Integrated and Sustainable Transport in Efficient Network - ISTEN

DT2.2.6 – Local Action Plan for Thessaloniki Area

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Document information

Abstract

This document presents the Local Action Plan (LAP) for Thessaloniki Port. It initially discusses the main bottlenecks that hinder the integration of the port with its hinterland and then discusses the main interventions, local measures, and conditions for making the port and hinterland an efficient and integrated hub. A number of solutions/interventions have been prescribed in response to two main bottlenecks identified during the interviews with the Local Working Group (LWG): i) Infrastructure-related bottlenecks and ii) Innovation-related bottlenecks. The Infrastructure-related bottlenecks pertain mainly to port connectivity and intermodality issues. In that respect, the key actions that are recommended deal with enhancements of the port-rail and port-road connectivity aspects. On the other hand, the solutions/interventions dealing with Innovation-related bottlenecks provide for the creation of an Innovation Hub encompassing several parallel initiatives such as the set-up of a Startup Incubator, a Digital Skills Academy, a Research Center and an Information Exchange System.

Keywords

Local Action Plan, Bottlenecks, Key actions, Thessaloniki Port

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1 INTRODUCTION

1.1 Deliverable Scope & Objectives

The herewith presented report corresponds to the ISTEN Project Deliverable D.T2.2.6 titled "Local Action Plan for Thessaloniki Area", within the framework of WPT2 "Implementation". It aims to present a Local Action Plan (LAP) that will identify and document the main interventions, local measures and key actions, as well as conditions for Thessaloniki Port towards promoting its transformation into an integrated hub and fostering the integration of the port with its hinterland. The objective of the Local Action Plan under consideration is to answer specific needs of the Thessaloniki port and its hinterland. By identifying the main bottlenecks and key action points for Thessaloniki Port, the competent authorities will be able to make strategic decisions and invest in solutions that will eliminate the above-mentioned bottlenecks and increase the competitiveness of Thessaloniki Port. The prioritization of the bottlenecks during the interviews indicated that the main clusters of bottlenecks in the case of Thessaloniki Area relate to Infrastructure and Innovation. These issues where jointly brought up by all interviewed organizations/associations and were unanimously recognised as the most important bottlenecks areas hindering the development of the port and its connection with the hinterland. As a result, the Local Action Plan for Thessaloniki Area, summarized in the subsequent sections of this document, places its particular focus on these two clusters of bottlenecks and the key actions/measures associated with their improvements or ideally their elimination.

1.2 Common Methodology for the Development of Local Action Plans (LAPs)

The development of the Local Action Plan for Thessaloniki Port has been governed by the Common Methodology for the Development of LAPs specified in D.T2.2.1 Deliverable ("ISTEN Common Methodology for Local Action Plans"). The Common Methodology employs the Canvas approach, which has been useful in supporting and summarizing the discussions held at local level with the relevant stakeholders. For selected measure(s), a Canvas table (Figure 1) was then developed in order to further detail the implementation of the measure in terms of stakeholders involved, aims, key actions, problems, timescale for implementation, risk assessment, funding resources, as well as impact on bottlenecks and main benefits for the implementation of an integrated network of ports and hubs at the regional/national level and international level. The Local Action Plan for Thessaloniki Port will be thereafter expected to contribute in the development of a Strategic Action Plan for Adrion Region (Activity T2.3) that will synthesize the respective, port-specific Local Action Plans in a coherent strategic planning framework.

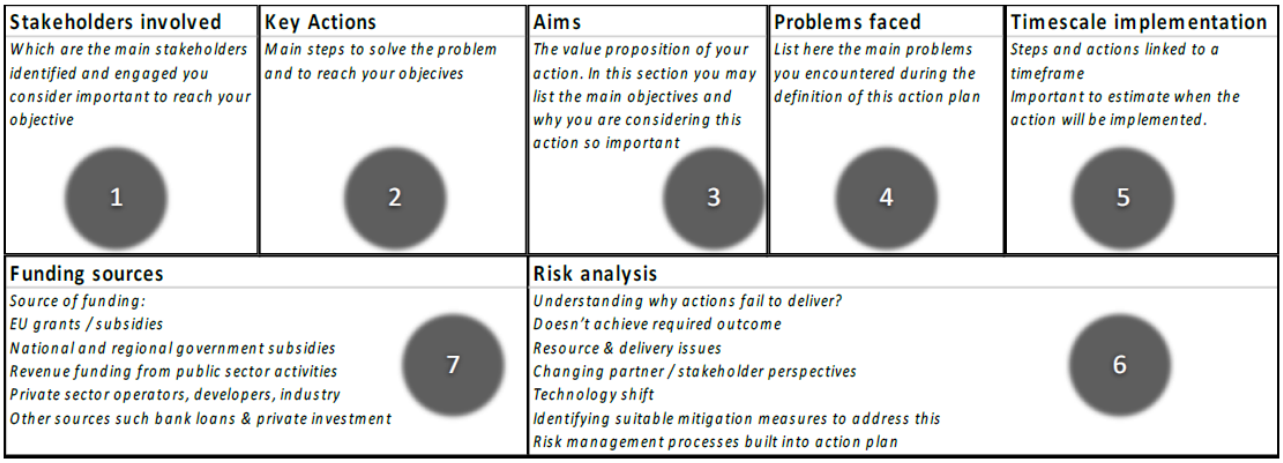

Figure 1: CANVAS Model Structure

The selected measures that were analyzed in the Canvas model have been defined to deal with the two most important categories/clusters of bottlencks, in line with the stated priorities by the stakeholders engaged in the Local Working Group (LWG). The initial information about the bottlenecks was sourced by the Local Context Analysis conducted within the framework of D.T1.1.6 ("Local Context Analysis for Thessaloniki"). In conclusion, the Local Action Plan is based on information, bottlenecks and best practices identified through the Local Context Analysis and interviews with the Local Working Group (Figure 2).

Figure 2: Local Action Plan source of Information.

1.3 Key Clusters of Bottlenecks for Thessaloniki Port

A comprehensive analysis of the port hinterland environment along with an overview of the existing bottlenecks and the main factors that will influence them in the next years has been provided in D.T1.1.6 ("Local Context Analysis for Thessaloniki"). The identified bottlenecks were categorized in 5 different clusters: i) market, ii) infrastructural, iii) operational, iv) organizational or institutional and v) innovation bottlenecks. Some of the most important bottlenecks identified highlight the need for upgrades of the port and railway infrastructures, the optimization and further development of Port Community Systems, as well as the deployment of Information and Communication Technologies (ICT) solutions for logistics, new

commercial agreements and strategies by the commercial stakeholders involved in the maritime and hinterland logistics chain, working with other ports and intermodal terminals as a network and enhanced maritime regulatory system in line with IMO and EU standards and regulations.

According to D.T1.1.11 Deliverable ("Analysis of ISTEN site contexts"), the Thessaloniki Port identified as first priority those related to infrastructural and operational aspects, with market, innovation and institutional being ranked as second priority bottlenecks. As part of our second-round consultation with the LWG stakeholders within the framework of the preparation of LAP for Thessaloniki, it was unanimously agreed that Infrastructural and Innovation-related bottlenecks should represent the first priority actions for improvements on the grounds that they bring some promise for long-term potential and solutions (i.e., infrastructure-related bottlenecks), while at the same time they can be easily brought forward as a low cost-benefit, short-to-medium run collaborative solution (i.e., innovation-related bottlenecks). In any case, it was underlined that the improvement or elimination of infrastructural bottlenecks should be primarily pursued not only as a measure aiming to boost the port's competitiveness but also as a prerequisite for unlocking the growth potential of other measures dedicated to deal with other bottleneck clusters (e.g., market, operations). Therefore, our analysis in this deliverable will subsequently focus on infrastructural and innovation-related bottlenecks. The infrastructural bottlenecks include: inadequate soft infrastructure, port infrastructure inadequate, incomplete or in poor condition, deficiency or inadequate capacity of port handling equipment, inadequate (capacity of) equipment of the rail operator to support hinterland flows, inadequate capacity of hinterland transport networks. The innovation bottlenecks account for the low innovation content in the services provided, and the lack of harmonization of digital information exchange between port-hinterland actors and between operational and public actors.

A complete and overall view of the 5 clusters of bottlenecks are presented in Table 1 below, according to the Local Context Analysis for Thessaloniki (D.T1.1.6 – "Local Context Analysis for Thessaloniki").

