D.3.1.3 Transnational inventory of projects' results

EU-funded projects of other cross- border and transnational ETC, H2020 or CEF Programmes on ICT applied to freight transport

Contents

Introduction

Digital transformation, efficiency and security in cross-border maritime and multimodal freight transport and logistics chains, communication and coordination between freight operators and the logistic nodes, and the digitization process at ports, are priorities anchored in the EU's Framework Programme.

The objective of this document is to collect the best international practices in the European projects (CEF, Horizon2020, Interreg) on ICT in maritime and multimodal freight transport. The analysis of the main results, knowledge, and experiences will be selected and also applied in the DIGSEA program area to transfer them at the transnational level.

The analysis investigates different types of instruments, programs, and funding implemented by the EU, such as Horizon 2020, Cef, and Interreg Programmes, on maritime transport to re-think future mobility in Europe.

In the framework of Horizon 2020, the research has been addressed mainly toward the Work Programme related to:

- *"Smart, green and integrated transport"* that follows the focus areas of Building a low-carbon, climate-resilient future, and Digitising and transforming European industry/services
- *"Industrial LeadersHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)"* in line with the 'Digital Agenda for Europe', which aims to the specific objective of ICT research and innovation (R&I) developing and exploiting the opportunities of ICT innovations.

The selected Horizon 2020 Projects aim to realize better coordination of stakeholders in the field of transport, and supports a multilevel and multidisciplinary transnational cooperation network, highlighting the topic of interoperability and data sharing to harmonize and simplify cross-border logistics processes.

Connecting Europe Facility (CEF) is an EU funding instrument that supports the development of high-performing, sustainable, and interconnected Trans-European Networks in the fields of transport, energy, and telecommunication. The projects selected aim to promote the integration and interconnection of transport modes, as well as interoperable solutions.

The Project from Interreg Programme (2Sea, Baltic Sea Region, Europe, Centrale Europe) constitutes examples for boosting growth and building connections especially in cross-border regions through public-private partnerships focus on the TEN-T corridors, ICT solutions, alternative fuels, and transport modes as well as solutions for supporting multimodality.

Project sheets

Listed below are the most remarkable projects, just completed or still in progress, addressing, from different points, global challenges of the seaports to make efficient and sustainable maritime and intermodal transports, the supply chain sea-port-inland-logistics.

Each Project sheet contains the information relating to the call, the title, the program, the priority, the field of research, the countries involved (coordinator and each partner), the starting and ending year of the project, the amount of funding obtained, the description/objectives and the results archived. It also includes the link to the site (or Cordis/CEF/Interreg page) for each project. The results section contains links to Use cases/ Pilot/Best practices to discover and investigate what has been achieved.

Project	**5G-Blueprint - Next generation connectivity for enhanced, safe & efficient transport & logistics**
Programme	H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)
Topic/Priority	5G for Connected and Automated Mobility (CAM)
Field of research/Keyword	5G, transport, logistic, economics, governance, economics
Budget	13 895 976,14 € Total (9 997 603,71 € EU)
Status/ Start date/End date	Ongoing - September 2020 - August 2023
Web site	https://www.5gblueprint.eu/
Lead Partner	MINISTRY OF INFRASTRUCTURE AND WATERWAYS , Netherlands
Partners	26 Partner: Martel Gmbh, Switzerland; Stichting Hz University Of Applied Sciences, Netherlands; Sentors Bv, Netherlands; Economic Impuls Zeeland Nv, Netherlands; Locatienet Bv, Netherlands; Swarco Nederlands Bv, Netherlands; Koninklijke Kpn Nv, Netherlands; V-Tron Bv, Netherlands; College Foundation Van Arnhem Ennijmegen Han, Netherlands; *Sweco Nederland Bv ,* Netherlands…https://www.5gblueprint.eu/about/consortium/
Project description/ objective	The objectives of the project can be broken down into three different categories: technical, business, and regulatory. The adoption of 5G technologies can improve transport and logistics in Europe. The EU-funded 5G-Blueprint project therefore aims to develop a technical architecture, business and governance model for uninterrupted cross-border teleoperated transport based on 5G connectivity. To achieve this, it will explore the economics of 5G tools in cross-border transport and logistics as well as passenger transport. It will investigate governance issues and solutions dependent on cross-border connectivity and seamless services, and the tactical and operational conditions required to fully exploit 5G-tooled transport and logistics. It will also prepare and pilot teleoperated and telemonitored transport on roadways and waterways. This could serve as a blueprint for pan-European teleoperated transport solutions in the logistics sector and beyond.
Results/Highlights	**First result** was gathering a thorough understanding of the requirements of each application layer component to provide a significant contribution to the safety and efficiency of teleoperation; in parallel identifying the requirements these application layer functions impose on the 5G network. Another achievement was a detailed functional and technical description of the application layer functions, together with details on how these should be integrated. Furthermore, first working non-integrated versions of the different application layer components

