediterranean?

What are the dynamics of urbanization of Port's hinterlands?

Who is leading this process of transformation?

METHODOLOGY

This thesis analyzes the spatial configurations of the extended urbanization process in the hinterlands of two port regions, Valencia (Spain) and Genova (Italy). Through a critical analysis that understands the urbanization process as a historical and geographical process, this thesis uses methods such as cartography reconstruction to inquire about the historical evolution of land use and geographical observation to understand the interest in strategic locations and their link with regional and local infrastructure projects.

This investigation unfolds in five parts. The first part is a literature review on the concepts of urbanization and extended urbanization, which are key to understanding and questioning the current global urban condition. It attempts to raise the question about what defines the urban and the role of the areas considered "rural" in contemporary urbanization processes. Through the introduction of the emerging urban condition: extended urbanization, referring to the re-elaboration and spatial extension of the forms of land use destined to facilitate the process of capital circulation, this thesis sets the question about how the process of extended urbanization is taking place in port networks.

The second part addresses port development and trajectories. It is an overview of the port's historical phases of development till it reaches its current state: Regionalization. Through the analysis of the changes produced in the interface of the port with the city, and the emerging phenomena such as containerization and the restructuring of the logistics and production chains, this chapter postulates the two key components for the development of the port network: inland terminals and corridors.

The third part aims to present the current scenario of the European port network and how infrastructural development projects such as TEN-T are leading the spatial transformation of areas while building a network of corridors stretching across the territories with the aim of integration.

Chapter four is composed of two parts. Part A introduces the two case studies, the Port of Valencia and the Port of Genoa. This part tries to expose the evolution trajectory of the ports in comparison to the evolution models described by the authors in the third chapter. This comparison will allow us to know the evolutionary trajectory that has led them to become essential port regions and to construct a network of interior nodes that make possible the development of the logistics chain that serves Europe.

Instead, Part B includes the historical and physical analysis of the land terminals. It intends to understand through the evolution of the spatial configurations of the nodes, the transformations of their land uses, as well as to recognize their origin as strategic positions within the network and their link with the development of transport infrastructures.

Finally, chapter fifth focuses on understanding and articulating the evolution of the logistics landscape by comparing four dimensions: physical, historical, spatial, and institutional. Through the construction of a matrix, it aims to reflect on how hinterland transformation processes are elaborated and evolved in the Mediterranean Landscape.

THE RESEARCH MAP

The “just-in-time” production

outsourcing, flexibility and changes in the logistic networks

Increase of global capital flows

↓

Have lead to a intensified, enlarge and speed the development of the industrial infrastructure

EXTENDED URBANIZATION

New ways of appropriating and reorganising the non-city geographies for collective and profitable uses.

TERRITORIAL DISTRIBUTION

At the regional level:

Countries at the edges of Europe / European Unification project

TEN T NETWORK

Mediterranean corridor

Migration of the port functions outside the port boundaries.

PORT

Increase of the volumen of cargo
Containerization
Intermodal Transport

PORT REGIONALIZATION

PORT REGIONS AS GROWTH POLES
Enlargement of the port hinterland

A emerging geography based on the inland distribution

THE INLAND TERMINAL

Inland terminals as hubs for logistics

National - Regional - Local
Who decides, who plans?

NETWORKS

1 What is the pattern of transformation of the network?
How is it being sewn into the landscape?

2 What are the dynamics of urbanization of Port's hinterland?

How is the spatial character of the emerging hubs?

3 Who is leading this transformation?

Who are the actors and forces?

At the national level:

Port cities at the edges of nations /
Second cities a away from the Capital /
Hubs along the corridors

National Network

Northwest Logistics Network - Italy
Center - East Logistic Network - Spain

At the local level:

Terminals at the edges of the Port cities

Port Region

Ligurian Region
Mediterranean Region

Figure 1. Genova & Sampierdarena Terminal, Italy.
From Genova's Port Authority

Chapter 1.

THEORETICAL FRAMEWORK

URBANIZATION, EXTENDED URBANIZATION, AND HINTERLANDS CONCEPTS

The first chapter is a literature review on the concepts of urbanization and extended urbanization, which are key to understanding and questioning the current global urban condition. The first part introduces the evolution of urban theories on the concept of urbanization. A process associated throughout history with the growth of urban centers, bounded by the "city" and whose definition has required to be redefine as a polymorphic and multi-scalar process in relation to the new forms of urban development.

The next concept discussed is planetary urbanization, the emerging problematic of urban theory raised by scholars Brenner and Schmid. They argue to recognize the forms of urbanization not only as a process of concentration but as a process of expansion, where the simultaneous proliferation of forms in the urban fabric are extended far beyond the traditional centers of urban agglomeration. These theoretical bases constitute the starting point to understand the current urban condition of the emerging urbanization, which implies a variety of operations and impacts in those localities, considered apparently "natural", "rural" or "remote", outside the boundaries of the " city".

Figure 2. Port of Genova
From Genova Port Authority

1.1 The concept of urbanization

The concept of urbanization has been primarily used to refer to the city's growth process, generally concerning social and economic macro-trends. The trajectory of its definitions can be traced back to the nineteenth and early twentieth century with the debates introduced by the Catalan architect Ildefonso Cerdá and the first assumptions about the city's spatial organization (Schmid, 2019). Further definitions were proposed by Ernest Burgess, School of Chicago, in 1921, with the descriptive urban land use model that divided cities into concentric circles expanding from downtown to the suburbs, once again labeling the city as a core. Modern capitalism exposed other redefinitions, which characterizes urbanization as a process in which different types of settlements, urban, suburban, and rural, coexist with a level of discretion and differentiation. From there, many theories and approaches have been developed to understand and define urbanization processes based on the city's figure as a unit of study. Indeed, many of these concepts mentioned above have helped many sciences, between them sociologists and institutions, to standardize and analyze the concept of urbanization based on the criteria of growth of the "city," relating population numbers with patterns of agglomeration (Brenner, 2014).

However, evaluating the city's centrality for a very long time has also made it possible for many theorists to evidence one of the significant transformation processes of the new urban era: the population shift from the countryside to the city. The phenomenon of migration and the rapid urbanization of nations has led theorists to rethink the definitions of the urban and to question the city's centric-population concept, which does not comprise the large scale of urbanization. Precisely here, affirmations such as those exposed by Benner and Schmid underpin the reflections about the scale within the series of trans-formation processes that are taking place outside traditional "urban" boundaries (Brenner, 2014; Brenner & Schmid, 2015).

1.2 The question of the scale

In the mid to late twentieth century, new questions emerged about urban, suburban, and rural connotations. The world capitalist restructuring of 1980 produced new emerging concerns associated with "globalization," "new economy of scale policy," and new spatial restructuring based on geo-economic integration. These emerging topics brought into discussion debates on the scale as a fundamental aspect of understanding urban transformation processes. The first efforts were to understand local and global connections and the different modes of insertion of spaces within broad networks of capital circulation. Subsequently, issues evolved toward understanding the scope of the politics of scale, with discourses predicting the end of geography and constructing a world without borders, "globalization." The process of globalization was now seen as a process of uneven transformation, contested, and interwoven between new forms of capitalist and regulatory institutional partnership (Brenner, 2019).

This emerging literature allowed scholars to investigate how cities and urban systems were inscribed within more extensive national and international labor processes and economies, initiating new research to understand urbanization's emerging patterns and dynamics. The most important one was consolidated in 1990, understanding scale as a critical dimension for urbanization and under that perspective, the evolution of the concept of understanding the urban as a multi-scale socio-spatial process of broad evolutionary dynamics and no longer as a unit or a type of settlement contained in the entity of the city.

1.3 The extended urbanization.

Extended urbanization refers to the concentration and extension of forms of transformation outside areas considered "urban". These areas known as "remote" "rural" "peripheral" undergo a series of socio-economic, infrastructural, and socio-ecological transformation to support the socio-economic dynamics of urban development (Brenner, 2014).

For Brenner and Schmid, the analysis of extended urbanization requires, a fundamental change of perspective: urbanization can no longer be understood as a spatial limited process centered on the city; on the contrary, it implies examining the diversity of urban manifestations that are being inscribed in territories and turning them into urban landscapes (Brenner & Schmid, 2015). The new urban vision raised by the scholars develops the concept of extended urbanization based on the hypothesis of Henri Lefebvre's work on the complete urbanization of the city. Lefebvre evidences the fragmentation and destruction of traditional European cities and the extension of logistic infrastructures and industrial parks while exposing the actualization of the scales of urbanization in favor of the movement of capital (Brenner, 2014).

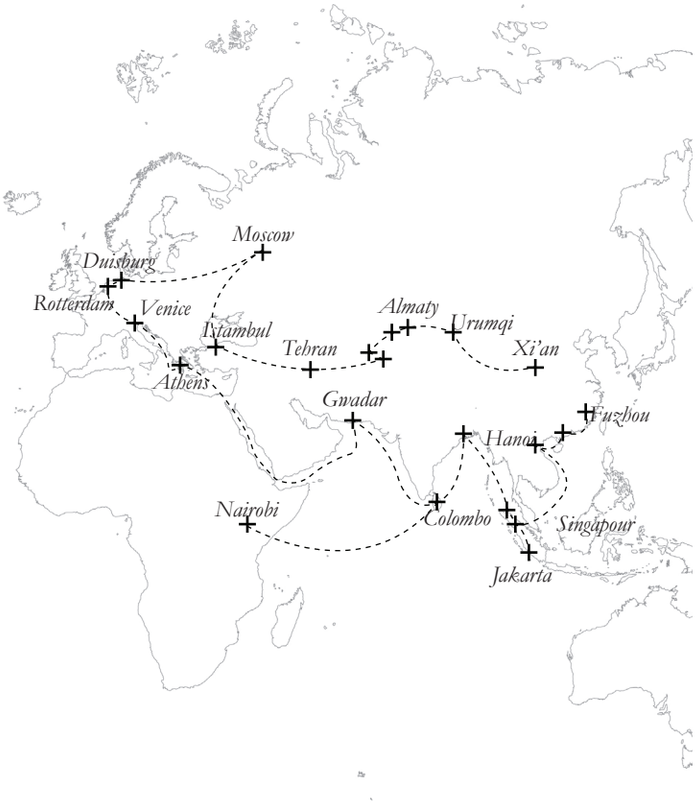


Figure 3. China's One Belt One Road project.
Source: The One Brief. Map adapted by the author.
The project is a global infrastructure development strategy adopted by the Chinese government in 2013. the project foresees the development of infrastructure to connect more than 150 countries. Its initiative relies on updating the infrastructure along ancient trade routes on land and sea. The "belt" refers to the physical road, which travels from Asia through Europe and into Scandinavia, while the "road" refers to the maritime shipping lanes, reaching as far as Venice.

These theoretical foundations constitute the critical starting point for constructing the emerging problem of the urban theory of planetary urbanization. Moreover, for raising the question about the variety of expressions of urbanization that have been excluded because they are outside the large agglomerations or "urban areas."

Under this perspective, scholars argued that areas considered non-urban peripheral, located outside urban centers, are constantly shaped by urbanization processes in multiple ways. They are situated within complex urban networks connected in many ways to urban centers. On the other hand, their role is critical since they are essential in sustaining chains of production of labor, materials, logistics, resources, and functions to serve the "city". These territories are managed under a wide range of specific strategies and policy frameworks that allow them to be modified and rearranged to accelerate processes of capital circulation (Brenner, 2016). Some of the most visible examples that can be mentioned are infrastructure projects such as road corridors, like China's huge One Belt, One Road project (Sidaway & Woon, 2017), which aims to connect a vast number of cities through inland corridors and sea routes; or the mega infrastructure projects for oil extraction in the Amazon in Latin America, which takes natural and low populated territories to position extraction plants (Schmid, 2019) or the massive infrastructures to support the mining exploitation of the Atacama Desert in Chile (Robinson, 2022) (figure 2).

In conclusion, there is an unprecedented density of networks, an intensification of land use, and a territorial enclosure to serve and facilitate processes and services for the city. They occur in non-visible areas and in different types of manifestations not recognized at first sight. Precisely, because of this, its analysis must be understood from a change of perspective that leaves out urban and rural distinctions to observe transformation processes from multiple morphologies, scales, and a wide range of institutional frames. This thesis aims to discover the multiple spatial configurations of extended urbanization in the ports by analyzing geographical and historically the evolution of traditionals hinterlands . It is driving by the questions:

How new territorial configurations are inscribed or reinscribed in the landscape?

Do they last or proliferate?

Area they restructured, remade, or imposed?

1.4 Defining Hinterlands

The definition of the hinterland dates back to the mercantile era, with the concept of the "isolated stated" introduced by Von Thünen. The hinterland was defined as an adjacent area to the city that serves as an outlet and center of production (Brenner and Katsikis, 2020). This definition was reconsidered in the industrialization era since the notion of a non-industrialized hinterland changed. Indeed, the hinterlands' evolution was taking place parallel to the city's transformation since they have been shaping to support the city-building processes. Many transformations produced during the last decades are attributed to globalization and are mainly related to the change in its role and scale.

First, the scale of the hinterlands has changed since they are now acting to serve the global supply chain. In other words, its role is separate from local and regional areas. Instead, they are restructured to respond to global and distant organizations.

Second, their role. The forms of production have been specialized and globalized. Hinterlands must be within intense and prolonged production cycles, which has brought the construction of massive infrastructures to enable extensive production processes (T. Notteboom, 2009).

Figure 4. Lithium Mining, Atacama Desert, Chile.
Clarin news. Photography by Catherine Hyland

Atacama has been a key point for mining in history of Chile, ranging minerals from saltpetre, cooper (still country's main export), and now lithium. The booming of electronic cars and solar panels has accelerated the demand for immeasurable quantities of lithium, as it is an essential component for the development of green technologies. Massive infrastructures are being foreseen to turn the Atacama Desert into one of the world's largest lithium production areas.

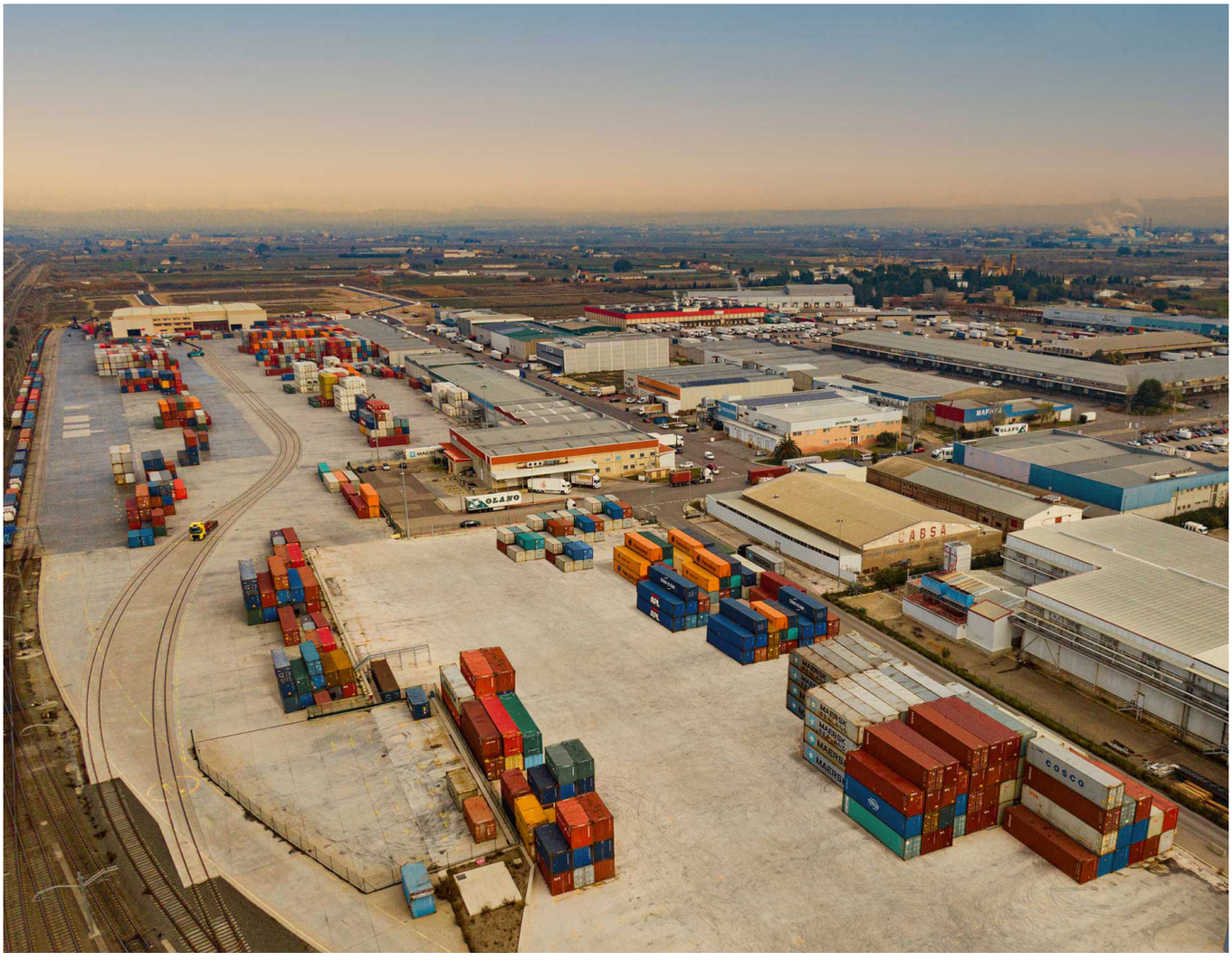


Figure 5. Terminal Maritima de Zaragoza, Spain.
From ALIA, Cluster logistico Aragón.

1.5 Defining Port-Hinterlands

Approaches to defining the Hinterlands arose in the early 20th century, with the meaning of 'the land behind,' introduced by the geographer Chisholm in 1908. Decades later, this definition was reformulated as the "areas served by a port" with the first analysis on his Spatial and Functional Characters of Sargent (1938). Morgan made additional contributions when examining the problem of the delimitation of port hinterlands, pointing out several problems related to port traffic, difficulties between areas and the type of cargo, and the last aspect related to overlapping hinterlands. In this sense, Morgan argued that "hinterlands can be served by multiple ports." By doing this, the schoolchildren began to discuss the definition of the limits and the hierarchy of the interior of a port (Sdoukopoulos & Boile, 2020).

According to the Economic and Social Commission of the United Nations, ESCAP, an inland port is "the area of land located in the vicinity of the port, as immediately near or within the limits of the port and that works in an interactive and close manner with a port by providing various commercial activities, regardless of whether or not the hinterland is within the administrative jurisdiction of the port authority" (Akhavan, 2020). Nevertheless, its definition is debatable for some scholars due to the emergence of regionalization phase (further details in chapter two). For Notteboom (T. Notteboom, 2009), it is very difficult or even unfeasible to delimit the Hinterland of a port since the Hinterland varies concerning the goods (bulk versus containers), the weather (seasonal impact, economic cycles, transport policy, and technology). changes and modes of transportation. Although these definitions varied between another, considering the fact they have evolved according to tie and history, some definitions will be taken as pre-concepts for the development of this investigation:

1. Hinterland is the area where a port draws most of its business. Today, to respond to global changes, many maritime ports have developed logistics clusters in their Hinterland.
2. Hinterlands are planned in strategic places for the connection with the market. This fact means that its location responds to its proximity to infrastructures of significant scope.
3. Hinterlands are not constrained within the area of a port. On the contrary, they are developed areas at great distances, without a continuous pattern, and generally located outside the political limits of the port regions.

"We have to think about those 'elsewheres' upon which cities depend as intrinsic to the urbanization process: They may be distant, in geographical terms, but they are not remote. The so-called hinterlands that are normally rendered invisible, or depicted as if they were empty, are now understood to be the environmental foundations of modern social existence."

Neil Brenner, 2020.

"Linking Europe's peripheral regions and islands to the mainland. Seaports contribute to territorial cohesion. For islands and remote areas, the port is vital to the development of the region and to bring those areas closer to Europe's mainland and its markets."

The European Sea Ports Organization, 2020.

Figure 6. APM Terminal, Valencia, Spain
From Valencia's Port Authority

Chapter II.

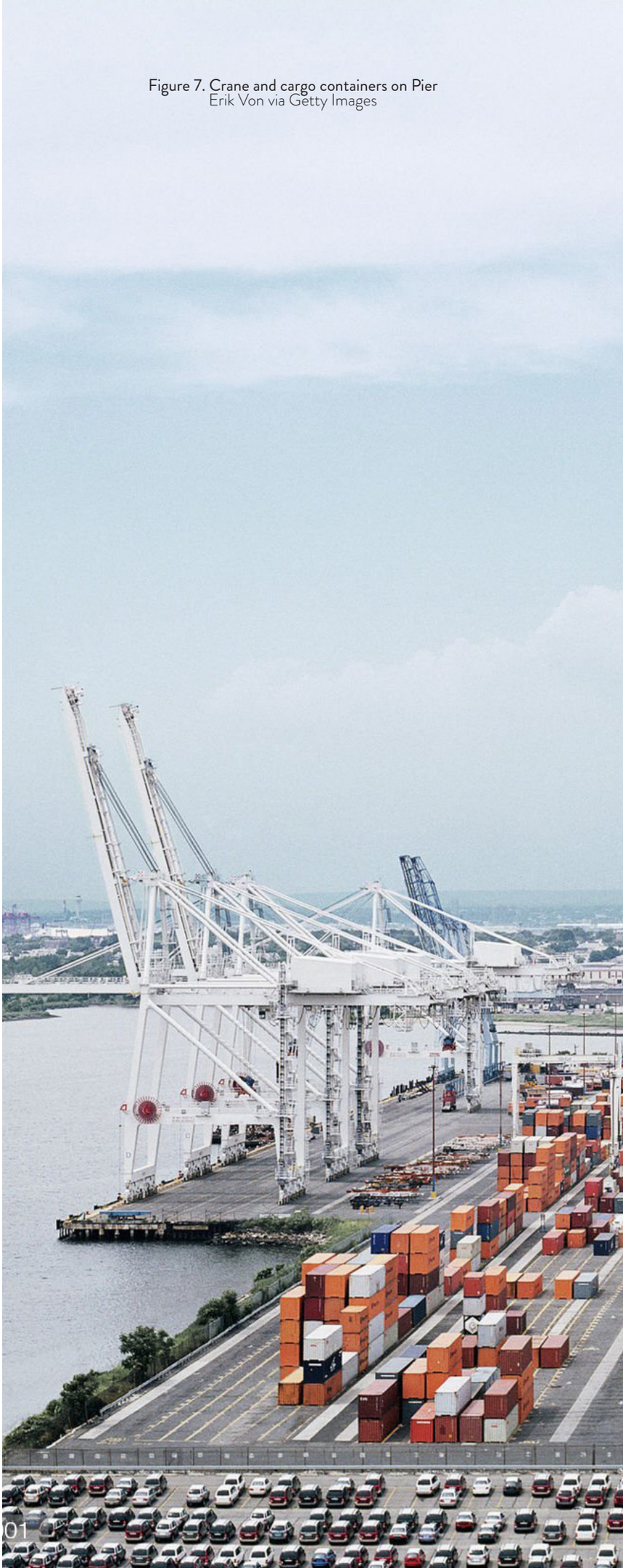
PORTS INSERTED IN A BROADER NETWORK OF SUPPLY CHAIN

PORT DEVELOPMENT & THE PRODUCTION OF THE LOGISTICS SPACE

The argument of this thesis aims to analyze the process of extended urbanization centered on the ports. Ports, which throughout history have been economic centers, drivers of flows, connections, and commercial trade, are undergoing profound transformations caused by the global restructuring of labor systems and technological advances. This second chapter aims to expose the current scenario of the ports inserted in a broader network of supply chains. Moreover, it describes the spatial phenomena caused by the intensification and expansion of its logistics infrastructures.

The first part of the chapter aims to address the Port's development and trajectories, to understand the spatial development patterns and the changing interface with the territory. The second part will introduce the concept of regionalization to understand the phenomena of relocation of functions to the interior and the spatial transformation of the port areas. Moreover, it will explain the emergence of this regionalization: inland terminals and corridors.

Figure 7. Crane and cargo containers on Pier
Erik Von via Getty Images



2.1 The perspective of port cities and maritime networks.

Throughout history, ports have been drivers of urban development and trade dynamics, not only because they act as economic centers but also because they are centers of exchanges through which people, goods, and different environments meet. Many of the most outstanding cities today were born as port cities, Rotterdam, Antwerp, Hamburg, and Marseille; their development has mainly been associated with the anchor activity of the port and its evolution. Akhavan (2020), highlights two components of the port cities: the port as a node within a transport system and the city as the central place of a wider spatial system, which is considered vital to interconnecting their location, development, issues, and activities.

Literature on port geography and port-city studies has been well documented for a long time, such as the reports on port-city development by (Bird, 1963, 1971); (B. Hoyle, 1988; B. S. Hoyle, 1989); studies based on the role of the port in the global supply chain, by (Guerrero, 2014; Hesse & Rodrigue, 2004; Lee & Ducruet, 2009); or reports on port regionalization and hinterland expansion by (T. Notteboom, 2009; T. E. Notteboom & Rodrigue, 2005). More recently, there are some approaches which aim to illustrate the characteristics of the port-city development dynamics, with a focus on the process of configuration of port's hinterlands in the Middle Eastern region (Akhavan, 2020). Despite the extensive literature on port-city studies, a strand of investigation still needs to be explored, which precisely refers to the evolution and dynamics of urbanization of the port's hinterland within the complex network of global connections.

2.2 Port's development and trajectories.

The first aims to analyze and interpret the evolution of the port and the regional systems started during the 60s, with the work of James Bird based on the British ports. Bird (1963), through the "Anyport" port model, discusses the three main development phases that ports may experience:

i. Setting: (Up to the nineteenth century). Port functions are based on its geographical features, with port-related facilities (warehousing) adjacent to the port;

ii. Expansion (from the nineteenth until the twentieth century, industrial revolution). Port hinterland expands, and new infrastructure is built to respond to the new requirements of industrialization;

iii. Specialization (from the mid-twentieth century till the technological era of globalization). The need for more space and handling capacitates due to Containerization and technological advancement.

Although this model constitutes a theoretical base to understand the morphological evolution of ports in time and space, it did not fit with the emerging contemporary port development process. The current scenario, characterized by the growing specialization, technological improvements, and new port-in-frastructure developments, brought substantial changes outside the historical boundaries of the port cities. Ports experienced a new era of transformation led by containerization and maritime innovation. In this regard, a new model was proposed by Hoyle (B. Hoyle, 1988) , emphasizing the current reality: 'Economically and geographically, ports and cities have grown apart' (B. S. Hoyle, 1989). Holey pointed out the following factors as responsible for altering the relationship between ports and cities.

- The need for more space
  induced
  migration of several terminals towards peripheral areas.
- The advent of containerization
  led to
  the reduction of traditional port activities and labour forces.
- The improvement of hinterland accessibility
  has enable
  to locate further inland not necessarily in proximity to the port.

Figure 8. Historical Port Genova in 1910, Italy.
Marka/Touring Club Italiano via Agesfotostock

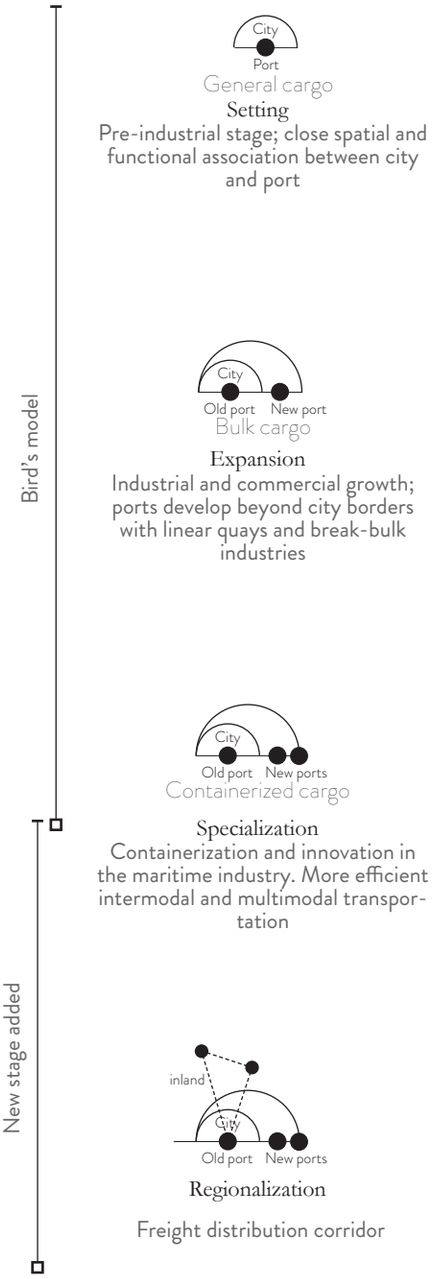


Figure 9. Bird's Anyport model stages of port development

Figure by Author, modified from Mina Akhavan

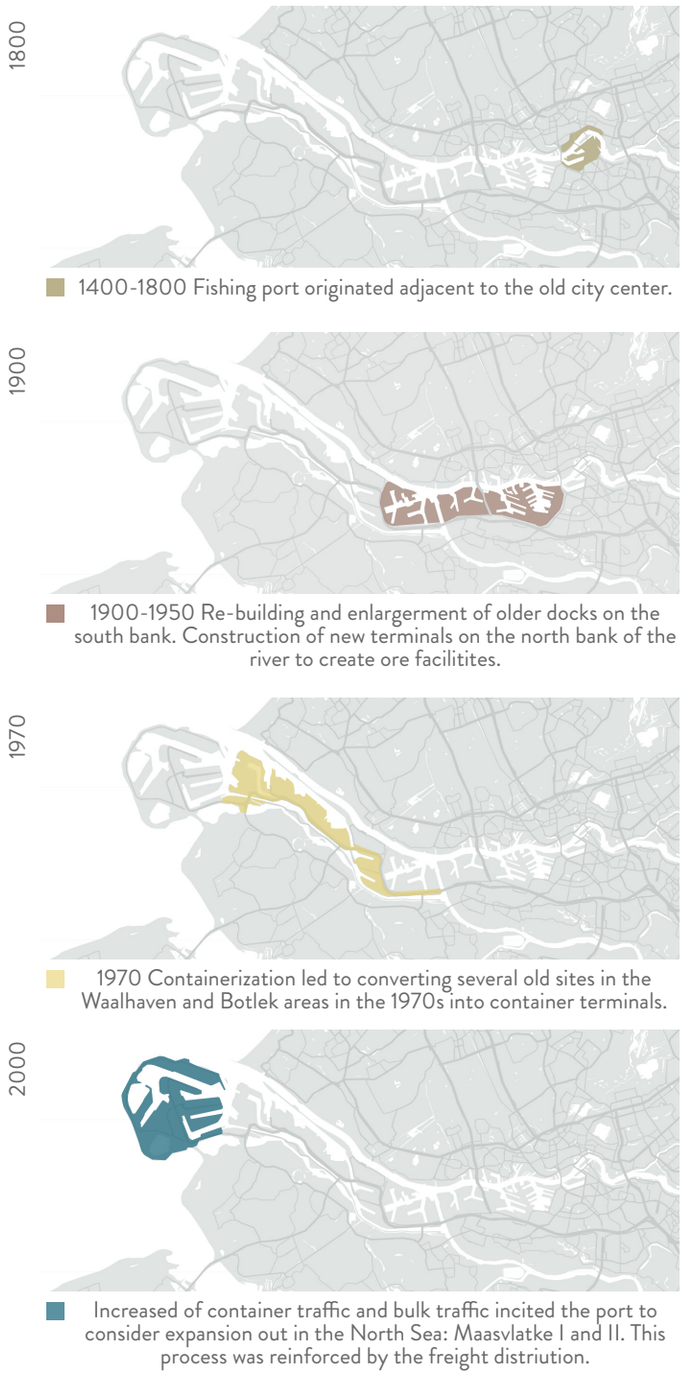


Figure 10. I.e. Rotterdam Port development

Figure by Author, modified from T. Notteboom

Consequently, the model updated by Hoyle (1988) describes the port city development in six phases. Rather than only focusing on the spatial characters, it describes the change in the port-city interface.

