ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

European Research for Maritime Eco(nomic) clusters governance Strategy - ERMES

Targeted Analysis

Final Report

Final Report

This targeted analysis activity is conducted within the framework of the ESPON 2020 Cooperation Programme.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Final Report

European Research for Maritime Eco(nomic) clusters governance Strategy - ERMES

Version 28/05/2021

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The final version of the report will be published as soon as approved.

Table of contents

List of Figures

List of Tables

Executive summary

This study analyses four urban-maritime regions (the region of Liguria (Italy), East Flanders (Belgium), Malta and Crete (Greece) for their development potential, and assesses to what extent the improvement of urban-maritime interfaces can assist in realising such potential. We conclude that the current positions of these four regions differ considerably, but that they face similar challenges – particularly those concerning environmental sustainability, digitalisation and hinterland connectivity. Specific recommendations are formulated for each region on how to reach their development potential and on how to improve the functioning of the maritime eco-cluster as a prerequisite. As a final step, six recommendations are developed at a higher level and with application value for a wider range of urban-maritime regions in Europe.

Europe's urban-maritime regions are vibrant areas and often establish an interface between cities, industrial activities, recreational activities and nature. Historically, land that is proximate to seas and rivers has provided these areas and their inhabitants economic opportunities. European ports play an indispensable role in ensuring the cost-efficient distribution of goods to/from European consumers and producers.

European urban-maritime regions have their own specialisations. Coastal areas in the northwest of Europe are home to some of the biggest ports in the world in terms of processed cargo. Ports in the Mediterranean region are generally smaller in size, but play an important role in passenger transport. Some ports focus on bunkering services, whereas others specialise in container transhipment or cruises. Ports in mainland Europe service a large hinterland and island ports often cater for the local market.

Port activities can also have negative impacts on urban-maritime regions. They can pose a threat to the environment and can lead to congestion along the region's infrastructures. Guaranteeing economic growth while minimising the negative impacts on the environment is one of the core challenges for European urban-maritime regions in the upcoming ten years. It is a challenge that can only be overcome when regional stakeholders from industries, government and academia join forces. In other words, through effective eco-cluster developments. The question of 'how can effective eco-clusters be developed?' sits at the core of the ESPON ERMES Targeted Analysis (European Research for Maritime Eco(nomic) clusters governance Strategy – ERMES). In this study eco-clusters are defined as:

'a geographic concentration of interconnected economic activities and related institutions that cooperate and compete to achieve (environmentally) sustainable economic development'

The aim of ERMES was to **analyse the maritime cluster development potential in the four European urban-maritime regions, and to see how improvement of the so-called urban-maritime interfaces can help to realise these potentials.** We have carried out our analysis in the region of Liguria (Italy), Crete (Greece), Malta and the Province of East Flanders (Belgium), and have drawn region specific conclusions on their maritime cluster development potentials and recommendations that can help local policy makers in reaching this potential. Additionally, 'horizontal' recommendations have been formulated. These horizontal recommendations can be used by policy makers in all urban-maritime regions in Europe in stimulating eco-cluster development.

Based on desk research, the project team developed a territorial analysis of the stakeholder regions in terms of economic activity, type of port activity, governance structure and cluster potentials. Furthermore, four global trends in urban-maritime regions were identified: Optimisation of (port) operations, Port regionalisation and multimodality, Innovation and digitalisation and Enhancement of environmental sustainability., With the use of these trends and in consultation with a variety of representatives from the stakeholder regions, development scenarios towards 2030 were formulated per stakeholder regions Different types of development and actions are needed in the urban-maritime regions to realise these scenario potentials. A next step was to assess the challenges that the regions may face. Some challenges were identified which may hinder the progress of each region. Finally, the project team established policy recommendations on how such challenges could be overcome using eco-cluster development.

In this study it became clear that the four urban-maritime regions, while embedded in different local contexts, are likely to face similar challenges in the upcoming 10 years. The need to transition towards more environmentally sustainable practices, for example through the use of alternative fuels, applies to all regions. The increasing demand for digitalisation, innovation and more efficient modes of operation is a similarly overarching trend. The need for efficient and sustainable transport to/from the ports' hinterlands remains an important challenge. We can even go as far as to suggest that these trends coexist and that simultaneous development in these fields for all ports is a prerequisite for a successful future.

To ensure that urban-maritime areas progress, collaboration between the different actors in the region is essential: port authorities, industrial actors and businesses, governmental organisations and (academic and applied) researchers all hold part of the key. Collaboration between them, for example for the effective development of (eco)clusters, will therefore contribute the success of the region. This study shows that each of the four regions has a different starting position when it comes to facilitating or enhancing existing forms of collaboration. This local context is determined not only by the nature of the economic activities, but also relates to the extent to which governance reforms have been implemented in the recent past.

The study demonstrates that for Liguria, the main priority in the coming years is to focus on closer collaboration between public and private parties to reach agreement on an integrated strategy to tackle the challenges Liguria is facing.. East Flanders faces a similar situation. A key recommendation here is to make use of the broad network and knowledge that is available in the region, by seeking collaboration with neighbouring ports in areas such as digitalization. Through shared development, efficiency gains are possible. On the other hand, Malta and Crete face different challenges. In Malta, shared investments towards sustainable solutions regarding green fuels and transport are needed, whereas the developments in Crete hinge on the privatisation of certain parts of the port, which will in turn bring investment opportunities in the field of maritime transport and tourism.

So, what does this analysis mean in practice? The results of this ERMES study include recommendations at the level of the stakeholder regions - detailed in the case study reports (provided as an accompanying document) - and a set of horizontal recommendations.

The horizontal recommendations are interrelated and reflect different steps in a process of policy development and implementation that is relevant for all urban-maritime regions. The horizontal recommendations build upon the outcomes of the desk research, workshops and problem analysis in the four stakeholder regions. They are more general recommendations that apply for all urban-maritime regions in Europe. The horizontal recommendations are summarised below. **More detailed explanations can be found in Chapter 7 of the final report**.

Recommendation 1) Develop a shared, integrated and sustainable development strategy.

To unleash the socio-economic potential that the port and maritime sector can offer to a region, it is imperative that relevant stakeholders (public, private, academic, etc.) commit to a shared, integrated and sustainable ambition. This will provide a vision for actions to be targeted towards, allowing for the alignment of resources that stakeholders can offer to benefit the development of the region.

Recommendation 2) Stimulate communication and participation through an eco-cluster organisation.

A formalised structure through which actors can communicate and cooperate is often lacking, while clear communication is essential to facilitate the development of a joint and integrated strategy. In this eco-cluster organisation, port authorities, industry, the private sector, universities and government should be represented to jointly decide upon a strategy towards environmentally sustainable growth in the region. This eco-cluster organisation can also facilitate additional activities, such as capacity building activities or knowledge sharing events.

Recommendation 3) Create opportunities for innovation.

In order to increase competitiveness and encourage effort towards sustainability, significant investments in innovation in a broad range of areas is required in European ports. Examples where innovation is most needed include, but are not limited to, digitalisation, greener fuels, data management, smart transport. This study has shown that significant differences exist between urban-maritime regions. There is a need for increased cooperation between port authorities, port operators and research institutions in all stakeholder regions in order to increase opportunities for innovation. However, the existing level of innovation, and the means for improving opportunities for innovation, are very much dependent on local contexts.

Recommendation 4) Enhance the development of skills and re-skilling.

Sustainable maritime transport is an essential source of economic activity. At the same time, the education of new workers and the updating of skills of existing workers is key to shaping future economy possibilities. Urban-maritime regions should enhance and promote opportunities for 'blue' (i.e. marine and maritime) careers by developing skills, exchanging knowledge and valorising research towards sustainability. They should also aim to develop new curricula and increase employability in the marine and maritime sectors. Urban-maritime regions should also enhance the shared knowledge through higher education as well as research and innovation.

Recommendation 5) Improve transregional cooperation to tackle the challenges.

A transregional system of cooperation should be created for ports/maritime regions to address the many common challenges they face. For regions with a less favourable starting position, this would enable a quick acceleration in development as good practices (mimicked from more advanced ports/maritime regions) are adopted. This would provide the regions with the possibility to reinforce their position during the implementation phase of the European Green Deal[1].

Recommendation 6) Monitor and evaluate progress.

In order to achieve the goals and intended benefits of any strategy, a structured monitoring plan is necessary to ensure that progress is made within the schedule of the timeline and the boundaries of dedicated resources. The monitoring plan should also allow for necessary adjustments to the actions of the strategy in the event of a delay.

The final delivery of the ERMES study includes this final report as well as a set of case study reports which further detail the outcomes at the level of the individual regions and an Atlas with visualisations (accompanying documents).

[1] COM(2019) 640 final: https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF.

1 Introduction

1.1 Background

In this report we present the results of the ESPON Targeted Analysis "*European Research for Maritime Economic clusters governance Strategy*" (ERMES).

This study started on the 11 of March 2020 and covered a period of twelve months. The study focused on four stakeholder regions: The Region of Liguria (Italy), Crete (Greece), Malta and the Province of East Flanders (Belgium). Its aims were (1) to analyse the urban-maritime interfaces and cluster development potentials in the stakeholder's regions; (2) to define regional-specific urban-maritime spatial planning scenarios, involving triple helix actors, policy-makers and city-port authorities; (3) to provide policy recommendations for the elaboration of strategies for urban-maritime regions; and (4) contribute to the production of an Atlas/Roadmap on future polycentric urban-maritime port regions in Europe.

The study centres around a set of four research questions, some of which encapsulate more detailed questions which have been formulated at a lower level.

1. Considering the actions undertaken within cooperation networks among city ports, what are the territorial benefits that cluster collaboration can bring in the stakeholders' territories?
2. To what extent and how could clusters contribute to the development of urban-maritime regions?
    - How can clusters benefit insular areas that combine a high number of territorial disparities, such as those described in Article 174[2]?
    - Which actions/policies are needed to ensure the sustainable and integrated management of economic clusters in coastal regions and island territories?
3. Are economic clusters able to support local business development in urban-maritime regions?
    - What are the main economic sectors affected?
    - Which schemes can be used to investigate how the agglomeration of firms and related actors has an impact on the regional maritime economy (jobs/business creation and sustainable growth)?

[2] Of the Treaty on the Functioning of the European Union. Article 174 states the following: '*In order to promote its overall harmonious development, the Union shall develop and pursue its actions leading to the strengthening of its economic, social and territorial cohesion. In particular, the Union shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions. Among the regions concerned, particular attention shall be paid to rural areas, areas affected by industrial transition, and regions which suffer from severe and permanent natural or demographic handicaps such as the northernmost regions with very low population density and island, cross-border and mountain regions.*'

4. How can framework conditions be created in stakeholders' coastal regions to strengthen the relationship between existing industrial service assets and strategical infrastructure development?
    - Do economic clusters contribute to the improvement of networking and cooperation of urban-maritime regions?
    - Which opportunities do citizens benefit from in the implementation of cluster policies?

The research questions have been answered throughout the report. Relevant conclusions to the questions can be found in the paragraphs indicated in the table below.

Table 1: Overview of research questions and related sections of the final report.

Research question	**Paragraph**
Considering the actions undertaken within cooperation networks among city ports, what are the territorial benefits that cluster collaboration can bring in the stakeholders' territories?	Paragraph 8.1 Case study reports
To what extent and how could clusters contribute to the development of urban-maritime regions? • How can clusters benefit insular areas that combine a high number of territorial disparities, such as those described in Article 174 ? • Which actions/policies are needed to ensure the sustainable and integrated management of economic clusters in coastal regions and island territories?	Paragraph 8.2
Are economic clusters able to support local business development in urban-maritime regions? • What are the main economic sectors affected? • Which schemes can be used to investigate how the agglomeration of firms and related actors has an impact on the regional maritime economy (jobs/business creation and sustainable growth)?	Chapter 5
How can framework conditions be created in stakeholders' coastal regions to strengthen the relationship between existing industrial service assets and strategical infrastructure development? • Do economic clusters contribute to the improvement of networking and cooperation of urban-maritime regions? • Which opportunities do citizens benefit from in the implementation of cluster policies?	Paragraph 8.2

1.2 Contents of this report

According to the Terms of Reference (ToR), the final report should include the following aspects:

- executive summary focusing on conclusions and recommendations based on the stakeholders' knowledge needs;
- summary findings of the analysis supported by some key maps/visualisations;
- final results of tasks 1-4.

This final report fulfils these requirements through the following:

- **Chapter 2** describes the methodological challenges encountered and mitigation measures adapted during the research process;
- **Chapter 3** provides a conceptual framework for the analysis and includes definitions of important concepts within this ERMES study;
- **Chapter 4** describes the European perspective on urban-maritime development and provides overarching information on the territorial and economic context of all European urban-maritime regions;
- **Chapter 5** provides the results of the analysis on urban-maritime interfaces and development potentials;
- **Chapter 6** identifies the urban-maritime scenarios for the four stakeholder regions;
- **Chapter 7** presents guidance and recommendations for stakeholders on the elaboration of strategies for added urban-maritime value;
- **Chapter 8** presents the conclusions of the ERMES Targeted analysis**.**

1.3 Additional documents delivered as part of final delivery

Aside from this final report, the final delivery consists of the following products (provided as accompanying documents):

1. **Atlas** with key maps and figures that delineate the outcomes of the ERMES study;
2. **Case study reports** with extensive information on each of the stakeholder regions;
3. **Synthesis report** (max. 8 pages) including:
   - Main results of the Targeted Analysis;
4. **Scientific annexes** including:
   - Everything that has to be known to make the study repeatable and verifiable;
   - Full descriptions of the spatial analysis and the scenario work;
   - Proposals for further research in the subject area of the activity;
   - Content for the ESPON website (max. 12 pages) showcasing the key results and insights of the main report,
5. a **PowerPoint presentation** (approximately 30 slides), consisting of the main components of the final report, including the key maps and results of the study,
6. **Key maps** (2-5) (as appropriate) and accompanying text following the structure of the ESPON Online MapFinder,
7. **Source files** for the maps and figures included in the delivery reports (in vector format);
8. **Geodatabase(s)** for all the maps included in the Final Delivery;
9. **data gathered** according to the ESPON metadata template and proof of the integration of data in the ESPON 2020 database.

2 Note on methodological challenges

2.1 Measures related to the COVID-19 crisis

International institutions and European governments have taken restrictive measures to slow down the spreading of COVID-19. Throughout the implementation phase of this research, the project team have been affected by the effects of these measures. Most importantly, the restrictive measures have prevented us from engaging in physical meetings with stakeholders and other actors involved. Luckily, with the help of digital tools and the flexibility of all actors, we have been able to retrieve the necessary information to conduct this study. All that have contributed to this research has shown a high degree of flexibility and understanding for the situation.

With regard to the stakeholder engagement process, we have not delayed the activities of responding to emails, questions, requests. In response to the potentially limited availability of interviewees to participate in interviews (face-to-face or phone), we have developed online surveys. This approach allowed respondents to choose the most appropriate time for responding. A downside of this approach has been that the interviewer did not have an immediate opportunity to build on answers and ask follow-up questions. In order to address any gaps in the content provided via the survey, a number of interviews were conducted. The aim was to conduct 4-5 interviews per region. Unfortunately, and despite bets efforts, the project team have not been able to conduct this amount of interviews for each region. This is perhaps partly due stakeholder fatigue, since stakeholders were invited for multiple workshops both within the framework of the ERMES project and through other projects. In the annexes of the four case study reports, an overview is provided of the different stakeholders that have been contacted during the implementation of this study.

The COVID-19 pandemic has most notably affected the organisation of the scenario development workshops. Given the travel restrictions and the fact that physical multi-person meetings were impossible, these workshops were conducted in a virtual environment. The project team had anticipated this scenario, which enabled us to prepare the virtual workshops well in advance. However, for some workshops (e.g. East Flanders) the number of participants was low. The project team furthermore recognised that a virtual meeting cannot offer the same degree of interaction and discussion as a physical meeting. This offers a partial explanation for the seemingly lower willingness to participate in virtual workshops. Nevertheless, we are confident that we have been able to maximise the level of interactivity and engagement with the participants.

The project team used a variety of approaches to improve the interaction of participants during the virtual workshops. For example, it was decided that all four regional workshops would be conducted in the local languages, therefore making sure that the participants would not feel hampered or limited in expressing their thoughts and ideas. After consulting with our local

expert for Malta, it was agreed that an exception would be made for Malta and that this workshop would be conducted in English, with the local expert being available to offer ad-hoc translation if required. The Maltese workshop thus also allowed an opportunity for the project team to ensure that the redesigned methodology (i.e. the virtual environment for stakeholder participation) worked in practice and provided the needed inputs. The Maltese workshop, being held first, assured the project team that the methodology was suitable for the purpose, allowing for the intended inputs to be acquired and hence no major changes were made for the remaining regions workshops. One minor change was however made to improve the participation of stakeholders towards the end of the workshop - a 'teaser' of the mapping slide was moved earlier in the agenda (just before the coffee break), to ensure that the participants know that an additional interactive activity would occur later in the presentation.

For the practical organisation of all the workshops in a virtual environment, two members of the project team were trained in the use of WebEx. Their knowledge allowed them to train other project team members and provide technical support to the moderator, map operator, minute taker and participants during the workshops.

Due to the decision to conduct the other three workshops in the local language, proficiency in the local languages was a requirement of certain team members involved in the workshops. The local experts (Laura Parducci, Joost Hintjens and Evangelos Sambracos) took on the moderation duties, while colleagues proficient in the local language from Ecorys and Spatial Foresight took the roles of impact mapping, taking minutes and handling the correspondence with the participants. This meant that a number of training sessions had to be organised, in order to make sure that the members of each workshop team were comfortable with both the content of the respective workshop as well as the technical aspects. Both the moderator and the map operator had to be able to share PowerPoint slides in WebEx, and make modifications to the slides while presenting. Trainings where therefore organised first for the whole team involved in running the workshops, and then on ad-hoc basis for individuals who required further practice to feel comfortable in their role. Guidance documents were also produced to support the workshop team in preparation for the event.

Ahead of the workshop, confirmed participants were provided with a comprehensive background document which included the scenarios (as well as their related storylines and assumptions) which would be presented. This allowed for the workshops to be more efficient. In the virtual environment it was not feasible to split the workshop participants into smaller groups as originally planned for the face-to-face workshops. It therefore proved to be more challenging to engage all participants equally and to receive the maximum amount of input from each participant. Having played a key role in drafting the list of invitees and conducting interviews earlier during the project, the moderators were already familiar with the majority of participants. The moderators were therefore able to encourage individual participants at appropriate moments (for Malta, the local expert was present to support the moderator in this regard). Furthermore, the overall length of the workshop had to be significantly reduced for the

virtual setting (from the intended 4 hours to 2.5 hours), which allowed less time for each input. Finally, the stakeholders that participated in the workshop were able to provide feedback on the results a week after the workshop.

2.2 Other methodological challenges

The impact mapping session proved to be the most challenging part to organise in the virtual workshop. In some workshops (mainly Liguria and Crete), where the participants had a lot of inputs during the first half of the workshop, slightly less time was left available for the mapping session. Moreover, many of the impacts identified by the participants were not of the sort that could easily be located - being either immaterial or covering the entire region. This was particularly the case for the workshops on East Flanders and Crete. Some of the impacts collected during these workshops could therefore not be used as impacts, but were nevertheless of added value elsewhere in the report.

Regarding the collection of data which was used for task 1, no serious gaps in data were found. The project team mainly used European data sources for this purpose and made less use of regional databases. This approach allowed for a better comparison between the different European regions. However, some data are less detailed than initially anticipated.

3 Conceptual framework

The ERMES project focuses on the ways in which eco-clusters can contribute to the development of urban-maritime regions. The linkages and interaction between the maritime and urban economy, and the way in which clusters can contribute to strengthening (the value) of these linkages, is central. To study this, a deep understanding of the (evolution of) the cluster concept, as well as related topics such as port development and governance, is necessary. In the paragraphs below, the conceptual framework is defined - on which this study is developed. First, the concepts of eco-clusters, cluster organisations and cluster policies are defined. Then we delve deeper into different understandings of port-city interface, the effects of clustering and port governance. Finally, we discuss the concept of insularity and its effects on regional economic development.

3.1 The definition of eco-clusters

For the purpose of this study, the project team stuck to a practical definition of clusters which is widely shared in current academic and applied research. It is based on the classical definition of professor Michael E. Porter, but incorporates more recent developments in this field of study (and practical application). As defined by professor Michael E. Porter, a cluster is "a geographic concentration of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also cooperate"[3]. Clusters are not just an abstract concept, but also a real economic phenomenon[4]. More specifically, clusters are the concentration of economic activities in groups of related industries in a specific location that are connected through multiple linkages and spill-overs[5] . In the definition by Porter, the role of institutions in clusters is emphasised. In this study, we also place emphasis on the connection between a related business sector and the surrounding institutions. Finally, the 'eco' section of eco-clusters refers not only to the economic phenomenon that clusters are usually associated with, but also to a broader ecological or sustainable value that can be incorporated in cluster approaches. We hence define eco-clusters as the following:

[3] Porter, M. E. (1998). *Clusters and the new economics of competition* (Vol. 76, No. 6, pp. 77-90). Boston: Harvard Business Review.

[4] Delgado, M., Porter, M. E., & Stern, S. (2016). Defining clusters of related industries. *Journal of Economic Geography*, *16*(1), 1-38.

[5] European Commission. (2016). *Smart Guide to Cluster Policy. How to support SME Policy from Structural Funds*.

'a geographic concentration of interconnected economic activities and related institutions that cooperate and compete to achieve (environmentally) sustainable economic development'

Every stakeholder region involved in this study has an urban-maritime cluster. The structure of these clusters can differ significantly due to different types of organisations, industries and activities that take place in the cluster. Nevertheless, two core commonalities can be derived from these perspectives that form the core of an operational definition. First, all perspectives are based on the assumption that urban-maritime clusters develop from complex relationships between interconnected firms and other organisations - including governments. Second, urban-maritime clusters are related to a coastal location because the industry is located in regions where it is physically possible to access and exploit maritime and sea-related activities[6].

Clusters are related to the phenomenon of networks, but are distinctly different. Organisations and firms in a cluster are linked by working in a similar field or industry and are in spatial proximity to each other. They are not necessarily cooperating directly. Networks can be broader alliances of firms and organisations that do cooperate together. Networks are either 'horizontal' or 'vertical' in nature: horizontal networks encompass firms and organisations that work and compete on the same market, whereas vertical networks are alliances between parties in the same value chain. Networks can exist within clusters, but also outside of clusters.

Cluster policies

In recent years, clusters have attracted multilateral attention, from academia and practice alike. Many governments have acknowledged the important role that maritime clusters play in not only promoting economic development, but also supporting potential innovation and technological development. Thus, maritime cluster policy initiatives and programs have proliferated in a myriad of contexts[7].

