This document has been prepared to have a recent panoramic on a sample of ICT tools that are already in practice in the ADRION territories and beyond. it must be functional to analyse tools that are of benefit to the port-hinterland integration by ITL

REPORT ON THE TRANSNATIONAL BEST PRACTICES CONCERNING ICT TOOLS FOR IMPROVING MULTIMODAL TRANSPORT IN PORTS AND AT BCPS KNOW-HOW TRANSFER

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The project ADRIPASS is funded by the European transnational Programme Interreg Adriatic-Ionian and it aims at integrating multimodal connections in the ADRION region, from both a strategic and operational perspective.

ADRIPASS envisages to increase the capacity of ADRION transport stakeholders (port authorities, terminal/logistic operators, freight forwarders) and policy makers at national and European level (ADRION national Ministries of Transport, European Commission – DG MOVE, DG REGIO and DG NEAR – European Transport Corridor Coordinators) to plan and implement transport facilitation measures on the TEN-T Corridors of the ADRION region, with a special focus on the recently extended ones to the Western Balkans.

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Glossary of abbreviations

ADRION	Adriatic-Ionian programme area
BCP	Border Crossing Points
CNC	Core Network Corridor according to Regulation (EU) 1316/2013
EU	European Union
ICT	Information Communication Technologies
IWW	Inland waterway
KPI	Key Performance Indicator
MoS	Motorway(s) of the Sea
MS	Member States of the European Union
n.a.	not available / not applicable
NMSW	National Maritime Single Window
PCS	Port Community System
RFC	Rail Freight Corridor according to Regulation (EU) 913/2010
TEN-T	Trans-European Transport Network
TENtec	TENtec (the European Commission's information system to coordinate and support the Trans-European Transport Network Policy)
WP	Work Package

1. Introduction

As led in the *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*[1] "new technologies for vehicles and inland traffic management will be key to lower transport emissions in the EU as in the rest of the world. The race for sustainable mobility is a global one. Delayed action and timid introduction of new technologies could condemn the EU transport industry to irreversible decline. The EU's transport sector faces growing competition in fast developing world transport markets". Accordingly the development of a single European transport system and greening of freight transport are two key targets of the EU policies for mobility and transport. Both elements are nowadays highly dependant upon the adoption and diffusion of innovative solutions aimed at rationalising and optimising the flows and vehicles and goods for all transport modes, reducing times associated to travel and terminal operations, for both single mode and multimodal solutions. The adoption of technological solutions to support dematerialisation and automation processes can furthermore reduce the gaps in terms of competitiveness of maritime, railway and combined transport solutions in comparison to road transport.

The integration of maritime and hinterland goods transport requires smooth information flows between ports and chain actors via electronic forms. In this scenario, the integration of the technologies among ports and hinterland nodes, between ports and the business players or institutions can benefit of the development of cloud solutions, augmented reality, big data, robotics, cyber security to establish and develop technological and functional communities that involve more nodes, corridors and networks at the regional, national, and international scale supporting the development of a single European transport system.

1.1. Rationale

ADRIPASS is a flagship project providing "soft" recommendations (e.g. administrative improvements at border crossings, increased transport efficiency between the port and the hinterland at corridor level also through ICT solutions, allowing better communication between different stakeholders) to the ADRION programme and, in turn, to support the implementation of the EUSAIR strategy (Pillar 2-"Connecting the Region"). Being the development of efficient multi-modal and environmentally friendly freight transport and logistics chains strongly dependent from the integration between ports, hinterland and Transport Corridors (e.g. The Core Network Corridors), ADRIPASS dedicates part of its research to the role played by ICT innovation. ICT – Information and Communication

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN

Technologies – is a concept that is simplified somehow and deserve a clear perimeter depending to the context analysed.

For this reason this deliverable D.T2.1.3 REPORT ON THE TRANSNATIONAL BEST PRACTICES CONCERNING ICT TOOLS FOR IMPROVING MULTIMODAL TRANSPORT IN PORTS AND AT BCPS KNOW-HOW TRANSFER is the opportunity to have a recent panoramic on a sample of ICT tools that are already in practice in the ADRION territories and beyond. There is a clear perimeter in this research of good practices, it must be functional to analyse tools that are of benefit to the port-hinterland integration, by far distinctive characteristic of the transport of goods in the ADRION area, and supporting multimodality to better integrate different transport modes smoothly.

Besides a detailed explanation of the 'best practice' approach of this deliverable, explained later on, we are glad here to remark the scope of D.T2.1.3 is to analyse what kind of improvements such implemented ICT solutions have brought in the single ports/hinterland nodes and to what extent these evidences can become legacy to transfer and means of functional integration in the ADRION programme area and EU.

1.2. Structure of the report

Further to this introductory section, this report includes the following chapters:

- Chapter 2: providing a summary of the scope of WPT2 of the ADRIPASS project, and an overview of the partners involved in the task, including a description of their role;
- Chapter 3: outlining the methodology adopted to perform the WPT2, including the definition of the best practice concept used for the identification and analysis of the ICT solutions presented in this report, an overview of the logistics nodes involved in the survey and the tool used for the collection of relevant information and data from the ports and hinterland nodes interviewed as part of the study;
- Chapter 4: presenting the results of the analysis and evaluation of the best practices identified as part of the WPT2 together with the concerned stakeholders. Further to a qualitative and quantitative description of the ICT solutions, main comments about the most relevant findings of the analysis have been included in this chapter concerning the adoption, benefits and transferability of ICT solutions at ports and hinterland nodes for the improvement of the performance of the logistics chain along core network corridors and the development of an integrated and single European transport system in the ADRION area;
- Chapter 5: providing some concluding considerations and remarks.

In addition to the above Chapters constituting the main body of this report, Annex A includes the most relevant results of the survey, presented in table format. This information has been graphically represented in Chapter 4.

The questionnaires filled in by the stakeholders interviewed as part of the WPT2 are provided in Appendix 1, submitted under separate cover.

2. Preface

2.1. WPT2 Description and purpose of the deliverable

WPT2 (*ICT tools for improving multimodal transport*) focuses on Information and Communication Technologies (ICT) pilot actions, and pre-investment studies in ADRION key ports (Koper, Bar, Ploče, Durres and Igoumenitsa). It plays the role of 'tool' to streamline freight traffic flows and improve the ports' role of gateways and corridor roots for the transport of goods, improving coordination between terminal operators, logistics operators, freight forwarders companies and public institutions (e.g. port authorities, customs agencies, etc.). Pilot actions represent the core activities in this WPT2, giving the fact where theory meets practice to test ICT solutions for the benefit of the stakeholders operating in the ADRION territories.

As reported in the WPT2 methodology, *D. T2.1.1 - JOINT METHODOLOGY FOR THE IMPLEMENTATION OF THE WP,* two main strands of activities undergoing the transnational collaboration of ADRIPASS partners and stakeholders the WPT2 foresees:

- WPT2.1 – of which the above mentioned methodology is part of, the elaboration of the report on transnational best practices concerning ICT tools for the improvement of multimodal transport in ports and BCP areas (**D.T2.1.3**) and eventually the technical coordination meetings foreseen in the project plan (D.T2.1.2);
- Pilot actions with pre-investment studies (D.T2.2.1->D.T2.2.6) for the concrete development of concepts and data analyses completed in the first phase of the project.

This deliverable, **D.T2.1.3** REPORT ON THE TRANSNATIONAL BEST PRACTICES CONCERNING ICT TOOLS FOR IMPROVING MULTIMODAL TRANSPORT IN PORTS AND AT BCPs KNOW-HOW TRANSFER, undertakes the following main activities as per description in the ADRIPASS Application Form: to report on the transnational best practices concerning ICT tools for improving multimodal transport in ports and at Border Crossing Points (BCPs). Best practices of Italian and Slovenian ports are presented by involving relevant stakeholders. Luka Koper presents its state-of-the-art PCS, and ITL showcases the benefits of the PCS of the port of Ravenna as well as the ICT tools employed by the Bologna freight village. Additionally, best practices of other ICT tools implemented by hinterland nodes are presented, bringing experiences from and outside the ADRION programme area.

D.T2.1.3 provides input to the Pilot implementation (from D.T2.2.1 to D.T2.2.6) with information on best practices in terms of ICT solutions for Ports and Hinterland nodes, and serves as comparative tool to the overall and final WPT2 evaluation (by testing the ICT tools as possible solutions at larger scale – each port for its main issues, following the needs at regional level, which are basically the improvement of existing tools and better

connection with the hinterland) on ICT needs for the ADRION area. The way the deliverable uses the concept of best practice, and what is the transferable outcomes is depicted in Chapter 3.1.

Deliverable D.T2.1.3, according to the application form and as described by the WPT2 Joint methodology, have been jointly prepared by the ADRIPASS partners in October 2018.

It is of utmost importance to underline that even if such a specific ICT best practices analysis is given in this deliverable, ITL has collaborated with WPT1 leader (AUTH) to further extend the collection of ICT status of the art in the ADRIATIC – IONIAN programme area. Concretely WPT1 embeds into its data collection & corridor analysis specific knowledge on the status of the art of the entire area respect to the use of ICT technologies in Ports, hinterland and BCPs nodes. This strategic operation is (1) to accompany the pilot leaders, WPT2 leader and WPT3 leader when planning ADRIPASS following activities, but (2) is also an attempt to consolidate the status of the art of ICT implementation in the ADRIATIC-IONIAN area to leave a legacy to its stakeholders.

2.2. Involved partners

Previous chapters have already introduced the type of cooperation among the ADRIPASS partners. The work is organised in the framework of the WPT2 (leader is Luka Koper, project partner) with the lead of the Institute for Transport and Logistics (ITL) who also has the responsibility to prepare the final deliverable.

Methodological issues and coordination decisions, among the partners, to define roles and efforts for this specific activity follow up on the description of the WPT2 as they are depicted in the application form. These points have been duly discussed with the Steering Committee members and the Technical members during the kick off meeting (held in Trieste 31st January and 1st of February 2018) and eventually agreed in occasion of the second Steering Committee meeting and Technical meeting (held in Koper 3rd and 4th of July 2018).

ITL has a long lasting experience in EU projects dealing with goods transport and ICT. This means that ITL has a consolidated network of stakeholders in the ADRION area and beyond, to contact and activate to the purpose of this activity. From the project managerial point of view ITL is the contact with the WPT2 leader and the project coordinator to share the activity plans, monitor of the activities and report on status of the activities. From the technical point of view, ITL is responsible of the deliverable preparation, which means to define the methodology & templates for data collection, to collect / stimulate / analyse inputs and eventually to consolidate all the gained knowledge into the deliverable. ITL is the partner with more resources to dedicate to the best practice research & analysis compared to the other partners, for this reason ITL has provided most of the information about hinterland and ports nodes' best practices in and outside the ADRION area. In line

with this, ITL is the Emilia – Romagna regional stakeholder entitled to collaborate with the regional logistics nodes (in particular with Port of Ravenna and Bologna Freight village) to support the preparation of their inputs for the ICT best practice analysis.

WPT2 leader is involved in the activities for two main reasons, the first is by providing the overall WPT2 methodology, which embeds D.T2.1.3 activities to assure the envisaged alignment to the other WPT2 activities; second because it is the stakeholder entitled to transfer to ADRIPASS the knowledge of the ICT tools developed in the port of Koper.

Other project partners involved in the activities are:

- WPT1 leader, which has done an attempt to consolidate an overview on ICT best practices for a selection of key Greek ports;
- ADRIPASS project coordinator, who is involved when decision are taken and examine the material to be circulated to the other partners.

Summarising, apart from Luka Koper and WPT1 leader, all the technical activity is carried out by ITL, which has activated its network of logistics nodes inside and outside the ADRION area.

ITL being very active in EU networks also guarantees appropriate sharing of the deliverable's outcomes with other initiatives (e.g. on-going projects linked to EUSAIR strategy) and network (e.g. ITL is the president of Open ENLoCC European Network of Logistics Competence Centers http://www.openenlocc.net/).

3. Methodology for ICT tools best practices collection

3.1. Best practice concept

To the scope of the analysis performed as part of the WPT2 of the ADRION initiative on the identification of transnational best practices and transfer of relevant know-how, *best practice* has been used in a wider meaning, referring to any ICT technology and solution whose adoption and application has contributed to the improvement of processes and operations at the logistics nodes and between logistics nodes. Accordingly, the interviewed port and hinterland node administrative and managing authorities have been given the possibility to identify and propose to the ADRIPASS community the tools and solutions that in their opinion could be considered as best practices, based on the benefits associated with their use.

Such a wider concept was deemed more appropriate in consideration of the nodes directly involved in the ADRIPASS project, that will be ultimate beneficiary of the transferring of the know-how under the scope of the ADRIPASS WPT2, including Koper, Bar, Ploče, Durres and Igoumenitsa, all of them presenting very different characteristics in terms of size of the infrastructure, throughput of traffic volume, catchment areas and type of cargoes and commodities.

Albeit at a different degree of innovation, deployment and integration, ICT tools and solutions to maritime and multimodal transport are already in use at the nodes in the ADRION programme area. Several of these nodes were already involved in pilot and innovative initiatives in this field which gave them the possibility to know and test these solutions. Rather than limiting the scope of analysis to the identification of the most recent and innovative solutions implemented outside the ADRION programme area, in logistics nodes that for size and overall throughput could be hardly comparable to the existing operations in the ADRION programme area, the scope of the ADRIPASS WPT2 was intended to establish and support a dialogue between the partners involved in the project concerning the solutions already tested and implemented by them in terms of ICT. This was also aimed at providing continuity between the ADRION initiative and previous projects implemented in the region and concerning ICT and the promotion of multimodal transport and solutions. Accordingly, the concept of best practice adopted for analysis has been associated with any tool and solution which according to the nodes has generated benefits to the logistics community.

The purpose of supporting dialogue and discussion on transport digitalisation and application of ICT solutions to maritime and multimodal transport in the ADRION programme area was also considered relevant in promoting the integration of ICT tools and services at the node level (through the development or further development of Port

Community Systems – PCS), and more importantly at the national or even better international, basin or corridor levels (Single Window).

3.2. Overview of the ports and hinterland nodes involved in the WPT2

In line with the concept adopted for the identification and analysis of the best practices the nodes involved in the WPT2 for the identification of the best practices are mainly concentrated in the ADRION programme area.

Nonetheless, two nodes located outside the region have been contacted, i.e. the port of Antwerp in Belgium and the port of Valencia in Spain. Notwithstanding the primary scope of the WPT2 to establish a dialogue between the partners involved in the ADRION programme area, the involvement of Antwerp and Valencia in the identification of best practices was deemed appropriate for the relevance of their expertise and experience in the field of application and deployment of ICT solutions, as also recognised by the international multimodal logistics and freight transport community.

Thanks to its privileged location between the Suez Canal and the Gibraltar Strait, and to its high-performance infrastructures, the Port of Valencia covers a leading role in Mediterranean in terms of commercial flows, particularly regarding container traffics, and represents a key terminal node for the Mediterranean corridor. The relevance of the port for this study is linked to its commitment towards innovation in the ICTs, that it demonstrated through the implementation of the most efficient information systems over years. According to the International Port Community Systems Association (IPCSA), Valencia Port was a pioneer in the Spanish port system, when it introduced Electronic Data Interchange (EDI) systems and launched the Community Information System (SIC). Furthermore, at present, the port is up-to-date in terms of integrated IT systems, which are used by leading logistics agents through technological platforms which are ad-hoc developed.

The Port of Antwerp represents a virtuous example in the field of IT solutions, thanks to its long tradition in electronic messaging systems and to its information exchange technologies, all integrated in the PCS. At the IPCSA reports, communication services were implemented at support of all types of goods, all transport modes and all the potential actors of the logistic chain, while electronic messages support the daily administrative and operational activities.

