DOCKSTHEFUTURE

defining the concept of "Port of the Future"

R&D and Policy recommendations on the basis of validated projects results

Deliverable 5.5

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1. Executive Summary

The present document relates to task 5.5 R&D and Policy recommendations on the basis of validated projects results of WP5 – Exploitation of results under the DocksTheFuture H2020 Project.

The aim of the document is to formulate policy recommendations for integration of validated project results. It aims to translate political visions into initiatives and actions to deliver 'outcomes" and establish what needs to be done – analysing the underlying rationale for the effectiveness of policies.

It reflects the results of the analysis of different types of inputs, such as reports, papers and other project deliverables and addresses the problem of how the Port of the Future concepts should be covered by specific support from the European Commission in the years to come.

Bearing in mind that exploitation is the use of the results during and after the project's implementation, while it can be for commercial purposes but also for improving policies, and for tackling economic and societal problems, the aim of WP 5 Exploitation of results is to define how to transfer the project results in the most effective way, using the project results for the purpose of enhancing certain policies.

It also analyses the potential spheres/topics where mixing the EU policy instruments can result in better addressing needs as well as solving issues that call for greater attention.

The document begins with an analysis of the results/outcomes of the project implementation (Chapter 2), followed by a holistic set of findings recommendations on the various pre identified topics (Chapter 3). In these chapters we analyse past/future changes in both policies, simultaneously, trying to answer the question about areas in which one can achieve better initiatives by responding to specific challenges of the EU.

The analysis covered the following categories:

- Port infrastructure & management;
- Accessibility and fulfilment of EU standards;
- Integration in supply chain & synchro modality;
- Environmental concerns;
- Sustainability;
- Safety and security;

- Digitalization;
- Port-city relation
- Port governance;
- Human element;
- Relation with neighbouring countries.

Additionally, an Inter-service Consultation is used (Chapter 4), which is a consultation process launched among the different Commission Departments in order to ensure that all aspects of the matter in question are considered.

The Inter-service Consultation does not envisage to question the findings of the previous deliverables/reports. In fact, it uses these findings to nurture and feed the policy options to be used in the consultation process. Furthermore, the results of the consultation will then be inserted in the related chapters of the document, namely chapters 2 and 3 (the majority of votes defines then the best policy option).

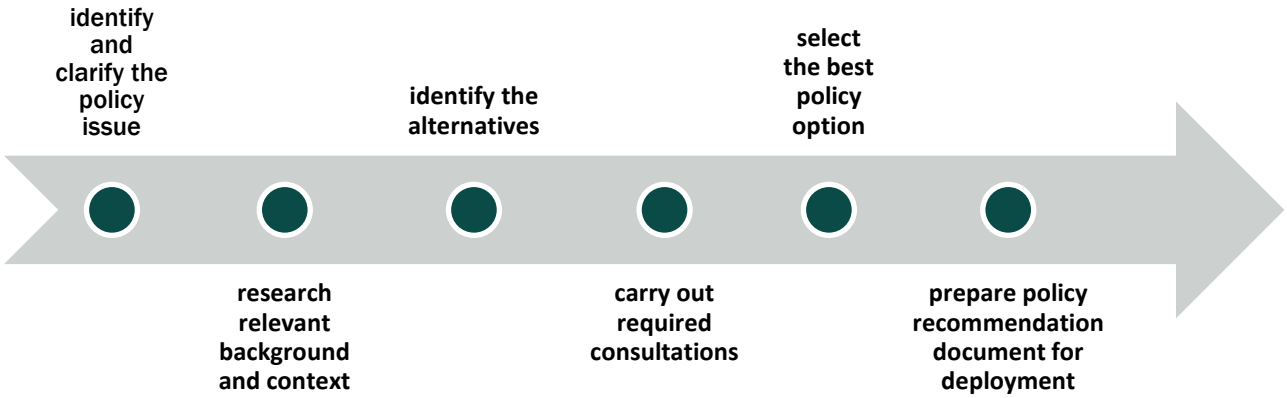
In this way, the present document uses both the validated results of the project and the consultation of different Commission departments and Ten-T Ports to identify the appropriate Policy Recommendations (please see the proposed methodology – section XXX).

In this context and in relation to the Project Background (EC funded initiative, Horizon 2020 Program), the main target for Recommendations will be the European Commission DGs Departments and TEN-T Sea Ports. The following methodology will be used in order to produce DocksTheFuture R&D Recommendations, Policy Recommendations as results to be disseminated and exploited:

- identify and clarify the policy issue;
- research relevant background and context;
- identify the alternatives;
- carry out required consultations;
- select the best policy option;
- prepare policy recommendation document for deployment.

1.1 Methodology

The following methodology will be used in order to produce DocksTheFuture R&D Recommendations, Policy Recommendations as results to be disseminated and exploited:



Identify and clarify the policy issue – analyse existing legislation / policy relevant including future planned legislation (legislative drivers).

Research relevant background and context - through a desktop analysis we will analyse the main policy and R&D recommendations expressed by the stakeholders of the sector.

Identify the alternatives - Define possible options to change / influence existing legislations / policies considering some outcomes of project.

Carry out required consultations – Consult stakeholders on these policy options/alternatives identified).

Select the best policy options and– Define possible policy and R&D recommendations.

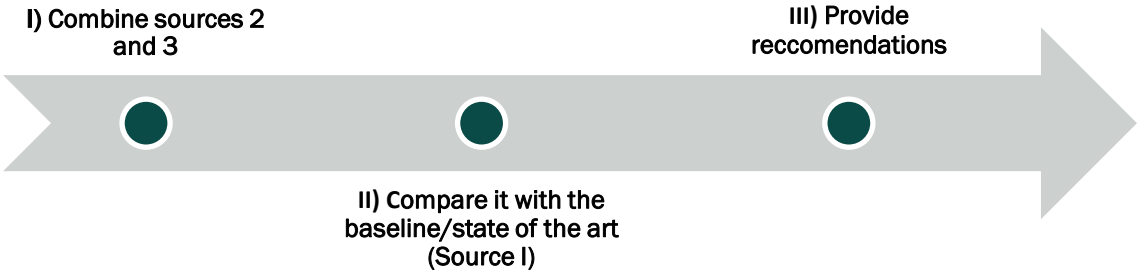
Three sources will feed the deliverable:

1 – State of the art - Current policies, planned regulations, and findings of DTF reports;

2 – Past and future deliverables of the project;

3 – Stakeholder consultation;

Based on these three sources, the deliverable is built on the following methodology:


I) Combine sources 2 and 3
III) Provide reccomendations
II) Compare it with the baseline/state of the art (Source I)

Co-funded by the Horizon 2020 programme
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2. R&D / Policy Issues

Europe is one of the leading maritime centres in the world, home to a thriving maritime services sector and marine equipment industry.