Modern cluster policies aim to put in place a favourable business ecosystem for innovation and entrepreneurship in which new winners can arise and hence support the development of new value chains and emerging industries. This implies more than merely supporting networking activities and setting up cluster organisations that manage networking and provide support services to small and medium-sized enterprises (SMEs). It means that specialisation strategies need to be placed in a broader context and secured in a policy framework that goes beyond a

[6] Doloreux, D. (2017). What is a maritime cluster? *Marine Policy*, *83*, 215–220. https://doi.org/10.1016/j.marpol.2017.06.006.

[7] Koliousis, I. G., Papadimitriou, S., Riza, E., Stavroulakis, P. J., & Tsioumas, V. (2017). Strategy, policy, and the formulation of maritime cluster typologies. *Marine Policy*, *86*, 31–38. https://doi.org/10.1016/j.marpol.2017.09.010.

sectoral, geographical and departmental 'policy-silo pattern'. Modern cluster policies thus follow a systemic and integrated method that unites several policies, programmes and instruments[8].

The economic drivers of such cooperation can vary extensively and include different aims. For example, to gain a stronger competitive position to attract and retain traffic flows, better access to capital, or improved, general control over the logistics chain. From a governance perspective, the cooperative agreements can range from top-down, government-influenced alliance formation to bottom-up, collaborative projects, and from long-term market contracting to full-fledged mergers[9].

3.2 Port-city interface

Many cities around the world are port cities, and yet, industrialisation of port activities and changes in port operations have resulted in the separation between the city and its port[10]. Adding recent developments, like the sustainability and energy transition, causes port authorities around the world to find ways to use port assets more efficiently and productively in economic, social, as well as environmental terms. Some ports have moved away from urbanised areas, while in others fences and security barriers are being erected to separate a city from the water areas. Space is contested, and tension is increasing between urban and industrial use of the waterfront areas. However, the proximity of city spaces to industrial activities is unavoidable and managing the relations between port operations and the city becomes one of the main priorities of the port managing companies.

Evidence coming from studies on port-city relations show different meanings of the interface. According to the historical character of cities on water, the interface may reinforce their maritime attitude, or rather become an opportunity for that urban area to grow, by catching new meanings within the urban context. Cooperation of the public sector with management authorities proved to be pivotal for the success of actions. An extensive community consensus, reached by working on their awareness, re-establishes huge parts of the city to its users[11]. Nevertheless, the risk for transition areas (working among powers, functions and forms) is likely to become a

[8] European Commission. (2016). *Smart Guide to Cluster Policy. How to support SME Policy from Structural Funds*.

[9] de Langen, P. W., & Haezendonck, E. (2012). Ports as Clusters of Economic Activity. In W. K. Talley (A c. Di), *The Blackwell Companion to Maritime Economics* (pagg. 638–655). Wiley-Blackwell. https://doi.org/10.1002/9781444345667.ch31.

[10] Van den Berghe, K. (2018) *Planning the Port City* PhD Thesis, Ghent University.

[11] Calabrò, J., Rugolo, A., & Viglianisi, A. (2019). The Port-City Interface. In F. Calabrò, L. Della Spina, & C. Bevilacqua (A c. Di), *New Metropolitan Perspectives* (Vol. 101, pagg. 192–199). Springer International Publishing. https://doi.org/10.1007/978-3-319-92102-0_21.

ground for political conflict, which can stop the completion of the initiatives and influence the urban environment[12].

Finally, the governance structure and relation between the port authority or port managing companies (PMC) and the municipalities near the port defines the organisational framework. This framework provides a basis within which the PMC needs to operate in order to mitigate the tension between urban spaces and the port. This tension requires accurate management of port stakeholders, a well-thought communication strategy and the development of distinct initiatives aimed at diminish negative external effects correlated to port activities[13].

3.3 Effects of port clustering and regional economic spin-off

Ports bring both positive and negative impacts to the regions and communities in which they are located. On one hand, ports and related industrial clusters can generate regional economic spin-off (jobs), and port-related activities stemming from the supply of goods and services can drive economic productivity and growth. On the other hand, port-related activities create negative externalities. Ports are energy and emission intensive and often have negative impacts on regional accessibility. Many of the positive effects of port regions spill over to neighbouring areas.

Various reports (e.g. 2010, 2014) by the International Maritime Organization (IMO) and academic studies found that shipping accounts for roughly 1.5% and 3.3% of global CO_2 emissions. In addition, maritime transport is also responsible for a substantial part of global SO_x, NO_x and PM_{10} emissions. According to the annual EU report on CO_2 emissions from maritime transport, emissions in the EU add up to over 138 million tonnes of CO_2, which represents 3.7% of the European CO_2 emissions. Besides resource depletion and polluting emissions, waste management remains one of the main environmental issues for ports, according to the European Sea Ports Organisation (2012).

From 1 January 2020, new (stricter) emission regulations for shipping were in force. These regulations reduce the maximum permitted percentage of sulphur in ships' fuel, leading to a 77% decrease in SO_x emissions from ships. Additionally, efforts have been made to reduce emissions as a result of shifting container traffic to lower carbon transport modes, such as rail and waterborne transportation, and by promoting the use of more fuel-efficient trucks[14].

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[12] Ciulla, V., & De Capua, A. (2016). La nuova forma urbana. *LaborEst*, *12*, 85–88. https://doi.org/10.19254/LaborEst.12.14.

[13] Carpenter, A., & Lozano, R. (A c. Di). (2020). *European Port Cities in Transition: Moving Towards More Sustainable Sea Transport Hubs*. Springer International Publishing. https://doi.org/10.1007/978-3-030-36464-9.

[14] Acciaro, M., & Mckinnon, A. (2013). Efficient Hinterland Transport Infrastructure and Services for Large Container Ports. JTRC Discussion Paper Series.

Given that ports are systems with a high level of resource depletion and polluting emissions, ports can have a large contribution to society and the environment by optimising resources and waste management in coastal areas, and by having an active and positive role on the development of coastal and urban landscape in the surrounding port region[15]. Several ports responded to this (global) trend by implementing measures to optimise resource and waste management by intensifying interactions between different stakeholders in the same region or between stakeholders from different regions that share logistical and infrastructural connectivity. For example, by-product exchanges and utility sharing, self-management of externalities, multi-stakeholder collaborations aimed at reducing and preventing pollutant emissions flowing into the port, port-city cooperation over recycling facilities[16], collaborative dredged material management[17], integrated management of port and port related activities[18].

Need for cluster policies

Within the boundaries of the port, the advantages of clustering from a business perspective are clear. Shipping and port industries are highly dependent on sub-contractors and various kinds of services. Often a specialised labour market forms within the port[19]. Related specialised (maritime) business sectors (such as trading, banking, legal and insurance) can profit from the physical proximity of a seaport as information flows more easily (and more informally). The successful creation of these clusters, where port and city are more interrelated, is however very dependent on context. Merk[20] notes that "the role of policy is thus to respond to locally identified needs, and to encourage these tendencies only when this is logical in light of alternative uses of resources". In the same report, four main categories of policy instruments are mentioned which actively support and stimulate cluster growth. These are:

- **developmental support** instruments that support the emergence and maturation of embryonic clusters through the formulation of broad development strategies and the provision of basic facilitating infrastructure;

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[15] Cerceau, J., Mat, N., Junqua, G., Lin, L., Laforest, V., & Gonzalez, C. (2014). Implementing industrial ecology in port cities: International overview of case studies and cross-case analysis. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2014.03.050.

[16] Van Berkel, R., Fujita, T., Hashimoto, S., & Geng, Y. (2009). Industrial and urban symbiosis in Japan: Analysis of the Eco-Town program 1997-2006. Journal of Environmental Management. https://doi.org/10.1016/j.jenvman.2008.11.010.

[17] Abriak, N. E., Junqua, G., Dubois, V., Gregoire, P., Mac Farlane, F., & Damidot, D. (2006). Methodology of management of dredging operations I. Conceptual developments. Environmental Technology. https://doi.org/10.1080/09593332708618653.

[18] Cerceau, J., Mat, N., Junqua, G., Lin, L., Laforest, V., & Gonzalez, C. (2014). Implementing industrial ecology in port cities: International overview of case studies and cross-case analysis. Journal of Cleaner Production. https://doi.org/10.1016/j.jclepro.2014.03.050.

[19] de Langen P.W. (2015) Governance in Seaport Clusters. In: Haralambides H.E. (eds) Port Management. Palgrave Readers in Economics. Palgrave Macmillan, London.

[20] Merk, O. (2013). The competitiveness of global port-cities: synthesis report. OECD Regional Development Working Papers. https://doi.org/http://dx.doi.org/10.1787/5k40hdhp6t8s-en.

- **fiscal and financial incentive** instruments that seek to spur or renew growth in already-existing clusters by providing fiscal relief or financial transfers to strategic aspects of the cluster;
- **coordination and information-sharing** instruments that aim to improve cluster governance and overcome collective action problems;
- **human capital matching** instruments that seek to better embed the cluster locally by improving matches between the local labour pool and the cluster's human capital requirements.

3.4 Port governance

In recent years, renewed interest in the role of port authorities has emerged. Scholars have developed various recommendations for a 'renaissance' of port authorities, revisiting traditional landlord, regulator and operator functions and conceiving a community manager function and a dimension beyond the local port perimeter. Since the 1990s and early 2000s, a wave of port reforms has been observed. While these port reforms were different in both their objectives and forms, they shared a common ground in terms of a dynamic world economy - characterised by a modernised globalisation of production and consumption, consequent burgeoning growth in maritime trade and, more specifically, booming demand for container transport and its supporting infrastructure provided by container ports and terminal operators[21]. By 2017, the port reform timeline moved on. With some countries having implemented no reforms at all, others achieved significant improvements in performance.

In spite of these different approaches, however, the general trend still clearly exists for greater devolution, privatisation or commercialisation, within each country's context and understanding of the terms. As stated by Brooks et al. "supporting all such trends and approaches is the desire to govern ports in a way that makes them more profitable and efficient, and, increasingly, a way that makes them more sustainable and green"[22].

The options for port authorities can be brought together in a hypothetical typology, whereby port authorities act either as conservators, facilitators or entrepreneurs. The power balance with their respective governments stands out as a principal factor which influences the legal and statutory framework, the financial capability and the room for a pro-active management culture at the corporate level of the port authority. Additional consideration should be made towards the supra-national level of the European Union which has the potential of setting a more independent legal and policy framework for port authorities[23].

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[21] Verhoeven Patrick. (2011). *European Port Governance*. European Sea Ports Organisation (ESPO).

[22] Brooks, M. R., Cullinane, K. P. B., & Pallis, A. A. (2017). Revisiting port governance and port reform: A multi-country examination. *Research in Transportation Business & Management*, *22*, 1–10. https://doi.org/10.1016/j.rtbm.2017.02.005.

[23] Verhoeven Patrick. (2011). *European Port Governance*. European Sea Ports Organisation (ESPO).

3.5 Islands and insularity

Island countries share some common features and vulnerabilities to future territorial developments, such as insularity, geographic remoteness, economic dependences, population size and available area for development. Of the four stakeholder regions studied in this study, Malta and Crete are in part characterised by their insular nature. Insularity in the context of islands can be defined as **disconnection from the mainland**[24]. Insularity can also be defined through the common characteristic of all islands, namely **small size** (relative to the mainland), **remoteness and isolation**, **special experiential identity** and **particular, rich and vulnerable natural and cultural environment**[25].

The disconnection from mainland gives rise to multiple challenges, which can be mitigated or exacerbated by other physical and social factors present on the island. These are identified as follows[26]:

- **Challenges in transport and trade logistics**: The importance of well-functioning, reliable, sustainable and resilient transportation systems, in particular maritime and air transport, is highlighted at islands due to their insularity. Challenges arise for shipping services, transport costs, port infrastructure and equipment, as well as for market accessibility and operation potential. At the same time, the disconnection from transport and energy networks could result in the reliance of islands to fossil fuels and energy imports, which could pose daunting challenges and undermine their ability to achieve their sustainable development goals;
- **Market accessibility & Economies of Scale**: Smaller vessels and smaller cargo volumes on islands may limit their ability to benefit from economies of scale or attract shipping services and investors due to having to bring higher costs per total equivalent units (TEUs) than larger vessels. This, combined with relatively low and imbalanced import and export volumes, remoteness, which results in long and indirect transport routes, can have a significant impact on transport costs. In this context, considerations of ship economics (ship size in relation to volume of cargo, required service frequency, route length, ship speed, physical constraints to ship size at ports and time in ports) and indivisibilities in associated seaport infrastructure, superstructure and equipment can all drive up transport and import costs, and reduce the competitiveness of exports;

[24] ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

[25] ESPON The Development of the Islands – European Islands and Cohesion Policy (EUROISLANDS). Interim Report 2013. Available at: https://www.espon.eu/sites/default/files/attachments/inception_report_full_version.pdf

[26] ESPON The Development of the Islands – European Islands and Cohesion Policy (EUROISLANDS). Interim Report 2013. Available at: https://www.espon.eu/sites/default/files/attachments/inception_report_full_version.pdf

- **Geographic remoteness & Economic Dependences**: Participation in global trade depends significantly on a country's ability to access reliable transport services that connect regional and global trading partners and to do so cost effectively. As such, geographic remoteness is an important factor contributing to higher transport costs and higher degree of economic dependency on imports/exports;
- **Vulnerability to external shocks**: Islands are further exacerbated by concurrent trends such as globalization, environmental degradation, climate change and limited financial resources for infrastructure development and maintenance;
- **Access to funds**: Financing is a key challenge when developing, rehabilitating and maintaining island infrastructures and facilities. Most of the time limited financial resources are at the heart of the problem for the territorial development of islands, as they can often be highly indebted and have limited access to concessionary loans and resources. Raising levels and diversifying sources of funding as well as increasing private sector involvement in territorial development are some of the recommendations that could help overcoming this challenge;
- **Access to technology and know-how**: The necessary technology and know-how needed to advance in the territorial development of islands is not always present. As such, islands should promote collaborative approaches (both within and across islands) between their public and private investment partners so as to encourage the sharing of lessons learned, experiences and best practices and ensure that existing opportunities are explored and exploited[27].

As noted in the ESPON BRIDGES report[28], the level exposure to these challenges are dependent on context-specific factors, such as the size, population, location, urban endowment and institutional status of the island.

Insularity also affects the local governance. In insular areas social ties and community involvement are often strong, which can allow for quick and effective decision making and for engaging people in both policy formulation and implementation. However, the close proximity between elected representatives, senior officials and stakeholders may also lead to a degree of clientelism and conflict of interest.[29] Insular areas also often experience rapid demographic change, which may weaken the social ties. There may also be over-reliance on central

[27] INSULEUR declaration in the frame of the 11th Forum "Transports and infrastructures : islands territorial cohesion and economic growth" (2011). Available at: https://www.insuleur.org/documentos/D_223.pdf

[28] ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

[29] Corbett, J. Democratic innovations and the challenges of parliamentary oversight in a small state:

Is small really beautiful? Small States & Territories, Vol. 1, No. 1, 2018, pp. 35-5; ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

government, or a lack of communication between national and regional authorities, leading to barriers to innovation and untapped opportunities.[30]

Malta, for example, as an island state, benefits from high degree of autonomy in policy formulation and implementation, allowing to consider and mitigate the challenges, as well as to make use of specific governance opportunities and challenges linked to close ties between a limited number of stakeholders. Crete, meanwhile, is more dependent on the capacity of the national authority on the mainland to take account of its needs and integrate it in the national networks of exchange, energy and communication.

In addition to presenting challenges, the insular nature provides islands with both natural and cultural assets that can provide development opportunities and even competitive advantages. Tourism is a common competitive advantage for the islands in the Mediterranean, and for example in Greece the sector largely depends on the insular regions.[31] Tourism can however lead to significant social and environmental strain if not carefully managed. The development of sustainable tourism, taking into account both the ecological carrying capacity and the needs of the local community, therefore becomes both an opportunity and a necessity. There is also potential in cooperation between islands across the EU and globally, for example for the purpose of sharing knowledge and best practices. Malta and Greece both participate in the Observatory on Tourism for Islands Economy, which collects data and publishes research on island tourism.[32] This study explores sustainable and smart tourism development particularly for Crete, where the local stakeholders consider it to be vital for the future development of the island and the Port of Heraklion.

Sustainability is also a central factor for the development of energy security in insular areas. In popular tourism areas, the increase in demand during high tourism season adds to this challenge. Additionally, the ports have to respond to the need for sustainable energy and fuel for transport. At EU level, improving accessibility and connectivity for islands is among the main priorities of the Trans-European Transport Network guidelines.[33] EU funds are also increasingly directed towards developing sustainable energy and decarbonising transport in the 2021-2027

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[30] ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

[31] Carbone, C. (2018) Expert analysis on geographical specificities. Mountains, Islands and Sparsely Populated Areas Commissioned by Directorate-General for Regional and Urban Policy. European Commission. Brussels. Available at: https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/expert_analysis_geographical_specificities_en.pdf;

Pallis, C., Prasinos, A. and Pallis, P. The Relation Between Tourism, Local Development and Insularity: Case Study of Southern Aegean, Greece. Journal of Tourism and Hospitality Management, December 2017, Vol. 5, No. 6, 223-232. doi: 10.17265/2328-2169/2017.12.002.

[32] See the observatory website at: https://www.otie.org/

[33] Tsoutsos, T., Tournaki, S. and Coroyannakis, P. (2008). Sustainable Energy Communities in Insular and Ecologically Sensitive Areas; ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

MFF. Environmentally sustainable development is thus also a key for the development of the transport system in Malta.

The ESPON BRIDGES report emphasises the need of integrated place-based strategies to promote the territorial potential of islands based on their unique characteristics, of enhancing economic resilience and avoiding compromising the flexibility that allows to adapt for external shocks. Collaboration, innovation and digital connectivity are seen as critical tools to allow for islands to make use of their inherent opportunities. This study will include these tools in its analysis of how the island urban-maritime regions can turn their development scenarios into reality.

4 European port developments

4.1 Introduction

European coastal regions are very diverse in nature. Some have a highly specialised maritime sector focusing on container transport. Others focus on passenger transport services. And some coastal regions do not have major port-related activities at all. In the paragraphs below, we present our insights into the fabric of European coastal regions. We focus on the different types of trade flows of European ports and assess the different connections with the European hinterlands. We then also describe the European coastal regions according to their eco-cluster potential. In short, this chapter provides the European background to this ERMES study.

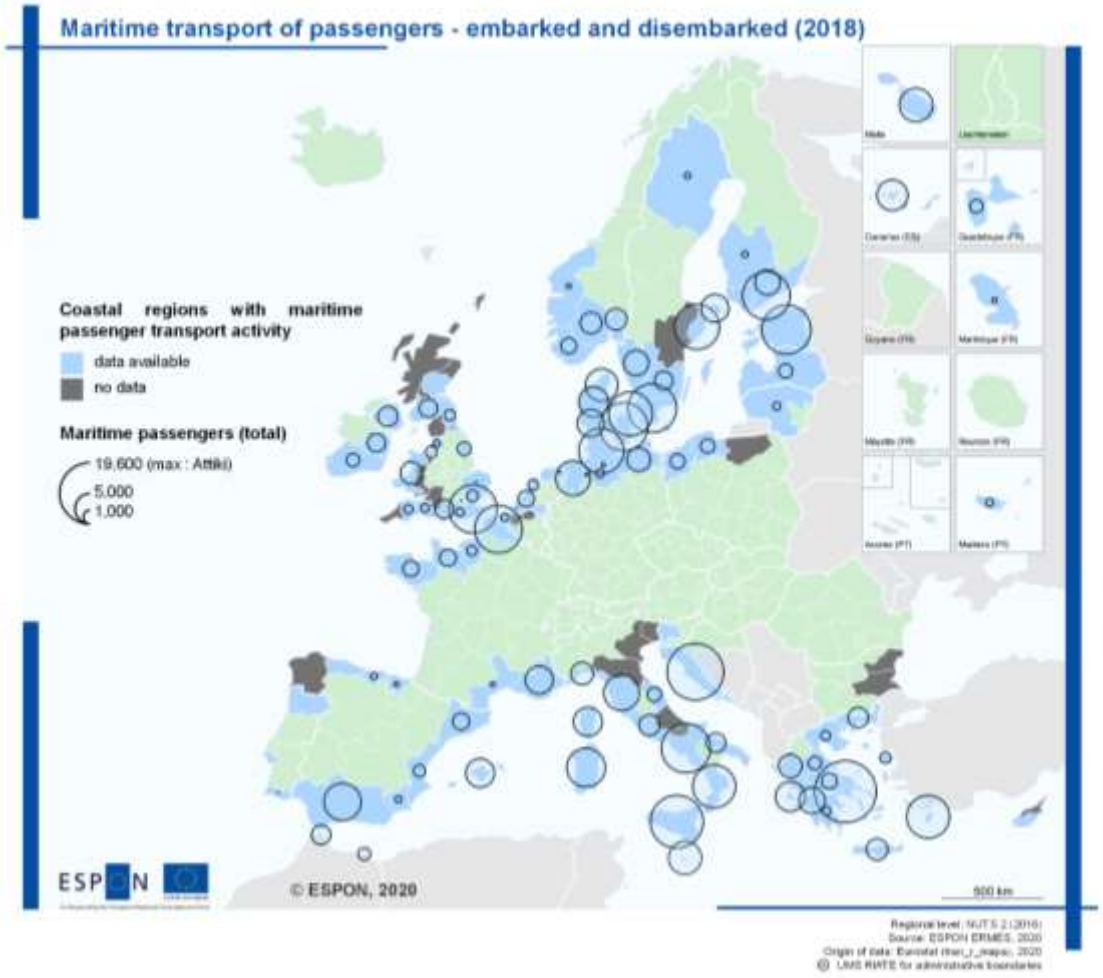
4.2 Flows of passengers and goods in European ports

Flows of passengers and goods differ significantly among different ports in Europe. A distinction can be made between maritime transport of passengers and goods.

Maritime transport of passengers

The number of passengers passing through EU ports increased by 5.6 % between 2017 and 2018, to almost 410 million passengers. With almost 85 million passengers passing through its ports, Italy was the major seaborne passenger country in Europe in 2018, followed by Greece with 73 million passengers. These two leading seaborne passenger countries had a combined share of more than one third of the total number of seaborne passengers embarking and disembarking in EU Member States (Eurostat, 2018 data).