1. Primitive City-Port: Pre-industrial stage; close spatial and functional association between city and port.
2. Expanding City-Port: Industrial and commercial growth; ports develop beyond city borders with linear quays and break-bulk industries.
3. Modern Industrial City-Port: Fordism/economies of scale; industrial growth (esp. oil refining) and introduction of containers/ro-ro require separation and increased spaces.
4. Retreat from the Waterfront: Post-Fordism stage; changes in maritime technology induced growth of separated maritime industrial development areas.
5. Redevelopment of the Waterfront: Flexible accumulation; large-scale modern port consumes large areas of land and water space; urban renewal of the original core.
6. Renewal of Port-City Links: Globalization and intermodal transport transform the role of ports (Port regionalization); urban redevelopment enhances port-city integration.

Even though these models refer to the analysis carried out in western port cities and therefore cannot be a target as a general global pattern to the East, they suggest a common trend between these two regions the new port infrastructure is extended beyond the historical city. This fact raised once again the question of the scale; ports activities are no longer comprised between the traditional boundaries of the hosting city while started to question the emerging interface between ports and cities.

Several numbers of literature are reported to understand the driving fosters in the changing relationship of port cities. Many scholars argue whether this relation is fostered by the restructuring of logistics (O'Connor, 2010) or by the effect of globalization in the leadership of foreign (Slack & Frémont, 2005); most of them have conducted their research to characterize two opposing ideas the weakening and strengthening relationship. Scholars such as Ducret and Jeong (Ducruet & Jeong, 2005) started to analyze the emerging interface of the ports by reading the spatial patterns based on the concepts 'of urban centrality' and 'port intermediacy. Through the matrix representation, they explained and classified different port cities based on the city's capacity to generate activities and, on the other hand, the spatial quality of its transportation system (Ducruet & Jeong, 2005).

As seen in figure 1, the city port is in the middle of the matrix and represents the state of balance between the city size and port functions. While on one side stands the coastal town as a city with limited size and port activities, to the opposite side stands the port metropolis with the capacity to maintain its central position to expand in size and generate many port functions.

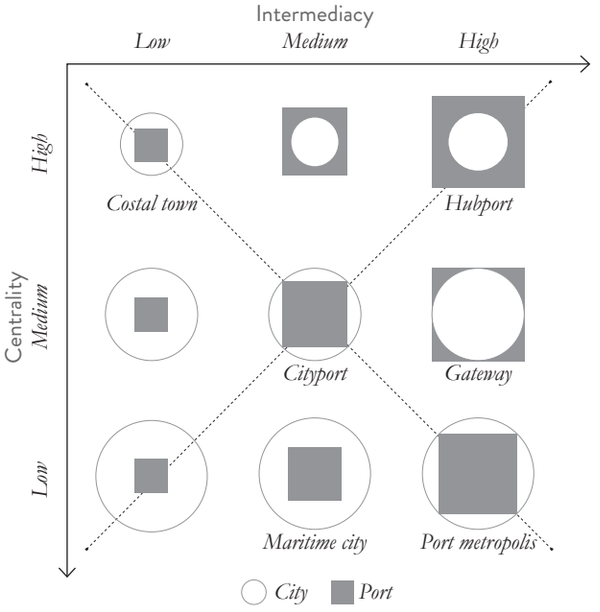


Figure 11. A matrix of port city relationships.
Figure by the author, modified from Ducruet, Jeong 2005.

2.3 The evolution of the port-city interface.

According to Hayuth (Hayuth, 1982), the port-city interface is a transition area in which port activities and urban functions interact through spatial, functional, economic, and ecological dimensions. Conversely, for (Ducruet & Jeong, 2005), the port city interface is also that area of transition between different geographical scales. In the revision of the geographical literature reported by (Ducruet & Jeong, 2005), urban and port spatial models have remained separated for a long time. Few studies have acknowledged the expanded spatial dimension influenced by the port. Spatial systems are built through multiple dynamics and are characterized by heterogenic networks rather than proximity factors (Lee & Ducruet, 2009).

This spatial configuration at multiple scale levels can be read in the evolution of the interface at different stages. It is visible that the overlapping of the port and urban growth in the port-city interface is constantly being transformed not only spatially but also functionally. According to figure 1 and taking the example of the Port of Valencia, it is observed that in the first stages, urban land uses area separated from port functions, with visible barriers translated into less accessible waterfronts; the second stage represents the relocation of functions outside to the traditional port city interface, here the proximity is no longer an important feature and the port-industries are located in other urban zones. The third and current stage shows the growth of the hinterland with an interface barely visible but with a most radical spatial and functional structure between port and city.

(Hayuth, 1982) attributes the stage of evolution of the interface to contemporary global phenomena: i. Conteinarization, ii. Intermodal transport, and iii. Despite being part of global transformations, globalization is translated in different ways around the globe. For example, a study conducted by (Ducruet & Jeong, 2005) comparing European with Asian port cities shows different realities. In Asian cases, due to the importance of the coastal market, the sea becomes more significant than in the European port cities where the inland market is dominant (Akhavan, 2020). On the one hand, the European territory is experiencing an integration of economies at different levels, thus moving towards one single market and hinterland, defined by multiple ports. Therefore, in the spatial organization of the European ports, they act as gateways and serve as a remote hinterland. In contrast, in the case of Asian port cities, they act as multifunctional nodes, and the immediate hinterland contributes to the concentration of a wide range of port functions.

Figure 12. Port of Valencia 1945
From Valencia Port Authority
Separate urban functions of the port: Less accessible waterfront.

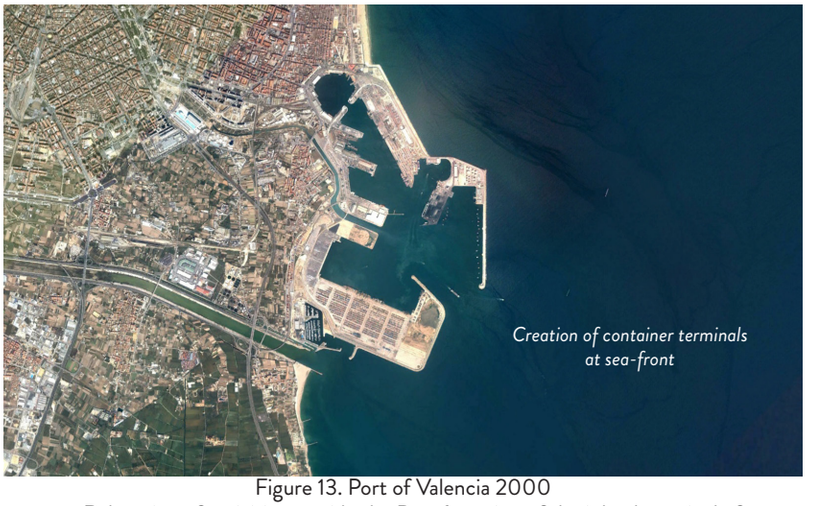


Figure 13. Port of Valencia 2000
Relocation of activities outside the Port (creation of the inland terminal of Madrid) - Expansion of container terminals in the port.
At maritime level, the port finds support for the activities in two more ports: Sagunto and Gandia. Not visibles anymore in the port-city interface.

Figure 14. Port of Sagunto 2021

Figure 15. Port of Gandía 2021

Figure 16. Port of Valencia 2020
Images from Google Earth.

Inland terminal in operation, Madrid, Zaragoza, Azuqueca de Henares.
Further expansion are planned in the North-East extension.

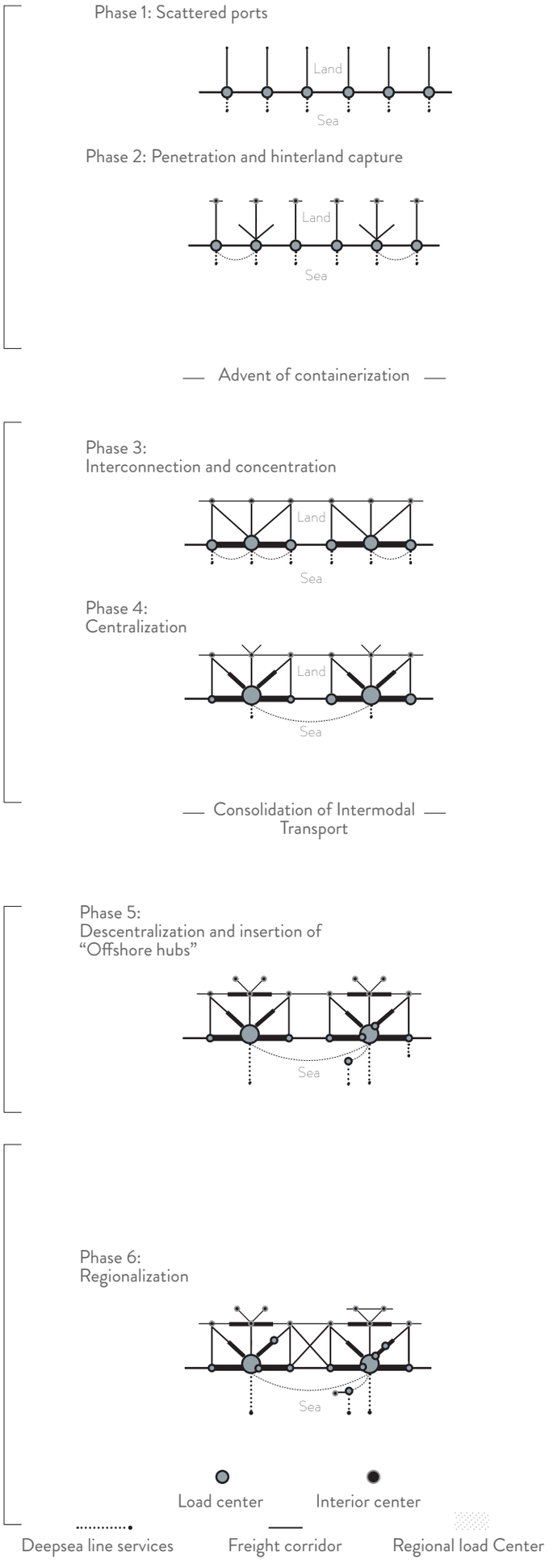


Figure 17. The spatial development of a Port system.
Figures by the Author, modified from Notteboom and Rodrigue, 2005.

2.4 Port regionalization.

As studied before, the model presented by Bird provided a solid background about the spatial model of port development defined into three phases: Setting, expansion, and specialization. However, as (T. E. Notteboom & Rodrigue, 2005) argued, the model needed to explain the recent changes that ports face, represented by the emerging seaports, inland terminals, and inland freight distribution centers as driving forces in port development.

Noteboom and Rodrigue explained regionalization as the expansion of the port's hinterland reach through several market strategies and policies linking it more closely to inland freight distribution centers. Literature on this phase has been expanded in order to explain spatial restructuring. As shown in Figure 2, the geographic development of the port system would evolve from an initial pattern of scattered, barely connected ports along the coastline to a main solid network consisting of corridors between gateway ports and major hinterland centers. Phase two exemplifies the increasing level of port concentration as certain routes and hinterlands develop in association with major urban centers. While in phase three, the system is represented by the interconnections and concentration between the main ports of entry and the interior corridors. During phases four and fifth, a major organization is based on the centralization regarding some ports that have become spatially concentrated while others have evolved into a distributed system. Some cases can exemplify phases fourth and fifth. The port of Valencia has evolved into a port region, creating two additional ports, Sagunto and Gandia; while Algeciras, Gioia Tauro, Malta, and Cagliari outstand among the most competitive offshore ports of the Mediterranean region.

Noteboom (2005) characterizes Port regionalization by a deep functional interdependency of a load center with a multimodal logistics base, which sews a regional load network. Two main factors can be identified to explain the emergence of this concept:

1. Local constraints: Ports face local constraints that hold back their growth and efficiency. The need for land for expansion and limited access to deep water to handle large ships. Added to this are the difficulties in managing the increased port traffic, with limited local road and rail systems, and finally, environmental impact problems.
2. Global restructuring: Global production and consumption have changed distribution with the emergence of regional production systems and large consumer markets. In this regard, a single locality cannot serve a complex global supply chain. Thus, developing a distribution network corresponds closely to fragmented production and consumption systems.

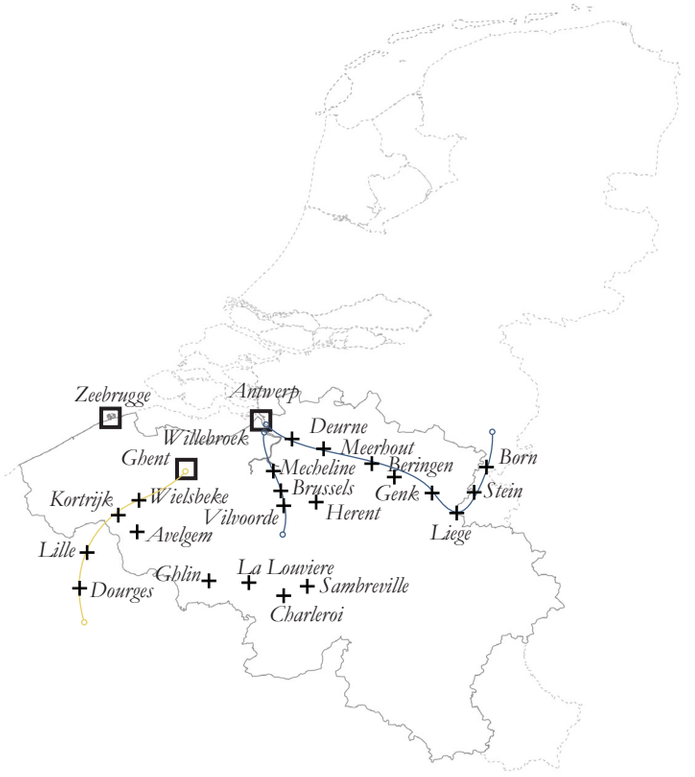


Figure 18. Port regionalization, inland terminals network in Antwerp, Belgium.
Map by the author, modified from Port economics, management and policy, Notteboom, T. (2006).

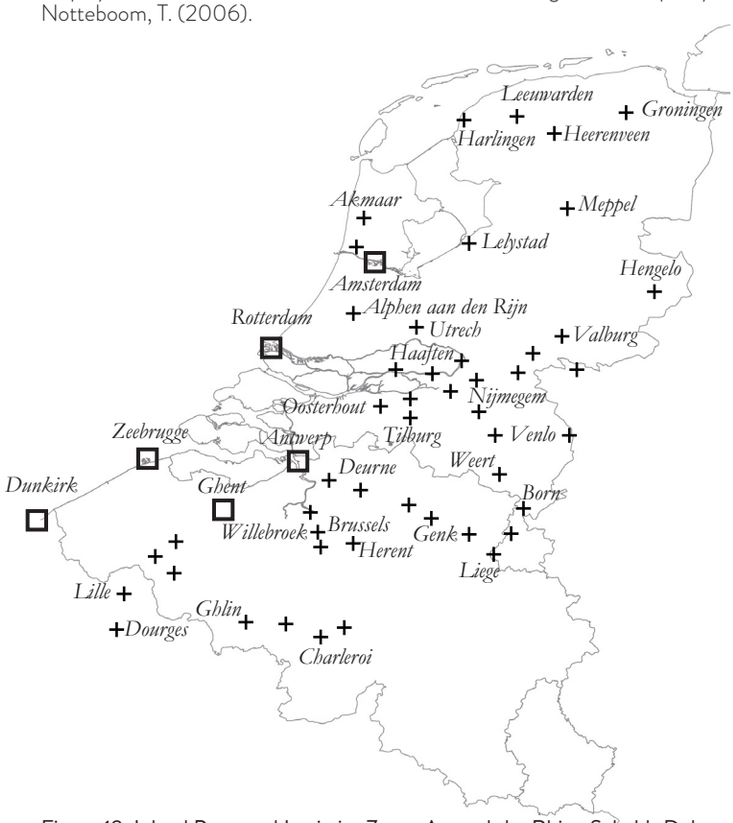


Figure 19. Inland Ports and Logistics Zones Around the Rhine Scheldt Delta.
From Port economics, management and policy, Notteboom, T. (2006).
Map by the author.
The Hamburg-Le Havre range consists of about nine ports, including 5 main ports: Rotterdam, Antwerp, Hamburg, Le Havre and Amsterdam. To remain competitive in the Northern Cordillera, all ports are acting under shared strategies, such as the expansion of a shared hinterland, the creation of a network of intermodal links throughout the territory, as well as developing their own areas of focus. For example, Rotterdam and Le Havre have specialized in rapid transit, Antwerp in logistics activities with warehousing, and Hamburg as a hub for Central and Eastern Europe.

All these factors mentioned above have been translated into new distribution systems. In order to satisfy the demands of a global production network, international supply chains have become complex. As logistics models have evolved, manufacturing practices have become fully dependent on costs and time, triggering customers to seek a more integrated approach (Hesse & Rodrigue, 2004).

Most port cities seen today are reaching a stage of regionalization, where market forces and political frameworks shape in many ways the load center (the port), the nodes (inland terminals), and the multiple linkages observed as the network. Some examples can be cited to observe the functional development from the port city into the port network closely: the case of Antwerp illustrates one biggest formation of Inland Ports and Logistics Zones in the North Sea. Two axes are observed: along the corridor Antwerp-Brussels, potentially identified as a growing region, and the largest axis Antwerp-Liege, with large concentrations of inland services that reach the Netherlands. Although Antwerp has developed a large infrastructure to serve the Rhine and North-Mediterranean corridors, it is also part of a complex network model around the Rhine Scheldt Delta, formed by three ports Rotterdam, Amsterdam, and Antwerp.

In discussing the functional development of the port of Rotterdam in the Netherlands, Van Klink used the term "borderless main port" to describe the functional development from port city to port network (van Klink, 1995). Indeed, this assumption has been proven through the evolution of complex port networks into port alliances, as the case of Brussels and Netherlands mentioned, which has been turned into a multiport-gateway region.

The Rhine-Scheldt Delta and the Helgoland Bay ports, both part of the so-called Le Havre-Hamburg range, together represent 40% of the total European container throughput. The market share of the Rhine-Scheldt Delta is quite stable. At the same time, the North German ports have gained market share, mainly because of Hamburg's pivotal role in feeder flows to the Baltic and land-based flows to the developing economies in East and Central Europe (T. Notteboom, 2009).

2.5 Inland terminals and corridors as driving forces

Inland terminals and corridors are the backbones of port regionalization since port terminals are supported in inland hubs accessible by corridors. Indeed, with the expanding hinterlands, several reasons have conducted the establishment of regional inland nodes that serve a local market and a much broader region. Inland terminals are the node used to transfer goods to the distribution structures. In other words, they are meant to support the functions of the port away from the port. The inland terminal can have different functions; they are called to serve as load centers, which support activities such as intermodal, warehousing, and logistics functions, or transshipment centers to serve as a link between freight distribution systems (T. E. Notteboom & Rodrigue, 2005).

In parallel to the emergence of inland ports, territorial distribution found its bases in modal transport. As inland terminals were increasingly positioned in discontinuous and distant locations, new routes and corridors were developed for their accessibility and rapid circulation. Consequently, the network of many port regions has been built based on these two components under a deep-level integration approach.

Some cases can illustrate this system, such as those previously reviewed in the Rhine-Scheldt Delta area of the northern ports, which has developed a complex and open network of connections. On the other side, we found the case of France, which shows a more compact network by positioning the interior terminals along a main corridor that crosses the city from north to south.

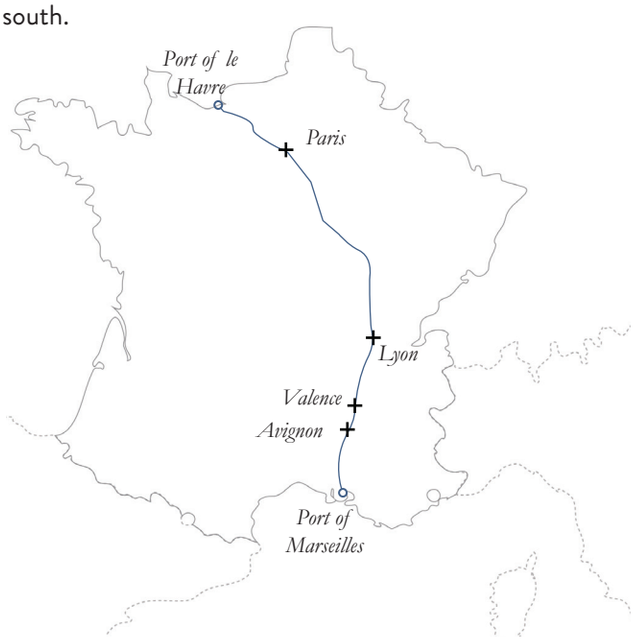


Figure 20. Inland hubs along the corridor of France.
Figure by the author, modified from Guerrero 2014.
Alogn the ports in the Mediterranean, Marseille is the one with a unique inland intermodal distribution, serving a directly to 21 locations, besides the fact that it also serve its own hinterlands.

Figure 21. Busto Arsizio Terminal “HUPAC”, Italy.
From Hupac.

Figure 22. HUPAC Terminal Busto Arsizio
From HUPAC

Chapter III.

INLAND TERMINALS AND TERRITORIAL DISTRIBUTION OF THE EUROPEAN NETWORK

THE CURRENT SCENARIO OF THE MEDITERRANEAN REGION

This chapter aims to know the scenario of the port network in the European area, its characteristics, regulatory framework, and the projects carried out under the objective of integration of its member countries. The first part will focus on exposing the trade pattern on a European scale to learn about the growing trend and interest in the Mediterranean area. The infrastructure project outlined by the European Union, known as TEN-T, includes a network of corridors distributed throughout the European territory. The Mediterranean has been chosen as the study area in this thesis. Two port regions will be analyzed within the Mediterranean area: Genoa in Italy and Valencia in Spain. The second part will address the role of actors in restructuring the Port-hinterlands.

3.1 Trade patterns and distribution networks at the edges of Europe.

The geographical conditions of Europe have certainly favored trade flows within and outside the EU. The Baltic, Mediterranean, and Black Sea comprise a network of ports in Europe, each characterized by its own location qualities, sizes, and strategic functions to serve European inland markets.

This combination of different types and sizes of ports and inland development call for competition between ports, which try to offer greater maritime accessibility and better conditions to supply chains.

Looking at the performance of ports by region, the Northern range is the largest area of port activity. Its ability to develop hinterland accessibility allows its ports to capture a large share of the European market. While in the Mediterranean range, the increase in trade between Asia and interior Europe has favored the growth of these ports as gateways and the extension of connections. Recent waves of EU connection have further promoted these two levels of distribution structure with the definition of strategic regions to cover the entire geographic area. In such way that the favorite regions would be located in the north of Germany and Finland for access from the north; Hungary, southern Germany, and Austria for central access; northern Italy and the northern Adriatic region for access from the south; and the Czech Republic and Poland for access from the east (T. Notteboom, 2009).

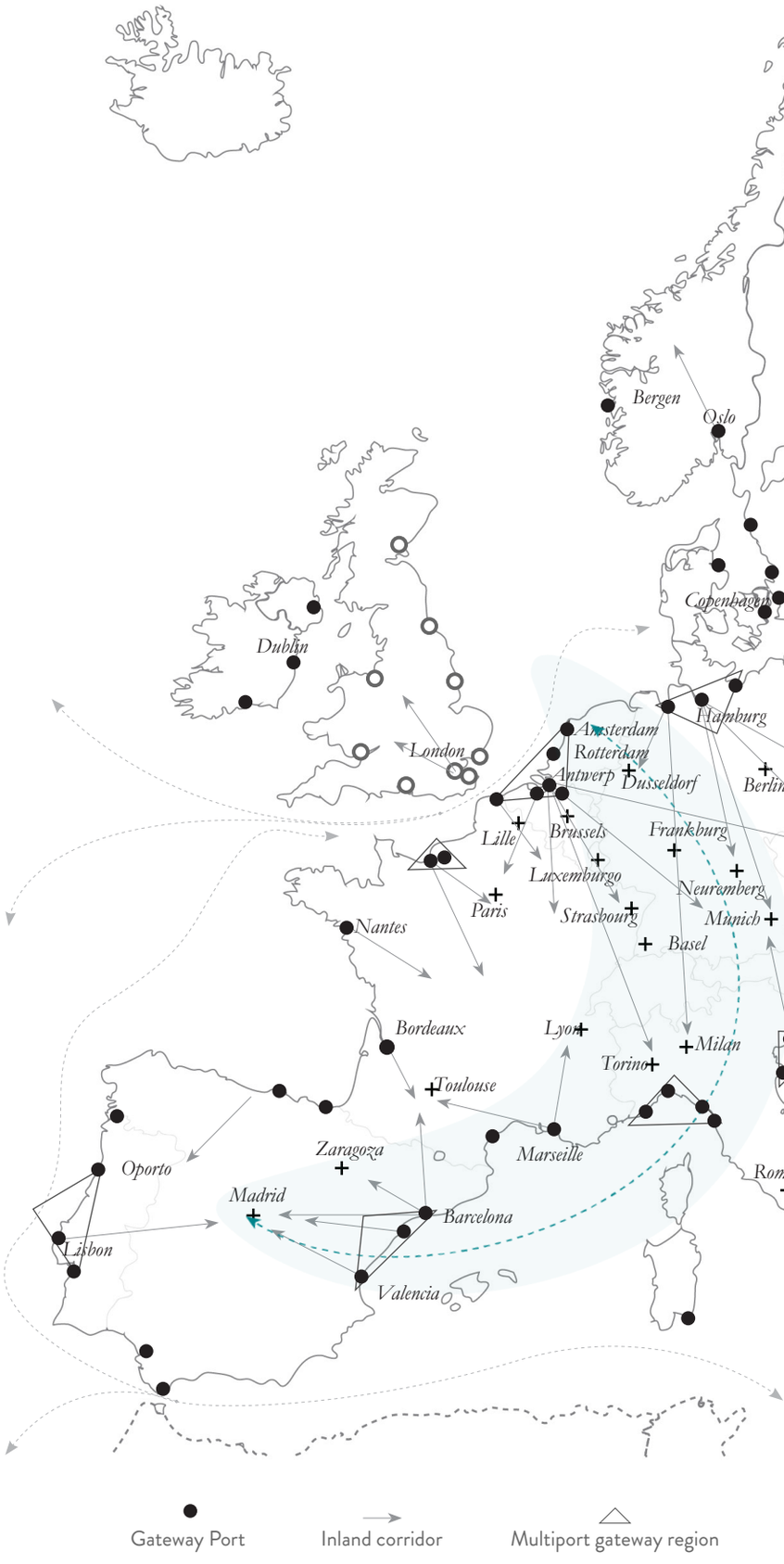
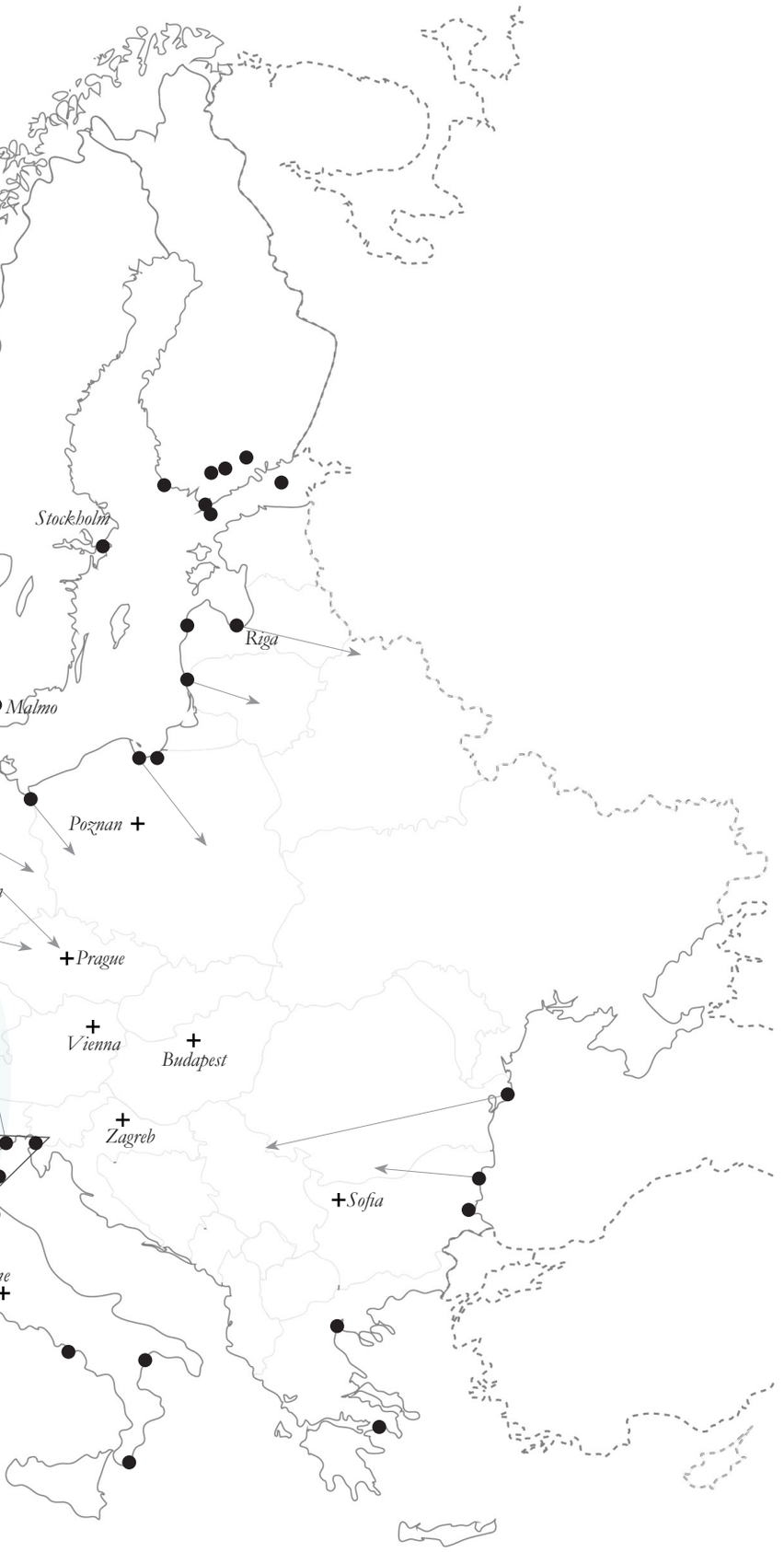


Figure 23. Trade patterns in Europe
Figure by Author, modified from Notteboom, 2009.



