D.3.1.1 Project exploitation plan

Identifying results, exploitable routes and associated risks

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1 Introduction

The main objective of WP3 is to gather the results of the IT-HR and other EU projects on ICT applied to multimodal freight transport as to feed the 2021-2027 Programming Period and transfer them at transnational level. First, led by PP4, PPs gather the already available results and knowledge in this field. With the support of all PPs, PP3 develops an exploitation plan, suggesting the strategy of how to make the most use of cluster project results, PP7 collects the main project results in this field achieved by IT-HR projects and PP2 does the same with projects co-funded by other ETC Programmes, CEF and H2020/Horizon Europe. Besides, KIP analyses the most recent ICT innovations and best practices, such as blockchain, IoT and 5G applications, Also, PP1 and PP4 define the structure of a cross-border training curriculum on ICT application in the freight transport sector. Then, led by PP6, PPs contribute to the 2021-2027 programming period. With the support of all PPs, PP6 develops three project ideas supporting the implementation of IT-HR 2021-2027 priority 3.2 for improving the intermodality capacities of ports, including project objectives, expected results, outputs, list of activities, profiles of the most suitable PPs. Also, PP3 drafts a “Flagship Paper” describing the thematic contribution that the cluster project could give in regard to the EUSAIR. Finally, led by PP1, PPs engage maritime and multimodal transport stakeholders of other Italian and Croatia ports by presenting the thematic contents developed in the previous activities in ad-hoc targeted events: PP1 in the port of Venice, PP2 in the port of Ravenna, LP in the port of Bari, PP5 in the port of Split and PP7 in the port of Zadar. Besides, in the framework of the high-level final conference (D.2.1.4), LP organizes a physical/virtual thematic seminar in combination with initiatives/EU Programmes. WP3 is led by PP3 with the full engagement of all PPs.
As a result, the main outputs are:

- O.3.1 – Cross-border inventory of projects' results, with the main outputs from the involved IT-HR Standard and Standard+ projects on ICT applied to freight transport.
- O.3.2 – Transnational inventory of projects' results, with main outputs from EU-funded projects of other crossborder and transnational ETC, H2020 or CEF Programmes on ICT applied to freight transport
- O.3.3 – Best practice analysis, with most recent developments on ICT tools for enhancing maritime and multimodal transport (e.g. blockchain, 5G and IoT applications)
- O.3.4 – Cross-border training curriculum on ICT application in the freight transport sector
- O.3.5 – Project ideas for the 2021-2027 programming period
- O.3.6 – EUSAIR flagship paper, describing the thematic contribution that the cluster project could give in regard to the EUSAIR Flagship "Smart/green ports" on digitalisation
- O.3.7 – Study visits to five Italian and Croatian ports, engaging stakeholders and illustrating available technical documents (O.3.1-4)
- O.3.8 – Thematic seminar with other initiatives/EU Programmes on project results tackling ICT applied to multimodal transport, jointly with the high-level final conference.

The aim of this document is to suggest a strategy to make the most use of results deriving from DIGSEA outputs O.3.1.-O.3.4.
The document is structured as follows. In Section 2, we illustrate the methodology used to identify and qualify the exploitable results. Section 3 is devoted to discussing which stakeholders might potentially be interested in exploiting the results of the DIGSEA outputs. Section 4 explores the potential exploitation routes, suggests a list of items to identify them. Section 5 performs a risk assessment analysis to illustrate potential barriers and constraints to the full exploitation of the results. Finally, Section 6 reports the partners' expectations, interest and concerns regarding the DIGSEA outputs.

2 Exploitable results

In order to identify and describe the exploitable results (ER), we developed a methodology based on the scheme illustrated in Table 1.

Table 1 – Identifying and describing an Exploitable Result (ER)

Description\value proposition of the key ER	Present a concise and clear description of the ER, including the necessary technical details
Type of ER: • direct • indirect	Indicate the direct and\or indirect ERs. A direct ER is, a software, a manual, a paper, a guideline, a model, a new or improved product, a new or improved process, a new or improved understanding of the process An indirect ER is a reduced material or energy usage, improved safety, or better-trained staff
Type of content to be exploited: • material assets • immaterial assets	Indicate whether the content is material assets (e.g., a tool, equipment, platform, etc.) and\or an immaterial asset knowledge, methodologies, requirements etc.)
Collateral\secondary ER	Indicate whether there are collateral ERs which are linked or associated with the key RE
Strategic area of application	Indicate the area of application. Examples are: Improvements in nautical accessibility and safety, Promotion of Intermodal transport, Process digitalization, PCS improvement, Enhanced Port cooperation, Improved human resources
Acronym of the project that achieved the ER	
Types of project partners that achieved the ER	Indicate the type of project partners who participated to the achievement of the ER, e.g., port authorities, terminal operators, custom agency, freight forwards
ER availability (proprietary\public)	Indicate whether it is planned that the ER be proprietary (Intellectual Property rights) or publicly accessible (free of charge)
Responsible partner to be contacted	

