ESPON

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

Targeted Analysis

Case study report Crete

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1 Introduction

1.1 Background

In this report, the final outcomes of the ESPON Targeted Analysis "*European Research for Maritime Economic clusters governance Strategy*" (ERMES) for the stakeholder region of Crete are presented.

The study started on 11 March 2020 and covered a period of 12 months. The study focuses on four stakeholder regions: The Province of Liguria (Italy), Crete (Greece), Malta and the Province of East-Flanders (Belgium). Its aim is to analyse the urban-maritime interfaces and cluster development potentials in the stakeholder regions; to define regional-specific urban-maritime spatial planning scenarios, involving triple helix actors, policymakers and city-port authorities; to provide policy recommendations for the elaboration of strategies for urban-maritime regions; and to 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.

- Considering the actions undertaken within cooperation networks among city ports, what are the territorial benefits that cluster collaboration can bring in the stakeholders' territories?
- To what extent and how could clusters contribute to the development of urban-maritime regions?
  - How can they benefit insular areas that combine a high number of territorial disparities such as described in Article 174[1]?
  - What kind of actions/policies are needed to ensure the sustainable and integrated management of economic clusters in coastal regions and island territories?
- Are economic clusters able to support local business development in urban-maritime regions?
  - What are the main economic sectors affected?

[1] Article 174 of the Treaty for the European Union reads: '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.'

- Which schemes can be used to investigate how the agglomeration of firms and related actors have an impact on the regional maritime economy (jobs/business creation and sustainable growth)?
- How can framework conditions be created in stakeholders' coastal regions for strengthening the relationship between existing industrial-services assets and strategical infrastructure development?
  - Do economic clusters contribute to the improvement of the networking and cooperation of urban-maritime regions?
  - Which opportunities do citizens benefit from in the implementation of cluster policies?

1.2 Interim phase

The information in this document was gathered in the period between March and December 2020. During this period, the following activities were carried out by the consortium:

- qualitative-quantitative analysis of the urban-maritime interface in Crete;
- scoping interviews with a selection of Cretan stakeholders that represent businesses, government and other organisations linked to maritime activities in the country;
- an extensive survey among a selection of Cretan stakeholders;
- a virtual scenario building workshop that took place on 24 November;
- expert analysis of the different inputs by the consortium;
- development of the draft case study report.

During the interim phase, Chapters 2 and 3, the urban-maritime interfaces and the urban-maritime scenarios, were largely developed., A draft version of Chapter 4, focusing on guidance and recommendations, was also produced in the interim phase.

1.3 Towards the final document

Between December 2020 and March 2021, additional information was gathered to finalise the case study report. During this period, the following activities were carried out by the consortium:

- a meeting with the Steering group was organised in order to discuss the feedback on the interim report;
- additional interviews were conducted with a selection of stakeholders in order to further develop and refine the guidance and recommendations formulated in the interim report;
- a horizontal workshop with stakeholders from all four regions was organised on 11 February. During this workshop, the overarching recommendations that were identified in the interim report were validated.

Based on the feedback that was received on the interim report, Chapter 2 and 3 have been fine-tuned. Additionally, Chapter 4 on guidance and recommendations was further developed based on the additional interviews and further research.

2 Urban-maritime interfaces in Crete

2.1 Port and hinterland structure

Regional aspects

The total area of the island of Crete is 8 336 km^2. (6.3% of the total area of the Greek territory). It is located on the southern edge of the Aegean Sea, at a distance of about 160 km from the Greek mainland. It has a remarkable coastline of more than 1 000 km. The economy is predominantly based on services and tourism; however, agriculture also plays an important role.

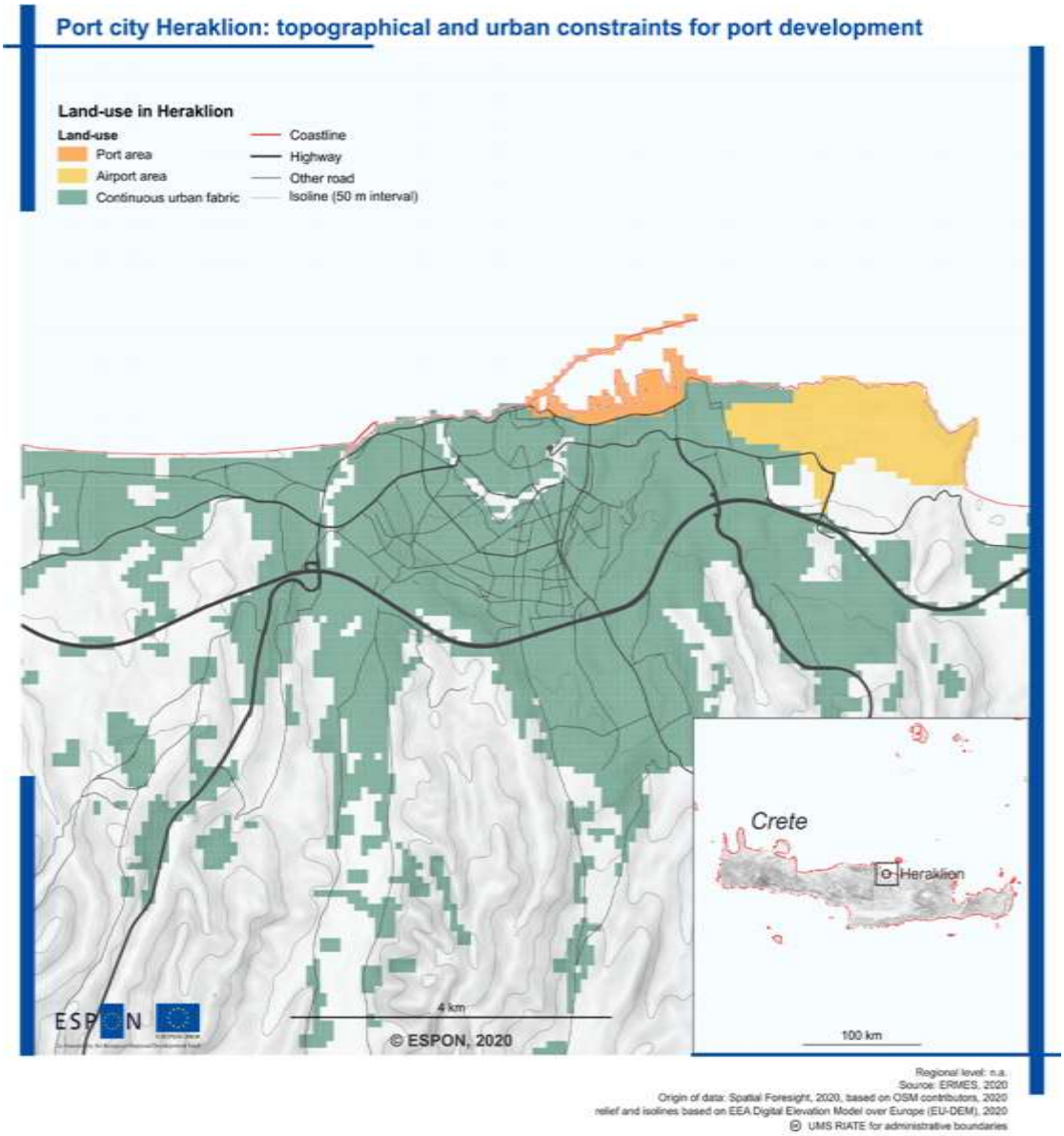
The port of Heraklion, located at the Northern side of Crete, is the third busiest port in Greece, and serves around two million passengers a year. Located in central Crete along the north coast, the port is 145 km east of the town of Chania, 80 km east of Rethymnon. Hinterland connections are limited to road and short sea shipping.