In addition to regions and location strategies, trade flows show a pattern of growth and expansion in Western European markets. According to Notteboom (2009), two factors represent the trade pattern of Europe.

First, the intra-EU trade represents two-thirds of the EU's trade total, meaning that despite the globalization flows, intra-European trade remains very significant, besides the fact that this trend is increasing progressively due to the enlargement of the EU. The comparison between the trend of trade in some countries supports this fact. For example, for small economies such as Czech Republic, Benelux, or Denmark, the shares of intra-EU trade in total exports are very substantial. On the import side, the overall picture is mixed: to Netherlands, Greece, Italy, and the United Kingdom are among the countries with a strong reliance on non-EU imports, while the scenario for Spain and Portugal of non-EU imports ranges between 30%.

Secondly, the West European markets are becoming mature since consumer goods or automotive sectors are growing speedily. This specialization can be seen in the patterns of growth of each region. For instance, countries such as Germany, Hungary, the Czech Republic, and Slovakia are increasingly exporting more technology-driven or high-skill products in Central and Eastern Europe. In comparison, Northeastern Europe remains focused on low-skill or labor-intensive products. This tendency has favored the construction of a vast infrastructure from East to West, especially in the borders of Germany.

This trend has caused the shape of the traditional blue banana, which for many years represented the EU's urbanization axis, to approach now to a boomerang due to extensions from central and east Europe to the Mediterranean (T. Notteboom, 2009).

The blue banana is a corridor of urbanization in Western, and Central Europe conceptualized in 1989. It references the urban corridor of industry and services stretching from northern England to northern Italy. Its shape has been debated in recent years due to the shift towards Germany and its driving activity on industrialization.

Figure 24. Savona Terminal Italy.
From Genova Port's Authority.

3.2 Why the mediterranean?

The Mediterranean has been one of the most active areas throughout history. Its trade feature dates back to the Rome Empire; goods were traded from Rome to other localities. Although today's Rome no longer has a major commercial port nearby, many of the old nodes/ports remain important such as Tarraco/Barcelona, Corinthus/Piraeus, Istanbul, and Marseilles (Arvis et al., 2019).

The inherited trade vocation of these areas, and old ports, was intensified in the 19th century with the opening of the Suez canal, positioning the Mediterranean as the primary transit route between Europe and Asia. These have led to Mediterranean ports offering transit time advantages over the northern European ports for accommodating cargo flows between Asia/Middle East and large parts of Southern and Central Europe.

The advent of containerization brought another wave of transformation for the Mediterranean due to the evolution of its ports as major gateways. The increasing number of ships transiting through the Mediterranean heavily influences the shipping routes in the Mediterranean, leading to the upgrade of the role of the ports and their network. For these ports, this means a wave of opportunity to add value to their infrastructure, container terminals, and warehousing, as well as the expansion of the network for connectivity (as mentioned in chapter 2). Nevertheless, at the same time, this meant the need for solid policies and strategies for the region in order to foster trade connectivity (Arvis et al., 2019).

Some scholars refer to three interdependent dimensions when talking about trade connectivity—maritime networks, which refer to the structure and performance of shipping before the port; Port efficiency, which refers to the port's performance (or group of ports sharing the same hinterland); and Hinterland connectivity. Therefore, policies that work well in one dimension could positively impact others.

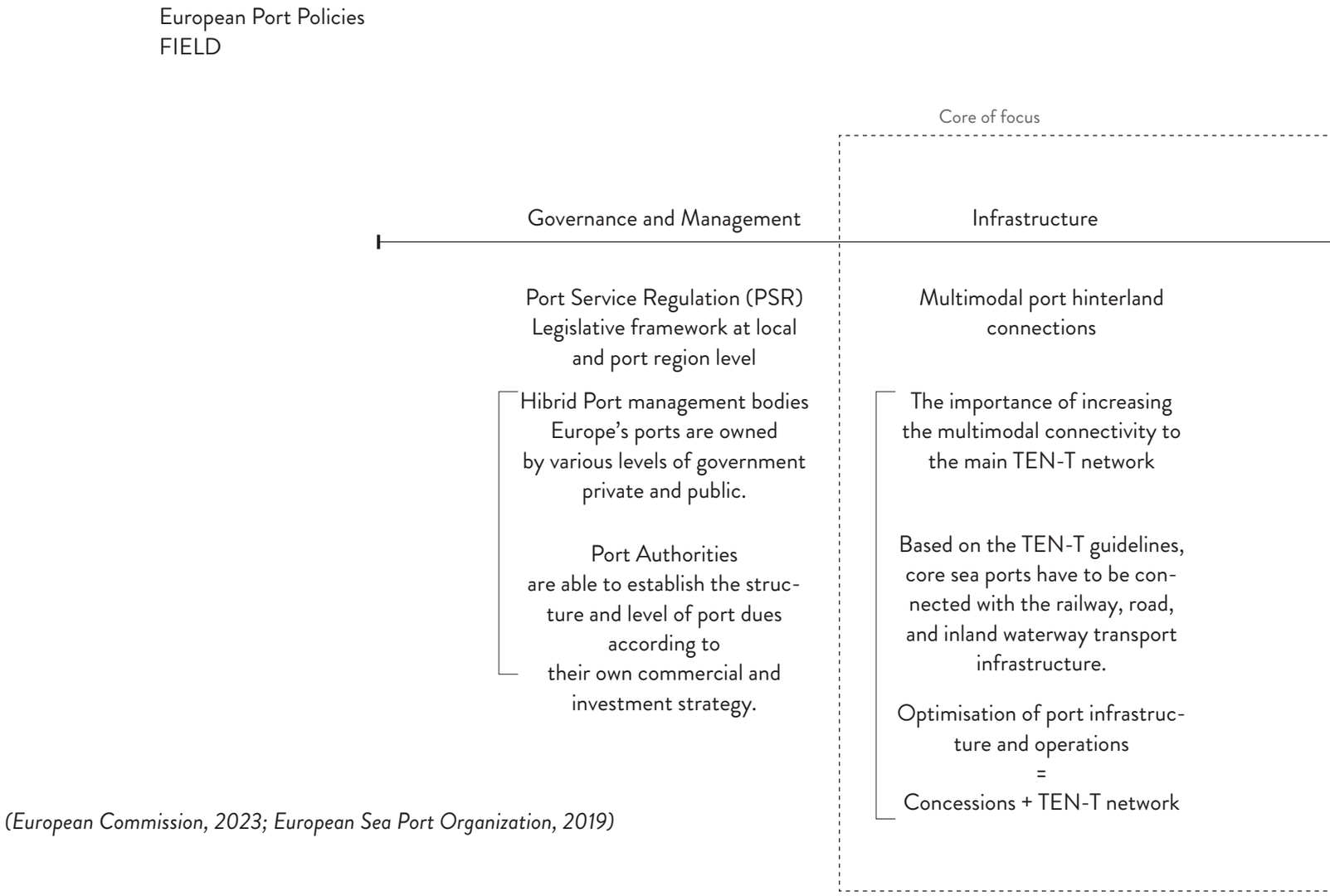
Under this perspective, the European Union has developed the concept of core corridors to connect all EU through a transport policy. The TEN-T policy promotes transport infrastructures' connection, modal integration, and operability to foster the efficient circulation of goods and people. It comprises railways, inland waterways, shipping routes, and roads linking urban nodes, maritime ports, airports, and terminals (European Commission, 2023). The cornerstone of this policy relies on the corridors; each corridor has its governance structure in which a work plan of linkages is set.

One of the points highlighted in the Plan of priorities of European ports 2019-2024 is the Multimodal port hinterland connections, which states, "core seaports have to be connected with the railway, road and, where possible, inland waterway transport infrastructure of the Trans-European Transport Network by 31 December 2030" (European Sea Port Organization, 2019). Indeed, this fact is accurate. All the Core and Comprehensive Network seaports are already connected to the TEN-T rail network. Ongoing efforts to improve the existing connections, as will be seen in the following chapter, unfold the large network connecting hinterlands.

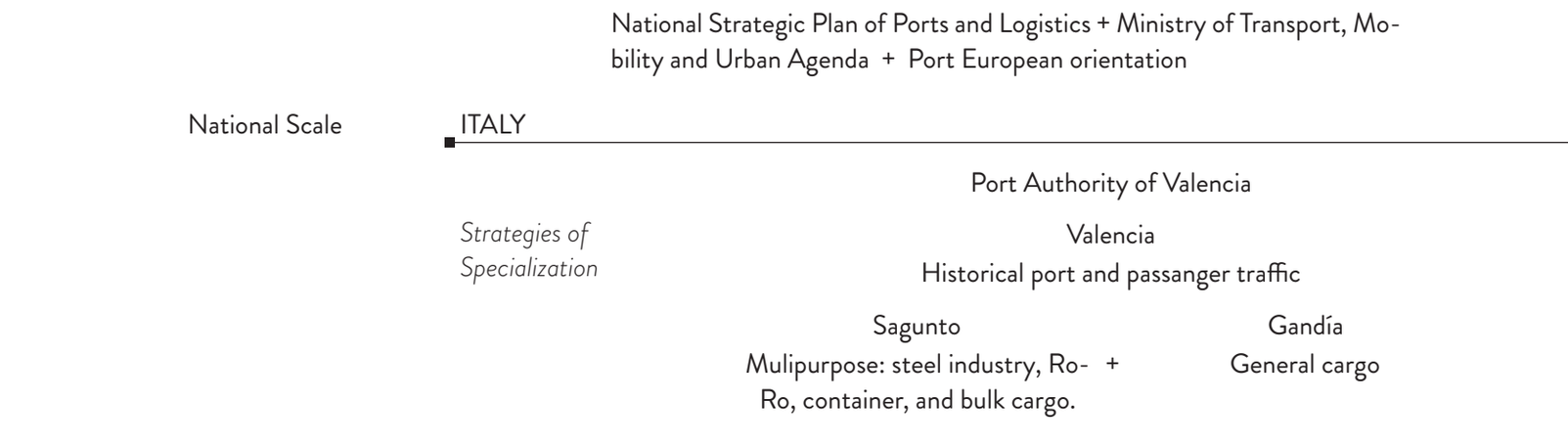
Figure 25. Vado Ligure Port, Cosco & APM Terminal Italy.
From Genova Port's Authority.

This investigation presents two Mediterranean port regions as a case of study: Genova and Valencia. Besides being the most competitive region in their countries, they are linked by the same infrastructure system: The Mediterranean corridor. Despite having common objectives, regulatory framework, and sharing connections with similar areas along the corridor, the spatial structure of the port network has been developed with different patterns but with similar urbanization dynamics and evolution.

3.3 Regulatory framework



(European Commission, 2023; European Sea Port Organization, 2019)



(Documento Di Pianificazione Strategica Di Sistema, 2021; Piano Regolatore Portuale, 2001)

Transport

TEN-T policy (2013) based on two pillars:

Trans-European Transport Network (TEN-T)

The Core Network
The Comprehensive Network

The Connecting Europe Facility (CEF)

Financial pillar of Europe's Transport Infrastructure policy and covers the period 2014–2020 / 2021-2027

Logistics

Digitalization

Transport

To enhance the safety and security of the supply chain through early warnings, real-time alerts and optimised checks.

Environmental

To enhance environmental performance through a better use of transport means.

Efficency, supply chain

To monitoring the real use of infrastructure and rationalize its use and maintainance.

Enviromental

Port services regulation according to their environmental performance

Air quality

Descarbonization & Energy transition

Noise

Ports & citizen enviroment

SPAIN

Port Authority: Ports of the Western Ligurian Sea

Genova
Historical port and passanger traffic

Pra'
Container terminal

+

Savona
Multipurpose: forest , steel products, bulk, and Ro-Ro cargo.

+

Vado Ligure
Fruit sector, container terminal, Ro-Ro cargo

(Autoridad Portuaria de Valencia, 2018; Plan Director Del Puerto de Valencia, 2019)

3.4 The rol of the actors in structuring hinterlands

Although ports are inserted within a newly competitive globalized, and corporatized environment, they are also part of a logistics-restructured base. That means that its performance is highly linked with objectives and strategies from several players. As previously mentioned, clear objectives have been underlined in the European scenario to reach the ports' significant competitiveness. By doing this, ports and hinterland networks are planned under several strategies linking them more closely to inland distribution centers.

A study illustrated by (Song & Panayides, 2008) revealed that the most important parameters contributing to port/terminal integration in supply chains relate to technology, value-added services, the relationship with clients and liner operators, and the facilitation of intermodal transport and channel integration practices. Most of these factors lay on geographical dimensions that go far beyond the port's visible limits. Indeed, as regionalization expands the hinterland, more market players are interested in strengthening hinterland connections and improving load center efficiency. Three principal actors can be acknowledged in this network:

a. Shipping lines

Over the last few years, shipping lines have implemented internal and external growth strategies to reach major economies and lower transport costs. As a result, a series of alliances and mergers have been generated to obtain more excellent market coverage. Today, the top twenty carriers control 90.2% of the world's TEU-slot capacity (T. Notteboom, 2009).

As seen in figure 8, the top controlled 26% of the world TEU-slot capacity in 1980, 41.6% in 1992, 54% in 1999, and 81.4% in 2007. This increase has been possible due to forming alliances to gain a significant number of locations. Some examples can be cited, the 2M alliance formed by Maersk and Hamburg Süd and Mediterranean Shipping Company as indicated on the chart, the two leaders of the list, or the alliance composed by the major Chinese shipping lines, Cosco, CMA-CGM, OOCL and Evergreen, known as the Ocean Alliance. In such a way, shipping lines at the seafront have more access to significant numbers of terminals. However, alliances did not end on the seafront. Shipping companies know the importance of land extension. Indeed, as regionalization triggered the formation of port terminals, there is a growing interest in controlling inland hubs too. Almost all the alliances have become terminal operators as well.

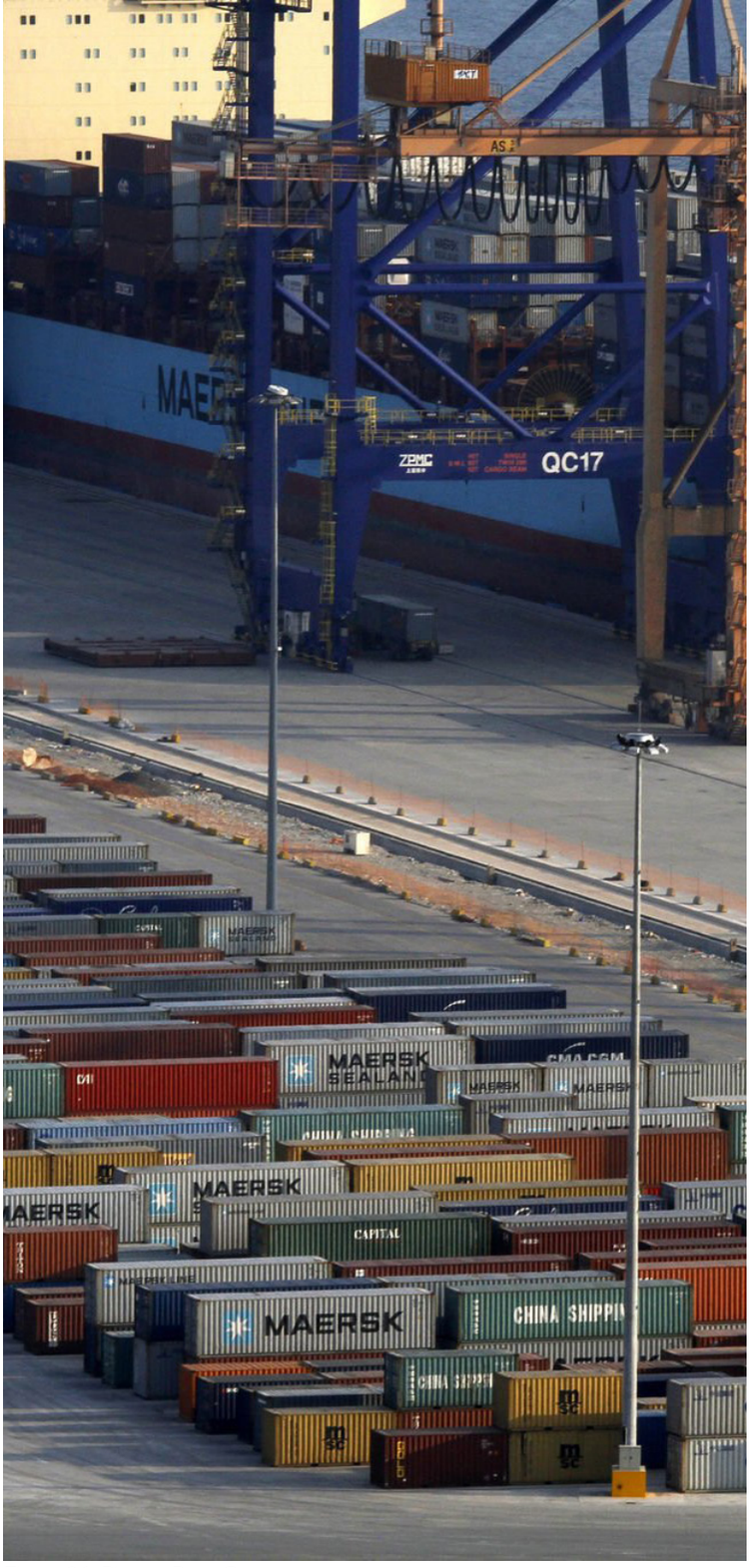


Figure 26. Piraeus Port, Greece.
From Kostas Tsironis via Getty Images

Greece 2011. The government is looking at selling its entire holdings in Piraeus Port Authority SA and Thessaloniki Port Authority SA by the end of the year and will seek buyers for between 43 percent and 66 percent of other ports, between them Cosco a potential buyer.

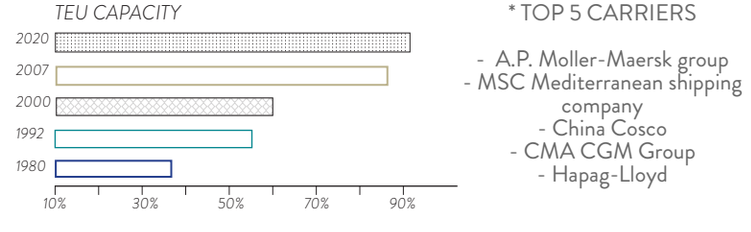


Figure 27. TEU capacity through years from top 5 carries
From Port economics 2019. Map by the author.

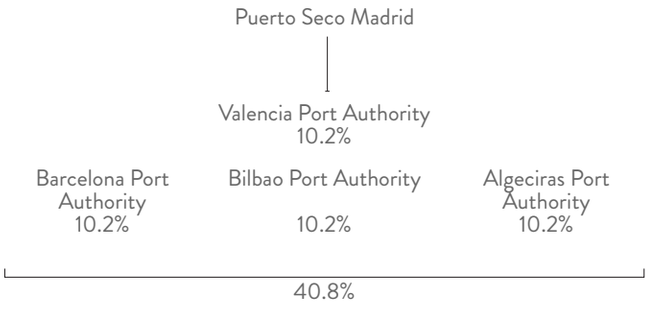
b. Terminal and transport operators

As mentioned above, the shipping lines' strategy includes land terminals and warehouses. Terminal operators and transport operators are combined to boost territorial distribution. In a chain that flows from the maritime terminal -the land terminal- land distribution finally reaches the market in a cycle that depends to a great extent on the efficient functioning of the land terminal as a distribution node, and of course, on the carriers (intermodal transport). These interests have translated into the creation of big companies and powerful alliances of actors.

Shipping lines such as Maersk and Cosco are one of the most illustrative examples since they have created several companies to cover the logistic chain. Maersk shipping lines work as terminal operators through APM terminals but also provide rail services by owning European Rail Services (ERS) (T. Notteboom, 2009). Similar is the case of Cosco Group, which operates through Cosco shipping ports as terminal operators, Cosco shipping lines as a shipping company, and most recently, Cosco Iberian rail services. Despite these alliances, an increasing number of companies outstand among the carriers, also working in alliances to transport services companies to reach more locations. This is the case of Eurogate, covering the north-south axis connecting the rail and road activities under the subsidiary Sogemar, Contship, and Hannibal group (Contship Italia Group, 2023)

c. Ports Authorities

Port authorities' role is a substantial base in the port network, although its role is lately seen as less active and independent. Notteboom (T. Notteboom, 2009) argues they still rely on the traditional tools as policies and concessions confined in the port area. However, they are crucial players at the interior level since they are active planners and investors of inland networks. Examples can be observed in Spain, where Port Authorities have a substantial percentage of ownership in inland terminals, the case of Madrid, and the case of Azuqueca de Henara terminal, with ranges from 40 to 50% of participation.



(Puerto Seco de Madrid, 2022)

Figure 28. Oceanogate Italia.
From Contship Italia via Flickr

Railway operator of the group Contship Italia (Eurogate)

Figure 29. Port of Pra', Genova, Italy
From Genova's Port Authority

Chapter 4.

MEDITERRANEAN LANDSCAPES

PORT EVOLUTION: VALENCIA AND GENOVA

PART A

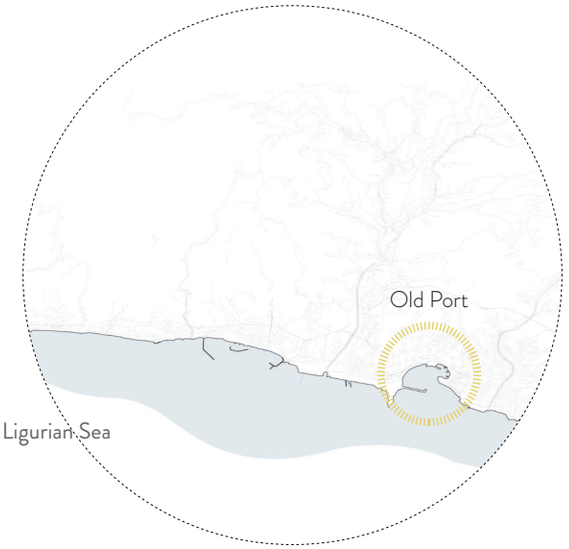
4.1 Genova's Port Evolution

Setting

1855

Old Port. Twelve docks were distributed along the natural perimeter between the current Molo Vecchio (which is being extended) and the Molo Nuovo, following a radial layout perpendicular to the coast.

The project provides all the necessary infrastructure for the proper functioning of the port: cranes, warehouses and railway connections.

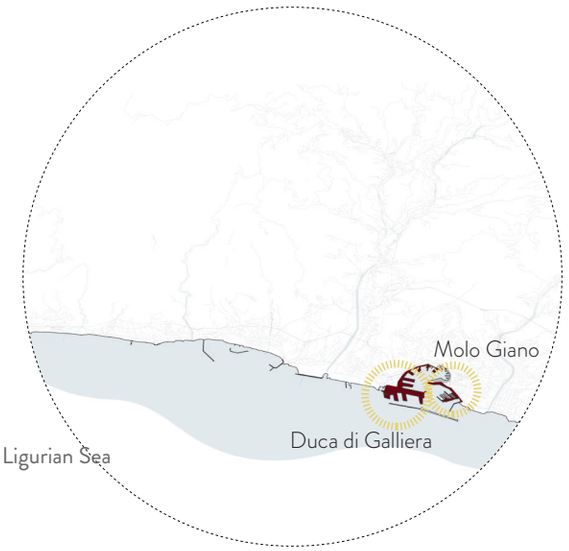


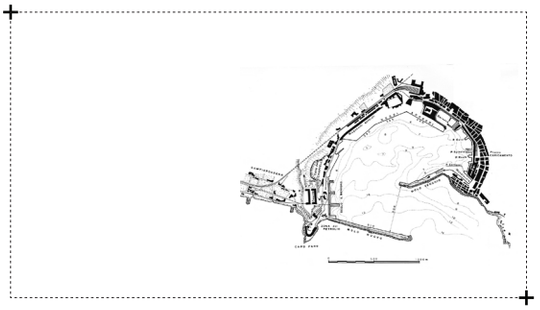
Expansion

1900

The first Marster plan proposes the construction of two docks.
Duca di Galliera. (Molo Nuovo West dock) Hosting the the first rail station "Bettolo Park" and providin space for a oil station.

Molo Giano. (East Dock). Located away from commercial traffic to carry out the first ship repair centers of the Port.



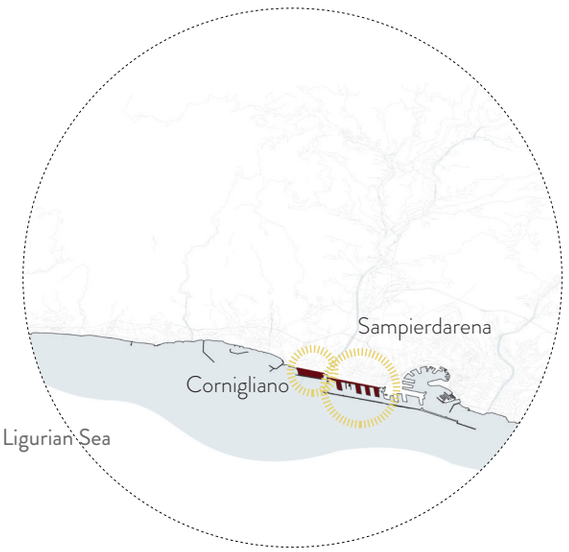


Specialization

1935

The Sampierdarena dock is expanded into five docks, with the aim of creating more space for the handling of various products, such as Base Metals, Steel, Ferroalloys, Soft Commodities, Forest Products, Project Cargo, General Cargo.

To the west of the Ponte S. Giorgio a temporary seaplane base was set up.



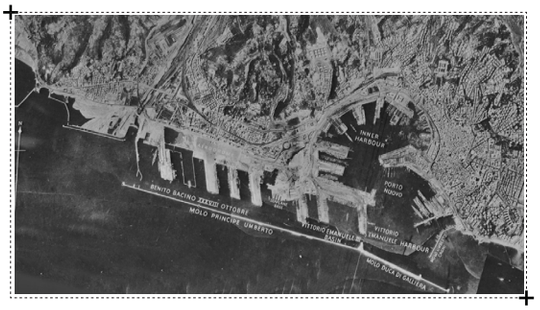


Figure 30. Genova Port's evolution diagrams.
(Piano Regolatore Portuale, 2001)

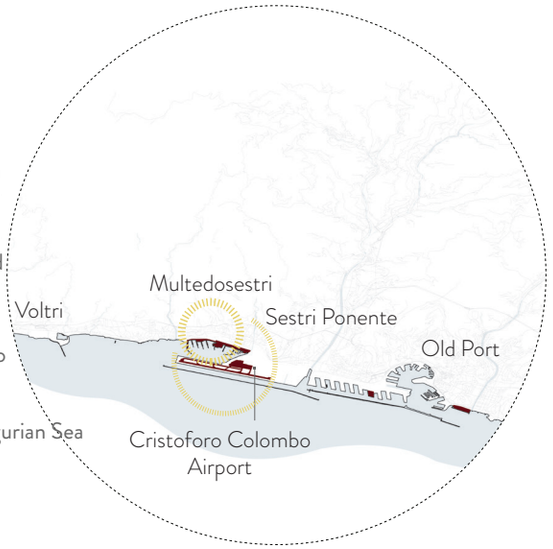
Centralization & Desentralization

Regionalization

1970

The Multedosestri area is projected as a large oil terminal, made up of inner harbor for mooring oil tankers, a dock with two berths, and four piers. The first pier came into operation in 1963, the second in 1965 and at the end of 1970 the four piers were completely operational.

Construction of the Cristoforo Colombo airport starting a new pole f development to the Sestri Ponente area.

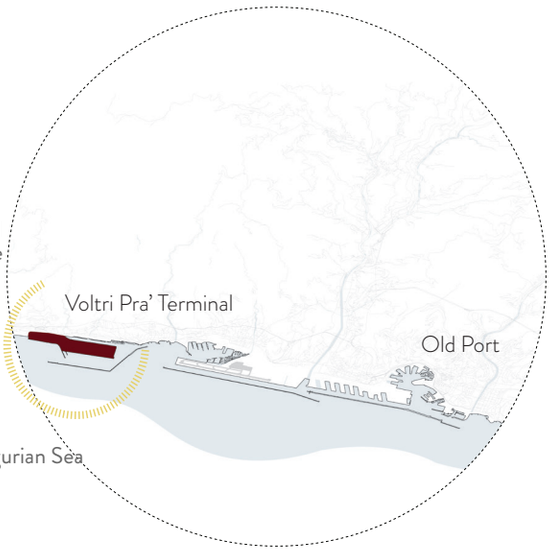


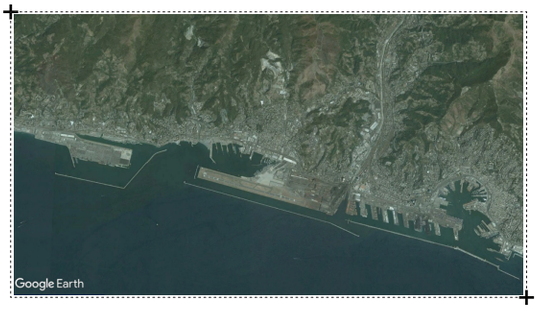
Advent of containerization

Intermodal transport

1990

Construction of the new Voltri terminal for bulk solid and liquid cargo. Given the evolution of the transport and handling systems of diverse goods, the new terminal features the improvement of the traditional dock and technology.





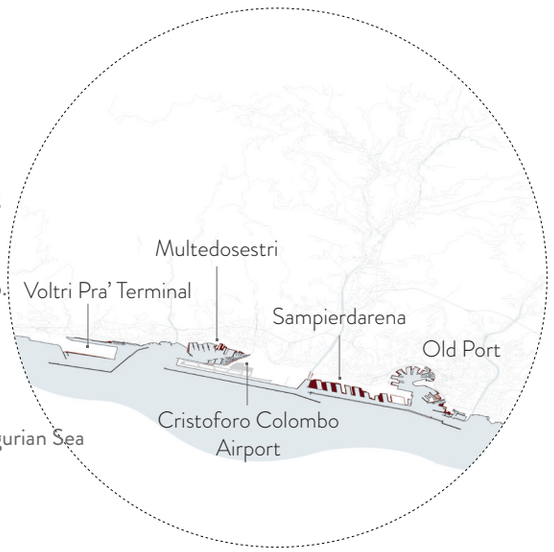
Emergence of inland terminals

Desentralization: Savona and Vado Ligure Terminals

from 2000 ongoing...