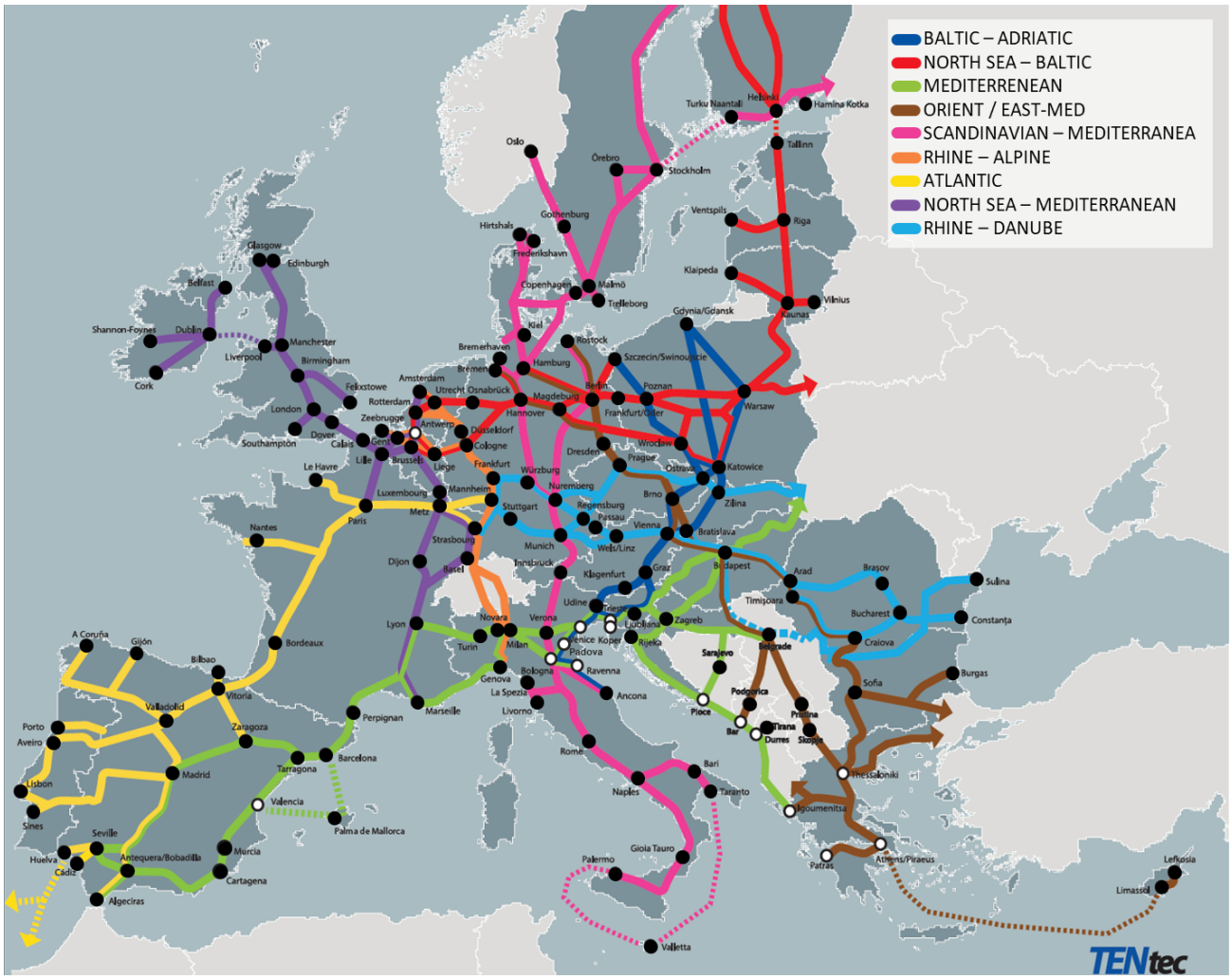

Figure 1 Indicative Map of the TEN-T Network with the nodes subject of WPT2

Note: the node of Padova was added to the original map

The map above represents a new possible layout of the TEN-T Core Network Corridors following the ongoing process of revision of the CEF Regulation. The extension of the Mediterranean Core Network Corridor is particularly meaningful in the ADRION programme area which will also increase the number of logistics nodes integrated in the Core Network Corridors.

The nodes marked white in the map represent the ports and hinterland nodes that were involved in the WPT2. These have been either considered for the identification of the best practices and/or as partners of ADRIPASS and as such interested in the transferring of relevant know-how:

- Nodes in the ADRION programme area involved in ADRIPASS: Ravenna, Venezia, Trieste, Koper, Ploce, Bar, Durres, Igoumentsa, Patras, Piraeus and Thessaloniki (ports); Bologna, Padova, and Trieste (hinterland nodes);

- Nodes in the ADRION programme area considered for the identification of the best practices: Patras, Piraeus, Ravenna, Venezia, Thessaloniki, Trieste, Koper (ports); Bologna, Padova and Trieste (hinterland nodes);
- Nodes involved in the identification of the best practices located outside the ADRION programme area: Antwerp and Valencia (ports).

The following table provides the publicly data available concerning the traffic throughput at the ports considered in the analysis.

Table 1 Cargo volumes at ADRION ports

Ports	*Unit*	Liquid bulk goods	Dry bulk goods	Large containers	Ro-Ro - mobile self-propelled and non-self-propelled units	Other cargo not elsewhere specified	Total
Antwerp Port	Thousand tons	71,945	11,840	101,023	6,215	10,180	201,203
Bar Port	Thousand tons	N/A	N/A	N/A	N/A	N/A	3,673*
Durres Port	Thousand tons	N/A	N/A	N/A	N/A	N/A	4,022
Igoumenitsa Port	Thousand tons	N/A	77	N/A	3,082	N/A	3,159
Koper Port	Thousand tons	3,833	7,345	8,489	1,155	1,489	22,311
Patras Port	Thousand tons	327	163	N/A	2,301	31	2,822
Piraeus Port	Thousand tons	418	354	39,420	4,997	13	45,202
Ravenna Port	Thousand tons	6,907	15,692	2,664	2,805	1,096	29,164
Thessaloniki Port	Thousand tons	7,444	3,112	3,379	0	573	14,508
Trieste Port	Thousand tons	42,091	2,438	6,005	1,816	2,819	55,169
Valencia Port	Thousand tons	3,204	2,279	45,881	1,714	7,038	60,116
Venezia Port	Thousand tons	8,142	9,503	4,797	1,380	1,300	25,122

*This figure relates to the total tons handled at Montenegro Ports

Source: Eurostat, Instat and Monstat.

3.3. Identification of best practices and data gathering and collection process

In order to identify the best practices and collect relevant information in terms of know-how to be transferred and shared among the ADRIPASS community, a data collection sheet structured in a form of questionnaire has been elaborated which has been submitted to 8 logistics nodes, i.e. Antwerp, Ravenna, Valencia, Trieste, Koper (ports); Bologna, Padova and Trieste (hinterland nodes).

The data collection sheet has been structured to support the identification and description of best practices in the field of ICTs already implemented at ports and hinterland nodes (either technical and/or service solutions), capable of generating benefits and added

value to the logistics industry at the nodes or between nodes. Further to general information on the node and on the status of development of the PCS and single window initiatives at the port, the questionnaire includes specific questions focussed on the three most relevant ICT tools/solutions that most impacted on the node processes and operations.

In order to maximise the effectiveness of the data collection exercise a screening of the information on ICT solutions and tools publicly available on Internet including at the Web Sites of the nodes involved in the identification of the best practices has been performed. On this basis, the data collection sheets have been pre-filled before their submission to the representatives of the ports and hinterland nodes for validation and integration. Also considering the variety and degree of detail of the information requested in the questionnaire, this solution was also deemed appropriate to invite the stakeholders to provide more in depth details with respect to the topics and questions included in the questionnaire and minimise the risk of obtaining general answers.

The following chapters provide the findings of the analysis of the best practices identified and described in these questionnaires. Further to the best practices identified upon direct consultation of the 8 above referred nodes, the following sections also report on best practices implemented at the port of Venezia. Albeit not directly involved in the survey, the port of Venezia is deemed to have implemented important example solutions in the field of ICT and relevant information is publicly available about them. Finally, the ports of Patras, Piraeus, and Thessaloniki have been also consulted as part of the assessment, for which no structured information has been however collected and analysed in detail.

4. Analysis & evaluation of the identified best practices

4.1. Description and main characteristics of the identified best practices

The table below lists the 28 best practices identified as part of the analysis performed under the scope of the WPT2, also providing a brief description of each solution. The best practices are listed alphabetically by node and relevance, as declared by the involved entities. Indeed, the responsible persons for the questionnaire asked the interviewees to select and rank the ICT solutions that were implemented to overcome bottlenecks.

Table 2Short description of the identified best practices

Ports	*BP*	*Solutions*	Provided services
Antwerp Port	BP1	e-Desk (Customs notifications and communications on export and transit declarations for containers and Ro-Ro)	It simplifies the formalities in the export process for containers and ro-ro shipment, and brings transparency to each partner in the supply chain. It is an easy free web application allowing users to notify terminal operators about upcoming cargo and to pass declaration details electronically
	BP2	Antwerp Port Information and Control System (APICS)	It is an integrated series of port-related processes that enables the Port Authority and its partners to efficiently plan, direct and monitor shipping traffic. The services provided include: - Ship's waste declaration - Seagoing ship prenotification - Notification of arrival/exit - Berth reservation - Order for pilot, tug or mooring services - Notification of arrival/departure of dangerous goods - Consultation of the IMDG register - ISPS declaration - SafeSeaNet message
	BP3	Barge Traffic System (BTS)	It is a unique online handling slot request and monitoring system for container barges. It allows barge operators to request a handling slot for the container loading/unloading. The barge position can be consulted by barge and terminal operators through this web application. Terminal operators can call up a list of requests by container barges in the BTS.
Koper Port	BP4	VBS (Vehicle Booking System)	It is a vehicle booking system that works digitally at gates, for the automatic detection of vehicles. The system works efficiently thanks to an integrated communication between truck terminal and port community, and to digitalised information about cargo availability. The actors of the logistic chain can plan the activities that are linked to the management of cargo from/to the port.
	BP5	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	The Port of Koper adapted its IT system, process and equipment for the new provisions of the SOLAS Regulation (IMO – MSC.1/Circ. 1475). The solution provides the involved actors with the following services: - Booking of order - Definition of yard and cargo info - Definition of special position for dangerous goods and info about type of cargo - Definition of loading/unloading location and cargo info - Cargo info and documentation available - Accompanying documentation for the transported cargo - Clearance status - Positioning of cargo and availability
	BP6	ACAR hybrid truck announcement for	The solution allows the port's operators to automatically detect the type of cargo entering/leaving the port. Cars entering/leaving the port are

Ports	*BP*	*Solutions*	Provided services
		vehicles at car terminal	immediately visible in the system with all their related data. Trucks in the hinterland can book a window for the arrival at the port on the basis of the available freight. Trucks entering/leaving the port are announced. The registering procedures are digitalised.
Ravenna Port	BP7	Customs clearance at sea	Customs clearance at sea is an experimental procedure with which the Customs can authorize the Freight Forwarder to submit the import declaration before the goods are physically into the terminal. Once unloaded, all the goods cleared at the sea can exit the port immediately. Some communications among the involved actors (Public and Private) are mandatory to obtain the authorization as well as the monitoring of the route followed by the vessel. The PCS provides a function with which all the involved actors can exchange the relevant messages and monitor the process from the submission of the request for the authorization to the arrival of the vessel. The procedure, initially reserved to goods transported in containers, has been recently extended to new vehicles, and a pilot for the extension to the bulk goods is underway.
	BP8	Data exchange with National Maritime Single Window	Using the web services published by the National Maritime Single Windows the PCS acquires and updates all the data related to the port calls that can be communicated to the port operators and used for the definition of ship voyages that is the basic information for all the functions of the PCS related to the Customs formalities and the goods processes.
	BP9	Fast Road Corridor	It is an experimental procedure authorized by the Customs Agency. A fully digitalized logistic chain allows the transit of containers, by road, from Ravenna to Bologna, where the Customs formalities and controls take place.
Trieste Port	BP10	Full automation of rail operations (Manifesto Merci Treno - CH30)	Today the 'Sinfomar' allows to generate a unique CH30 in a single format agreed with the operators and the Customs Authority according to objective criteria, and prepared using a shared terminology and structure. The presence of barcodes containing the customs formalities, such as the MRNs of the Train Freight Manifest, allows customs operators to close the consignment of goods on AIDA through the use of a manual scanner, thus reducing the time taken to acquire information from 10 - 15 minutes to less than one minute and eliminating errors due to manual data entry. Furthermore, in this way a complete tracking of the goods and the specific information regarding single cargo units is ensured.
	BP11	Integration of inland terminal with PCS (e.g. Hinterland nodeo di Trieste)	A dedicated module of the PCS - "External Terminal Point Management" - has been developed. From a technical point of view, this module has four distinct functions that allow to consult the summary of the situation in real time: 1. Expected to be in progress / Vehicles arriving at RRT of Trieste (Fernetti) 2. Vehicles present at the RRT of Trieste 3. Vehicles bound to the port of Trieste not in the customs corridor; 4. Vehicles bound to the port of Trieste in the customs corridor (currently prepared but not in use).
	BP12	Interoperability with RFI	The CH30, prepared by the terminal operator, is automatically transmitted to the shunting company and RFI within the same IT platform. Previously, the RFI had to manually copy the CH30 in its IT platform.
	BP13	Interoperability with RCA	RCA sends the Port of Trieste their own CH30 before its arrival. Previously, the CH30 was manually prepared at the train's arrival in the Trieste station. With this new system the Port of Trieste receives certified data about the train composition (CH30) long before the train's arrival, allowing a smoother and faster train entrance in the Port.
Valencia Port	BP14	PCS Railway Services	The Rail Transport Service allows the agents involved in the transportation of goods by rail to generate and manage the transport orders, cargo acceptance and delivery orders required to transport these goods within the port facilities managed by Valenciaport, and to notify the delivery and acceptance of containers in the container terminals and/or depots.

Ports	*BP*	*Solutions*	Provided services
			Operators and Railway Companies send their lists of loading and unloading to the terminals based on the documentation generated previously by the shipping agents and freight forwarders.
	BP15	Virtual Lanes	Creation of a virtual lane between the access port gate and the container terminal gate to allow a smooth and reliable circulation of trucks and prepare an advanced and modern truck appointment system connected in real time through smart solutions.
	BP16	Port Collaborative Decision Making (PortCDM)	Sea Inland traffic management (STM) enables authorised stakeholders to securely share real-time information about their intentions and actual actions on a continuous basis. One of the main concepts of the STM is the Port Collaborative Decision Making (PortCDM). It allows to establish a common view of all available information but also to use this information as a tool to create a common situational awareness as well as to support the involved actors in making efficient collective decisions. The result is a better planning of arrival and departure times and improvement of how a port interacts with a ship to optimise its port call.
	BP17	Equipment Status and Cargo Tracking	Equipment Status allows ValenciaportPCS users to know the status of their containers and vehicles both at load and unload operations. This service provides ValenciaportPCS users automated paperless customs control of containers and vehicles for export and transhipment. The cargo tracking allows users of ValenciaportPCS to obtain information to track and trace their shipments such as the current status of their cargo, transhipments carried out and/or documents processed. The platform also enables users to integrate this information into their systems to present it to their customers.
Venezia Port	BP18	Integration of LogIS and SAFE (Security and Facility Expertise)	This solution allows control of port access points and management of entrance authorizations.
	BP19	Integration of LogIS and SEEMARINER	This solution consists in the integration into LogIS of data for monitoring of dangerous goods
	BP20	Integration of LogIS and AIDA	It allows a telematic management of custom information of goods departing from Venezia Port
Hinterland nodes		***Solutions***	Controls of port access points and management of entrance authorizations
Bologna Hinterland node	BP21	Cluster Community System - CluCS	CluCS (Cluster Community System) is an IT platform supporting the governance of the Proximity Terminal Network (PTN) and operations through the efficient management of information: cargo flows, assets within the nodes of the PTN and in relation to the surrounding logistics nodes, especially ports configured as the Cluster. Such platform provides full visibility and operations management capabilities in all the terminals in a certain cluster functioning as connector between the different sub-systems. This allows a coordinated management of multiple hubs with different specializations, creating synergies and linking the Cluster to different TEN-T corridors. The CluCS is a unique and first attempt to establish co-ordination and collaboration between neighbouring and regional terminals on the one side and pooling cargo co-ordinated processes on the other side. It transfers and advances methods and research results as developed in the context of Port Community Systems (PCS) towards a cluster context (advancing beyond iCargo, eMAR, GET Services, CONTAIN, EcoHubs).
	BP22	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Project aiming at fostering interoperability and competitiveness of the service providers at EU level by enhancing transport service providers visibility, decreasing transaction costs and promoting shared multimodal solutions through a transnational cloud platform.