Cluster	Bottlenecks
Market	***I. Fragmentation, discontinuity and low trade attractiveness*** - Limited hinterland market although growth prospects exist (planned investments, rise in transit traffic) - Market discontinuity due to lack or low quality of services provided in the hinterland - Low trade attractiveness due to high transportation costs to reach North-East and Central East markets ***II. Political factors and cross-border differences*** - Lack of political stability (e.g., FYROM, Kosovo) - Cross-border differences in legislation and transport network capabilities
Infrastructure	***I. Port corridors (network level)*** - Lack of rail interconnection of key ports (e.g., Patra, Igoumenitsa) - Annual capacity covered from competing ports (e.g., Hamburg,

Cluster	Bottlenecks
	Limassol) - Lack of gas supply points (i.e., Greek ports besides Piraeus, Burgas) - All ports should increase capacity to accommodate traffic flow increases resulting from the completion of network projects avoiding bottlenecks ***II. Road and rail infrastructure (network level)*** - Roadway network in poor condition due to low maintenance - Missing multimodal connections (i.e., to be constructed or substile upgraded) between Hungary, Bulgaria, Romania and Greece - Differences in rail line lengths, axle roads and rail network in poor condition due to low maintenance (North-South divide) - Noncompliance of rail infrastructure with technical characteristics set in EU regulations (e.g., traffic management systems, electrification, operational speed) - High costs of rail transport infrastructure development in Greece (considering topographical characteristics) - lack of investment interest due to low demand - Linear structure (low coverage) and limited capacity of railway lines in Greece (many single lines, low level of electrification) affecting the number of freight trains that can use the existing network - Low or modest public investments on rail infrastructure in Greece - traditional funding sources less sustainable ***III. Road and rail infrastructure (at port level)*** - Bridge linking the main port gate with PATHE still incomplete causing traffic problems and delays (region of Central Macedonia to complete the project) - Only railway operator present in the port does not have sufficient equipment to support hinterland flows ***IV. Port infrastructure*** - Limited availability of the port land area considering the port's function as storage depot as well as the existing lack of rail capacity - Lack of truck capacity considering recent growth in demand - Lack of online connection of the port's information systems with those of public and private port community actors (e.g., customs office) ***V. Policy*** - Current infrastructure charging and transport taxation schemes in Greece, differ substantially from EU countries creating market distortion and inefficiencies
Operational	***I. Cross-border operations***

Cluster	Bottlenecks
	- Low quality and reliability of freight transport services due to lack of coordination in cross-border capacity offer, traffic management and planning of infrastructure works - Slow cross-border procedures (e.g., controls in Serbian and FYROM borders) - propagation of impact given the proximity of the port of Thessaloniki in Greece's northern borders ***II. Port operations*** - Non-24-hour operation of port gates causes delays in the port-hinterland chain - Lack of staff in customs office to accommodate inbound and outbound traffic - Range of services provided by the port and hinterland actors is limited (e.g., the manufacturing industry remains untapped)
Organizational (or Institutional)	- Multiplicity of actors involved and related fragmentation of responsibilities and jurisdictions - Complexity of administrative, operational and legal framework of maritime transport and logistics sectors - Lack of direct e-exchange of information and documentation - Compulsory documentation in Greece of inventory management and goods movement along supply chains - New governance structures (e.g., Regulatory Port Authority, Public Port Authority) do not support the transition towards procedure simplification - Domestic road freight transport largely protected - cabotage subject to restrictions, with operators facing difficulties to optimize their operations - Monopoly in the rail freight market
Innovation	- Lack of innovation content in the services provided by local port-hinterland chain actors - Lack of connectivity and exchange of information regarding port operations with port-hinterland actors - Level of internal management tools and staff's computer literacy diversified across organizations

Table 1: Key Clusters of Bottlenecks for Thessaloniki Port

1.4 Local Working Group

The other source of additional input/information for the Local Action Plan for Thessaloniki comes through the interviews and consultation with the Local Working Group. Key local stakeholders were invited to participate in the Local Working Groups in order to elaborate upon the identified bottlenecks stressing out points to be carefully considered and solutions/measures to be further undertaken. As the Thessaloniki port has a variety of organizations and associations involved in the port's ecosystem, we aimed to map the stakeholders (Table 2), prioritize and

select those ensuring a holistic view of Thessaloniki's port operations, services, and surrounding environment, as well as stakeholders representing the collective interests of the industry (e.g., associations, chamber of commerce, regional authorities). In addition to associations/authorities having an overall view about port's bottlenecks, we aimed at engaging also private operators with their operational activities being primarily influenced by ports' bottlenecks. Therefore, we eventually came up with the following list of stakeholders summarized in Table 3.

Authorities	
Port authorities	**Rail infrastructure providers**
Thessaloniki Port Authority	Gaiaose
Inland Terminals	Ergose
SRS - Sindos RailContainer Services	**Road Infrastructure Providers**
Municipalities	Egnatia Odos S.A.
Municipality of Thessaloniki	Aegean Motorway
Municipality of Delta	Hellastron
Municipality of Ampelokipi-Menemeni	**National Administrations**
Regional Administrations	Ministry of Shipping and Insular Policy
Region of Central Macedonia	Ministry of Infrastructure and Transport
	Ministry of Development and Investments
Customs, Security & Sanitary	
Custom Authority	**Custom Agents**
Customs Office A'	Association of Customs Brokers - Customs Representatives of Thessaloniki
Customs Office B'	**Police**
Customs Office C'	Hellenic Cost Guard
Industrial Sector	
Key industry associations	**Industrial Parks**
Thessaloniki Chamber of Commerce and Industry	Thessaloniki Industrial Park
Thessaloniki Chamber of Professionals	
Thessaloniki Chamber of Handicrafts	
Federation of Industries of Greece	
Thessaloniki Trade Association	
Private Operators	
Freight forwarders	**Rail companies**
Kuehne + Nagel	TrainOSE
Association of International Freight Forwarders & Logistics Enterprises of Greece	Rail Carlo Logistics Goldair
3PL-4PL and container depots	PEARL - Piraeus Europe Asia Rail Logistics
Goldair Cargo	**Haulage companies**
PAEGAE	Iliadis Cargo S.A.
SARMED	Sidiropoulos Transport S.A.
Makios Logistics	Grammadas
Delta4	National Union of Road Transport Operators
HERMES Agencies	Hellenic Federation of Road Transports
Top Logistics	**Export & import companies**
Tsourekas Transport	Greek Exporters Association
Sfera	**Shipping line companies & shipping agents**
Hub Logistics	Shipping Agents Association of Thessaloniki
Diakinisis	
Delatolas Express Cargo	

Others	
Academic & Research Organizations	**Transport consultants**
Centre for Research and Tehnology Hellas	Samaras & Associates S.A. - Consulting Engineers
University of Macedonia	**Business Support Organizations**
Aristotle University of Thessaloniki	Hellenic Logistics Company

Table 2: Mapping of Thessaloniki Port Stakeholders

Due to COVID-19 pandemic, we were unable to run multiple rounds with the Local Working Group. Instead, we set up two runs with the Local Working Group in which 6 organizations participated. The selected organizations include different categories of stakeholders like Private Operators (Export & import companies, Haulage companies), authorities (Road infrastructure providers, Regional Administration), organizations from the industrial sector (Key Industry Associations) and other organizations. A detailed presentation of the stakeholders who take part in the creation of the Local Action Plan is given in the table below.

Association	Information about Association
Region/Prefecture of Central Macedonia	The Region of Central Macedonia is the largest and second most populous region in Greece. Administratively, it is a secondary organization of local self-government and geographically covers the central part of Macedonia, with the exception of the peninsula of Mount Athos which is governed by a special regime. https://www.pkm.gov.gr/
Thessaloniki Chamber of Commerce and Industry (TCCI)	The TCCI is the second Chamber in Greece in terms of size and its contribution in the development of the country until now is very important. Important part of TCCI activities is the organization of various events to promote the European Idea. Today, the TCCI has 20 thousand active members (registered) which with their dynamic business presence have ensured the 50% of Greek exports for Thessaloniki and the greater region. https://www.ebeth.gr/en
Greek Exporters' Association	The Association has 725 members from all over Greece. It aims to support its members in further developing their business by strengthening their export activities. The Association has also a key role in informing the government concerning all export activities, acting also as a knowledge center. The Association has undertaken important initiatives in consultation with several relevant port stakeholders in Northern Greece and the city of Thessaloniki. More specifically, the Association contributed into formulating a network of chambers in Thessaloniki (e.g., Chamber of Commerce and Industry, Chamber of Professionals, Chamber of Handicrafts) and other port-related stakeholders that all acknowledge the port as the main engine for growth not only for the city of Thessaloniki but for the region as a whole. Very recently, the Association also conducted a study looking at the impact of port-related companies on other companies and industry agglomerations (i.e., Kalochori and Sindos).

