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Maritime Transport Infrastructure Effects on the Territory Development

Hanan Kaffoura[1], Ossama Khalil[2]
[1]Ambassador of the Italian National Observatory for the Protection of the Sea, Expert at the Italian Council of Public Works and International Maritime Organization IMO Consultant
Rome, Italy
kaffourahanan@gmail.com
[2] Sharjah Archaeology Authorly
Sharjah, United Arab Emirates UAE
ossama@saa.shj.ae

Abstract - The Port represents the main Maritime Transport Infrastructure which has suffered developments and changes of use, often with negative effects on the urban development of the surrounding territory, losing the original morphology, authenticity and integrity of the relationship between the land and the sea. In recent years, with the development of society, people's awareness of environmental protection has increased, although the Port promotes economic development and employment levels. For this reason, the local authorities and the local communities have started to analyse and study solutions to solve these negative impacts, following the international standards of international organizations. In this contribution we present the situation of the development of the commercial port in relation to the surrounding territory through a case study concerning the port of Lattakia in Syria, reflecting three trends: the first is the great changes and continuous challenges that the Port faces today; the second concerns the enhancement and analysis of the maritime and terrestrial fabric; the last is the role of the ecological transition in sustainable development in finding solutions respectful of the environment and in favour of the society that uses it, with the aim of safeguarding the original identity of the relationship between the land and the sea, offering more social spaces of relationship and less transport traffic within the area connected between the sea and the city.

***Keywords*:** Maritime Transport, Maritime Infrastructure, Port- Territory and Sustainable Development.

1. Introduction

Maritime shipping handles about 80% of global trade by volume, As the dominant form of trade, international shipping plays a vital role in the global economy. The efficiency of a port directly affects the economies of the countries it serves, the COVID-19 pandemic has been a stark reminder that when ports slow down, everyone suffers. Lockdown measures caused disruptions and delays in many ports around the globe. The median time container ships spent in ports worldwide, for example, increased by 20% between 2019 and 2021. During the pandemic, freight rates reached record highs and have again soared in the wake of the war in Ukraine due to logistics disruptions and port congestion. The United Nations Conference on Trade and Development UNCTAD analysis has shown how surges in freight rates can raise the prices of goods, especially in least developed countries and small island developing states. This justifies the permanent desire of the concerned countries to development, all maritime transport infrastructure facilities in general must be developed, especially the port and its shipping network and multimodal transport associated with it, the port should be developed to offer more spaces for containers and people. But many ports are being constrained from further expansion due to environmental restrictions on further development, urban encroachment, lack of industrial land for port associated industries, lack of spare capacity in linear infrastructure corridors for road and rail access and services such as electricity transmission and pipelines. The responsible of port and territory surrounding it see that the port is a part of the territory and the Port development is a very complicated operation, because it is linked to many naval, maritime and terrestrial factors. These factors should be studied all together, analysing the problems of each factor in detail, trying to solve them without damaging the other factor.

The main problem that is defined with the phrase "the relationship between the port and the territory". It is a very complicated situation in most cases it is not well studied, for reasons of lack of direct administrative and scientific relations

between the responsible and specialized authorities. Therefore, the Port- Territory topic highlights the need to understand and evaluate the consequences of port developments with respect to the more general infrastructural system that must be supported by the responsible and specialized authorities. The port master plan is often studied by itself, instead of being related to the territory development plans and taking into consideration the environment and the social and cultural aspect of the local inhabitants.

The guidelines of the international specialized organizations provide us solutions through the Ecological Transition role in the sustainable development of Port offer us a perfect solution to recover the relationship between the port and the territory in a way that respects the environment and in favour of the society that uses it, safeguarding the original identity of the port and the territory, offering more social spaces of relationship and less transport traffic within the connected area between the sea and the territory "the Port", and turn it into decarbonized traffic.

2. Maritime Transport Infrastructure

The description and classification of the maritime transport infrastructure depends primarily on its geographical location (land and sea) and secondly on the type of this infrastructure (physical and digital). Since this article regarding to the relationship between the maritime transport infrastructure with the territory, it is better to follow the geographical classification: Land infrastructure “the technical term is Onshore" and Sea infrastructure the technical term is "Offshore".