Within this framework, Ports are vital gateways, linking European transport corridors to the rest of the world. As 75% of European external trade transits through EU ports, the shipping sector plays a major role in connecting the European market with its trade partners.

With a dynamic short-sea shipping sector, the European maritime sector also contributes to the development of a competitive and resource efficient transport system in the EU. Today, shipping accounts for around a third of intra-EU exchanges, and annually 400 million passengers embark and disembark at EU ports.

The short definition of a port of the future – as defined in this project - is:

The port of the future delivers value to its customers by deploying managed services. These services have with minimum negative impact on the society and are compliant with all applicable legal instruments. The port of the future delivers these services by running lean business processes supported by maturing technology. These processes can be tailored to the needs of the customers and can be adapted [1]to ever changing circumstances.

However, a number of challenges still persist and limit reaching the potential of the sector. Innovation, changing business, economics and technology are highlighting the need to adapt EU's maritime and ports policy to ensure high standards for safety, security and environmental protection, an efficient internal market and global competitiveness.

A study, commissioned by the European Sea Ports Organisation investigating the future investment needs of European ports, estimates that European ports face investment needs of around 48 € billion for the period 2018-2027. It also shows that port authorities have only been able to obtain 4 percent of the grant envelope over the last 4 years.1

The EU has put in place probably the most extensive and successful legislative framework for safety, environmental protection and quality shipping, which covers the entire chain. While the European approach largely reflects the international obligations set by the International Maritime

[1] THE INFRASTRUCTURE INVESTMENT NEEDS AND FINANCING CHALLENGE OF EUROPEAN PORTS, Report prepared for the European Seaports Organisation (ESPO) Prepared by Peter de Langen, Mateu Turró, Martina Fontanet and Jordi Caballé.

Organisation (IMO), it also ensures that rules are made practically enforceable to protect its ships, coasts and citizens. Nonetheless, additional measures and policies must be put in practice.

Although its environmental record can be one of its greatest assets, the maritime sector needs to ensure its performance is sustained and even improved to effectively tackle climate change, air or water pollution.

2.1 Human element

Ports have significant economic impact for EU. Therefore, the port operations should be handled in efficient way. The education and training of port workers play a significant role for developing ports to respond to the future challenges.

In line with D5.3 Transferability Analysis, the following conclusions were made:

• Training should be according to the port strategy. For C levels this should be about megatrends, so that they know what the future will bring. For operational profiles it should be on the use of new technology, newly automated business processes, new roles, specialized skills, safety, security, accidents with port workers;

• There are several levels of technology knowledge that require new skills, demanding new forms of education and training. E.g. persons able to analyse data;

• Involve other stakeholders in addition to port and city, in the training and education planning process. Among them: education institutes (port training school), metropolitan or even regional transport authorities (depending on the ports), environmental agencies, citizen committees;

• The social dimension is still the most important and humans are the most valuable asset for ports. Therefore, the introduction of new technology should be human centred, focused on gender equality and enhancing good relations with the labour force. In the end a good work life balance is wished for;

Additionally, and related to socio economic development strategies, there is a need for a common education path. Moreover, training could be a tool for improving social inclusion (for instance by helping in finding port-related jobs) and youngsters should be shown the possibilities of career in ports, to orientate them in their studies and job search.

Additionally, the EU maritime transport sector employs around 203,000 people[2]. It is essential to promote a smart and safe work environment. The European Commission has identified key objectives to be reached in this area[3], such as:

i) create and safeguard adequate labour force in the maritime sector, make this sector more attractive to young people and promote maritime safety and security.

ii) upskilling of maritime professionals tackling new challenges coming from new technologies, such as handling alternative fuels or dangerous cargo.

[2] https://stats.unctad.org/handbook/MaritimeTransport/MerchantFleet.html
[3] https://ec.europa.eu/transport/modes/maritime/seafarers_en

Finally, it is of foremost importance to attract women and youth to the industry.

In this sense, the EU Gender Equality Strategy presents policy objectives and actions to make significant progress by 2025 towards a gender-equal Europe. The goal is a Union where women and men are free to pursue their chosen path in life, have equal opportunities to thrive, and can equally participate in and lead our European society.

The key objectives are the following:

- ending gender-based violence;
- challenging gender stereotypes;
- closing gender gaps in the labour market;
- achieving equal participation across different sectors of the economy;
- addressing the gender pay and pension gaps;
- closing the gender care gap and achieving gender balance in decision-making and in politics[4].

[4] https://ec.europa.eu/info/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en

2.2 Port services efficiency

Ports contribute to the long-term competitiveness of European industries in world markets while adding value and jobs in all Union coastal regions. In order to address the challenges facing the maritime transport sector and to improve the efficiency and the sustainability of transport and logistics chains, the full integration of ports in seamless transport and logistics chains is needed to contribute to growth and a more efficient use and functioning of the trans-European transport network and the internal market[5].

In order to guarantee the sustainable development of the sector, private investments represent a core element; nevertheless, to attract them, more convenient conditions have to be created. In particular, it is necessary to guarantee a level playing field as well as to foster transparency and non-discriminatory practices.