Association	Information about Association
	https://www.seve.gr/
Hellenic Logistic Association	EEL was founded in 1994, representing the first association in our country to promote the science and the practice of Logistics. Over the past twenty+ years, EEL interacted with over 500 members/supporters, creating one of the most active Scientific Associations in Greece, with clear focus and dedication to assist on Enterprise Business Development and the reinforcement of the Greek Economy. EEL constitutes the Scientific, non-profit Organization that promotes the interests and demands of the Logistics Market and represents the Greek logistician at all competent Institutions and Governmental Authorities, contributing significantly to the development of the entire sector. The purpose of EEL is to promote the role of the Greek Logistician into the center of the Greek Business and the Economy, as well as to transform the country into an essential Logistics and Transportation HUB for the Balkans and the Southeastern European Region. https://eel.gr/en/
Iliadis Cargo S.A.	Iliadis Cargo S.A. is a transportation company specialized in both international and national transportation, ocean and air freight services, as well as a large variety of distribution and logistics services. The company is located in the premises at Thessaloniki, in Kalochori; a strategic location in between the port and the industrial park of the city. https://www.iliadis-ae.gr/en/
Egnatia Odos S.A.	Egnatia Odos S.A. studies and constructs sections of the nine vertical axes, which connect the hinterland of Balkan and Southeastern Europe with the Egnatia Odos, the ports of the Aegean and the airports of Northern Greece. https://www.egnatia.eu/

Table 3: Key Local Stakeholders participating in the LWG for Thessaloniki

The first run of the Local Working Group which held on 30/6/20 was informative, as we presented some general information about Thessaloniki Port, the bottlenecks identified from the Local Context Analysis, and their impact. During an online presentation, participants exchanged information and opinions about the initially identified port's bottlenecks. As it was practically impossible to find a common day for all the participants in the middle of the pandemic, the second run of discussions with the Local Working Group included personal interviews through online videoconferencing. The coordinator of the interview, 3 days before the interview, provided instructions and the context of the interview as well as background material about the bottlenecks and specific interview questions for each stakeholder. The duration of each interview was approximately 1-2 hours. In Table 4, we provide further details about interview arrangements.

Association or Public Authority	Category	Interview Day
Greek Exporters Association (SEVE)	Private Operators - Export & import companies	09/07/2020
Egnatia Odos S.A.	Authorities - Road infrastructure providers	09/07/2020
Hellenic Logistic Association (EEL)	Other- Business Support Organizations	15/07/2020
Iliadis Cargo S.A.	Private Operators - Haulage companies	20/07/2020
Region/Prefecture of Central Macedonia	Authorities – Regional Administration	23/07/2020
Thessaloniki Chamber of Commerce and Industry	Industrial Sector – Key Industry Associations	27/07/2020

Table 4: Interview Details

2 INFRASTRUCTURE

2.1 Introduction (and goals)

The Local Context Analysis for Thessaloniki (DT1.1.6 – "Local Context Analysis for Thessaloniki") indicated 4 categories of bottlenecks related to infrastructure cluster. The categories are related to port corridors (network level), road and rail infrastructure (network level), road and rail infrastructure (port level), port infrastructure, and policy. The table below presents in detail the bottlenecks of each category.

Category of Bottlenecks	Bottlenecks
Port corridors (network level)	- Lack of rail interconnection of key ports (e.g., Patra, Igoumenitsa) - Annual capacity covered from competing ports (e.g., Hamburg, Limassol) - Lack of gas supply points (i.e., Greek ports besides Piraeus, Burgas) - All ports should increase capacity to accommodate traffic flow increases resulting from the completion of network projects avoiding bottlenecks
Road and rail infrastructure (network level)	- Roadway network in poor condition due to low maintenance - Missing multimodal connections (i.e., to be constructed or substile upgraded) between Hungary, Bulgaria, Romania and Greece - Differences in rail line lengths, axle roads and rail network in poor condition due to low maintenance (North-South divide) - Noncompliance of rail infrastructure with technical characteristics set in EU regulations (e.g., traffic management systems, electrification, operational speed) - High costs of rail transport infrastructure development in Greece (considering topographical characteristics) - lack of investment interest due to low demand - Linear structure (low coverage) and limited capacity of railway lines in Greece (many single lines, low level of electrification) affecting the number of freight trains that can use the existing network - Low or modest public investments on rail infrastructure in Greece - traditional funding sources less sustainable

Category of Bottlenecks	Bottlenecks
Road and rail infrastructure (at port level)	- Bridge linking the main port gate with PATHE still incomplete causing traffic problems and delays (region of Central Macedonia to complete the project) - Only railway operator present in the port does not have sufficient equipment to support hinterland flows
Port infrastructure	- Limited availability of the port land area considering the port's function as storage depot as well as the existing lack of rail capacity - Lack of truck capacity considering recent growth in demand - Lack of online connection of the port's information systems with those of public and private port community actors (e.g., customs office)
Policy	- Current infrastructure charging and transport taxation schemes in Greece, differ substantially from EU countries creating market distortion and inefficiencies

Table 5: Infrastructure Bottlenecks based on the Local Context Analysis for Thessaloniki

All the interviewed stakeholders mentioned the importance of infrastructure as a condition for ports' future growth and competitiveness. Also, they underlined that a modern port should be connected with industrial areas. In the case of Thessaloniki, the port connection with the surrounding industrial areas is considered problematic due to lack of infrastructure. Until today, the only way to transport cargo from port to other locations is via road transport/trucks which is considered an environmental unsustainable solution due to increased gas emissions.

Solving infrastructure bottlenecks will help the port of Thessaloniki to play a leading role in the Balkan region and South-East Europe in general and should be on top of priority. Thus, the key action that come up after the interviews with the Local working Group is a combined transport solution including improvements to road and rail infrastructure in hinterland and surrounding area in domestic and Balkan level. Finding a solution to this bottleneck will cause externalities and solve other bottlenecks related to the limited availability of the port land. Based on the information gathered during the interview we could say that the infrastructure bottleneck is the cause of problems related to ports connectivity. In order for the key action to be accomplished, 3 additional sub-measures (Figure 3) should be brought forward. These measures could enhance port's rail connection, and modernize the infrastructure which will be useful to set-up industrial areas in the vicinity of the port and the creation of a dry port network.

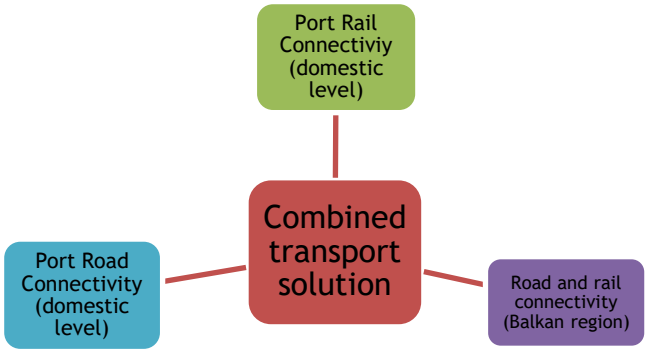

Figure 3: Infrastructure-related Measures

2.2 Stakeholders involved

All interviewed stakeholders unanimously recognized the importance of infrastructure bottlenecks in general, and they underlined the poor conditions of the existing road and rail infrastructure. The Greek Exporters' Association underlined the importance of railway connection for Thessaloniki Port and Balkan region. To stress the railway connection problem, two years ago, the Association gathered the relevant government bodies and ministries, and organized a meeting with rail transport operators of the Balkan region. Furthermore, Egnatia Odos S.A. stated that the most practical solution in the case of Thessaloniki port is a combined port transport system.

Association	Category	Information about Association
Region/Prefecture of Central Macedonia	*Authorities – Regional Administration*	It is a secondary, regional authority that geographically covers and administers the central part of Macedonia.
Thessaloniki Chamber of Commerce and Industry (TCCI)	*Industrial Sector – Key Industry Associations*	It has 20 thousand active members (registered) which with their dynamic business presence have ensured the 50% of Greek exports for Thessaloniki and the greater region.
Greek Exporters' Association	*Private Operators - Export & import companies*	It aims to support its members in further developing their business by strengthening their export activities.