As the port is the main link between these two types of infrastructure, and is the basic geographical area that includes the physical and digital infrastructure. The operation of the Port must ensure the safety and the motoring of completing the cycle of shipping goods and people from one place to another according to the "land-sea-land" chain.

Knowing that the two types of Maritime infrastructure "physical and digital" are a set of joint works between land and sea. The physical infrastructure, sometimes called "tangible infrastructure" are structures that support maritime activities, examples of tangible maritime infrastructure include cranes, wharves, dredged channels, locks, dams, platforms, subsea structures, pipelines, and cables.

While The digital infrastructure, sometimes called "intangible infrastructure" are the information and communication systems that support maritime activities, examples of non-tangible maritime infrastructure include maritime information infrastructure, which supports the safe and efficient movement of freight by providing information on shipping routes, weather, and other conditions. The non-tangible maritime infrastructure also supports non-freight activities such as cruise ship and ferry terminals, commercial fishing, recreation, and commercial and residential activities at ports. Investment in information technology can mitigate the effects of limitations in the ability to invest in hard infrastructure.

The Maritime Transport "ships" play the role of a carrier of goods and people across the water surface from one port to another, while the port plays the role of the starting point from land or the point of arrival to land, and then completing the Supply chain through multimodal transport. For this reason, the port development process is a complex process with links to multiple disciplines. If it is not carefully observed, the port will not play its role effectively in the supply chain process.

3. Port role in Maritime Transportation Infrastructure and its effects on the Territoy

Port performance is not only dependent on the scale of the physical infrastructure; the institutional infrastructure is almost as, if not more, important. The efficient functioning of a port, and its access infrastructure, needs four types of assets overseeing the importance of an appropriate regulatory and policy framework. The overall efficiency of any port depends on an appropriate quality of all four assets which are: first, the physical infrastructure; second, the digital infrastructure; third, the institutional, or soft, infrastructure; fourth and finally, the human capital in the port administration, operations, and marine services as well as the logistics sector supporting the port.

Previously, the Ports have been mostly concerned with their own activity and economic efficiency, rather than the impact of port operation on the surrounding environment. Wherefore, Port areas have been regularly expanded to accommodate the increase of cargo volume handled. However, expanding port areas is becoming more difficult than before due to a growing environmental awareness and the subsequent community opposition. It continues to expand due to the lack of local guidelines that consider the international guidelines, or sometimes the non-compliance with them despite the availability of these guidelines, due to a defect in the administrative structure of the specialized institutions, in other words, the lack of Sustainable Capacity Building (SCB).

However, from an environmental point of view, this expansion process is not neutral since we cannot overlook its impact on the surrounding territory. The main problem of the Port related to its expansion process is by far the reclamation of land

from the sea, and from the adjacent areas, in order to construct new port facilities. The construction of new quays, protruding into the sea, has affected the coastal hydrography causing erosion in the nearby beaches due to reduced sediment availability. Coastal erosion takes place when there is a land-connected structure protruding into the sea that changes the depositional-hydrodynamic regime as a result of altering littoral currents.

As a result of this expansion process, this will affect on the surrounding territory (Urban or non-Urban), through the establishment of multimodal transport networks to respond to the port's growing needs. This effect will be negative if it undergoes an unstudied development and will be positive if it undergoes a studied development. An example of this is the Italian experience, which requires that the development of the port be compatible with the development of the city, which is called in Italian "Piano Regolatore Portuale Integrato PRPI, che signigica: il Piano Regalotore Portuale PRP in rapporto al Piano Regolatore della Citta PRC", in English "Integrated Port Master Plan, which means: the Port Master Plan in relation to the Master Plan of the City", are guidelines approved by the Italian Ministry of Transport and Infrastructure, High Council of Public Works.