Additionally, and aligned with the findings of D1.6 Port of the Future concepts, topics and projects-consolidated versions, the improvement of energy efficiency policies and strategies, indeed, is one of the most cost-effective ways to currently reduce energy-related emissions. It assures affordable energy prices and improves economic competitiveness. For this purpose, the Energy Efficiency Directive (EED; Directive 2012/27/EU) entered into force on in 2012. The EED established a common framework of measures across the Member States to ensure the achievement of the EU's 20% headline target on energy efficiency by 2020, and to pave the way for further energy efficiency improvements beyond this date. The target is to enhance efficient use of energy in supply and demand side and explains requirements of energy audits and energy management systems. This covers both large as well as small and medium-sized enterprises (SMEs). Whilst large enterprises are required to be subject to an energy audit, starting from 5 December 2015 and repeated at least every four years.

Raising the environmental profile of European ports and promoting excellence in port environmental management and performance is one of the European Ports Policy's key priorities[6]. The need for well-connected port infrastructure, efficient and reliable port services and transparent port funding is profound. The European Sea Ports Organisation is the principal interface between European seaports and the European institutions and its policymakers. Since 1996, it has been monitoring the main environmental concerns of European port authorities in Europe. The link

[5] REGULATION (EU) 2017/352 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 February 2017 establishing a framework for the provision of port services and common rules on the financial transparency of ports
[6] Developing a Port Energy Management Plan: Issues, Challenges, and Prospects, Transportation Research Record Journal of the Transportation Research Board

between carbon footprint and climate change has become an important driver of environmental and energy policies at ports over recent years.

This has led to 57% of the European ports to develop energy efficiency programmes[7]. However, this percentage will likely increase, considering the focus of the EU on efficiently addressing port externalities as highlighted in the European Ports Policy. According to the ISO and European standards, ports are starting to develop energy management plans (EnMPs), either at a port authority and/or at a terminal operator level, as part of their overall "green" port policy.

In May 2014, the European Commission (EC) released its Energy Security Strategy[8] in which it developed a set of short- and long-term measures in order to ensure a stable and abundant supply of energy for European citizens and the economy. The European Council endorsed 30% energy efficiency improvement targets (Boile et al, 2015). Ports are increasingly developing policies and practices to reduce the carbon footprint of the ports and their stakeholders. These strategies range from monitoring tools to investments in renewables and carbon-free energy, the development of visions to decarbonise the industry in the port and the imposition of transport modes to be respected by each concessionaire.

Additionally, port energy efficiency initiatives and shifting from fossil fuel-based power sources to renewable energy sources should be further promoted.

[7] Environmental Impacts of International Shipping The Role of Ports, OECD page 130
[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0330&from=EN

2.3 Sustainability and environment

Environmental issues have been and will continue to be a top priority for the EU.

The European Green Deal for the European Union (EU) resets the Commission's commitment to tackling climate and environmental-related challenges that is this generation's defining task.

The European Green Deal is a response to these environmental challenges. It is a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. It also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. At the same time, this transition must be just and inclusive. It must put people first, and pay attention to the regions, industries and workers who will face the greatest challenges. Since it will bring substantial change, active public participation and confidence in the transition is paramount if policies are to work and be accepted. A new pact is needed to bring together citizens in all their diversity, with national, regional, local authorities, civil society and industry working closely with the EU's institutions and consultative bodies[9].

One big potential change on the EU policy scene relates to green taxation. The possibility of a "carbon border adjustment mechanism" has been formally included in the proposed policy measures of the Green Deal, and the maritime sector is likely to be impacted, in particular through its effects on trade.

The focus on decarbonisation of the maritime sector points to an important need for projects innovating in for example ship propulsion the mid-term priority should be on non-fossil fuel power and long-distance capability. New engine types should also be considered.

The EU Energy Taxation Directive 2003/96/EC is also on the agenda for revision and could result both in a different energy tax structure, i.e. affecting shore side electricity, and put an end to the current tax exemption for shipping fuels. This would have an important impact on the maritime sector's choice of fuels.

Furthermore, work is currently underway in the European Commission to come up with a Green Taxonomy, in order to harmonise European standards and avoid greenwashing and to classify environmentally sustainable activities.

The EU has the collective ability to transform its economy and society to put it on a more sustainable path. It can build on its strengths as a global leader on climate and environmental measures, consumer protection, and workers' rights. Delivering additional reductions in emissions is a challenge. It will require massive public investment and increased efforts to direct private

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640&from=EN

capital towards climate and environmental action, while avoiding lock-in into unsustainable practices. The EU must be at the forefront of coordinating international efforts towards building a coherent financial system that supports sustainable solutions.

This upfront investment is also an opportunity to put Europe firmly on a new path of sustainable and inclusive growth. The European Green Deal will accelerate and underpin the transition needed in all sectors. The environmental ambition of the Green Deal will not be achieved by Europe acting alone. The drivers of climate change and biodiversity loss are global and are not limited by national borders. The EU can use its influence, expertise and financial resources to mobilise its neighbours and partners to join them on a sustainable path.

In line with the abovementioned, Ports subscribed to the Paris Climate Agreement goal which aims to keep the increase in global average temperature to well below 2 °C above pre-industrial levels. Port community actors can collaborate in refining and developing tools to facilitate reduction of CO_2 and greenhouse gas emissions from shipping, port and landside operations. In addition, they can take initiatives to enable energy transition, improve energy efficiency and stimulate circular economy.

GHG emission reduction from ships is the highest priority right now. Initiatives include providing onshore power supply, incentivising best-performing vessels, investing in infrastructure to supply low carbon fuels and port call optimization. This is in line with the international policy developments at the level of the International Maritime Organization and its Initial Strategy on GHG emission reduction, which aims at least halving emissions from international shipping by 2050, compared to 2008 levels[10].

Another priority is improving energy efficiency of operations in the port area. This is being achieved through innovative processes and technologies addressing the production, demonstration and implementation of clean and renewable energy in ports. So far, few of the submitted projects address the issues around circular economy and the management of ecosystems for carbon capture and adaptation to climate change.

The reduction of the EU's carbon footprint is high on the agenda of the European Commission. Transport, as one of the main sources of the CO_2 emissions, will be closely in the focus, including the shift to more sustainable transport modes. The modal split data collection is essential to demonstrate the positive impacts of the initiatives taken by European ports to promote sustainable transport modes.