Association	Category	Information about Association
Hellenic Logistic Association	*Other- Business Support Organizations*	It constitutes the scientific, non-profit organization that promotes the interests and demands of the Logistics Market and represents the Greek logistician at all competent Institutions and Governmental Authorities, contributing significantly to the development of the entire logistics sector.
Egnatia Odos S.A.	Authorities - Road infrastructure providers	It studies and constructs sections of the nine vertical axes, which connect the hinterland of Balkan and Southeastern Europe with the Egnatia Odos, the ports of the Aegean and the airports of Northern Greece.
Iliadis Cargo S.A.	*Private Operators - Haulage companies*	Iliadis Cargo S.A. is a transportation company specialized in both international and national transportation, ocean and air freight services, as well as a large variety of distribution and logistics services.

Table 6: Information about Stakeholders Prioritizing Infrastructure as a Key Bottleneck

The majority of association representatives underlined the importance of public authorities and government in this key action in order to overcome the infrastructure-connectivity bottleneck. The Region of Central Macedonia recognized its role as key stakeholder in this action and they have already done relevant actions. More specifically, the Egnatia Odos S.A. has already concluded the relevant procurement procedures and it is expected that within the next 2-2,5 years, Pier 6 of the port (i.e., container terminal) will be connected with the national roadway network. In addition, the ERGOSE has already initiated some relevant works, but these need to be expedited. However, both region of central Macedonia and Egnatia odos S.A. mentioned that there is more work to be done in the road and rail infrastructure-connection of the port with the surrounding areas.

Furthermore, as in many cases interviewees mentioned the connection with the Balkan region and especially through the rail connection. As it is important for the key action, it is essential railway operators from the Balkan region to participate in order the same standards to be adopted in every country. However, the participation of public-private organizations/association from the Balkan region is not enough, and the participation of Balkan governments are considered critical in order to optimize the border control processes so delays to be minimized and a 'green lane' concept can be facilitated shortening significantly the time needed for goods to reach key destinations within the Balkan region and in the central European market. Furthermore, bilateral agreements with different Balkan countries should be made for addressing current inefficiencies of the network enabling again to realize significant time and cost savings.

2.3 Key Actions

The conclusion is that the improvement of the poor condition of road and rail infrastructure can be a solution to other bottlenecks related to port infrastructure as the lack of available port land. Thus, a combined transport solution (Table 7) signifies the high-level initiative in response to road and rail infrastructure bottlenecks at port level. Currently, almost all freight volumes are being accommodated by trucks; a costly and environmental unsustainable solution. Furthermore, this solution does not fall within a sustainable development strategy nor high-quality service. Efficient connections of the port with the rail but also road network are of high importance for the port's growth and development strategy.

To accomplish this action, some additional measures should be additionally considered (Table 7). The first measure pertains to the enhancement of port's rail connection in domestic level, and is a major priority and an important prerequisite for supporting the port's growth, considering also planned investments at the port area (e.g. expansion of Pier 6, new terminal equipment, etc.). As the Hellenic Logistic Association suggested, the railway line connecting the port with the network should be modernized so that the shipment and receipt of goods can be facilitated. To be able to efficiently handle the freight volumes, the line should be a double one, thus it is of utmost importance to complete the bridge, so that the port is provided with a dedicated rail access (i.e. not interfering with city traffic) which will further strengthen its competitiveness thus will contribute towards achieving lower transportation costs. Except of the bridge construction, relevant works should be undertaken also in the port area so that loading / unloading processes on rail wagons are facilitated and enhanced. The representative of the Thessaloniki Chamber of Commerce and Industry mentioned that this would be a sustainable environmental solution.

The second measure is about the improvements of road connection in domestic level. The poor condition and the poor connection of port with industrial areas represent a thorny issue and an obstacle to port's further development. Several port service providers are now concentrated in the area of Kalochori which however presents structural and infrastructural problems given the absence of relevant urban plans. Recent studies examining the development of an industrial park there should be soon materialized and an analytical assessment should be conducted on infrastructure improvements that need to be undertaken. Once these are documented and prioritized, available funding mechanisms should be investigated and exploited (e.g., from national programmes, funds from the Region of Central Macedonia) so that the implementation process can be rapidly initiated. The benefits to be derived from these works should be successfully communicated to the stakeholders located there so that any inconveniencies caused are easily overcome and delays in the implementation process are minimized. Furthermore, targeted incentives should be provided so that invest interest is enlarged and companies providing complementary services to existing ones are attracting addressing the current fragmentation that the port-hinterland market presents.

In the same time, attention should be given to the road and rail connection with the international market and especially with the Balkan region, as it is considered an important parameter which could solve other infrastructure bottlenecks of Thessaloniki Port. There are major structural gaps on the railway network in the Balkan countries. Repair works need to be undertaken at several parts of the network so that greater speeds can be achieved. The greater capacity that rail transport offers should be better exploited, and there is indeed a great interest from actors located in countries surrounding the Balkan region (e.g., Poland, Ukraine, Austria) to support such developments. Once the rail and road connection of the port to the hinterland is improved, the bottleneck related to the limited port land would be eliminated with the creation of a network of dry ports located in carefully selected positions within the Balkans

that meet all required preconditions (i.e., efficient connections with the road and rail transport network, availability of large storage facilities). Those dry ports can serve as extended gates transferring some key functions of the port there so that the negative impact on the surrounding the port roadway network is reduced. In that way, the port of Thessaloniki will be able to further extend its reach into more distant hinterland markets and attract additional freight flows better supporting its advancement into a hub for South-East Europe.

In order for such an initiative to be successful, an administrative team should be created that will coordinate each measure and connect the different parties. As a coordinator, the administrative team would have to secure sufficient funding, identify and connect the key domestic and Balkan stakeholders. The connection of the key stakeholders would have as a result the creation of partnerships between public and private parties. However, the most important task of the administrative team will be to run a study examining the condition, the improvements and the required standards of the existing rail and road infrastructure. This study would be an input for the other measures and will accelerate each process. Another great importance initiative, which will be held by the administrative team, will be the government level agreement in board control and "green lane". These initiatives are connected with the road and rail connection as they eliminate the waiting time during cargo transport.

Combined Transport Solution Key Actions			
a/a	**Task**	**a/a**	**Task**
Administrative Team		**Rail and Road Connection (Balkan Level)**	
1	Secure sufficient funding	13	Study examining all necessary preconditions will allow to identify the most appropriate locations of these dry ports and then examine the right governance model to be followed.
2	Identify domestic key stakeholders	14	Private-public partnerships
3	Identify key stakeholders in Balkan region	15	Construction
4	Study to identify the condition, the improvements and the required standards		
5	Partnerships with private-public entities		
6	Set the rail and road standards		
7	Agreement in government level about board control and "green lane"		
Rail Connection (Domestic Level)			
8	Conclude the bridge project		
9	Study specifically for rail connection in domestic, Balkan, and European level.		
10	Adopt the suggested standards		
	Construction		
Road Connection (Domestic Level)			
11	Adopt the suggested standards		
12	Construction		

Table 7: Key Steps for implementing Key Action in response to Infrastructure Bottlenecks

2.4 Aims

Advancing the rail and road connection of Thessaloniki Port will set the port as a transport hub for South-East Europe. As mentioned above, due to externalities the new road and rail connection will solve other infrastructure bottlenecks such as the limited availability of the port land area considering the port's function as storage depot as well as the existing lack of rail capacity. In addition, the port should benefit from the introduction of new operators in the Greek market and should investigate what services can be offered allowing the development of efficient multi-modal solutions. This will decrease the transportation costs and improve ports competitiveness.

2.5 Problems faced during the implementation of the CAP

The majority of stakeholders connect the rail and road bottlenecks in ports hinterland with the limited availability of the port land area. Many stakeholders point out that if the road and rail connection of port with the surroundings area where better and properly maintenance some of other cluster bottlenecks would be solved like market and operational bottlenecks.

2.6 Timescale implementation

As we can conclude from the Local Working Group interviews, the main action that should be completed in order to solve the major infrastructure related bottlenecks pertains to a combined transport solution. The latter should focus on road and rail connection of the port with the surrounding areas and with the Balkan region. To achieve this, the administrative team which will coordinate the parallel initiatives/projects should set the foundation for the future projects in the first two years (Table 8).

- **1st - 2nd year:** The first year and the first two quarters of the second year the administrative team should try to cover the funding needs of these measures. Another condition to succeed this action is to identify the key stakeholders both in domestic and Balkan level. This task will take place during the third and fourth quarters of the first year. A precondition is the completion of the study to identify the condition, the improvements and the required standards for the rail and road infrastructure. The completion of the study will also offer a clear picture about the road and railway standards that should be adopted in order to improve the connection between Greece and other Balkan countries. However, all these tasks cannot progress further if there will be no partnerships between private and public entities and agreements in government level about board control and "green lane".