Ports	*BP*	*Solutions*	Provided services
	BP23	Corridor Strategic Planning and Monitoring – CoSPaM	The corridor design and management platform facilitates the promotion/publishing of transport providers' services and design of their incremental and collaborative operations (Multimodal Corridor Design - McoD) as well as transport monitoring and control along established multimodal corridors (Management of Multimodal Corridors – M2Co). This solution serves the demand for multimodal transport service providers' efficient handling of transport and cargo units.
Trieste Hinterland node	BP24	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	This practice allows for a free rail circulation between different part of Free Zone (namely along the route Punto Franco Nuovo – Punto Franco di Fernetti). The port Authority can track goods from the ship to the train and vice versa along all the movements between all the different free zones.
	BP25	Free circulation by road between free zones and Gate Automation	This practice allows for a free road circulation between different part of Free Zone (namely between the free zones of Trieste Port and Trieste Interporto). The port Authority can track goods from the ship to the truck and vice versa along all the movements between all the different free zones.
Padova Hinterland node	BP26	Gate automation	This system was implemented for the management of the transit control procedures at roadway and railway gates. Video cameras and laser scanners track vehicles at gates. The ID codes of containers and railway wagons are acquired in real time. Data are sent to the Control Room operators, who can verify whether the actual composition of trains corresponds to the one indicated in the transport documents. The procedure is integrated with the Customs system.
	BP27	Fast Rail Corridor	A fully digital logistic chain has been developed to allow the transit of containers, by rail, from La Spezia Port to Padova Hinterland node, where the customs checks take place. The Manifest (e-Manifest) containing the destination (Padova Hinterland node) and the warehouse code is transmitted online to the hinterland node. The Manifest is registered and the responsibility of the container is transferred to the Padova hinterland node. Trains are tracked from the port gates to the hinterland node gates through the "Il Trovatore" system, owned by the Customs Agency. Once the container is unloaded and the presence of anomaly checked, the goods entering the warehouse are registered.
	BP28	Algorithms for the optimization of container storage and Interoperability and Intermodality	Implementation of algorithms for the optimization of container storage and Interoperability and Intermodality. The solution will work in synergy with the gateway automation, instructing truck drivers on the designated loading/unloading location inside the terminal. This information will be processed considering the time of arrival/departure of the trains and of the ships in the event the cargo's O/D also involves maritime transport. The terminal operator is also considering a further technological upgrade of cranes, in order to make them remotely controlled.

Table 4 reports the identified ICT solutions, grouped by node, and the main area of applicability where each of these solutions provide services. In most of the cases, solutions are either designed to perform several functions or integrated with other systems that extend their field of application.

If considering ports and hinterland nodes together, out of the 28 ICT solutions investigated, inland traffic management results to be the activity included in the highest number of ICT solutions, i.e. 16, followed by track and trace with 15.

Intermodality and interoperability services as well as eMaritime & Customs Administration services are provided by 13 solutions each, while maritime transport services are

mentioned eight times in total. It follows that, except for maritime transport, all the activities listed in the table appear to have comparable relevance within the group of analysed nodes. Interestingly, only two categories of services, namely inland traffic management and eMaritime & Customs Administration, show cases of ICT solutions, four and one respectively, in which they are singularly provided, i.e. they are not combined with other typologies of services (Figure 2).

However, a prevailing activity can be identified per each solution, despite the number of services provided. If referring to the main activity (Figure 3), the scenario results to be meaningfully different, and the relevance of each activity might be re-evaluated. Although inland traffic management remains the most often provided service, eMaritime & Customs Administration becomes the second core activity associated to the greater number of ICTs (i.e. eight). Moreover, six solutions are related to interoperability and intermodality, and two are related to maritime transport. Finally, only one solution was implemented with the track and trace service indicated as core activity.

According to Figure 4, six ICT tools are dedicated to the accomplishment of one activity specifically, while 22 are thought to provide more than one service. However, 13 of them are associated to two activities only, which means that out of the 28 best practices investigated, 19 are designed to provide one to two services only. The ACAR hybrid truck announcement for vehicles at car terminal and the Verified Gross Mass (VGM) Self Service for the automation of traceability and business processes, both implemented at the Port of Koper, result to be the only solutions that applies to the whole list of services.

In general terms, the greater the number of services that a single ICT solution can provide and the greater its potential appeal to other nodes, since more areas of the logistic chain would be benefitted.

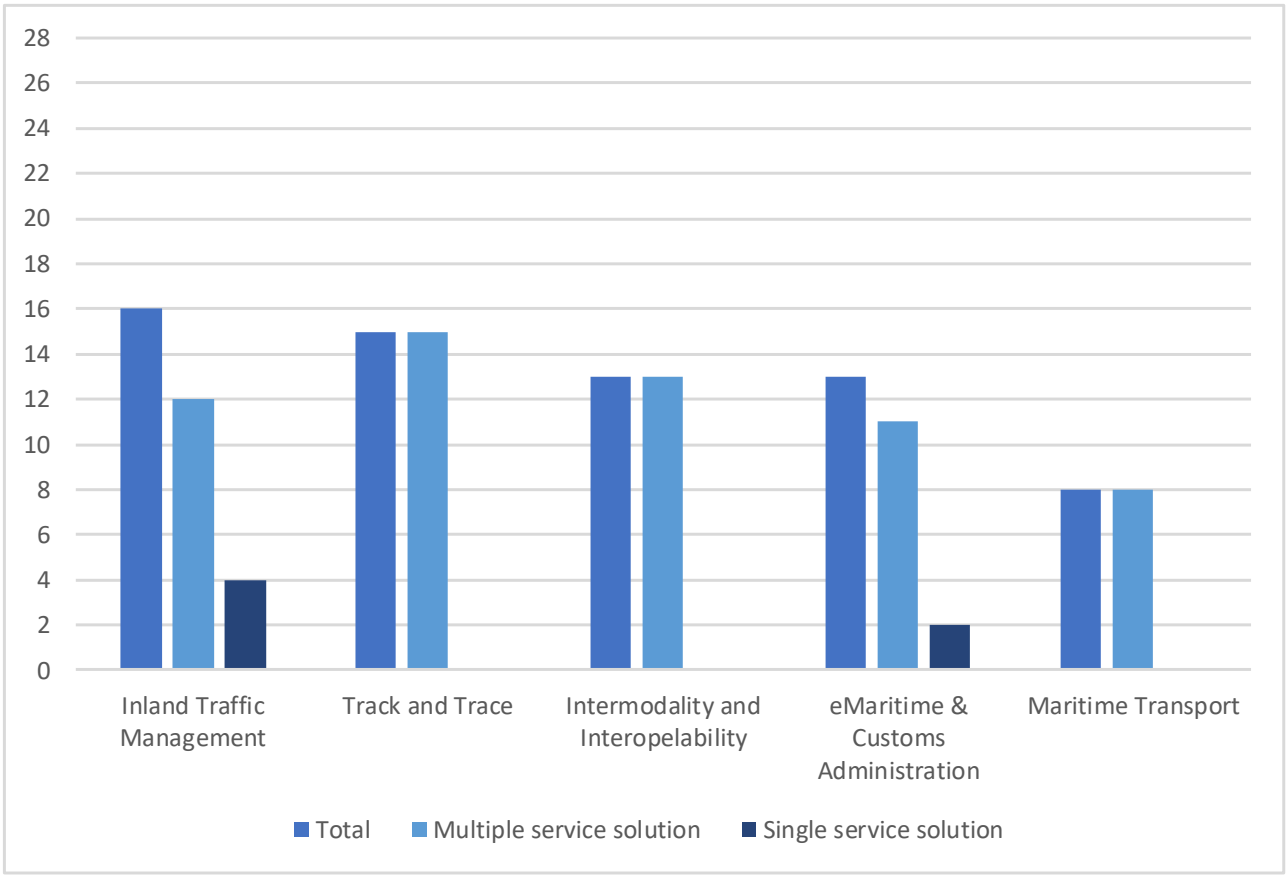

Figure 2 Number of best practices per provided service

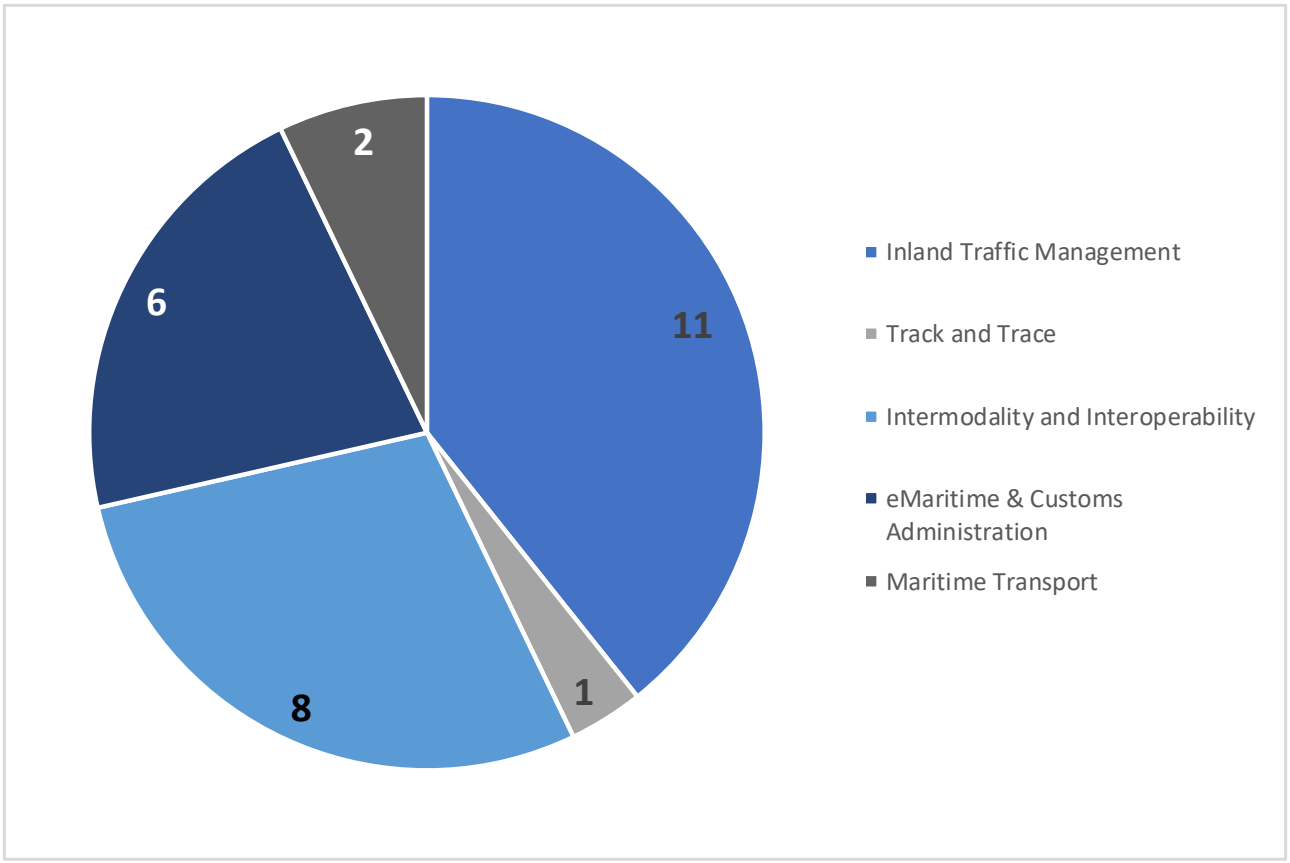

Figure 3 Number of best practices per prevailing activity

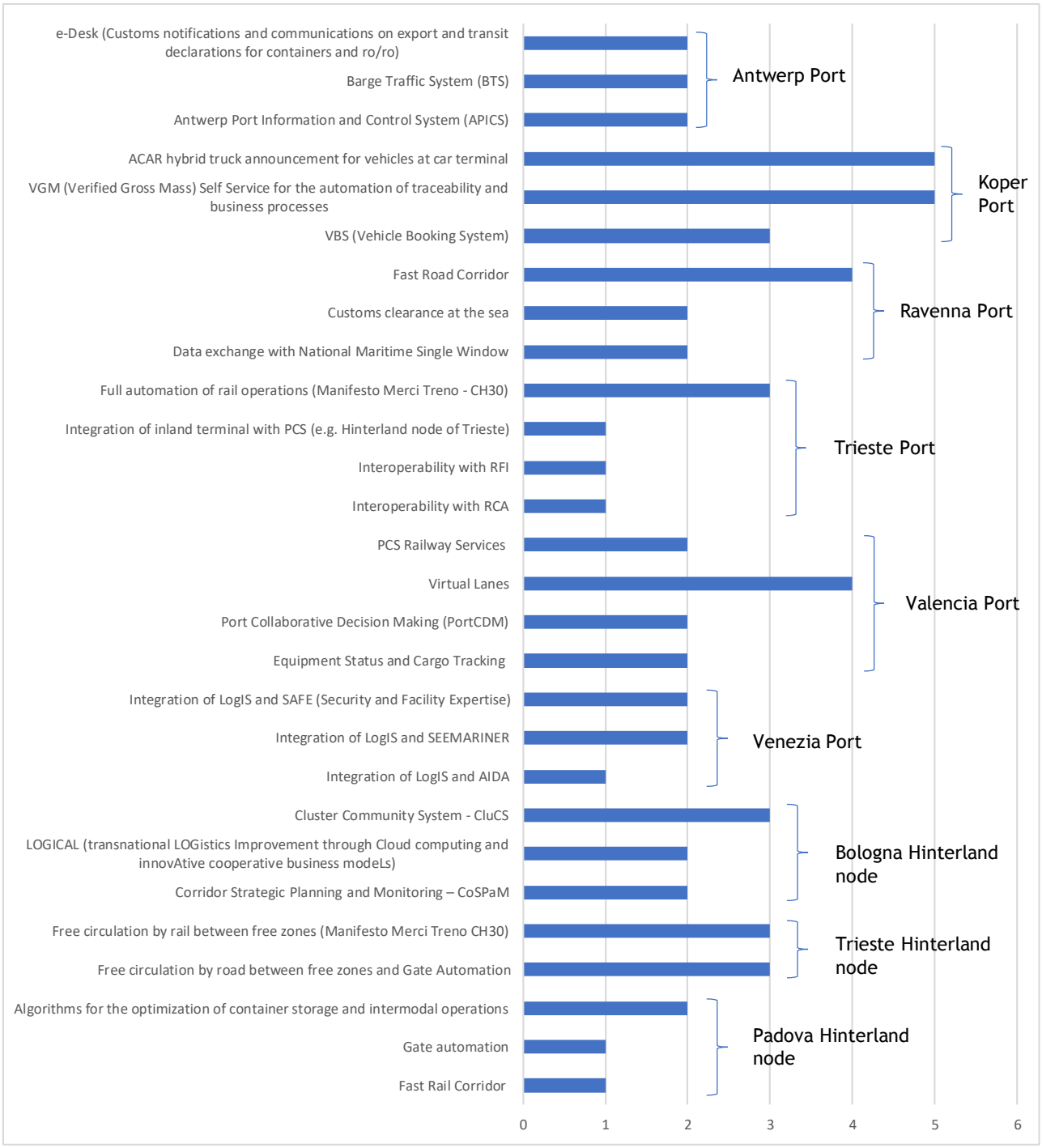

Figure 4 Number of provided services per best practice

With reference to the transport mode involved in the application of the ICT best practice (Table 5), it may be noticed, in the first place, that an ICT solution was associated to more than one mode either because it directly applies to various means of transport or because there is a flow of information among different actors concerning multimodal operations.

As displayed in Figure 5, road, rail, and maritime transports are associated to the same number of ICT solutions (i.e. 14). Four ICT solutions are found to be applicable also to inland waterways (IWW), as among the consulted ports, Antwerp and Venezia also present inland waterways operations.