The port of Heraklion is in the third place for passenger traffic in Greece, as it serves more than 1.6 million passengers and more than 300 000 vehicles annually, and is the main transport gateway for the Region of Crete. Crete is an important tourist destination because of the island's historical heritage, tradition and natural beauty. The port is directly integrated into the life of the city of Heraklion, which not only facilitates ship and cruise passengers, but also ensures activity and movement throughout the year in important parts of the port area. The good road connectivity of the port with the city of Heraklion, the cultural centres and the airport of N. Kazantzakis (with a strong cooperation potential) is another advantage of the port. Concerning the activities of Heraklion Port Organization (OLI), they are developed in all areas of service for the movement of ships and vessels of all kinds, passengers, vehicles and goods by sea. The freight segment of the port is dominant on the island as it almost exclusively supplies the island with materials, goods and equipment to cover the needs of the island's permanent and seasonal residents and to export Cretan products. Finally, OLI's experience in container transit helps to exploit whatever opportunities arise.

The updated Master Plan for the port was adopted in 2019. It determines land use definitions and building restrictions. The plan recognised the need for new port facilities created by technological, commercial and other changes; as well as the close historical link between the port and the development of the city. It aims to harmonise and adapt the development planning to serve the new needs; including the creation of institutional and financial incentives for cooperation between co-competent bodies as well as securing consensus and the involvement of local partners in the design and implementation of development plans.

In Crete, and particularly in the port of Heraklion, no maritime cluster has been created yet. Efforts are being made by the Hellenic Shipowners' Union, the Hellenic Chamber of Commerce and the Chamber of Commerce and Industry to establish the Greek maritime cluster, bringing together all maritime and pre-maritime operations on a common basis. Its creation will have many benefits to these businesses as it reduces production and marketing costs, develops new production methods, establishes co-operative networks and leverages local development programmes.

Figure 1: Topographical and urban constraints of port development around Heraklion



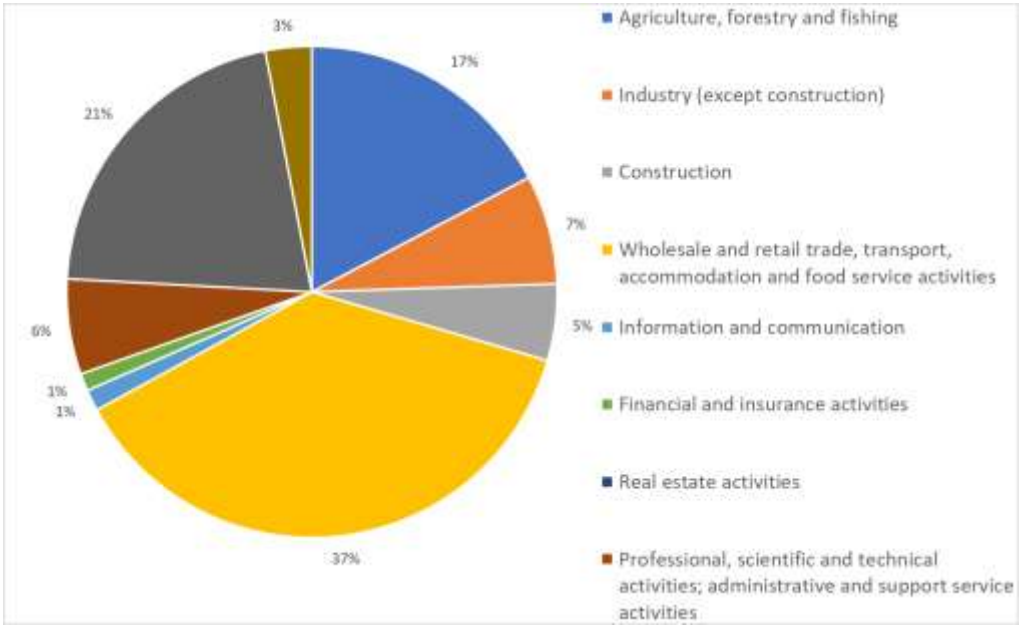
Economic structure of the region

The island has a much higher per capita income than the Greek average, whereas unemployment is at approximately 4%, one-seventh of the country overall. The population of the Region of Crete is ca. 600 000 residents, which is ca. 5% of the population of Greece.