	Initiative	1st Year				2nd Year			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Administrative Team	Secure sufficient funding	x	x	x	x	x	x		
	Identify domestic key stakeholders			x	x				
	Identify key stakeholders in Balkan region			x	x				
	Study to identify the condition, the improvements and the				x	x	x	x	

	required standards								
	Set the rail and road standards								x
	Partnerships with private-public entities							x	x
	Agreement in government level about board control and "green lane"							x	x

Table 8: Timescale Implementation of Year 1 and 2

2.7 Risk analysis

For each measure that is proposed to overcome infrastructure bottleneck, some risks should be taken in mind (Table 9). To minimize these risks, we propose strategies that will help port authorities to transcend. In order to be able to fulfill the complementary measures, we should minimize the risk related to the key action. One of the risks that the administrative team should take in mind is to secure sufficient funding. As it is a high importance task, the Team has multiple options like the EU funding sources, national funding programs and synergies between public and private sector. However, the European Union is funding a variety of programs that promote the upgrade of infrastructure and programs with high environmental impact like this. Another risk is the unwillingness of stakeholders to participate in a conversation about a combined transport solution. Even the possibilities important stakeholders to be unwilling to participate in a conversation like this is few, it is a potential risk which will have great affect in future steps. Thus, they should be prepared and create a series of presentations which will underline the importance of this project and its externalities. A pre-condition for the combined transport solution is to set some standards in rail line length, axle roads etc. as it is different in every Balkan country. This risk is high importance as it will be the solution in multiple problems that the countries face in their transportation. In the case of Thessaloniki Port, this task is vital and is the precondition to solve other infrastructure bottleneck related to limited port space for storage. Thus, it is suggested either to follow the standards given by the European Union or to adopt the mostly used standard as concluded for the study. The last risk related with the administrative team is to fail reaching an agreement about the border control and the "green lane" concept. Although, it is an important task which reduces the transport and waiting time in customs, it is not expected to seriously affect the future implementation progress of the key action.

	Risk Identification	Risk Evaluation	Response Strategy
Administrative Team	Funding	High importance	Create investment schemas in which public and private authorities will participate
	Unwillingness from stakeholders to participate	High importance	A series of presentations that would promote the benefits and opportunities from this initiative
	Unable to set standards	High importance	Follow the standards set by the European Union or the conducted study

	Risk Identification	Risk Evaluation	Response Strategy
	Not reaching an agreement for border control and "green lane"	Medium Importance	Continue of the negotiations after the original timeframe

Table 9: Potential Risks for Key Action

2.8 Funding resources

As the representative of the Region of Central Macedonia mentioned, the European Union constitutes the key source of funding this type of activities as there is a variety of funding programs that target the improvement or modernization of existing infrastructure, the development of infrastructure projects that promote the financial growth of cities. The Region of Central Macedonia has already funded with nearly € 7 million a relevant project looking at how the port can be better connected with the railway network, but of course continuing the construction of the relevant infrastructure is necessary. Except of the funding programs that target the development and update of infrastructure, there are funding programs aiming to promote environmental sustainability. The interviewee from Thessaloniki Chamber of Commerce and Industry (TCCI) underlined that focusing on the improvement of railway connection of port hinterland with the surrounding areas will have an environmental impact and reduce gas emissions, due to the currently dominant role of road/truck transport. This calls for a new approach pursuing new funding avenue or instruments as both in European and domestic level there is a variety of funding programs that promote environmental-friendly solutions and investments. In the case of Thessaloniki, as the port represents an integral part of the city, the environmental factor is considered extremely important and necessary for future growth. Another important funding source is the national funds which try to increase country's competitiveness by improving infrastructure. Furthermore, the Ministry of Maritime Affairs and Insular Policy promotes programs that improve ports' infrastructure.

2.9 Impacts on bottlenecks

The combined transport solution will decrease transportation costs which will affect the import and export costs since new players will participate in the port-hinterland market. Solving infrastructure bottleneck should improve ports competitiveness and be the starting point to solve other significant bottlenecks like operational, innovation, market etc. Another effect that the combined transport solution would have is to further extend its reach into more distant hinterland markets and attract additional freight flows better supporting its advancement into a hub for South-East Europe.

2.10 CANVAS Action Plan (CAP)

<table>
<tr><td>Stakeholders involved

Region of Central Macedonia

ERGOSE

Governmental bodies/ authorities

Construction Companies (e.g., Egnatia Odos S.A.)

Stakeholders from Balkan region (e.g., railway operators)</td><td>Key actions

A combined transport solution which will improve rail and road connection both domestic and internal (Balkan region)</td><td>Aims

Become a transport hub for South-East Europe</td><td>Problems faced

A connection between transport problems with the lack of storage space in ports hinterland</td><td>Timescale implementation</td></tr>
<tr><td colspan="2">Funding sources

EU funding programs (infrastructure improvement, environmental sustainability)

National funding (Ministry of Maritime Affairs and Insular Policy)

Investment schemas with private and public participants</td><td colspan="3">Risk analysis

Funding

Unwillingness from stakeholders to participate

Unable to set standards

Not reaching agreement for border control and “green lane”</td></tr>
</table>

3 INNOVATION

3.1 Introduction (and goals)

The Local Context Analysis for Thessaloniki (D.T1.1.6 – "Local Context Analysis for Thessaloniki") indicated 3 main bottlenecks for the innovation cluster:

- the lack of innovation content in the services provided by local port-hinterland chain actors,
- the lack of connectivity and exchange of information regarding port operations with port-hinterland actors and
- the level of internal management tools and staff's computer literacy diversified across organizations.

These bottlenecks represent a liability for port competitiveness as they reduce efficiency and are an obstacle for other innovative services and initiatives to develop. The interviewed stakeholders recognized these bottlenecks and suggested relevant actions that aim to remove innovation bottlenecks and suggest solutions that will solve existing problems important not only for the hinterland but also for every stakeholder in this ecosystem. For example, many problems arise due to different data formats and documentation in hinterland's supply chain which affects every participant in the ecosystem. This problem can be alleviated by adopting common approaches and formats and by developing an information exchange solution, as the Hellenic Logistic Association underlines. However, an important stakeholder that should be involved to overcome some of these bottlenecks are public authorities and more specifically policy makers who develop standardization in order to support implementation of this solution. Some form of collaboration between stakeholders and policymakers is essential and necessary to eliminate problems and accelerate operations across countries.

The Key Action that is proposed in order to overcome the Innovation Bottleneck is the creation of an Innovation Hub. As the stakeholders mentioned during the Local Working Group is the creation of an Innovation Hub will help Port of Thessaloniki achieve additional growth, increase its competitiveness and efficiency. Initially, the Innovation Hub would focus in 4 axes that according to stakeholders are capable to solve the majority of the innovation bottleneck and be a solution for bottlenecks from other clusters. These 4 axis will include a startup incubator, a digital skill academy, an initiative that will solve the lack of connectivity and exchange of information inside port operations (Information Exchange System) and a research center (Figure 4).

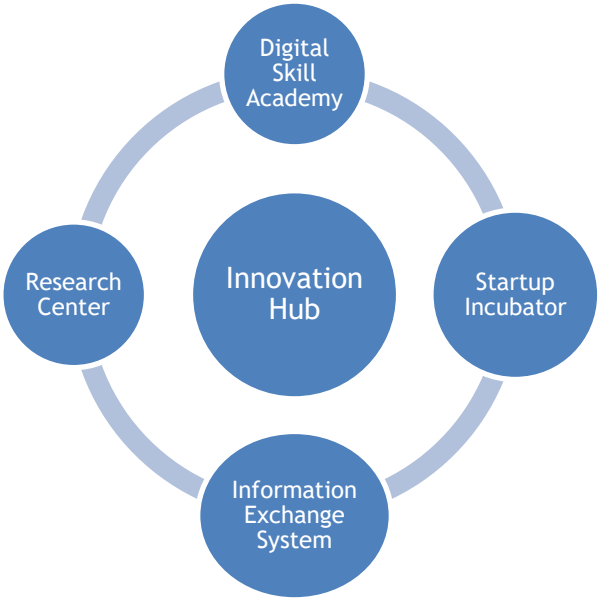

Figure 4: Key Sub-measures of Innovation Hub

3.2 Stakeholders involved

During the meetings with the local working group four stakeholders, Greek Exporters Association, Hellenic Logistic Association, Region/Prefecture of Central Macedonia and Iliadis Cargo S.A. consider innovation as a key bottleneck for port's growth and competitiveness. Greek Exporters' Association places great attention on all relevant issues pertaining to the Port of Thessaloniki, and actually, representatives of the latter are also members of the Association's Management Board. To this end, the Association is willing and keen to participate in any initiatives that will further enhance the competitiveness and performance of the port and its links to the hinterland. On the other hand, the Hellenic Logistic Association is also keen on supporting relevant initiatives as it has a clear picture of the technological needs of Port of Thessaloniki but also for Port of Piraeus as they consider innovation as an important factor which could add value by improving port's efficiency and produce valuable outcomes in the future. The Table below enclosed some information and stakeholder's category.