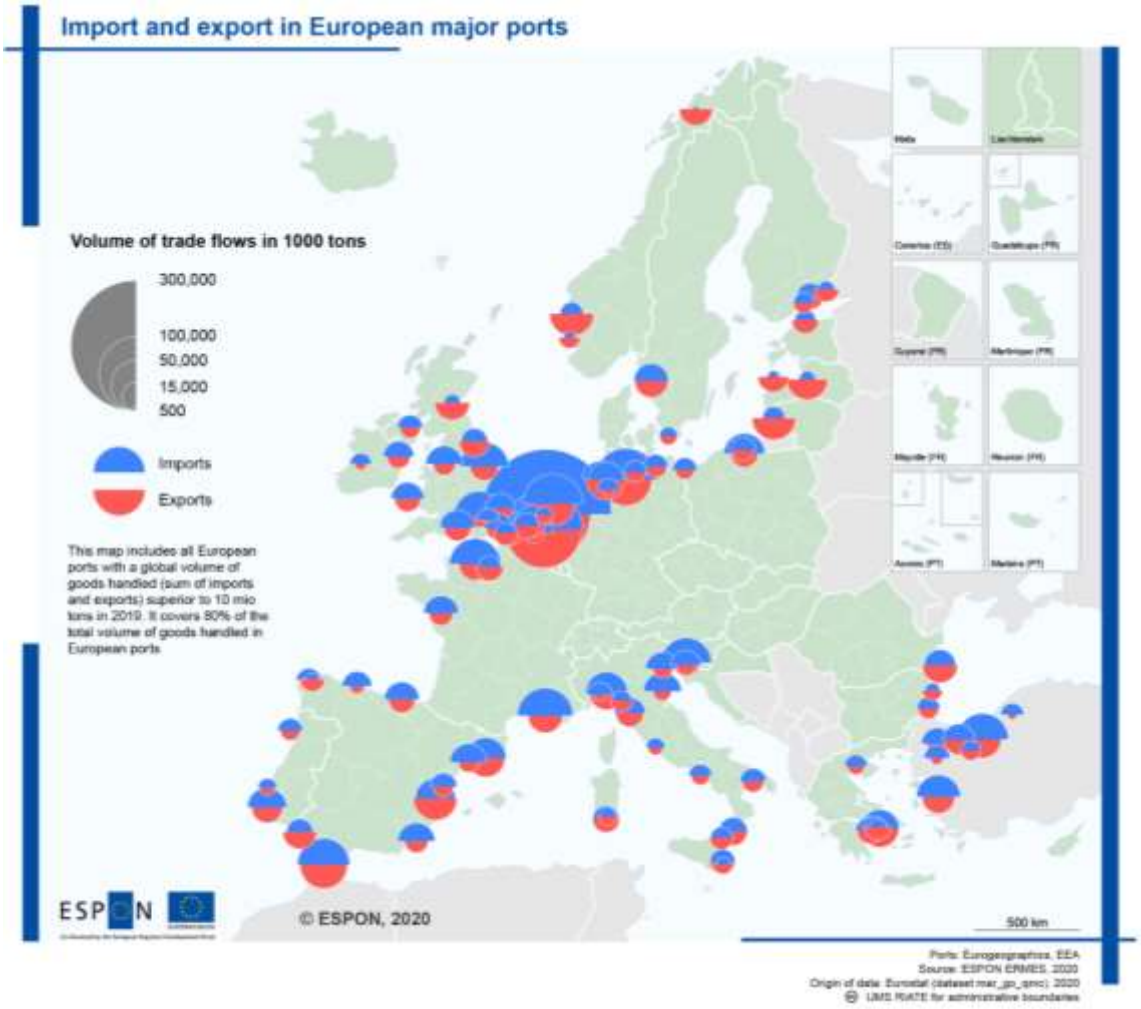
Figure 1: Maritime Passenger transport in Europe



Maritime transport of goods

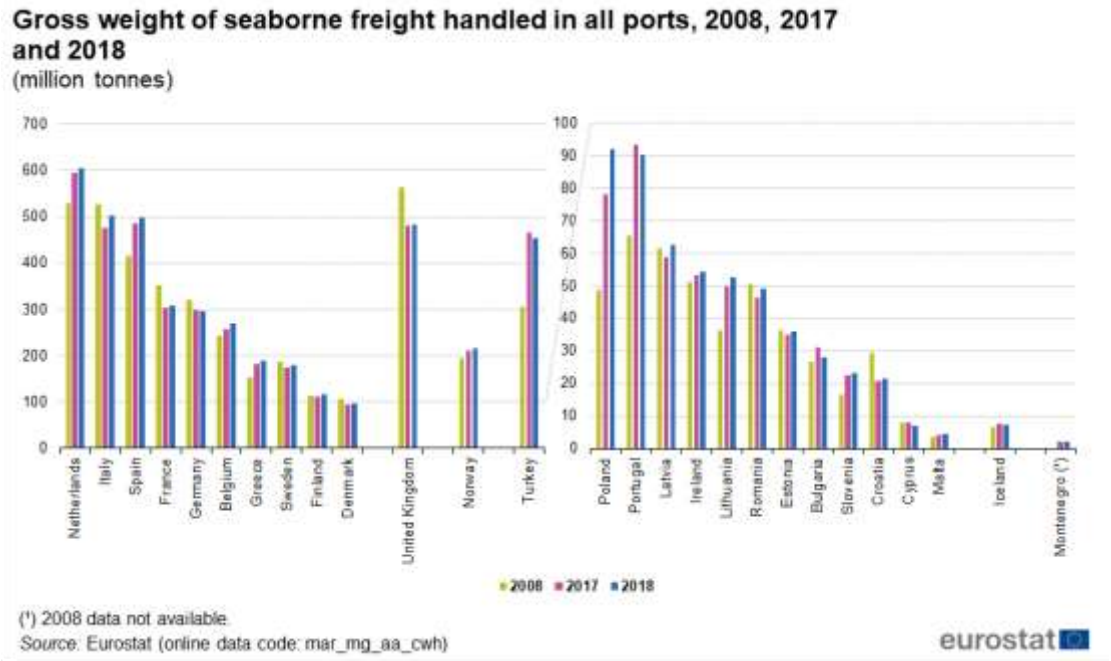
When the transport of goods is considered, a different picture arises. Whereas Mediterranean ports are focused strongly on passenger transport (e.g. cruise tourism), the ports along the North Sea focus primarily on the transport of goods. In particular, the Dutch, Belgian and German ports are strong, each focusing on specific commodities – for example, Rotterdam's port on liquid bulk and containers (crude oil and refined oil products), Amsterdam's port on fuels, Zeebrugge on RoRo transport (car imports and ferry connections), and Antwerp in the chemical cluster and container handling. According to Eurostat (2020), the Netherlands remained the largest maritime transport country in Europe in 2018, while Rotterdam, Antwerp, Hamburg, Amsterdam, Algeciras, and Marseille maintained their positions as the respective 6 largest ports.

Figure 2: Gross weight of goods handled in European ports that handle upwards of 10 million tonnes in 2019



As depicted in the next figure, the Netherlands has reported the largest volumes of seaborne freight handling in Europe every year since overtaking the United Kingdom in 2010. At 605 million tonnes, the volume of seaborne goods handled in Dutch ports represented 16.8 % of the EU total in 2018. The Netherlands was followed by Spain and Italy. Their respective shares were 14.4 % and 13.9 % of the EU total.

Figure 3: Gross weight of seaborn freight handled in all ports (2018) in million tonnes



Goods transport per commodity type

Liquid bulk goods (e.g. crude oil, fuels and chemical products) accounted for 36 % of the total cargo handled in the main EU ports in 2018, followed by containerised goods (24 %), dry bulk goods (e.g. coal, ore and grain, 23 %), and goods transported on Ro-Ro mobile units (e.g. new cars and trucks, 11 %).

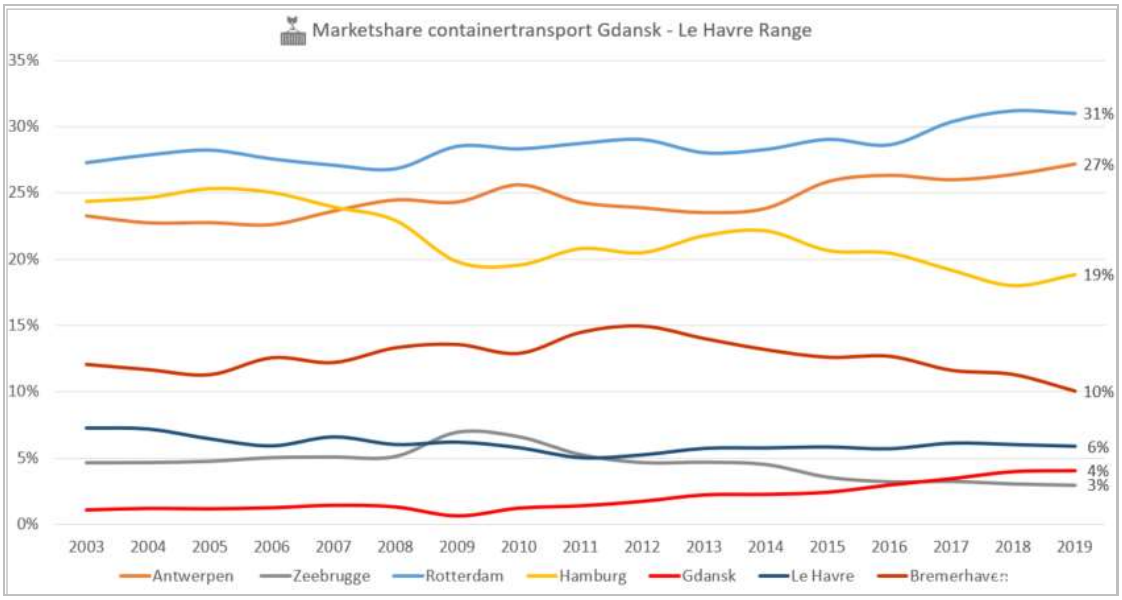
The largest volumes of liquid bulk goods were handled in the Netherlands (275 million tonnes), mainly port of Rotterdam (74 million tonnes) and Amsterdam (33 million tonnes). These Dutch ports were also responsible for the largest volumes of dry bulk goods in the EU. The port of Rotterdam and Amsterdam are handling respectively over 200 million tonnes and 50 million tonnes of liquid bulk per year.[34] Followed by Spain with 117 million tonnes. Containers were the dominant type of cargo handled in German and Belgian ports in 2018, with shares of 43 % and 41 % respectively of the total cargo passing through the ports of these two Member States.

The largest volumes of containerised goods, however, were handled in Spanish and Dutch ports, with 155 million tonnes and 129 million tonnes, respectively. The two top container countries were followed by Germany with 127 million tonnes and Belgium with 110 million tonnes of containerised goods.

[34] Port of Rotterdam and Amsterdam annual report (link) (link).

On a port level, the Ports of Rotterdam and Antwerp compete for the largest market share (31% and 27% respectively). In Figure 4, the market share of the largest container ports in Europe is presented.

Figure 4: market share container ports in Europe (2003-2019)



Source: Ports statistics, 2020. Collected by Ecorys I Gdansk – Le Havre Range[35]

The share of Ro-Ro mobile units in the total tonnage of goods was the highest for Ireland (31 %), Denmark (29 %) and Sweden (27 %), reflecting the importance of Ro-Ro ferry traffic in the seaborne transport of these countries. In tonnage terms, Italy (96 million tonnes) recorded the largest EU volumes of goods transported on Ro-Ro mobile units in 2018. However, these volumes were lower than tonnage of Ro-Ro mobile units recorded in the United Kingdom (108 million tonnes) – according to Eurostat, 2018 data.

Market share of ports in the Hamburg-Le Havre range

The largest of European seaports are located between Le Havre and Hamburg. These seaports supply the European continent. Depicted in the next figure, volumes at these ports developed positively in the last 4 decades. In particular, Rotterdam and Antwerp lead the expansion of port activities. Some are still recovering from the 2009 crisis, others are growing for 10 years in a row.

Position of the case study regions in the EU port sector

[35] Given Gdansk is growing fast as container port in the Northern port range, it is added in the market share analysis.

North Sea Port is located within the Hamburg-Le Havre range and handles more than 70 million tonnes of maritime goods in 2018. The three main port areas – Terneuzen, Ghent and Vlissingen – have their own port characteristics. Zeeland for instance has historically been a trading place for commodities (e.g. coal and liquids). In Terneuzen, the chemical plant of Dow is responsible for the bulk share of liquid trades. In the Ghent port zone, the industrial sites of Arcelor Mittal steel mill and Volvo (cars and trucks) represent a large share of the employment numbers. However, in recent years the containerisation of goods, especially cooled supply chains, has grown fast. Moreover, opportunities are explored in the offshore wind turbine industry.

The Ligurian region handles roughly 68 million tonnes of cargo and thereby plays a central role in the maritime activity in the Mediterranean Sea. The Ports of Genoa handle all kinds of commodities (e.g. Ro-Ro, dry bulk, general cargo) and are the leading Mediterranean gateway for containers, project and heavy-lift cargo and fruit. In particular, container transportation grew rapidly in recent years (+50%, compared to 2009 volumes).

4.3 Mapping the core EU ports

Maritime transport is the main mode for commodity flows to and from Europe. The ports are located in Member States with coastal territories. The Northern ports of the Hamburg-Le Havre range have developed a dominant position, with the new port of Gdansk as an upcoming container hub in the Baltic, serving the Northwest European hinterland, competing with especially the German ports. Commodity flows to and from these ports is facilitated with an elaborate network of infrastructure, comprising road, rail, inland waterway and pipeline transport options.

The European Commission set out ambitious modal shift goals in 2011 in the White Paper *Roadmap to a Single European Transport Area - Towards a Competitive and Efficient Transport System*, and wanted to significantly increase the share of rail, inland waterways and short sea shipping in the modal split: "The performance of multimodal logistics chains must improve: by 2030, 30% of freight transport by current road must take place over distances of more than 300 km by rail or water and by 2050 more than 50%." Therefore, European Member States must contribute to the creation of Trans-European Networks (TEN). These are infrastructure networks, more specifically in the transport, telecommunications and energy fields. Within the TEN, the TEN-T networks are the transport networks for goods and people. The networks are organised into corridors. These consist of priority, core parts of the infrastructure (the "core network") and secondary more extensive supply networks (the "comprehensive network").

This EU network has at its core the TEN-T network, an EU-wide network linking consumer and producer regions with urban nodes and ports. Clusters of port infrastructures and transport corridors allow innovative hubs to be formed. Short sea transportation (e.g. the Motorways of

the Sea) and alternative connections between port regions over water can also be considered in order to avoid congestion on the (road) networks and decrease the transport emissions.

The operationalisation of the TEN-T network is established via the Core Network Corridors (CNCs) and Rail Freight Corridors (RFCs). In these RFCs coordination of infrastructure and developments in the market take place by traffic managers. It is important to note that the TEN-T corridors are similar to RFCs, but RFCs are often connecting maritime regions.

Expected benefits of connections to the TEN-T network

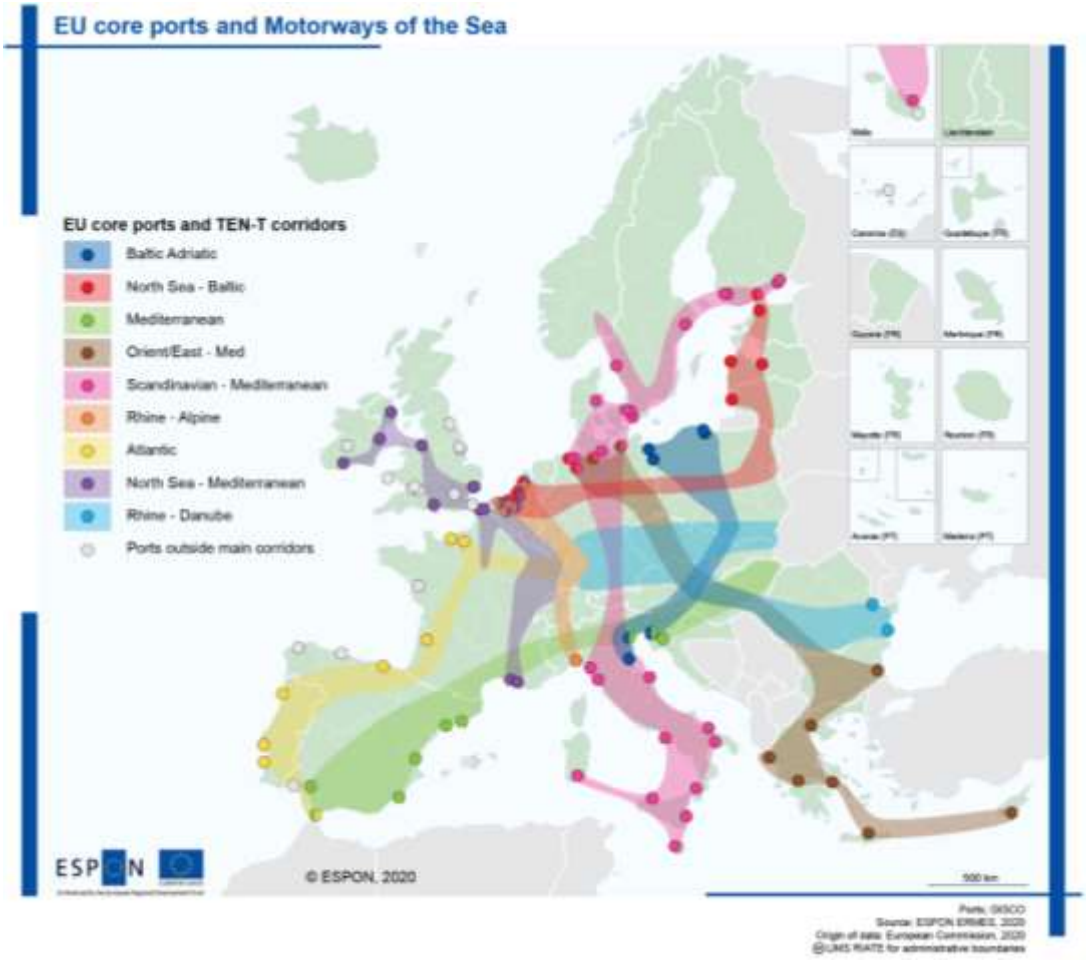
The rationale behind the TEN-T network is that by improving connections between European regions, economic development will be strengthened. The development of new infrastructures is expected to increase trade opportunities, enhance business development and support the regional economy (Öberg, 2018). Another main benefit for regions is that the TEN-T network is a source of financing for infrastructure projects (so called CEF projects). It hence is beneficial for ports to be linked with the TEN-T corridors.

Drawbacks of the TEN-T network for urban-maritime regions

Within the framework of urban-maritime development, the core network corridors have a strong focus on rail and road connections. While the introduction of Motorways of the Seas (MoS) does include the maritime aspect, port authorities feel that this aspect is somehow underdeveloped (Öberg, 2018). There is a larger dependency on the willingness of shipping companies to operate in the area. Another concern surrounds the fact that the corridor approach focuses on connecting the strongest regions and hubs, rather than developing a network that supports more peripheral regions. This means that insular regions have less benefit from the TEN-T network than regions that are located on mainland Europe.

The combined network of EU's core ports, TEN-T and MoS are depicted in the Figure 5. In the next section, the position of the study regions within this European network will be described.

Figure 5: Core ports and Motorways of the Sea



Source: European Commission (2020), Trans-European Transport Network (TEN-T) (incl. MoS). Adaptation by Ecorys and Spatial Foresight

Position of the case study regions in the TEN-T network

The region of East Flanders is connected to the TEN-T network via multiple corridors. To be specific, the city of Ghent is connected to both the North Sea Med and the Rhine Alpine corridor. The port area of Ghent and Terneuzen, North Sea Port, has direct access to the European (rail- and inland waterway) corridors. In this context, the North Sea – Mediterranean and Rhine Alpine corridor is directly connected to North Sea Port, while the North Sea – Baltic corridor is only indirectly connected via Antwerp.[36]

The region of Liguria has two connections with the TEN-T network. The Port of Genoa is directly connected to the RFC Rhine Alpine and the Port of La Spezia is connected to the Scandinavian – Mediterranean RFC.

[36] North Sea Port performed eleven studies to achieve an optimal cross-border rail infrastructure (link).

Malta is connected to the TEN-T network via the Scandinavian-Mediterranean Core Network Corridor. Via the Motorway of the Sea of south-west Europe, Malta is connected to the other main seaports in the region.

Crete is not connected to the TEN-T network. Via the Motorway of the Sea of south-east Europe, Crete is connected to the Adriatic Sea, to the Ionian Sea and the rest of the Eastern Mediterranean.

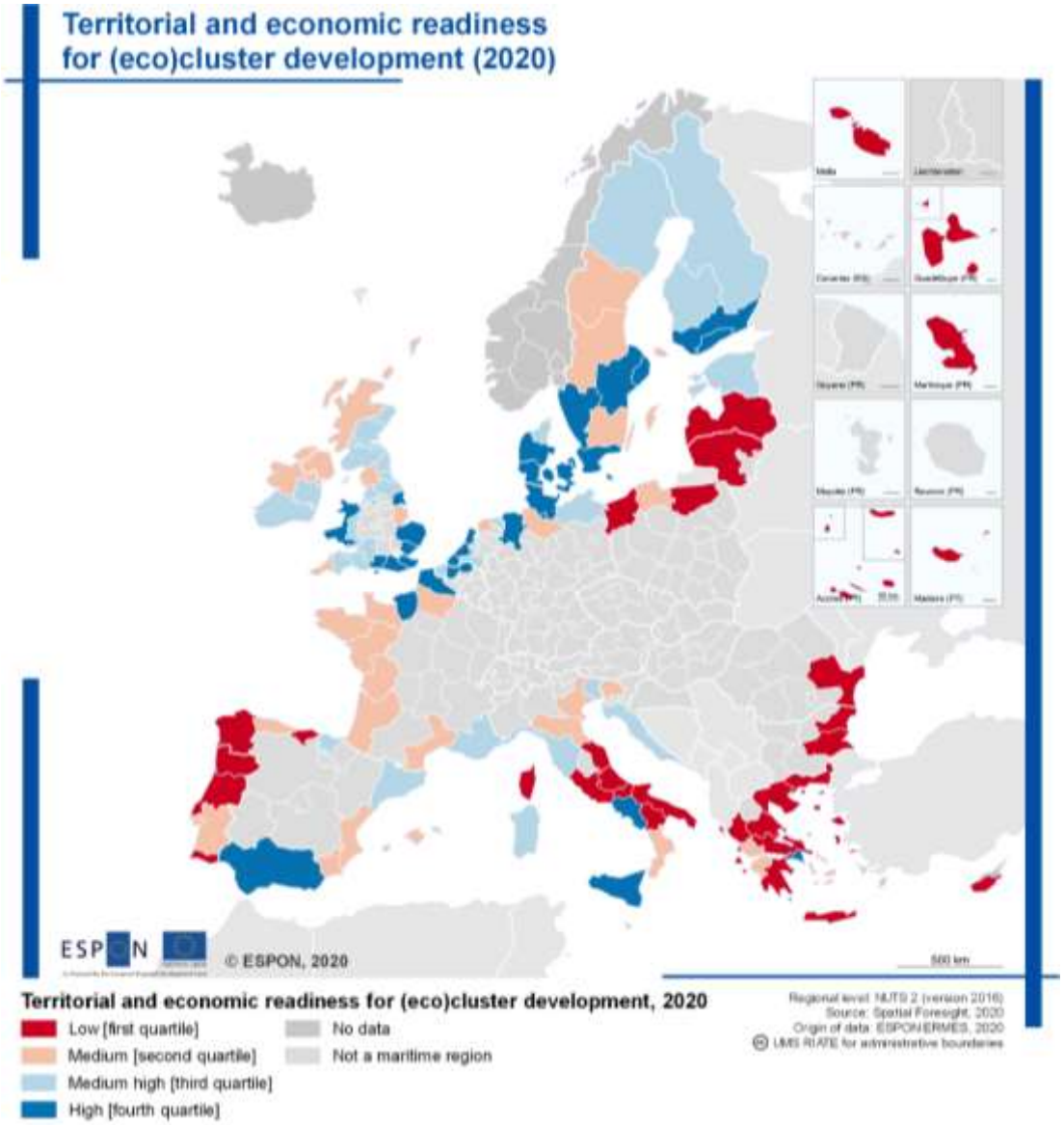
4.4 Territorial and economic context for urban-maritime cluster development

An overview of the composition of the local economy gives a first insight into the potential for cluster development. According to the *Smart Guide to Cluster Policies*[37], the potential of cluster development in urban-maritime regions is determined by different factors. The specialisation of industries and their relative size form a key aspect of cluster potential. Additionally, local employment and productivity indicators (such as information on wages), other productivity indicators and new business formation, and the general competitiveness landscape of the region play an important role. Regions that are highly competitive, strongly specialised, and highly productive, have more cluster development potential than regions that are less competitive, specialised, and productive.