The Region of Crete participates in the Gross Domestic Product (GDP) of the country at a percentage of ca. 5%. In particular, for the year 2017, according to recent data of the Regional Accounts of the Hellenic Statistical Authority, the GDP of Crete amounted to 9 095 million euro and formed ca. 5% of the national GDP. The Regional Unit of Heraklion, being the most populated one, has the largest participation (ca. half) in the regional GDP.[2] The economic added value in 2018 was 8 170 million EUR. Employment in 2017 accounted for ca. 250 000 people. Both agriculture and the tourism industry contribute to more than 50% of the GDP of the island.

Total employment in the region (EL43) for ages 15-64 is equal to almost 250 000 people. Most of these employees are active in in the field of (1) wholesale and retail trade, transport, accommodation and food service activities (roughly 90 000 people); (2) agriculture, forestry and fishing, (roughly 42 000 people); and (3) public administration, defence, education, human health and social work activities (51 000 people).[3] Figure 2 presents employment by the economic activity on Crete.

Figure 2: Employment by economic activity on Crete



Source: Eurostat (2020), Employment by age, economic activity and NUTS 2 regions [lfst_r_lfe2en2]

[2] Eurostat (2020), Gross domestic product (GDP) at current market prices by NUTS 3 regions.

[3] Eurostat (2020), Employment by age (15-65), economic activity and NUTS 2 regions.

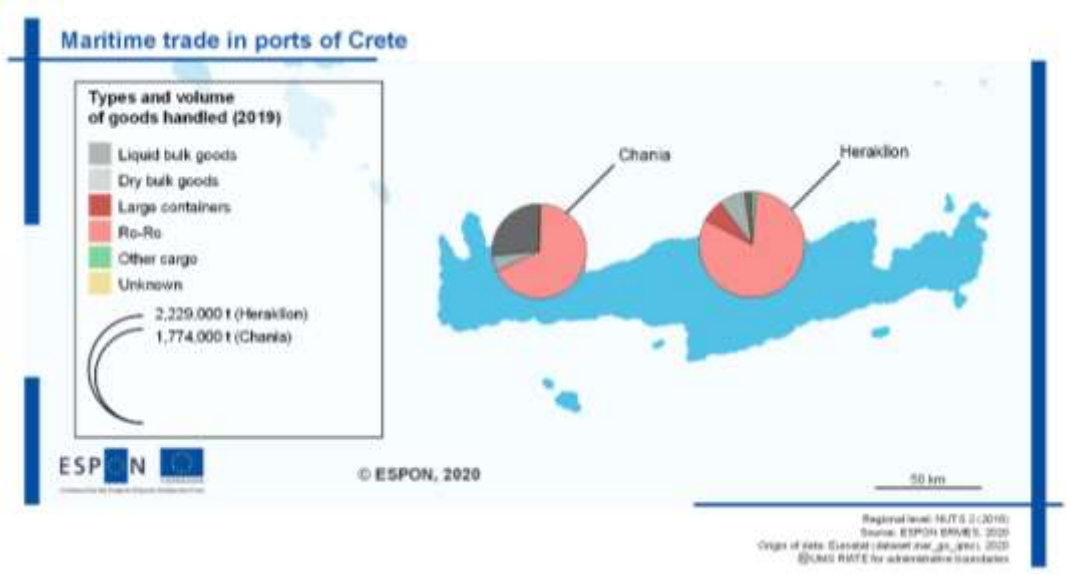
Ports characteristics

The Ports of Crete serve as the main gateway to the island, and are regularly connected to Athens (Piraeus). Generally, the port of Heraklion is connected daily with Piraeus with two ferry routes, run by passenger-car ferries (E/C-O/C). It is also connected with the Dodecanese, while in the summer season there are daily itineraries to many islands of the Cyclades.

Port terminals handled over 20 000 TEU per year, 30 000 tons of general cargo, 900 000 tons of liquid bulk. Mainly ferry and cruise ships make the bulk turnover of the port. Annually some 1.7 million passengers are counted (1.5 million ferry passengers and 180 000 cruise visitors).

Figures 3, 4 and 5 below illustrate the maritime and road traffic in and to/from Crete.

Figure 3: Maritime trade in ports of Crete



Source: Eurostat (2020), Gross weight of goods handled in main ports by direction and type of cargo

Figure 4: Ferry connections (passengers) from and to Crete (2020)