Based on D1.6 Port of the Future concepts, topics and projects-consolidated versions the need of a Port Energy Management Plan (PEMP) was discussed, since it is a crucial tool to address

[10] http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/GHG-Emissions.aspx

environmental objectives by structuring an in-detailed analysis of the current energy consumption in the port area and subsequently propose potential energy-saving solutions. The primary objective is to maximise the profit and to minimise the cost in a low-carbon economy systematic approach. In detail there are three groups of specific objectives to be achieved by Energy Management System application in EU Ports:

To meet the following European Directives and strategies at local and regional levels:

- Energy Efficiency Directive (EED; Directive 2012/27/EU);
- Directive 2014/94/EU on the deployment of alternative fuels infrastructure;
- Europe 2020: A European Strategy for Smart, Sustainable and Inclusive Growth;
- European Energy Security Strategy, published in 2014 by EU Commission.

To address environmental concerns:

- Reduction in energy consumption and consequently CO_2 Emission from port activities;
- Defining goals that result in the reduction of port-related Air Pollutant Emissions and the health cost on local communities in port-city;
- Raising the environmental profile/performance of ports and promoting innovation in sustainability;
- To reduce the energy consumption and improve the air quality which is currently the top priority of EU Ports according to ESPO 2016 Report;
- Improving environmental, energy and port performance in a systematic and standardised approach;
- Future proofing against the effects of climate change.

To support the port's sustainable growth through:

- Reduced energy consumption bills and its invoke the related cost savings;
- Reduction in Capital investments to meet the growing energy demand in the future;
- Improvement in the competitiveness through reduction of operational costs and increased energy supply reliability;
- Being cost-effective with environmental regulations;
- The increase of port efficiency and port performance.

The energy management framework helps Port Authorities to establish systemic energy management and to make all energy-related processes more efficient. It facilitates the documentation of all energy consumption and the reveal the potential for saving energy. It will lead to an economically, environmentally and socially sustainable port that is well aligned with all local, national and European policies. Within this process, the active participation of all key port

community stakeholders and the use of best practices in energy policies are the important prerequisites. Finally, through the port's energy management system, goals will be set to address the following:

- Resiliency: ability to sustain business continuity during a power outage and resume operations after a catastrophic event.
- Availability: access to energy sources that are required in order to meet present and future power demand of port operations through energy generation, transmission and distribution.
- Reliability: availability of high quality and consistent energy able to meet predicted peaks in demand.
- Efficiency: reductions in energy demand through management practices and technologies that maximize operational productivity and cost-effectiveness.
- Sustainability: integration of energy efficient practices and renewable power generation to minimize the depletion of natural resources.

In addition to the abovementioned and in line with the findings of D.1.4 'Analysis of Macro trends and perspectives-key results', the global economic and societal development will lead to an overall up warding demand for energy. In order to meet the demand within the time horizon until 2030, it is expected that fossil sources will play further on an essential role for the production of energy, even if alternative energy sources will gain an increased importance over the years to come[11]. However, alternative energy sources will continue to enhance market shares like offshore wind farms and other sea-related energy sources like technologies using the energy of waves and tidal currents. Positive impacts are expected for ports from production and handling sites for offshore platforms and other equipment and bases for related logistic services like maintenance and supply.

Furthermore, with the irreversible force and trend to reduce maritime shipping emissions there will be additional challenges for the ports on a global level – particularly with regard to port-city relations and the need for public acceptance of port operations and their negative impact.

Thus, the role of ports in the reduction of emissions from shipping and ports' operations will further increase. As done in the recent years, ports will have to initiate emissions reduction measures like infrastructure developments, incentives and regulations relevant for ship operators when calling a port but also for terminal operators and logistic providers involved in port and hinterland processes (e.g. pre- and on-carriage by trucks). Provisions of infrastructures for alternative fuels (like LNG or Onshore Power Supply) and for efficient hinterland processes (e.g. pre-gate systems), development

[11] Conclusion from D.1.4 'Analysis of Macro trends and perspectives-key results

of port-emission-reduction-strategies (e.g. by aiming at 'zero-emission terminals') as well as introductions of incentives for vessel operators to enhance their environmental performances of vessels (e.g. rebate systems in port charges like ESI) will be ongoing challenges for ports to contribute to local and global environmental improvements of the maritime sector.

Moreover, when analysing the current strategic documents from the EU, reflecting if they sufficiently cover the needs of the ports in 2030, the Projects outcomes resulted in the conclusion that the EU should:

- Develop one common strategy or else our supply chains will be taken over by external players and countries;
- Making the pollution costs clear;
- Provide more incentives and funds among others for greening ports.

As regards to sustainable investments, DTF understands that we shouldn´t consider sustainability as a cost. The regulator should enforce certain investments, since sustainable investments are not necessarily more costly because they can be economically beneficial, especially in the long-term. For this, one should make stronger concession agreements and include KPI's about sustainability.

Additionally, Shore-side power supply should also be further explored and developed, and capacity should be improved on the shore side increased, particularly in ports situated close to densely populated areas. Persistent local air and noise emissions in particular in city ports continue to be problematic, making the case for onshore power supply an urgent need.

Sustainability is the integration of three pillars: social, environmental, economical. Ports that are to design their future will have to integrate in their vision and mission these three pillars and pursue in their activities and operations objectives balanced upon these three elements.

2.4 Digitalisation

Ports are taking significant strides with digital transformation and are starting to declare themselves as "smart." The result is impressive gains in operational efficiency, regulatory compliance, and customer satisfaction. Smart ports have the opportunity to establish themselves as logistics information exchange hubs serving their regional transport ecosystem.

As ports digitalize their processes, they establish foundations for providing benefits to other participants in the transport ecosystems. A landscape of new revenue-generating information services enabling carriers, shippers, and other players to significantly improve their operational predictability, efficiency, visibility, and capacity utilization is now opening.

Optimisation of port operations, and the whole supply chain, through ICT solutions continues to be another trend to look out for in the maritime sector. New technologies are rapidly changing the transport and logistics landscape, hence requesting all transport, logistics and supply chains actors, including inland and sea ports, to be more innovative and agile. Port authorities need to prepare for and invest now in their digital future. However, it is often unclear what "digital" means for a port organisation, its core business and the port community at large. Port digitalization is in fact a long-term process which requires port organisations and port stakeholders alike to undergo continuous structural, functional and strategic transformations.