4. The compatibility of Port- Territory development, Lattakia Port in Syria as a Case study

The compatibility of Port- Territory development, depends on the type of the surrounding territory, Urban or non-Urban (natural not built yet), we have chosen in this Paper to present a specific case related to relationship between the Port and its Urban territory surrounding area (City), our case study is the city of Latakia is the main port city in Syria, located in the northwest of Syria and overlooking the Mediterranean Sea and its Port is commercial "Container".

Fig. 1: Syrian Map, Lattakia City.

The increase in container traffic has put the Port of Lattakia in the need to develop rapidly, without considering the relationship of the city with the sea. The port of Lattakia has developed parallel to the city itself, but each in a different direction, without bearing in mind that the port has always been part and must be part of the identity of the city. Unfortunately, the Municipal Administration and the Port Administration have always made decisions according to their own interests, without thinking about the urban, architectural, economic and social context as a whole.

The City master plan has always been designed and built with reasons that do not take the port into consideration as a vitally important space that connects the city to the sea. Even the Port master plan has always been designed and implemented with reasons that do not take into consideration the city and the surrounding area as the original context in which it was born; the function of the port was thought exclusively with the aim of increasing its space to respond to the increased container traffic, as if it were independent of the City.

Lattakia developed in three directions: south, east and north, forming an arc-shaped development from south to north, to the west, the pointed-shaped coast is very rocky in the south, less rocky in the central part and 80% sandy in the north.

Fig. 2: Lattakia, Port- City, Google Map.

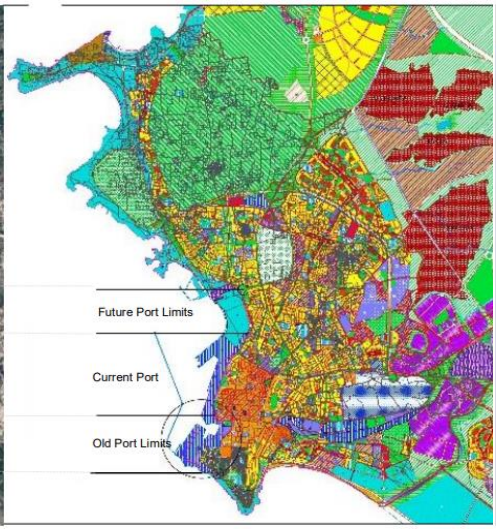

Fig. 3: Lattakia Municipal Master Plan.

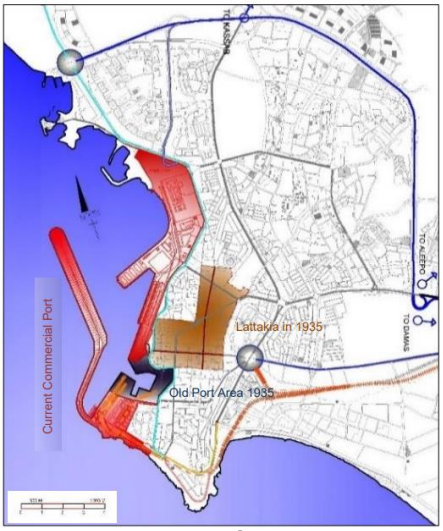

Fig. 4: Lattakia Port area.

The port developed starting from the first construction towards the south and then towards the north. At the southern edge of the port there is a popular tourist area with housing around it, while at the northern edge the area is of an international tourist character.

As the Port expanded northward, the City's Waterfront was completely covered by the expanded commercial port. With this realization the movement of the people has moved towards the south promenade in a completely modern urban context, instead the north promenade has been slowly abandoned, remaining only in the memory of the people due to the loss of its main function. The general society of the port of Lattakia since 1996s has always proposed to develop its port, risking to lose more and more its relationship with the sea. Because the required development included the entire north area up to the marina, indeed it proposed to take the entire area of the marina as well. I believe that it is possible to revive the city and its waterfront, redeveloping the old port and the southern part of the port for the recovery of the relationship with the sea, with which the northern part could be connected through the redeveloped old port (with a new tourist destination appropriate to the character and original identity of the city) to the southern part of the coast. In this way the redeveloped ancient port will become an important lung for the city, trying to open a new view towards its waterfront. This would save the marina, leaving the commercial port between the north marina and the old port area in the south, developing the port in this space in a correct and functional way and protecting the north part of the Waterfront open to the sea. But If a commission or a management composed of expert specialists from both the Municipality and the Port Authority is not formed, the port and the city itself will find themselves in serious development difficulties, with the risk of losing their original identity for both. So, with this situation, the redevelopment project for the recovery of the original identity becomes difficult and theoretical and there is a risk that it will remain on paper due to the absence of coherent programs for its implementation.