Association	Category	Information about Association
Region/Prefecture of Central Macedonia	*Authorities - Regional Administration*	It is a secondary, regional authority that geographically covers and administers the central part of Macedonia.
Thessaloniki Chamber of Commerce and Industry (TCCI)	*Industrial Sector - Key Industry Associations*	It has 20 thousand active members (registered) which with their dynamic business presence have ensured the 50% of Greek exports for Thessaloniki and the greater region.
Greek Exporters' Association	*Private Operators - Export & import*	It aims to support its members in further developing their business by strengthening their export

Association	Category	Information about Association
	companies	activities.
Hellenic Logistic Association	*Other- Business Support Organizations*	It constitutes the scientific, non-profit organization that promotes the interests and demands of the Logistics Market and represents the Greek logistician at all competent Institutions and Governmental Authorities, contributing significantly to the development of the entire logistics sector.

Table 10: Information about Stakeholders Prioritizing Innovation as a Key Bottleneck

The Interview with Greek Exporters Association indicates that are some other important stakeholders that should take part in this initiative as the Municipality of Thessaloniki, local and regional authorities, Thessaloniki Port Authority administration, and scientific/academic institutions. The Municipality of Thessaloniki had previously participated in an EU-funded research project focusing on "Digital Cities". In the context of this project, the interaction of the city with the port underlined a variety of priority issues as infrastructure, micro-logistics that are organized around the city center, etc. According to the Hellenic Logistic Association's point of view, other governmental institutions should involve fostering innovation like Independent Authority of Public Revenue, Ministry of Shipping & Insular Policy, Ministry of Development & Investments, and Ministry of Transport & Infrastructure. Including these institutions will be an assurance for fair competition but also will be a support to business development decisions.

To solve these issues, the cooperation between local and regional authorities is necessary, however, the collaboration with the scientific/academic community of the city is important. The fact that the scientific and academic community of Thessaloniki is located inside the city is considered a competitive advantage. As both interviewees highlighted the importance to foster innovation in port's hinterland, collaborative efforts between scientific/academic community and public authorities is essential, because public authorities can secure the funding and indicate problems for which cities' scientific and academic institutions have the knowledge, the technology solutions and are knowledgeable of best practices. The importance of relying on best practices as a guide to overcoming all the bottlenecks was underlined by Hellenic Logistic Association, as well.

3.3 Key Actions

To overcome the bottlenecks related to innovation, the Port of Thessaloniki should create an entity to foster innovation and entrepreneurship. More specifically, they should create an Innovation Hub which will foster innovation and entrepreneurship related to port-hinterland. As mentioned above, the Innovation Hub will include a startup incubator, mentioned from the stakeholders participating in the Local Working Group, a research center, a Port Communication System, a digital skill academy and a research center. These initiatives will help the Port of Thessaloniki to find solutions in different bottlenecks identified by the Local Context Analysis.

Part of the Innovation Hub should be an entity that could foster entrepreneurship, and especially startups; an action that underlined by the representative of Greek Exporters' Association and the Hellenic Logistic Association. More specifically, Greek Exporters' Association suggested the creation of an incubator to support port-related start-ups. Although this action had been previously discussed, it has not been materialized yet. This incubator can accelerate innovative ideas related to port hinterland and solve different bottlenecks like infrastructure, operational, and could potential create products and/or services of added-value, after receiving though proper business directions and targeted recommendations.

Another initiative is the creation of a Digital Skill Academy which will develop employees' digital skills, an action that both associations underlined as important given the low digital literacy of port employees. Greek Exporters' Association recommends targeted training programs that will be focused on occupations related to port policy and port management as well as on supply chain services. In organizations inside and outside port hinterland, there are employees with different levels of digital skills or even employees with the absence of adequate digital skills. The transition of Thessaloniki port from a public entity to a private one forces the personnel to adapt to new working conditions and the different culture that the private investors established within the organization.

Furthermore, the third axis of the Innovation Hub is a research center. As the interviewee for the Hellenic Logistic Association mentioned the research center will support technological advancements covering solutions related to Internet of Things (IoT), Artificial Intelligence (AI) (e.g. software robotics), etc that can be directly implemented to port related solutions such as supply chain integration, transportation, tracking, storage and more. The objective of the research center would be to develop solutions that could solve not only innovation bottlenecks but also infrastructure or operational bottlenecks.

However, the most important part axis of the Innovation Hub will be the information exchange software solution; a Port Community System (PCS). However, as the representative of Hellenic Logistics Association underlines the PCS is a sensitive issue especially at ports where the majority shareholders are private competitive investors. The same problem appeared in the case of the port of Piraeus where the investor is a shipping company (i.e. a competitor by default to the other port users), which also offers now logistics services through a relevant subsidiary that has been established. To overcome this problem, it is suggested a governmental institution to govern the software solution as insurance that all relevant actors share their data. Thus, it should be governed by a body that will be under the umbrella of a governmental institution, and it should be ensured that all relevant actors share their data. In this specific sector, there is a lack of available data today, so, the creation of a common software system will be used also as a data warehouse; helpful for strategic decision and policy-making as well as digitally enabled solutions and transformation. For providing added-value, the aforementioned information exchange solution must be in line with different governmental institutions such as the Independent Authority of Public Revenue, the Ministry of Shipping & Insular Policy, the Ministry of Development & Investments, and the Ministry of Transport & Infrastructure. Such a quadruple approach will ensure that the data collected will never be used for creating unfair competition, but on the contrary be utilized, as is the case in other countries, for supporting business development decisions.

A starting point in order the key action of Innovation Hub to be completed is to secure sufficient funding, building facilities and material infrastructure by the administrative team. As the creation of an Innovation Hub is a complicated and difficult task different administrative teams should be created in order to coordinate each initiatives tasks. More specifically, there will be 4 administrative teams responsible for the startup incubator, the research center, the digital skill

academy and the software development initiative; all of them will be managed by the Innovation Hub Administrative Team (Figure 5).

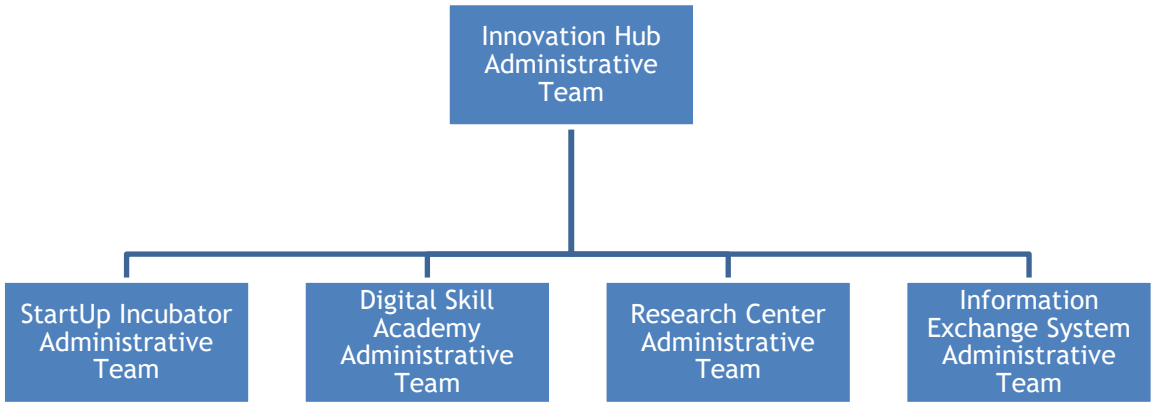

Figure 5: Organization Structure of the Innovation Center

Each administrative team will set its own goals, objectives and timeline in accordance with the Innovation Hubs' general goals, objectives and timeline. The analysis below indicates tasks of each administrative teams. If we exclude the task to secure sufficient funding and infrastructure for the hub, Innovation Hub Administrative Team should coordinate the individual administrative teams, evaluate their progress and intervene in case they deviate from their targets. Another important task of the Innovation Hub Administrative Team will be the connection of Thessaloniki port with city's scientific and academic community.