The Sampierdarena dock is expanded into five docks, with the aim of creating more space for the handling of various products, such as Base Metals, Steel, Ferroalloys, Soft Commodities, Forest Products, Project Cargo, General Cargo.

To the west of the Ponte S. Giorgio a temporary seaplane base was set up.



Vado Ligure and Savona

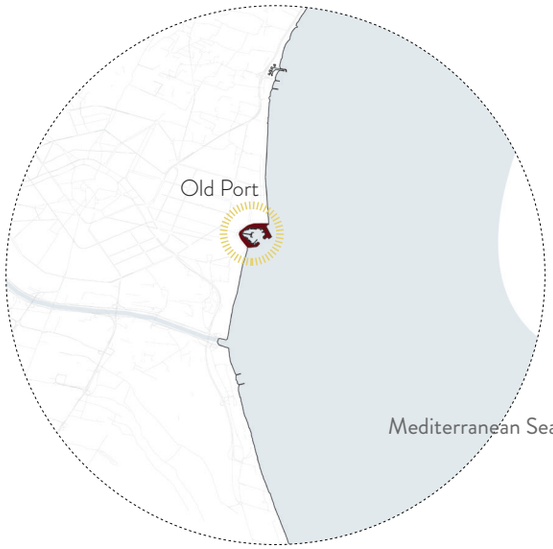
4.2 Valencia's Port Evolution

Setting

1860

The port was consolidated in 1820, after a series of failed efforts, fights against the Turia river and debates about its construction. At that time the port was away from the city and its access was through the Turia river.

The Old Port has a semi-curved shape with two branches El Levante Dock area in the North, and a small dock in the South.

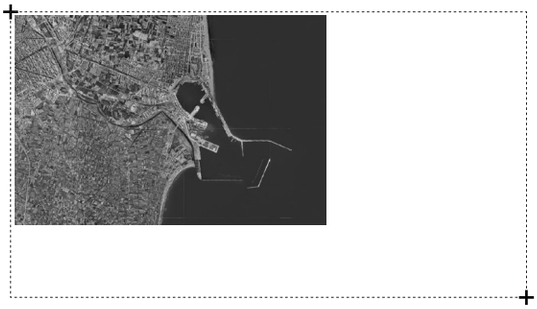


Expansion

1945

The inclusion of Valencia in free trade with America prompted the expansion of the El Levante Dock.
The pier at this new orientation would not only accommodate a larger number of ships but also solve tidal problems.

Better conditions were provided to the entrance to the port.



Specialization

1990

The growing container traffic fostered the construction of two areas: The Southern dock (Principe San Felipe), used temporarily for container activities. (By this time, Barcelona was the main port for container traffic)

And the Northeastern dock (El Levante area), started to operate as the main container terminal at the end of the 90s.

Advent of containerization

Intermodal transport

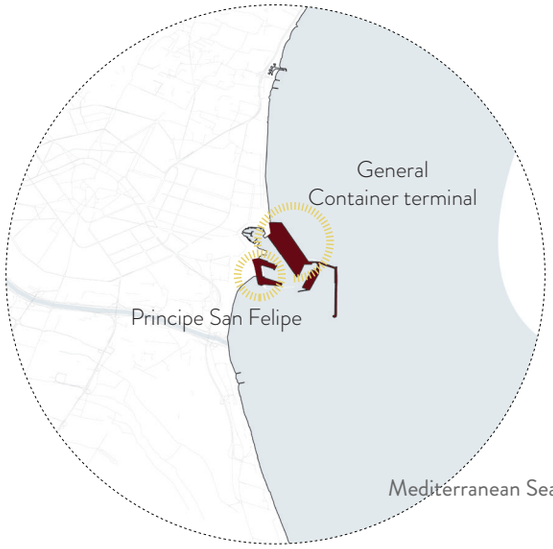


Figure 31. Valencia Port's evolution diagrams.
(Autoridad Portuaria de Valencia, 2015)

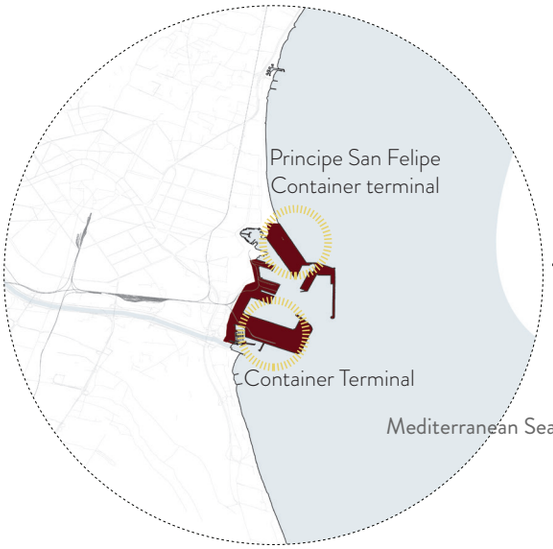
Regionalization

Centralization & Desentralization

2001

Construction of a new container terminal platform to the South-East and extension of the North-East platform. Two docks were proyected in the Southern platform.

A project was carried out to divert the course of the Turia river.



Sagunto Port

Gandía Port

Emergence of inland terminals

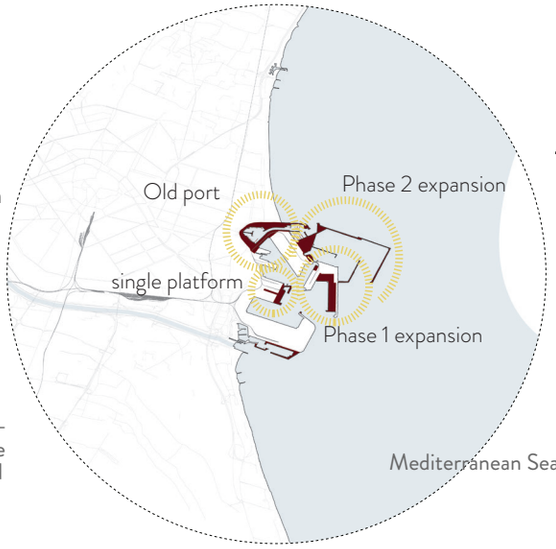
Desentralization: Gandia and Sagunto Ports

2012

With the redirection of the Turia river, the southern docks were configured in a single platform to host solid bulk cargo and container terminal

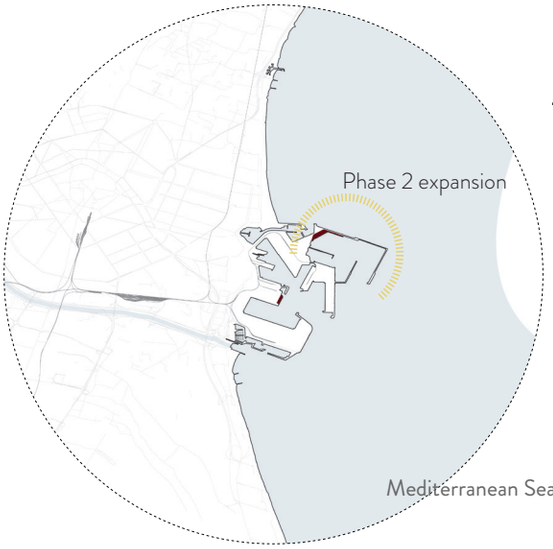
The expansion of the northern part is projected in two phases: Phase 1 destined for petroleum products and Ro-Ro cargo. Phase 2 container terminal

The access of the railway line to the interior of the container terminal divided the port in two. The old port area is destined for passenger and cruise ship traffic

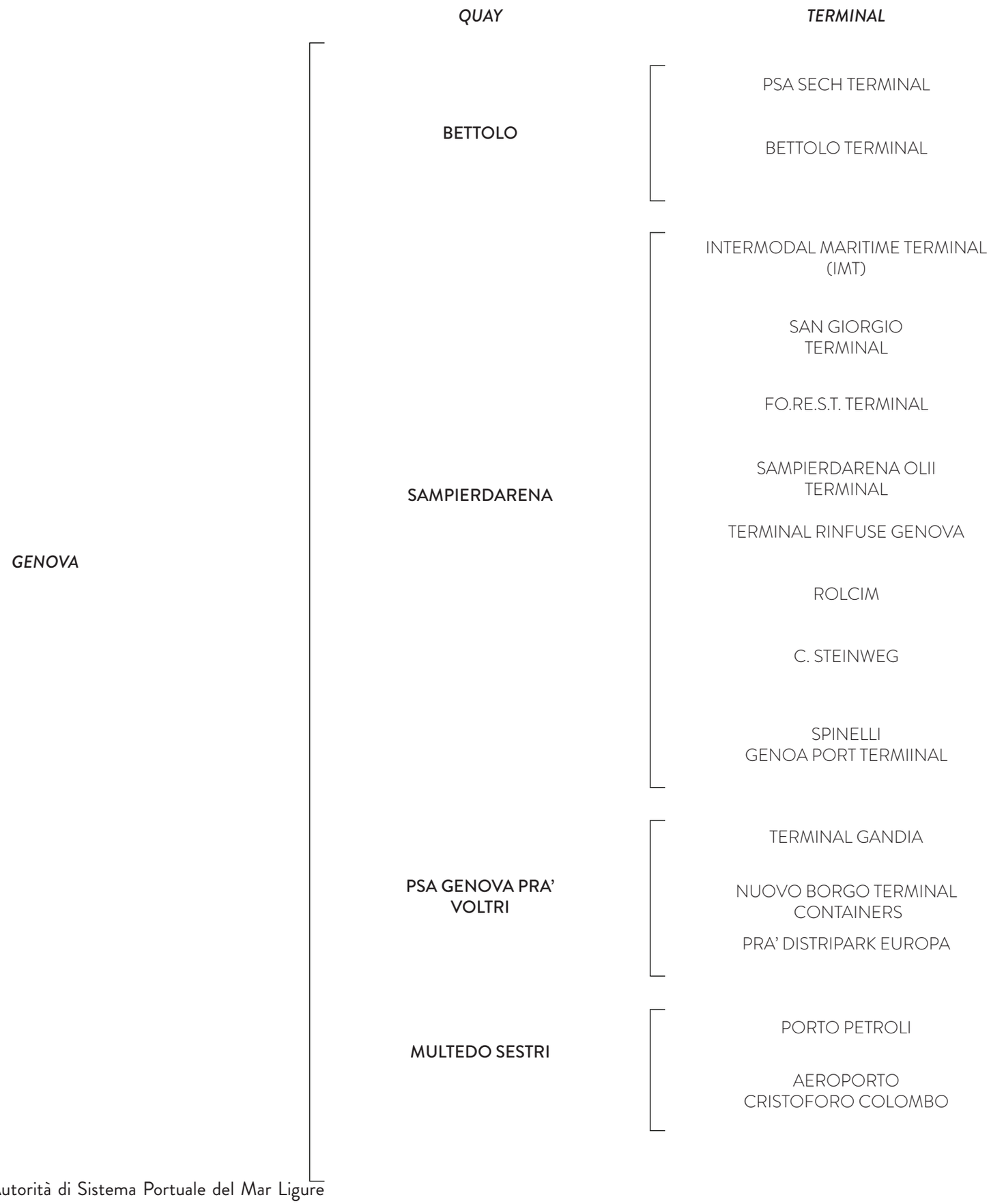


from 2015 ongoing...

Future expansions to host a new container terminal are expected in phase 2.



4.3 MaritimeTerminals: Genova



Autorità di Sistema Portuale del Mar Ligure Occidentale, 2023

FUNCTION	*TERMINAL OPERATOR*
Container terminal	PSA INTERNATIONAL
Container Terminal SAAR Liquid Bulk / GETOIL Mineral Oils PETROLIG Mineral Oils	MSC Group
Multipurpose terminal: containers, general cargos, equipment, yachts, boats and special cargos	Messina S.p.a
Containers, RORO cargo, steel, metals, break bulk, project cargo, heavy lift machinery and yachts.	Gavio Group
Forest products	Campostano Group
Bulk liquid products, animal, vegetable and mineral origin.	Sampierdarena Olii S.R.L
Bulk products: coal, silica sand, cement, fertilizers, minerals, biomass, project cargo, steel.	Terminal Rinfuse Genova S.r.l.
Cement products	Rolcim Spa Holcim / Lafarge group
Base Metals, Steel, Ferro Alloys, Soft Commodities, forest products, project cargo, General Cargo.	C. Steinweg - GMT S.r.l.
Containers, General Cargo and Ro-Ro.	Gruppo Spinelli
Logistic services / containers	PSA INTERNATIONAL
Logistic services / containers	Nuovo Borgo Terminal Containers Scerni Group
Logistic services	Gruppo Spinelli
Crude oil, petroleum and petrochemicals products.	Porto Petroli S.P.A
International passanger and cargo airport	Autorità di Sistema Portuale del Mar Ligure Occidentale (60%) Camera di Commercio di Genova (25%) Aeroporti di Roma S.p.A. (15%)

SAVONA

- SAVONA TERMINAL
- SAVONA TERMINAL AUTO
- MONFER

VADO LIGURE

- FORSHIP TERMINAL
- REEFER TERMINAL APM
- VADO GATEWAY

Autorità di Sistema Portuale del Mar Ligure Occidentale, 2023

Multipurpose: forest products, and bulk goods. Iron and steel products (semi-finished and finished products) and ferrous bulk.	Campostano Group/ MUST SpA
Cars, and operating machines. Project Cargo and Heavy Lift Cargo.	
Cereals, semi-oils products	Monfer S.P.A
Passenger traffic (ferry and cruise) and Ro-Ro operations.	Forship S.P.A
Multipurpose terminal: refrigerated cargo containers, fruits.	APM Terminals
Container terminal	APM Terminals (50,1%),
	Cosco Shipping Ports (40%)
	Qingdao Port International, (9,9%).

4.4 Maritime Terminals: Valencia

	QUAY	*TERMINAL*
VALENCIA PORT	DARSENA TURIA EL LEVANTE QUAY, SOUTH QUAY, EL PONIENTE QUAY	TCV CONTAINER TERMINAL
		BULK MARITIME TERMINAL S.L.
		TRANSMEDITERRANEA TERMINAL
		CEMEX
	SOUTH DARSENA PRINCIPE SAN FELIPE, TRANSVER- SAL COSTAL QUAY	CSP IBERIAN VALENCIA TERMINAL
		MSC TERMINAL VALENCIA
	EAST DARSENA	VALENCIA TERMINAL EUROPA S.A
		TERMINAL GRIMALDI
		TERMINAL GALP VALENCIA
		TEPSA
	NORTH QUAY EXTENSION	
SAGUNTO	DARSENA 1	NOATUM TERMINAL SAGUNTO
		VMG
		FERTIBERIA
	DARSENA 2	TOYOTA LOGISTICS TERMINAL
		GRIMALDI TERMINAL
		REGASIFICATION PLANT
GANDIA	SERPIS QUAY	TERMINAL GANDIA

Valencia Port Authority, 2023
APM Terminals, 2023
CSP Spain Port for all, 2023

FUNCTION	*TERMINAL OPERATOR*
Multipurpose / Container terminal	APM TERMINALS
Solid bulk cargo	TEMAGRA
Passenger Traffic terminal, Cruise and Ferry.	GRIMALDI GROUP
Cement products	CEMEX LOGISTICA ESPAÑA
Container terminal	COSCO SHIPPING Ports
Container terminal	MSC Group
Cargo RO-RO	GRIMALDI GROUP
Cargo RO-RO	
Chemical and petroleum products	
Passenger Traffic terminal, Cruise and Ferry.	
Multipurpose/Container terminal	NOATUM
Ship repairs area, manteinance.	VMG Refit & Repair S.L.
Fertiliser Plant	
RO-RO cargo/ vehicle terminal	TOYOTA
Passenger Traffic terminal, Cruise and Ferry.	GRIMALDI GROUP
Liquefied natural gas	SAGGAS
Multipurpose/Container terminal	NAVARRO AND BORONAD

4.5 Inland Terminals: Genova

INLAND TERMINAL	*OWNERSHIP*
NOVARA Piedmont	**CIM S.P.A** HUPAC (80%) Combiconnect (20%) Eurogateway
RIVALTA SCRIVIA TERMINAL EUROPA Piedmont	**RIVALTA TERMINAL EUROPA** Società Katoen Natie Gavio Group Maersk Group Orsero Group
MILANO - MELZO Lombardy	**CONTSHIP GROUP ITALY** Eurogateway: Rail Hub Milano - Sogemar - Hannibal group. Kombiverkehr
BUSTO ARSIZO - GALLARTE Lombardy	**HUPAC S.P.A** Hupac Intermodal Italia Termi S.P.A Swiss and Italian railway companies
MORTARA Lombardy	**T.I.M.O S.P.A** Kombiverkehr
SI.TO DI TORINO Piedmont	**FINPIEMONTE** Socotras S.P.A Mercitalia Logistics S.P.A

Autorità di Sistema Portuale del Mar Ligure Occidentale, 2023

Contship Italia group, 2023
Contship Italia group, 2023b
CIM S.P.A, 2023
HUPAC, 2020
S.I.TO Societa' Interporto di Torino, 2023
Polo Logistico di Mortara, 2020
Rivalta Terminal Europa SPA., 2020

	CORRIDORS	*ROUTES*
CORRIDOR 24 **CORRIDOR V**	**Rhine-Alpine / Mediterranean** The Netherlands, Germany Rhine/Main, Italy Belgium, Germany, Switzerland, France, Spain, Italy Scandinavia, North-South Germany, Italy	Ludwigshafen KTL Karlsruhe Rotterdam RSC Paris Bonneuil Hannover LH Zeebrugge C. Ports Lübeck Rail Baltic La Spezia Melzo
CORRIDOR 24 **CORRIDOR V**	**Rhine-Alpine / Mediterranean** The Netherlands, Germany Rhine/Main, Italy Belgium, Germany, Switzerland, France, Spain, Italy Scandinavia, North-South Germany, Italy	Ludwigshafen KTL Karlsruhe Rotterdam RSC Paris Bonneuil Hannover LH Zeebrugge C. Ports Lübeck Rail Baltic
CORRIDOR 24 **CORRIDOR V**	**Rhine-Alpine / Mediterranean** The Netherlands, Germany Rhine/Main, Italy Switzerland, Vienna, Italy China, Italy	Rotterdam RSC Rotterdam Botleck Koeln Eifeltor Venlo Vienna Padova Ravenna Frenkendorf Xi'an Marzaglia Bari La spezia Basel Zurich (Niederglatt) Novara
CORRIDOR 24 **CORRIDOR V**	**Rhine-Alpine / Mediterranean** The Netherlands, Germany Rhine/Main, Italy Belgium, Germany, Switzerland, France, Spain, Italy Scandinavia, North-South Germany, Italy	Ludwigshafen KTL Rotterdam RSC Venlo Antwerp HTA Barcelona El Morrot Trieste Switzerland Zeebrugge P&O Duisburg/Singen Hamburg Billwerder
CORRIDOR 24	**Rhine-Alpine** The Netherlands, Germany Rhine/Main, Italy Belgium	Rotterdam RSC Krefeld Gent
CORRIDOR 24 **CORRIDOR V**	**Rhine-Alpine / Mediterranean** The Netherlands, Germany Rhine/Main, Italy Belgium, Germany, Switzerland, France, Spain, Italy Scandinavia, North-South Germany, Italy	Rotterdam RSC Rotterdam Botleck Koeln Eifeltor Venlo Vienna Padova Ravenna Frenkendorf La spezia Basel Zurich (Niederglatt) Novara Barcelona

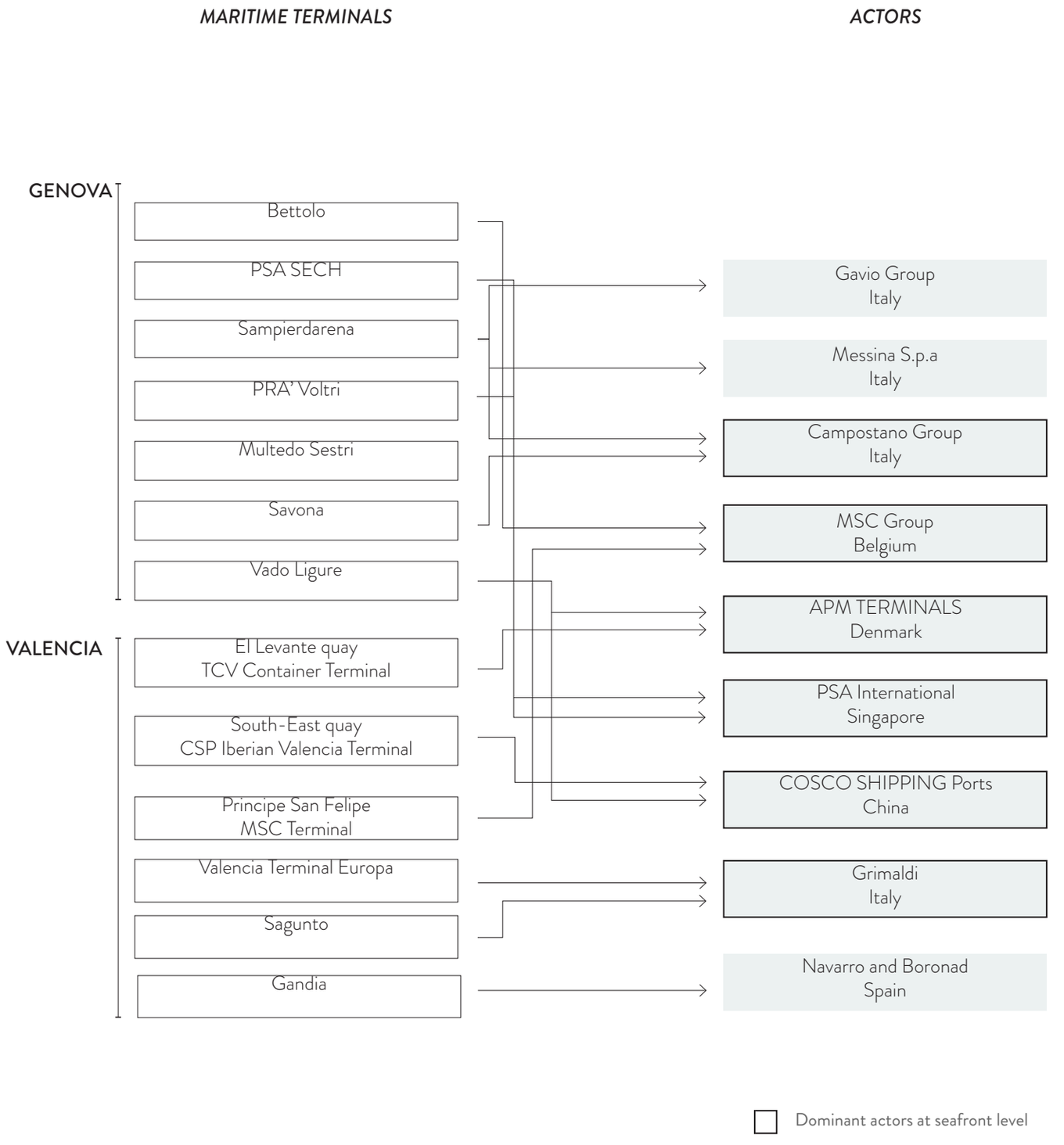
4.6 Inland Terminals: Valencia

INLAND TERMINAL	*OWNERSHIP*
PUERTO SECO DE MADRID Madrid	**CONTERAIL S.A.** COSCO SHIPPING Ports (Spain) Valencia Port Authority
PUERTO SECO DE AZUQUECA DE HENARES Guadalajara	**AZUQUECA DE HENARES S.A.** CMA CGM Barcelona Port Authority
TERMINAL MARITIMA DE ZARAGOZA Zaragoza	**TMZ SERVICES S.A.** APM TERMINAL (45%) Hutchinson Port Holding (20%) Barcelona Port Authority

Terminal Maritima de Zaragoza, 2023
APM Terminals, 2023
Puerto Seco de Madrid, 2022
CSP Spain Port for all, 2023
Aragón plataforma logistica, 2023

CORRIDORS	*ROUTES*	
Mediterranean / Atlantic Belgium, Germany, Switzerland, France France, Italy, Croatia, Hungary, China	Valencia Zaragoza Bilbao Strasbourg Antwerp Hamburg	Bremerhaven Felixstowe Singapore Hong Kong Qingdao
Mediterranean / Atlantic Belgium, Germany, Switzerland, France France, Italy, Croatia, Hungary, China	Valencia Zaragoza Bilbao Valencia Hamburg Paris	Hong Kong Qingdao Dourges
Mediterranean / Atlantic Belgium, Germany, Switzerland, France France, Italy, Croatia, Hungary, China	Valencia Barcelona Bilbao Algeciras Vigo Perpiñan Le Boulou Paris	Dourges Amberes Stuttgart Ludwisgshafen Duisburg Hamburg China

4.7 Maritime terminal actors: Genova and Valencia



4.8 Inland terminal actors: Genova and Valencia

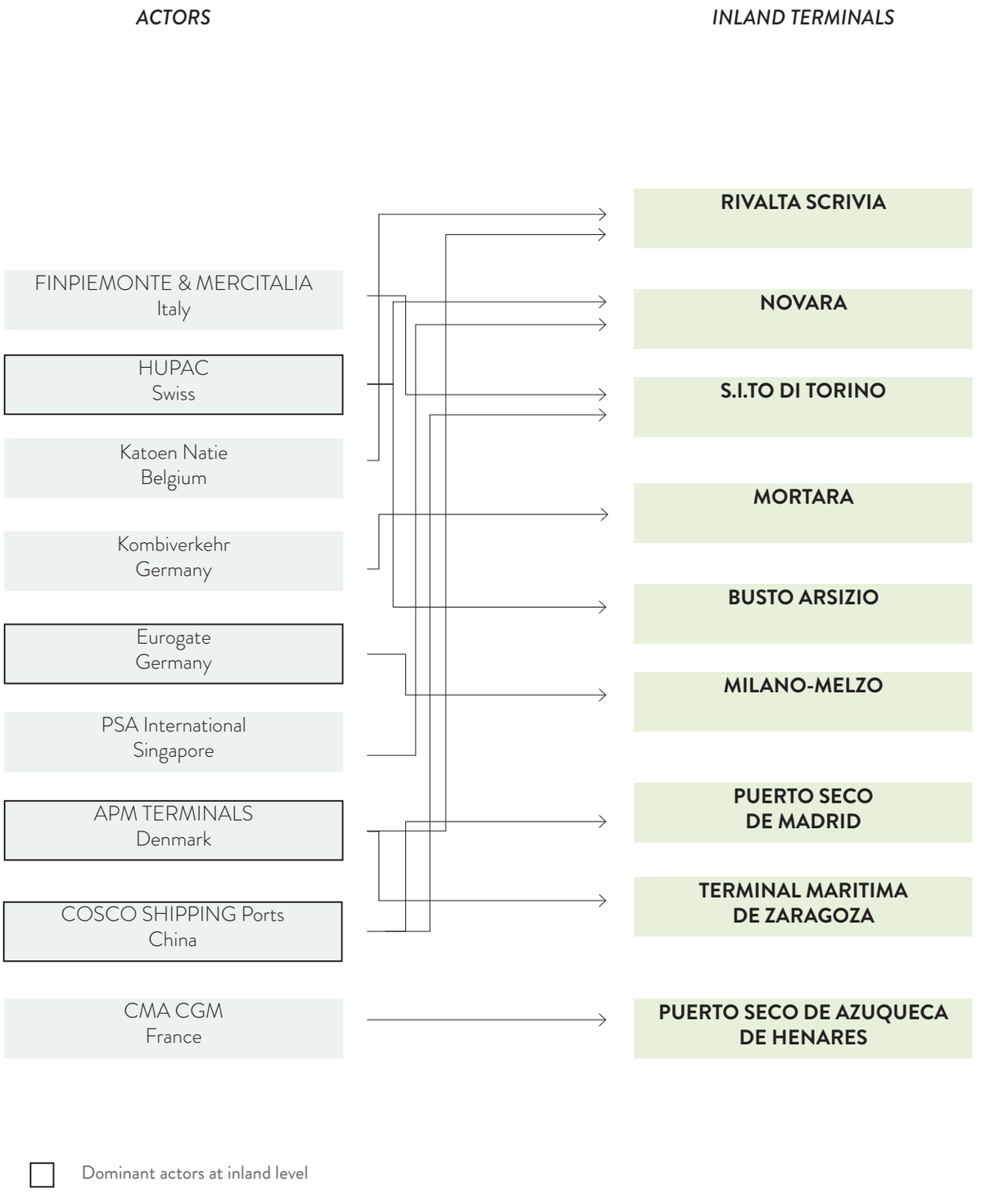


Figure 32. Milan-Melzo Terminal, Italy
From Contship, via Flickr

Chapter 4.