To visualise this on a European scale, an urban-maritime eco-cluster context typology was developed to depict the readiness for the development of innovative clusters in the EU's coastal regions. It portrays four different sub-indices, each built on multiple pillars, that display to what extent the territorial and economic circumstances favour cluster development in urban-maritime regions. A region that scores well has the right 'ingredients' for successful cluster development. A region that has a lower score might miss some crucial elements for clusters to work effectively. The final results of all coastal regions in Europe are presented in Figure 6.

[37] European Commission, DG GROW (2016). Smart Guide to Cluster policies.

Figure 6: Readiness for (eco)cluster development in urban-maritime regions



The index represents the more or less favourable regional context for (eco)cluster development. (Eco)cluster development has more potential to generate regional benefits in regions with a higher score, than in regions with a lower score. It is based on four pillars:

- the three first pillars describe assets of the region (institutions and infrastructures, economic efficiency, innovation) based on indicators taken from the Regional Competitiveness Index;
- the fourth pillar describes port performance based on aggregated statistics from main ports in the regions

Building on and adapting the European Regional Competitiveness Index (RCI)[38], and bearing in mind the prerequisites which determine cluster development potential, the project team

[38] https://ec.europa.eu/regional_policy/en/information/maps/regional_competitiveness/.

developed a method for identifying the readiness for cluster development of coastal regions in Europe. From the long list of 74 RCI indicators, a targeted selection was made by the consortium's experts on competitiveness, regional data and port economics. In total, 23 separate indicators were retained (see Annex 3).

The list was then broadened by adding a fourth sub-index related to port-specific activities. Five indicators were added, displaying port performance. As such, port-relevant RCI indicators (selection out of 3 sub-indices, and 23 separate indicators) were complemented with port-specific data in the newly added fourth sub-index 'port performance'. The decision was made to make use of harmonised maritime indicators of all 'main ports'[39][40] in Europe as regional maritime indicators stemming from 2002. Subsequently, these statistics (per port) were allocated to European regions at NUTS II level, after which they were aggregated to allow for a fair comparison of indicators.

Table 2: Urban-maritime interfaces cluster typology

Sub-index	**Pillars**	**Indicators**
Basic (1)	Institutions	Selection of 28 separate indicators out of 74. (e.g. on Employment, Scientific Publications, Household access to internet and Labour productivity).
	Macroeconomic stability	
	Infrastructure	
	Health	
Efficiency (2)	Basic education	
	Higher education and lifelong learning	
	Labour market efficiency	
	Market size	
Innovations (3)	Technological readiness	
	Business sophistication	
	Innovation	
Port performance (4)	Socio-economic parameters	Maritime transport of passengers
		Regional employment
	Throughput Freight	Gross weight of goods handled in main ports
		Vessels in main ports
	Port efficiency	Gross weight of goods per thousand employees

After establishing the fourth pillar, the final step before constructing the cluster score was to impose a weighting scheme used for the four sub-indices. The RCI method uses a differential

[39] "Main ports" are ports handling more than one million tonnes of goods or more than 200 000 passengers annually.

[40] European Commission (2020), Eurostat – Transport (link).

weighting scheme (based upon the development stage of regions) to take the intrinsic heterogeneity of regions into account.[41] The project team chose a weighting scheme with the purpose of identifying the most promising urban-maritime regions for cluster development. The weighting scheme puts (equal) emphasis on the third (innovation) and fourth (port performance) sub-index (see Table 3). This means that the sub-indices of innovation and port performance are considered the most important criteria to determine the readiness for eco-cluster development for an urban-maritime region. This approach is in line with the methodological assumptions in the RCI.

Table 3: Weighting scheme used for the four RCI sub-indices

Sub-index 1 – Basic	**Sub-index 2 - Efficiency**	**Sub-index 3 - Innovations**	**Sub-index 4 – Port performance**
10%	20%	35%	35%

The results of the top 10 regions in Europe, as well as the calculation steps, are presented in Table 4. These results are also tested for robustness by applying equal weights for every RCI sub-index (equal to 25%), which leads to shifts within, but not between the quartiles.

Table 4: Top 10 European regions in terms of cluster readiness

#	**Ctry**	**Regio**	**Sub-index 1 - Basic**	**Sub-index 2 - Efficiency**	**Sub-index 3 - Innovation**	**Sub-index 4 - Port performance**	**Region score (5) = (1, 2, 3, 4)**	**EU average (6)**	**Cluster score (5) – (6)**
1	NL	NL33	2,4	2,9	5,5	18,4	29,2	9,5	19,7
2	BE	BE21	2,2	2,7	6,0	11,3	22,2	9,5	12,7
3	EL	EL30	-2,1	1,5	4,6	16,6	20,6	9,5	11,1
4	SE	SE22	3,1	1,8	5,6	8,6	19,1	9,5	9,6
5	DK	DK01	3,4	2,2	7,5	5,9	19,1	9,5	9,6
6	FI	FI1B	2,9	2,0	6,5	6,7	18,1	9,5	8,6
7	UK	UKJ4	2,5	2,8	6,0	6,6	17,9	9,5	8,5
8	SE	SE11	3,1	2,3	7,2	4,5	17,1	9,5	7,6
9	DK	DK02	2,7	1,8	4,3	7,2	16,0	9,5	6,5
10	NL	NL32	2,5	2,6	5,7	5,0	15,8	9,5	6,3

Based upon these cluster scores, the readiness of regions for urban-maritime cluster development are categorised as follows:

[41] The EU Regional Competitiveness Index (2019) (link).

- **Low: the lowest 25th percentile of all cluster scores (ranges from a cluster score between -9,3 and -2,8).** Urban-maritime regions that fall within the low group often score below EU average on all sub-indices. This means that both basic socio-economic indicators and indicators on efficiency, innovation and port performance score below average. Regions within this quartile often are located in peripheral areas, with low population and GDP and fairly little maritime activity. They are mostly located in countries around the Mediterranean, or on the south-eastern shores of the Baltic Sea.

- **Medium: between the 25th and 50th percentile of all cluster score (ranges from a cluster score between -2,8 and -0,4).** Regions in the medium group of the index often have lower scores on the port performance and innovation sub-indices. They tend to be more rural regions located in north-west Europe, or regions without major maritime activity. Examples are the Scottish Highlands, the Dutch province of Friesland, or the French region Brittany.

- **Medium high: between 50th and 75th percentile of all cluster score (ranges from a cluster score between -0,4 and 2,2).** The regions in the medium high group score well on most of the sub-indices. They often house stronger economies and ports of some importance. Some of the leading port regions in the Mediterranean fall under this category, as well as peripheral regions in the Nordic countries.

- **High: the highest 25th percentile of cluster scores (ranges from cluster score between 2,2 and 19,7).** The urban-maritime regions in the high group are the strongest performers in Europe. They score above average on all the sub-indices and often house major ports, or large economical centres. Most of the leading ports in the Hamburg – Le Havre range fall in this category, with the ports of Hamburg, Bremen, Rotterdam, and Antwerp amongst the top performers. Also, the capital cities of the Nordic countries are high on this list, with Stockholm, Helsinki and Copenhagen holding positions in the top 10.

5 Urban-maritime interfaces in the stakeholder regions

5.1 Introduction

This chapter provides an overarching analysis of the urban-maritime interfaces in the stakeholder regions. A more detailed description per stakeholder region can be found in the case study reports. The stakeholder regions each have their unique local settings and context. Because of this, it is challenging to compare them directly. We can however make a generalised distinction between Liguria and East Flanders on the one hand, and Crete and Malta on the other hand. Liguria and East Flanders are both located in mainland Europe and therefore have a bigger hinterland than the islands of Crete and Malta. When looking at the generic characteristics such as population size and scope of economic activities, both within the region and the respective ports, a clear distinction can be made between Liguria and East Flanders on the one hand, and Crete and Malta on the other hand.

The port and hinterland structures, the governance in the regions, relevant policies and projects in the regions, and the competitiveness and degree of cluster development (at the time that this study was implemented) are discussed in the paragraphs below.

5.2 Port and hinterland structures

Each of the four stakeholder regions have a different structure in terms of its economy, type of maritime activities and the scope and scale of the activities. Such information is crucial to be able to determine the potential for eco-cluster development in the region. A selection of main characteristics from the four stakeholder regions is presented in the table below. These characteristics are further discussed thereafter.

Table 5: Overview of port and hinterland characteristics of the stakeholder regions

Variable	**Liguria**	**East Flanders**[42]	**Malta**	**Crete**
Main urban centres[43]	Genoa, La Spezia, Savona and San Remo	Ghent (BE), Terneuzen, Vlissingen (NL)	Valletta	Heraklion, Chania
Main ports	Genoa, La Spezia, Pra', Vado Ligure, Savona	Ghent, Terneuzen, Vlissingen	Valletta, Marsaxlokk	Heraklion, Chania
Hinterland description	Industrial centres of northern Italy as well as the alpine region and parts of southern Germany.	The North Sea Ports, are important hubs ("core ports") on two TEN-T	Islands of Malta, Gozo and Comino. Marsaxlokk Freeport serves as a	Island of Crete, with road and short sea shipping connections.

[42] Statistical data include figures from the Dutch province of Zeeland (i.e. Port of Flushing, Terneuzen and Borssele), which is the counterpart of East Flanders in the North Sea Port region.

[43] Urban centres with more than 50.000 inhabitants.

Variable	Liguria	East Flanders[42]	Malta	Crete
	Main port Genoa is connected by rail and motorway to the Genoa-Rotterdam corridor.	corridors: on the North Sea - Mediterranean and Rhine – Alpine.	transhipment hub in the Mediterranean.	
Economic size of the region (GDP) (2018)	€50 billion	€70 billion	€12.4 billion	€9.4 billion
Employment (2018)	590 000 people	850 000 people	260 000 people	249 000 people
Direct port related employment (2018)	36 000 people	+/- 50 000 people	23 000 people in the maritime sector	*Unknown*
Indirect port related employment (2018)	26 000 people (in Liguria)	+/- 60.000 people	*Unknown*	*Unknown*
Tonnes of cargo handled (2018)	68 million	71.5 million	2.2 million locally 27 million transhipment in Marsaxlokk Freeport	1.4 million
Yearly containerised trade in 'Twenty-foot Equivalent Unit' (TEU) (2018)	2.7 million TEU	330.000 TEU (in 2019)	2.3 million TEU	20.000 TEU
Passenger transport (transit and ferry passengers) (2018)	4.5 million	No passenger transport	1.6 million	1.7 million
Regional competitiveness index 2019	172th (of 268th)	31th (of 268th)	177th place (of 268th)	250th (of 268th)
Maritime cluster typology[44]	61th (of 134th)	27th place (of 134th)	104th place (of 134th)	119th place (of 134th)

Source: a detailed overview of references and year of reference is provided in Annex 1

It becomes clear from the table above that the four stakeholder regions show considerable differences in socio-economic development and type and scale of maritime activities. In the paragraphs below, these differences are further discussed and elaborated upon.

[44] Author assessment described in section 5.4.

5.2.1 Regional aspects

The stakeholder region of Liguria is located on mainland Europe on the Mediterranean coast in the northwest of Italy. It is home to the largest port of Italy, the port of Genoa. Aside from the port of Genoa, there are four other seaports in the region. They are united under the Western Ligurian Seaport Authority and the Eastern Ligurian Seaport Authority. Liguria's ports are connected to the main industrial hinterlands of northern Italy, the Alpine region and southern Germany.

East Flanders is a province in Belgium. Ghent, the largest city in the province, houses the Port of Ghent. The Port of Ghent is connected to the North Sea through the Terneuzen-Gent channel. The North Sea Port consists not just of the Port of Ghent, but also the ports of Terneuzen and Vlissingen. This makes the North Sea Port a unique cross-border port, since Terneuzen and Vlissingen are located in the Netherlands. The North Sea Ports are important hubs ('core ports') on two TEN-T corridors: on the North Sea - Mediterranean and Rhine – Alpine.

Malta is a group of three islands in the Mediterranean Sea, Malta, Gozo and Comino. The main island, Malta, houses two ports: the Port of Valletta and the Port of Marsaxlokk. Additionally, several smaller ports line the shores of the islands, including the Port of Mgarr on Gozo, which caters to all passenger and cargo transport to and from the Island of Gozo. The ports of Valletta and Marsaxlokk are natural deep-water ports and are primary entryways for goods into the country. Additionally, Marsaxlokk serves as a container transhipment hub.

Crete is the biggest of the Greek islands. The capital, Heraklion, is located on the northern shore of the island and is home to the biggest port of the Island. A second port is located in Chania. The ports on Crete are main locations for the import of goods on the islands, as well as for passenger transport. They serve the island of Crete primarily, but also cater short sea shipping connections.

5.2.2 Economic structure of the regions

The economic structure and size of the regions is quite different. Liguria and East Flanders are larger than their island counterparts, and this is reflected in economic indicators such as GDP and employment. Liguria has a GDP of roughly €50 billion (2018). East Flanders' GDP amounts to €70 billion (2018). Both regions have a large working population of 590 000 and 850 000 people respectively.[45] [46] In Liguria, most of these people are working in the field of wholesale and retail trade, transport, accommodation and food service activities. Public administration and industry follow as second and third sectors with the highest number of jobs in Liguria. In East

[45] Eurostat (2018), Employment by age, economic activity and NUTS 2 regions [lfst_r_lfe2en2] (link).

[46] Eurostat (2018), Gross domestic product (GDP) at current market prices by NUTS 3 regions [lfst_r_lfe2en2] (link).

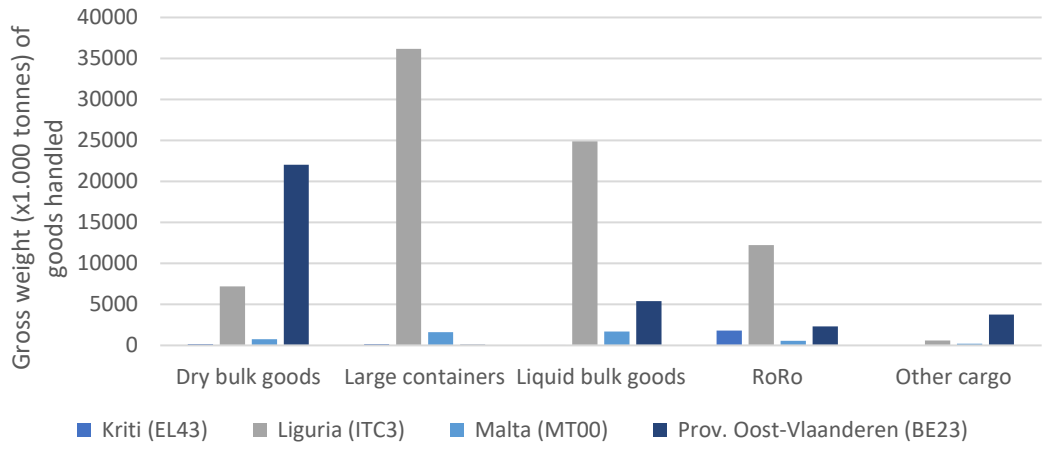
Flanders, the main economic activity is public administration, defence, education, human health and social work, which amounts to roughly one-third of the employment. Wholesale and retail trade come in second, and industry comes in as third in terms of employment.

In 2018, the islands of Malta and Crete have a lower GDP and smaller working population. The GDP of Malta is around €12.4 billion whereas the GDP of Crete is around €9 billion. Total employment in Malta amounts to roughly 250 000 people. Most of these employees are active in in the field of wholesale and retail trade, transport, accommodation and food service activities (roughly 66 000 people); public administration, defence, education, human health and social work activities (63 000 people) and industry (30 000 people). Total employment in Crete is equal to almost 250 000 people. Most of these employees are active in in the field of wholesale and retail trade, transport, accommodation and food service activities (roughly 90 000 people), public administration, defence, education, human health and social work activities (51 000 people) and, agriculture, forestry and fishing, (roughly 42 000 people).

5.2.3 Ports characteristics

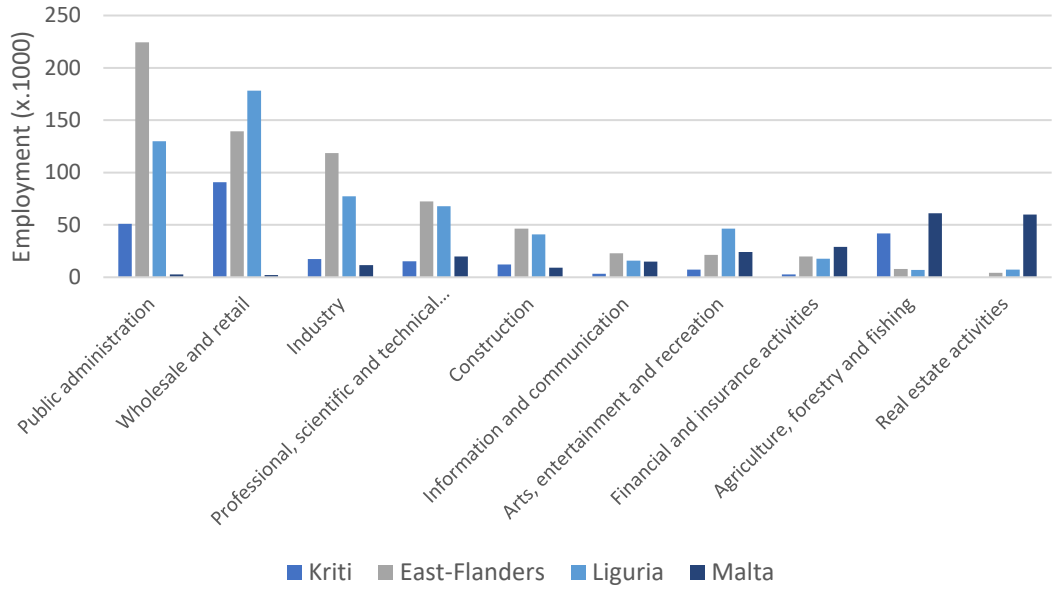
The Ligurian ports and North Sea Port are of a similar size in terms of processed cargo and employment. The Ligurian ports handled over 68 million tonnes of cargo and more than 4.5 million passengers in 2018. The Port of Genoa also has a strong focus on containerised cargo, with almost 2.7 million Twenty-foot Equivalent Unit' (TEUs) handled in 2018. The Ligurian ports are jointly responsible for around 32 000 jobs (direct employment). North Sea Port has a stronger focus on bulk trade and handled more than 70 million tonnes of cargo in 2018. North Sea Port does not provide passenger transport services. Direct employment related to North Sea Port's activities amounts to more than 28 000 jobs.

Figure 7: Gross weight (in thousand tonnes) of goods handled and type of cargo (2018)



The ports on Malta and Crete are of a smaller size, though the port of Marsaxlokk is one of the main transhipment ports in the Mediterranean. Jointly, the ports on Malta handled almost 30 million tonnes of cargo, of which around 27 million in the port of Marsaxlokk. The port of Valletta has a stronger focus on passenger transport, and the port of Mgarr accounts for inter-island connectivity between Malta and Gozo. Total passenger transport in and around the islands of Malta amounts to around 1.6 million passengers per year. The ports on Crete have a relatively small role in terms of cargo transport, with an annual cargo handled of around 1 million tonnes. Their role in passenger transport is significant, with main connections to the Greek mainland. Annually, some 1.7 million passengers are counted.

Figure 8: Employment by economic activity (2018)



5.3 Strengths and weaknesses of the stakeholder regions

Based on the territorial and economic context for cluster development, several elements for the regions in terms of strengths and weaknesses could be retrieved. Conclusions were made based on a comparison of the results of the urban-maritime analysis of the region and the eco-cluster index that was developed under paragraph 4.4.

We conclude the following when comparing the four study regions:

- **East Flanders** is placed in the high group of the territorial and economic readiness cluster index, which means it is among the strongest 25% of European coastal regions. The region has a high score on all the four sub-indices. In particular, indicators within the basic pillar (e.g. road and railway accessibility) and innovation (e.g. the number of innovative SMEs and knowledge workers) score substantially higher than the European average. East Flanders scores especially well on productivity and income related

indicators, market size and innovative indicators such as creative employees, innovative SME's, Research and development (R&D) expenditure. The region scores lower on indicators such as early school leavers, lifelong learning, sales of new to market and new to firm innovation. For maritime passengers, data is missing - this is a limited activity. The region is placed in a competitive (maritime) economy in one of the most densely populated and wealthiest regions of Europe and therefore scores high on many indicators. Innovation is a driving force in the economic fabric, but as the port sector is only one economic cluster in the region, it might be hard to fully develop its maritime potential;

- **Liguria** ranked in the medium high group of the index as the 61th region in Europe. Liguria scores lower than the European average and East Flanders at the basic and efficiency sub-index. Concerning innovation indicators (e.g. gross value added and exports in medium-high/high tech manufacturing), the region is close to the European average. The score on the fourth index (port performance) stands out as the scores on the maritime throughput and port efficiency indicators are well beyond the European average. The region is strong for all maritime related indicators: only regional employment is slightly below average, but the others are higher than average (vessels, throughput, passengers, etc). Liguria performs well on exports in medium-high/high tech manufacturing, gross value added, labour productivity and railway accessibility. The main indicators where Liguria underperforms are corruption and quality of government services. Innovation indicators are also frequently below average (lack of innovative SMEs, marketing organisational innovators and core creative class employment). The maritime sector is a historic factor in the development of the economic activities of Liguria, both in terms of freight and passenger transport. However, its potential is not fully utilised at his stage, as a result of lower scores on innovation aspects of economic development. The potential is there to further expand the maritime activities, if innovation would be encouraged;

- **Malta** took the 104th place in the urban-maritime eco-clusters index. It is placed in the low group of the index. The region scores slightly below the European average on all four indices. Especially for the sub-index innovation the region scores lower than the other study regions (e.g. scientific publications, R&D expenditure, etc). Strengths of the region include employment and employment rate, gross value added, employment in technology and knowledge-intensive sectors. The island has a strong position when it comes to maritime passengers. Main weaknesses of the region are market size, and innovative indicators like scientific publications and R&D expenditure and maritime throughput are also low;

- **Crete** took the 119th place in the urban-maritime clusters index. It is placed in the low group of the index. This is mainly caused by lower scores on the basic, efficiency and port performance sub-indices. The innovation index is close to the European average.