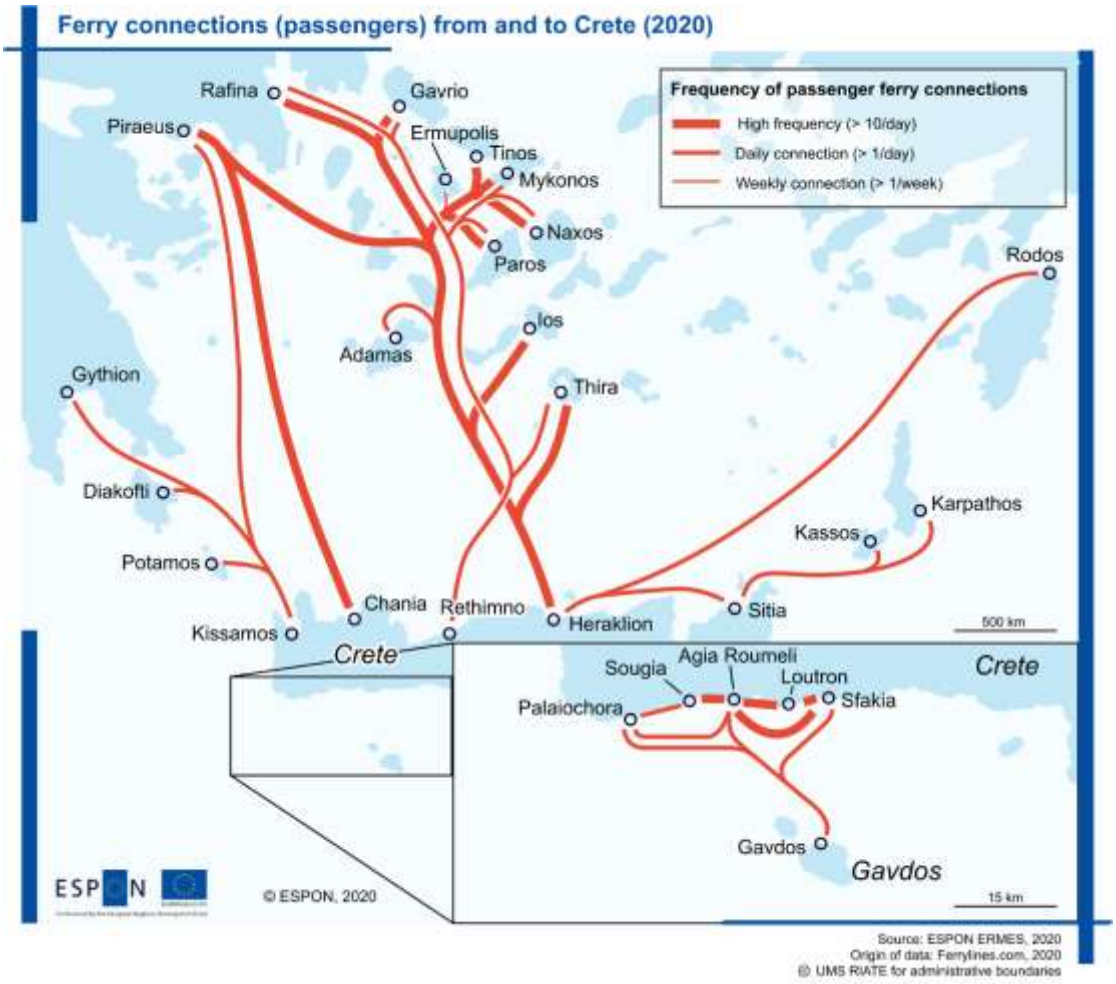


Figure 5: Traffic congestion in Crete

Competitiveness and cluster dimension

Crete takes the 119th place in the urban-maritime clusters 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 are maritime passengers, innovative SMEs and the marketing of organisational innovators. The main weaknesses are in infrastructural accessibility, overall employment and maritime innovation.

In the Region, no maritime cluster has been created yet. Only sector associations work together with the Region to develop common activities. Efforts have been made by the Region and the Port Authority by developing several projects. One of the most recent is PROteuS, supported by Interreg Med programme.

2.2 Governance

Figure 6: Institutional embeddedness Crete

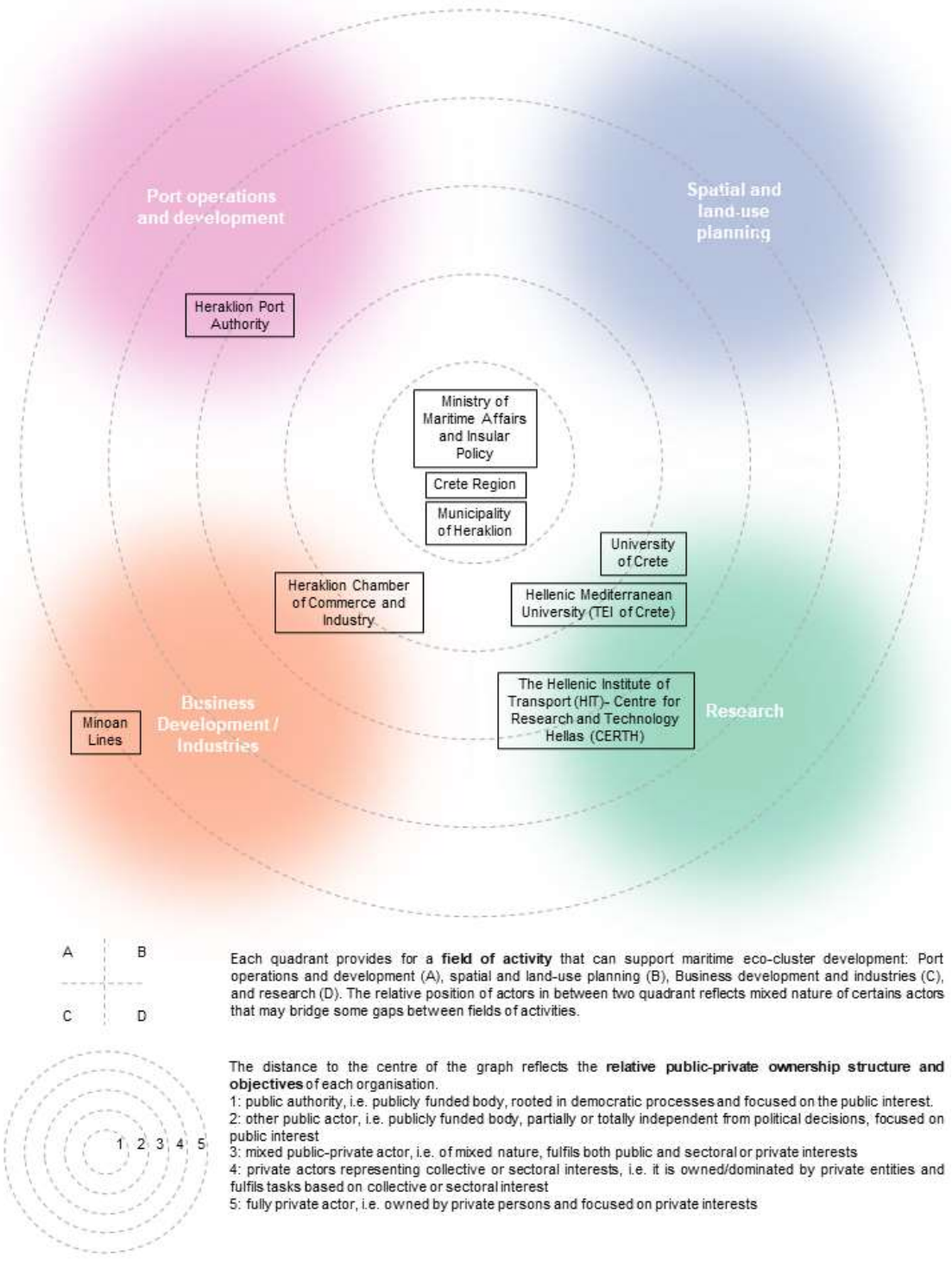
The port of Heraklion is managed by a Board of Directors, which consists of 11 members, including a chairman and the CEO. The members represent different relevant institutions, such as the Hellenic Republic Asset Development Fund, the Association of Permanent Dockers of Heraklion, the Workers ' Association O.L.I. S.A. and the Heraklion Chamber of Commerce. The Heraklion Port Authority is a member of the Union of Ports in Greece and the union of cruise ports of the Mediterranean and Black Sea. The organisation itself is a company owned by the Greek State, supervised by the Ministry of Maritime Affairs and Insular Policy. All of its share capital is owned by the Hellenic Republic Asset Development Fund (HRADF). In 2020, HRDAF announced that it will sell the majority of its shares in Heraklion port, as part of a larger privatisation programme that also includes other regional Greek ports. The terms with which the Port Authority's activities are regulated are governed by law 2932 of 2001 (GG. 145/A '/27-06-2001). They include the exploitation, management, operation and use of the port of Heraklion, as well as any space within the boundaries of its land and sea area, in a way that is beneficial for the public interest, for the national and local economy and Port services users.[4] This legal framework allows for flexibility in the administration and in the general decision-making process.