The first and foremost task to be performed is to describe the ER. The description should be concise, yet contain all relevant technical details. In describing the ER, it is important to assess as precisely as possible the ER value proposition, i.e. the value added of the identified ER relative to the previously available results.

In order to gain a better understanding of the ER, a set of classification methods are applied. The first one is a distinction between direct and indirect results. A direct ER is, e.g., a software, a manual, a paper, a guideline, a model, a new or improved product, a new or improved process, a new or improved understanding of the process. Such a result might stem from a project activity such as a pilot or a set of activities performed in the project. An indirect ER refers to the more general goal achieved such as a reduction in the use of materials (e.g., paper) energy, the achievement of improved safety levels, improved human capital, a higher digitalization level and so no. In short, the direct ER is the tool which might allow to achieve also indirect ERs.

A second classification concerns the material content of the ER. An ER might be a material asset (e.g., a tool, a machinery, an equipment, a web platform, etc.) and\or an immaterial asset such as a procedure, a test, an information, a knowledge, an analytical methodology, or a set of technical requirements.

The main ER might also permit to obtain collateral\secondary ERs. A secondary ERs might be achieved during the process of pursuing\applying the main ER or become available as a consequence of the ER. For instance, in the process of adopting a new equipment (software), an organizational change might lead to considerable efficiency gains. Alternatively, the adoption of the new equipment (software) might open up the possibility to re-organize how a specific process is traditionally performed leading to a reduction in the labor costs.

Having described the ER and its value proposition, a crucial task is to envisage the strategic area to which the ER can be applied. With reference to the port and maritime activities, the areas of application quite diverse. They might relate to sea-side port activities such as ship-port communications and planning nautical accessibility and safety. Activities taking place within the port such as port management and operations via a PCS, process digitalization, or the cooperation among ports. Land-side port activities dealing with port rail and road access, the interface between port and dry-ports, or the promotion of intermodal transport. The area of application might concern digital equipment, work processes or human resources.

Finally, the Table 1 requests indicating the acronym of the project that achieved the ER, the types of partners involved in the project, the ER availability and the responsible partner who can be contacted to access the ER.

Such a methodology will be applied to analyses the ERs derived from the cross-border inventory of projects concerning IT-HR Standard and Standard+ projects on ICT applied to freight transport (WP3 - 1. O.3.1). DIGSEA aims at building on the results and outputs of previous projects as a basis for further advancement and clustering. These include, among others:

- TRANSPOGOOD, which developed an innovative ICT tool to find the best solution of transport services (e.g., best price of combined transport),
- PROMARES, which assessed the use of ICT solutions in the port-hinterland domain.
- DIGLOGS that looked into improving information flows of transport processes on freight movements, status and authorizations.
- INTESA, which focused on the port-sea relation, with the goal of harmonizing and optimizing the procedures of the maritime transport processes.

Next, the project will consider the EU-funded projects of other crossborder and transnational ETC, H2020 or CEF Programmes on ICT applied to freight transport (WP3 - 2. O.3.2).
Potential candidates for consideration are the ones reported in Table 2.

Table 2 - Recent EU-funded projects

coordination	Acronym	Description	funding
Port Systems Authority for the South Adriatic Sea, Bari	Not assigned	Automated checks. interoperability between the Port Community System (GAIA) and the customs information system (AIDA) to digitalise the embarkation/debarkation procedures, the entry/exit to/from the port hubs, and duty payments in the Port of Bari.	ETC
Spain	PIXEL	Port IoT for Environmental Leverage. Two-way collaboration of ports, multimodal transport agents and cities	H2020
Spain	SafePort	Smart System for the safe Management of Nautical operations	H2020
Italy	PASSport	Operational Platform managing a fleet of semi-autonomous drones exploiting GNSS high Accuracy and Authentication to improve Security & Safety in port areas	H2020
Spain	SAURON	Scalable multidimensionAl sitUation awaReness sOlution for protectiNg european ports	H2020
Netherlands	RePortFlows	(Re)Connecting Maritime Ecosystems: Geospatial Mapping of the 'Spaces of Flows' in Port-City Regions	H2020
Israel	Living Ports	Reducing the ecological footprint of ports with ECOncrete®'s bio-enhancing concrete technologies. Developing carbon-storing, ecologically-friendly, structurally superior concrete	H2020
Germany	PortForward	Towards a green and sustainable ecosystem for the EU Port of the future. showcase a range of activities for the reduction of greenhouse gas emissions in ports while safeguarding competitiveness	H2020
Netherlands	MAGPIE	sMArt Green Ports as Integrated Efficient multimodal hubs. introduction of green energy carriers with logistics optimisation in ports through automation and autonomous operations	H2020