4.1. Lattakia Port Development Processes

Until 1930s, the old natural port of Lattakia did not have a real extension with major construction works and had remained within its natural limits. The real port construction began in 1931s with the installation of a quay and, later, in 1950s it acquired the first and significant port form, still leaving the city a close relationship with the sea. With the last construction phase in 1980s the city, however, completely lost this relationship. In 1996s the construction of the port was required in response to the development of container traffic. The port was studied by many international companies, but no proposal was applied.

Fig. 5: Lattakia Port development.


Fig. 6: Second construction,1958s.


Fig. 7: Lattakia Port currently.

The Syrian government and the authorities responsible for the port of Lattakia have received many proposals for the development of the Port of Lattakia and they are the following:

- In 1996s, Japan International Cooperation agency (JICA), 3 proposals;
- In 2003s the Russian Institute "Suezmone Project", 8 proposals;
- In 2005s, the UNDP Experts, 1 proposal;
- In 2007s, the Russian Institute "Suezmone Project", 1 proposal;
- In 2010s, the Russian institute "Suezmone Project", 1 proposal;
- In 2012s, the Russian institute "Suezmone project", 2 proposals.

All the solutions chosen by the international institutions for the port of Lattakia followed the requests of the Port Authority of Lattakia. Therefore, they found themselves in a difficult situation to solve the following problems: Expanding container terminals; Expanding the General Cargo terminals; Move the Grain terminal and the passenger terminal. But it was not easy because the port area is limited from a geographical and urbanistic point of view. So, the differences were few, so their decision was limited and changed following these problems: To save the navy or not, due to the fact of development towards the north for geographical reasons; The shape of the inlet channel and the shape of the terminals orthogonal or parallel to the coastline.

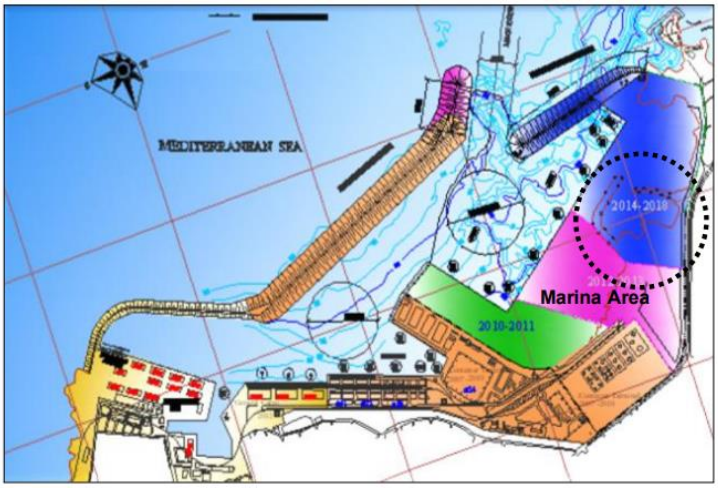

Fig. 8: Suezmone Project Proposal, 2007s.