[4] https://www.portheraklion.gr/index.php/en/organization/corporate-identity.

Cretan urban-maritime actors

The graph below demonstrates the different types of actors that are involved with urban-maritime activities in Crete. The mapping of these actors was done through contacts with local experts and stakeholders.

Figure 7: Actor mapping Crete



2.3 Policies and projects

National strategies

There are several national strategies that are relevant to this study, creating the framework for the urban-maritime development scenario for Crete to exist in. This section provides a brief look at relevant issues in some of those strategies.

The **National Energy and Climate Plan** (NECP) sets out the roadmap for the attainment of specific energy and climate objectives by 2030. It notes the Crete-Cyprus-Israel electrical interconnection project as an important part of securing the energy adequacy of Crete, but it also highlights the profile of Greece as a regional energy hub. New island interconnections are also being promoted in Greece, and starting with the interconnection of Crete, nearly all of the Aegean islands will be interconnected in the period 2020-2030, allowing for reduction in the use of diesel and utilising the RES potential of the islands in a more cost-efficient way. The NECP also provides plans for reducing emissions in shipping, acknowledging the need to develop the necessary infrastructure for the use of LNG in ports including Heraklion, but also to strengthen research on other environmentally and economically viable solutions. In addition, the NECP addresses energy consumption in ports, through promoting electrification, and RES, as well as improving energy efficiency. On tourism, the NECP provides plans for sustainable tourism development and destination management.

The **National Transport Plan for Greece** defines five High Level Objectives for the sector, which are relevant (and to large extent complementary) to the scenario for Crete. These are:

- delivering **economic growth and efficiency** in the development and operation of the transport system, at Regional and National level, measured through travel times, reliability, and cost effectiveness;
- improving **transport connectivity**, comprising connectivity with the islands, connectivity between complementary transport modes, interoperability of systems, territorial cohesion and cross-border connectivity with EU/non-EU countries;
- ensuring an **environmentally sustainable** transport sector;
- providing **accessibility and social inclusion** with respect to jobs, education and social services for the population;
- maintaining a **safe and secure** transport system.

For Crete specifically, the transport plan includes the North Crete Road Axis project and the new Heraklion airport. Under the investment pillar of *Fostering Regional Mobility and Growth*, upgrade of South Road Axis of Crete (NOAK) and its Vertical Axes is proposed pending a feasibility study.

The **National Circular Economy Strategy** recognises circular economy as both an opportunity and a need. It provides a set of Implementation Actions, of which *Action 1.23: Circular Economy and Ports* is of particular interest for this study. This action calls for making circular economy the main target of the islands' and island regions' development, while acknowledging the challenges of insularity and the heterogeneity of the islands.

Regional plans and projects

In Crete, there are a number of development plans that are relevant in the context of this study. These include the Smart Specialisation Strategy of the Crete Region (2015), the strategic plans of the municipalities of Heraklion and Malevizi, the general urban plan of Heraklion and the Master plan of the Port of Heraklion.

Relevant projects include:

- New road in Crete set to improve journey times and safety, 2014;
- North Road Axis & Ports of Crete;
- Poseidon MED II – LNG Bunkering Project, 2022;
- BlueHUBS: LNG and CNG Supply Chains Upgrading Core TEN-T Ports in Eastern, Mediterranean Project, 2022;
- Sustage Project – Horizon 2020;
- Connecting Crete to mainland Greece's power supply, 2019.

3 Urban-maritime scenarios

3.1 Introduction

Four scenario trends were presented to a targeted representation of stakeholders for each of the case study regions. These trends were based on potential global trends that seaports may be facing today and, in the future, but also on the influence the ports on 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 Crete are described.

Global trends

The four global trends identified were the following:

Trend 1 - Optimisation of (port) operations:

The need to optimise operations is becoming increasingly important. When it comes to port operations 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[5]. Regarding the latter, economies of scale at sea have led to the deployment of ever larger containerships[6], 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[7]. 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 & multimodality:

The competitiveness of seaports depends increasingly on the ability of cargo to reach its final destination[8-9]. 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

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

[6] 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.

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

[8] Ibid.

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

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

Trend 3 - Innovation & 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, such as: 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[10]; 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[11]; and 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 and developments will also increase the focus and attention towards cyber-security issues[12].

Trend 4 Enhancement of 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. Over the next decade(s) steps have to be taken to green these port complexes. A bio-based and circular economy offers great opportunities for these port complexes. Also, for the 'license to operate' and the 'license to grow' of seaports it is important that focus is put on more sustainable port development strategies. This especially applies to seaports that deal with a port-city interface.

3.2 Scenario description

From these four global trends, **trend 3 (innovation and digitalisation)** was clearly selected as the preferred future scenario option followed by **trend 1 (optimisation of (port) operations),** especially with regards to the need to improve the transport chain (i.e. new connections) and the need for more efficient and sustainable logistics operations at ports. **Trend 4 (enhancement of sustainability)** was not selected by survey respondents. However,

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

[11] 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.

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

references to sustainability issues were made in the justifications of the selected trends. **Tourism** is also included as a sector-specific trend, as Heraklion port-city's local economy is dependent on this sector.