Digitalization will continue to be a key driver for ports going forward[12]. With the past decade seeing a lot of new technologies enter the market these new technologies and possibilities will likely be rapidly adopted and established going forward. As an enabler of trade, and in a rapidly- changing world, the maritime sector has to ensure that it assimilates the newest technology developments in a timely manner in order to stay competitive and attractive to businesses and passengers.

Furthermore, digitalization can assist ports to enhance the efficiency of processes and operations, ensuring that they become more environmentally sustainable, economically efficient and capable of handling increased port traffic. Advances in automation and new innovative technologies, including Artificial Intelligence (AI), big data, Internet of Things (IoT) and blockchain, offer great opportunities for ports. In this context the 'Smart Port' concept has emerged. Smart Ports use technology solutions to increase efficiency and improve security.

In line with the discussions under D1.6 "Port of the Future concepts, topics and projects-consolidated versions", the Project debated around the following questions:

- What are the main technologies that will affect ports in 2030 concerning?

[12] https://www.porttechnology.org/news/ports-and-shipping-what-to-expect-in-2020/

- What new technologies might have a disruptive nature? What current jobs or businesses can we expect to be most affected by what technology trends? What opportunities?
- What business models will fundamentally change as a consequence of new technology?

The project reached the following consolidated answers:

- Major technology change might come from small start-ups;
- Look at different data sharing platforms (NxtPort, Port+, PierNEXT, The Docks);
- Look at industry 4.0 and see how this would affect ports of the future;
- Focus on (ICT) education and training;
- Completely new business models and business processes as a consequence of the introduction of new IT technology;
- The introduction of new technology is not an end goal but just a means to get to a goal. e.g. The use of technology could lead to a more effective use of infrastructure, avoid congestion;
- We need to define the applicability of new technology. E.g. autonomous vehicles would be feasible on terminals, for small barges, but probably not between islands;
- The more a port is specialised the more opportunities there are for automation;

- ICT platforms should not be stand-alone islands but integrated in a federated architecture;
- More available data also means that we would have better statistics available, quicker;
- As a consequence of new technologies, operational processes will run faster, so administrative processes should also run faster.

Additionally, ICT can be used for a better time scheduling along the logistic chain, in order to reduce congestions in the hinterland.

As regards to and in order to pursue the interoperability of data sharing and improve interconnection between maritime operators, customs, ports and other supply chain stakeholders in regards to vessel calls and cargo management, should consider the concept of the “federated network of platforms”, facilitatedby the Digital Transport and Logistic Forum (DTLF)[13]. The

[13] They facilitate the building of a common vision and road map for digital transport and logistics. The DTLF also contributes to identifying needs for measures at EU level and supporting their development and implementation where relevant.

federated network of platforms represents a decentralised data exchange environment in transport and logistics, based on common rules and principles, and connecting existing and emerging data sources and platforms.

Interoperability can be boosted by new technologies used to streamline different types of operations and to exchange data in real time. Blockchain may be able to:

- speed up cargo checks;
- supporting clearing procedures;
- Secured container release;
- Facilitate payments;
- Release of essential ship/cargo information to other stakeholders;
- Booking of time slots.

Thus, favouring transparency and fraud detection.

Additional technologies are emerging in terms of favouring the multimodal logistic chain such as Artificial Intelligence, Machine Learning, IoT and Robotic Process Automation.

2.5 Relation with neighbouring countries

Efficient infrastructure and connections create growth and jobs and enable people and goods to move. From transport links to energy networks, people-to-people contacts to digital webs, the EU must extend its own networks and contribute to new ones beyond its borders.

Our world depends on smooth and secure flows of goods, services and people. With a track record of a rules-based, fair and transparent internal market, the European Union is engaging with partners beyond its borders in order to promote similar approaches to sustainable connectivity.

The EU should pursue bilateral connectivity partnerships. The EU-China Connectivity Platform, for example, helps both parties to create synergies and address differing points of view. At a regional level, the EU is able to draw on its experience of contributing to the enhanced connectivity and integration of various regional cooperation structures, for example in the Baltic and Black Seas, as well as with ASEAN and as part of the ASEM process. Fostering increased region-to-region cooperation in connectivity would enable the European Union to extend its sustainable and rules-based connectivity model.

A better-connected Europe with neighbouring countries through transport links, energy, human and digital networks will strengthen the resilience of societies and regions, facilitate trade, promote the rules-based international order, and create avenues for a more sustainable, low-carbon future.

As regards to this topic the DTF project – specially in its D1.5 'Port of the Future concepts, topics and projects' – worked around the following questions:

How should the EU or its members states cooperate with other countries?

How should the EU ensure the knowledge transfer to and from neighbouring countries?

Based on these questions, the project reached the conclusion that there is a need for a unified EU voice about mature ideas and a reflection on how to plan the infrastructure – to expand and to cooperate with other non-EU countries. In addition, there is a lack of promotion of more logistics spaces – to establish a package of logistics (or logistics services) across countries.

In terms of Europe neighbouring countries, the trend is Africa. According to the African Development Bank, African economic growth was (pre-Covid-19) projected to accelerate to 4 percent in 2019 and 4.1 percent in 2020[14]. Following the new EU Africa Strategy announced on

[14] https://www.afdb.org/en/documents/african-economic-outlook-aeo-2019-english-version
https://www.worldbank.org/en/news/press-release/2012/10/04/despite-global-slowdown-african-economies-growing-strongly-world-bank-urges-countries-spend-new-oil-gas-mineral-wealth-wisely

March 9th one can anticipate an intensified cooperation between the two continents. Nonetheless, strong benefits can be obtained also from closer ties with Asia in particular through the Black Sea basin. Additionally, establishing regular short sea shipping links with non-African Mediterranean neighbours, such as Turkey, Israel or, Lebanon still presents strong advantages for the European maritime industry.

2.6 Port-city relation

This topic on port-city relations has been an issue for a number of decades when ports and cities started to lose their mutual interdependence and their developments since then has influenced each other.