MEDITERRANEAN LANDSCAPES

INLANDS TERMINALS EVOLUTION

PART B

4.1 The TEN-T European Network

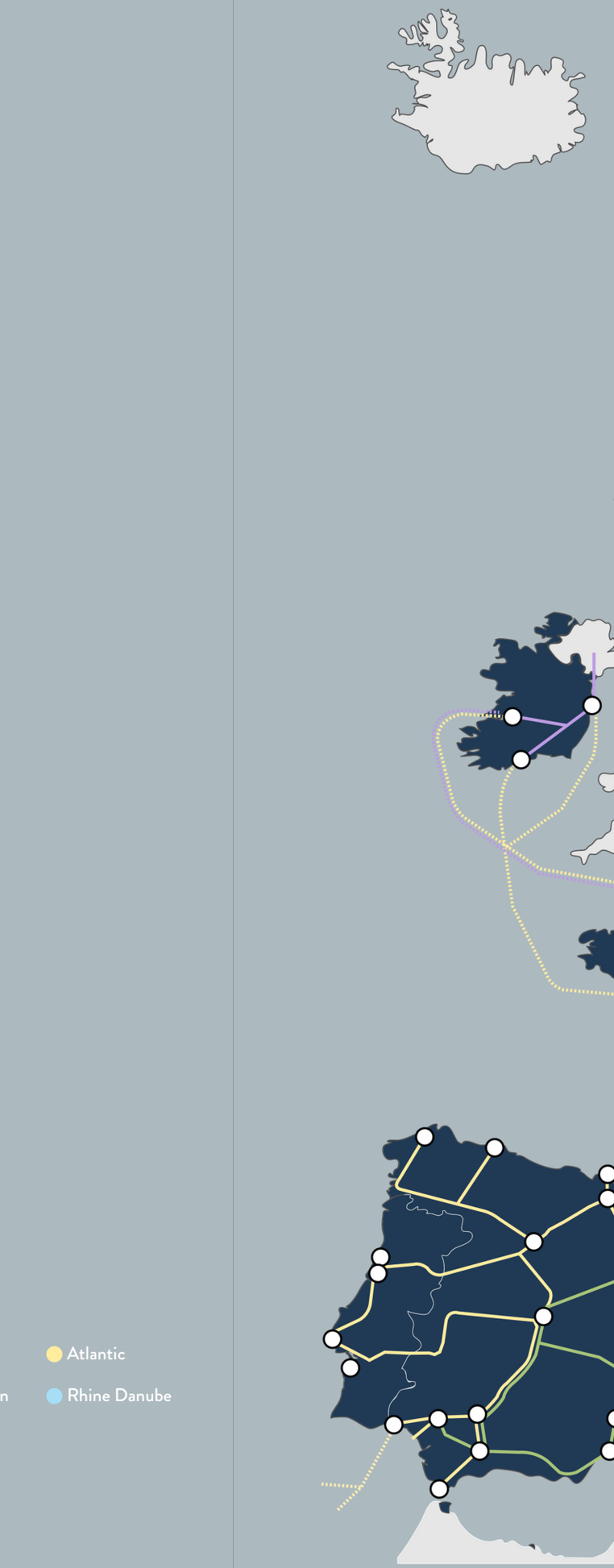
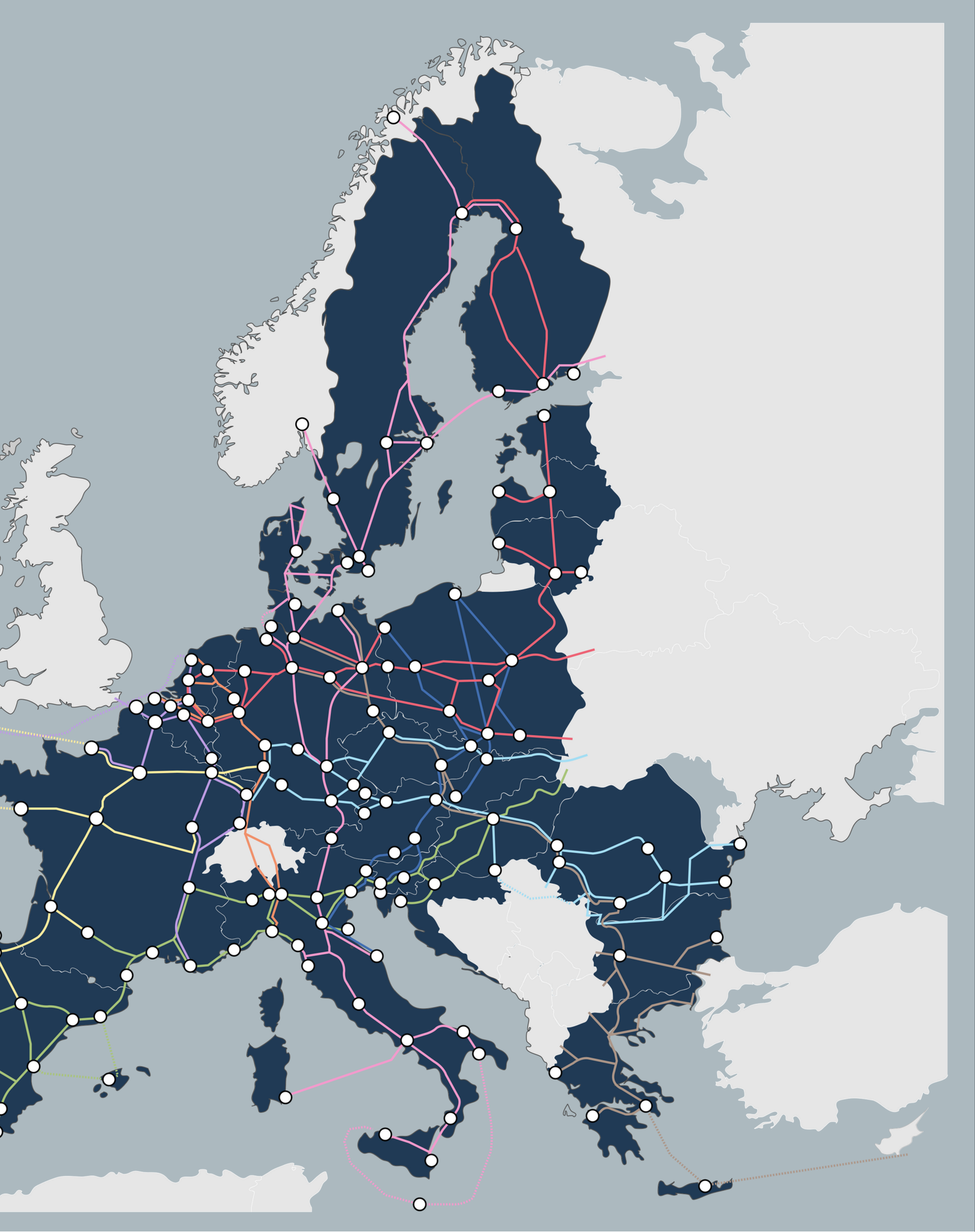


Figure 33. European TEN-T Network.
(European Commission, 2023)



LIGURIAN REGION

ITALY - PORT OF GENOVA

NORTH-WEST REGION

Figure 34. Study area Italy.
Map by Author.

4.2 Northwest Logistics network Italy

New emergencies

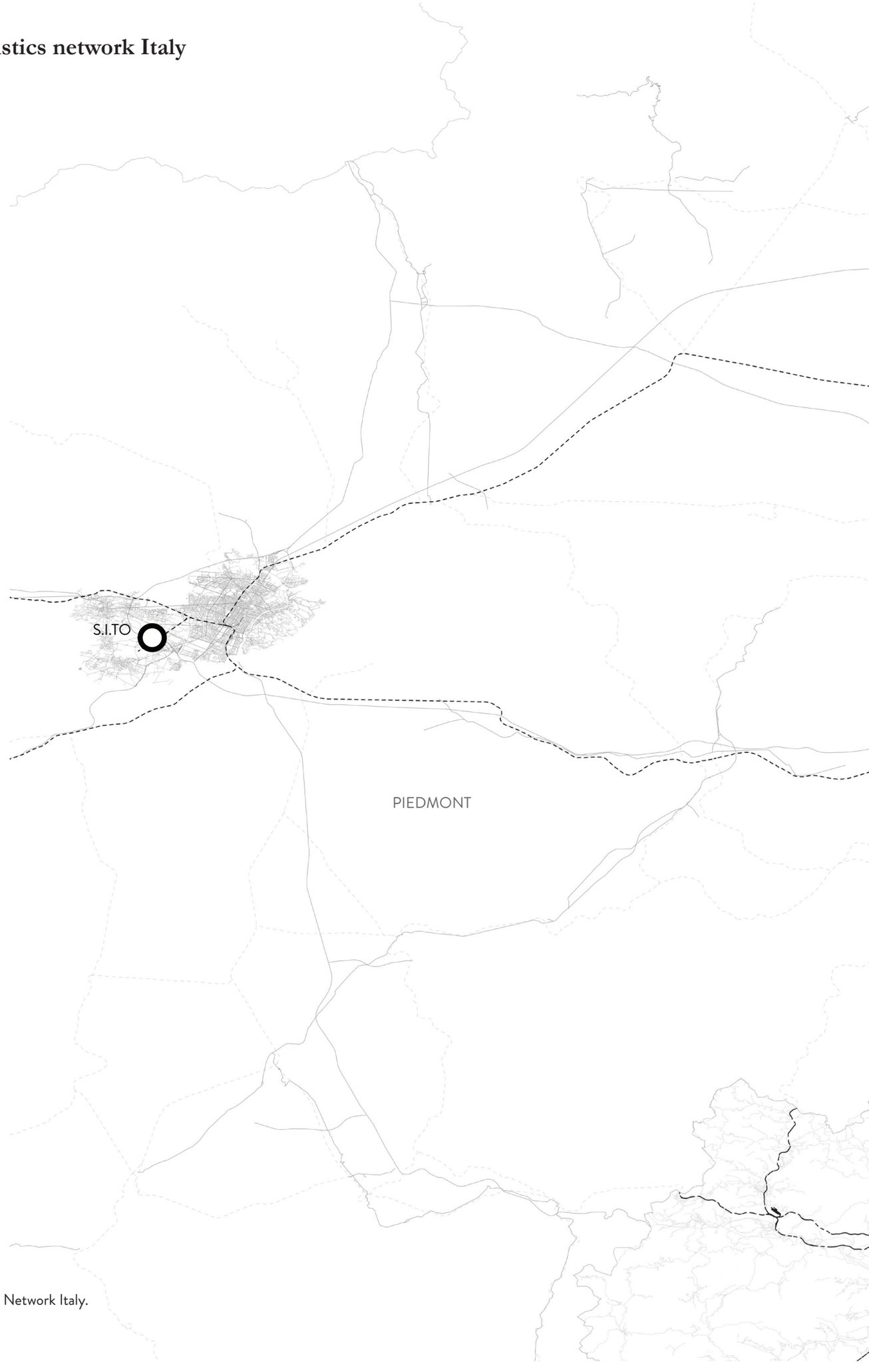


Figure 35. North-West Logistics Network Italy.
Map by Author.


Busto Arsizio
Milano-Melzo
Novara
LOMBARDY
Mortara
Rivalta Terminal Europa
LIGURIA
Genova
Savona
Vado Ligure
LIGURIAN SEA

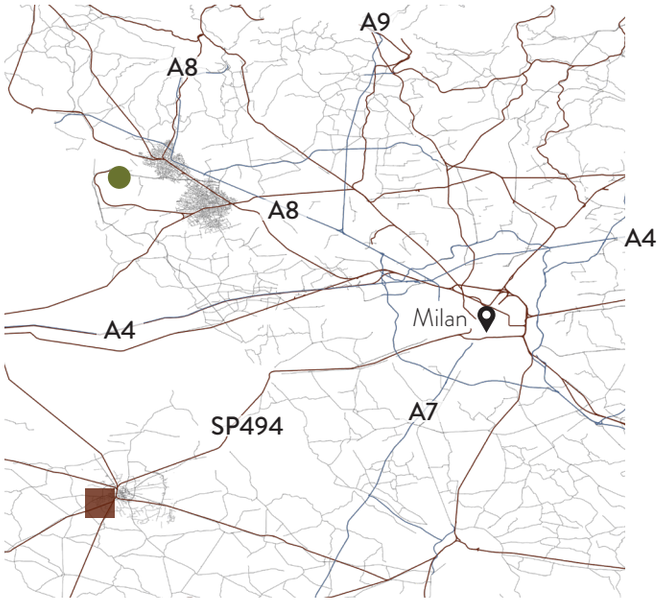
4.3 Transformation dynamics: Genova

Mortara

Mortara (PV), Lombardy.

Main Ports Genoa, La Spezia, Savona (undergoing)

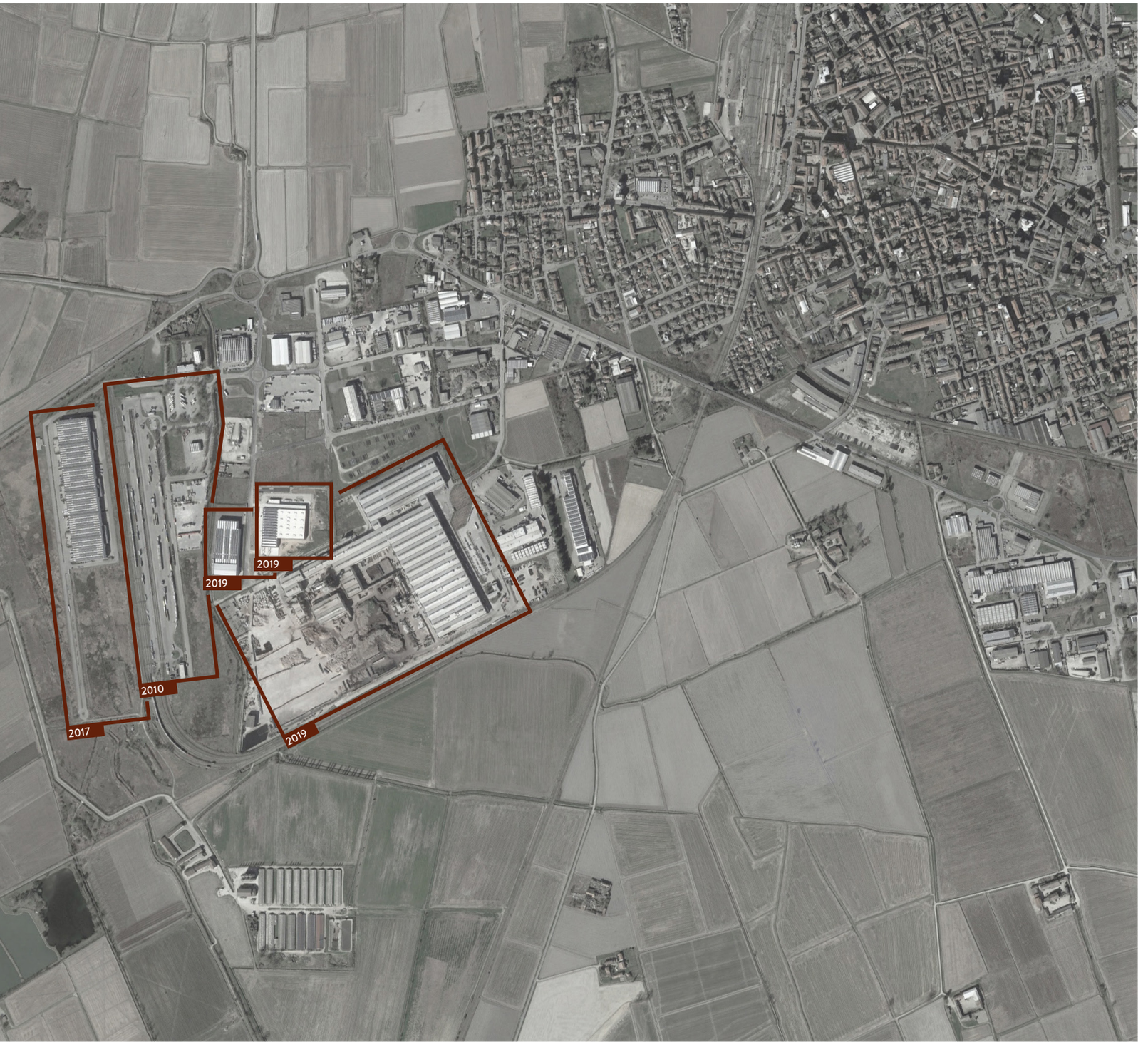
Main Routes Rotterdam / Krefeld / Gent



Malpensas Airport
Railway line
Highway line

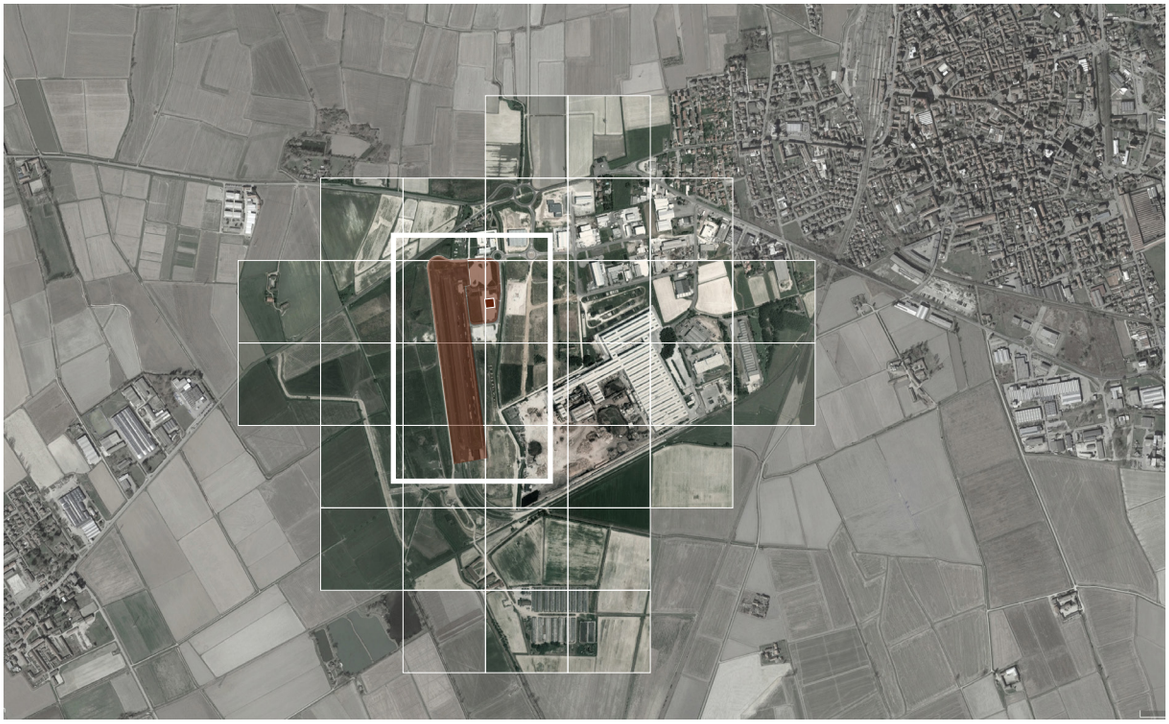
Figure 36. Mortara Terminal 2020.
Figure by Author, Google Earth.

Polo Logistico di Mortara, 2020
Polo Logistico di Mortara, 2023
Geoportale Regione Lombardia, 2023a
Geoportale Regione Lombardia, 2023b


2019
2019
2010
2017
2019

1998

Industrial and agricultural zone/ wood factory



2010

The terminal started to operate on 2009 with *The Intermodal zone:* the rail yard, a container storage facility and administrative centre).

The Mortara beltway was completed to improve the connection with the A4, A26 (Novara-Milan) and A7 highway.

2017

Construction of the logistics zone: the first warehouse of a group of 6 appeared in the northern part.
Upgrades of the A7 highway to foster the connections with Genova /
Milano-Genova railway line

2019

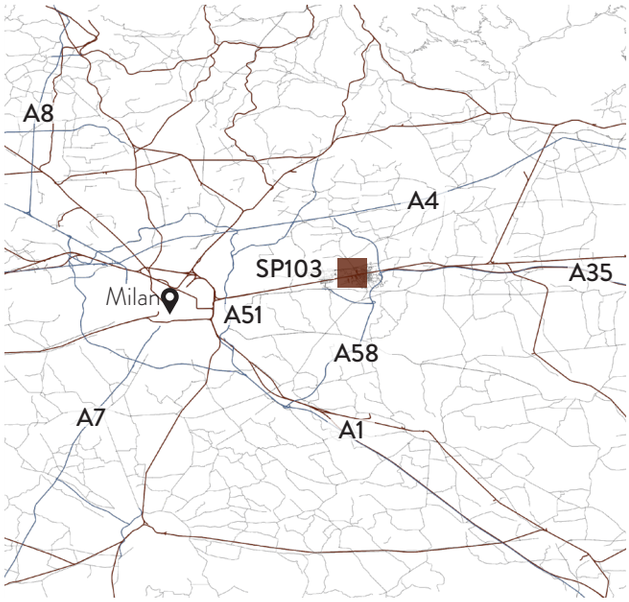
The industrial area begins to develop new facilities related to the transportation and storage of construction materials.

Milano-Melzo

Melzo, Lombardy.

Main Ports Genoa, La Spezia, Ravenna, and Bari.

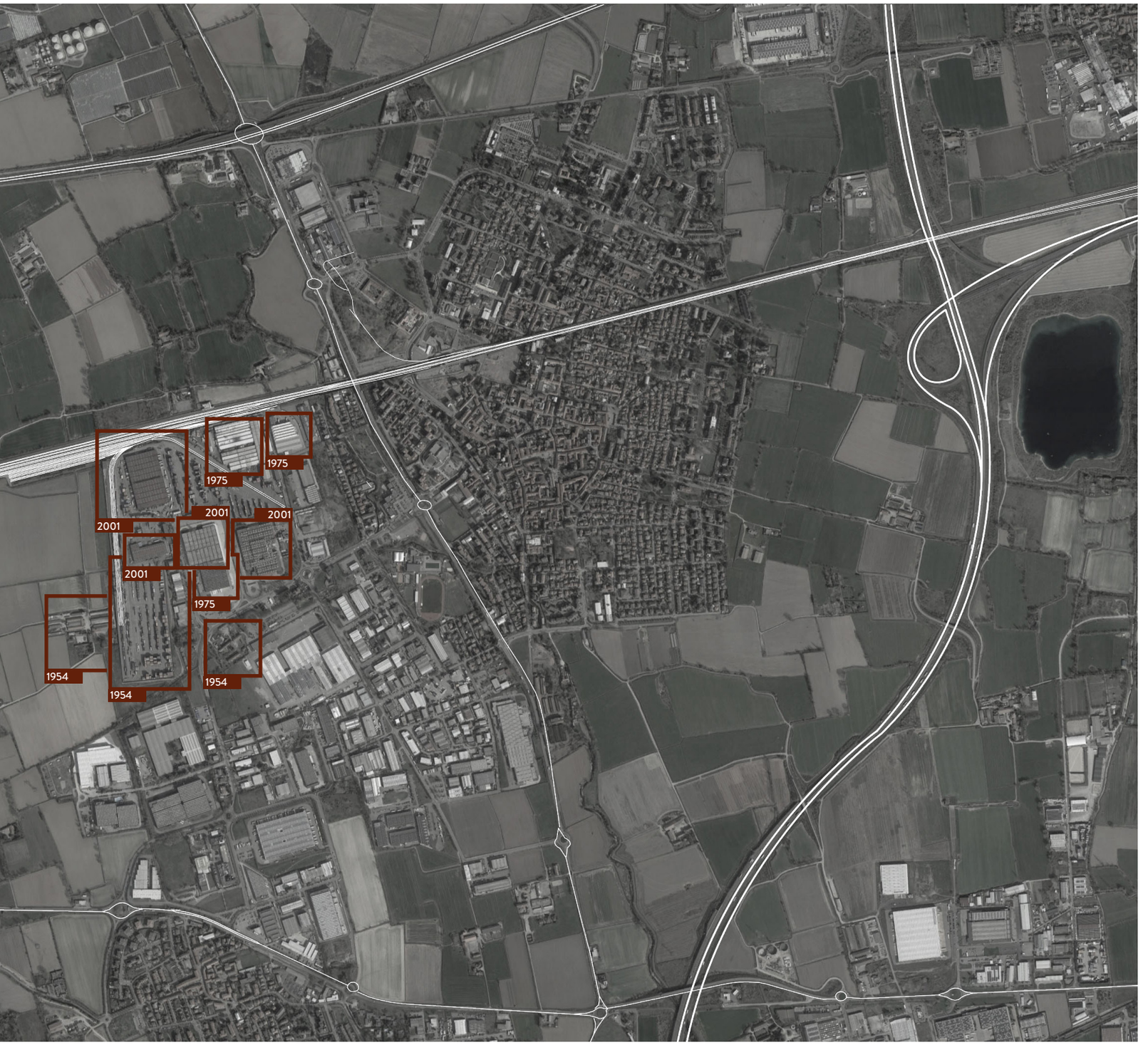
Main Routes Rotterdam / Duisburg / Frenkendorf / Vienna / Zurich / Xi'an



Railway line
Highway line

Figure 37. Milano-Melzo Terminal 2020.
Figure by Author, Google Earth.

Contship Italia group, 2023
Contship Italia group, 2023b
Ministero delle Infrastrutture e dei Trasporti, 2011
Geoportale Regione Lombardia, 2023b
Geoportale Regione Lombardia, 2023a
OTI Nord, 2023


1975
1975
2001
2001
2001
2001
1975
1954
1954
1954

1954

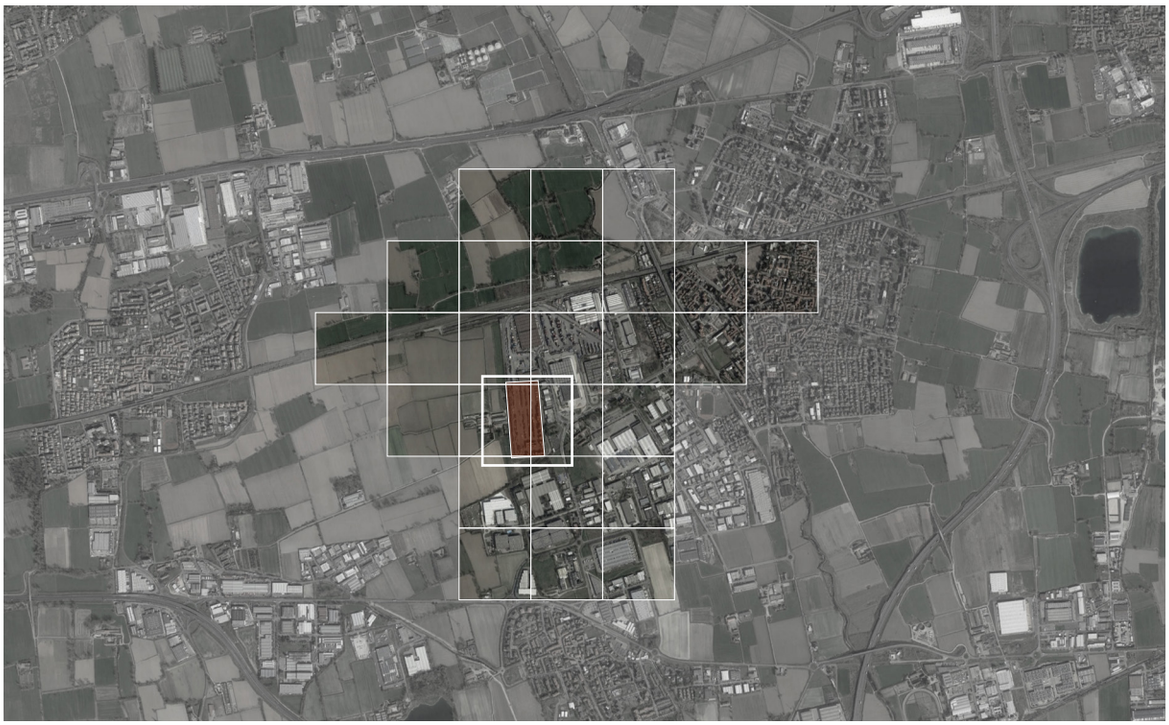
Cascina Guido / Cascina La Moneta

1975

1971. The terminal opened as a cargo terminal for the handling of goods and freight transport serving Milan.
Milano Porta Tosa-Treviglio railway line.
Further facilitites appeared on the southern along the road of the farmlands.

2009

2001. The intermodal container terminal was added to the existing facilities, operated by Contship Italia group, hosting the rail yard, truck and rails gates, and container storages facilities.
2008. Bre.Be.Mi highway (Brescia – Bergamo – Milan).



2015

2010. Milan External Eastern Ring Road - A58 TEEM (Genova) . AV/AC Milan Venice railway line.
Contship group founds Rail Hub Milan: Adding a New platform in the southest part (extension of rail yard and rail tracks, and yard equipment)

Busto Arsizio

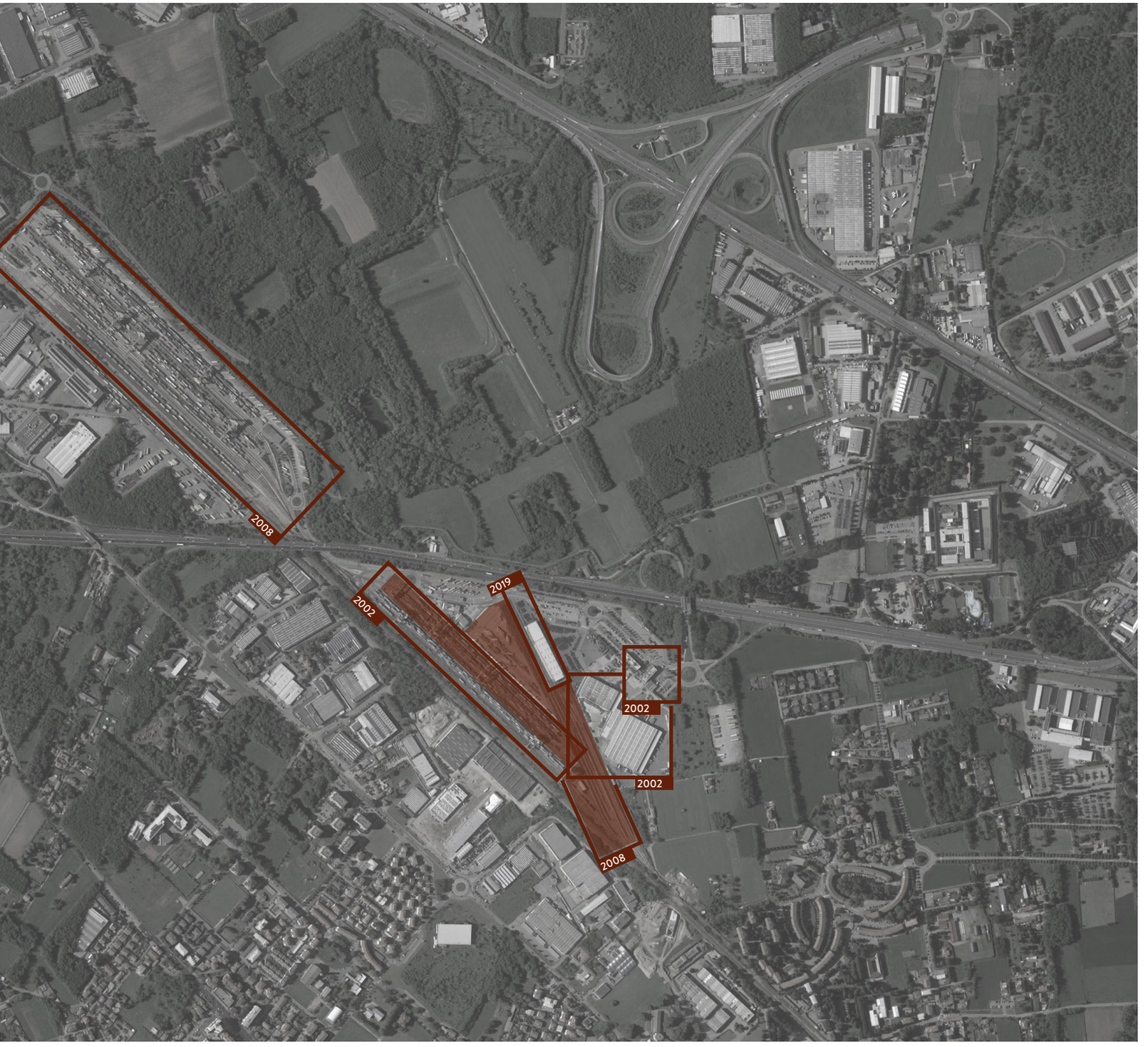
Busto Arsizio, Lombardy.