As such, the specific descriptions behind these selected trends are described below.

Trend 3 - Innovation & digitalisation

Efforts to transform Port of Heraklion into a 'Smart Port' will help to redefine cross-border trade, accelerate the seamless movement of products and potentially contribute towards a global collaborative environment. As such, the port aims to enhance its use for automation and innovative technologies (including artificial intelligence (AI), big data, internet of things (IoT) and blockchain) to improve its performance and complement its physical operations with digital processes. In this regard, the goal of the port within this innovation and digitalisation trend is to strengthen its position in the field of information technology and communications. Accelerated and continuous change will help the port evolve into a pioneering and smart marine intersection. Thus, digital convergence and entrepreneurship-efforts should be enhanced (including improvement of port operations, their digitalisation, capacity optimisation and efficiency, and efficiency and improvements in sustainability performance).

Cooperation and integration factors (such as the bundling of cargo, business clustering, information and data exchange, alliances, market cooperation, and port-city cooperation) should also be further enhanced in order to overcome the segmentation on operational activities and to stimulate collaboration agreements and partnerships with large industrial players.

Trend 1 - Optimisation of (port) operations

This trend aims to contribute to Crete´s maritime connectivity and multimodality through improved hinterland connections and accessibility to internal sea links in the South Aegean. At the same time, this trend aims to increase the efficiency and sustainability of the port´s logistic operations through a further development and application of innovative technologies. The port should continue to strive to protect the environment and improve the sustainability of its actions. This trend should also constitute a small first step towards the transformation of the port into an advanced 'Green' port, not only for the protection of the environment and the conservation of natural resources, but also for the development of alternative energy sources (i.e. cold ironing & LNG13). These efforts will aim to contribute to the competitiveness and productivity of local economies and to the development and differentiation of the region.

[13] See Poseidon Med II Project (which aims to take all the necessary steps towards adoption of LNG as marine fuel in East Mediterranean Sea while making Greece an international marine bunkering and

Sector-specific Trend - Tourism

The local economic development of many Greek port-cities (e.g. Rhodes, Heraklion, Chania, Nafplio, Kavala and Volos) are dependent on tourism. In order to maximise the benefits gained from tourism by local societies and economies, a certain strategic planning framework was established. Such a framework can potentially make use of information and communication technologies (ICT), therefore contributing to "Smart" Tourism Development and certain sustainability objectives (i.e. marine and land environmental protection, spatial and social cohesion, and economic development of coastal Mediterranean cities). In 2017, Heraklion developed a strategic plan (named 'Smart city strategic plan: Implementing smart city practices through interdisciplinary cooperation'[14]) which included interdisciplinary smart city practices around three pillars: Smart City, Resilient City and Cultural-Touristic City. Since then, major stakeholders are working together to achieve this long-term sustainable urban design and development, following three pillars of smart city development indicators: governance, economy and citizen participation. With regards to the latter, a government that encourages participation allows for challenges to be solved in an integrated fashion. Solutions have therefore not *only* been tailored only to the needs of a specific group of people, nor only to maximise economic benefits, but to positively affect all parties involved – individual citizens, businesses, communities and to the city as a whole. In this context, the tourism-specific trend aims to further develop its Smart City Strategy and the port's competitiveness within the tourism and cruising sectors by offering high quality services and experiences to its customers.

3.3 Opportunities and threats

From the above, three main types of actions can be discerned:

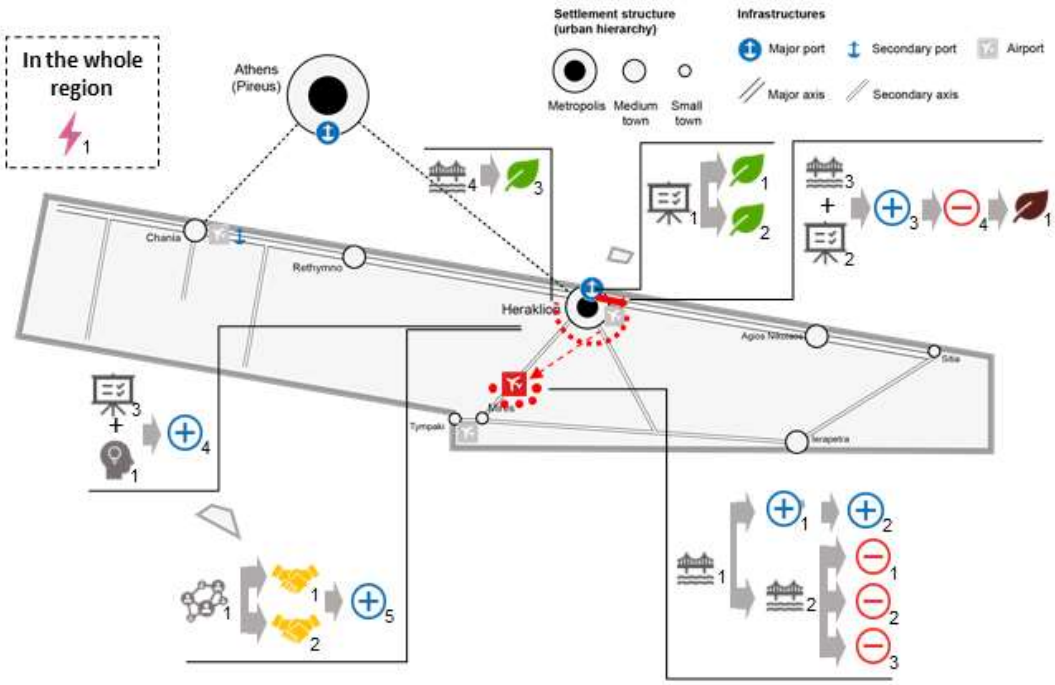
- improved coordination, collaboration and port operations through digitalisation;
- use of more sustainable solutions to both conserve natural resources and increase competitiveness and productivity;
- integrated and collaborative approach to steer tourism development.