The maritime transport sector, i.e. shipping and ports evolved like e.g. in terms of vessel developments, transport and ICT technologies, required terminal infrastructures and stacking areas, increasing volumes in port handling and pre- and on carriages, sea-side access, hinterland infrastructures, and port adjacent logistic services. The developments have been necessary to maintain ports' competitiveness in a fast-changing environment which has been heavily influenced by the demand side for port services. In addition to these factors which have driven ports' development in the recent past, a consequence of advanced ship and port technologies has been a decline in jobs for port workers.

In the meantime, urbanisation in port cities advanced. Populations in cities have grown and thus more living space has been required. Here, revitalisation of non-used older port areas has been only a part-solution to create new modern living quarters but also leisure facilities and commercial services, which only partly have links to the port business. Hence, port-city developments can be characterised as an increasing rivalry for limited land resources and in parallel by a decrease in benefits from ports for their port cities (e.g. in terms of employment) and an increase in negative consequences from port operations like environmental impacts and traffic congestions.

The importance of the port function for the city may be different in each situation, allowing to identify three situations in which:

- Port's functions dominate the urban functions (e.g. Rotterdam).
- Port's and urban functions have equivalent importance (e.g. Amsterdam).
- Urban functions dominate the port functions

(e.g. New York), the port holds a secondary role in the city.

The project addressed this topic, namely and specially in D1.3 'Maritime traffic analysis and forecast review-key results', where port-city developments were and can be characterised as an increasing rivalry for limited land resources and in parallel by a decrease in societal benefits from ports to their port cities (e.g. in terms of employment, revenue, establishment of international companies in city, …) and an increase in negative consequences from port operations like environmental impacts and traffic congestions.

Particularly environmental impacts from port operations on cities have become essential issues in the past which will even enhance in the future. The reduction of exposures from emissions and noise is a key issue here - particularly the reduction of emissions like SOx, NOx and PM as these emissions have strong local impacts on health, well-being and thus on quality of life of populations in and around port cities.

Thus, the adoption of green technologies is critical to reduce the environmental impact of port operations on port city, and to save resources. The adoption of some of the following technologies is part of the current debate among cities and port authorities:

- LNG
- Eolic Off-Shore energy
- Wave energy
- Cold ironing

Relocations of port areas or terminals and settling of new terminals outside urban areas is an ongoing trend to relieve port cities from pollutions and other inconveniences caused by port operations.

Further promoting a modal shift by increasing the share of environmental friendlier rail and inland waterway transport will remain a trend to lessen environmental conflicts in port-city relations. However, as road transport will have also in the future a significant share in the modal transport split, it will remain an essential challenge for ports and port cities to improve road transport's environmental performance by increasing its efficiency – in addition to new technologies from the truck manufacturing industries like autonomous vehicles, and alternative fuels. Here, technology solutions together with spatial planning are to be used, like e.g. truck-appointment-systems and pre-gate-systems which are joint issues of port authorities and urban development departments.

Additional measures will be required here to reduce local emissions in port areas also affecting port city populations. Besides the aim to tackle the issue of local emissions, port-city relations will have to cope also in the future with challenges deriving from climate change. Predicted increasing number of natural disasters like e.g. extreme rainfalls, high floods, winds, and a rising sea level will affect also ports and port cities and needs joint measures to develop the required port infrastructures. Hence, developments to reduce environmental impacts from ports will be also crucial drivers for port-city relations.

The development of economic clusters taking advantage not only of the ports but of the overall adjacent maritime business provide the chance to create mutual benefits between ports and cities and will be essential for port-city relations. Tourist activities like event tourism, leisure sailing, historical museums and gastronomy or new marine business-like offshore wind farms with production site and adjacent logistic services using benefits that port areas provide are examples for economic clusters benefiting ports and cities.

As environmental impacts from port operations, the provision of efficient port infrastructures and traffic systems, revitalisation of port areas or the development of new economic clusters and the balancing of interest and needs of ports and cities are complex issues and often interfering with each other, a good governance structure involving port authorities is key for sustainable port-city relations.

A survey was done in 2018 in the scope of the DTF project by AIVP *L´association int'l des villes portuaires*[15] , to understand the priorities of port-city actors, by asking their leaders or top managers. To do the survey, AIVP invited 3500 organizations worldwide, of which 224 responded to the call. The questions that were formulated in this survey reflect on the dominant topics that have been considered crucial for the port-city relationship either by AIVP or by experts in congresses, academic literature or specialized media.

Despite the sectorial differences, and tension that may emerge among port and city actors, the survey demonstrates that there is considerable common ground in the main issues like waterfront organization, port expansion, energy or mobility.

Cooperative approach is reflected in other answers in the survey, to develop hybrid waterfronts, preparing the local economy to answer to global companies, cooperate to finance projects, or develop the port-city interface to reduce the port nuances.

The concern to reduce port externalities was visible in several questions, indicating that port city actors, and mostly port authorities, are increasingly aware of the problem.

Mobility was considered an important problem for spatial organization in port cities, where there is the added challenge of port generated traffic, either by cargo or passenger. Predilection for:

- improving public transport,
- supporting multimodality.
- coordinating traffic plans and

[15] http://www.aivp.org/

• using smart tech is a top priority, but ports prioritize a sectorial approach, insisting on dedicated infrastructure.

Circular economy was considered the last priority regarding economic issues, protecting biodiversity was not among the top-3 environmental issues, while participatory processes were also the last priority among governance concerns.