Strengths of the region are maritime passengers, innovative SMEs and the marketing of organisational innovators. The main weaknesses are in government quality, infrastructural accessibility, overall employment and maritime innovation.

An integral comparison of the four regions resulted in a clear distinction between two types of regions. East Flanders and Liguria are both are regions located in the densely populated areas with strong economies. Therefore, it makes sense that these two regions have relatively high scores on most of the basic socio-economic indicators. For Malta and Crete, the aspect of insularity is clearly reflected in the outcomes of the index. The two regions scored lower on most of the basic indicators since their hinterlands are smaller and connectivity to other regions is limited to sea and air transport only.

Several similarities occur when comparing East Flanders and Liguria with each other. The infrastructure in both regions is well-developed, just as other basic elements like education. Both also have a strong historical position in the maritime economy and perform well on connectivity and total freight throughput. Both realise similar GDPs and have similar amounts of employed residents. Tonnage throughput relative to regional GDP is slightly higher in Liguria than in East Flanders. Liguria is more specialised in containerised trade, whereas East Flanders attracts more industrial activities and liquid bulk. Employment in the port related to the total GDP is also roughly equal; around 700 employees per 1 billion EUR of regional GDP. But East Flanders attracts more indirect port employment; with 60 000 people indirectly employed compared to only 26 000 for Liguria. The main differences between the two regions can be observed in the innovative aspects of the economy. East Flanders scores higher on capitalising on innovation in the economy, via SME and employment, whereas Liguria has the potential to further develop an innovative economy but is not realising it today. An important explanatory aspect in this regard could be the strength of the public sector in the regions, where Liguria's governmental organisations are considered less strong than those of East Flanders.

Comparing Malta with Crete, we see similar challenges. Both are limited in port development, potentially as a result of their insularity and limited hinterland. Therefore, it is reasonable that they are ranked lower than Liguria and East Flanders on the eco-clusters index. When we take a more detailed look at the information, we see that Malta has more port activity than Crete. The Port of Marsaxlokk plays an important role here, as large transhipment hub. Observing only freight transport related to the local economy, Crete and Malta demonstrate similar statistics. Both regions house smaller ports with relatively low local freight throughputs. As hubs for passenger transport, both regions hold strong positions in the Mediterranean.

5.4 Potential areas for cluster development

The paragraphs above highlighted the differences and similarities between the four stakeholder regions. Whilst the regions differ significantly in terms of size and specialisation, they face similar challenges and ambitions in the upcoming years. It has become clear from our study

that the four urban-maritime regions, though embedded in different local contexts, face many similar challenges in the upcoming years:

- The transition to more sustainable ways of operating the port along with the use of alternative fuels are trends that apply to all regions;
- The increasing development towards digitalisation, innovation and more efficient modes of operation is a similarly overarching trend;
- The need for efficient and sustainable transport to/from the ports' hinterlands is an important challenge.

Whilst the challenges are similar for all regions, there are differences between urgency. In some stakeholder regions the need for digitalisation is more prominent, whereas in other regions, sustainability aspects are more relevant. The challenges per stakeholder region are summarised below. In some cases, there is overlap between the different stakeholder regions. For all these challenges, collaboration between different organisations in the triple helix is essential. They are therefore considered potential areas for cluster development.

5.4.1 Liguria

Based on interviews with stakeholders and the urban-maritime analysis, the main challenges for Liguria in the next years are centred around innovation and digitalisation, and the improvement of connectivity with the hinterland. They are the most important challenges for Liguria. To tackle the challenges in innovation, digitalisation and connectivity, a key prerequisite is that the improvements should be made in a sustainable manner. As for all regions, the transition towards greener fuels is essential in the next ten years.

In summary, we conclude that Ligurian seaport stakeholders are looking to develop a scenario in the forthcoming years that aims to:

- Support and **enhance innovation and digitalisation** in the region (including improvement of port operations, their digitalisation, capacity optimisation and efficiency, and towards an enhancement of sustainability);
- Encourage **sustainability efforts** in the region (including the use of greener fuels, urban planning regeneration efforts, smart green ports development efforts);
- Support and **improve the connectivity** within the region (including infrastructural developments, better integration measures and support for risk management and emergency situations).

5.4.2 East Flanders

For the upcoming years, the main challenges for East Flanders relate primarily to making transport smarter and more innovative - most importantly with the use of data. Furthermore, transport and other flows of traffic will need to become more environmentally sustainable, with decreasing emissions. Innovation in transport, as well as making it smarter, will contribute into

making transport more efficient and therefore greener. However, more will be needed to reach a carbon neutral situation, for example the use of greener fuels. Companies can also complement each other in this transition, for example with reusing each other's CO_2.

In summary, we conclude that seaport stakeholders in East Flanders are looking to develop a scenario in the forthcoming years that aims to:

- Establish **smart** and **innovative** ways to use data in transport. Digitalisation, automatization and innovation are leading aspects;
- Pursue a **climate and energy transition** to a carbon neutral situation.

5.4.3 Malta

Malta's main challenges in the upcoming years relate primarily to the connectivity on and between the different islands. As an island, it is characterised by insularity which creates constraints such as remoteness from urban centres, as well as low accessibility to European markets. Indeed, the country has a high dependence on external transport linkages and the standard of service provided by air and sea transport plays a crucial role in influencing the islands' socio-economic development of the country and the quality of life. This insularity and peripherality reflects the inherent vulnerability of the country, which is amplified for the island region of Gozo which suffers from double insularity. The environmental impact of flows of traffic is an important aspect of this challenge, as the current modes of transport need to be replaced by more environmentally sustainable methods. The use of greener fuels and vehicles is therefore a high priority on the list for Malta. Also, a certain degree of flexibility in the use of current infrastructure is needed, so for example berths can be used more flexibly. As COVID-19 has shown, the need for specific types of infrastructure (in this case cruise ship berths) can change drastically in a short period of time. It would be more efficient if berths could be used more flexibly, to handle cargo at one time, while handling cruise shipping at another stage.

In summary, we conclude that Maltese seaport stakeholders are looking to develop a scenario in the forthcoming years that aims to:

- Address the need for a more **holistic transport strategy** (including improvement of connections, enhancement of the efficiency, digitalisation of operations, optimisation of capacities and enhancement of sustainability);
- Encourage **sustainable modes of transport** (through f.e. the use of greener fuels and vehicles).

5.4.4 Crete

Crete's main challenges in the upcoming years relate primarily to the connectivity with the rest of the eastern Mediterranean. As an island, Crete's insular character creates additional constraints, such as remoteness from urban centres, as well as low accessibility to European markets (ESPON BRIDGES). Consequently, it has a high dependence on external transport

linkages and the standard of service provided by air and sea transport plays a crucial role in influencing the islands' socio-economic development and the quality of life. Improving the maritime transport goes for the transport of cargo, but more importantly for the transport of people. Tourism is a very important economic driver for the island and will be for the upcoming ten years as well. As the COVID-19 crisis has shown, the development of 'smart' tourism, where information and communication technology is used to amend or enhance tourism experiences, is more relevant than ever before. Furthermore, additional effort will need to be made in the field of sustainability, in particular when it comes to the cruise industry, which has a large environmental footprint. An underlying prerequisite for these future developments is the enhancement of innovation and digitalisation.

In summary, we conclude that seaport stakeholders in Crete are looking to develop a scenario in the forthcoming years that aims to:

- Transform the port of Heraklion in an **important hub for maritime transport and tourism** throughout the eastern Mediterranean, within the framework of the trans-European transport networks;
- Make the port **more competitive by offering high quality tourism services and experiences**;
- Support and **enhance innovation and digitalisation** in the region (including improvement of port operations, their digitalisation, capacity optimisation and efficiency, and towards an enhancement of sustainability);
- Encourage **sustainability efforts** in the region (including the use of greener fuels, urban planning regeneration efforts, smart green ports development efforts);
- Support and **improve the connectivity** at the region (including infrastructural developments, better integration measures and support for risk management and emergency situations).

6 Urban-maritime scenarios

6.1 Introduction

Four scenario trends were presented to a targeted representation of stakeholders for each of the case study regions. These trends were identified in a literature review and are based on potential global trends that seaports may be facing in general and in the future, but also on the ports influence onto the nearby landscape beyond seaports. The stakeholders were asked to identify which trends applied to their respective region in the upcoming 10 years. The global trends are presented below. In the following paragraphs, the selected trends for each of the regions are described.

Global trends

Trend 1) Optimisation of (port) operations:

The need to optimise operations is becoming more and more important. There is a clear direction towards more efficient operations along with further integration of the supply chain, circular economy, personnel requirements and economies of scale[47]. Regarding the latter, economies of scale at sea have led to the deployment of ever larger containerships[48], which could lead to the potential developments of new terminal infrastructures. Growing container volumes and the increasing ship size could also lead to considerable pressure on cargo terminals, leading to congestion and other negative environmental externalities[49]. This scenario also looks at the potential need to optimise the transport chain (e.g. infrastructures), transportation capacity and accessibility and/or efficiency.

Trend 2) Port regionalisation and multimodality:

The competitiveness of seaports increasingly depends on the ability of cargo reaching its final destination[50-51]. Building on that, the main bottlenecks of most ports are in the direct hinterlands rather than at the seaside (port terminals). To ensure efficient and smooth access to the market in the future, the port system must be integrated in a multimodal (or synchromodal) transportation network that connects port and inland terminals through hinterland connections.

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[47] Kennisinstituut Mobiliteit (2019). Trends en hun invloed op zeehavens.

[48] Wu, W. M., & Lin, J. R. (2015). Productivity growth, scale economies, ship size economies and technical progress for the container shipping industry in Taiwan. Transportation Research Part E: Logistics and Transportation Review. https://doi.org/10.1016/j.tre.2014.10.011.

[49] Acciaro, M., & Mckinnon, A. (2013). Efficient Hinterland Transport Infrastructure and Services for Large Container Ports. JTRC Discussion Paper Series.

[50] Ibid.

[51] Merk, O., & Notteboom, T. (2015). Port Hinterland Connectivity. International Transport Forum. https://doi.org/10.1787/2223439x.

This integration should be coordinated between port developments and should also be in line with TEN-T planning.

Trend 3) Innovation and digitalisation:

Digitalisation and automation provide many new opportunities to increase port productivity, increase the efficiency of port logistics and eliminate bottlenecks. Several new digital trends and developments could help in such a task such as: (1) the use of adequate IT systems (truck and barge) to manage congestion, increase capacity, increase the efficiency and effectiveness of gate operations and to ensure adequate coordination and information exchange among operators[52]; (2) the use of automated and advanced IT systems at terminals to ensure efficient operations, as advanced electronic data interchange (EDI) systems provide real time information to port managers and integrate information flows from several operators[53]; and (3) the use of Internet of Things (IoT), 3D-printing and even the development of autonomous transportation for various modalities (inland waterways, trucks, trains). These new digital trends will also increase the focus and attention towards cyber-security issues[54].

Trend 4) Enhancement of environmental sustainability

The urgency for making an energy transition away from fossil fuels has a tremendous effect on seaports that are often strongly linked with the fossil fuel industry. In the near future, steps must be taken to green these port complexes. Bio-based alternatives and circular economy practices offer opportunities for these port complexes. Additional environmental requirements will need to be met by seaports for the 'license to operate' and the 'license to grow'. It is therefore important that focus is places on environmental sustainability considerations in port development strategies. This especially applies to seaports that deal with a port-city interface.

6.2 Scenario description

The table below displays which of the four trends were selected by the stakeholders when asked to identify which trends applied to their respective region in the upcoming 10 years. More detailed descriptions behind the selection of these trends can be found in the case study annexes.

[52] Acciaro, M., & Mckinnon, A. (2013). Efficient Hinterland Transport Infrastructure and Services for Large Container Ports. JTRC Discussion Paper Series.

[53] Kia, M., Shayan, E., & Ghotb, F. (2000). The importance of information technology in port terminal operations. International Journal of Physical Distribution and Logistics Management. https://doi.org/10.1108/09600030010326118.

[54] Kennisinstituut Mobiliteit (2019). Trends en hun invloed op zeehavens.

Table 6: Overview of selected trends for all stakeholder regions

	Liguria	**East Flanders**	**Malta**	**Crete**
Trend 1) Optimisation of (port) operations	x[55]		x	x
Trend 2) Port regionalisation and multimodality		x	x[56]	
Trend 3) Innovation and digitalisation	x	x		x
Trend 4) Enhancement of sustainability	x	x	x	
Sector-specific trend				x[57]

What is immediately noticeable from the table is that trends 3 and 4 are applicable to almost all regions. In Malta and Crete, more attention is being paid to the optimisation of (port) operations. This difference can partly be explained by the fact that Liguria and East Flanders are larger in size and have been able to invest larger amounts in the optimisation of their (port) operations in the past 10 years already.

During the workshops, it became apparent that a lot of the participants found it hard to separate the different trends from each other as presented in the background document. They pointed at the overlap and intertwining between the different trends. During the workshop on East Flanders for example, participants argued that the optimisation of (port) operations in the upcoming ten years cannot be done without investments in digitalisation and innovation, as these go hand in hand. The stakeholders in Malta stressed that the enhancement of sustainability is an overarching requirement towards the future, rather than an individual trend. The trends also reinforce one another. Investments in innovation and digitalisation should for example lead to the optimisation of port operations and a more sustainable way of working. The trends as such are thus relevant for all ports, but some are more relevant than others.

6.3 Opportunities and threats in the stakeholder regions

During the scenario building workshops, a range of actions and associated opportunities and threats were identified for each stakeholder region. Some actions will present socio-economic benefits, whilst others will affect the environment or affect cooperation and governance in the region. The paragraphs below demonstrate a cross-section of the opportunities and threats that

[55] Mentioned by some as a potential barrier to achieving the desired scenario.

[56] Only applicable to Port of Mgarr (Gozo).

[57] In the case of Crete 'Tourism' was added a sector specific trend.

were identified in the stakeholder regions. For a more detailed overview, please consult the case study reports.

Improvement of infrastructures

Actions in the improvement of infrastructures differ from facilitating the modal shift from road to rail, to developing new types of berths or preventing congestion issues. In general, the improvement of infrastructures is expected to increase flows of goods and passengers. The connection between port and hinterland will improve which makes the region more attractive for businesses and can enable companies to grow and develop as they can reach new markets. The use of alternative (more sustainable) modes of transport can also facilitate environmental improvements due to lower emissions or noise pollution. At the same time, the increase of transport flows can lead to negative external environmental effects. In case of touristic regions, the improvement of infrastructures can lead to overcrowding. There is also often resistance from local residents towards new infrastructure projects.

Networking actions, capacity building activities and new business models

Urban-maritime regions often house large numbers of stakeholders that are active in the maritime sphere. Stakeholders can benefit from and support each other through cooperation on challenges that are mutually occurring, such as for example the need to become more (environmentally) sustainable. This can happen in the form of an eco-cluster organisation that brings together different actors and helps define joint goals. This can provide opportunities through knowledge sharing, but also simply through economies of scale. The development of clusters and new networks is anticipated to have positive impact on cooperation. The stakeholders see opportunities in multi-actor governance between the port, the municipality and the region, but also in increased participation and ownership for the other involved stakeholders.

To facilitate the digitalisation of port operations, the workforce must be trained to deal with the new ways of working. These trainings would concern the whole chain, in the sense that truckers, shipowners and other actors will have to relate in a different way vis-à-vis their respective port operations. Digitisation facilitates operations but also requires that the subjects affected get used to this new system. This, in turn, can lead to better competitiveness of enterprises and the improvement of entrepreneur's skills. There might be some short-term resistance to innovation by operators due to the need for training and possible changes in business models. Technological innovation leads to inconveniences. For example, operators who are used to work in a certain way might try to resist changes that affect those work modalities. Operators who will see their competitiveness margins eroded might also resist the change. Increasing awareness and shared understanding of new technologies, in combination with upskilling employees to use these technologies, is expected to lead to more efficient port operations, as the technologies become more widely adopted.

Finally, there is a clear need for new business models that combine economic and environmental goals. This could for example relate to the use of alternative fuels, or a modal shift from rail to road, which in turn limits emissions in the region. As a result, the region would gain better environmental conditions and quality of life.

7 Recommendations

7.1 Introduction

In this final chapter of the report, a number of recommendations per region are presented as well as an overarching set of horizontal recommendations that apply to all European urban-maritime regions. The first section of this chapter focuses on overarching recommendations that apply to all urban-maritime regions. The reflect a **roadmap of actions** to undertake for eco-cluster developments in urban-maritime regions and are **transferable** to other regions in Europe. They are the result of combining the case study outcomes, interview results, literature review and discussion in the different workshops.

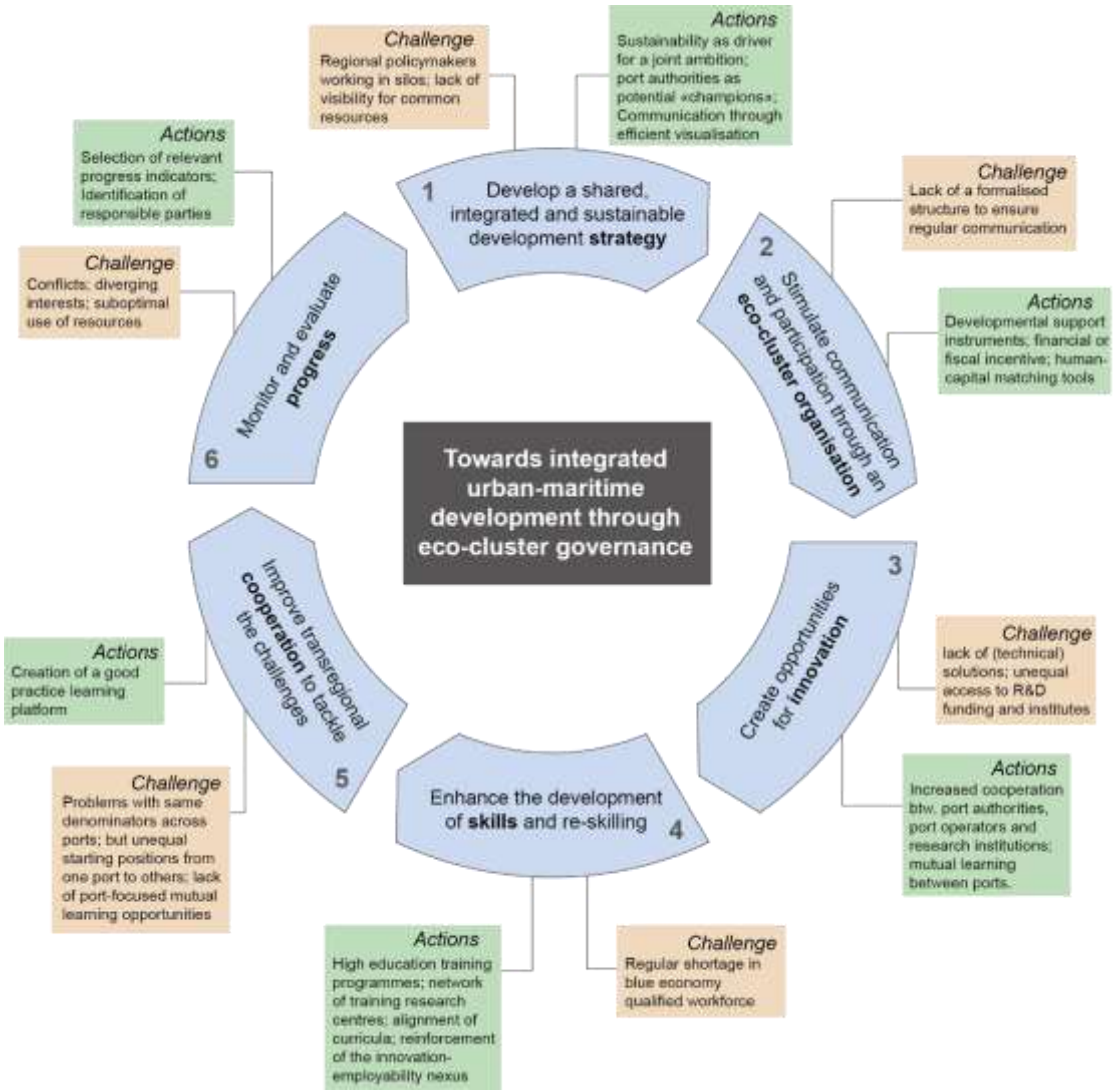
In the latter sections, we summarise the four urban-maritime interfaces from chapter 4 as well as the urban-maritime scenario's that have been developed in chapter 5. Analysing the scenarios in respect to the interfaces (the 'starting position' of the region) allowed us to formulate a number of recommendations per region which could serve as guidance on how to achieve these scenarios. These recommendations are focused on the effective development of eco-clusters.

7.2 Horizontal recommendations

The horizontal recommendations build upon the outcomes of the desk research, workshops and problem analysis in the four stakeholder regions. They are more general recommendations that apply for all urban-maritime regions in Europe. The recommendations are structured according to three steps, as outlined below:

1. First, we describe the challenge that the recommendation addresses;
2. Second, a description is provided of the recommendation and a selection of specific actions that can be taken to implement the recommendation. The recommendations are interrelated and reflect different steps in a process of policy development and implementation that is relevant for all urban-maritime regions. They are demonstrated in a simplified manner in the figure below;
3. We further clarify each of the recommendations in the latter part of this section.

Figure 9: Overview of horizontal recommendations



7.2.1 Recommendation 1) Develop a shared, integrated and sustainable development strategy

Our analysis has demonstrated that ports, maritime sectors and industries have a great influence on the overall socio-economic tapestry of a coastal region. However, we also observe that regional policymaking is not centred around this common strength. Instead, regional policy making is often characterised by the existence of so-called 'silo's', a practice of rather independent policy making by various stakeholders, only aimed at addressing one particular element or challenge in the region.