Although the best practices are implemented at multimodal nodes where at least two transport modes (rail and road) are present, if not three (maritime, rail, road) or four (maritime, rail, road and inland waterway) in the case of Antwerp and Venezia, most of the solutions directly affect the operation and management of one mode of transport. According to Figure 6, 17 practices out of 28 regard one mode transport, and hence only 11 solutions are associated to two or more. More in detail, six ICT solutions apply to two modes, three involve road, rail and maritime, and only two embrace the whole range of transport modes.

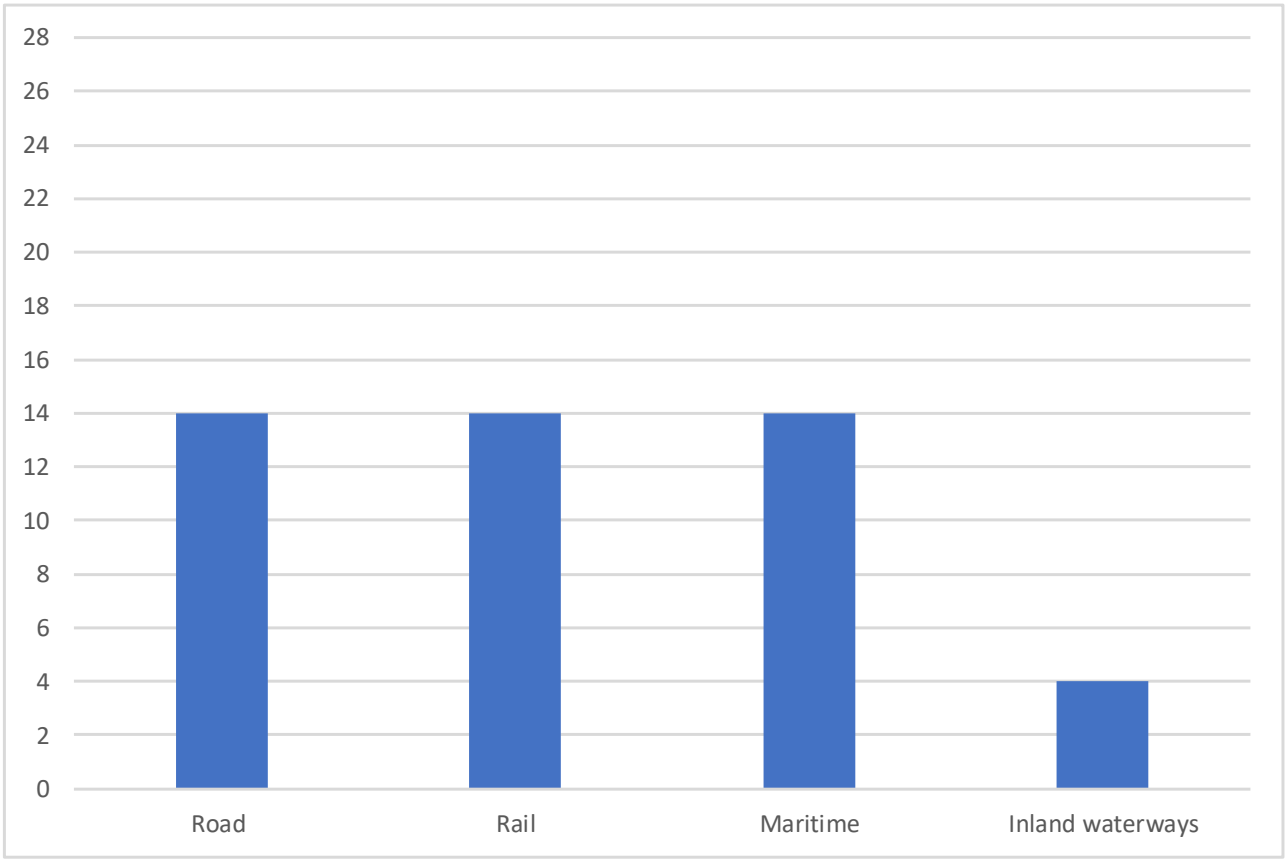

Figure 5 Number of best practices per mode of transport

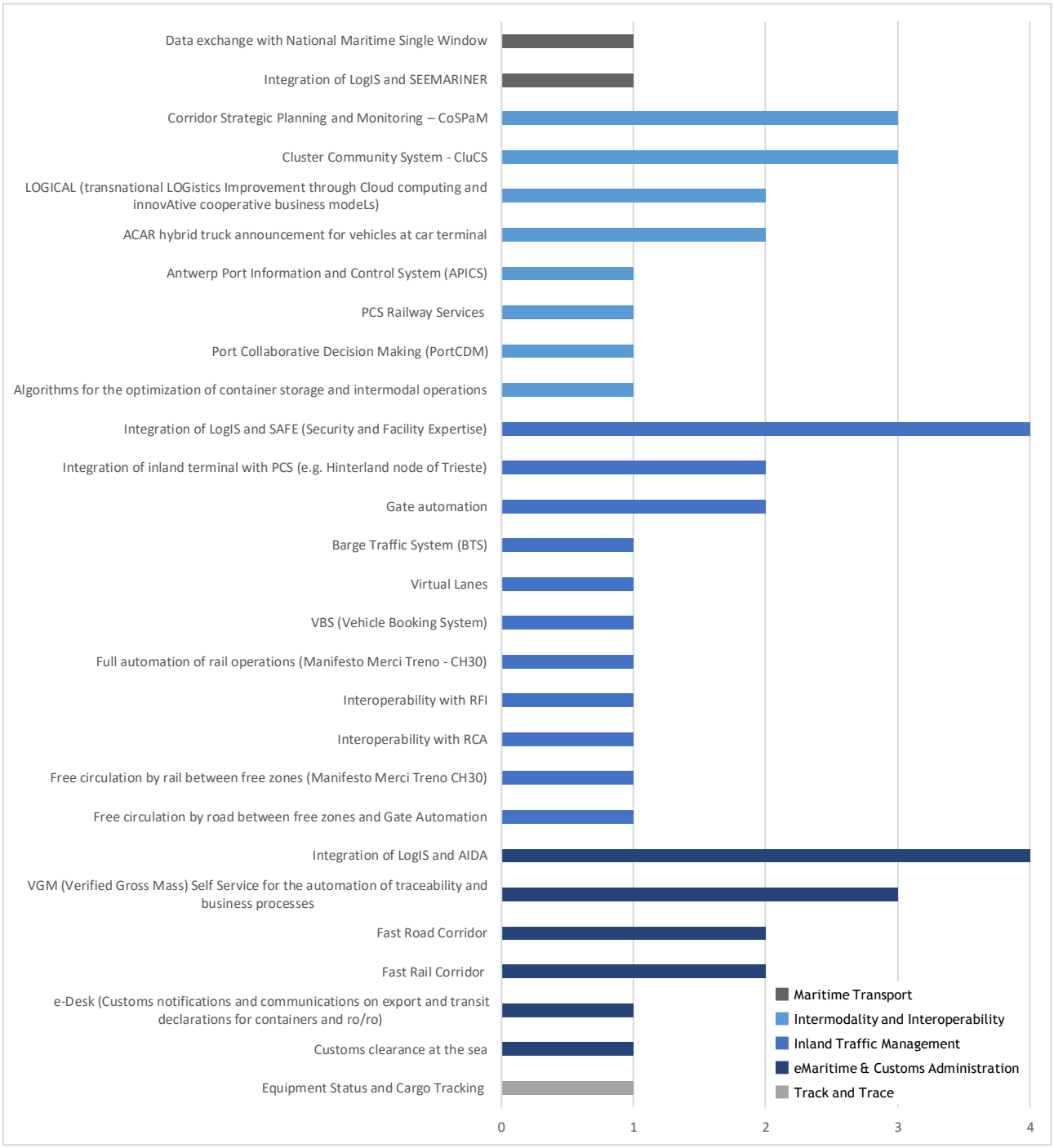

Figure 6 Number of transport modes per best practice

The analysis of the type of cargo associated with the adoption and use of the identified best practices, summarised in Table 6, reveals that almost all of them, i.e. 24 out of 28, are applicable to containerised cargo (see Figure 7). Among these, 14 concern container traffic only. However, as shown in Figure 8, 14 ICT solutions apply to two or more typologies of cargo.

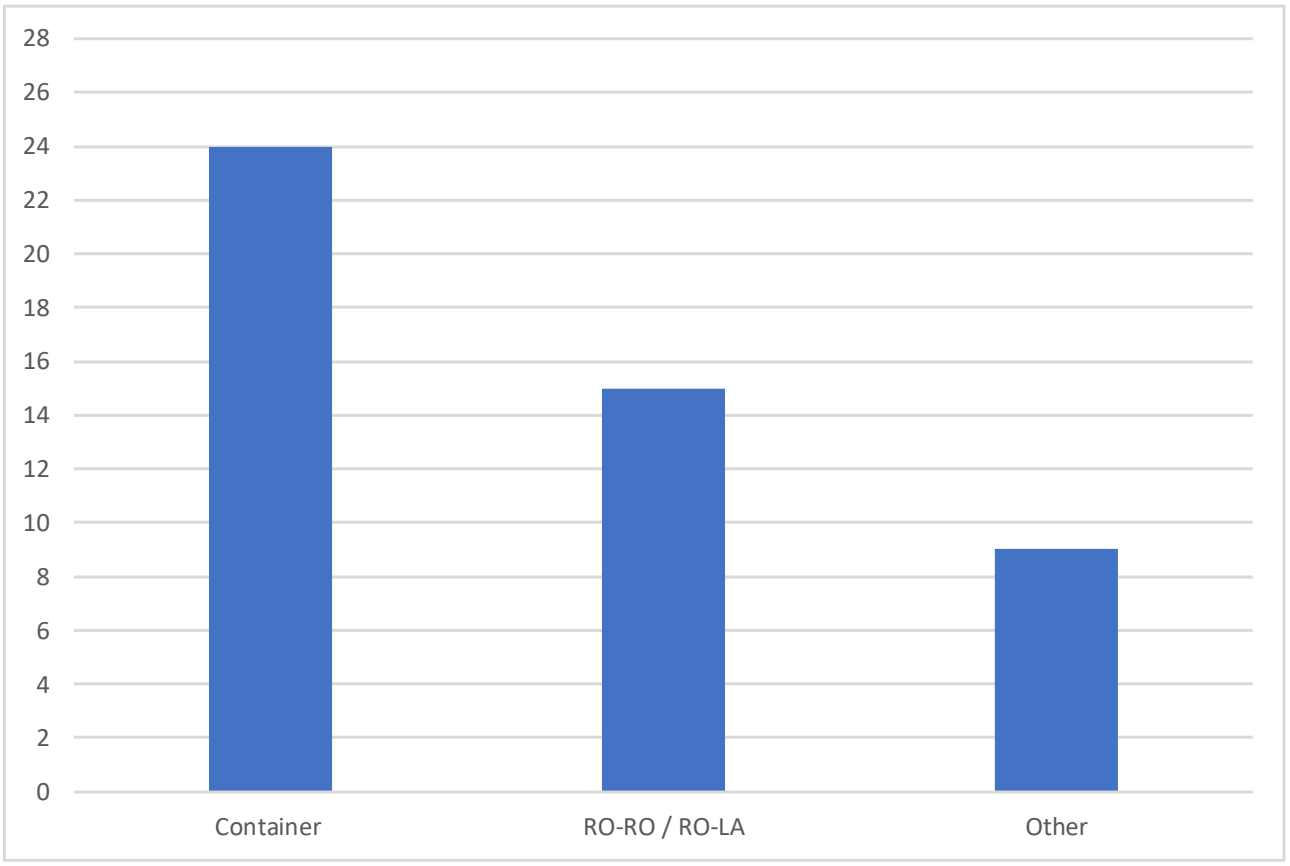

Figure 7 Number of best practices per type of cargo

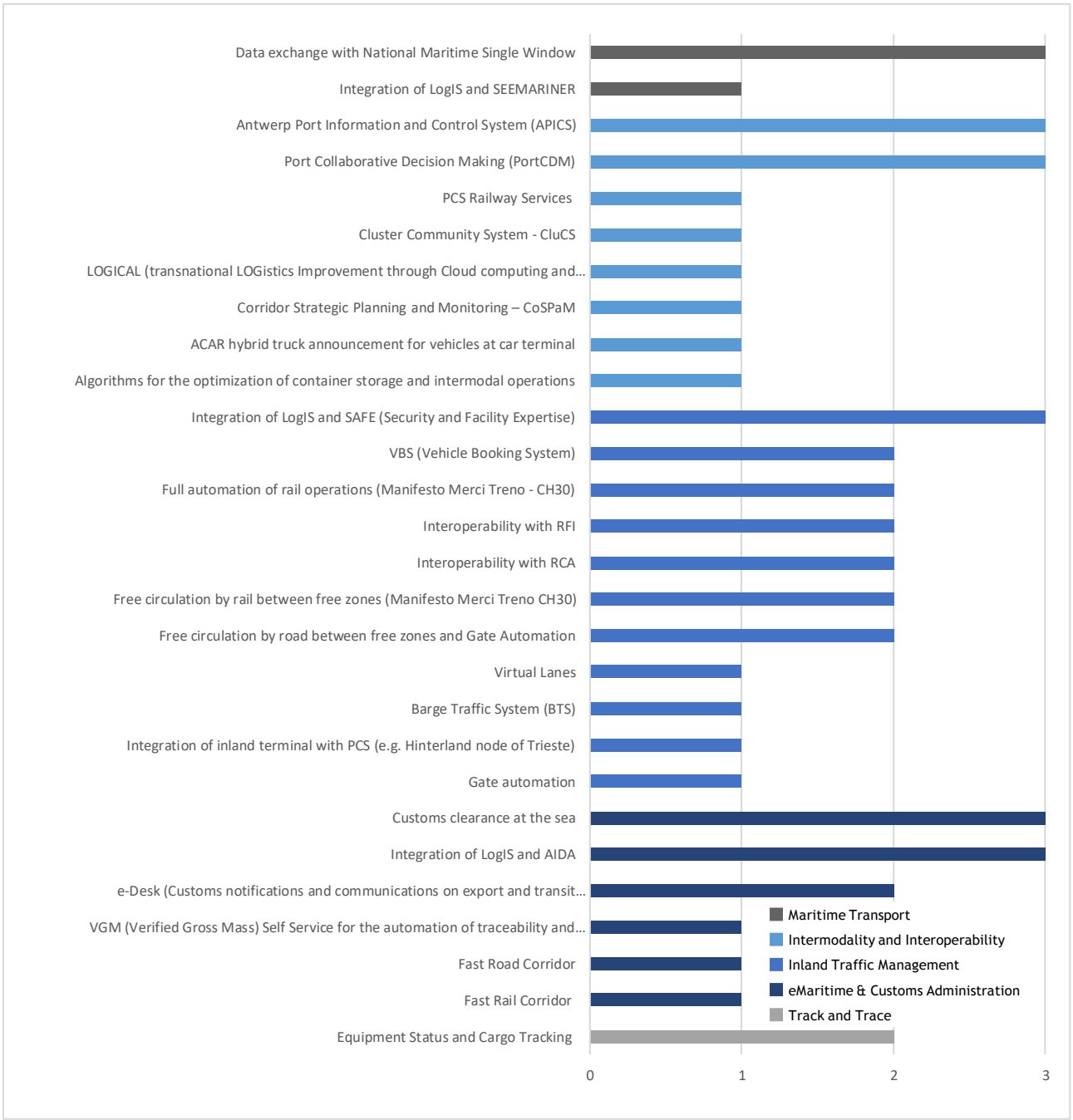

Figure 8 Types of cargo per best practice

The main technologies that are available at the nodes, also supporting the use of the identified best practices are summarised in Table 7.

As shown in Figure 9, all the nine investigated nodes are equipped with wireless communication technologies. Except for the Port of Trieste, all nodes are equipped with cloud computing systems, and seven of them have also cyber-security for advanced technology networks. This finding suggests that nowadays, the availability and integration of these technologies might represent the very basis to support the implementation of further ICT solutions. Also internet of things and big data analysis technologies are found to be largely adopted (six and five nodes respectively).

At the current state, robotics and autonomy and augmented reality are implemented in three nodes, whilst the Port of Antwerp, results to be the only node that is equipped with the augmented reality technology.