European Regional Development Fund

have been realized, serving as a basis for integrations and further iterations. And the integration of the various application layer components with other such components of the same type(UCs or EFs) has been started. The overall system architecture that specifies how the different modules of the system on both the application and 5G network layer are set up and are to interact with each other. Also the needed preparatory work for the validation of this technical architecture for uninterrupted cross-border tele-operated transport based on 5G connectivity has been performed. The pilot site details including test cases have been described, including location and trajectories where tests will be performed, based on analysis of the pilot site and on-site surveys. https://www.5gblueprint.eu/an-interview-with-dr-wim-vandenberghe-5g-blueprint-project-coordinator/

Use Case 1: Automated Barge Control. Port entry efficiency will be increased by reducing crew requirements for barging. Vessel navigation during barging will be performed completely by the vessel captain in collaboration with a teleoperating captain in the Shore Control Centre, eliminating further crew interventions. Pilots will be located in Antwerp-Briges and Vlissingen. https://www.youtube.com/watch?v=3mGFVNCP9bE

Use Case 2: Automated docking. Yard tractors will be equipped with standardized connectivity solutions for an optimized docking operation with respect to time and space requirements. Positioning of these yard trucks will be performed via camera based on Real-Time Locating System (RTLS), either stationary or via a drone. Next to this, a mobile harbour crane will be retrofitted with teleoperation functionality, operated by a remote control centre operator resources. Pilots will be located in Antwerp-Bruges and Vlissingen. https://www.youtube.com/watch?v=SPIusRI1O4Y

Use Case 3: CACC-based platooning. On dedicated cross-border roads Cooperative Collision Avoidance System (CACC) enabled cars and Fuel Cell Electric Vehicle self-driving containers with C-V2X capabilities will be piloted. Pilots will be located on cross-border roads. https://www.youtube.com/watch?v=gibfKyAmBnk

Use Case 4: Remote takeover. Yard truck and self-driving container pilot vehicles will be equipped for remote teleoperation operations by human operators in the pilot areas. Pilots will be located within harbor environments and in public road test stretch. https://www.youtube.com/watch?v=JJZ5f7ObpX0

D3.1: Business cases and initial value network. This document is aimed to describe and analyze the deployment of teleoperated in transport and logistics from a supply chain perspective. It provides a basis for the development of 5G business cases and models for teleoperated transport in cross-border operations. https://www.5gblueprint.eu/download/d3-1-business-cases-and-initial-value-network/?wpdmdl=537&masterkey=60b4e468b7095