The Startup Incubator Administrative Team has a relatively easier task as the startup community in Thessaloniki is well-developed. However, they should organize an incubator which specialized in port related startups. For the Digital Skill Academy Administrative team, the most important tasks are to search for associates that will design and execute the seminars but also to evaluate the current level of employees' digital skills. On the other hand, the Information Exchange System Administrative Team is responsible for one of the most difficult tasks to secure all stakeholders participation and governmental institutions participation in the proposed solutions. This task was considered to be rather difficult by most interviewees, since stakeholders are often reluctant to participate in such software solutions due to competition issues.

Innovation Hub Key Actions			
a/a	**Task**	**a/a**	**Task**
Innovation Hub Administrative Team		**Information Exchange System Administrative Team**	
1	Secure Sufficient Funding	20	Identify key stakeholders
2	Building Facilities	21	Secure stakeholders' participation
3	Material Infrastructure	22	Secure governmental institutions participation
4	Partnerships with city's academic community	23	Search and Partnership with organization for platform development
Startup Incubator Administrative Team		24	Identify key actions-operations
5	Search for Start-ups	25	Platform Development
6	Mentoring Program	26	Platform Development
7	1st Acceleration Bootcamp	27	Platform Adoption

Innovation Hub Key Actions			
8	Attracting research teams	28	Platform seminars
9	Evaluation of research teams	29	Stakeholders Feedback
10	Announcement of the selected research teams & funding	30	Platform improvements based on Feedback
Digital Skill Academy Administrative Team		31	New Platform version
11	Establishment of Digital Skill Academy	32	Stakeholders feedback
12	Search/Recruit for Associates	33	Final Platform launch & maintenance
13	Evaluation of the existing skills of administrative employees	34	Maintenance
14	"Digital Skill Program" development		
15	Define common culture and objectives		
16	1st Digital Skill Program		
17	Evaluation Process of the Program		
18	Redesign the program		
19	2nd Digital Skill Program		

Table 11: Key Steps for implementing Key Action in response to Innovation Bottlenecks

3.4 Aims

As many organizations try to digitally transform their processes, customer experience and business model in order to remain competitive and increase their revenue; indicates the importance that Port of Thessaloniki should be part of this movement. Implementing digital features to existing operations, or using digital technologies to advance the infrastructure would provide additional value to port's customers and enhance its services. To this end, the creation of an Innovation Hub, the improvement of employees' digital skills, and the development of a common Information Exchange System is an effort to support, and accelerate innovation in port hinterland.

As the interviewees that underlined the importance of innovation in the future growth of Thessaloniki Port are associations that take in mind the needs of port's customers (businesses) and community stakeholders but also, they have a clear view of sector's future development and needs. Thus, they consider the development of a new information exchange system, the research center, the startup incubator and the development of digital skills and new culture crucial for future growth; that would be not only support port's operation but also would upgrade services and improve efficiency. In other words, these solutions could have an extended result in the competitiveness of Thessaloniki Port. Also, the development of an information exchange system will create an ecosystem that will help organizations achieve a greater level of integration among businesses, which in turn can allow developing economies of scale.

3.5 Problems faced during the implementation of the CAP

All the stakeholders who participated in the local working group have not a complete proposal-solution to overcome innovation bottlenecks. In many cases, stakeholders' organizations do not adopt digital solutions in every aspect of the organization. The limited number of digitally transformed organizations could be a problem when organizations try to implement the proposed solutions.

3.6 Timescale implementation

As the interviewees point out the Innovation Hub can be separated into four axis/entities; the startup incubator, the digital skill academy, the research center and the Port Communication System. As each initiative that it is included in the Innovation Hub has its own administrative team, we create separate timescales. It is estimated that all entities of the Innovation Hub will be capable to operate in the end of the 4th year. In the early years of the Innovation Hub the administrative team would be hold twice the year meetings with the administrative team of each entity to evaluate the progress and make recommendations in cases that it is needed.

- **1st Year:** The activities that would take place during this year and are related to Innovation Hub in general include securing sufficient funding, finding the building facilities and material infrastructure, recruit executives for the administrative team of each entity, and create partnerships with the scientific/academic community of the city (Table 6).
- **2nd Year:** During this year the foundations for the other four initiatives would be set. The Administrative team of Startup Incubator would try to establish the startup incubator in the local startup community. By the end of this year the incubator will be fully operational and the mentoring program will be started. Also, in this period, it is planned the first Acceleration Bootcamp to be held in the incubator. On the other hand, the Digital Academy Administrative Team would establish a digital skill academy, search/recruit associates that will be capable to identify stakeholders' digital needs and develop the necessary programs based on the existing skill level of administrative employees and the existing culture/objectives in order to create programs that will develop their skills. For the Port Communication System, the actions should focus on securing different stakeholders' participation, governmental institutions (as it is suggested to be the "administrator" of the software to secure fair competition) and the search and partnership with a platform development company (Table 12).

	Initiative	1st Year				2nd Year			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Innovation Hub	Secure Sufficient Funding	x	x						
	Building Facilities		x	x	x				
	Material Infrastructure				x				
	Recruit employees			x	x				
	Partnerships with city's academic community				x				
Startup Incubator	Search for Start-ups					x			
	Mentoring Program						x		
	1st Acceleration Bootcamp							x	
Digital Skill Academy	Establishment of Digital Skill Academy					x			
	Search/Recruit for Associates					x	x		
	Evaluation of the existing skills of administrative employees							x	
	"Digital Skill Program"							x	

	development								
	Define common culture and objectives							x	
	1st Digital Skill Program								x
	Identify key stakeholders					x	x		
	Secure stakeholders' participation							x	x
	Secure governmental institutions participation					x	x	x	
	Secure sufficient funding						x	x	
	Search and Partnership with organization for platform development								x
Information Exchange System	Identify key stakeholders					x	x		
	Secure stakeholders' participation							x	x
	Secure governmental institutions participation					x	x	x	
	Search and Partnership with organization for platform development								x

Table 12: Timescale implementation of Year 1 and 2

- **3rd Year:** The research center would be created and would try to attract researchers capable to propose technological solutions (AI, IoT, Robotics) to solve port's bottlenecks. An important factor in this action is the already established relationships from the Innovation Hub Administrative Team with the scientific/academic community. As far as the Digital Skill Academy, based on the skill level evaluation, that took place in previous year, the participants would be separated into groups to participate in the program. The skill development program will be last 2 quarters (1 quarter in the 2nd year and one in the 3rd year) and after its finish, an evaluation process will take place. The results of the evaluation process will be an input for the redesign process of the program. Both of these activities will be completed in the second quarter of the second year. In the last two quarters of this year the second "Digital Skills Program v.2" will take place. The above-mentioned process will be repeated in the future to further develop employees' skills. Continuing from the previous year the information exchage system could search and partner with software development company, and will identify key actions and operations, and finally the development of software. Also, in this year the development of the platform would take place (Table 13).
- **4th Year:** In this year the only activities that would take place are related to the information exchange system. As the development of a standard is a complex and difficult task, the first version of the platform will be ready to be launched at the end of the second quarter of the third year. The adopting process of the organizations will be held in the third quarter of this year. But also, in this time organizations will take part in seminars to fully understand platform potentials and use. Furthermore, organizations will be able to send to platform organization feedback or to underline significant changes. The feedback process will last 3 months and more precisely the fourth quarter of the 3rd year. The following quarter platform development organization will implement the feedback input in the platform in order to launch the new version in the second quarter

of this year. The same process will be held one more time, meaning that participants will send their feedback for the new platform version in the third quarter but at the same time platform development company will add the input of the new feedback. The feedback and development process will take place at the same time that at the end of the fourth year the platform will be ready for its final operation phase (Table 13).