Indeed, according to Figure 10, the Port of Antwerp stands out compared to other nodes, being the only port that is equipped with all the technologies listed in the table and even more (see the column "Other"). Also the Port of Venezia and the Hinterland node of Padova, which is considering the possibility to implement big data analysis systems in the near future, appear to be one step forward, on the technological point of view, compared to the other nodes, given the number of different technologies they are equipped with. Currently, the port of Trieste seems to be the one with the least number of ICT tools implemented.

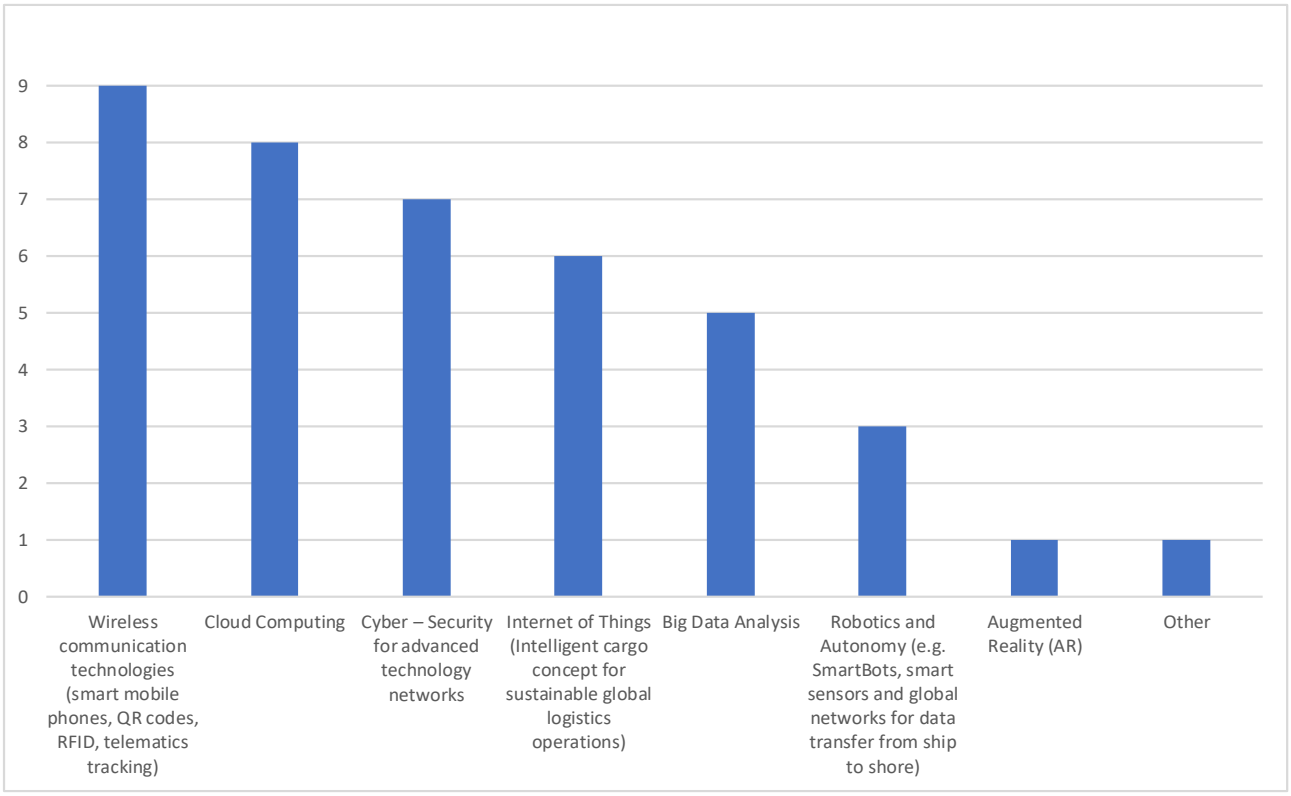

Figure 9 Number of nodes per implemented technology

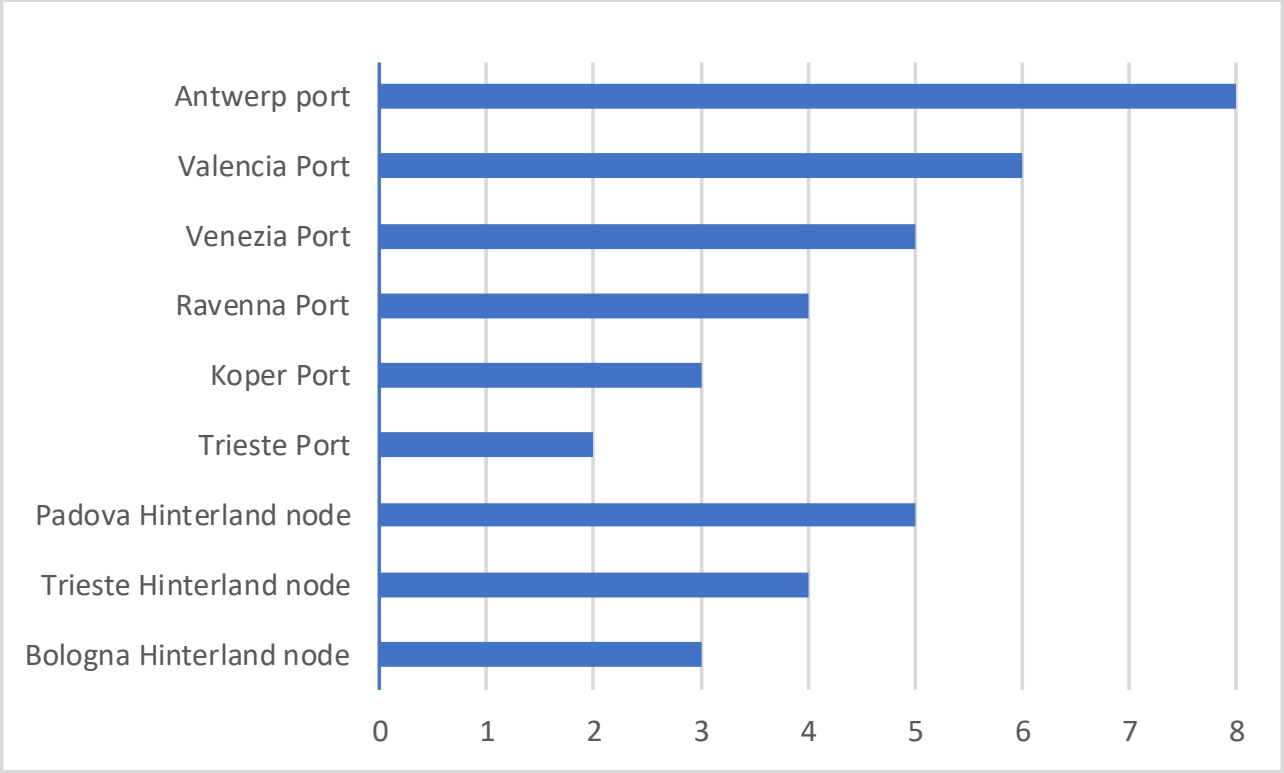

Figure 10 Number of ICT technologies already implemented at nodes

The type and complexity of the adopted technologies seems also to be correlated with the variety of modes, type of cargoes and services integrated by the proposed solution.

Concerning the implemented best practices at ports, it is worth to notice that a PCS is in place at all the involved nodes, albeit at different grades of complexity and articulateness in terms of type of integrated services and type and number of involved stakeholders. Several PCS are also integrated in national single windows, especially in what concerns customs-related administrative procedures.

The analysis of the PCS systems, particularly where these are more advanced, i.e. Valencia, seems to show that their integration with National Single Windows is structured in a way that the accessibility to the National Single Window is filtered or in any case mediated and provided via the local PCS. While ensuring transport flows between the local and national databases, this solution also allows more flexibility at the local with a possibility to integrate in the PCS specific solutions applicable at the local level. As further explained at section 4.5 below, concerning the transferability of the ICT solutions, whilst ICT tools and solutions can be in principle transferable, their application to a specific context and in any case PCS solutions are difficult to replicate.

4.2. Objectives of the identified best practices

Table 8

Table 8 matches the analysed ICT solutions, this time grouped by prevailing activity, with the target objectives of their adoption/deployment. The majority of them, i.e. 21 out of 28 solutions, regard the dematerialisation of processes. Basically, it includes all those technologies that make existing processes digitally accomplishable, thus reducing the amount of time required, paperwork, and the human error rate. Such kind of technologies appear to be crucial for increasing the smoothness of processes, and hence the competitivity of an intermodal node.

The possibility to know in real time the position of vehicles and/or cargo results to be another key issue to various involved stakeholders. As shown in Figure 11, 18 ICT solutions allow to track vehicles and/or to monitor cargos, discreetly or continuously depending on cases.

Solutions for the planning and the coordination of flows and operations, and those related to information and data sharing have been respectively implemented as part of 14 and 13 investigated solutions. In nine cases, these two categories are found in the same ICT solution, suggesting that the availability and the shareability of data can contribute to the improvement of planning and coordination of different processes and actors of the logistics chain.

The rationalisation of processes and/or procedures occurred in relation to three different solutions and mainly referred to those activities that, thanks to the dematerialisation, can be accomplished in a more time-effective manner. It is the case of the fast corridors, for instance, implemented by the Port of Ravenna and the Hinterland node of Padova for road and rail transport respectively. These solutions aimed to anticipate/postpone the Customs clearance procedures in order to reduce the permanence of cargos at nodes.

Solutions that require the full automation of a specific process/operation are reported two times, both in relation to the hinterland node of Padova. With all probabilities, the limited adoption is due to the implementation costs rather than the low utility of the solution itself.

The least mentioned practices are those that have security/cyber-security and environmental protection as objective, accounting for one ICT solution each.

As depicted in Figure 12, the objectives of the proposed solutions vary between one and four. However, out of 28 solutions, 24 relate to two to four different objectives, with 20 of them involving two or three solutions. Four ICT tools apply to one category, all concerning inland traffic management ICT solutions. Three of them are implemented at the Port of Trieste and one at the Port of Venezia.

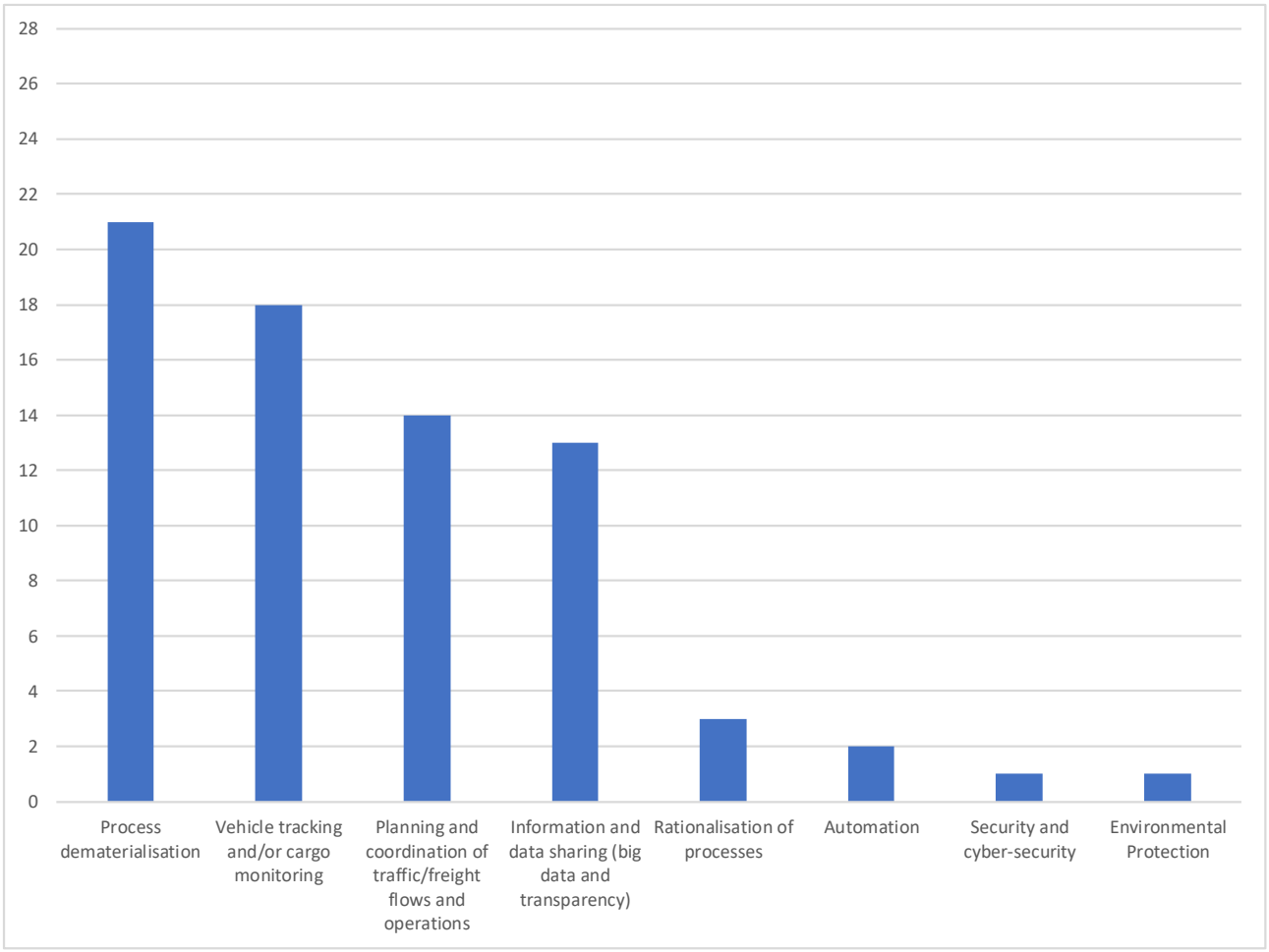

Figure 11 Number of best practices per objective

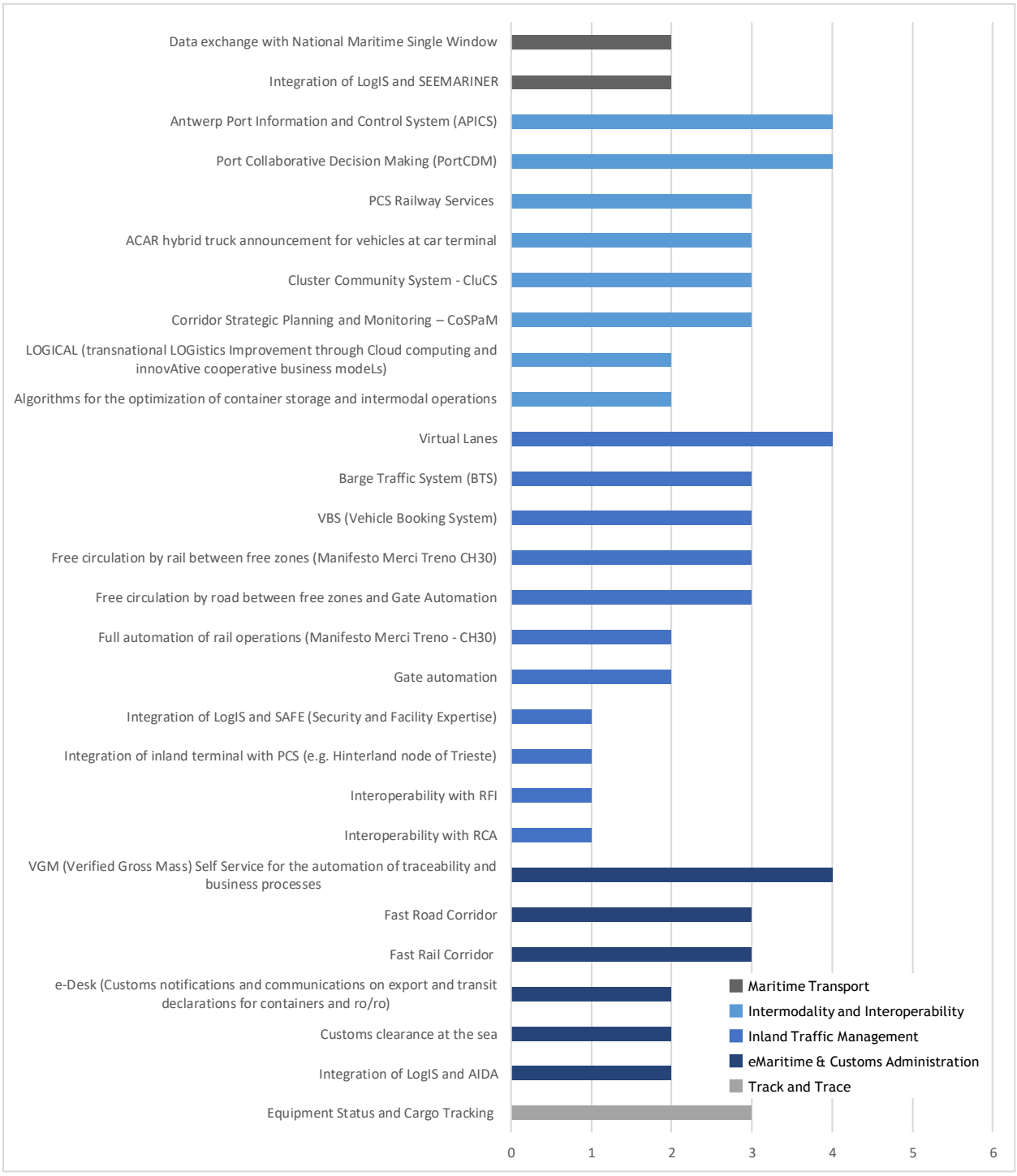

Figure 12 Number of objectives per best practice

4.3. Stakeholders involved in the use of the identified best practices

An important variable to take into account when considering ICT best practices is the type of stakeholders that are involved (Table 9

Table 9), since it might influence the actual feasibility and functioning of an ICT solution due to its likely greater complexity.