They deal with topics such as: digitalization of logistics processes, port efficiency and security, sea-port ecosystems, reducing the ecological footprint of ports, and green energy for ports. All such issues are largely intertwined. Digitalization is a pre-requisite both for improving safety, energy efficiency and reducing the environmental impact of maritime and port transport. Consequently,

the analysis of the main ERs deriving from the above describe project might shed some light on to best achieve the results aimed for in DIGSEA.

Furthermore, the project will analyse the recent developments on ICT tools for enhancing maritime and multimodal transport (WP3 - 3. O.3.3). A growing array of ICT tools are available for enhancing maritime and multimodal transport. They include:

- Digitization and big data
- Industry platforms
- Cloud Computing
- Blockchain
- Internet of Things
- Drones
- Fast Corridors
- Truck Appointment System
- Big Data Analytics
- Automation and artificial intelligence
- Digital Twin

Each of these offers great potential to achieved higher level of digitalization.

Finally, the project will discuss the results emerging from the cross-border training curriculum on ICT application in the freight transport sector (WP3 - 4. O.3.4). The organization of the cross-border training curriculum on ICT application in the freight transport sector will provide interesting results to enhance management efficiency and effectiveness in many areas of the supply chain.
It commonly accepts that digitalization rest on the shoulder of women and men that used it. The issue of human capital is, consequently, crucial. Two crucial questions to which the cross-border training curriculum need to shed light on are: 1) how to attract and retain talent; and 2) how to use software resources for better recruitment, development, training processes.
The training curriculum will provide ERs concerning: i) the assessment of the tasks of supply chain personnel; ii) the assessment of the human capital and the mindset of managers, iii) the matching job tasks to human capital levels, and iv) the assessing the effectiveness of the supply chain personnel and development planning. By incorporate such results, the ERs will help improve the effectiveness of the actions implemented.

3 Identification of interested stakeholders

Depending on the characteristics of the ER and its area of application, the interested stakeholders need to be carefully identified. Table 3 presents a list of potential interested stakeholders.

Table 3 – Interested stakeholders for each ER

Projects\Activities	Potential interested stakeholders
IT-HR Standard and Standard+ projects	Port authorities, shipping companies, custom agencies, freight forwarders, intermodal operators, truck operators, train operators, terminal operators, manufacturing firms, consultancy firms, software houses
Other EU-funded projects (ETC, H2020, CEF)	Port authorities, shipping companies, custom agencies, freight forwarders, intermodal operators, truck operators, train operators, terminal operators, manufacturing firms, equipment development, energy authorities, environmental agencies
Recent ICT tools	Port authorities, shipping companies, freight forwarders, intermodal operators, truck operators, train operators, terminal operators, manufacturing firms, equipment development, energy authorities, environmental agencies.
Cross-border training curriculum	High school, training institutions universities, vocational schools, freight forwards, public authorities, logistic companies

Maritime, port and logistics operators, both public and private entities, are relevant stakeholders for all outputs. In the first three set of outputs - i.e., IT-HR Standard and Standard+ projects, other EU-funded projects (ETC, H2020, CEF) and recent ICT tools - providers of software modules and ICT equipment are also important stakeholders. If the ICT topics are extended to energy and environmental issues, the corresponding authorities become relevant stakeholders.

The cross-border training curriculum requires a strong connection with the various institutions devoted to provide secondary and tertiary education, both at national and international level.

The remaining outputs – i.e., project ideas for the 2021-2027 programming period, the EUSAIR flagship paper, the study visits to five Italian and Croatian ports, and the thematic seminar sees the involvement also of the research community and the projects' steering bodies.

4 Exploitation routes

In order to explore the exploitable routes, we developed the methodology reported in Table 4.