In conclusion:

• port and city actors are aware of the problems; they believe it is important and show willingness to cooperate and find solutions. The question is then how can this cooperative spirit be translated into concrete actions supported by all actors;

• We cannot rely only on technological innovation to address all challenges related to sustainable development and sustainable port-city relationships;

• It is necessary that the "smart" tech is accompanied by new mindsets and governance structures that can profit from the new tools, otherwise, we risk making changes only superficially, without tackling the core of the problems;

Although port city actors recognize the importance of several key topics such As Sustainability, energy transition, circular economy, or protecting biodiversity emphasized, the Economic focus of ports still remains dominant, not recognizing these new issues as top priorities

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3. DTF Findings / Recomendations

Policy Area	Recommendation	Benefits
Human element	Promote a common education path and possibly shared physical space Youngsters should be shown the possibilities of career in ports, to orientate them in their studies and job search Training should be according to the port strategy and visions New type of workers will require new forms of education and training Involve other actors in addition to port and city in the planning process introduction of new technology should be human centred strive Focus on (ICT) education and training Create and safeguard adequate labour force in the maritime sector promote maritime safety and security upskilling of maritime professionals	Training could be a tool for improving social inclusion (for instance by helping in finding port-related jobs) strive for gender equality and for good relations with the labour force New labour able to analyse data make this sector more attractive to young people tackle new challenges coming from new technologies, such as handling alternative fuels or dangerous cargo
Port services efficiency	improvement of energy efficiency policies and strategies Publish open data. Raise the environmental profile of European ports need for projects innovating in ship propulsion and efficiency priority on non-fossil fuel power and long-distance capability New engine types	producers would have an incentive to curtail waste production improve the security of supply reduce energy-related emissions energy efficiency improvements

Sustainability and environmental concerns	Reduction in energy consumption and consequently CO_2 emission from port activities. Defining goals that result in the reduction of port-related Air Pollutant Emissions and the health cost on local communities in port-city Raising the environmental profile/performance of ports and promoting innovation in sustainability. To reduce the energy consumption and improve the air quality which is currently the top priority of EU Ports according to ESPO 2016 Report. Improving environmental, energy and port performance in a systematic and standardised approach. Future proofing against the effects of climate change. Develop one common vision and strategy or else our supply chains will be taken over by external players and countries; Making the pollution costs clear Provide more incentives and funds among others for greening ports; Make stronger concession agreements and include KPI's about sustainability – make it a common practice	Reduced energy consumption bills and its related cost savings. Reduction in Capital investments to meet the growing energy demand in the future. Improvement in the competitiveness through reduction of operational costs and increased supply reliability. Being cost-effective with environmental regulations. The increase of efficiency and port performance Improving port's market position Sustainable investments are not necessarily more costly, they can be economically beneficial, especially in the long-term
Digitalisation	Incentivise investment in the digital future Integrate ICT Platforms in a federate architecture Enhance Port specialization More data available	assist ports to enhance the efficiency of processes and operations higher efficiency and speed regarding port processes As a consequence of new technologies, operational processes will run faster, so

	Define the applicability of new technology Focus on (ICT) education and training Better time scheduling along the logistic chain pursue the interoperability of data sharing and improve interconnection between maritime operators, customs, ports, and other supply chain stakeholders in regard to vessel calls and cargo management Smart systems using such tools for transparency and fraud detection should also be further explored.	administrative processes should also run faster The use of technology could lead to a more effective use of infrastructure, avoid congestion Completely new business models and business processes reduce congestions in the hinterland speed up cargo checks; supporting clearing procedures favour transparency and fraud detection streamline maritime logistics operations, speed up cargo checks, decrease the risk of delays and penalties levied on for customs compliance
Relation with neighbouring countries	a unified EU voice Reflection on how to plan the infrastructure – to expand and to cooperate with other non- countries closer ties with Asia in particular through the Black Sea basin. Additionally, establishing regular short sea shipping links with non-African Mediterranean neighbours, such as Turkey, Israel or, Lebanon	stablish a package of logistic across countries enhance cooperation
Port-city relation	Provision of efficient port infrastructures and traffic systems Revitalisation of port areas New economic clusters Balancing of interest and needs of ports and cities Shore-side power supply should also be further explored and developed	reduce local emissions optimise port-related traffic with regard to competitive hinterland structures creation of mutual benefits between ports and cities

	Capacity should be improved on the shore side increased, particularly in ports situated close to densely populated areas.	

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4. Stakeholder Consultation

Explanatory note

Stakeholders Engagement is a continuous and systematic process by which an organisation establishes a constructive dialogue and a fruitful communication with its key stakeholders. The purpose of involvement is to contribute both for decision makers' expectations and interests of stakeholders, so that the former can take the gathered inputs into account in decision making. Ports, indeed, represent areas where different conflicting interests (environmental, social and economic) meet. Ports are not just an organisation by themselves, separated from their environment, but are also embedded in the local, regional, national and international environment and this has to be reflected in the stakeholders' engagement.

This consultation process was launched in order to ensure that all aspects of the matter in question are considered. This exercise will use these findings to nurture and feed the policy options to be used in the consultation process. Furthermore, the results of the consultation will then be inserted in the related chapters of the document.

In this way, the present document will use the consultation to develop and suggest the appropriate Policy Recommendations.

The stakeholder's selection will be carried out having as a basis the content, the expected results and the impacts of the project, as well as the available resources, the objectives of the engagement, and the willingness or the ability of the stakeholders to engage and to be involved to the project. Nonetheless, the main target for this part of the Recommendations will be European Commission DGs Departments and TEN-T Sea Ports.

The following European DGs and TEN-T Sea Ports are/will be interviewed:

- European Commission Directorate-General Clima
- European Commission Directorate-General Environment
- European Commission Directorate-General Employment, Social Affairs and Inclusion
- European Commission Directorate-General Energy
- European Commission Directorate-General Informatics
- European Commission Directorate-General International Cooperation and Development
- European Commission Directorate-General Maritime Affairs and Fisheries
- European Commission Directorate-General Mobility and Transport

- European Commission Directorate-General Research and Innovation
- TEN-T Sea Ports

The results will then be reported on the D5.7 Port of the Future Roadmap 2030 which is due to deliver on November 2020.

The stakeholder questionnaire is the following:

Name of the European Commission DG / TEN-T Sea Port:

Type of the organization:

European Commission Directorate-General ☐

Port Operator ☐

Port Authority ☐

Please indicate how much your organization activities are connected with ports on a scale from 1 to 10 (1= not connected / 10= extremely connected)[16]:

1 ☐

2 ☐

3 ☐

4 ☐

5 ☐

6 ☐

7 ☐

8 ☐

[16] by hours worked on port topics

9 ☐

10 ☐

For each of the following topics, please indicate what is their level of importance in a scale from 0 to 5, where 5 is very important and 0 means not important (these topics are related to enhancing the innovation and addressing current and future challenges in ports).