Most of the actors listed in Figure 13 (i.e. five out of eight) relate to a number of ICT solutions that varies between 20 and 24. More specifically, terminal operators are the actors that are more frequently interested by the best practices (24 solutions), followed by Port Authority (22 solutions) and shipping agents (21 solutions). Both Freight forwarders and official bodies are all involved in 20 best practices, while haulage companies appear in 18 solutions. Shippers and depots are accounted for 12 and 8 times respectively.

According to Figure 14, the number of actors involved by the ICT solutions varies between a minimum of two and a maximum of eight, which occurs in five best practices out of 28. 20 ICT solutions interest five or more stakeholders, with half of them involving five actors. Only six of the suggested best practices involve two to three different entities, while there is no solution designed to be used by a single actor specifically.

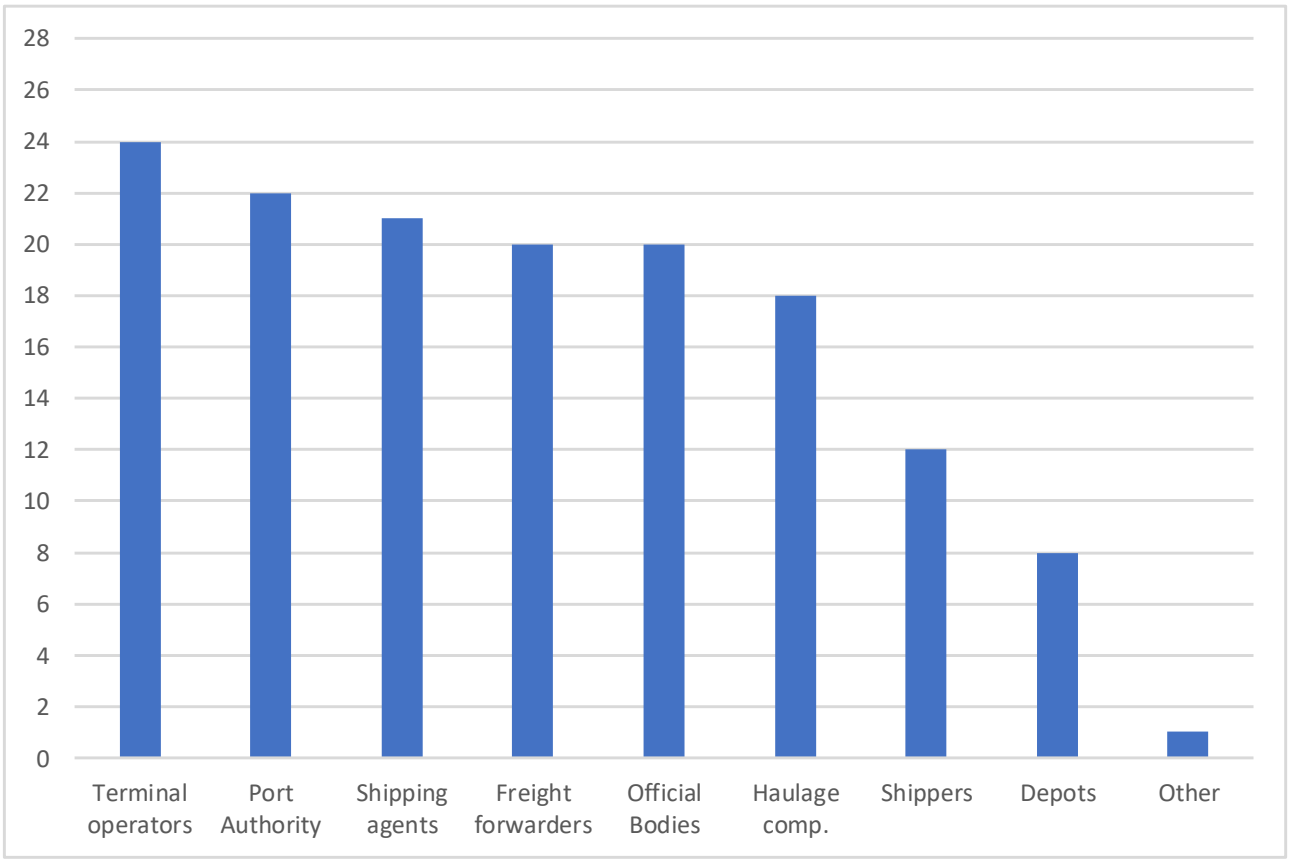

Figure 13 Number of best practices per stakeholder

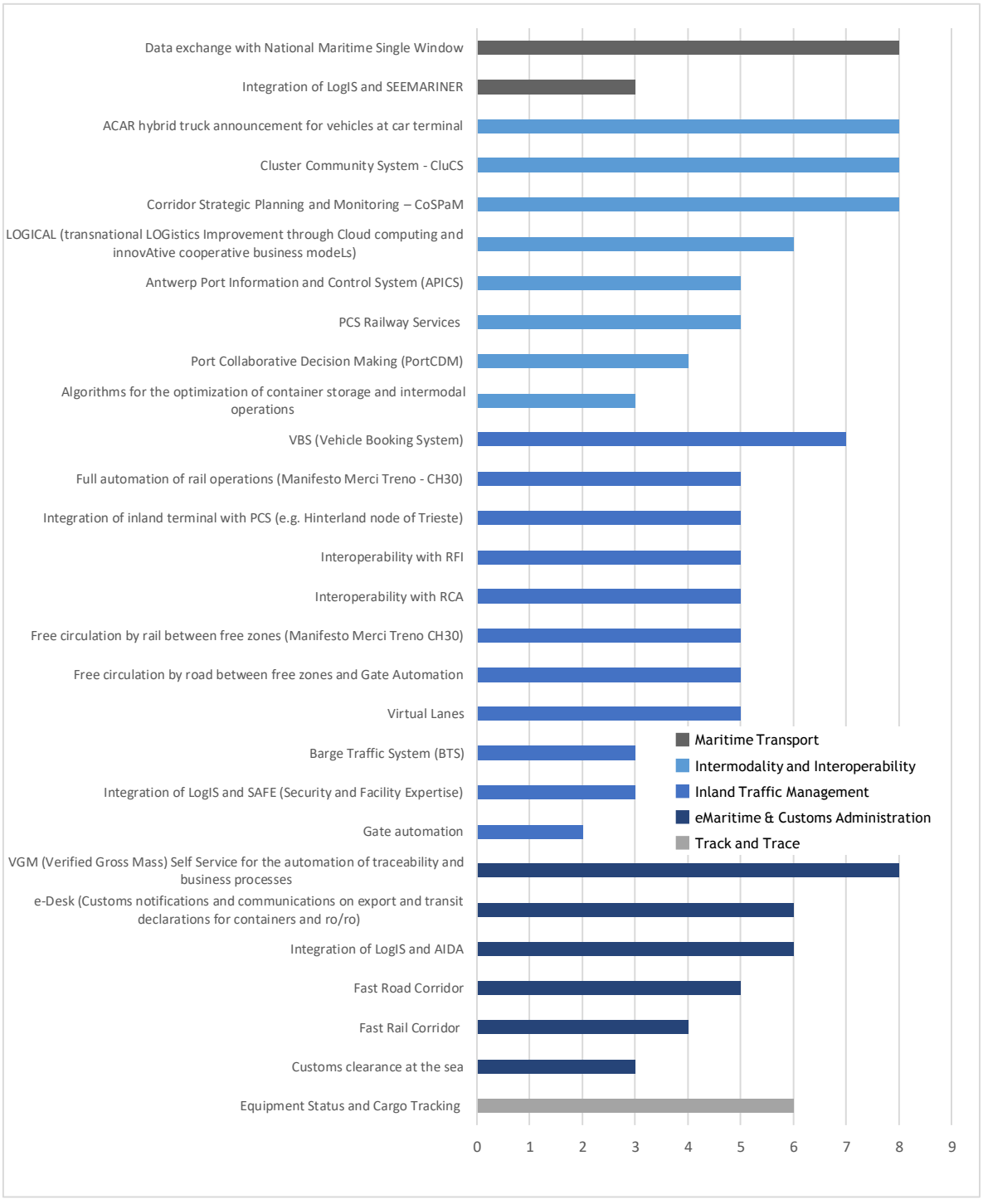

Figure 14 Number of stakeholders involved per best preactice

4.4. Benefits associated with the implementation of the identified best practices

The number of benefits that can be generated by a specific ICT solution is possibly the main driver for the selection of the most suitable best practice, once the objectives are clearly identified. The benefit-related results of the questionnaires are reported in Table 10

Table 10.

As Figure 15 shows, most of the analysed solutions generated benefits in terms of time and costs savings to the Port Administration and the involved operators, either directly or indirectly. Several solutions resulted to be beneficial for the security and safety within terminals, as well as for the environment, thanks to a reduction of pollution, and for the urban traffic, through a decrease of the congestion due to the traffic flows from/to the port.

Accordingly, 26 best practices produced benefits in terms of time savings, which in turn contributed to the generation of costs saving to operators (i.e. 21) and to the Administration (i.e. 19). However, several ICT solutions generated monetary savings per se, thanks, for instance, to the dematerialization of administrative procedures and processes.

Security benefits were generated as many times as the increases in information sharing and transparency, namely six. Benefits linked to the mitigation of environmental impacts were mentioned in five cases, whilst benefits in terms of improved safety and reduced traffic congestion were both generated by four ICT solutions respectively.

As shown in Figure 16, none of the best practices generated more than six benefits. Ten solutions generated one to two benefits, 13 solutions generated three to four, and five generated five to six benefits in total. However, most of the best practices, i.e. 20, generated two to four different typologies of benefits. It is worth noticing that most of the ICT solutions that generated four to six benefits are implemented to provide intermodality and interoperability services or inland traffic management services.