Table 4 - Exploring exploitation routes

Areas into which it is expected to make an impact	Examples: data collection, data management, data utilization, data reporting, ship monitoring, ship guidance, port operations (e.g., cranes, container movement, loading, unloading), passenger access, truck access, rail movements, logistics planning, weather forecast, ship arrival time forecast, port analytics, etc.
Needs that might be solved/met by the results	Examples are: Improvements in nautical accessibility and safety, Promotion of Intermodal transport, Process digitalization, PCS improvement, Enhanced Port cooperation, Improved human resources
Commercialization potential	Expected revenue of the sale, use fee, free of charge.
Intellectual Property Rights:	Yes\No
Potential users of the results	E.g., port authorities, custom agency, terminal operators, intermodal operators, freight forwarders, manufacturing firms, MTO, truck operators, train operators, shipping companies
Methods to contact them	Project Website, Organization of a joint workshop, Organization of an international conference, One to one meeting
Passive exploitation mechanisms	E.g., project website, guidelines, social media, journal & conference papers, presentations at scientific, technical & policy conferences and workshops
Active exploitation mechanisms	webinars, demonstration events, training courses, living labs, company visits, joint elaboration of business models

The main point of attention consists into identifying the areas into which an ER is expected to make an impact. These involve the many areas monitored, managed or forecasted concerning a port, its sea-side and land-side interfaces. They might involve:

- Data collection, management, utilization, reporting or forecasting;
- Documents acquisition, management, sharing and distribution;
- Ship monitoring, managing, loading and unloading;
- Containers monitoring, managing, loading and unloading;
- Trucks and trains monitoring, managing, loading and unloading;

- Logistics activities including warehousing and packaging;
- or other areas of growing interest related to the energy needs and environmental impact

It is crucial to examine all existing possibilities, allowing also for the fact that new or unexpected exploitation areas might emerge as the innovation is introduced in real-world applications.
At the same time, it is important to identify which needs might be solved\met by the ER. In this case, it is possible to be specific and\or to identify needs in general terms.
An ER might have a commercialization potential which can be translated into revenue from the sale of the patent, fees paid to utilize it or, on the contrary, might be distributed free of charge. Some ERs might even be protected by intellectual property rights.
As a result of the previous features, the potential users should be identified based on previous experience, similar products\processes or market analysis.
The communication methods are to be analysed distinguishing between passive and active exploitation mechanisms. The former relates to forms of communication characterized by the fact the ER owner\developer publishes the results via, e.g., website, guidelines, social media, journal & conference papers, presentations at scientific, technical & policy conferences and participation at workshops. The latter requires a greater effort by the ER owner\developer in actively engaging to promote the results via webinars, demonstration events, training courses, living labs, company visits, or elaboration of business models in collaboration with invited stockholders and partners.
Such a methodology will be applied to the outputs discussed above.

5 Risk assessment

In line with the above approach, we developed in
Table ***5*** a set of guidelines to perform a risk assessment analysis.
Table 5 – Defining and measuring risks

Risk	Risk description	Risk level
Match between needs and the solution.	Does the innovation match the needs of a potential adopter? Is a simpler version required? Is it sufficient?	Low, medium, high
Innovation propensity of the supply chain	Identify whether the value chain is: a) keen to innovate, b) traditional, c) conservative	Low, medium, high
Regulatory environment	Does the existing regulation favor\hinder the introduction of the proposed innovation? How should it change?	Low, medium, high
Intellectual property right issues	Yes\No	Low, medium, high
Compatibility issue	Does a standard exist? It the proposed innovation compatible?	Low, medium, high
Financing requirements	Describe the minimum level of investment and distribution of the investment over time	Low, medium, high
Cost and revenue structure	How is the cost\revenues distribution? Economic sustainability	Low, medium, high
Skills	Describe the minimum skill requirements, the need for training courses, and lifelong learning requirements	Low, medium, high
New ERs	Are there any other risks associated with ERs that were not initially foreseen?	Low, medium, high

The first step is to analyse the adherence of the ER to the needs of the adopter. It might happen that the methodology does not perfectly match those needs, being either too wide or too narrow. In such a case, the ER should be modified accordingly. Hence, a certain level of flexibility is need it to avoid the risk of a lower adoption rate.
A second challenge is to adapt the ER to the characteristics of the supply chain; a supply chain might be keen to innovate, traditional, or conservative. A conservative supply chain might not feel the need to innovate or resist innovation. In such as case, it might be difficult to convince stakeholders to introduce the innovation or it might require a gradual approach to underline the pros and cons of the innovation via a direct and active approach.