Main Ports Genoa, La Spezia, Trieste

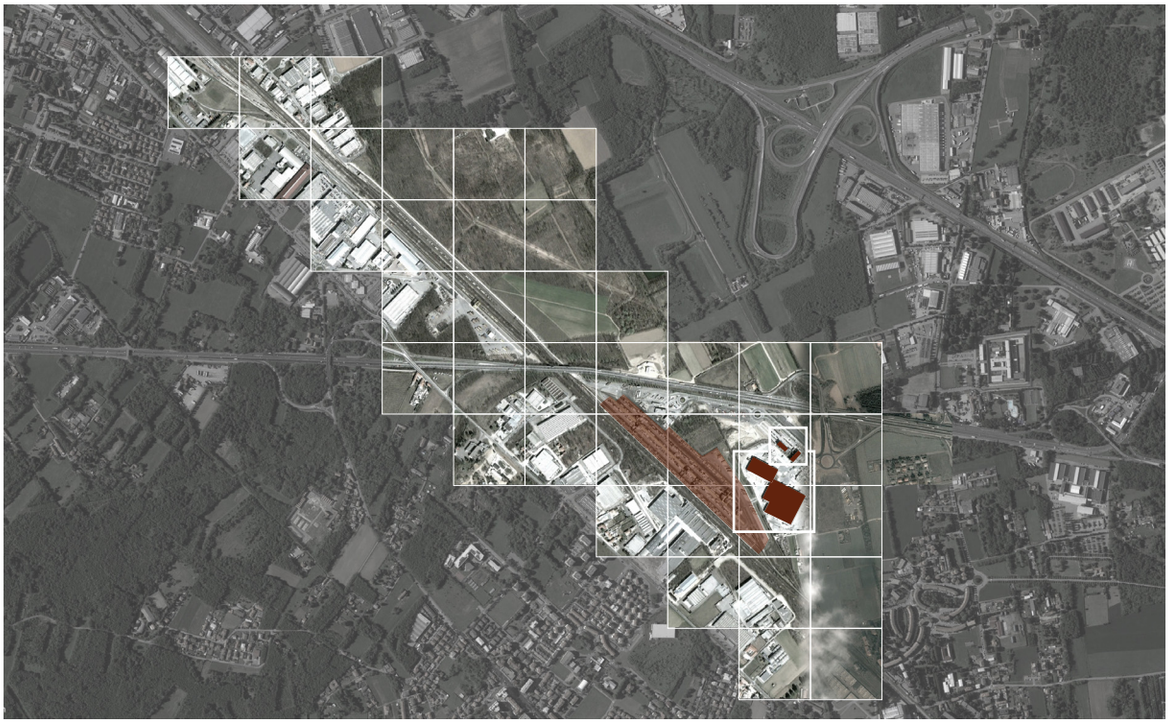
Main Routes Rotterdam / Ludwigshafen / Barcelona / Switzerland / Hamburg

Figure 38. Busto Arsizio Terminal 2020.
Figure by Author, Google Earth.

HUPAC, 2020
Raonline, 2023
Geoportale Regione Lombardia, 2023a
Geoportale Regione Lombardia, 2023b


2008
2019
2002
2002
2002
2008

1975
Farmlands



2002
The intermodal container terminal started to operate the area of the farmland, with two container warehouses, administration centre and a rail yard along the rail axis.
Key connections to the nord: Luino, Domodossola e Chiasso which fostered the upgrades of the A8, A36, and E62

2008

Ungrades of the existing rail yard, equipment yard and operational tracks.
New addition of an internal yard equipment, railway rails, truck and rails gates. New construction of intermodal terminal on the North-East, in the area of Gallarte.

2019

New addition of railway maintenance area inside the terminal, railway rails and mainteincance centre.
Upgrades in the northern part of the intermodal terminal, yard equipment.
Seregno-Malpensa-Novara railway: upgrading

Novara

Novara, Piedmont

Main Ports Genoa, La Spezia, Trieste

Main Routes Rotterdam / Ludwigshafen / Barcelona / Switzerland / Hamburg

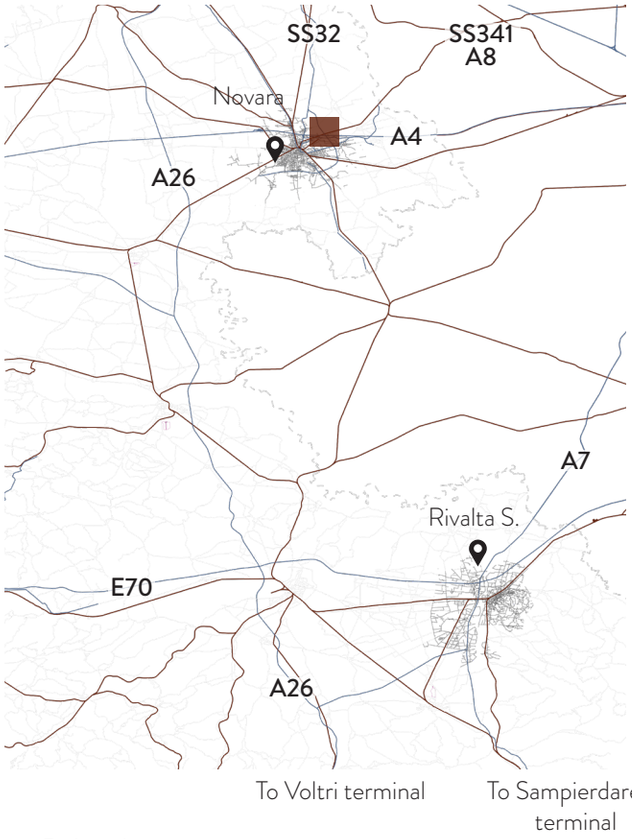
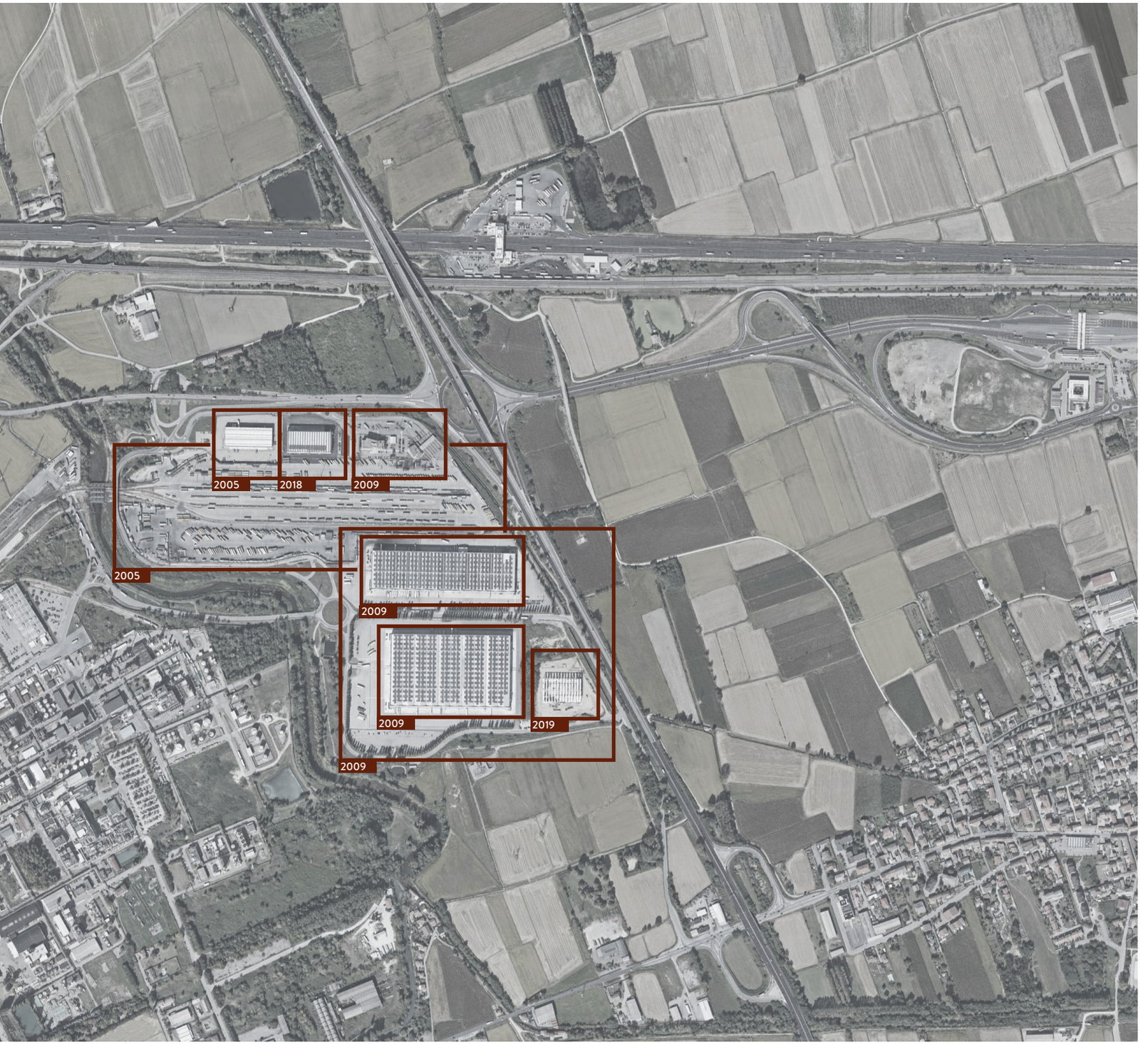
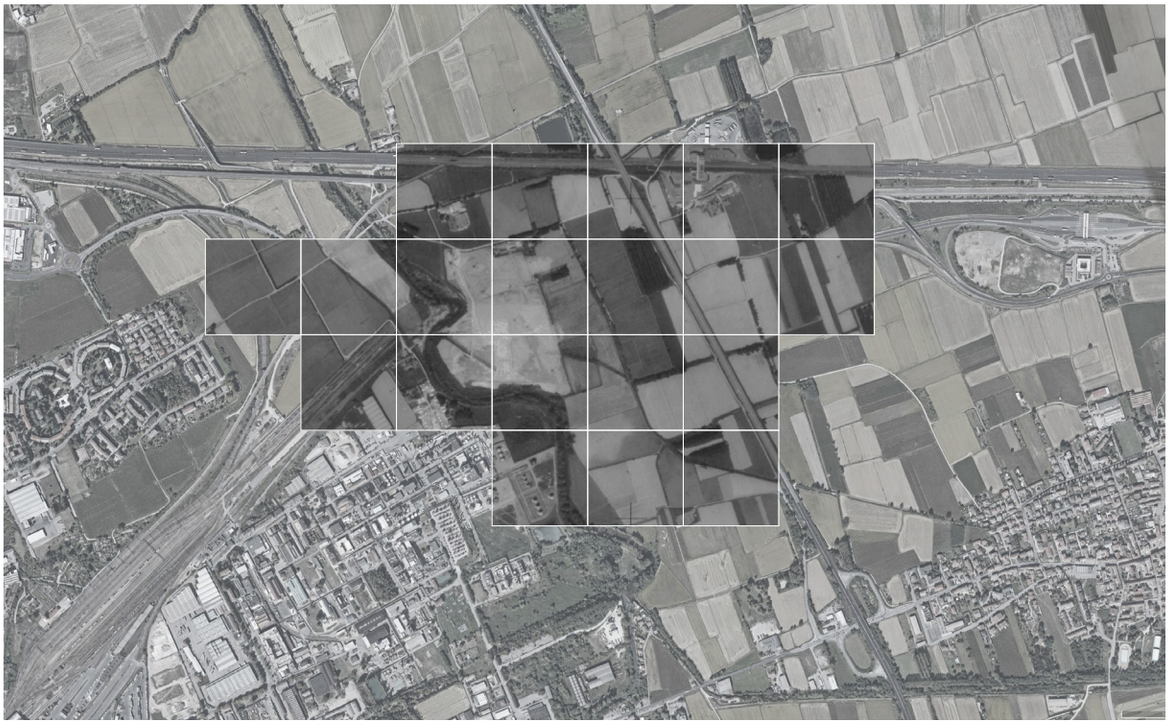


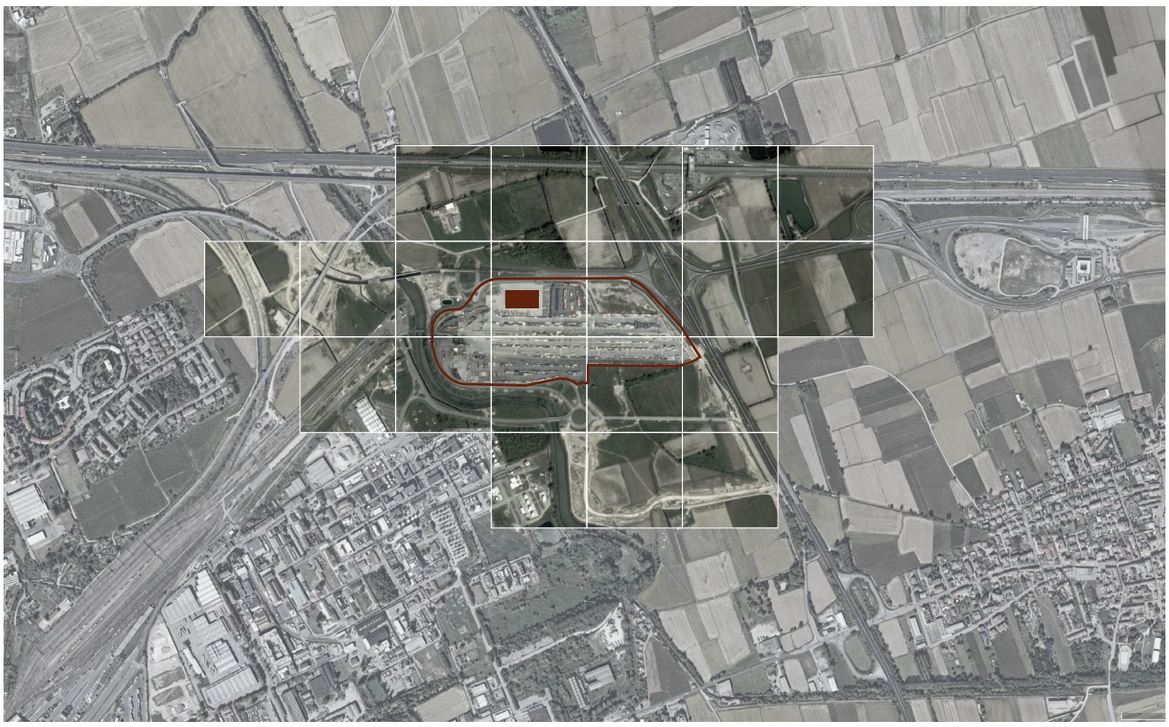
Figure 39. Novara Terminal 2020.
Figure by Author, Google Earth.

CIM S.P.A, 2023
OTI Nord, 2023b
Ministero delle Infrastrutture e dei Trasporti, 2011
Comune di Novara, 2023


2005
2018
2009
2005
2009
2009
2019
2009

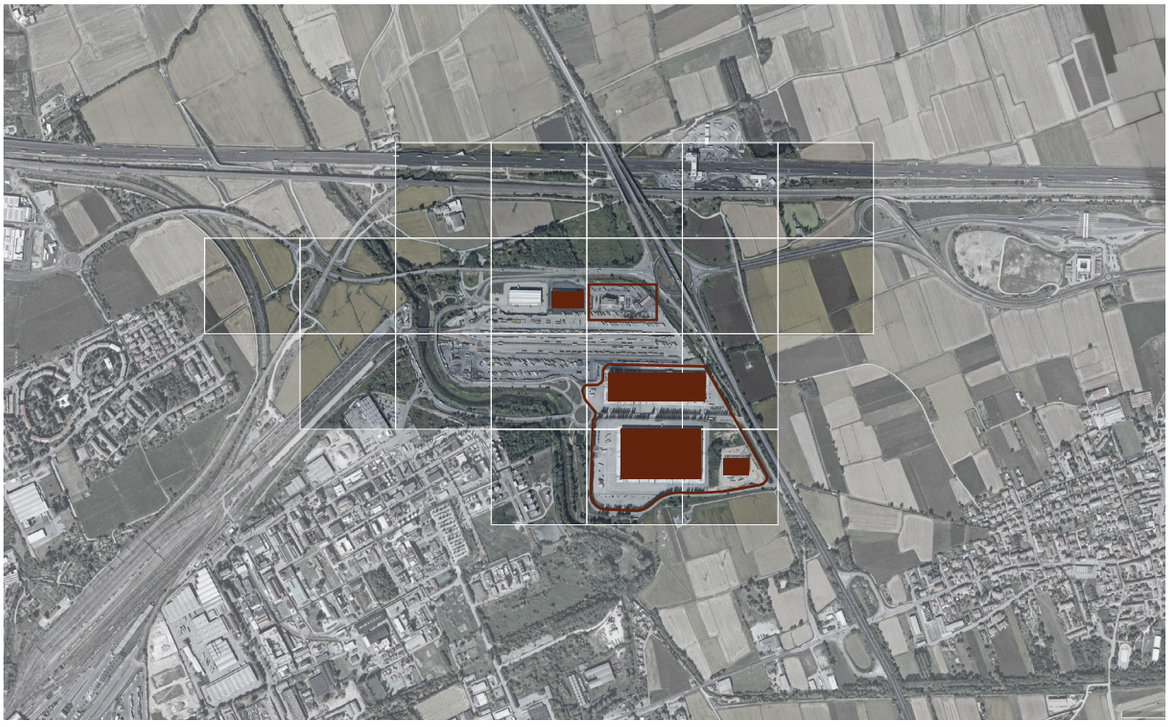


1980
The intermodal container terminal started to operate the area of the farmland, with two container warehouses, administration centre and a rail yard along the rail axis.
Key connections to the nord: Luino, Domodossola e Chiasso which fostered the upgrades of the A8, A36, and E62 highways.



2005

2005. The terminal begins operations with the intermodal area consisting of the rail and equipment yard, and a warehouse adjacent to the terminal on the north side.
Upgrading of the Novara-Busto Arsizio section. Improving the connectivity of the East tangential ring road and the A4 Highway.
Novara railway connected to the AV/AC Turin-Milan line.



2019

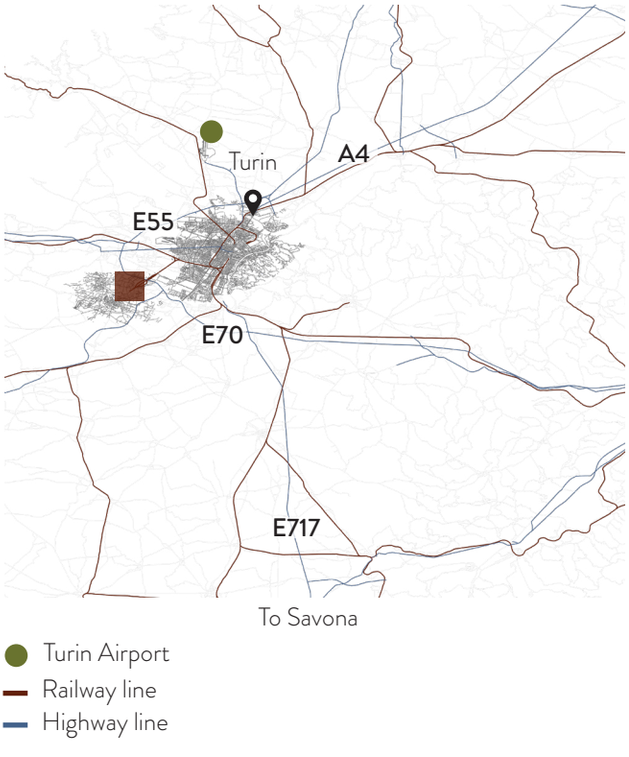
2009. Construction of the Logistics platforms to the southern part, formed by two warehouses.
A new truck access is created in the Nort-West area hosting Eurogate instalations.
2018. A new facility is added in the north to support intermodal services.

SI.TO di Torino

Orbassano, Piedmont

Main Ports Genoa, La Spezia, Trieste

Main Routes Rotterdam / Ludwigshafen / Barcelona / Switzerland / Hamburg



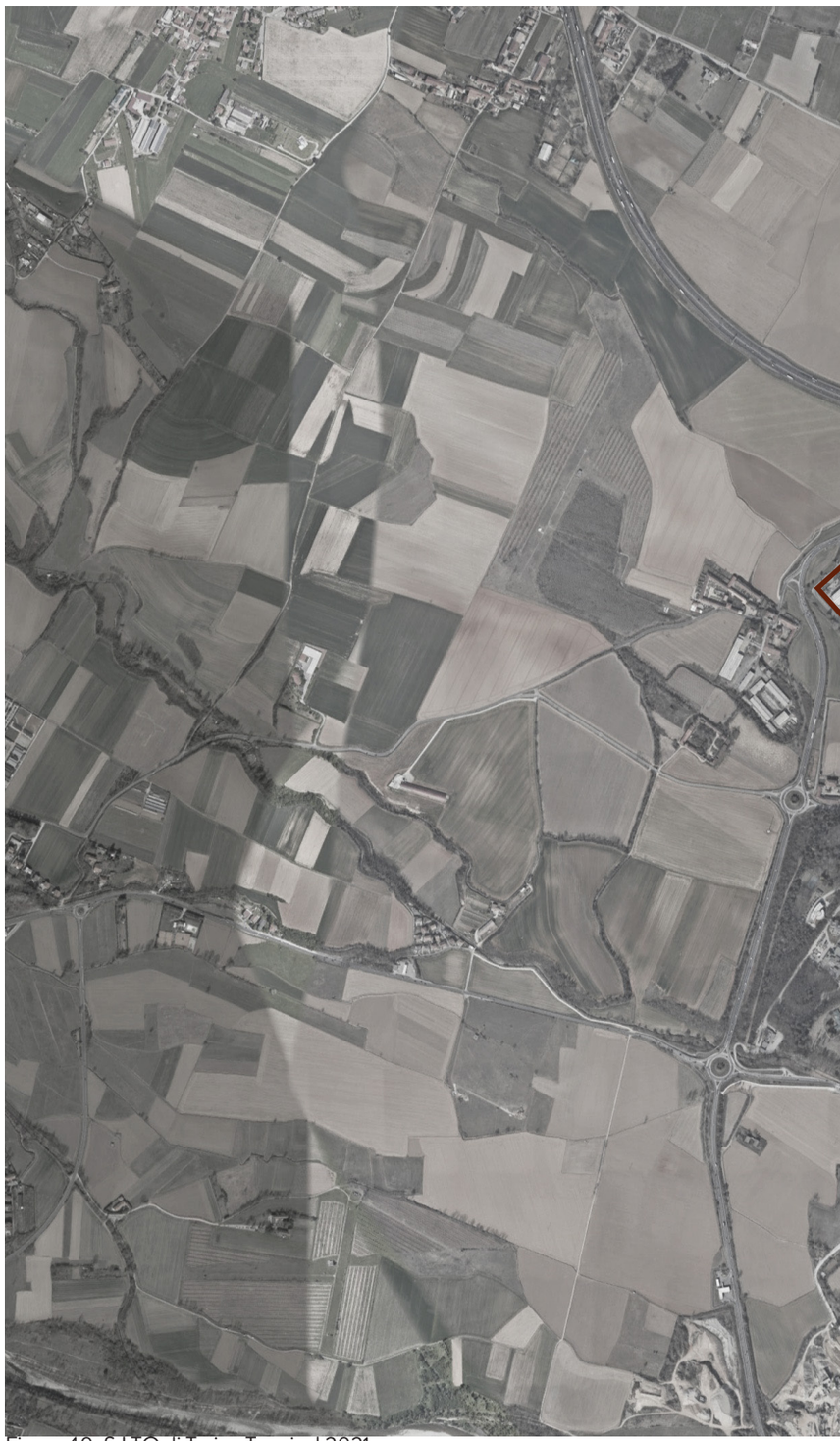


Figure 40. S.I.TO di Torino Terminal 2021.
Figure by Author, Google Earth.

S.I.TO Societa' Interporto di Torino, 2023
OTI Nord, 2023c
Ministero delle Infrastrutture e dei Trasporti, 2011


2005
2019
2005
2005
2011
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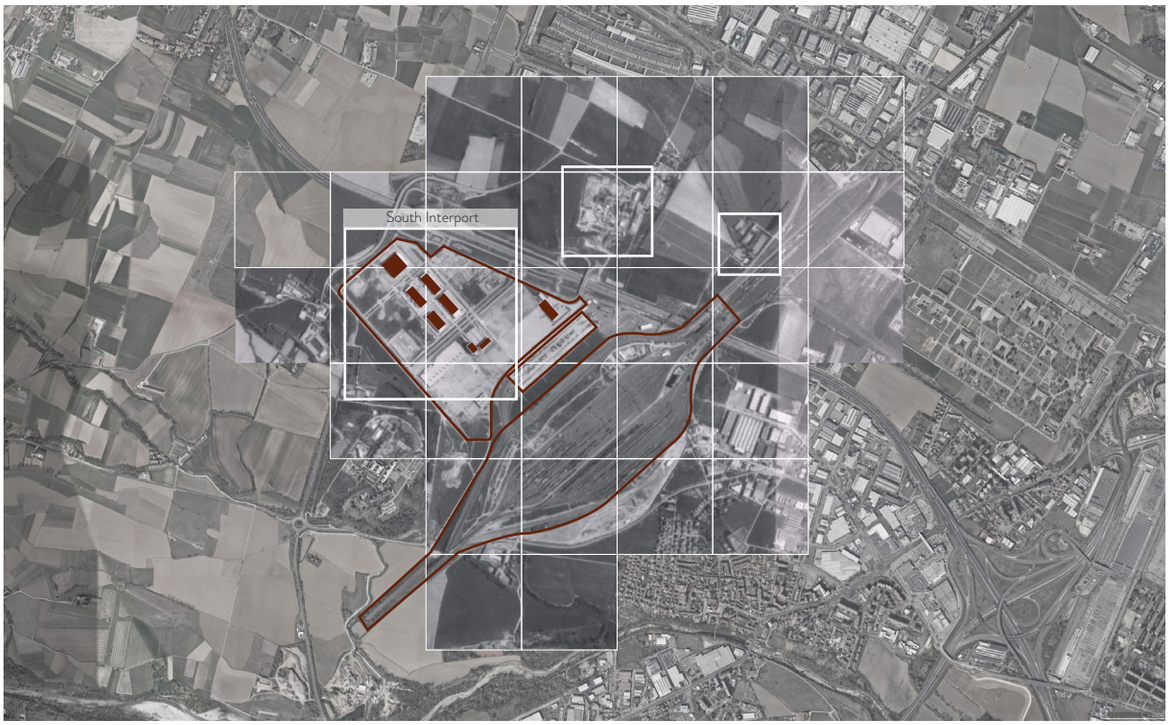
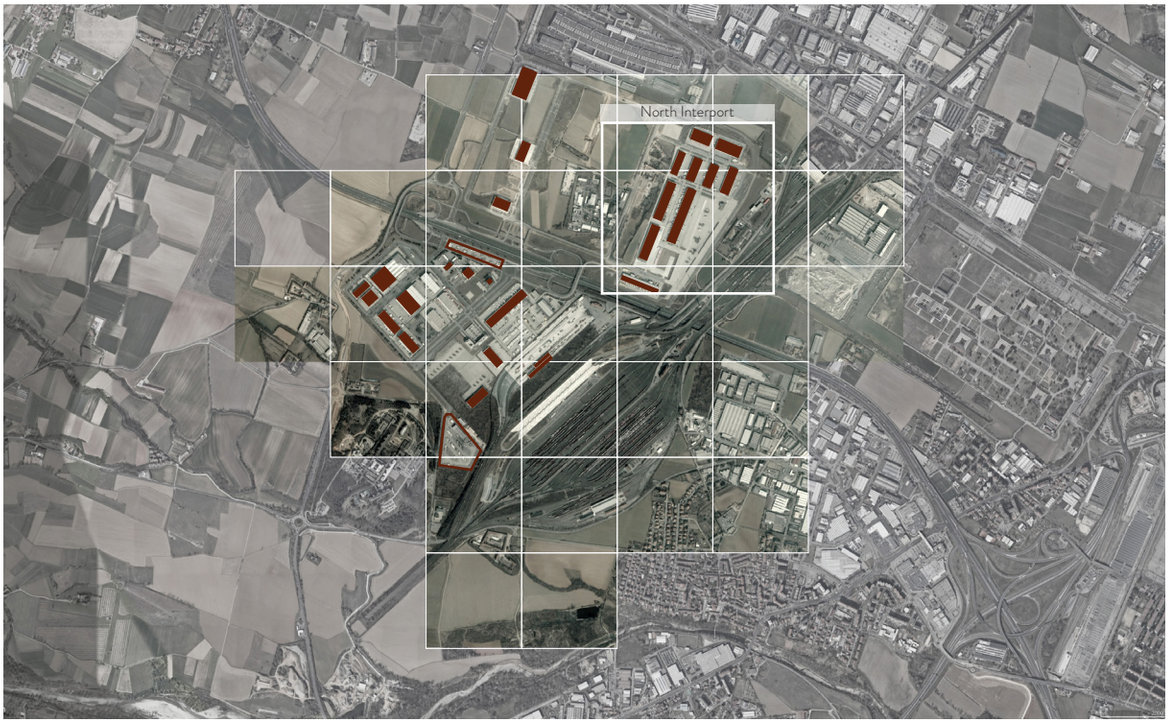
1990



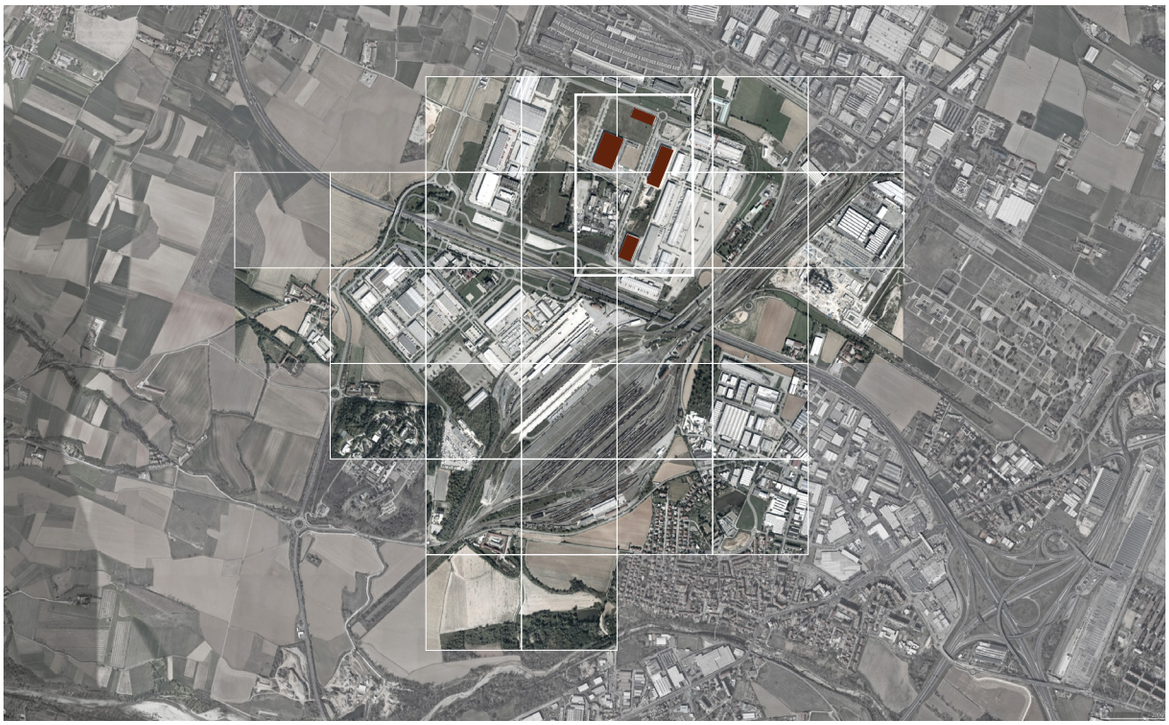
1990

The area began to operate in the 90s, with the intermodal terminal and equipment yard. The layout of the north-west part is
characterized by a grid with the first facilities: four warehouses to serve commodity services.
Scattered installations appeared at the Nord Interport.
The external ring of Turin is completed with the A55 highway, improving the connections with the E70 road.
Additional logistics platforms appeared on the North, adjacent to the the axis of the railway and the A55 highway.