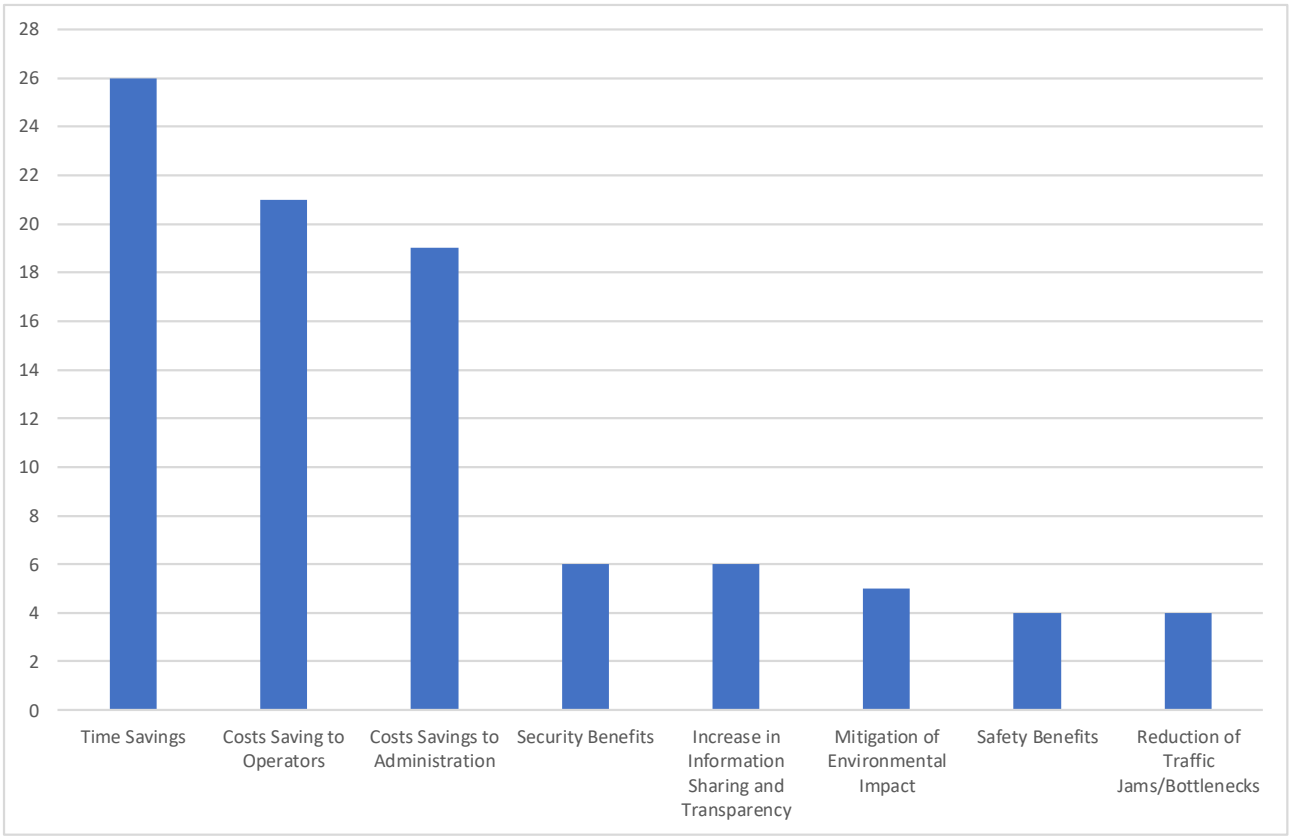

Figure 15 Number of best practices per benefit

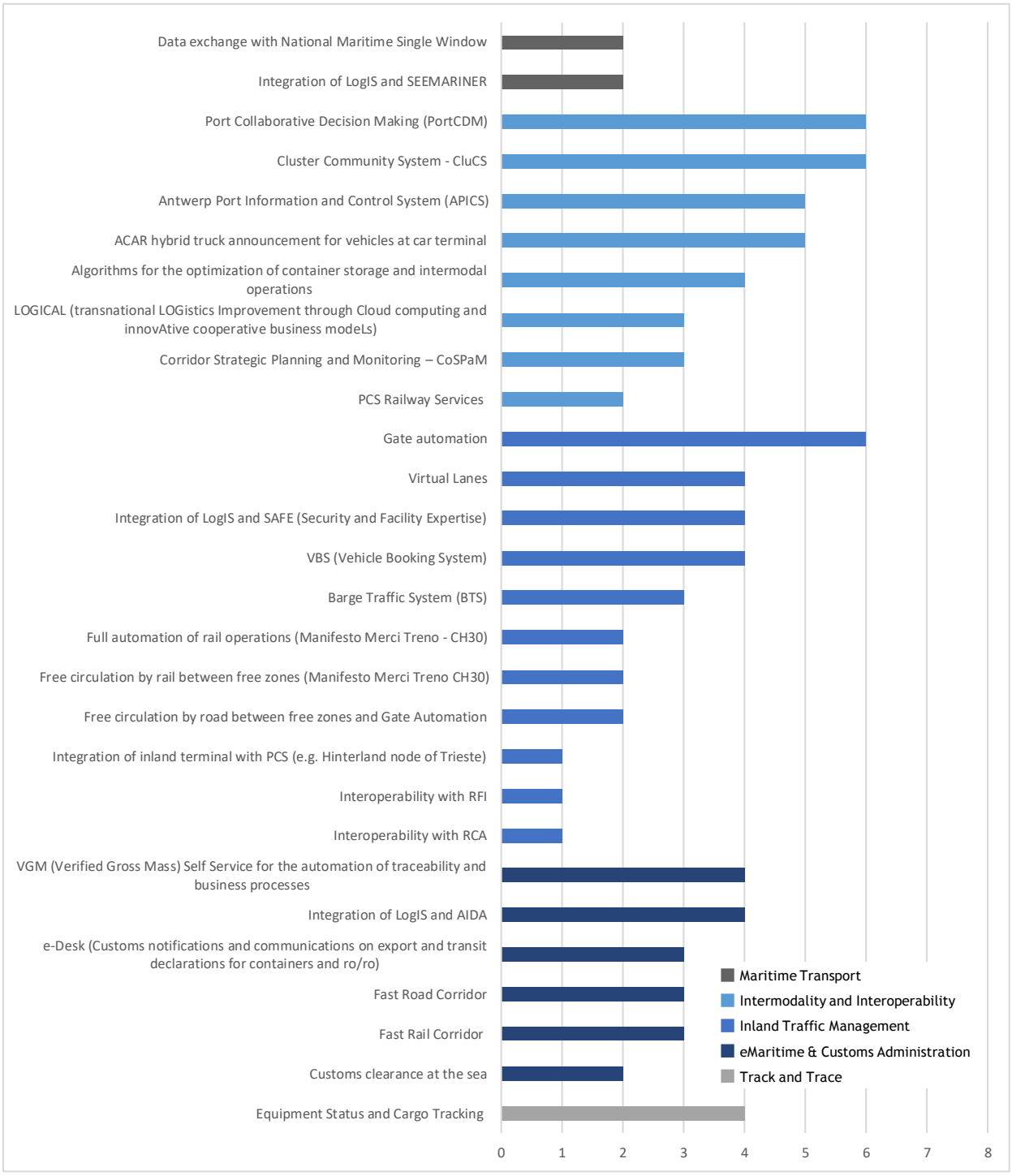

Figure 16 Number of generated benefits per best practice

4.5. Transferability of the identified best practices

The table below summarises the outcome of the analysis with respect to the possibility to transfer the identified best practices to other nodes. The interviewed stakeholders consider most of the implemented technologies as transferable to other nodes. Tools and solutions are in several circumstances tailored to the local business and administrative contexts, however they can be adapted to different realities. ICT tools and solutions can generally be implemented at different nodes, specified that their exact replicability is limited. The more the solution is diversified and integrated in terms of provided services the more its replicability is difficult.

Two solutions are deemed not to be transferable to other nodes. The first one is dedicated to the transport of cars at Koper which is deemed to be very specific to the context. The Antwerp Port Information and Control System (APICS) is also deemed to be very specific to this port as the solution is dependent upon the geographic configuration of the node.

Table 3Best practices in the field of ICT at logistics nodes belonging to the core network

Ports	*BP*	*Solutions*	Transferability	Comment
Antwerp Port	BP1	e-Desk (Customs notifications and communications on export and transit declarations for containers and Ro-Ro)	Yes	The solution is quite easily transferable to other ports/port communities; main barrier (implementation change) in the specific communication setup with country's Customs export control process
	BP2	Antwerp Port Information and Control System (APICS)	No	This solution is not transferable. It is specific implementation for the Antwerp Port processes (lock planning and execution, vessel inland traffic management, berth management, pilots, tug boats, etc…)
	BP3	Barge Traffic System (BTS)	Yes	Can be adopted and extended to other ports, where inland waterways are involved
Koper Port	BP4	VBS (Vehicle Booking System)	Yes	This solution can be used wherever a need for better planning of cargo availability is crucial. When more actors are linked with the same information, to work on a logistic chain, the shared information and news about cargo availability can help all in planning their activities. The main issue for the adoption of a unified solution in all the terminals, ports, hubs etc., is the unicity of systems at the above-mentioned areas. For example, every port can have a PCS but it's usually an ad-hoc software for the specific port and for the type of cargo managed by the port. Software providers help their customers in obtaining optimal solutions and these solutions are tough or cannot be replicable out of the port's area
	BP5	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Yes	System's adaptations are linked with port's PCS which remains an ad-hoc solution for this type of logistics and customer. Anyway, the system is owned and provided by external experts which can adopt small modifications to adapt the solution to other entities or customers. The main obstacle is the diversification of potential users for this solution, which means that eventual solutions cannot be only copied/pasted in other realities
	BP6	ACAR hybrid truck announcement for vehicles at car terminal	No	The unicity of port's structure and PCS cannot be shared as a solution without structural modifications for the use of this solution in other realities. By adopting a single model structure, the logistic chain could be more streamlined and could offer a larger quantity/type of data for the whole group of stakeholders involved in the logistics of the specific transported unit
Ravenna Port	BP7	Customs clearance at the sea	Yes	The experimental procedure could be extended to the bulk cargoes and general cargoes that can be identified unambiguously (e.g. coils)
	BP8	Data exchange with National Maritime Single Window	Yes	At the moment it is possible to acquire only a limited set of information from the national Maritime Single Window and is not possible to transfer or share with it any information. Extending the number of information provided by NMSW and sharing of information between the PCS to the NMSW could be very helpful in order to

Ports	*BP*	*Solutions*	Transferability	Comment
				eliminate many bottlenecks related to the use of different ICT system for the same port process
	BP9	Fast Road Corridor	Yes	The solution is implementable in other nodes
Trieste Port	BP10	Full automation of rail operations (Manifesto Merci Treno - CH30)	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity
	BP11	Integration of inland terminal with PCS (e.g. Hinterland nodeo di Trieste)	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity
	BP12	Interoperability with RFI	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity, using the same set of certified data
	BP13	Interoperability with RCA	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity
Valencia Port	BP14	PCS Railway Services	Yes	No major obstacles are identified for the possible adoption of this solution by other nodes
	BP15	Virtual Lanes	Yes	No major obstacles are identified for the possible adoption of this solution by other nodes
	BP16	Port Collaborative Decision Making (PortCDM)	Yes	No major obstacles are identified for the possible adoption of this solution by other nodes
	BP17	Equipment Status and Cargo Tracking	Yes	No major obstacles are identified for the possible adoption of this solution by other nodes
Venezia Port	BP18	Integration of LogIS and SAFE (Security and Facility Expertise)	Yes	The solution is deemed transferable under the conceptual and technological point of view to other nodes
	BP19	Integration of LogIS and SEEMARINER	Yes	The solution is deemed transferable under the conceptual and technological point of view to other nodes
	BP20	Integration of LogIS and AIDA	Yes	The solution is deemed transferable under the conceptual and technological point of view to other nodes
Hinterland nodes		***Solutions***		
Bologna Hinterland node	BP21	Cluster Community System - CluCS	Yes	The approach proposed by CluCS is absolutely transferable and scalable in other regions areas. Furthermore, it is of great value for the solution to involve more terminals and hubs both in an existing cluster and by forming other clusters which can be interconnected each other
	BP22	LOGICAL (transnational LOGistics Improvement through Cloud	Yes	The solution will benefit from other nodes and transport modes joining the platform

Ports	*BP*	*Solutions*	Transferability	Comment
		computing and innovAtive cooperative business modeLs)		
	BP23	Corridor Strategic Planning and Monitoring – CoSPaM	Yes	The solution can be replicated wherever there is need to improve collaboration of transport stakeholders along multimodal transport corridors
Fernetti Hinterland node	BP24	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity
	BP25	Free circulation by road between free zones and Gate Automation	Yes	This solution can be replicated in any other port / RRT. The main challenge relates to the need for data interoperability between involved stakeholders and full reciprocity
Padova Hinterland node	BP26	Gate automation	Yes	The solution is based on consolidated technology and involves a very limited number of stakeholders. Moreover, it can be easily implemented, and it guarantees benefits to the involved entities
	BP27	Fast Rail Corridor	Yes	The solution can be considered for implementation also for road transport and other ports
	BP28	Algorithms for the optimization of container storage and Interoperability and Intermodality	Yes	All nodes could adopt this solution, the main barrier of which is represented by the realisation costs

5. Concluding remarks and considerations

This deliverable D.T2.1.3 REPORT ON THE TRANSNATIONAL BEST PRACTICES CONCERNING ICT TOOLS FOR IMPROVING MULTIMODAL TRANSPORT IN PORTS AND AT BCPS KNOW-HOW TRANSFER provides a recent panoramic on a sample of 28 ICT tools that are already in practice in several ADRION logistics [i.e. Ravenna, Venezia, Trieste, Koper (ports); Bologna, Padova and Trieste (hinterland nodes)], as well as at the ports of Antwerp and Valencia, both recognised as leading best practices promoters in the field of ICTs by the international maritime transport and multimodal logistics industries. The report is aimed to provide a basis for dialogue and discussion among the ADRIPASS partners and particularly the ports of Koper, Bar, Ploče, Durres and Igoumenitsa, about the opportunity to implement new tools and/or improve already adopted ICT solutions, in light of the implementation of Regulation (EU) 1315/2013 concerning the European Union policy on the development of the TEN-T network. In this regard it is noticeable that all the investigated solutions are implemented at nodes belonging to one or more core network corridors of the Union.

As explained at Section 3.1, the WPT2 analysis used the *best practice* concept in a wider meaning and the investigated solutions have been proposed by the concerned stakeholders due to their particular benefits to the logistics sector, regardless their identification as best practices by the scientific or industry communities. This approach was in line with the scope of the work package to provide a knowledge base of implemented and implementable solutions that could be pragmatically used by the ADRIPASS ports to improve their performance and consolidate their integration and competitiveness in the European single transport area. The limited size of the sample, did not allow to draw statistically significant conclusions on the basis of the results of the WPT2 analysis described at Chapter 4 above. Nonetheless the following remarks and considerations can be made with reference to the directions provided in the above referred Regulation (EU) 1315/2013, and more generally in the subsequent activities and studies for the implementation of the TEN-T policy.

In terms of relevant remarks, it may be noticed that the 28 identified solutions seems well responding to the requirements set in the TEN-T Regulation:

- In line with art. 29 setting the priorities for multimodal transport infrastructure, these solutions contribute to the development of smooth flows of information between the transport modes and/or enable multimodal and single- mode services to be provided across the trans-European transport system (out of 28 ICT solutions, 21 are related to the process dematerialisation, 18 allow for tracking vehicles and/or monitoring of cargoes, and 13 involve information and data sharing specifically);

- According to art. 31 concerning the requirements for the adoption of telematic applications, the identified solutions enable traffic management (which resulted to be the most often provided service, being identified as the core activity of 11 solutions) and the exchange of information within and between transport modes for multimodal transport operations and value-added transport-related services (11 best practices involve two or more transport modes, while 8 were implemented to promote intermodality and interoperability services), improvements in safety, security and environmental performance, and simplified administrative procedures (in terms of benefits, most of solutions produced time and cost benefits to operators and administrations; besides, 6 solutions improved security at nodes, 5 were implemented to mitigate the environmental impacts, 4 generated safety-related benefits to operators, and other 4 helped in the reduction of traffic congestion). Furthermore the analysis shows that the ports' identified best practices also include single-window services such as the maritime single window, port community systems and relevant customs information systems (most solutions implemented at ports are integrated in the respective PCSs; In addition, 6 solutions were reported to be beneficial to the stakeholders through an increase in information sharing and transparency);
- In line with art. 32 the assessed ICT measures contribute to the competitiveness and further development of sustainable freight transport services by promoting the deployment of innovative transport solutions (in this regard, 14 best practices were implemented for the planning and coordination of traffic/cargo flows and operations), including through motorways of the sea, telematic applications and the development of the ancillary infrastructure necessary to achieve mainly environmental and safety related goals of those services, as well as the establishment of relevant governance structures; and/or by facilitating multimodal transport service operations, including the necessary accompanying information flows, and improve cooperation between transport service providers (indeed, 20 ICT solutions involve 5 to 8 stakeholders);
- According to art. 33 on the adoption of new technologies and innovation, these solutions improve the safety and sustainability of the transport of goods and further enhance the development and deployment of telematic applications within and between modes of transport.

The following considerations seem to be also applicable to the logistics nodes in the ADRION area based on the review of the sample of 28 identified solutions and consultation with the interviewed stakeholders:

- The identified solutions contribute to increase the competitiveness of maritime, multimodal and combined transport, by reducing times and costs associated with the dematerialisation of administrative procedures and automatisation of

processes, and by means of optimisation of transport activities at terminals, including management of traffic and loading/unloading operations. The improvement of last mile connections of ports and the digitalisation of transport have been identified in the corridor studies as priorities for the removal of the main technical and administrative barriers to multimodal transport. This is also in line with one of the key pillars identified by the European Coordinator of Motorways of the Sea, namely the *Integration of Maritime Transport in the Logistics Chain*. For a full integration of maritime transport in the logistics chain it is however important that ICT solutions integrate more nodes and particularly more hinterland nodes with a port or a system of ports. This may be also reasonably expected to support territorial cohesion and integration. In accordance with art. 32 of Regulation (EU) 1315/2013, telematic applications shall indeed also facilitate seamless connection between the infrastructure of the comprehensive network and the infrastructure for regional and local transport.

- The investigated eMaritime solutions have been already implemented and also integrated in Port Community Systems. With the exception of customs-related procedures and processes, these solutions seem to have been predominantly implemented at the single node level. Art. 32 of Regulation (EU) 1315/2013 foresees that telematic applications shall be deployed where feasible across the Union, in order to enable a set of interoperable basic capabilities to exist in all Member States. In this regard, the analysis of the transferability of the identified solutions suggests that the ICT tools and solutions can generally be implemented at different nodes, specified that their exact replicability seems rather limited. More importantly, tools and solutions are in several circumstances appropriately tailored to the local business and administrative contexts, as well as node and terminals configurations and layout. Accordingly, one fit all solution does not seem always appropriate. Whilst ICT supporting technologies seem to be adaptable to different contests, which may also support the development of interoperable systems, solutions shall be flexible in order to accommodate local specialisms and specificities. This praxis seems also confirmed by the analysis of relevant international best practices (i.e. Valencia), where local PCS represents in any case the door and provides accessibility to the national single window.
- The development and operation of ICT tools and solutions requires the availability of specialised skills and know how. The number of skills, and particularly the amount of human and financial resources required to develop and operate ICT systems, may significantly vary according to the type and quantity of technologies and tools developed as well as the services provided and the transport modes and stakeholders involved. Very large and articulated ICT systems such as the PCS implemented at the ports of Antwerp and Valencia either require the set up of an internal tool and a team of specialised staff or the outsourcing of the technology

supporting the system and its management. Provided that these systems are capable of generating significant benefits to the port community, a *critical mass* of users and/or services seems to be required to set up similar systems, in order to recover their investment and operating costs. Such solutions are also difficult to be implemented without a significant involvement of the Port Authority both in administrative and financial terms. Smaller scale solutions prove in any case also to be beneficial to the logistics industry, which may be focussed on specific types of cargoes and/or operations and services and which due to their benefits may involve also private companies in the management and operation of the solutions.

Annex A – Detailed Tables of Analysis

This annex includes the tables resulting from the elaboration of the information collected through the questionnaires filled in by the logistics nodes involved in the data collection. The questionnaires are provided in Appendix 1 to this report, submitted under separate file.