In the regional workshop conducted in November 2020, these actions and their potential impacts were further discussed. The outcomes of the discussion are presented in the map below.

distribution hub for LNG in south-eastern Europe) and BlueHUBS LNG and CNG Supply Chains Upgrading Core TEN-T Ports in Eastern Mediterranean Project (which aims at establishing the supply chain for the distribution of LNG for vessels and LNG/CNG for port heavy duty vehicles and buses, including bunkering and refuelling facilities the Port of Limassol (in Cyprus), and the Ports of Piraeus and Heraklion (in Greece)).

[14] https://urbact.eu/smart-city-strategic-plan.

Opportunities and threats related to the development of port infrastructures and port-related activities in Crete



Actions

Infrastructures

1 Transfer of the airport site

2 Business development areas around the new airport

3 Extension of the port towards the current airport

4 Redirecting big truck outside the city

New business models

1 Moving towards greener ports operations

2 Development of interactions between cruise/city tourism

3 New technologies: awareness raising / shared understanding

Capacity building

1 Upskilling employees to use new technologies

Networking

1 Cluster development / new networks

Actions to be developed are located in red on the map

Opportunities and threats

Socio-economic

+1 New connection with low cost flights (low season)

+2 Extended touristic period

+3 Crete becoming a more attractive tourist destination

+4 More efficient port operations

+5 Port of Heraklion as a model for other regional ports

−1 Bureaucracy creates delay in development (e.g. in relation to archaeological findings)

−2 Lack of available capital for investment could lead to difficulties

−3 Increased demand in the search for space and investment opportunities

−4 Overcrowding city with tourists

Environmental

1 Utilisation of renewable and new energy resources (green fuel) / decarbonation

2 Biodiversity / water restoration

3 Less traffic inside the city

1 Overcrowding city with tourists

Cooperation / conflicts

1 Multi-actor governance (port-municipality-region)

2 Increased participation and ownership

1 Disjunction: daily decisions vs. long term planning

3.3.1 Infrastructure actions and related opportunities and threats

In terms of infrastructure developments, one of the actions discussed was the redirection of large trucks outside the city. This is expected to lead to reduced traffic within the city of Heraklion itself, which is positive for the environment, but can also help boost the satisfaction of both local residents and tourists.

The extension of the port towards the current airport plays an important part in improving and broadening the tourism offer on Crete. The stakeholders anticipate that, together with development of interactions between cruise tourism and city tourism, it provides an opportunity for Crete to become a more attractive tourist destination. It was, however, also acknowledged that this opportunity carries with it the socio-economic and environmental threat of overcrowding the city with tourists.

The transfer of the airport site is another important infrastructure action for the development of tourism. The stakeholders expect it to result in new connections with low-cost flights, which would allow for developing the Cretan tourism offer also outside the high season. It is also expected to support business development areas around the new airport. The stakeholders also anticipate some socio-economic threats to the development of the area, such as delays caused by bureaucracy – particularly in the context of archaeological findings – as well as lack of available capital and increased demand of space and investment opportunities.

3.3.2 Capacity building and business model actions and related opportunities and threats

Moving towards greener port operations is seen as an important factor for developing both the port operations and tourism. Aside from direct positive environmental impacts, the stakeholders also expect improvements in biodiversity and restoration of water in the region.

Increasing awareness and shared understanding of new technologies, in combination with upskilling employees to use these technologies, is also expected to lead to more efficient port operations, as the technologies become more widely adopted.

The development of clusters and new networks is anticipated to have a 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.

3.3.3 Overarching opportunities and threats

Regarding the whole region of Crete and all of the identified opportunities, the stakeholders identified the threat of disjunction between daily decisions and long-term planning. If the daily decisions do not support the long-term planning, or focus on the long-term goals is maintained, it becomes difficult for the Port of Heraklion and the region of Crete to actualise the identified opportunities.

3.4 Cluster development potential

Crete's main challenges in the upcoming 10 years relate primarily to the connectivity with the rest of the eastern Mediterranean. Improving the maritime transport goes for the transport of cargo, but more importantly for the transport of people. Tourism is an important economic driver for the island and will continue to be for the upcoming 10 years. As the COVID-19 crisis has shown, the development of 'smart' tourism, or tourism that uses innovative information and communication technologies to improve efficiency, sustainability and visitor experience[15], is more relevant than ever before. Furthermore, an 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 all these future developments is the enhancement of innovation and digitalisation.

In summary, the Crete seaport stakeholders are looking at developing in the forthcoming 10 years a scenario that aims to:

- transform the port of Heraklion into 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 services and experiences;**
- steer the **"Smart" Tourism Development**;
- support and **enhance innovation & digitalisation** in the region (including improvement and digitalisation of port operations, capacity optimisation and efficiency, and moving towards an enhancement of sustainability);
- encourage **sustainability efforts** in the region (including the use of greener fuels, urban planning regeneration efforts, and 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).

For each of the goals, strong collaboration between different actors in the industry and governmental organisations is necessary. Here, well-structured and managed clusters can play an important role.

In the case of Crete, inertia and bureaucracy have been identified as two key barriers that could prevent the development of the scenario and of clusters. Inertia relates to the tendency of those who execute the actions to lose track of the overall long-term goal. Therefore, awareness

[15] Halime Göktaş Kulualp and Ömer Sarı (2020). Smart Tourism, Smart Cities, and Smart Destinations as Knowledge Management Tools. Handbook of Research on Smart Technology Applications in the Tourism Industry. DOI: 10.4018/978-1-7998-1989-9.ch017.

raising and development of a common understanding of technologies to be used are necessary. A role clusters can play in Crete is to firmly establish the long-term goals and the commitment to achieve them, i.e. to ensure the stakeholders involved remain aware of the goals and, if necessary, adjust them to changing circumstances. In addition to this, clusters can support developing a common understanding of what is a common good, beyond the individual understandings of different sectors, departments, and enterprises. Clusters, in their holistic role, can also play a role in maximising the performance of the different value chains. Finally, clusters should guarantee a sense of participation in the decisions that are being made.

Other barriers for cluster development mentioned by the stakeholders relate to political developments on the island, namely the increasing popularity of populist parties and the spread of disinformation. Another challenge applicable to the situation in Crete is the potential lack of investments to make change possible.