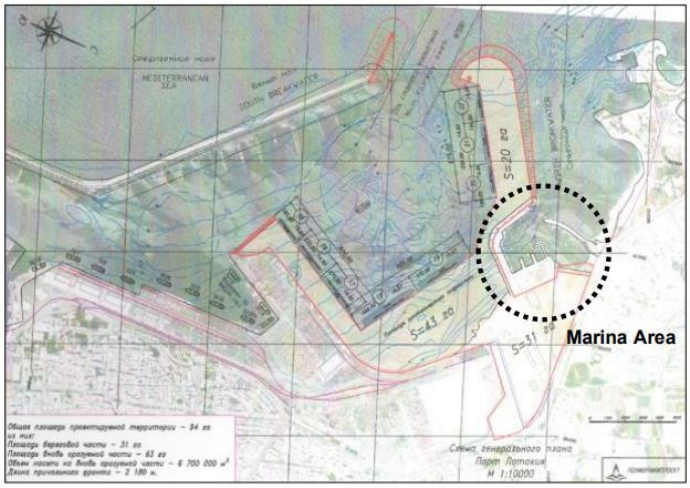

Fig. 9: Suezmone Project modification, 2012s.

For this reason, similar solutions have been proposed, but the most important argument which is the relationship between port and city has been abandoned. Hence, the recovery of the relationship between the Port and the City and how it would be possible. The historical factor of the ancient Port of Lattakia has been forgotten or abandoned, which presents the memory of all the people of Lattakia as a place that is part of the City, indeed it is a place that has grown in parallel with the development of the City itself.

Solutions should be sought to develop the port according to the needs and the vision of an expansion strategy, structured for traffic and tourism, but at the same time, keeping anyway, a visual space in the north. A project is therefore envisaged for the redevelopment of the ancient port area including the southern area of the port which leaves all the urban and architectural symbols of historical value.

4.2. Lattakia Port Development according to the environmental, social and economic principles

Referring to the international proposals of the Master Plan of the Port of Lattakia, considering the purposes of each individual proposal, the requests of the Port Authority of Lattakia and the municipal council of Lattakia and with particular attention to the relationship with the city itself, it is possible to define the principles of a new Strategic Zoning Masterplan of the Port of Lattakia which are the following:

- Expand container terminals, and connect the container terminals with internal dry ports, based on Eco-innovation transportation systems;
- Expansion of the General Cargo terminals;
- Move to the Grand Terminal;
- Create an independent area of the passenger terminal;
- Respect the location of the marina;
- The location of the freight terminal near the road exit;
- The shape of the new terminals should be orthogonal or parallel to the coastline;
- Newly built areas must be neither seismic nor expensive;
- Do not occupy the facade of the City;

- Recover the relationship between people and the sea, then the relationship between the port and the city through the maintenance of the Marina function and a redevelopment project of the old port, offering more, ecological spaces.

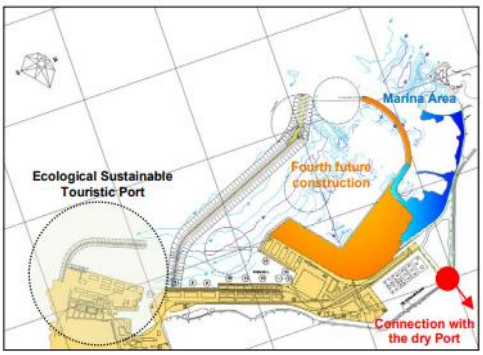

Fig. 10: First new proposal.

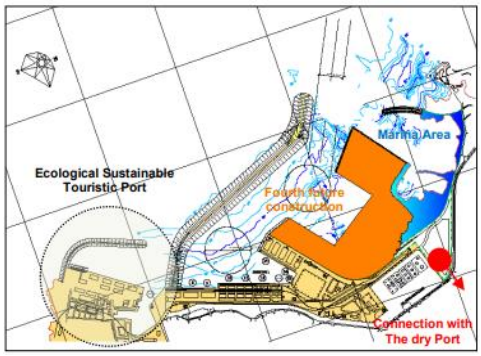

Fig. 11: Second new proposal.

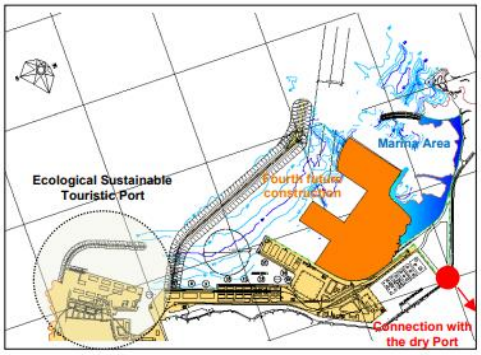

Fig. 12: Third new proposal.