The regulatory environment might represent a barrier to the introduction of innovation. Safety or privacy rules might hamper the adoption pace. A preliminary analysis of the regulatory environment is, consequently, a pre-requisite to evaluate the innovation diffusion potential.
In some cases, intellectual property rights might protect an innovation, or part of it. This might enhance the cost of its adoption. Compatibility issues often represent a barrier\risk to innovation diffusion. A thorough analysis is needed to assess such a risk. Learning by doing might be unavoidable and a certain number of mistakes should be considered when planning the exploitation routes.
The analysis financial and economic costs and benefits is a crucial part of a successful exploitation plan. The investment requirements and their distribution over time should be attentively specified. Cost-benefit analysis present the challenge of enumerating and evaluation all cost and benefits associated with the introduction of the innovation. It is likely that costs are more easily identifiable and quantifiable than the benefits. Often, costs occur in the initial phase of the adoption and can be easily monetized. Benefits, on the contrary, occur during the use of the innovation and might comprise both material and immaterial benefits. In such a case, monetizing benefits is a difficult and to some degree discretionary tasks. In addition, the joint evaluation of costs and benefits occurring in different time periods requires the use of a discount rates, adding a further level of uncertainty.
A further important aspect concerns the skills need to exploit the full potential of an innovation. Such skills might not be present. There might be the need to acquire them or to train human resources to make the best possible use the innovation.
Finally, unforeseen issues, difficult to predict in advance, might materialize during the adoption of the ER.

6 Individual partners' exploitation expectations

Finally, project partners have evaluated the exploitation potential of each output via a survey technique. A summary of the PPs' expectations is summarized below.

Output	*Project partners' exploitation expectations*
O.3.1 – Cross-border inventory of projects' results from the involved IT-HR Standard and Standard+ projects on ICT applied to freight transport.	The cross-border inventory of the clustered projects' results will enrich the understanding of their main outputs, to be communicated to interested parties – multimodal transport stakeholders – through communication and dissemination activities (e.g. project website, digital promotional campaign, short videos, etc.) as well as during the study visits (D.3.3.1). It will give a detailed overview what is realized through these projects, so that each interested part can discover the needs and solutions in more local context. Furthermore, it can be used to network and collaborate with cluster members and other port community stakeholders in order to further develop ICT application in freight transport chains.
O.3.2 – Transnational inventory of projects' results from EU-funded projects of other cross border and transnational ETC, H2020 or CEF Programmes on ICT applied to freight transport	The transnational inventory of the clustered projects' results will ensure that the project's main objective is achieved "without re-inventing the wheel", taking account of the most valuable results achieved by other EU-funded projects. Outcome of the analysis will be communicated to interested parties – multimodal transport stakeholders – through communication and dissemination activities (e.g. project website, digital promotional campaign, short videos, etc.) as well as during the study visits (D.3.3.1). Both Croatia and Italy are diverse country with many transport and commercial ties with different EU countries. With the transnational inventory, the partners would be able to learn about results and solutions from different perspective and context and adapt them to their needs in order to further help the development of ICT application in Croatian and Italian freight transport chains.

O.3.3 – Best practice analysis, with most recent developments on ICT tools for enhancing maritime and multimodal transport (e.g. blockchain, 5G and IoT applications)	The best practice analysis will allow the integration of the most up-to-date achievements in the domain of ICT applied to maritime and multimodal transport in the knowledge to be shared with interested parties – multimodal transport stakeholders – through communication and dissemination activities (e.g. project website, digital promotional campaign, short videos, etc.) as well as during the study visits (D.3.3.1). The best practice analysis is a way to consolidate the knowledge of the most recent developments in the ICT world applied to the maritime and multimodal transport. This consolidated knowledge then can be shared with stakeholders interested in thematic as well as those interested to participate in the future project proposals. Port infrastructure is critical infrastructure which demands secure and special Technology and ICT systems and its implementation. Often is needed integration between existing systems to provide message exchange. These kind of tools and documents can speed up pilot actions implementation and can be used in process of technology selection and its implementation which can have also greater financial impact.
O.3.4 – Cross-border training curriculum on ICT application in the freight transport sector	The cross-border training curriculum will be transferred to interested parties – research/training centres, universities, vocational training institutions - through communication and dissemination activities (e.g. project website, digital promotional campaign, short videos, etc.) as well as during the study visits (D.3.3.1). The training curriculum is a useful tool to attract interested parties to take notice of the partners' work in the project and share competences on ICT application. It is significant for improvement of skills of all relevant operators and stakeholders. This can be especially applied to port authorities and terminal operators to expand their views and knowledge needed for communication with all other port stakeholders.