	Initiative	3rd Year				4th Year			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Research Center	Attracting research teams	x							
	Evaluation of research teams	x							
	Announcement of the selected research teams & funding		x						
Digital Skill Academy	1st Digital Skill Program	x							
	Evaluation Process of the Program		x						
	Redesign the program		x						
	2nd Digital Skill Program			x	x				
Information Exchange System	Search and Partnership with organization for platform development	x							
	Identify key actions-operations	x	x						
	Platform Development		x	x	x				
	Platform Adoption					x			
	Platform seminars					x			
	Stakeholders Feedback						x		
	Platform improvements based on Feedback						x		
	New Platform version							x	
	Stakeholders feedback							x	
	Final Platform launch & maintenance								x

Table 13: Timescale Implementation of Year 3 and 4

3.7 Risk analysis

For each axis that is proposed to overcome innovation bottleneck, some risks should be taken in mind. To minimize these risks, we propose strategies that will help port authorities to transcend. The key action is the creation of an Innovation Hub (research center and startup incubator) inside port hinterland which would be dedicated to innovative solutions for ports. One of the main risks that could affect this action is the authorities to be unable to find the necessary facilities and funding resources. The risk of facilities is low because in the port hinterland there are several non-utilized buildings. On the other hand, the funding risk is of high importance because it sets in danger the overall development of the Innovation Hub. One solution to overcome this problem is to find multiple investors, a pattern that is commonly used in other countries. Another risk that is relates to the Startup Incubator would be not to find startups who will have ideas that will solve hinterland's problems. However, this risk is low importance because in Thessaloniki and Greece general there is a well-developed startup community. Also, the use of digital technologies like video conference, video calls would help the startup incubator to expand its coverage.

The main risk about the Digital Skill Academy, could arise in this action is the unwillingness of employees and stakeholders to take part in the training programs to develop digital skills. This risk is of high importance and it is essential for port's digital transformation efforts. We could compare digital skills as the foundation of the building; thus, the participation of employees is essential. To overcome this risk presentations would be held in which will be presented the benefits and the opportunities that arise from the use of digital technologies. Except for digital skills, employees should embrace the new culture that would accompany digital transformation efforts. This risk could be considered as medium importance as it takes time and organization to adopt a new culture. However, having a plan of how to implement the new culture to existing one would be essential.

However, the risk of the Port Information Exchange System is high importance as many private stakeholders are unwilling to participate in a system like this for competitive reasons. By securing the participation of governmental institutions like Independent Authority of Public Revenue, Ministry of Shipping & Insular Policy, Ministry of Development & Investments, and Ministry of Transport & Infrastructure will secure a fair competition. Furthermore, as in the case of Innovation Hub, the funding risk exists here, too, and has a big impact on future projects. In this case, too, the participation of different investors will eliminate the problem of funding. The development of a common information exchange system could be an added value to all domestic ports.

	Risk Identification	**Risk Evaluation**	**Response Strategy**
Innovation Hub	Facilities	Low importance	The port administration could grant a facility/building
	Funding	High importance	Create a funding schema with multiple investors
Startup Incubato	Low interest in the startup community	Low importance	Expand the coverage both domestic and nationally (in the Balkan region)
Digital Skill Academy	Unwillingness to participate in digital skills programs	High importance	A series of presentations that would promote the benefits and opportunities from using digital technologies
	New culture adoption	Medium importance	A detailed plan of how to implement the new culture to existing one
Information Exchange System	Organizations participation	High importance	Securing the participation of governmental institutions
	Funding	High importance	An investing schema with multiple investors

Table 14: Potential Risks for Innovation Hub

3.8 Funding resources

To overcome the above-mentioned bottlenecks organizations, have to secure sufficient funding resources through local and regional public authorities, academic/scientific community. Due to the multiple aspects that are included in the Innovation Hub. The organization is capable to secure funding related to entrepreneurship or digital entrepreneurship, digital skill development, digital transformation etc. The participation of public authorities can secure sufficient funding from programs that are only for public authorities like ESPA or EU research projects similar to "Smart Cities". On the other hand, the academic community has access to funding programs both from the EU (like Horizon2020) and other institutions.

The H2020 supports SMEs by funding research and innovation fields, enhances EU international research, and Third Country participation. Furthermore, the H2020 attaches high importance to integrate social sciences and humanities encourages to develop a gender dimension in projects. Based on this description, the H2020 fund could be used to fund the software development action as it could be a partnership between SMEs, research institutions, and other participants. Furthermore, to promote ICT activities an interesting source of funding is the European Structural and Investment Funds (ESIF). The ESI funds are used to boost jobs, growth, and investment across Europe while focusing on the least developed areas and sectors with growth potential. Some of the promoted initiatives include Research & Innovation and Digital Technologies.

Private funding and Venture Capital that will allow the development of the start-up ecosystem supported by either large existing companies in the region or VCs that are interested in development of innovative solution related to port operations can also be a significant part of the funding equation.

3.9 Impacts on bottlenecks

The Local Context Analysis for Thessaloniki port identified as the main innovation bottlenecks the lack of innovation content in the services provided by local port-hinterland chain actors, the lack of connectivity and exchange of information regarding port operations with port-hinterland actors, and the low level of internal management tools and staff's computer literacy diversified across organizations.

The key actions that participants in the Local Working Group identified offer a solution to all above-mentioned bottlenecks. The establishment of an Innovation Hub could be a solution for port's need to inject innovation to its offer services and to digitally transform port's supply chain. On the other hand, the digital skills training program will improve the low level of employee's digital literacy. Finally the Information Exchange system could be a solution for the second bottleneck (lack of connectivity) and the first part of the third bottleneck the low level of management tool. However, it is essential decisions about these issues should involve policymakers and different ecosystem stakeholders as they are problems confronted not only from port authorities and associates but also from collaborative businesses.

3.10 CANVAS Action Plan (CAP)

<table>
<tr><td>Stakeholders involved

Municipality of Thessaloniki

Other local and regional authorities

Governmental institutions

Scientific/academic community</td><td>Key actions

Innovation Hub which include 4 axis (startup incubator, digital skill academy, Information exchange solution and research center)</td><td>Aims

Support hinterland innovation by developing employees' digital skills and creating economies of scale and</td><td>Problems faced

Limited innovation capacity of the Ecosystem meaning the lack of digital skills from employees and stakeholders and the lack of standardization</td><td>Timescale implementation

Within 48 months after initial actions</td></tr>
<tr><td colspan="2">Funding sources

EU Funding through local and regional public authorities (ESIF)

Local and National Public Development Programs and Initiatives

Private funds and Venture Capital in order to secure development of innovative SMS and services</td><td colspan="3">Risk analysis

Facilities, Funding, No interest from startups

Unwillingness on behalf of employees to develop digital skills and embrace the new culture

The common standard or system is not adopted</td></tr>
</table>

4 CONCLUSIONS

The Local Action Plan is part of the work package WPT2, which aims to transfer the ISTEN approach into actions applied at local and ADRION regional level, on the basis of the local context analysis and the transnational exchange of knowledge carried out in WPT1. In this deliverable, we presented the "Local Action Plan for Thessaloniki Area", in which main interventions, local measures and key actions are identified and analyzed in order to deal with the key categories of bottlenecks coming out of the Local Context Analysis for Thessaloniki. The prioritization of the bottlenecks during the interviews indicated that the main clusters of bottlenecks in the case of Thessaloniki Area relate to Infrastructure and Innovation. Infrastructural and Innovation-related bottlenecks should represent the first priority actions for improvements on the grounds that they bring some promise for long-term potential and solutions (i.e., infrastructure-related bottlenecks), while at the same time they can be easily brought forward as a low cost-benefit, short-to-medium run collaborative solution (i.e., innovation-related bottlenecks). In any case, it was underlined that the improvement or elimination of infrastructural bottlenecks should be primarily pursued not only as a measure aiming to boost the port's competitiveness but also as a prerequisite for unlocking the growth potential of other measures dedicated to deal with other bottleneck clusters (e.g., market, operations).

The main infrastructure bottleneck of Thessaloniki port is the rail and road connection in port level. The key action that is proposed is about a combined transport solution. The key action is accompanied by 3 measures involving improvements to road and rail infrastructure in hinterland and the surrounding area at domestic and Balkan level. More specifically, the measures target to improve the rail connection in domestic level, the road connection in domestic level, and the rail and road connection in Balkan level. These measures could enhance port's rail connection, and modernize the infrastructure which will be useful to set-up industrial areas in the vicinity of the port and the creation of dry port network.

The Key Action that is proposed in order to overcome the Innovation Bottleneck is the creation of an Innovation Hub in port-hinterland. Solving this bottleneck, the Thessaloniki Port would be able to achieve additional growth, increase its competitiveness and efficiency. Initially the Innovation Hub would focus in 4 axes that, according to stakeholders, are capable of solving the majority of the innovation bottlenecks identified in previous analysis. These 4 axis will include a startup incubator, a digital skill academy, an initiative that will solve the lack of connectivity and exchange of information inside port operations (Information Exchange System) and a research center.