To unleash the socio-economic potential that the port and maritime sector can offer to a region, it is imperative that **relevant stakeholders (public, private, academic, etc.) commit to a shared, integrated and sustainable ambition**. This will provide a vision for actions to be targeted towards, allowing for the alignment of resources that stakeholders can offer to benefit the development of the region.

The following results of this study are relevant for the formulation of such a (set of) ambition(s).

- The project team have concluded that many of the challenges that port regions face are the same, clustered around (though not always limited to) sustainability, digitalisation, and hinterland connectivity. In several European regions we see **that by jointly agreeing on (long term) ambitions for adopting sustainability goals,** the commitments of both public and private stakeholders can be aligned. This presents a first step for policy making. The setting of common goals towards digitalisation and/or hinterland strategies can additionally be of great value to align the stakeholders in the ports/maritime cluster;
- In the early stages of the formulation of the common goal(s), there was **a clear need for a 'champion'**: i.e. a stakeholder who is willing to invest time and efforts in exploring the idea of common goal setting, discusses ideas with other stakeholders, and eventually is able to integrate all ideas in one coherent (set of) ambition(s) and policies whilst creating the necessary (broad) support for these ambitions. Based on these findings, port authorities seem well-fitted and well-situated to take up this role;
- This study furthermore concluded that the continuous efforts to disseminate the goals with all involved (and to keep on activating all stakeholders to contribute to the realisation of the goals) are indispensable. Such efforts should use a set of strong (innovative) communication/visualisation instruments.

7.2.2 Recommendation 2) Stimulate communication and participation through an eco-cluster organisation.

To facilitate the development of a joint and integrated strategy as described in recommendation 1, clear communication between the different types of actors in a region is essential. At this stage, stakeholders often meet on an ad-hoc basis. A formalised structure through which actors can communicate and cooperate is often lacking. This makes it difficult to formulate a joint strategy.

The development of an eco-cluster organisation can address this challenge. In this eco-cluster organisation, port authorities, industry, the private sector, universities and government should be represented to jointly decide upon a strategy towards environmentally sustainable growth in the region. This eco-cluster organisation can also facilitate additional activities, such as capacity building activities or knowledge sharing events.

For the successful creation of this eco-cluster, it is necessary that the benefits of the governance structure are made apparent to the different stakeholders. In other words, the benefits that this form of cooperation brings to each stakeholder needs to be explicit. The following types of support can be used to stimulate the development of an eco-cluster organisation.

- Developmental support instruments that encourage the emergence and maturation of the eco-cluster organisation through the formulation of broad development strategies and the provision of basic facilitating infrastructure;
- Fiscal and financial incentive instruments that seek to spur or renew growth in already-existing eco-clusters by providing fiscal relief or financial transfers to strategic aspects of the cluster;
- Coordination and information-sharing instruments that aim to improve eco-cluster governance and overcome collective action problems;

- Human capital matching instruments that seek to better embed the eco-cluster locally by improving matches between the local labour pool and the eco-cluster's human capital requirements.

7.2.3 Recommendation 3) Create opportunities for innovation.

In order to increase competitiveness and encourage effort towards sustainability, significant investments in innovation in a broad range of areas is required in European ports. Examples where innovation is most needed include, but are not limited to, digitalisation, greener fuels, data management, smart transport. As a separate sub-index in the urban-maritime eco-cluster ranking, innovation plays an important role in determining the cluster development potential of an urban-maritime region. This study has shown that significant differences exist between urban-maritime regions. Some ports have the advantage of having high-quality universities and research institutions in their direct proximity, for example in East Flanders. Malta on the other hand scores relatively low on the sub-index innovation. Differences also exist within ports. Some port operators are part of companies that are active around Europe or even the world and therefore already have large (financial) resources to invest in research and development. For smaller port operators, it is often more difficult to invest in this area.

There is a need for increased cooperation between port authorities, port operators and research institutions in all stakeholder regions in order to increase opportunities for innovation. However, the existing level of innovation, and the means for improving opportunities for innovation, are very much dependent on local contexts.

The list below provides an overview of specific actions that were recommended in different stakeholder regions, but that can be applied to urban-maritime regions across the EU.

- In order to stimulate the cooperation in the area of innovation, a separate liaison officer that is focused on bringing together the Port Authority, the port community and the scientific community could be of added value;
- Urban-maritime regions that are less resourceful in the area of innovation should discover opportunities for cooperation with urban-maritime regions that face similar challenges;
- Port authorities should stimulate cooperation between large resourceful port operators and port operators that are smaller and less resourceful.

7.2.4 Recommendation 4) Enhance the development of skills and re-skilling.

Sustainable maritime transport is an essential source of economic activity. At the same time, the education of new workers and the updating of skills of existing workers is key to shaping future economy possibilities. Countries must harness that potential and the opportunities for growth, employment and investment that it provides. Yet many economic sectors are experiencing difficulties in finding the right employees and most sectors expect these difficulties to continue in the near future as the skills gap between education offer and labour market needs is not being covered. Main gaps in skills have been highlighted especially with regards to

technological developments and innovation, marine environmental, engineering and scientific monitoring and overall sustainability adaptation knowledge.

Urban-maritime regions should enhance and promote opportunities for 'blue' (i.e. marine and maritime) careers by developing skills, exchanging knowledge and valorising research towards sustainability. They should also aim to develop new curricula and increase employability in the marine and maritime sectors. Urban-maritime regions should also enhance the shared knowledge through higher education as well as research and innovation. Key enablers for this recommendation would be those from academia, industry, government, civil society and education (i.e. universities, technological centres, innovative businesses, maritime clusters, smart and green businesses, etc.). The list below presents specific actions that could be taken to enhance skill development and re-skilling.

- Planning for high education-training programmes (i.e. Advanced Studies Master Programmes) through the so-called Vocational Education and Training (VET) and higher education centres, as well as summer schools, research mobility efforts, professional traineeships and specific workshops and/or conferences;
- Develop a network of training research centres to train new professionals;
- Align high education curricula, establish joint MSc, PhD programs, short term scientific exchanges, to prepare the next generation workforce, technologist and entrepreneurs;
- Co-develop training courses and knowledge exchange activities to improve the level of institutional, technical and human capacities;
- Develop new modalities of training exploiting the opportunities offered by the augmented reality techniques and new digital technologies;
- Promote capacity building to increase resilience to disasters;
- Make marine knowledge and sustainable innovation the key drivers for skilling and re-skilling;
- Support eco-clusters to become an excellent intermediary of knowledge;
- Harmonise sustainable education trajectories with existing Smart Specialisation Strategies;
- Reinforce the innovation-employability nexus (triple, quadruple and quintuple helix).

7.2.5 Recommendation 5) Improve transregional cooperation to tackle the challenges.

One of the important results of our study is the finding that (1) many of the problems and challenges have common denominators. We have also concluded that (2) the starting position of ports/maritime regions can differ considerably, and that (3) the regional communities explored in this study do not have a platform that enables them to learn from good practices developed elsewhere in Europe. Finally, another important finding concerns that (4) the EC, when pushing forward the Green Deal, has the clear expectation that ports/maritime regions can play an important role in contributing to achieving the EU ambitions.

It is recommended that a transregional system of cooperation is created for ports/maritime regions to address the issues mentioned before. For regions with a less favourable starting

position, this would enable a quick acceleration in development as good practices (mimicked from more advanced ports/maritime regions) are adopted. This would provide the regions with the possibility to reinforce their position during the implementation phase of the European Green Deal and related instruments (e.g. Connecting Europe Facility). The list below outlines some specific actions to work towards this recommendation.

- A first step towards more cooperation could be to investigate whether the unique set of characteristics and challenges set for ports/maritime regions can become an part of an existing organisation to achieve the transregional cooperation. Should this not be feasible, it should be considered to form a new platform, it can be expected that there is support within the EC if this initiative would be clearly centred around a theme that is also a strong part of European policy making (Green Deal, TEN-T);
- The network of four regions of this ESPON study might serve as a springboard to explore these possibilities.

7.2.6 Recommendation 6) Monitor and evaluate progress.

Various factors, such as conflicts arising from diverging interests and priorities of different stakeholders, disruptions due to external factors, and changes in local, regional and national priorities can interfere with the timely execution of the developed strategy or associated actions. This in turn can have a negative impact on for example the efficient use of resources and motivation/commitment of stakeholders, and ultimately even result in the end goal becoming unattainable.

In order to achieve the goals and intended benefits of any strategy, a structured monitoring plan is necessary to ensure that progress is made within the schedule of the timeline and the boundaries of dedicated resources. The monitoring plan should also allow for necessary adjustments to the actions of the strategy in the event of a delay.

The main progress indicators should be defined already when the strategy to be monitored is developed. Depending on the needs of the strategy, the indicators can refer to specific deliverables of the strategy, the immediate effects of the strategy or associated actions on the direct addressees, and/or the impacts of the intended outcomes on the wider region/economy.

The party (or parties) responsible for the monitoring and reporting should also be clearly indicated, as well as the stakeholders to be consulted. The overall timeline for the monitoring should also be indicated, covering the time both during and after the implementation of the strategy to be monitored.

In order to be credible, the monitoring process needs to be transparent, evidence-based, and allow for inputs from representatives of different stakeholders involved in or affected by the strategy. However, the monitoring process should also be proportionate to the strategy in question, and minimise overlap with any other information collection obligations. Clearly defined sets of progress indicators, with specific units of measurements where relevant, can help minimise the costs of monitoring.

Having a well-chosen monitoring framework in place also enables communication and cooperation structures (see other horizontal recommendations) that are needed for well-functioning maritime eco-clusters.

7.3 Overview of key challenges and recommendations for Liguria

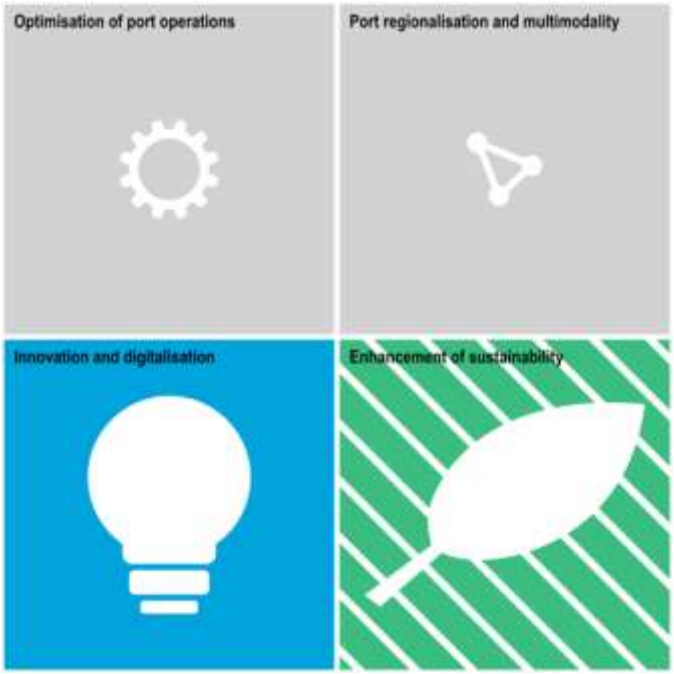
7.3.1 Summary urban-maritime interface

The region of Liguria houses the largest port in Italy. With strong connections to the industrial heartlands of northern Italy and the Alpine region, the Ports of Genoa and other ports in the Western Ligurian Port Authority are catering to a large hinterland. They combine strong cargo handling services with an extensive passenger transport sector. As such, the region is a leading urban-maritime hub. The Ligurian ports are in close proximity to large urban areas and are surrounded by a relatively mountainous hinterland. As a result, any negative external effects quickly affect the adjacent urban areas. There is a need to work in a more sustainable manner to limit the negative external effects of the ports. The stakeholders share the viewpoint that this could be reached through further digitalisation of port activities, to ensure more efficient ways of working. At this stage, the Ligurian ports face a new governance structure which is more inclusive than the previous structure. The new governance structure has the potential to increase the efficiency of port operations by introducing digitalisation and innovation in the port. However, to do this, the governance structure must be embraced by a variety of actors.

Summary scenario and associated challenges

The optimisation of port operations is needed to develop towards a more sustainable and innovative urban-maritime region in the next ten years. This is also reflected in the Ligurian strategy document '*Liguria: From the sea to life'*. The region aims to develop maritime technologies and innovative solutions towards sustainability and resilience of the region. The region aims to reach this through a focus on digitalisation.

Figure 10: Importance of different trends in Liguria



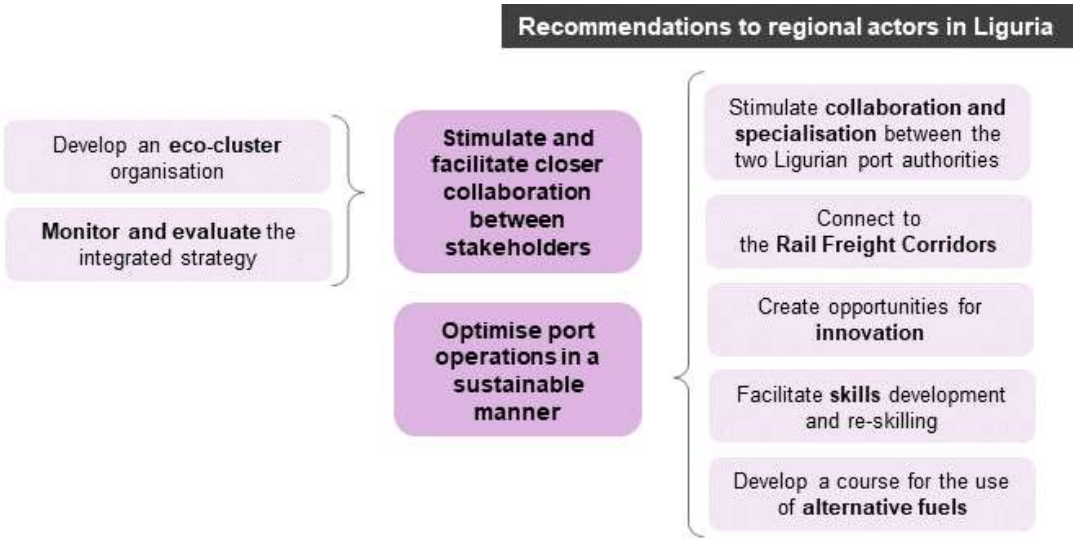
Consequently, trends in the fields of 'innovation and digitalisation' and 'enhancement of sustainability' are of major (fully shaded – in blue) or some (partially shaded – in green) relevance for future port development and will become more important if the impact of present activities and efforts fully unfolds (**Error! Reference source not found.**).

The main challenge in this regard is the interaction between high-level government on the one hand, and actors at the more local level. Because of the diversity in the types of activities in the Ligurian ports, there are many different actors and incentives. This complicates governance in the region. A second major challenge for the Region of Liguria is its vulnerability to shock and stress factors. Landslides and flood risks are among the main shock factors for Liguria, which are the cause of extensive damage, especially to regional infrastructure. Liguria, however, is ready to react investing in the protection of the territory and enhancing its resilience.

7.3.2 Recommendations Liguria

To address the challenges for the urban-maritime region of Liguria, two main lines of recommendations are formulated. One line focuses on the cooperation and governance within the region. It includes recommendations on cooperation between the Western Ligurian Seaport Authority and the Eastern Ligurian Seaport Authority, and recommendations on collaboration between different types of actors in the region. The other line of recommendations focuses on the actions needed to optimise the port operations and increase environmental sustainability. The region-specific recommendations are provided below.

Figure 11: Recommendations to regional actors in Liguria



Collaboration and governance

- Recommendation 1) *Develop an eco-cluster organisation to stimulate an integrated and sustainable strategy;*

All actors in the region recognise the need for sustainable growth. Various initiatives have been put in-place such as the 'Liguria: from sea to life' approach or the Ligurian RIS3 strategy, but there is a need for a joint approach. An eco-cluster organisation could create the framework needed to develop this joint approach. As such, it would be worthwhile to investigate the development of an eco-cluster to tackle the integrated challenges for the Ligurian urban-maritime region. In this eco-cluster, port authorities, industry, the private sector, universities and government should be represented to jointly decide upon a strategy towards environmentally sustainable growth in the region. To ensure an integrated strategy works, it is essential that the functioning does not remain at the higher level, but seeps down into lower levels of governance, including the municipal level. At the same time, private companies are the main actors in the maritime sector in Liguria. They are the core of the ports. Because they are market driven, they focus on solutions within the strategic dialogue that aim to be effective and cost-efficient. They ensure that any actions are feasible from the industries point of view. As such, their involvement in this potential eco-cluster would be essential and could be managed through the different Italian associations such as Assoporti or Assiterminal. For the successful creation of this potential eco-cluster it is necessary that the benefits of the governance structure are made apparent to the different stakeholders, i.e. the benefits that this form of cooperation brings to each of the stakeholders needs to be explicit.

- Recommendation 2) *Ensure that the strategy is monitored and adapted as the situation evolves;*

In order for an integrated strategy to bring the expected benefits, it needs to be monitored and guided. The goals of the strategy should be fairly solid, but the actions that are needed to work towards the goals can be amended and refined when necessary. To do this, regular dialogue between the stakeholders is essential. This can happen within the structure of the eco-cluster suggested in recommendation 1.

Optimisation of port operations and sustainability

- Recommendation 3) *Stimulate closer collaboration and specialisation between the two Ligurian port authorities;*

The introduction of the Western and Eastern Ligurian Port Authorities in 2016 has enabled strategic policy development at a more inclusive scale than before. The grouping of ports under the two port authorities provides benefits of scale and enables more specialisation at the level of the individual ports. These benefits can be expanded if the Western and Eastern Ligurian ports extend their collaboration across port authorities. This process could start with regular dialogues at strategic level on topics that are relevant for all ports and do not directly interfere with the competition between the ports, such as sustainability or connections to the hinterland.

- Recommendation 4) *Connect to the Rhine – Alpine and Scandinavian – Mediterranean Rail Freight Corridors;*

At the point of writing, the ports of Genoa and La Spezia are connected to two different Rail Freight Corridors. The Western Ligurian seaports are connected to the Rhine - Alpine corridor, whereas the Eastern Ligurian seaports are connected to the Scandinavian – Mediterranean corridor. The connection to a Rail Freight Corridor promotes intermodality between rail and other transport modes and is thus relevant to have a better connection to the port hinterland. It also provides financing opportunities. It would be worthwhile to investigate opportunities for the region as a whole to be connected to both corridors.

- Recommendation 5) *Create opportunities for innovation towards integrated and sustainable solutions;*

Liguria houses excellent universities and private companies that have the potential to create innovative solutions to work towards the integrated strategy. In order to facilitate this process, opportunities for collaboration between private companies, academia and the public sector have to be understood. This could be done with the help of funding opportunities through, for example, different European funds.

- Recommendation 6) *Facilitate trainings to ensure workers can adapt to new jobs;*

The challenges identified in this study demonstrate a need to innovate and to develop new skills, capacities and ways of working. As a consequence, in the next years the labour force needs to be given the opportunity for re-skilling, and gain knowledge and skills to deal with these new ways of working. The facilitation of (paid) trainings could be a part of the responsibility of an eventual eco-cluster such as suggested under recommendation 1. This ensures that people know how to apply the new technologies in the most effective and efficient manner.

- Recommendation 7) *Decide upon a course for alternative fuel solutions.*

All actors in the Ligurian maritime sector agree that in the next years a transition should be made towards more (environmentally) sustainable ways of working. In particular the use of alternative fuels is mentioned frequently. The challenge with the transition to alternative fuels is both that technological solutions are not yet readily available, and that investment costs are large, especially in the maritime sector. The size of the costs for adaptations of bunkering facilities and ships leads to a need for long lived solutions; e.g. new facilities that can be used for multiple decades. Hence, there is a need for all stakeholder in the region, and possibly even stakeholders at European level, to align and select a common solution to ensure investments are sustainable.

7.4 Overview of key challenges and recommendations for East Flanders

7.4.1 Summary urban-maritime interface

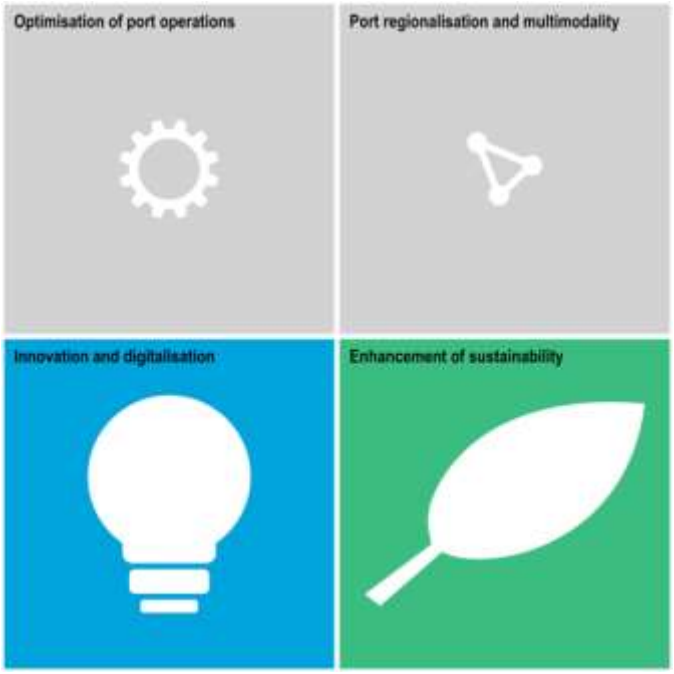
North Sea Port is unique in Europe given its cross-border nature. It is an industrial port with a strong focus on bulk trade. Due to its location on the European map, North Sea Port has a large hinterland. Within North Sea Port limited number of large and resourceful companies, namely Volvo and Arcelor Mittal. East Flanders is characterised by high quality and accountability of government services. Furthermore, the region has the advantage of having the presence of prominent academia and other research institutions in close proximity. Furthermore, there is already high-quality infrastructure and connectivity with the hinterland. This situation will only be further improved once the construction of the Terneuzen sea lock is finalised. Having a strategic position at the centre of European waterways, railways and highways, North Sea Port is a multimodal port. Over half of all transport between the port and the hinterland is conducted via inland shipping. Other important means of transport take place via road and rail. Additionally, 15 million tonnes of products are transported to the hinterland by pipeline on a yearly basis.

Summary scenario and associated challenges

The scenario developed for East Flanders centres around two things. First, there is a need for smart and innovative ways to use data in transport. Digitalisation, automatization and innovation are leading aspects in this respect. This need relates to the strong focus on bulk trade within North Sea Port. The main challenge relates to the ownership of data and the willingness to share data among companies. Second, East Flanders has the ambition to make a lot of progress towards 2030 in the climate and energy transition to a carbon neutral situation. The main challenge in this respect are the potential competitive cost disadvantages that companies might face when embracing this development. Companies are focused on short-term investments and profits. Another important challenge relates to the cross-border nature of North Sea Port. Investing in a significant number of pipelines that would allow for eco-friendly alternatives for transporting CO_2, hydrogen and synthetic nafta has been one of the recommendations made in the Clean Underground Sustainable Transport (CUST) project, which was finalised in 2019. This study concluded that the construction of these pipelines could contribute to a significant reduction in CO_2 emissions.