4 First guidance and recommendations

4.1 Introduction

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. As Crete is an island, the hinterland is relatively small. Tourism is the core business of the island, and it has been heavily impacted by the COVID-19 crisis in 2020. 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 the port of Heraklion, announced that this port, together with other regional Greek ports, will be privatised.

4.2 Overview of key challenges

As discussed above, in 2030, the port of Heraklion aims to be transformed into 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 realising this ambition. Furthermore, support and the enhancement of innovation and digitalisation in the region is needed, both in regard to encouraging sustainability efforts and improving competitiveness. Finally, support and improvement in regard to connectivity in the region is needed (including infrastructural developments, better integration measures, and support for risk management and emergency situations).

The main challenges identified for the development of this scenario relate to inertia and bureaucracy, resulting in the loss of focus on and the connection to the goal, hindering long-term planning and preventing effectively reaching the set goals.

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.

As mentioned in the main report, the disconnection from mainland gives rise to multiple challenges, which can be mitigated or exacerbated by other physical and social factors present in the island.

Insularity related challenges in Crete are identified as follows:

- **Challenges in transport and trade logistics**: The importance of well-functioning, reliable, sustainable and resilient transportation systems, in particular maritime and air

transport, is particularly important for islands due to their insularity. As discussed above, development of the port of Heraklion and the airport, along with the redirection of trucks, are considered as important aspects of streamlining transport and logistics on the island and supporting the development of the tourism offer;

- **Market accessibility & Economies of Scale**: The cost of insularity is clearly manifested in the territorial discontinuity which constitutes a barrier to the diffusion of positive effects emanating from the economies of scale enjoyed by Regions on the mainland. The implications of higher costs and time-lags are also a factor on the costs of doing business as well as the attraction of foreign direct investment;
- **Geographic remoteness & Economic Dependences**: Geographic remoteness and reliance on imports are important factors contributing to higher transport costs and higher degree of economic dependency on imports/exports. As above, development of the different trade logistics infrastructures is important for compensating for this challenge;
- **Vulnerability to external shocks**: Islands such as Crete are faced with external economic shocks over which there is little control, thus rendering them vulnerable (Briguglio, 1995)[16]. The vulnerability to external shocks includes natural shocks affecting the environment. Natural assets are a central part of Crete's tourism offer, but also made more vulnerable by the large number of visitors. As an island, Crete is also more vulnerable to the impacts of climate change, such as extreme weather and sea level rise, than the mainland;
- **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. Governance aspects and structure are also key both to access funds and to manage them. Crete is somewhat 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;
- **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 discussed above, Crete is a strong performer in innovative SMEs and the marketing of organisational innovators, while it is weaker in maritime innovation. Access to and dissemination of innovative technologies is critical in particular for sustainable development, both in terms of logistics infrastructure and tourism.

[16] Briguglio, L. (1995). Small island developing states and their economic vulnerabilities. World development, 23(9), 1615-1632.

4.3 Draft recommendations

The extent to which Crete will be able to realise the scenario described above will to an extent depend on the privatisation of the port. At this stage it is unknown who will hold the majority of the shares in the upcoming years. Privatisation will likely result in an increase in financial possibilities, which in turn might provide a real boost in becoming an important hub for maritime transport and tourism throughout the eastern Mediterranean, as well as making the port more competitive by offering high quality services and experiences. The agenda of the future majority share owners will be of significant influence on the direction that the port will take towards 2030.

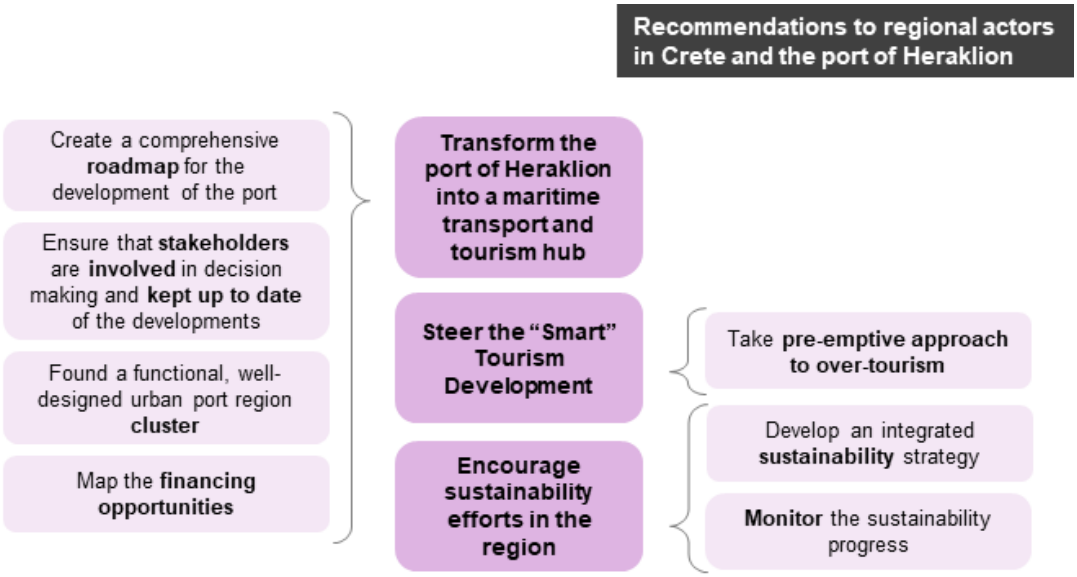
In case this agenda includes the enhancement of sustainability, clusters could play an important role in firmly establishing the long-term goals, i.e. by reminding all the stakeholders involved on a regular basis what the goals are and, if necessary, adjust them to changing circumstances. In addition to this, clusters can support developing a common understanding of what is a common good, beyond the individual understandings of different sectors, departments and enterprises. Special attention should be given to smart and sustainable tourism.

4.4 Case study specific 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. National-level plans such as the ones on airport construction and road improvements 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. For this purpose, the following is recommended.



4.4.1 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.

4.4.2 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[17], as well as from other Mediterranean destinations such as Venice and Dubrovnik[18], 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 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.

4.4.3 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

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

[18] 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.

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.

ESPON 2020 – More information

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