2005

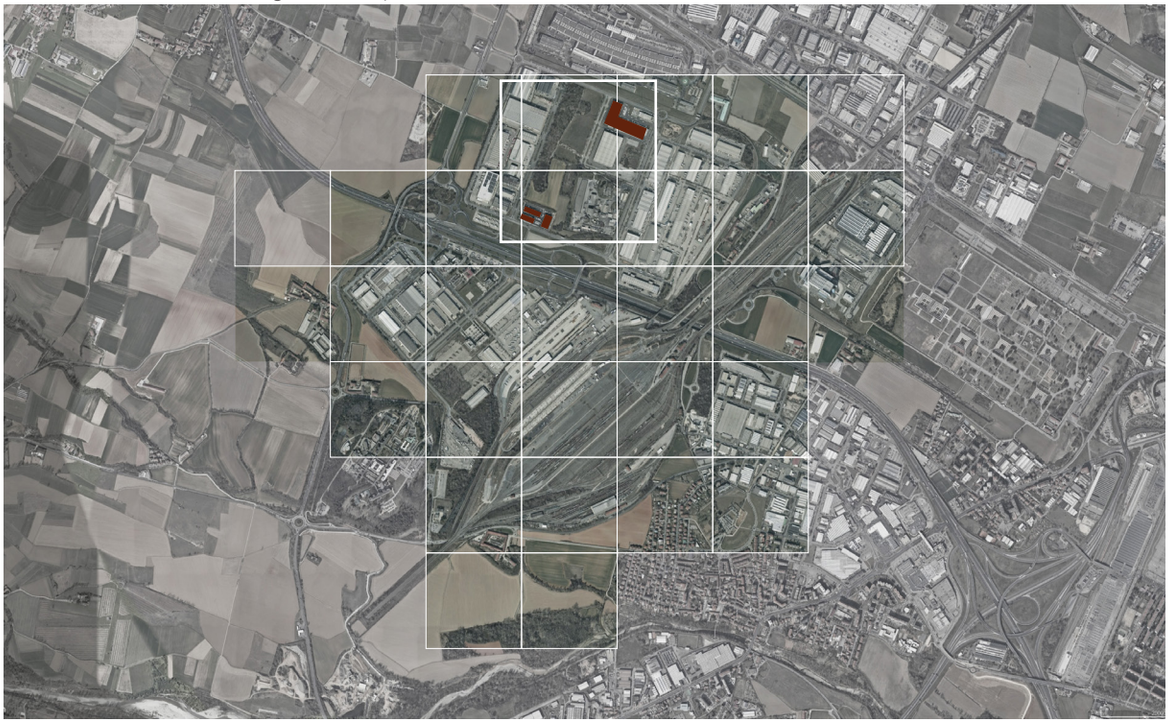
Some improvements were carried out throughout the area: the optimization of the intermodal, rail and container yard, and the addition of a warehouse in the container depot. improvements to the truck gate and the new addition of truck parking. Additional warehouses were placed in the north, thus completing the northern layout.
Whislt the northern part, above the road, continued being expanded with logistics platforms for complementary services to the intermodal terminal, storage and distribution of special cargo within the boundaries of SITO.



2011

2011. With the activation of the Interport improvement plan, the spatial development took place at the Interport Nord. The plan foresees the construction of new facilities and the reactivation of existing facilities related to logistics and intermodal services in the area.

Further plans are carried out in order to expand the freight village. They consist in the expansion of warehouses and the optimization of the lines, as well as investment in connectiong and alternative energies. They are projected in parallel with the Development of the AV/AC Turin-Lyon, started on 2015 and planned to be finished on 2023 (Improving the railway connections to Milan, Savona, Genoa, Alessandria.).



2019

Further logistics platform placed at the North Interport.

Rivalta Terminal Europa

Rivalta Scrivia, Piedmont

Main Ports Genoa, La Spezia, Trieste

Main Routes Rotterdam / Ludwigshafen / Barcelona / Switzerland / Hamburg

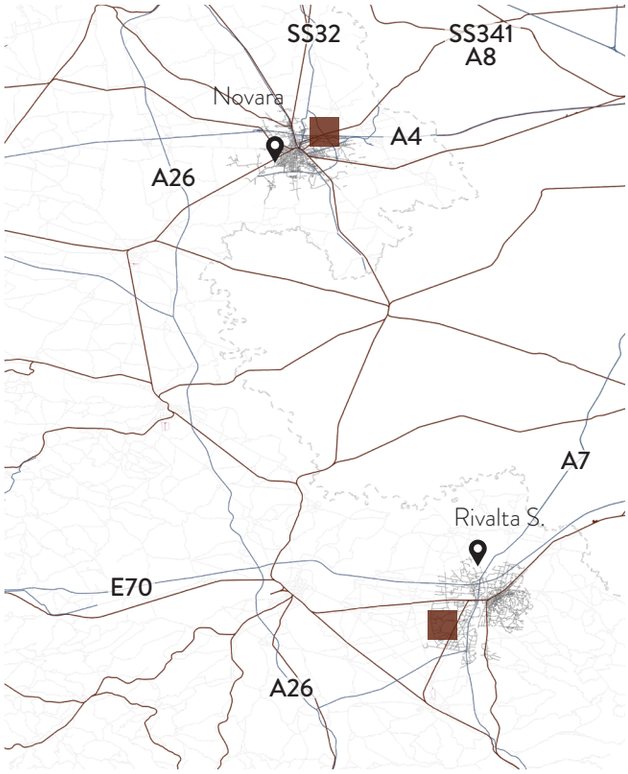
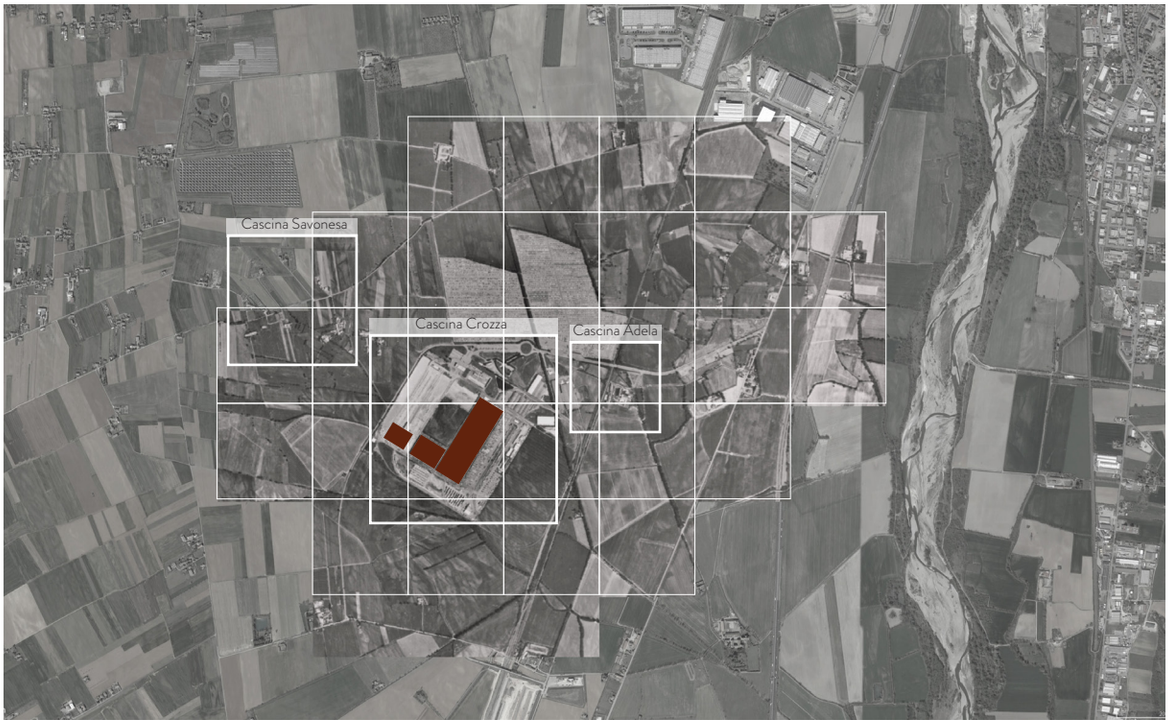


Figure 41. Rivalta Terminal Europa 2021.
Figure by Author, Google Earth.

Rivalta Terminal Europa SPA., 2020
OTI Nord, 2023d
Geoportale Regione di Piemonte, 2023


2016
2016
2020
2005
2005
1980
2016
16



1980

1963. The terminal begins to operate in the area belonging to the Cascina Crozza. The area comprised two warehouses and the rail and container yard.
Improvements in the railway connections with the port were carried out during the 80s.

2005

Refurbishment of the two existing warehouses and expansion of the third warehouse on the west, creating the first logistic platform during the 90s.
The railway lines were redesigned towards the South-West perimiter and the container yard was relocated to the middle of the area serving as a core for the projected East logistics platform (expansion)
Key connections were enhaced:

2016

2013. Upgrading plan of the interport hub: logistics platform in the Alessandria area/ Development of the Novi-Ligure railway line and Novi-Tortona (Terzo Valico)

Rail Hub Europe implements the railway container terminal located in the southeastern part of the area.

Katoen Natie started to operate. The East logistics zone is consolidated by three warehouses and a container yard and depot.

2022

Further facilitites were consolidated in the north industrial area.

SPAIN REGION

SPAIN - PORT OF VALENCIA

CENTER - EAST REGION

Figure 42. Study area Spain.
Map by Author.

4.2 Center-East Logistics network Spain

New emergencies

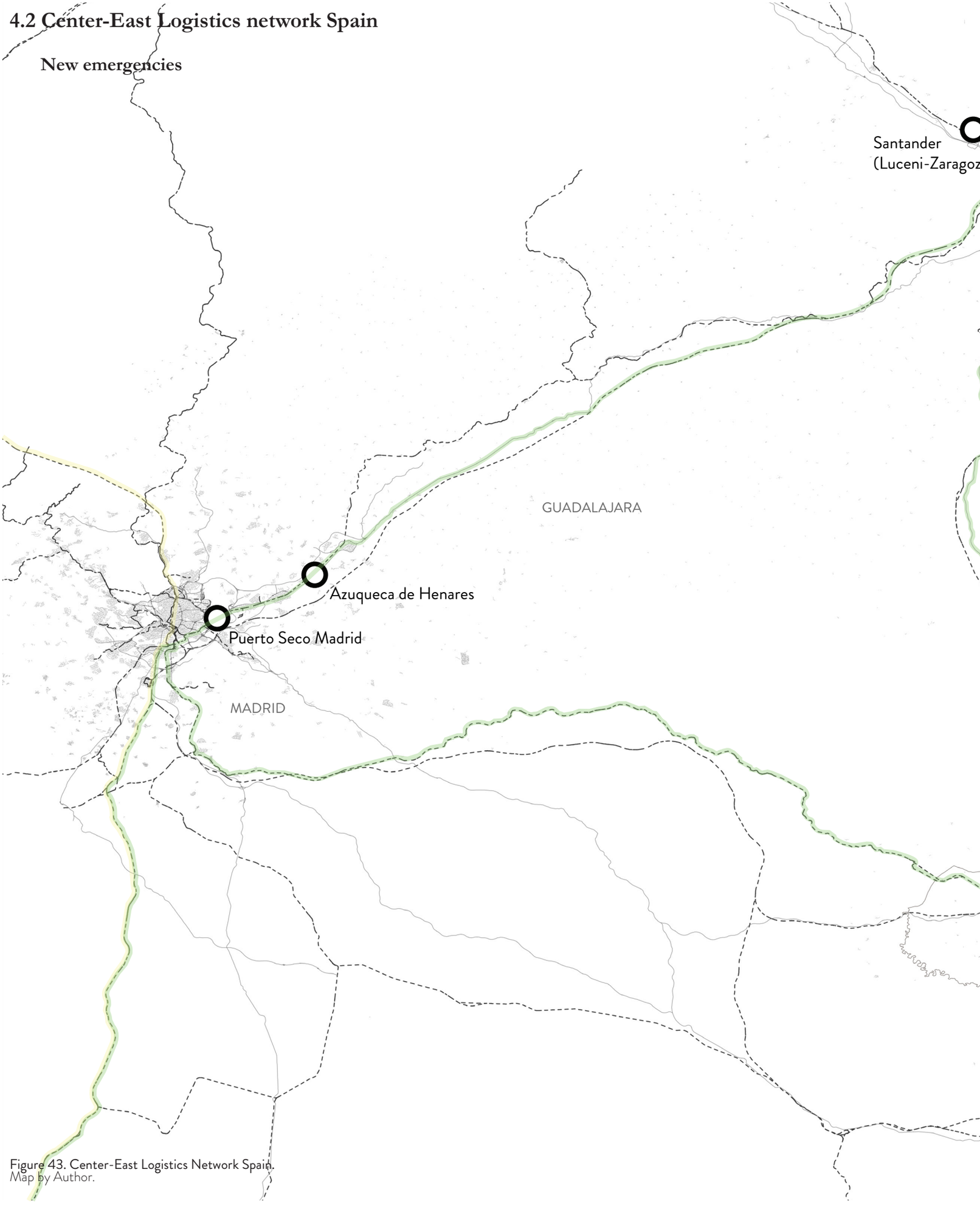


Figure 43. Center-East Logistics Network Spain.
Map by Author.


TMZ Zaragoza
ZARAGOZA
CATALUÑA
Tarragona Port
MEDITERRANEAN SEA
Sagunto Port
Valencia Port
VALENCIA
Gandia Port

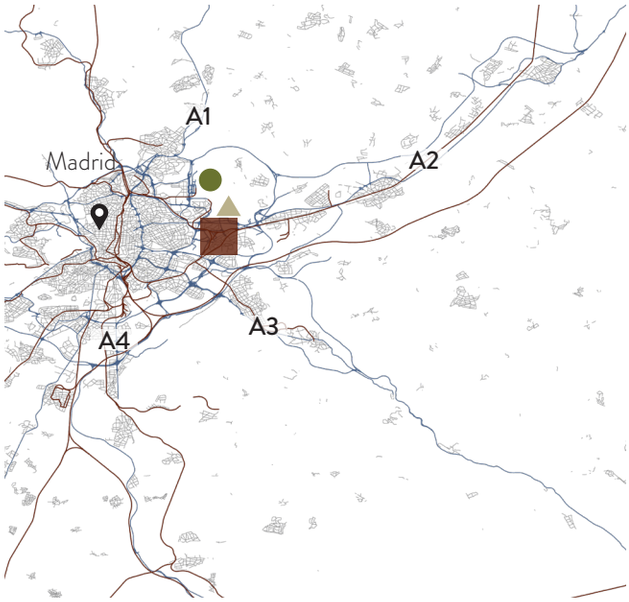
4.5 Transformation dynamics: Valencia

Puerto Seco de Madrid

Coslada, Madrid

Main Ports Valencia, Algeciras, Barcelona, Bilbao

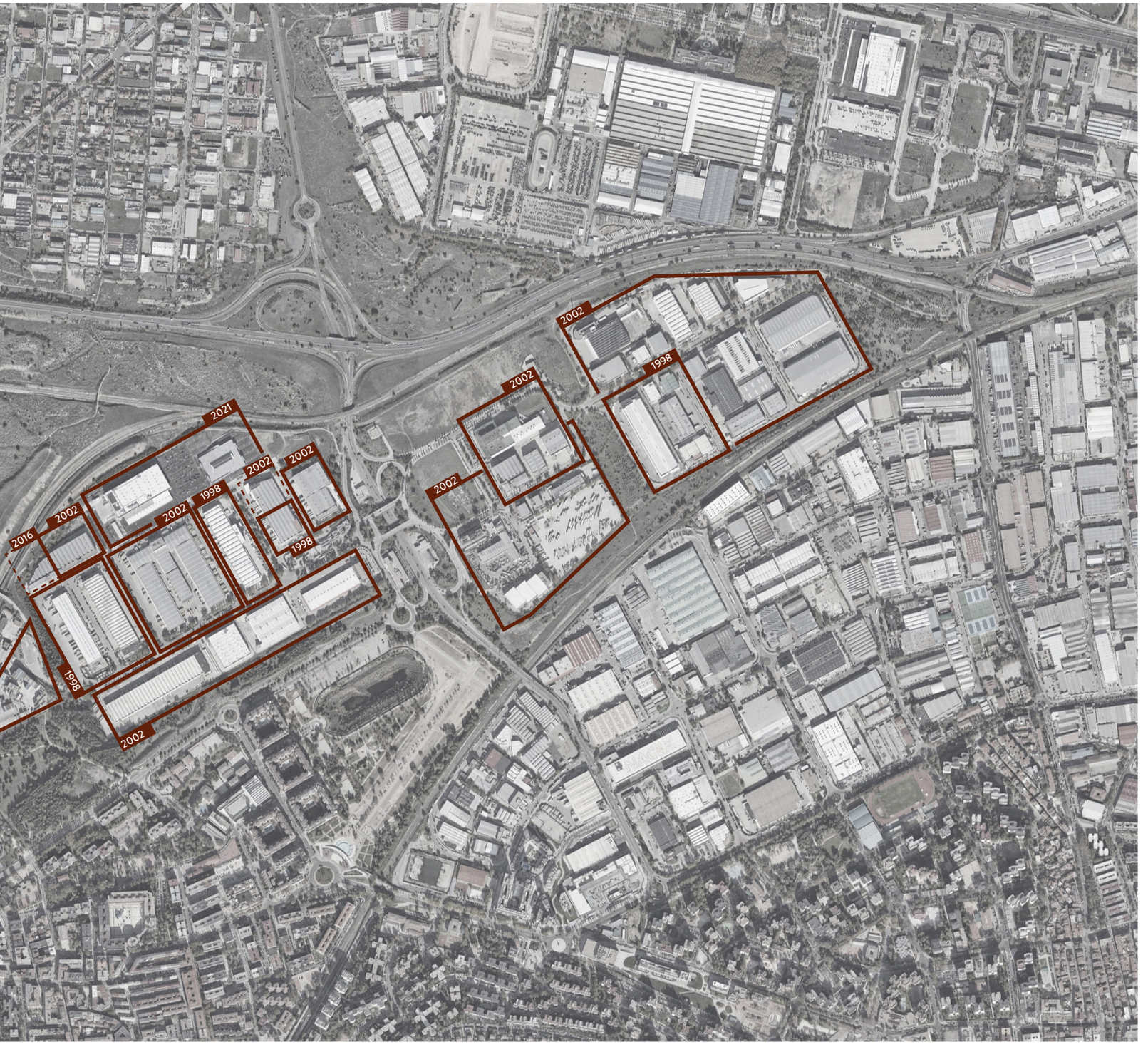
Main Routes Strasburg / Lisbon /



Barajas Airport
Madrid Barajas air cargo center
Railway line
Highway line

Figure 44. Puerto Seco de Madrid 2021.
Figure by Author, Google Earth.

Puerto Seco de Madrid, 2022
CSP Spain Port for all, 2023
Geoportal Comunidad de Madrid, 2023
Via Libre, 2013
ADIF, 2023
Asociación de cargadores de España, 2019


2021
2002
2002
2002
1998
2016
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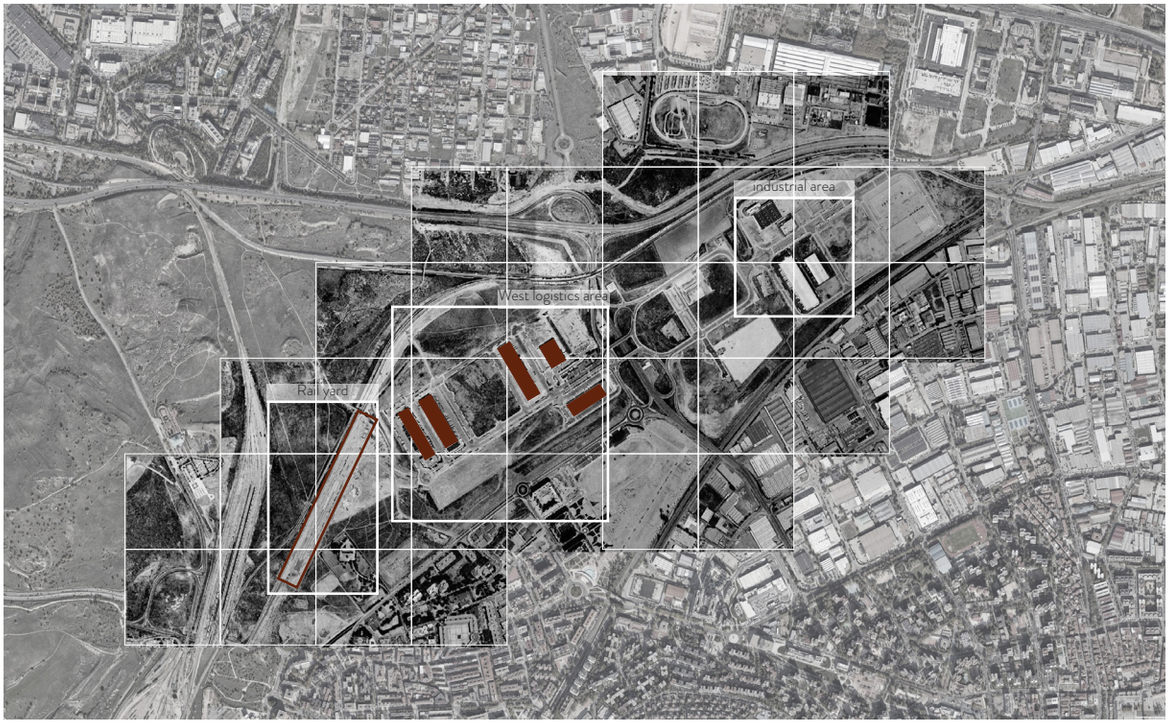
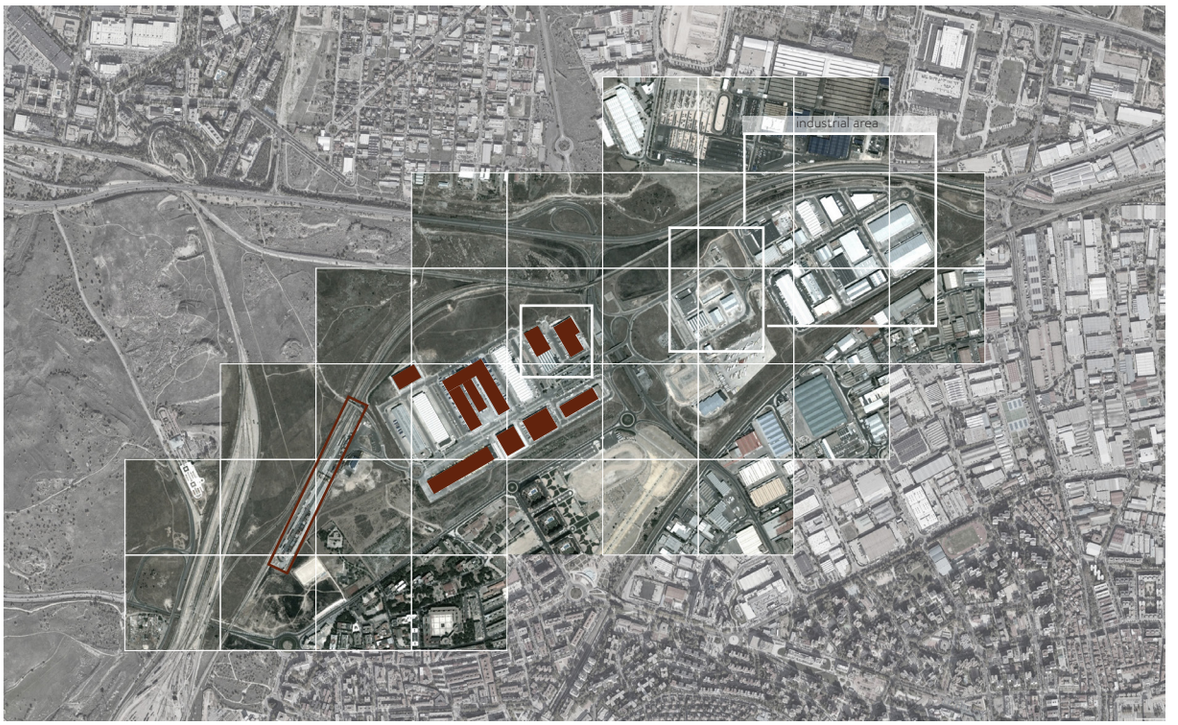
1998



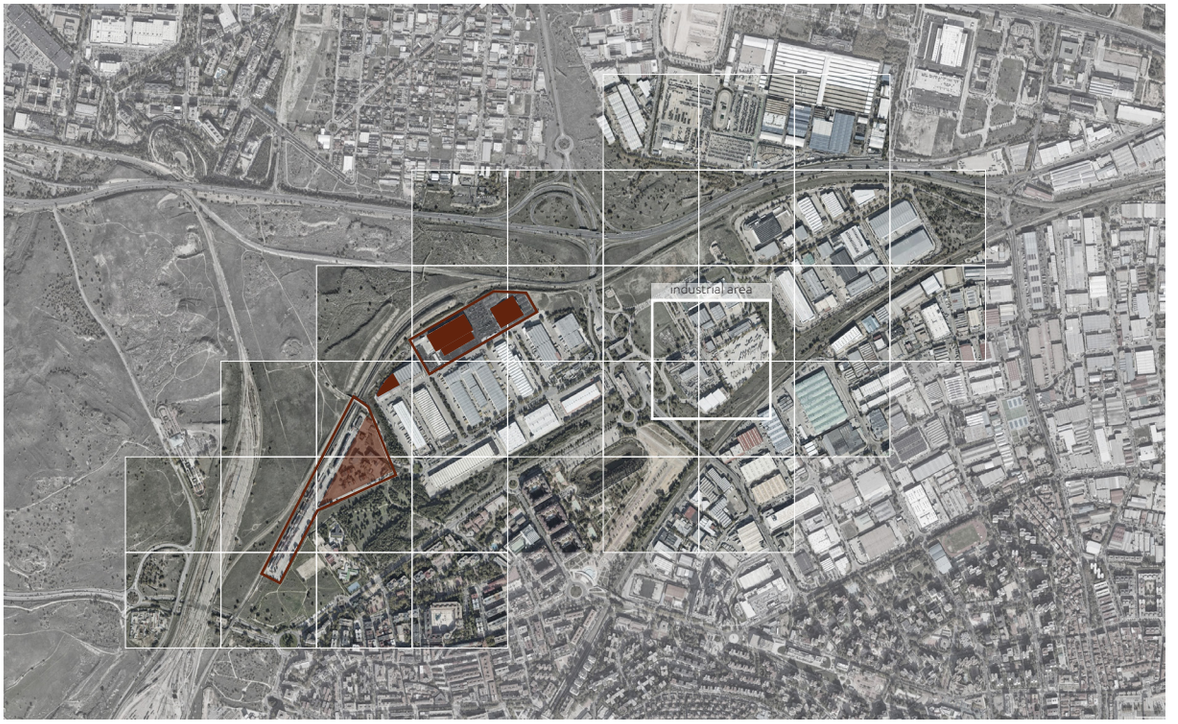
1998

2000. The terminal project begins to operate in the industrial area of Coslada with a strategic location to access national and international corridors. Connection with the radial network of highways (A2 corridor Madrid-Zaragoza-Barcelona; A3 corridor Madrid-Valencia); the existing railway network (Vicalvaro Station); and Barajas air cargo center. The first facilities are concentrated on the west side, with the railway yard, four warehouses and the administrative center. Some private logistics platforms begin to appear in the northern part.



2002

Improvements are made to the intermodal yard; four more logistics areas are added in the south and another one in the center. Expansion and construction of structures in the north. Development of a logistics platform village in the northeast. Key connections were fostered: High-speed line projects LAV Madrid - Levante and LAV Madrid-Barcelona, French border.



2021

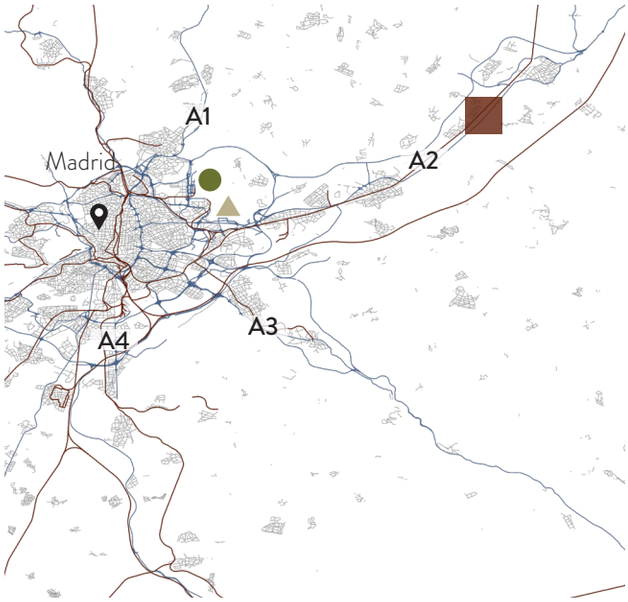
The intermodal yard is expanded, the container depot is created next to it. Expansion of warehouses and small refurbishment work in the village. Addition of two warehouses in the north of the village.
The industrial area presents development in the southern part, with a vehicle yard and facilities for logistics service providers.

Puerto Azuqueca de Henares

Guadalajara

Main Ports Barcelona, Bilbao, Santander

Main Routes Strasburg / Lisbon /



Barajas Airport
Madrid Barajas air cargo center
Railway line
Highway line

Figure 45. Puerto Azuqueca de Henares 2021.
Figure by Author, Google Earth.

Puerto Azuquena de Henares, 2020
La Cronica, 2023
Stock Logistics, 2019
Instituto Geográfico Nacional Gobierno de Esapaña, 2023


2003
2003
2003
2003
1998
2003
1998
2013
2003

1998

The terminal is located in the area that corresponds to the industrial zone of the province of Guadalajara.
In 1996, the first works carried out in the terminal correspond to the layout of the railway yard and the logistics areas, while the southern part is occupied by a steel mill. The northern area has small storage facilities.
The well-known railway vocation of the area and its access to the A2 motorway allowed the development of the area as an intermodal strategic point within the classification of ZAL areas.