Table 4Classification of best practices by main area of applicability

Ports	*Solutions*	Inland Traffic Management	Track and Trace		Intermodality and Interoperability	eMaritime & Customs Administration	Maritime Transport	Prevailing Activity
Antwerp Port	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)		x			x		eMaritime & Customs Administration
	Barge Traffic System (BTS)	x			x			Inland Traffic Management
	Antwerp Port Information and Control System (APICS)				x		x	Intermodality and Interoperability
Koper Port	ACAR hybrid truck announcement for vehicles at car terminal	x	x		x	x	x	Intermodality and Interoperability
	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	x	x		x	x	x	eMaritime & Customs Administration
	VBS (Vehicle Booking System)	x	x		x			Inland Traffic Management
Ravenna Port	Fast Road Corridor	x	x		x		x	eMaritime & Customs Administration
	Customs clearance at the sea					x	x	eMaritime & Customs Administration
	Data exchange with National Maritime Single Window		x				x	Maritime Transport
Trieste Port	Full automation of rail operations (Manifesto Merci Treno - CH30)	x	x			x		Inland Traffic Management
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	x						Inland Traffic Management
	Interoperability with RFI	x						Inland Traffic Management
	Interoperability with RCA	x						Inland Traffic Management
Valencia Port	PCS Railway Services	x			x			Intermodality and Interoperability

	Virtual Lanes	x	x		x	x		Inland Traffic Management
	Port Collaborative Decision Making (PortCDM)				x		x	Intermodality and Interoperability
	Equipment Status and Cargo Tracking		x			x		Track and Trace
Venezia Port	Integration of LogIS and SAFE (Security and Facility Expertise)	x				x		Inland Traffic Management
	Integration of LogIS and SEEMARINER		x				x	Maritime Transport
	Integration of LogIS and AIDA					x		eMaritime & Customs Administration
Hinterland nodes	***Solutions***	**Inland Traffic Management**	**Track and Trace**		**Intermodality and Interoperability**	**eMaritime & Customs Administration**	**Maritime Transport**	**Prevailing Activity**
Bologna Hinterland node	Cluster Community System - CluCS		x		x	x		Intermodality and Interoperability
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)		x		x			Intermodality and Interoperability
	Corridor Strategic Planning and Monitoring – CoSPaM		x		x			Intermodality and Interoperability
Trieste Hinterland node	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	x	x			x		Inland Traffic Management
	Free circulation by road between free zones and Gate Automation	x	x			x		Inland Traffic Management
Padova Hinterland node	Algorithms for the optimization of container storage and intermodal operations	x			x			Intermodality and Interoperability
	Gate automation	x						Inland Traffic Management
	Fast Rail Corridor					x		eMaritime & Customs Administration

Table 5Identified best practices and modes of transport

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Road	Rail	Maritime	Inland waterways
Maritime Transport	Data exchange with National Maritime Single Window	Ravenna Port			x	
	Integration of LogIS and SEEMARINER	Venezia Port			x	
Intermodality and Interoperability	Corridor Strategic Planning and Monitoring – CoSPaM	Bologna Hinterland node	x	x	x	
	Cluster Community System - CluCS	Bologna Hinterland node	x	x	x	
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Bologna Hinterland node	x	x		
	ACAR hybrid truck announcement for vehicles at car terminal	Koper Port	x		x	
	Antwerp Port Information and Control System (APICS)	Antwerp port			x	
	PCS Railway Services	Valencia Port		x		
	Port Collaborative Decision Making (PortCDM)	Valencia Port			x	
	Algorithms for the optimization of container storage and intermodal operations	Padova Hinterland node	x			
Inland Traffic Management	Integration of LogIS and SAFE (Security and Facility Expertise)	Venezia Port	x	x	x	x
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	Trieste Port	x	x		
	Gate automation	Padova Hinterland node	x	x		
	Barge Traffic System (BTS)	Antwerp port				x
	Virtual Lanes	Valencia Port	x			
	VBS (Vehicle Booking System)	Koper Port	x			
	Full automation of rail operations (Manifesto Merci Treno - CH30)	Trieste Port		x		
	Interoperability with RFI	Trieste Port		x		
	Interoperability with RCA	Trieste Port		x		
	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Trieste Hinterland node		x		
	Free circulation by road between free zones and Gate Automation	Trieste Hinterland node	x			
eMaritime & Customs Administration	Integration of LogIS and AIDA	Venezia Port	x	x	x	x
	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Koper Port	x	x	x	
	Fast Road Corridor	Ravenna Port	x		x	
	Fast Rail Corridor	Padova Hinterland node		x	x	

	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)	Antwerp Port			x	
	Customs clearance at the sea	Ravenna Port			x	
Track and Trace	Equipment Status and Cargo Tracking	Valencia Port				x

Table 6Identified best practices and type of cargo

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Container	RO-RO / RO-LA	Other
Maritime Transport	Data exchange with National Maritime Single Window	Ravenna Port	x	x	x
	Integration of LogIS and SEEMARINER	Venezia Port			x
Intermodality and Interoperability	Antwerp Port Information and Control System (APICS)	Antwerp port	x	x	x
	Port Collaborative Decision Making (PortCDM)	Valencia Port	x	x	x
	PCS Railway Services	Valencia Port	x		
	Cluster Community System - CluCS	Bologna Hinterland node	x		
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Bologna Hinterland node	x		
	Corridor Strategic Planning and Monitoring – CoSPaM	Bologna Hinterland node	x		
	ACAR hybrid truck announcement for vehicles at car terminal	Koper Port		x	
	Algorithms for the optimization of container storage and intermodal operations	Padova Hinterland node	x		
Inland Traffic Management	Integration of LogIS and SAFE (Security and Facility Expertise)	Venezia Port	x	x	x
	VBS (Vehicle Booking System)	Koper Port	x		x
	Full automation of rail operations (Manifesto Merci Treno - CH30)	Trieste Port	x	x	
	Interoperability with RFI	Trieste Port	x	x	
	Interoperability with RCA	Trieste Port	x	x	
	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Trieste Hinterland node	x	x	
	Free circulation by road between free zones and Gate Automation	Trieste Hinterland node	x	x	
	Virtual Lanes	Valencia Port	x		
	Barge Traffic System (BTS)	Antwerp port	x		
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	Trieste Port		x	
	Gate automation	Padova Hinterland node	x		
	Customs clearance at the sea	Ravenna Port	x	x	x

eMaritime & Customs Administration	Integration of LogIS and AIDA	Venezia Port	x	x	x
	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)	Antwerp Port	x	x	
	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Koper Port	x		
	Fast Road Corridor	Ravenna Port			x
	Fast Rail Corridor	Padova Hinterland node	x		
Track and Trace	Equipment Status and Cargo Tracking	Valencia Port	x	x	

Table 7ICT technologies and tools available at the nodes

Ports	Wireless communication technologies (smart mobile phones, QR codes, RFID, telematics tracking)	Cloud Computing	Cyber - Security for advanced technology networks	Internet of Things (Intelligent cargo concept for sustainable global logistics operations)	Big Data Analysis	Robotics and Autonomy (e.g. SmartBots, smart sensors and global networks for data transfer from ship to shore)	Augmented Reality (AR)	Other
Antwerp port	x	x	x	x	x	x	x	x: Blockchain ANPR-camera's & Digital Processing images
Valencia Port	x	x	x	x	x	x		
Venezia Port	x	x	x	x	x			
Ravenna Port	x	x	x		x			
Koper Port	x	x	x					
Trieste Port	x		x					
Hinterland nodes								
Padova Hinterland node	x	x	x	x		x		
Trieste Hinterland node	x	x		x	x			
Bologna Hinterland node	x	x		x				

Table 8Main objectives of the identified best practices

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Process dematerialisation	Vehicle tracking and/or cargo monitoring	Planning and coordination of traffic/freight flows and operations	Information and data sharing (big data and transparency)	Rationalisation of processes	Automation	Security and cyber-security	Environmental Protection
Maritime Transport	Data exchange with National Maritime Single Window	Ravenna Port		x		x				
	Integration of LogIS and SEEMARINER	Venezia Port		x		x				x
Intermodality and Interopelability	Antwerp Port Information and Control System (APICS)	Antwerp port	x	x	x	x				
	Port Collaborative Decision Making (PortCDM)	Valencia Port	x	x	x	x				
	PCS Railway Services	Valencia Port	x	x	x					
	ACAR hybrid truck announcement for vehicles at car terminal	Koper Port	x		x	x				
	Cluster Community System - CluCS	Bologna Hinterland node		x	x	x				
	Corridor Strategic Planning and Monitoring - CoSPaM	Bologna Hinterland node		x	x	x				

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Process dematerialisation	Vehicle tracking and/or cargo monitoring	Planning and coordination of traffic/freight flows and operations	Information and data sharing (big data and transparency)	Rationalisation of processes	Automation	Security and cyber-security	Environmental Protection
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Bologna Hinterland node			x	x				
	Algorithms for the optimization of container storage and intermodal operations	Padova Hinterland node			x			x		
Inland Traffic Management	Virtual Lanes	Valencia Port	x	x	x	x				
	Barge Traffic System (BTS)	Antwerp port	x	x	x					
	VBS (Vehicle Booking System)	Koper Port	x		x	x				
	Full automation of rail operations (Manifesto Merci Treno - CH30)	Trieste Port	x	x						
	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Trieste Hinterland node	x	x	x					

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Process dematerialisation	Vehicle tracking and/or cargo monitoring	Planning and coordination of traffic/freight flows and operations	Information and data sharing (big data and transparency)	Rationalisation of processes	Automation	Security and cyber-security	Environmental Protection
	Free circulation by road between free zones and Gate Automation	Trieste Hinterland node	x	x	x					
	Gate automation	Padova Hinterland node	x					x		
	Integration of LogIS and SAFE (Security and Facility Expertise)	Venezia Port	x						x	
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	Trieste Port		x						
	Interoperability with RFI	Trieste Port	x							
	Interoperability with RCA	Trieste Port	x							
eMaritime & Customs Administration	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Koper Port	x	x	x	x				
	Fast Road Corridor	Ravenna Port	x	x			x			
	Fast Rail Corridor	Padova Hinterland node	x	x			x			

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Process dematerialisation	Vehicle tracking and/or cargo monitoring	Planning and coordination of traffic/freight flows and operations	Information and data sharing (big data and transparency)	Rationalisation of processes	Automation	Security and cyber-security	Environmental Protection
	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)	Antwerp Port	x	x						
	Customs clearance at the sea	Ravenna Port	x				x			
	Integration of LogIS and AIDA	Venezia Port	x			x				
Track and Trace	Equipment Status and Cargo Tracking	Valencia Port	x	x		x				

Table 9Stakeholders involved in the use of the identified best practices

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Terminal operators	Port Authority	Shipping agents	Freight forwarders	Official Bodies	Haulage comp.	Shippers	Depots	Other
Maritime Transport	Data exchange with National Maritime Single Window	Ravenna Port	x	x	x	x	x	x	(x)		(x)
	Integration of LogIS and SEEMARINER	Venezia Port		x			x		x		
Intermodality and Interoperability	ACAR hybrid truck announcement for vehicles at car terminal	Koper Port	x	x	(x)	x	x	x	(x)	(x)	
	Cluster Community System - CluCS	Bologna Hinterland node	x	(x)	(x)	x	x	x	x	x	

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Terminal operators	Port Authority	Shipping agents	Freight forwarders	Official Bodies	Haulage comp.	Shippers	Depots	Other
	Corridor Strategic Planning and Monitoring - CoSPaM	Bologna Hinterland node	x	x	x	x	x	x	x	x	
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Bologna Hinterland node	x		x	x		x	x	x	
	Antwerp Port Information and Control System (APICS)	Antwerp port	x	x	x		x	x			
	PCS Railway Services	Valencia Port	x		x	x		x		x	
	Port Collaborative Decision Making (PortCDM)	Valencia Port	x	x	x				x		
	Algorithms for the optimization of container storage and intermodal operations	Padova Hinterland node	x					x	x		
Inland Traffic Management	VBS (Vehicle Booking System)	Koper Port	(x)	(x)		x	x	x	(x)	(x)	
	Full automation of rail operations (Manifesto Merci Treno - CH30)	Trieste Port	x	x	x	x	x				
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	Trieste Port	x	x	x	x	x				
	Interoperability with RFI	Trieste Port	x	x	x	x				x	
	Interoperability with RCA	Trieste Port	x	x	x	x	x				
	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Trieste Hinterland node	x	x	x	x	x				
	Free circulation by road between free zones and Gate Automation	Trieste Hinterland node	x	x	x	x	x				
	Virtual Lanes	Valencia Port	x		(x)	(x)	(x)	x			
	Barge Traffic System (BTS)	Antwerp port	x	x				x			
	Integration of LogIS and SAFE (Security and Facility Expertise)	Venezia Port		x			x	x			

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Terminal operators	Port Authority	Shipping agents	Freight forwarders	Official Bodies	Haulage comp.	Shippers	Depots	Other
	Gate automation	Padova Hinterland node		x				x			
eMaritime & Customs Administration	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Koper Port	x	x	x	x	x	x	x	x	
	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)	Antwerp Port	x	x	x	x		x	x		
	Integration of LogIS and AIDA	Venezia Port	x	x	x	x	x		x		
	Fast Road Corridor	Ravenna Port	x		x	x	x	x			
	Fast Rail Corridor	Padova Hinterland node	x	x			x	x			
	Customs clearance at the sea	Ravenna Port			x	x	x				
Track and Trace	Equipment Status and Cargo Tracking	Valencia Port	x	x	x	x	x	x			

Table 10 Benefits generated by the implementation of the selected best practices

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Time Savings	Costs Saving to Operators	Costs Savings to Administration	Security Benefits	Increase in Information Sharing and Transparency	Mitigation of Environmental Impact	Safety Benefits	Reduction of Traffic Jams/Bottlenecks
Maritime Transport	Data exchange with National Maritime Single Window	Ravenna Port	x	x						
	Integration of LogIS and SEEMARINER	Venezia Port			x			x		
	Port Collaborative Decision Making (PortCDM)	Valencia Port	x	x	x		x	x	x	

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Time Savings	Costs Saving to Operators	Costs Savings to Administration	Security Benefits	Increase in Information Sharing and Transparency	Mitigation of Environmental Impact	Safety Benefits	Reduction of Traffic Jams/Bottlenecks
Intermodality and Interoperability	Cluster Community System - CluCS	Bologna Hinterland node	x	x	x		x	x		x
	Antwerp Port Information and Control System (APICS)	Antwerp port	x	x	x	x			x	
	ACAR hybrid truck announcement for vehicles at car terminal	Koper Port	x	x	x			x		x
	Algorithms for the optimization of container storage and intermodal operations	Padova Hinterland node	x	x		x			x	
	LOGICAL (transnational LOGistics Improvement through Cloud computing and innovAtive cooperative business modeLs)	Bologna Hinterland node	x	x	x					
	Corridor Strategic Planning and Monitoring – CoSPaM	Bologna Hinterland node	x	x	x					
	PCS Railway Services	Valencia Port	x	x						
Inland Traffic Management	Gate automation	Padova Hinterland node	x	x	x	x			x	x
	Virtual Lanes	Valencia Port	x	x		x	x			
	Integration of LogIS and SAFE (Security and Facility Expertise)	Venezia Port	x	x	x	x				
	VBS (Vehicle Booking System)	Koper Port	x	x	x			x		
	Barge Traffic System (BTS)	Antwerp port	x	x	x					
	Full automation of rail operations (Manifesto Merci Treno - CH30)	Trieste Port	x		x					

Main area of applicability	*Solutions*	*Ports / Hinterland nodes*	Time Savings	Costs Saving to Operators	Costs Savings to Administration	Security Benefits	Increase in Information Sharing and Transparency	Mitigation of Environmental Impact	Safety Benefits	Reduction of Traffic Jams/Bottlenecks
	Free circulation by rail between free zones (Manifesto Merci Treno CH30)	Trieste Hinterland node	x		x					
	Free circulation by road between free zones and Gate Automation	Trieste Hinterland node	x		x					
	Integration of inland terminal with PCS (e.g. Hinterland node of Trieste)	Trieste Port								x
	Interoperability with RFI	Trieste Port	x							
	Interoperability with RCA	Trieste Port	x							
eMaritime & Customs Administration	VGM (Verified Gross Mass) Self Service for the automation of traceability and business processes	Koper Port	x	x	x		x			
	Integration of LogIS and AIDA	Venezia Port	x	x	x		x			
	e-Desk (Customs notifications and communications on export and transit declarations for containers and ro/ro)	Antwerp Port	x	x	x					
	Fast Road Corridor	Ravenna Port	x	x		x				
	Fast Rail Corridor	Padova Hinterland node	x	x	x					
	Customs clearance at the sea	Ravenna Port	x	x						
Track and Trace	Equipment Status and Cargo Tracking	Valencia Port	x	x	x		x			

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