Deliverable: https://www.5gblueprint.eu/library/deliverables/

Project	5G-LOGINNOV - 5G creating opportunities for LOGistics supply chain INNOVation
Programme	H2020-EU.2.1.1.- INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)
Topic/Priority	5G core technologies innovation
Field of research/Keyword	5G, transport, logistic, internet, information
Budget	7 926 474,29 € Total (5 999 702 € EU)
Status/ Start date/End date	Ongoing - September 2020 - August 2023
Web site	https://5g-loginnov.eu/
Lead Partner	European Road Transport Telematics Implementation Coordination Organisation - Intelligent Transport Systems & Services Europe, Belgium
Partners	Akka High Tech, France; Circle Spa, Italy; Continental Automotive Romania Srl, Romania; Institute Of Communication And Computer Systems, Greece; Consorzio Interuniversitario Per L'ottimizzazione E La Ricerca Operativa, Italy; Politecnico Di Torino, Italy; Universita Degli Studi Di Modena E Reggio Emilia, Italy; Internet Institute, Communications Solutions And Consulting Ltd, Slovenia; Luka Koper, Port And Logistic System, D.D., Slovenia; Piraeus Container Terminal Single Member Sa, Greece; Swarco Traffic Systems Gmbh, Germany; Tec4u Ingenieurgesellschaft Mbh, Germany; Telekom Slovenije Dd, Slovenia; T-Systems International Gmbh, Germany; Fundacion Centro De Tecnologias De Interaccion Visual Y Comunicaciones Vicomtec, Spain; Vodafone Innovus Anonimi Etaireia Systimaton Epikoininias Aytomatismonkai Efarmagis Pliroforiki, Greece
Project description/ objective	Ports are essential for Europe's economy and growth. 74% of goods exported or imported to the EU are sustainability. The emergence of 5G has created unlimited potential for improving efficiency, tackling pollution and innovation in all sectors. 5G-LOGINNOV applies this potential to ports, freight and the logistic supply chain. 5G-LOGINNOV is supported by a range of 5G technological building blocks, including the new generation of 5G terminals for future Connected and Automated Mobility (CAM), the new Internet of Things (IOT)-5G devices, data analytics, next generation traffic management and emerging 5G networks functions. Through the creation, testing and deployment of services, 5G-LOGINNOV will ensure port areas and city-ports can handle upcoming and future capacity, cope with traffic congestion and environmental challenges. 5G-LOGINNOV aims to minimise the environmental impact of ports, reduce congestion around the port area and disturbance to the city, represent a pillar

	of economic development and business innovation for the region, facilitate the integration of the autonomous truck platoons of the future.
Result/Highlights	5G-LOGINNOV planned an innovative framework addressing integration and validation of CAD/CAM technologies related to the industry 4.0 and ports domains by creating new opportunities for LOGistics value chain INNOVation. 5G-LOGINNOV is supported by 5G technological blocks, including new generation of 5G terminals notably for future Connected and Automated Mobility, new types of Internet of Things 5G devices, data analytics, next generation traffic management and emerging 5G networks, for city ports to handle upcoming and future capacity, traffic, efficiency and environmental challenges. 5G-LOGINNOV will deploy and trail 11 families of Use cases beyond TRL7 including a GREEN TRUCK INNITIAVE using CAD/CAM & automatic trucks platooning based on 5G technological blocks. **Use cases in living labs in brief** **Hamburg** Floating Truck and Emission Data (FTED), GLOSA and Automated Truck Platooning (GTP) under 5G-LOGINNOV Green initiative, Dynamic control loop for environment sensitive traffic management actions (DCET) *Intervention description*: https://5g-loginnov.eu/hamburg-living-lab/ https://5g-loginnov.eu/wp-content/uploads/2022/07/22jul13_5GL_4_TP25_t-systems_HTWK.pdf **Athens** Optimal selection of yard trucks: Installation of a 5G access point on yard trucks and 5G latency, precise localization services, etc. Surveillance cameras / video analytics: Installation of connected 4K surveillance cameras and AI/ML solution for container seal presence, human presence detection, social distancing etc. Predictive Maintenance: 5G access point installed on yard vehicles and AP will collect and forward in real time with low latency telemetry data over the 5G network. *Intervention description:* https://5g-loginnov.eu/athens-living-lab/ https://5g-loginnov.eu/wp-content/uploads/2022/10/Ideathon-Athens-Living-Lab-MANO-Usecases-Demos.pdf **Koper** Port control, logistics and remote automation; business critical and mission critical communications *Intervention description*: https://5g-loginnov.eu/koper-living-lab/ https://5g-loginnov.eu/wp-content/uploads/2022/09/5G-LOGINNOV_Koper-LL-Ideathon_Agenda.pdf **Project presentation October 2022** https://5g-loginnov.eu/wp-content/uploads/2022/10/22sep29_5G-Loginnov_t-systems_cid.pdf **Deliverables:** https://5g-loginnov.eu/library/ **Publications:** https://5g-loginnov.eu/library/