To achieve this vision, the North Sea Port seeks to provide high-quality port infrastructures and related services. Against the background of positioning the comparatively young North Sea Port, the trends of 'innovation and digitalisation' and 'enhancement of sustainability' are of major (fully shaded – in blue and in green) importance.

Figure 12: Importance of different trends in East Flanders

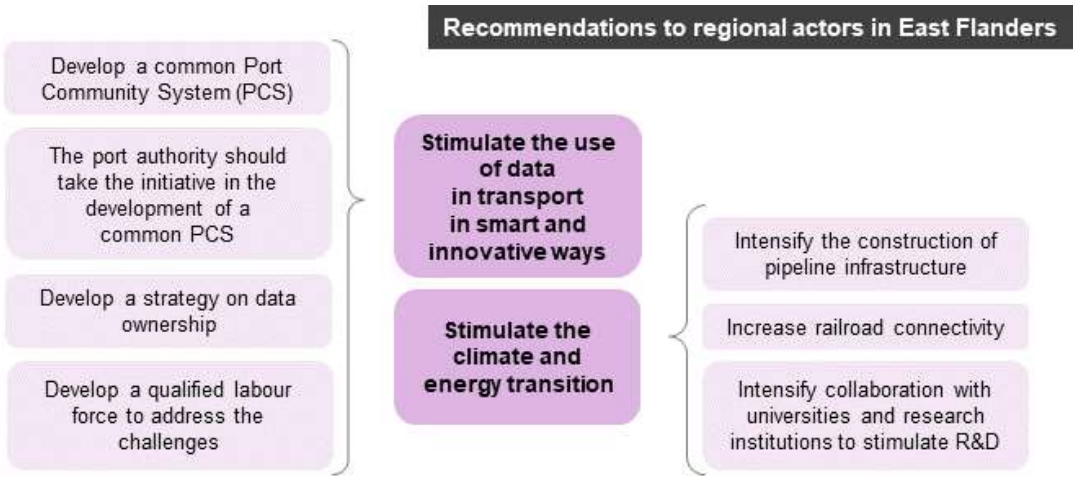


7.4.2 Recommendations East Flanders

The recommendations for East Flanders are centred around: (1) recommendations related to the use of data in transport systems; and (2) recommendations regarding the climate and

energy transition. The region-specific recommendations are provided below. For more detailed recommendations, please consult the case study report.

Figure 13: Recommendations to regional actors in East Flanders



Stimulate the use of data in transport in smart and innovative ways

- Recommendation 1) *Develop a common Port Community System (PCS);*

Currently, North Sea Port has a port information system in place that allows clients and terminals to make use of existing services in order to share data concerning the entire supply chain with partners: Enigma+. North Sea Port should join forces with neighbouring ports to develop a common PCS. Especially in the container business (with PoA and PoR) but also in Roro (with MBZ and PoA) and the break-Bulk (with PoA) the needs are similar. In the neighbouring ports of Antwerp (NxtPort) and Zeebrugge (RX/Seaport) individual platforms have already been created that allow the exchange of data and information of all actors involved in the logistical chain of the respective ports. A PCS for all Flemish ports will make logistics processes more efficient and facilitate supply chains.

- Recommendation 2) *The port authority should take the initiative in the development of a common PCS;*

Digitalisation enhances the role of port authorities as facilitators of the supply chain. Therefore, the port authority should take the initiative in further mapping the exact needs of its port operators and initiate the development of a common PCS by joining forces with port authorities of neighbouring ports.

- Recommendation 3) *Develop a strategy on data ownership;*

The third recommendation touches upon the most important stumbling block when it comes to developing a PCS: the question of data ownership. In order to solve the issue of data ownership, a strategy on data ownership should be developed simultaneously that includes all companies that are in need to make their transport flows more efficient. Particular attention should be paid

to data ownership, since data is becoming more and more valuable. An external (semi)governmental institution in charge of data ownership should be explored as a potential option. Larger companies in the area could serve as an example for smaller parties.

- Recommendation 4) *Develop a qualified labour force to address the challenge;*

A holistic and integrated approach to use data in transport in smart and innovative ways also requires attention to guaranteeing that supply and demand of the labour market of 2030 are in line. Intensified collaboration between the ports and the universities and universities of applied sciences that are in proximity of North Sea Port will be of added value in attracting talented people that can help shape the future of North Sea Port.

Stimulate the climate and energy transition

- Recommendation 5) *Intensify the construction of pipeline infrastructure;*

Intensifying the construction of pipeline infrastructure will not only offer significant opportunities in regard to the energy and climate transition, it will also improve the position of North Sea Port as multimodal port. Within the CUST project, recommendations have already been formulated on how the construction of underground pipeline infrastructure could contribute to the reduction of CO2-emmissions in the port area.[58] From a governance perspective, (cross-border) cooperation was identified as an absolute necessity in order to realise a cross-border pipeline network. Both between Dutch and Flemish public authorities to facilitate the routes in planning and legal terms. In line with the recommendations formulated within the CUST project, the formation of a consortium in which industry, network operators, governments and North Sea Port can collaborate is included as a recommendation in this study as well.

- Recommendation 6) *Increase railroad connectivity;*

Increasing railroad connectivity will not only offer significant opportunities in regard to the energy and climate transition, it will also improve the position of North Sea Port as multimodal port. In February 2021, North Sea Port announced that the European Commission accepted its request to include North Sea Port in the Rail Freight Corridor (RFC) 'North Sea-Baltic'. North Sea Port is already part of RFCs 'Rhine-Alpine' and 'North Sea-Mediterranean'. North Sea Port authority should, in consultation with its main port operators, discover the need for a connection with other RFCs as well, for example with RFC Atlantic. In this way, hinterland connectivity with France and Spain will be further improved.

- Recommendation 7) *Intensify collaboration with universities and research institutions to stimulate R&D.*

[58] https://www.northseaport.com/aanbevelingen-voor-pijpleidinginfrastructuur-in-north-sea-port-om-klimaatambities-waar-te-maken.

The climate and energy transition will require significant effort in the field of R&D. The port authority could take the Port of Antwerp as an example for its use of a scientific liaison officer between the Port Authority, the port community and the scientific community surrounding the port. The port eco-system consists of a few big players (Arcelor Mittal, Volvo) but even mid-sized players like DFDS and the multitude of small companies do not have the resources or the management time available to spend on R&D. The Port Authority should take a supporting role in this regard.

7.5 Overview of key challenges and recommendations for Malta

7.5.1 Summary urban-maritime interface

Malta's two main ports, Valletta and Marsaxlokk, each have their own specialisations. Marsaxlokk focuses primarily on transhipment of goods, and is one of the main hubs in the Mediterranean. The Port of Valletta also has cargo-related activities, but has a stronger focus on passenger transport to and from the island. There is a fairly large tourism and cruise shipping sector on the island, though COVID-19 puts pressure on this sector. Malta also houses a strong bunkering sector. Being an island, Malta has a small hinterland. Through the activities in Marsaxlokk Freeport, Malta has partially avoided this handicap. The main challenge for Malta however is in the connections between the different ports on the island. The connection between Marsaxlokk and Valletta faces congestion, and the connection further north towards the island of Gozo faces similar challengers. In Malta, a National Transport Strategy[59] and a Master Plan[60] already exist which have clear objectives and goals (8 guiding principles describing the strategic direction[61]), however the strategy and plan are **not holistic**. In this regard, stakeholders in Malta stress the need to develop, **in the next ten years, a holistic and sustainable transport** strategy which should not be static in nature, but dynamic - taking into consideration even international or supranational policy developments in the maritime sector (e.g. the European Green Deal).

Summary scenario and associated challenges

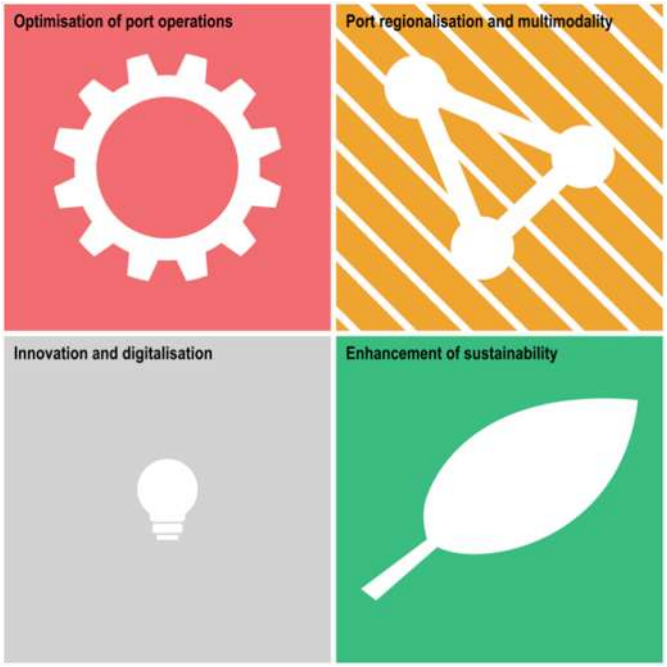
[59] Malta National Transport Strategy (NTS) 2050. Available at https://transportmalta.wetransfer.com/downloads/02a871c2a36e859b751f40dd405a4b4a20161202212452/4df52a.

[60] Transport Master Plan (TMP), 2025. Available at https://transportmalta.wetransfer.com/downloads/c0ed2f41cbdb8b47a22ef7c932bbebaf20170327084338/cfb89a.

[61] These 8 guiding principles are: 1. Efficient utilisation of the existing transport system: Traffic Management, Logistics Planning and Enforcement; 2. Creating modal shift; 3. Integrated approach to planning and design; 4. Encouraging use of greener vehicles and fuel; 5. Developing and improving the effectiveness and quality of the strategic transport network; 6. Education, information and human resources; 7. Room for research and innovation; 8. Financing and generating revenue.

The Maltese Case Study poses some challenges for a holistic and sustainable transport strategy. As an island, it is characterised by insularity which creates constraints such as remoteness from urban centres, as well as low accessibility to European markets. Indeed, the country has a high dependence on external transport linkages and the standard of service provided by air and sea transport plays a crucial role in influencing the islands' socio-economic development of the country and the quality of life. This insularity and peripherality reflects the inherent vulnerability of the country, which is amplified for the island region of Gozo which suffers from double insularity. One of such is the limited hinterland space (as previously mentioned) which calls for the need to more effectively plan the use of such existing space. Another challenge comes from the need for a **clear business case for transport and connections**, as well as for the storage of alternative fuels, which **is currently lacking**. At the same time, the fleet is fairly old, and thus efforts are required to modernise it whilst opting for the cleaner use of fuels. Other related **challenges include the lack of strong innovative centres.**

Figure 14: Importance of different trends in Malta



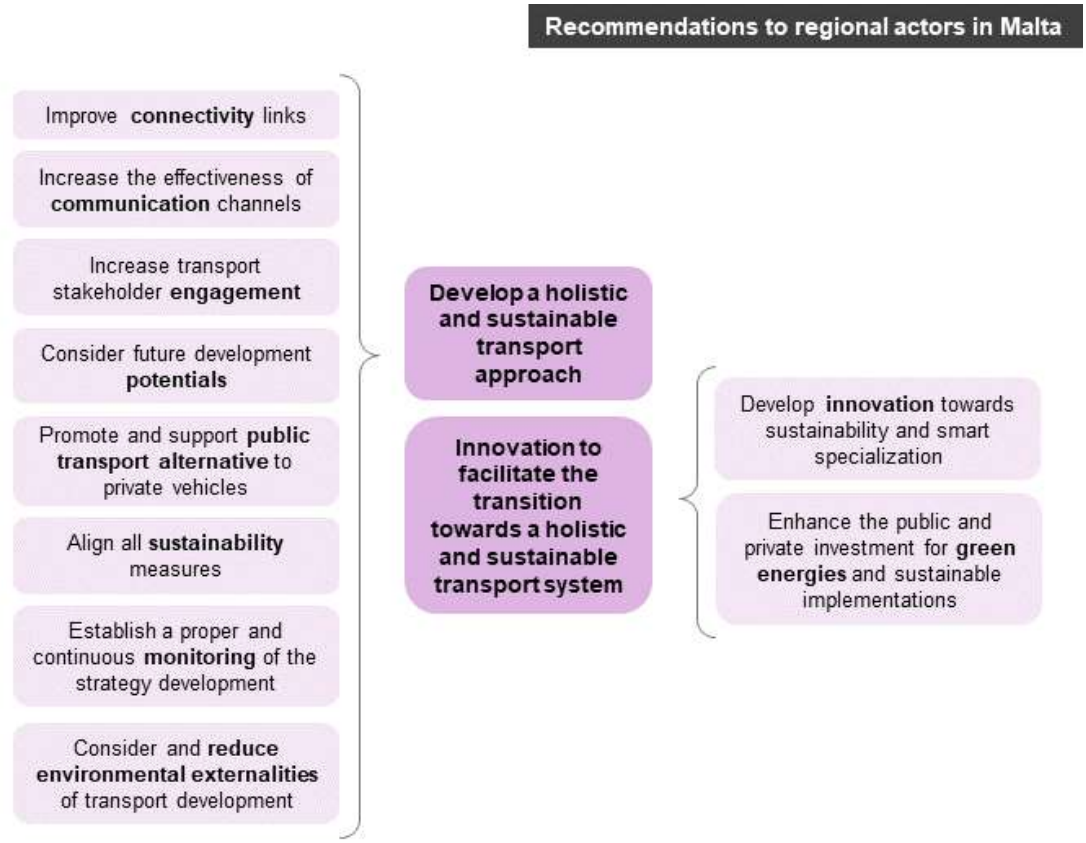
Against this background, the trends of 'optimisation of port operations' and 'enhancement of sustainability' are of major importance (fully shaded – in red and in green). In addition, the trend of 'port regionalisation and multimodality' is another important trend for future port development, although to a lesser extent than the other two trends (partially shaded – in yellow) (**Error! Reference source not found.**).

7.5.2 Recommendations Malta

Having in place a transport strategy and a master plan, Malta would need to work on the approach or roadmap to **achieve it in a holistic and sustainable way**. This entails that

strategy development cannot be developed in isolation and that it would need effective cooperation, knowledge and experience drawn from the various stakeholders involved in transport aspects in Malta. At the same time, the strategy should acknowledge the dynamic development needs of the different stakeholders and should ensure that these needs are addressed in a sustainable and coherent manner. The region-specific recommendations are provided below.

Figure 15: Recommendations to regional actors in Malta



Develop a holistic and sustainable transport approach

- Recommendation 1) *Improve the connectivity;*

The strategy needs to address accessibility in Gozo and encourage better links between Malta and Gozo, ensuring the development and improvement of sustainable transportation modes in Gozo. At the same time it must be ensured that Business Hubs and Enterprise hubs are well served by public transport.

- Recommendation 2) *Increase the effectiveness of the communications channels;*

Communication channels need to be improved both within the government ministries dealing with the various aspects of sustainable transport (mainly the Ministry for transport, infrastructure and capital projects - MTIP; the Ministry for energy, enterprise and sustainable development – MESD and the Ministry for the environment, climate change and planning – MECP) and between the government and those actors dealing with transport issues in Malta.

- Recommendation 3) *Increase transport stakeholder engagement;*

So as to develop a clear vision and a robust strategic planning process. Effective engagement helps translate stakeholder needs into strategic goals and creates the basis of effective strategy development. As such, a clear vision derived from a robust strategic planning process can only come from a proper and holistic stakeholder engagement. Participation should be as interdisciplinary as possible, which would call for new models of knowledge production in order to be able to develop holistic solutions, to consider a plurality of perspectives, and to support a more deliberative democracy approach. The creation of an all-inclusive Maltese FORUM could help achieving this recommendation. This forum could gather and foster alliances (amongst others) between the existing Malta Maritime Forum, the Malta Chamber of Commerce, the Gozo Business Chamber, the Malta Council for Economic and Social Development (MCESD), the Gozo Regional Committee within the MCESD, Malta Enterprise, Industrial Innovative Solutions Malta (INDIS), Malta Investment Management Company Limited (MIMCOL), Universities, Port Authorities, Terminal Operators, Engineers, Architects, Sustainability experts, etc.

- Recommendation 4) *Consider future development potentials;*

Ensure that areas defined for higher capacity development are well served by public transport and that land use development and transport planning take place in an integrated manner. At the same time efforts to prioritise the efficient use of the port area on land and sea especially for the grand Harbour and Freeport is essential for a proper sustainable urban-port development. Ensuring the accessibility to port areas, industry related areas, the airport and aviation related activities by planning for the transport network to accommodate their anticipated growth is also encouraged.

- Recommendation 5) *Public transport as an alternative to private vehicles;*

There is a need to take the connectivity of the transport in a full manner and to pursue a more holistic public connectivity until final destination. This change would require push and pull measures. Restricting the use of private vehicles, promoting mixed use developments, designing a transport plan based on a sound analysis of the mobility patterns and promoting the need to change bad habits is therefore necessary. Whilst car restriction measures such as parking charges or congestion charges might result in social inequalities (only those of higher income being able to afford the use of a car), public transport must become an attractive option. It must be accessible to the disabled, transport connections both within towns and between towns would need improvement, frequencies could be increased, the use of sustainable modes of transport could be promoted through education, etc. At the same time, ensuring easy accessibility to facilities by walking when daily facilities are within walking distance and ensuring access by other sustainable modes of transport when walking is not possible is essential.

- Recommendation 6) *All sustainability measures should be aligned;*

The National Transport Strategy already foresees: 1) reducing and mitigating green-house gas emissions (through promoting renewable energy sources and zero carbon modes for transport);

2) ensuring the efficient and sustainable use and management of resources (through promoting the efficient use of resources in the construction of infrastructure projects); 3) ensuring adaptation to climate change, minimising the impact of transport to enhance the landscape and townscape; 4) preserving the natural habitats and biodiversity; and 5) respecting historical and heritage resources. However, those sustainability goals have been so far developed by isolated actions and implementations. There is an urgent need to align the implementation of such sustainability implementations into a structured roadmap with a clear sustainability vision. For this, increasing the effectiveness of its communications channels both within the government ministries dealing with the various aspects of sustainability (mainly the MTIP, the MESD and the MECP) is necessary. At the same time, seeking funding and investment opportunities, such as EU-funding opportunities that could help to advance on this recommendation is essential. These opportunities may come from DG MARE, DG ENER, DG MOVE, EU Green Deal, EU NEXT funds, etc. However, most businesses in Malta are small entities and SMEs with small secretariats who find it difficult to get involved in the application and implementation of EU funds. The government has placed a department to help accessing these funds but from an operational perspective these entities continue to face difficulties.

- Recommendation 7) *Establish a proper and continuous monitoring of the strategy development;*

Once the strategy has started its implementation there is the need for a monitoring strategy to be developed where a potential monitoring board could check its performance, monitor the efforts, the amounts spent and the tasks developed and suggest amendments of changes to the remaining tasks to aim to fulfil the strategy in due time.

- Recommendation 8) *Environmental externalities of transport developments should be considered and diminished;*

Adopting environmental measures to avoid pollution, reducing congestion, reducing traffic impact, ensuring accessibility and supporting the creation of quality environments within the urban area and prime tourism sites is essential so as to retain and ensure the attractiveness of the areas. At the same time, supporting the integrated regeneration of degraded areas through infrastructural improvements and the introduction of environmentally friendly initiatives is also encouraged. Mitigation measures need to be in-place and an-ongoing conversation between ports and society needs to continually happen.

Optimization of operations through innovation to facilitate the transition towards a holistic and sustainable transport system

- Recommendation 9) Innovation should further be developed;

Innovation should be further developed to achieve the strategy goals in a more efficient and economic manner. Malta can drive innovation towards sustainability through its R&D efforts and it has already developed a post-2020 R&I Strategy towards smart specialization . However, due

to scale limitations, Malta should not re-invent the wheel and should take advantage of the technologies and developments developed elsewhere and bring them Malta. Consideration should be given to good practices and technologies which can be applied to address the needs of the local sector.

- Recommendation 10) Enhancing the public and private investment for Green Energies and sustainable implementations.

However, there has to be a clear consensus and clarity on which investments are needed to fulfil the goals of the strategy. The transition towards sustainable infrastructure could be costly, but, at the same time, the effects (in terms of better environmental quality and new job opportunities) will benefit both industrial stakeholders and local and regional authorities. As such, there should be incentives at a governmental level to stimulate actions by businesses, but businesses would also need to invest private funds so as to improve their performance, efficiency and minimize their carbon footprint.

7.6 Overview of key challenges and recommendations for Crete

7.6.1 Summary urban-maritime interface

Crete and the port of Heraklion have a strong focus on passenger transport and the cruise industry, while cargo and containerised trade only play a minor role. Being an island, the hinterland is relatively small. Tourism is the core business of the island, which has been heavily impacted by the COVID-19 crisis this year. Crete performs relatively weak on three out of four sub-indices, so it has a vulnerable starting position compared to other regions. Earlier this year, Hellenic Republic Asset Development Fund, which currently holds 100% of the shares in port of Heraklion, announced that this port, together with other regional Greek ports, will be privatised.

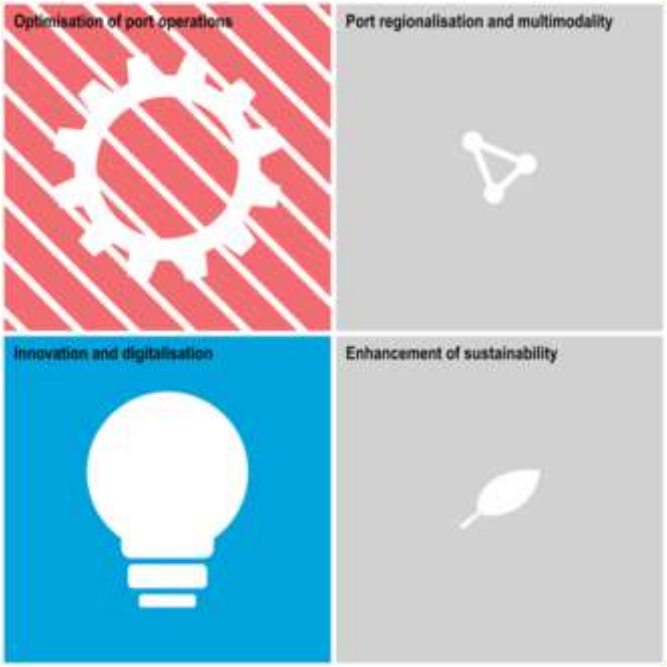
Summary scenario and associated challenges

By 2030, the port of Heraklion aims to be transformed in an important hub for maritime transport and tourism throughout the eastern Mediterranean, within the framework of the trans-European transport networks. Making the port more competitive by offering high quality services and experiences is a prerequisite to realise this ambition. Furthermore, support and the enhancement of innovation and digitalisation in the region is needed, especially with regard to encouraging sustainability efforts. Finally support and improvement with regard to connectivity in the region is needed (including infrastructural developments, better integration measures and support for risk management and emergency situations).