The new solution solution should consider two important factors: first, the needs of the commercial Port and second, the relationship between the Port and the City, based on some elements of the ecological transition.

For the needs of the commercial port, a new port area was created up to the border of the marina. And three forms of the new port area have been chosen, in which not much changes for the capacity of the containers, but what changes is the construction costs which depend on the shape of the quays between orthogonal or parallel to the coast line in relation to the depth. of the water below. Furthermore, by creating a railway and road connection with dry port, it is possible to build it in regional areas outside the urban area to increase the capacity of the containers.

While for the relationship with the City, two areas of connection with the city have been created: The first is the area of the historic old Port, trying to hope for it from the commercial port and redevelop it, opening it again to the city as a historical tourist area, it presents all the identity of the City of Lattakia. In addition, make this area in connection with the southern part of the coast which has the popular tourist features; The second area is that of the marina, although it has no historical value, but it has an ancient, social and economic value for most of the families in the north of Lattakia. Hence, save the north facade of the City from the expansion of the commercial port and save the internationally valuable tourist features of the north coast of Lattakia.

4.3. Connecting Lattakia City with the sea through the development of its Port

Lattakia should have its own social tourist port area separated from its commercial port and inserted into the urban and environmental context of the city itself in relation to the surrounding urban area through the current use of the architectural, urban and environmental elements present on site. In order to mend the relationship between the port area studied and the urban area of the city. Based on the following principles and guidelines:

- Historical and symbolic, saving the buildings of historical and symbolic value in the old port area and around, and transforming the ancient deposits into a photographic exhibition presenting the history of the birth of the port;
- Environmental, ecological and social sustainability, recreate significant connecting open spaces between the saved and transformed buildings and the urban area around, bringing people to the ancient story of the birth of the port of Lattakia in a philological way, saving the traces of the place, creating more meaningful ecological green urban spaces, using the original names of the places (such as Ramita and Laodicea) which are the original roots of the city of Lattakia.
- Improve the Marine Environmental fact, decreasing the mass of container traffic and limit this type of traffic in a maritime area under control and monitoring;
- Touristic at local, regional and international level; transform some buildings in and around the ancient port area into maritime tourist structures and Planning tourist sea routes that connect the ancient port of Lattakia with the cultural heritage sites of Syrian positioned along the Syrian coast and other routes maritime connections with other Mediterranean countries;
- Economical and commercial; Transforming some buildings in the old port area and around it into commercial services, markets and restaurants, and creating an area for outdoor maritime games in the southern part of the port;

- The using of Sustainable Energy, using solar energy (green energy) for all buildings and open spaces. Furthermore, improve the Eco- innovation transportation system and decarbonisation policy for maritime and land traffic, reducing pollution in the area.
- Maritime, railway, vehicular and pedestrian Viability:
  a- Naval Station: Transforming the current passenger lounge into a naval station suitable for the new project,
  expanding it in space and adding a space for temporary naval maintenance;
  b- Railway station: it is proposed to build it in the southern area at the entrance;
  c- Car station: for buses and coaches, it is proposed to build it in the south area at the entrance;
  d- Create parking lots in suitable places close to the pedestrian entrances of the old port area;
  e- Create pedestrian paths that connect all the buildings and spaces present in the area of the old Port.

The general purpose is to create an open relationship between the people of the city and the sea through a tourist, social and ecological port space that has an urban form well inserted in the general urban context of the city itself and making it open in all senses to the sea on one side and the city on the other. The design hypothesis of the "Master Plan of the ancient port" redevelopment starts from the general idea of the general Master Plan of the port of Lattakia proposed in the previous part, suggesting dividing the current port of Lattakia into two separate parts with two different uses:

- Creating an ecological and cultural environmental area, transforming the area of the ancient port into an ecological tourist, social and cultural port. Then, connect the city with the sea through the new proposed reuse in the tourist port area, thinking of attracting the attention of the citizens of Lattakia and transforming this area into an ecological healthy lung, bringing a new clean area to its body of the city of Lattakia;
- Less commercial shipping traffic and reducing total water logging, through a limited commercial port between the old port area and the marina and connecting it with internal dry ports outside the urban area. Then, connect the north seafront with the south one through the new use of the ancient port, creating a single seafront that surrounds the coast of Lattakia from south to north and, in the middle, the tourist port square is presented as an ecological and social meeting point tourist.