Topic	0	1	2	3	4	5
Create a R&D projects portfolio						
Increase project transferability from research to deployment						
Modal shift in transport from roads and air to ferries and short sea shipping						
Make the EU a frontrunner in low- and zero-carbon technologies						
EU cohesion on all transport system and an integrated multi-modal transport approach						
Incentivise investment in the digital future						
Raising the environmental profile/performance of ports and promoting innovation in sustainability.						
introduction of human centred strive new technology						
Predictability and consistency from European institutions in terms of legislation						
Harmonization of education and training of port workers in EU						
Focus on (ICT) education and training						
Use of solar power						
Emission reductions						
Make stronger concession agreements and include KPI's about sustainability						
Energy transition towards new energy store facilities and energy production						
Improving environmental, energy and port performance in a systematic and standardised approach.						
Incentivise investment in the digital future						
Support circular economy schemes						

promotion of more logistics spaces						
Increase financial and human support to small ports, islands and deserted areas						
Increase resilience against climate change						

Please rank in order of importance the following issues of Port workers education and training.

Please indicate any additional issues that you believe are of foremost importance.

- New forms of education and training
- Training and education according to the particular port strategy
- Actively promote the possibilities of careers in ports
- Involve other actors in the education and training planning

1.
2.
3.
4.

Please rank in order of importance the following issues of Digitalisation.

Please indicate any additional issues that you believe are of foremost importance.

- Provide more data available;
- Focus on (ICT) education and training;
- Incentivise investment in the digital future.

My top three list of digitalisation issues is: 1. 2. 3

Please rank in order of importance the following issues of Port Sustainability.

Please indicate any additional issues that you believe are of foremost importance.

- Energy savings;

- Waste emission from industry;

- Cargo waste;

- Polluter pays.

My list of priorities for Port Sustainability issues:

1.

2.

3.

4.

Please rank in order of importance the following issues of Port-city relations.

Please indicate any additional issues that you believe are of foremost importance.

- Revitalisation of obsolete port areas;

- Creation of new economic clusters;

- Provision of efficient port infrastructures and traffic systems.

My....

1.

2.

3.

4.1 Consultation Findings

Policy Area	Recommendation
Human element	
Port services efficiency	
Sustainability and environmental concerns	
Digitalisation	
Relation with neighbouring countries	
Port-city relation	

5. Conclusions

Based on the information provided in the previous chapters it is obvious that the topic of sustainability, and especially environmental sustainability, is recognized as a major issue for European Ports. Although its environmental record can be one of its greatest assets, the maritime sector needs to ensure its performance is sustained and even improved to effectively tackle climate change, air or water pollution. Sustainability is the integration of three pillars: social, environmental, economical. Ports that are to design their future will have to integrate in their vision and mission these three pillars and pursue in their activities and operations objectives balanced upon these three elements.

Additionally, and related to socio economic development strategies, there is a need for a common education path. Moreover, training could be a tool for improving social inclusion (for instance by helping in finding port-related jobs) and youngsters should be shown the possibilities of career in ports, to orientate them in their studies and job search.

Moreover, the need for well-connected port infrastructure, efficient and reliable port services and transparent port funding is profound.

Digitalization will continue to be a key driver for ports going forward. With the past decade seeing a lot of new technologies enter the market these new technologies and possibilities will likely be rapidly adopted and established going forward.

Furthermore, the project recognizes that a better-connected Europe with neighbouring countries through transport links, energy, human and digital networks will strengthen the resilience of societies and regions, facilitate trade, promote the rules-based international order, and create avenues for a more sustainable, low-carbon future.

This chapter needs further inputs based on the results of the stakeholder consultation (chapter 4). Once the project collects the results of the consultation this chapter will be improved accordingly.

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6. Bibliography

Relevant studies, publications and position papers

- Study on reporting obligation resulting from Directive 2010/65/EU
- Ex-Post evaluation of Directive 2000/59/EC on port reception facilities (PRF) for ship-generated
waste and cargo residues
- Support study for an Impact Assessment on: Directive 2002/59/EC as amended - "The Union Vessel Traffic Monitoring and Information System"
- Study to assess the future evolution of SSN to support CISE and other communities
- Port Labour in the EU: Labour Market Qualifications & Training Health & Safety Volume I and II
- State of the European Port System – Market Trends and Structure Update:
Final Report of the Study aimed at supporting an impact assessment on: "Measures to enhance the efficiency and quality of port services in the EU";
- **Synthèse thématique des recherches : le transport maritime et fluvial;**
- Thematic Research Summary: Infrastructure and TEN-T;
- World Ports Sustainability Report 2020, The World Ports Sustainability Program;
- ScienceDirect, Changing training needs of port workers due to future trends, Ville Hinkka, Jenni Eckhardt, Antti Permala, Heikki Mantsinen;
- Position Paper, A Green Deal for the European shipping industry, European Community Shipowners' Associations.

Communications from the Commission

- The European Green Deal, Brussels, 11.12.2019 COM (2019) 640 final

The EU Transport Strategy and Motorways of the Sea

- Commission Comm. on Europe 2020: A strategy for smart, sustainable and inclusive growth
- The Commission Communication on the White Paper on Transport 2011 (currently under review)
- The Commission Communication on the EU Maritime Strategy 2018 (currently under review)
- The Commission Communication on Building the Transport Core Network: Core Network Corridors and Connecting Europe Facility.
- Decision 1692/1996 on Community guidelines for the development of the trans-European transport network
- Regulation 1315/2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU
- The annual reports of former MoS Coordinator Luis Valente de Oliveira
- MoS Work Plan of the European Coordinator Brian Simpson
- Core Network Corridors - Progress Report of the European Coordinators Corridors Studies and work plans of the nine core network corridors

EU legislative requirements

- Directive 2014/94/EC on the deployment of alternative fuels infrastructure
- Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system
- Directive 2010/65/EC on reporting formalities for ships arriving in and/or departing from ports of other Member States
- Directive 2000/59/EC on Port Reception Facilities for ship-generated waste and cargo residues
- Directive 2005/65/EC on Port Security
- Proposal for a Regulation on market access to port services and financial transparency of ports

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