As an island, Crete’s insular character creates additional constraints, such as remoteness from urban centres, as well as low accessibility to European markets. Consequently, it has a high dependence on external transport linkages and the standard of service provided by air and sea transport plays a crucial role in influencing the islands’ socio-economic development and the quality of life.

Against this background, especially trends related to 'innovation and digitalisation' (fully shaded – in blue) and, to a lesser extent, trends in the field of 'optimisation of port operations' (partially shaded – in red) are of importance for future development perspectives of the port (**Error! Reference source not found.**).

Figure 16: Importance of different trends in Crete



7.6.2 Recommendations

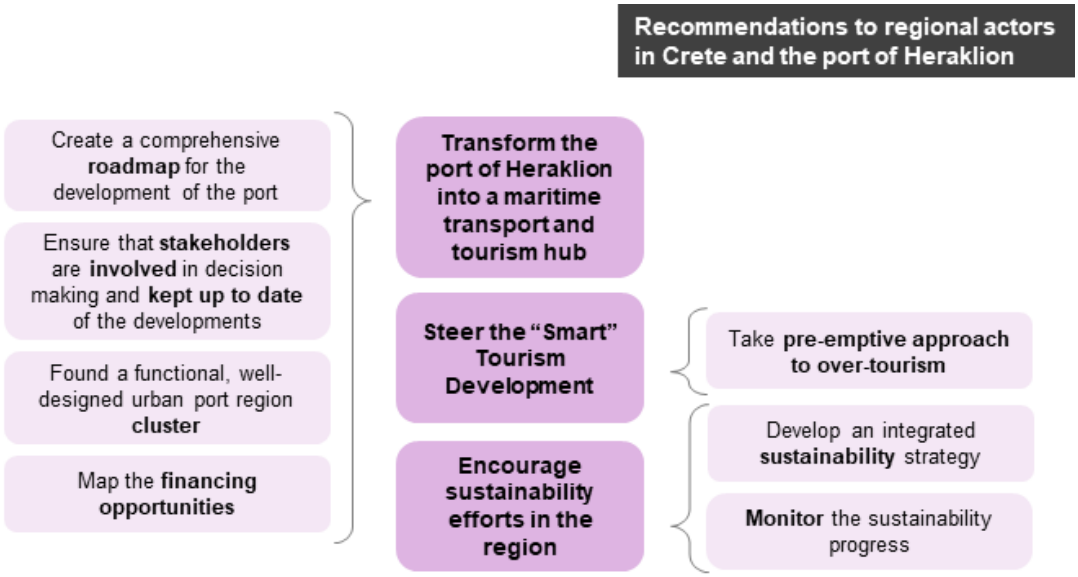
Crete and the Port of Heraklion are well placed to make the scenario described above a reality. The role of the port as a transport and tourism hub is already recognised, and national-level plans on, for example, airport construction and road axes improvement support this goal. Moreover, the *Smart City Strategic Plan* is bringing major stakeholders together to achieve the long-term development plan. Stakeholders consulted as a part of this study also emphasised the importance of maintaining and improving sustainability throughout the process.

Crete's insular nature has an impact on aspects such as community involvement, relationship with the central government, and natural and cultural assets (see the main report for a detailed discussion on the impacts of insularity), further highlighting the need for transparent long-term planning, systematic involvement of stakeholders, and careful management of tourism and any impacts on environmental sustainability. Coordinated approach to exploring funding options is also of particular importance for insular regions such as Crete.

The main challenges identified for the realisation of the scenario therefore primarily relate to finding the right tools to ensure that the process is effective, stays on track, and involves all the

relevant stakeholders. In line with these challenges, region-specific recommendations are provided below.

Figure 17: Recommendations to regional actors in Crete



Transform the port of Heraklion into a maritime transport and tourism hub

- Recommendation 1) *Create a comprehensive roadmap for the development of the Port of Heraklion;*

A comprehensive roadmap needs to be created for the development of the Port of Heraklion, integrating environmentally and socially sustainable tourism development, support for innovation and digitalisation, and environmentally sustainable development of the region with the aims of the port Master Plan. By clearly setting targets that take all of these aspects collectively into consideration, together with short-term and long-term goals, deadlines, action items and financing across the different themes, this roadmap will bring together the different strategies and help overcome the stagnation resulting from inertia. Most importantly, a clear management and monitoring structure must be set, with an assigned party responsible for maintaining the overview of the roadmap, keeping track of deadlines and ensuring that problems are solved and obstacles are overcome. The Port Authority (or the new owner) is best placed to take the responsibility for the coordination of responsibilities.

- Recommendation 2) *Ensure that stakeholders are involved in decision making;*

An important part of realising the scenario is to ensure that stakeholders are involved in decision making and kept up to date of the developments, especially in cases where development in one area causes a temporary delay in another (this will strengthen stakeholder commitment to the long-term plan). A well organised and managed cluster (see below) can be well positioned to support in this, due to its ability to effectively foster communication. Heraklion already has several years of experience in productive stakeholder cooperation and participatory approach, e.g. under the Smart City strategic plan and Committee. The lessons learned from this practice

can be used to support the cluster development, by adapting successful approaches and pre-emptively addressing identified issues.

- Recommendation 3) *Develop a functional, well-designed urban port region cluster;*

Bringing together the port authority, the municipal authority, government, academia, chambers of commerce, and local businesses involved in shipping, port operations, services and tourism can play a significant role by fostering open communication between different stakeholders. Thus, improving the sense of common goals, minimising the spread of misinformation, developing ways to minimise local bureaucracy and to share the burden of national and EU level bureaucracy. The cluster can also ensure and support the planning and management of regional development. However, for this purpose, the cluster itself must also be well developed and managed. The management structure and division of roles and responsibilities must be clear, both for the overall cluster operation and for processes related to individual goals. This is particularly important in light of the privatisation of the Port of Heraklion, which will have an impact on the dynamics of the urban maritime region.

- Recommendation 4) *Map the financing opportunities;*

Thematically, the planned scenario fits well with the priorities of the 2021-2027 MFF, regarding both enhancement of innovation and digitalisation and development of environmentally sustainable port operations and tourism. For example, priorities of CEF Transport for the new programming period include connected, sustainable, inclusive, safe and secure mobility, and decarbonising transport. The new Invest EU Fund, the successor of the European Fund for Strategic Investment, will fund projects on sustainable infrastructure, innovation and digitisation, but also offer a database matching projects with potential investors. It is important to make information available to the stakeholders as new calls become available under the 2021-2027 programming period, with clear identification of benefits and caveats involved.

Steer the "Smart" Tourism Development

- Recommendation 5) *Take pre-emptive approach to over-tourism;*

The port of Heraklion is currently working with the Global Sustainable Tourism Council (GSTC) and other stakeholders to ensure the sustainable return of tourism to the destination. The region can also learn from existing best practices in Smart Tourism[62], as well as from other Mediterranean destinations such as Venice and Dubrovnik[63], on how to address and prevent over-tourism associated with cruise traffic, so that problems such as overcrowding, traffic congestion, degradation of locales and important assets, and resident and visitor alienation can

[62] See e.g. European Capital of Smart Tourism (2019). Compendium of Best Practices. Available at: https://smarttourismcapital.eu/best-practices/.

[63] See e.g. the GSTC report on Dubrovnik 2019, available at: https://www.gstcouncil.org/wp-content/uploads/GSTC-Destination-Assessment-Dubrovnik-2019-Final-Report.pdf.

be prevented even before they fully manifest on Crete. Depending on the conclusions of the GSTC research, appropriate measures can include controls on numbers of arrivals during peak times (through limits to or staggering of cruise ship arrivals); improved cooperation between the port and the new airport to limit overcrowding, traffic congestion, degradation of locations and visitor alienation; and/or setting limits to non-institutionalised forms of tourist accommodation and providing preferential access to local residents to limit resident alienation. The Municipality of Heraklion, together with the Port Authority, should take the lead on this action, in close communication with the local community and businesses.

Encourage sustainability efforts in the region

- Recommendation 6) *Develop an integrated sustainability strategy;*

In developing a sustainable port, as with the overall approach, it is important to maintain the overview of the overall aim to prevent stagnation resulting from inertia. With a range of local and national strategies, including the Heraklion Smart City project, the plan for sustainable tourism in Heraklion, the National Energy and Climate Plan, the National Circular Economy Strategy, and the National Transport Plan with its HLO for environmentally sustainable transport sector, a framework exists for sustainability efforts on Crete. However, it needs to be ensured that all steps are harmonised and complementary, to avoid stagnation and to ensure an efficient use of resources. An integrated overview of the different strategies should take into consideration present and future technological developments (e.g. fuel development in shipping and the consequent infrastructure development), port operations, and incentives for stakeholders. The plan must provide a clear vision, as well as concrete steps including budget and timeframe.

- Recommendation 7) *Monitor the sustainability progress.*

As with the port development roadmap (Recommendation 1), the real value of the integrated sustainability strategy is achieved only through strict monitoring. Already in the development stage, the responsibilities need to be clearly assigned, together with transparent monitoring process and measures to be taken in the event of delays or necessary changes to the plans. As with the port development road map, the Port Authority (or the new owner) is the best placed to take the responsibility for the original coordination of responsibilities.

8 Conclusions

To conclude the ERMES Targeted Analysis, we refer back to the main questions in the Terms of Reference that were also introduced in the introduction of this final report. Because of the overlap between questions, we have written overarching conclusions on two topics; the territorial benefits of cluster collaboration (paragraph 8.1), and; the way in which eco-clusters can be organised to stimulate territorial benefits (paragraph 8.2).

8.1 Territorial benefits of cluster collaboration

The main territorial benefits of cluster collaboration can be roughly divided in two main fields: the prevention and mitigation of negative externalities of maritime activities, and the stimulation of factors that trigger economic development. With regard to the negative externalities, the most obvious example of this is the impact that current port operations have on the direct environment. In all stakeholder regions, a need for more (environmentally) sustainable practices in port operations were mentioned as a key challenge. The benefits of more sustainable practices land in the full territory of the urban-maritime region (and beyond). At the same time, the negative externalities caused by for example the extensive use of fossil fuels also land in the full territory of the urban-maritime region. For a real transition to sustainable practices, it is important that all relevant port actors are involved. Moreover, sharing knowledge and experiences through cluster collaboration can help to facilitate this transition.

In economic terms, cluster collaboration can put in place a favourable business ecosystem for innovation and entrepreneurship in which new winners can arise and hence support the development of new value chains and emerging industries. The economic drivers of such cooperation can vary extensively and include different aims. For example, to gain a stronger competitive position to attract and retain traffic flows, better access to capital, or improved, general control over the logistics chain. Through collaboration in an eco-cluster, these two aims can be combined, to strive for economic development in an environmentally and ecologically responsible way.

Specific examples of areas in which stakeholders' territories can benefit from cluster collaboration are mentioned under the stakeholder recommendations in Chapter 7 of this report.

8.2 Organisation of eco-clusters

8.2.1 Eco-clustering in insular areas

Island countries share some common features and vulnerabilities to future territorial developments, such as insularity, geographic remoteness, economic dependences, population size and available area for development. Of the four stakeholder regions studied in this study, Malta and Crete are in part characterised by their insular nature. The disconnection from mainland gives rise to multiple challenges, which can be mitigated or exacerbated by other physical and social factors present on the island. These are identified as follows[64]:

- **Challenges in transport and trade logistics**
- **Market accessibility & Economies of Scale**
- **Geographic remoteness & Economic Dependences**
- **Vulnerability to external shocks**
- **Access to funds**
- **Access to technology and know-how**

The level of exposure to these challenges are dependent on context-specific factors, such as the size, population, location, urban endowment and institutional status of the island.

Insularity also affects the local governance. In insular areas social ties and community involvement are often strong, which can allow for quick and effective decision making and for engaging people in both policy formulation and implementation. However, the close proximity between elected representatives, senior officials and stakeholders may also lead to a degree of clientelism and conflict of interest.[65] Insular areas also often experience rapid demographic change, which may weaken the social ties. There may also be over-reliance on central government, or a lack of communication between national and regional authorities, leading to barriers to innovation and untapped opportunities.[66]

In addition to presenting challenges, the insular nature provides islands with both natural and cultural assets that can provide development opportunities and even competitive advantages. Tourism is a common competitive advantage for the islands in the Mediterranean, and for

[64] ESPON The Development of the Islands – European Islands and Cohesion Policy (EUROISLANDS). Interim Report 2013. Available at: https://www.espon.eu/sites/default/files/attachments/inception_report_full_version.pdf

[65] Corbett, J. Democratic innovations and the challenges of parliamentary oversight in a small state:

Is small really beautiful? Small States & Territories, Vol. 1, No. 1, 2018, pp. 35-5; ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

[66] ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

example in Greece the sector largely depends on the insular regions.[67] There is also potential in cooperation between islands across the EU and globally, for example for the purpose of sharing knowledge and best practices.

Sustainability is also a central factor for the development of energy security in insular areas. In popular tourism areas, the increase in demand during high tourism season adds to this challenge. Additionally, the ports have to respond to the need for sustainable energy and fuel for transport. At EU level, improving accessibility and connectivity for islands is among the main priorities of the Trans-European Transport Network guidelines.[68] EU funds are also increasingly directed towards developing sustainable energy and decarbonising transport in the 2021-2027 MFF.

Collaboration through an eco-cluster can help insular regions to develop integrated approaches to tackle the challenges mentioned above. There is a strong need of integrated place-based strategies to promote the territorial potential of islands based on their unique characteristics, of enhancing economic resilience and avoiding compromising the flexibility that allows to adapt for external shocks. Collaboration, innovation and digital connectivity are seen as critical tools to allow for islands to make use of their inherent opportunities.

For clear recommendations on cluster development in insular regions, please consult the case study reports of Malta and Crete.

8.2.2 Actions and policies for eco-clusters

To ensure the successful management of eco-clusters in coastal regions and island territories, a range of elements are necessary. In this study, these elements have been encapsulated in the 'Horizontal Recommendations' (Chapter 7.2). They are summarised below:

Recommendation 1) Develop a shared, integrated and sustainable development strategy

To unleash the socio-economic potential that the port and maritime sector can offer to a region, it is imperative that **relevant stakeholders (public, private, academic, etc.) commit to a shared, integrated and sustainable ambition**. This will provide a vision for actions to be

[67] Carbone, C. (2018) Expert analysis on geographical specificities. Mountains, Islands and Sparsely Populated Areas Commissioned by Directorate-General for Regional and Urban Policy. European Commission. Brussels. Available at: https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/expert_analysis_geographical_specificities_en.pdf;

Pallis, C., Prasinos, A. and Pallis, P. The Relation Between Tourism, Local Development and Insularity: Case Study of Southern Aegean, Greece. Journal of Tourism and Hospitality Management, December 2017, Vol. 5, No. 6, 223-232. doi: 10.17265/2328-2169/2017.12.002.

[68] Tsoutsos, T., Tournaki, S. and Coroyannakis, P. (2008). Sustainable Energy Communities in Insular and Ecologically Sensitive Areas; ESPON BRIDGES – Balanced Regional Development in areas with Geographic Specificities. Final Report 2019. Available at: https://www.espon.eu/geographical-specifities.

targeted towards, allowing for the alignment of resources that stakeholders can offer to benefit the development of the region.

Recommendation 2) Stimulate communication and participation through an eco-cluster organisation

To facilitate the development of a joint and integrated strategy as described in recommendation 1, clear communication between the different types of actors in a region is essential. The development of an eco-cluster organisation can address this challenge. In this eco-cluster organisation, port authorities, industry, the private sector, universities and government should be represented to jointly decide upon a strategy towards environmentally sustainable growth in the region. This eco-cluster organisation can also facilitate additional activities, such as capacity building activities or knowledge sharing events.

Recommendation 3) Create opportunities for innovation

In order to increase competitiveness and encourage effort towards sustainability, significant investments in innovation in a broad range of areas is required in European ports. Examples where innovation is most needed include, but are not limited to, digitalisation, greener fuels, data management, smart transport. This study has shown that significant differences exist between urban-maritime regions. There is a need for increased cooperation between port authorities, port operators and research institutions in all stakeholder regions in order to increase opportunities for innovation. However, the existing level of innovation, and the means for improving opportunities for innovation, are very much dependent on local contexts.

Recommendation 4) Enhance the development of skills and re-skilling

Sustainable maritime transport is an essential source of economic activity. At the same time, the education of new workers and the updating of skills of existing workers is key to shaping future economy possibilities. Urban-maritime regions should enhance and promote opportunities for ‘blue’ (i.e. marine and maritime) careers by developing skills, exchanging knowledge and valorising research towards sustainability. They should also aim to develop new curricula and increase employability in the marine and maritime sectors. Urban-maritime regions should also enhance the shared knowledge through higher education as well as research and innovation.

Recommendation 5) Improve transregional cooperation to tackle the challenges

It is recommended that a transregional system of cooperation is created for ports/maritime regions to address the issues mentioned before. For regions with a less favourable starting

position, this would enable a quick acceleration in development as good practices (mimicked from more advanced ports/maritime regions) are adopted. This would provide the regions with the possibility to reinforce their position during the implementation phase of the European Green Deal and related instruments (e.g. Connecting Europe Facility).

Recommendation 6) Monitor and evaluate progress

In order to achieve the goals and intended benefits of any strategy, a structured monitoring plan is necessary to ensure that progress is made within the schedule of the timeline and the boundaries of dedicated resources. The monitoring plan should also allow for necessary adjustments to the actions of the strategy in the event of a delay.

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Annex 1: Detailed overview of (territorial) data sources

Dimension	Indicator	Liguria	East Flanders	Malta	Crete	Report reference
Connectivity of the region	Intermodal connections (e.g. ferry connections)	Derived from Ferrylines (link) and Ecorys Intermodal Links (2020) (link)	Not applicable	Derived from Ferrylines (link) and Ecorys Intermodal Links (2020) (link)	Derived from Ferrylines (link) and Ecorys Intermodal Links (2020) (link)	Project atlas
	Road connections	Not applicable	Not applicable	Derived from typical traffic from Google Maps (2020) (link)	Derived from typical traffic from Google Maps (2020) (link)	Project atlas
	Maritime transport of passengers by NUTS 2 regions	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Figure 1
Economic activity	Gross domestic product (GDP) at current market prices by NUTS 3 regions	Eurostat [nama_10r_3gdp] (2018) (link)	Eurostat [nama_10r_3gdp] (2018) (link)	Eurostat [nama_10r_3gdp] (2018) (link)	Eurostat [nama_10r_3gdp] (2018) (link)	Table 4
	Employment by age, economic activity and NUTS 2 regions (NACE Rev. 2)	Eurostat [lfst_r_lfe2en2] (2018) (link)	Eurostat [lfst_r_lfe2en2] (2018) (link)	Eurostat [lfst_r_lfe2en2] (2018) (link)	Eurostat [lfst_r_lfe2en2] (2018) (link)	Table 4
	Direct port related employment (measured in number of employees)	Port of Genoa (2016) (link) (link)	Havenmonitor (2020) (link) Mobiliteitsraad (2020) (link)	Malta government (2019) (link)	Not applicable	Table 4
	Indirect port related employment (measured in number of employees)	Port of Genoa (2016) (link) (link)	Havenmonitor (2020) (link) Mobiliteitsraad (2020) (link)	Not applicable	Not applicable	Table 4
Freight and passenger transport	Gross weight of goods handled in main ports by direction and type of cargo	Eurostat [mar_go_qmc] (2018) (link)	Eurostat [mar_go_qmc] (2018) (link)	Eurostat [mar_go_qmc] (2018) (link)	Eurostat [mar_go_qmc] (2018) (link)	Figure 2

Dimension	Indicator	Liguria	East Flanders	Malta	Crete	Report reference
	Total throughput (measured in tonnes of cargo handled) in ports	Port of Genoa (2019) (link)	North Sea Port (2020) (link)	NSO (2019) (link)	Hellenic Statistical Authority (2019) (link)	Table 4
	Total containerised trade (loaded and unloaded) in TEUs	Port of Genoa (2019) (link)	Mobiliteitsraad (2020) (link)	NSO (2019) (link)	Hellenic Statistical Authority (2019) (link)	Table 4
	Maritime transport of passengers by NUTS 2 regions	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Eurostat [tran_r_mapa_nm] (2018) (link)	Figure 1
	Trans-European Transport Network (TEN-T) - Core and comprehensive ports	European Commission (2020) (link)	European Commission (2020) (link)	European Commission (2020) (link)	European Commission (2020) (link)	Figure 5
	Trans-European Transport Network (TEN-T) - Motorways of the Sea	European Commission (2020) (link)	European Commission (2020) (link)	European Commission (2020) (link)	European Commission (2020) (link)	Figure 5
Cluster development	Regional Competitiveness Index (RCI)	RCI (2019), RCI scorecard (link)	RCI (2019), RCI scorecard (link)	RCI (2019), RCI scorecard (link)	RCI (2019), RCI scorecard (link)	Table 4
	Maritime Cluster Typology[69]	Constructed by Ecorys (based upon RCI (2019))	Constructed by Ecorys (based upon RCI (2019))	Constructed by Ecorys (based upon RCI (2019))	Constructed by Ecorys (based upon RCI (2019))	Table 4 & Figure 6

[69] Author assessment described in section 3.4.

Annex 2: Urban-maritime interfaces – indicators

Sub-index	Pillars	Indicators
Basic (1)	Institutions regional	Quality and accountability of government services
		Corruption
		Impartiality of government services
	Infrastructure	Road accessibility
		Railway accessibility
Efficiency (2)	Higher education and lifelong learning	Higher education attainment
		Lifelong learning
		Early school leavers
	Labor Market Efficiency	Employment rate (no agriculture)
		Labor productivity
	Market Size	Disposable income per capita
		Potential market size in GDP
		Potential market size in POP
Innovations (3)	Business Sophistication	Employment (K-N sectors)
		GVA (K-N sectors)
		Innovative SMEs
		Marketing organisational innovators
	Innovation	Core creative class employment
		Knowledge workers
		Scientific publications
		Total intramural R&D expenditure
		Human Resources in Science and Technology
		Employment in technology and knowledge-intensive sectors
		Exports in medium-high/high tech manufacturing
		Sales of new to market and new to firm innovation
Port performance (4)	Social-economic parameters	Maritime passengers
		Total regional employment
	Throughput Freight	Maritime Throughput
		Maritime Vessels
	Port performance	Port Efficiency

ESPON 2020 – More information

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The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.