5. Conclusion

The development of the port is the cornerstone of the development of the maritime transportation infrastructure, which is a complex process that must be subject to several factors that are interrelated and affect each other, with the aim of creating a sound and correct relationship between the port and the city, so that to preserve the regional environment from any effects that harm the relationship of the local

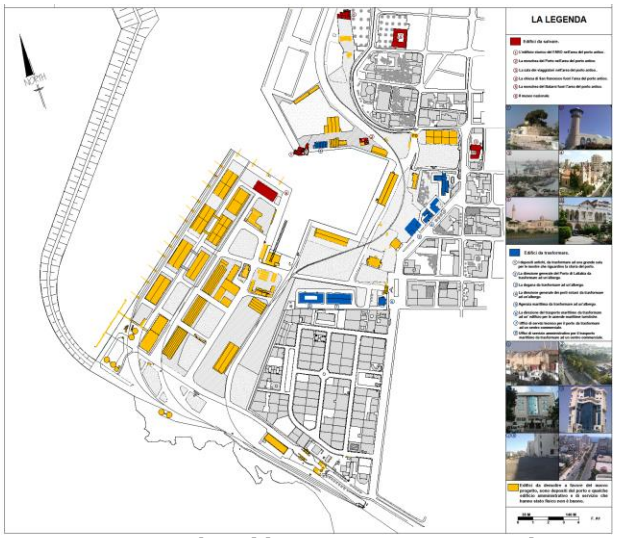

Fig. 13: Lattakia old Port, Current State Analysis.

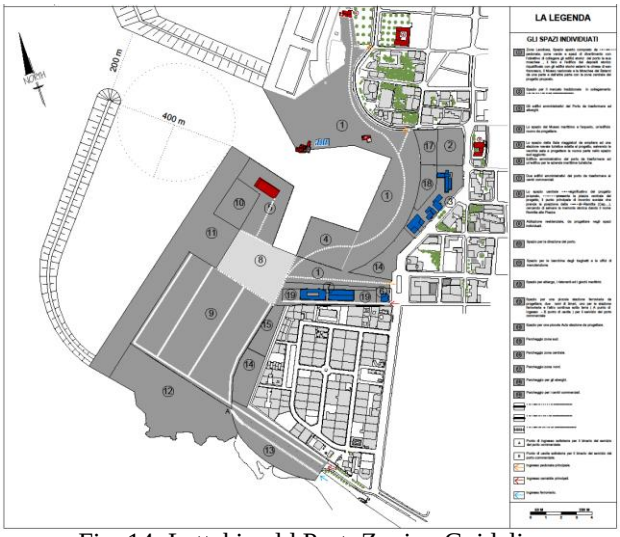

Fig. 14: Lattakia old Port, Zoning Guidelines.

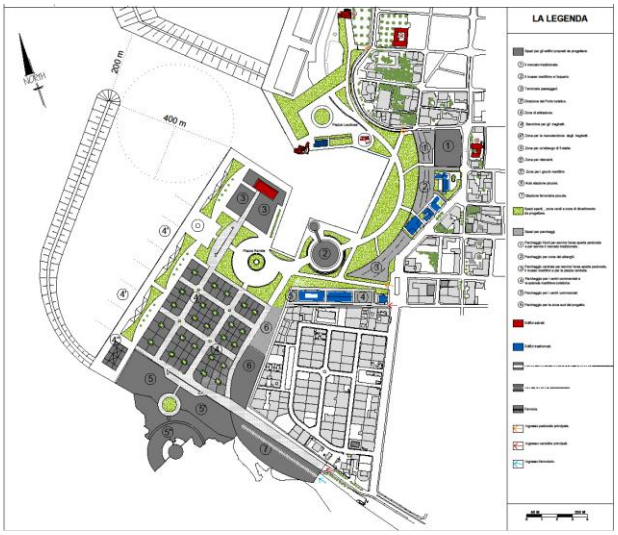

Fig. 15: Lattakia old Port, Final Masterplan Proposal.