2013

The village is developed into three areas: the intermodal yard, adjacent to the railway axis; the second area comprises a group six warehouses and the third area another group of two warehouses and administrative centre. The steel factory is removed and the terminal expanded its area. The northern part on the highway began to be populated by various logistics platforms and intermodal services.

LAV Madrid-Barcelona high speed project is carried out in parallel.

Terminal Maritimo Zaragoza

Zaragoza

Main Ports Barcelona, Bilbao, Santander

Main Routes Hamburg / China/ Duisburg/ Amberes / Dourges / Ludwisghafen / Stuttgart / Paris /

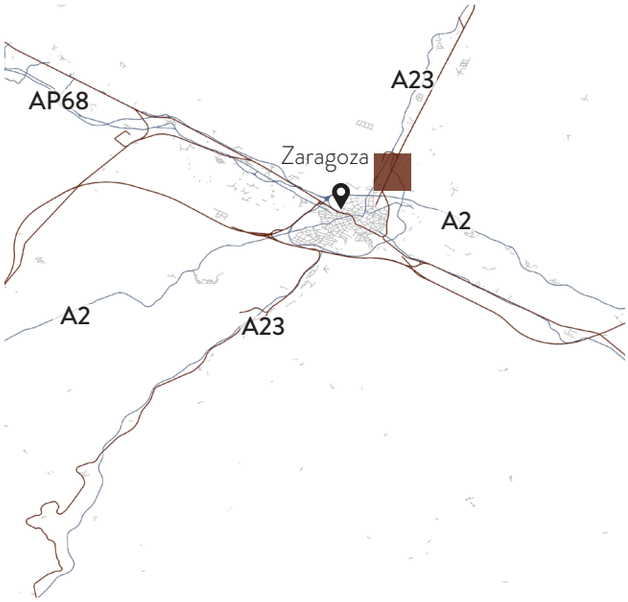
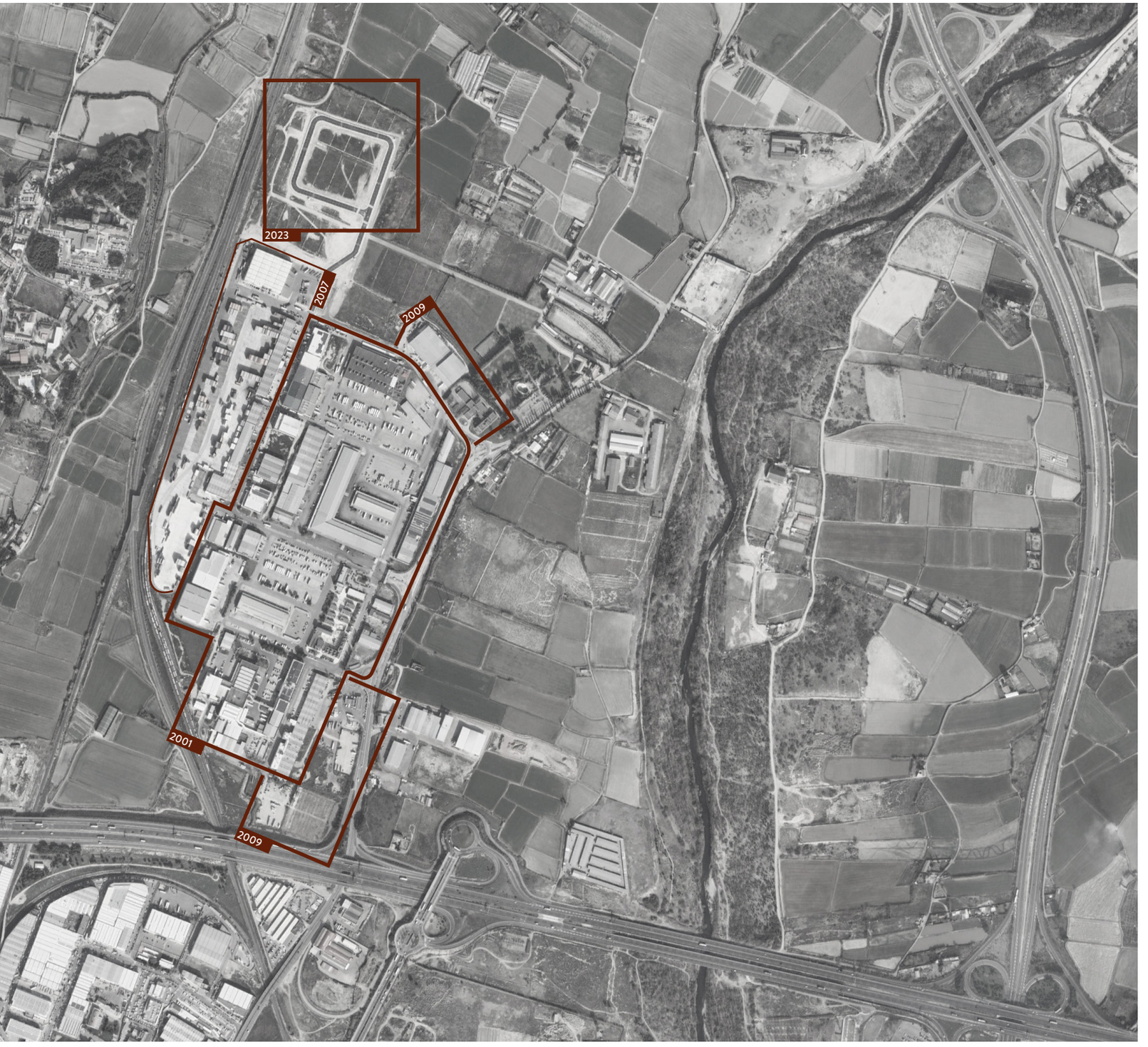


Figure 46. Terminal Maritima Zaragoza 2022.
Figure by Author, Google Earth.

Terminal Maritima de Zaragoza, 2023
Aragón plataforma logistica, 2023
APM Terminals, 2023


2023
2007
2009
2001
2009

2001

The area is inhabited by Mercazaragoza, an agri-food logistics platform that began operating in 1968 as a Fruit, Vegetable and Slaughterhouse Market. Its growing commercial activity allowed the expansion of its chain of work, with processes ranging from production, transformation, as well as the development of its complementary activities related to distribution and logistics.

1987. Construction of the ZAC (logistics services)

Key connections: the area is located on the road axis A2, and the railway corridor (Madrid-Zaragoza).

2009

2007. The railway terminal is created on the North-West of the area while the wailway corridor Madrid-Zaragoza is completed (2005). The development of the area comprises the platform for the intemodal yard, and one warehouse located at the north.

Mercazaragoza continued to be expanded towards the south and north.

2017

The first phase is completed with the The intermodal yard and two areas for container depot.
Improvements are made in the extension of the railways. Key road connections are improved: A2 highway Madrid-Barcelona.

2023

Phase two undergoing: Extension of the logistic area towards the north, along to the railway axis.
2021. The corridor Algeciras-Zaragoza is fostered to connect the Algeciras' Port with Zaragoza.

Figure 47. COSCO & MSC Terminals, Valencia, Spain
From Valencia's Port Authority

Chapter 5.

COMPARISON MATRIX

UNFOLDING THE NETWORK: REFLECTING AND ARTICULATING HINTERLAND'S DYNAMICS

This chapter aims to understand and articulate the evolution of the logistics landscape by comparing four dimensions: physical, historical, spatial and institutional. A process that aims to be seen and understood from different perspectives and multiple scales, but at the same time recognized as a continuous, changing process where spatial configurations are remade, imposed, and intensified while new appropriation dynamics are reinscribed.

The following matrix is a reflection on how hinterland transformation processes are elaborated and evolved.The first part shows the geographical and historical features of the interior terminals, in order to understand its origin as strategic positions, its potentialities for connection with port areas, and the efforts for strengthening the infrastructure. While in another hand, it analyzes the spatial transformations by questioning about the restructuring and repositioning of traditional hinterlands to finally expose the pattern of transformation identified in the Mediterranean. The second part of the matrix allows us to observe the development dynamics in relation to the built environment, as well as their growth morphology that turns them into large or medium-sized dominant structures in their respective urban settlements. This dimension is correlated with the institutional dimension as a mediator and promoter of specific patterns of territorial development to accelerate and facilitate the processes of capital circulation.

5.1 Matrix

POSITION IN THE CORRIDOR

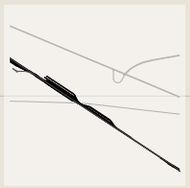
HISTORICAL LAND USE

TRANSFORMATION PATTERN

Along one axis

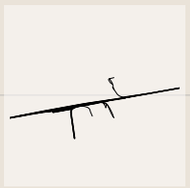
Extension of the railway axis

Busto Arsizio
Lombardy



Gallarte & Busto Arsizio railway station

Milano-Melzo
Lombardy



Milano-Venezia High speed/capacity railway line

Mortara
Lombardy

Alessandria railway line and access to A7 highway (to Genova)

Novara
Piedmont

Novara Boschetto cargo yard

S.I.TO di Torino
Piedmont

Torino Orbassano cargo yard

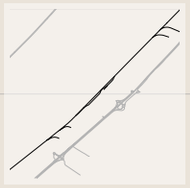
Rivalta Scrivia
Piedmont

Tortona-Novi Ligure railway line.

Puerto Seco Madrid
Madrid

Vilcaváro railway station

Azuqueca de Henares
Guadalajara



Madrid Zaragoza Railway line/A2 road corridor

Terminal Maritima Zaragoza
Zaragoza

Madrid Zaragoza Railway line/A2 road corridor

Farmhouse

Farmland/ Forest

Industrial low density

Railway zone/ station

Market/ slaughterhouse

Substitution

Replacement of existing infrastructures

Evolution

From cargo yard stations to intermodal terminals & logistics platforms

Insertion

New installations / expansion

Inherited

From a specific social interaction, settlement, and land use pattern

Physical dimension

Historical dimension

URBANIZATION DYNAMICS

Hub relation to the settlement fabric

Growth Morphology

POLITICAL INTEREST/DOMAIN

Gateway to European corridor

Serving a political/ finantial capital

New emergencies supporting corridor

ACTORS

Merged — Infilling

Merged — Colonization

Isolated Branch — Infilling

Isolated Branch — Branching

Isolated Branch — Colonization

Isolated Branch — Colonization

Merged — Branching

Merged — Infilling

Isolated Branch — Colonization

Eurogate Germay

kombi verkehr Germany

HUPAC Swiss

KATOEN NATIE Belgium

PSA Singapore

COSCO SHIPPING China

Finpiemonte & Mercitalia Spa. (RFI) Italy

APM TERMINALS Denmark

CMA CGM France

Spatial dimension

Institutional dimension

5.2 Urbanization dynamics

a. Hub relation to the settlement fabric

ISOLATED BRANCH

Developed outside populated cores.
Based on the radio distance regarding residential/historical settlement (out 3km)

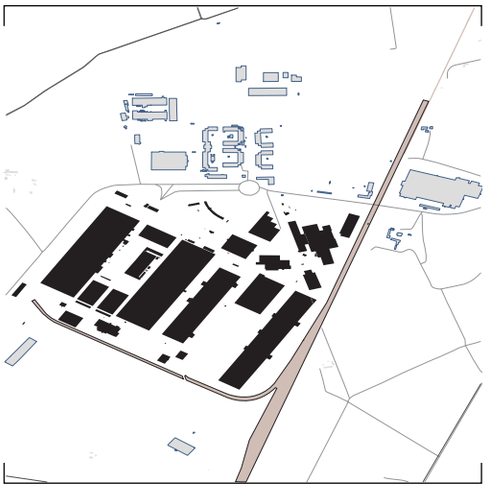


Figure 48. Rivalta Scrivia Terminal

Out of 3km radius limit.

Figure 50. Busto Arsizio Terminal

Isolated from historical center. Blended with industrial core of Busto A. and Gallarte

MERGED

Developed inside populated cores.
Based on the radio distance regarding residential/commercial/historical settlement (within 1.5km)

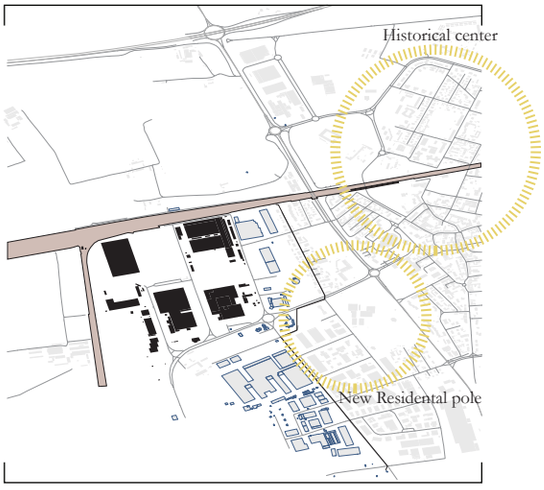


Figure 49. Melzo

Blended with residential fabric.
Historical core within 1.5km limit.

Figure 51. Puerto Seco Azuqueca de Henares

Blended with commercial and industrial fabric.
Historical core within 1.5km limit.

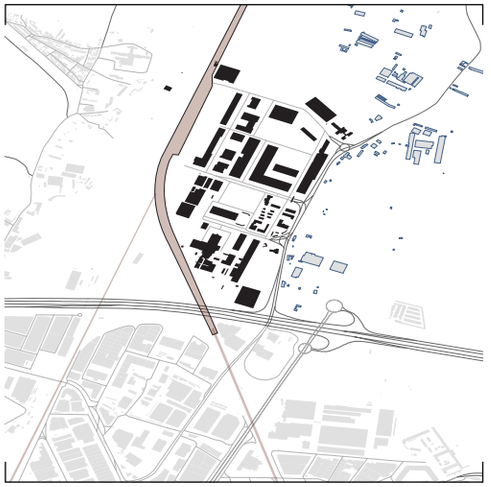


Figure 52. Terminal Maritima Zaragoza

Out of 3km radius limit.

In between the two types

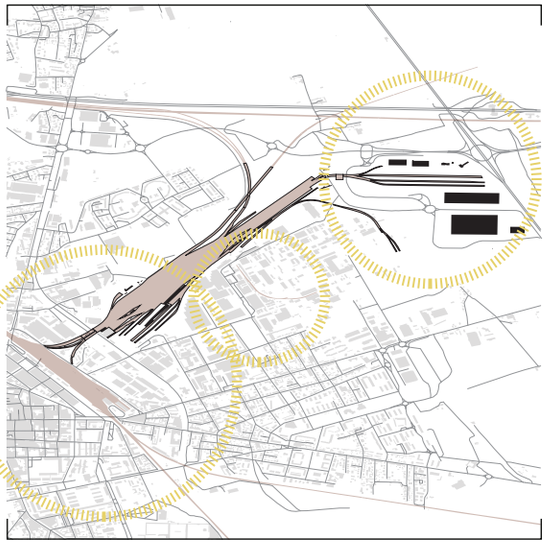


Figure 55. Novara Terminal

Agglomeration settlements have reached the first phase of development while the second phase remains isolated.

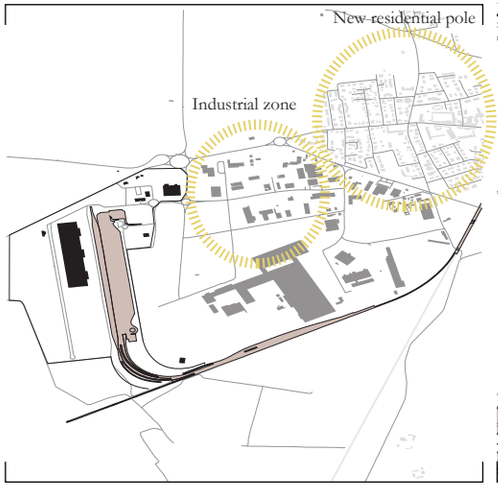


Figure 53. Mortara Terminal

Blended with residential and industrial fabric. Historical core within 1.5km limit.

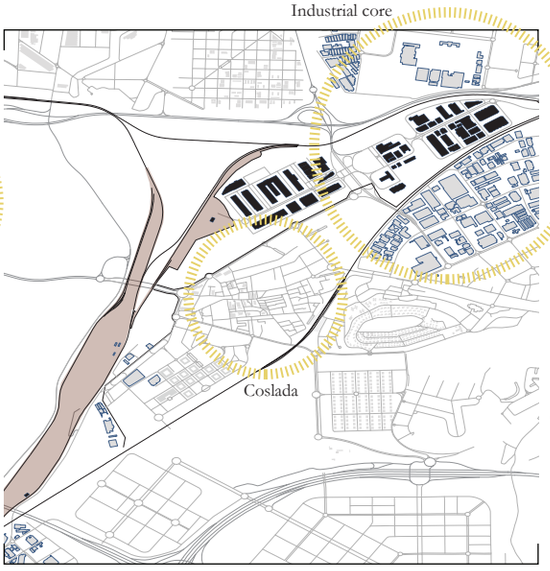


Figure 54. Puerto Seco Madrid

Blended with residential/historical core of Coslada to the South and industrial tissue to the North-East.

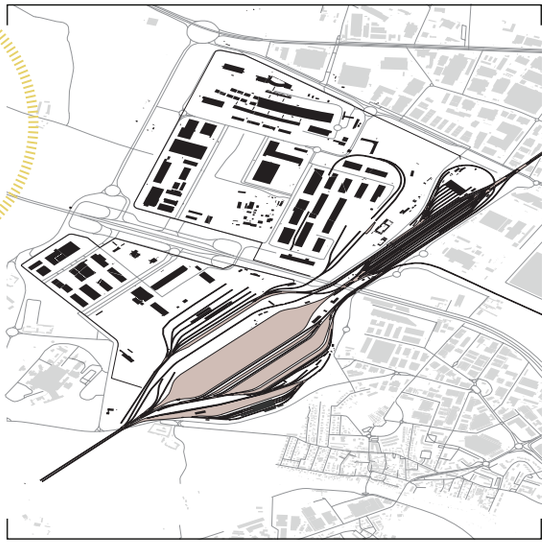


Figure 56. S.I.TO di Torino

Blended with settlements of Orbassano. Out from the radius of settlements of Torino.

b. Growth Morphology

INFILLING

Fill-in / or added to an existing activity pole.

Figure 57. Busto Arsizio Terminal
Added to industrial area.

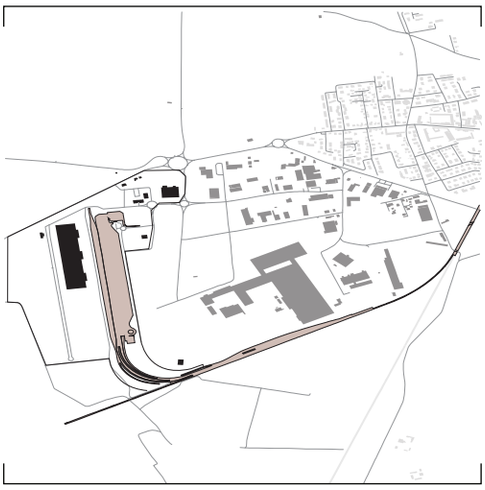


Figure 62. Mortara Terminal
Added to industrial area.

COLONIZATION / PROLIFERATION

Developed outside populated cores. Based on the radio distance regarding residential/historical settlement (3km)

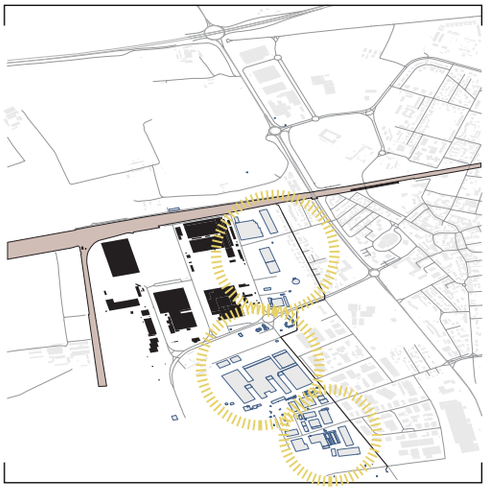


Figure 58. Melzo
Colonization of the terminal area and the proliferation of adjacent logistics platforms (towards South and East)

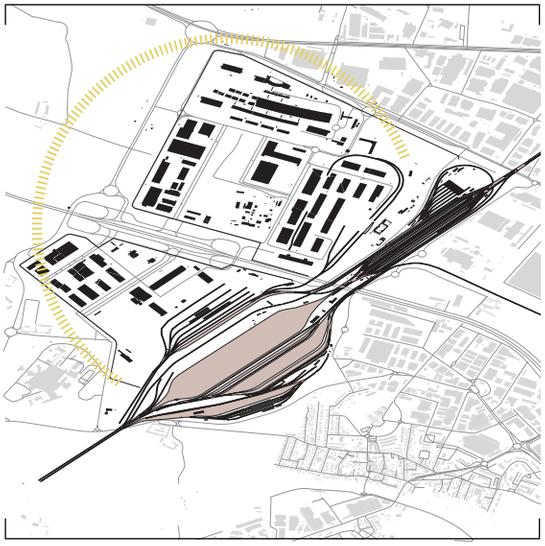
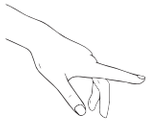


Figure 60. S.I.TO di Torino
Colonization of the area within the private limits of the terminal



BRANCHING/ RAMIFICATION

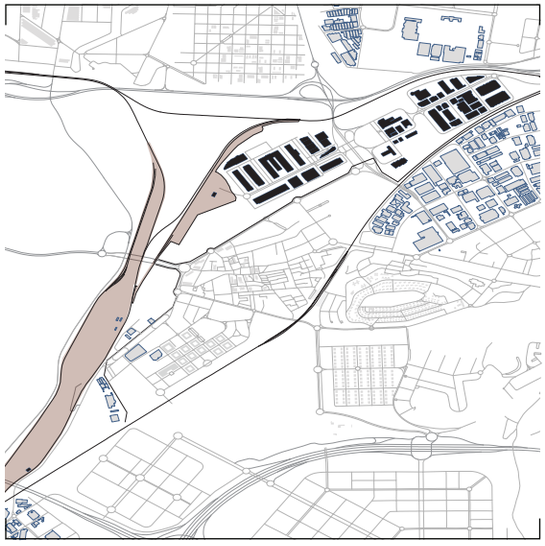


Figure 69. Puerto Seco Madrid
Extension of the railway area and branching of logistics platforms towards the North axis

Figure 61. Novara Terminal
Extension of the railway area and branching of logistics platforms towards the North-East axis

point/linear?

Figure 63. Puerto Seco Azuqueca de Henares
Added to industrial/commercial area.

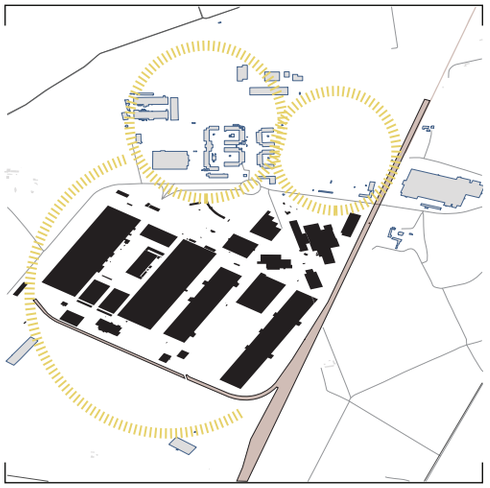


Figure 64. Rivalta Scrivia Terminal
Colonization of the terminal area and the proliferation of adjacent logistics platforms to the North.

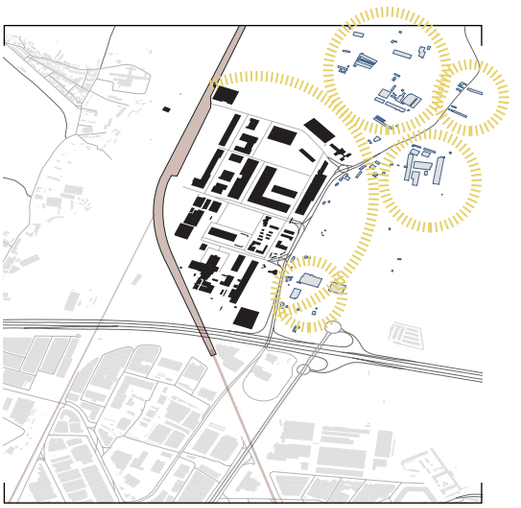


Figure 65. Terminal Maritima Zaragoza
Colonization of the terminal area and the proliferation of industrial activity along the road axis.

compact?

spread?

Figure 65. Pra' APM Terminal, Italy.
From Valencia's Port Authority

6. Conclusion

By the comparison of the two port regions was possible to identify thBy comparing the two port regions, it was possible to identify the process of urbanization as a set of layers mediated through a wide range of physical, historical, and spatial dimensions, all of them shaped by specific strategies and institutions. The matrix presented in chapter five exposes that the transformation process started with the geographical dimension, positioning the key locations across the Mediterranean corridor. From this classification, it is possible to recognize the two initial patterns of the morphology of the terminals, whether they can be located along the axis (linear pattern) or as an extension to the existing railway axis (branched pattern). The historical dimension mediates this physical dimension since the type of patterns led to intensified certain kinds of functions. The railway function was intensified and accelerated in places with a railway vocation, either because they are close to an existing rail corridor or near transport centers - Novara, Torino, and Madrid.

Conversely, those terminals located in potential places to develop a new corridor were devoted to developing systems of commerce and production as the Market/Slaughterhouse – Zaragoza - or seen as areas to support industrial activity – Mortara-. On the opposite side, to a part of the group of terminals located along the axis, the historical land use pattern was related to systems of productions, such as the Farmhouses – Melzo, Rivalta Scrivia – or Farmlands/Forests as Busto Arsizio Gallarte. The only terminal which shares features from two types of classifications is Azuqueca de Henares since its linear pattern as being located along the corridor was mainly associated with the railway activity that the area adopted many years later, and which purposes were mainly related to developing the area as a pole of industrial activity.

With the correlation of these two dimensions, the dominant historical land use patterns range from the Railway vocation to the systems of production: Farmhouses, Farmlands/Forest, market/Slaughterhouse, to the industrial low-density present by that time. Now, bringing up the first research question of the thesis: ***I.*** *What is the pattern of transformation of the port regions in the Mediterranean?* It is possible to answer by comparing traditional hinterlands' historical use with their current land use. In such a way, it is possible to identify four patterns leading the transformations: Substitution, Evolution, Insertion, and the inherited pattern. The substitution pattern is related to the historical land use of the Farmhouses, as Melzo, and Rivalta Scrivia. In those places, there was a spatial restructuring of existing facilities into warehouses and replacing functions. The pattern evolution is mainly associated with the evolution of the existing railway activity, where the traditional hinterland, considered a cargo yard station, evolved into an intermodal-logistics terminal. The third pattern is the insertion, grouping almost all the terminals since it is correlated with the land use of production and industrial activity. Finally, the inherited pattern refers to the preserved land use of the Zaragoza terminal. The land use was intensified and went from a fruit and vegetable market to an agri-food logistics platforms.

Urbanization dynamics can be understood from two classifications: the Hub relation with the urban fabric and the growth morphology. Regarding the Hub relation to urban settlements, there is a more significant number of terminals with a merge pattern. Although initially, it is possible to associate the isolated pattern to its physical morphology and position in the corridor (having the single branch could have favored its growth outside large agglomeration centers), it is observed that even isolated branch types have merged within the urban fabric. This fact is mainly attributed to the accelerated process of urbanization that both populated centers and the hubs are facing, as the case of SI.TO di Torino and Puerto Seco de Madrid, where their agglomeration forms have reached populated areas. While the isolated patterns are still present in sites such as Busto Arsizio, Rivalta Scrivia, and Zaragoza, it is possible to associate their growth with the condition that they are relatively new emergences. Moreover, Novara, which remains in the middle of both types, shares a merged pattern on its initial railway phase, while the new logistic terminal is positioned isolated as an extension.

Subsequently, the classification hub-settlement relation can be analyzed in parallel with the morphology of the growth since it is possible to relate the compact, linear, and spread forms with the extension within the urban fabric. Regarding growth morphology, many terminals are grown in a colonization pattern characterized by profound densification of the area and land enclosure. This pattern is highly represented by the compactness of its facilities, the layout of roads, and zoning that seems to turn them into "logistics villages." On the other side is the infilling pattern, which refers to the terminals placed to infill an existing industrial pole. In such cases, its morphological pattern, linear/punctual, has been confined by a limited area to grow together with the other land uses.

Moreover, the last pattern is Branching-ramification, which can be considered a mutation of the previous patterns described. There was undoubtedly a territorial expansion from which an initial linear pattern was proliferating and generating various forms of agglomeration. The first part can be considered as branches, with little concentration of forms, while in the second phase, the concentration of forms has led to colonizing areas.

Then, the answer to the second question: ***II.*** *What are the dynamics of urbanization of Port's hinterlands?* Three tendencies are highlighted: First, colonization is the main pattern; almost all the terminals have achieved the complete densification of their territory. Colonization is not only evident within the physical limits of the terminal, nor by its delineated spatial and road organization. It is also present with the land grabbing by external entities dedicated to complementing or gaining the advantage of the proximity to the terminal. Therefore, by proliferating, they also colonize the territory. This spatial extension has been accelerated in the last years by institutions and alliances which have invested in new installations and improving connections with other points. By doing this, they have inevitably expanded till being merged with other agglomeration centers (historical centers, new residential and commercial poles). Thus, not longer considered distant or remotes.

Second, there are trends of mutation. The initial linear/branch isolated patterns, limited and developed along a railway station, are being reached by populated areas; therefore, on the second way of transformation, the area evolves outwards, but with a dense concentration and proliferation of forms. This type mainly comprises inland terminals with long trajectories, such as Novara and Puerto Seco de Madrid. Additions to an existing pole of industrial activity characterize the last trend. Thus, they arrived to intensify and accelerate the spatial growth of a particular area while mixing and correlating with new agglomeration centers.

Finally, regarding the last question, ***III.*** *Who is leading this transformation process?* It would be difficult to define who tops the list. There is not a single actor or organization that is leading this transformation, but rather it is an integration of actors that work under extreme coordination of functions. Although it is true that many of these actions are carried out because the national and regional states instrumentalize certain territories and create uniform frameworks for spatial organization, the current period has shown that there is an expansion in this territorial governance. Governments begin to respond to transnational market regimes, and prioritize deregulation, privatization, and ownership-led investment. As can be seen in the matrix, the actors that manage the terminals are mostly private institutions, which independently, or under alliances, or through state associations, struggle to influence the production of space.

This thesis work has been driven by the deep interest in exploring those territories that support port activity, in an attempt to understand its various spatial configurations in the territories. It is a reflection on the network of logistic flows and components that is completely invisible and remote from the perception of traditional, “visible” limits. But it does not try to redefine or expand urban or port borders, rather it tries to recognize the different morphological expressions, spatial configurations and the appropriation dynamics that a series of port and logistics processes have in the Mediterranean territories. This thesis recognizes the transformations of port hinterlands as a form of urbanization and at the same time tries to raise the question about how many forms of appropriation and reorganization of areas known as non-cities are emerging forms of urbanization?

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