community with the city itself on the one side, and the relationship of this society with the sea, on the other side. The true definition of a Port is to be a link between the City and the Sea and attract the residents with the passion and sensibility to this place. In addition, we must remember that the Port has a primary role in decarbonization operations in accordance with the guidelines of the International Maritime Organization (IMO) to achieve the 2050 goals of the United Nation Development Program (UNDP), it is an interesting and important topic, but it needs an article of its own.

References

[1] G. Saada, "A brief history of Latakia,", Damascus- Syria 1984.
[2] H. Agerschou, "Planning and design of ports and marine terminals,", Page Brothers Ltd Norwich, London- U.K 1983.
[3] H. Hejaze, "The ancient Ports on the Syrian coast,", Dar Amani Editor, Damascus-Syria 1992.
[4] H. Agerschou, "Planning and design of ports and marine terminals,", 2nd edition, Thomas Tedford, London- U.K 2004.
[5] P. Viola, E. Colombo, "Tourist Ports,", Dario Flaccovio Editore, Palermo- Italy 2010.
[6] H. Kaffoura, "The Sustainable Development of Ports in relation to the City. Syria, the case of the port of Lattakia, for a better naval movement," Ph.D. dissertation, Department of Civil Engineering and Computer Engineering, Tor Vergata Univ., Rome, 2015.
[7] H. Kaffoura, N. Santopuoli and O. Khalil, "The Ecological Transition Role in the Sustainable Development of Historic Urban Ports,The case of the old urban Port of Lattakia in Syria", Le vie dei Mercanti, Naples- Italy2022.
[8] F. De Rosa, M. Di Palma, "Historic Urban Landscape Approach and Port Cities Regeneration: Naples between Identity and Outlook," Sustainability 2013, University of Naples (Fedrico II), Naples- Italy 2013.
[9] P. Isbell & B. Édes, "Port cities are key to reducing maritime carbon emissions", Green Biz Group, Oakland, California- USA 2021.
[10] S. del Saz-Salazar, L. García-Menéndez and O. Merk, "The Port and its Environment, Methodological Approach for Economic Appraisal", Working Papers on Regional Development 2013/24, OECD Public Governance and Territorial Development Directorate, Paris- France 2013.
[11] F. Russo and G. Musolino, "The Role of Emerging ICT in the Ports: Increasing Utilities According to Shared Decisions", Edwin Van Hassel, University of Antwerp, Belgium 2021.
[12] Japan International Cooperation Agency JICA, "The study on the Port Development plan in the Syrian Arab Republic", Ministry of Transport the Syrian Arab Republic, Damascus- Syria 1996.
[13] United National Development Program UNDP, "Developing the Syrian Ports: Lattakia and Tartus", Ministry of Transport the Syrian Arab Republic, Damascus- Syria 2006.
[14] Euromed Transport EU & Syrian Government, "Syria and Motorways of the Sea-Medamos Project", Ministry of Transport the Syrian Arab Republic, Damascus- Syria 2007.
[15] Det Norske Veritas DNV, Marine Infrastructure, Independent technical expertise for efficient ports, terminals and waterways, Norway 2016.
[16] United Nations Conference on Trade and Development UNCTAD, why ports are at the heart of sustainable development, Geneva, Switzerland 2022.
[17] Source of photographs and Plans:
- H. Kaffoura`s Ph.D. Thesis Mentioned above [6].
- Maritime Transport Directorate at the Ministry of Transport in Damascus.
- Directorate of Construction of the Port of Lattakia in Lattakia.
- Directorate of Statistics of the port of Lattakia in Lattakia.
- General Company of Studies in Lattakia.
- Directorate General of Ports - Hydrographic office in Lattakia.