Project	AWARD - All Weather Autonomous Real logistics operations and Demonstrations
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Efficient and safe connected and automated heavy-duty vehicles in real logistics operations
Field of research/Keyword	sensors, automotive engineering
Budget	26 398 799,01 € Total (19 892 905,63 € EU)
Status/ Start date/End date	Ongoing - January 2021 - December 2023
Web site	https://award-h2020.eu/
Lead Partner	EASYMILE, France
Partners	29 Partner: Continental Teves Ag & Co Ohg, Germany; Kamag Transporttechnik Gmbh & Co.Kg, Germany; Terberg Benschop Bv, Netherlands; Smart Airport System, France; Association Cara, France; Navtech Radar Limited, United Kingdom; Business Upper Austria - Oo Wirtschaftsagentur Gmbh, Austria; Its Norge-Norsk Forening For Multimodale Intelligente Transport Systemer Og Tjenester - Its Norway, Norway; Linz Center Of Mechatronics Gmbh, Austria; Fh Oo Forschungs & Entwicklungs Gmbh, Austria; Avinor As, Norway; Adasky Ltd, Israel; Foresight Automotive Ltd, Israel; Brp-Rotax Gmbh & Co Kg, Austria; Certx Ag, Switzerland…
Project description/ objective	AWARD's objective is to bring disruptive changes in the logistic industry by scaling Autonomous Driving Vehicles (AD Vehicles) system and Logistics Operation & Fleet Management (LOFM) system for heavy-duty vehicles, targeting compliance with ISO 26262 and taking into consideration SOTIF recommendations. The AD Vehicles' Autonomous Driving System (ADS) will be based on multiple sensor modalities and an embedded teleoperation system to address 24/7 availability. The ADS will then be integrated into multiple vehicle types used in low-speed areas. Finally, these vehicles will be deployed, integrated and operated in a variety of real-life use cases to validate their value in the application and identify any limitations and functional level to address 24/7 availability. This challenge will be particularly tackled by extending the AD Vehicles performances under harsh weather conditions (rain, fog, snow) that are today limiting the Operation Design Domain (ODD), which describes the specific conditions under which a given AD Vehicle or feature is intended to operate. These are to be developed along with an adapted regulatory framework for autonomous logistics operations in warehouses, airports, and ports.

	The main impact of this project is systemic. The processes and the various operations carried out throughout the global supply chain will change drastically. The progressive automation of loading/unloading operations and the introduction of autonomous vehicles will profoundly challenge many of the drivers of the supply chain ecosystem. AWARD focuses on highly replicable driverless logistics operations and targets a wide range of end-users, thus ensuring the maximum impacts of its results. These autonomous vehicles will be deployed, integrated and operated in a variety of real-life use cases to validate their value in the application and identify any limitations. Logistics operations will be optimized thanks to a new fleet management system that will act as a control tower, gathering all information from subsystems (vehicles, road sensors, etc.) to coordinate the operations and protect vulnerable road users.
	USES CASES DESCRIPTION
	Use Case 1: Autonomous loading & unloading forklift operations. Demonstration of an autonomous counterbalanced forklift truck for logistics operations within factories, in Linde Aschaffenburg Material Handling (Germany).
	Use Case 2: Hub-to-hub autonomous logistics. Demonstration of an autonomous swap body truck between the Engine Factory of BRP-Rotax and the Logistic Hub of DB Schenker (Gunskirchen, Austria), which are connected via factory areas, public side roads, public main roads and public crossing areas.
Result/Highlights	**Use Case 3:** Automous ground support equipment in airport. Demonstration of an autonomous baggage tractor on airside in Avinor OSL Gardermoen airport (Norway).
	Use Case 4: <u>Trailer transfer operations and automated ship loading in port. Demonstration of an autonomous trailer on a busy roll-in/roll-off terminal in Rotterdam Port (The Netherlands).</u>
	D7.1 Test end evaluation plan
	This report summarizes the preliminary test and evaluation plans for the operational vehicle testing phase of the AWARD project. The tests will use automated industrial trucks to transport goods on fixed routes. Technical targets have been set for the project for operations in every weather.
	USE CASE 4: In the port demonstrations will take place at DFDS's Rotterdam (Vlaardingen) terminal in the Netherlands. The tests focuses on an automated Terberg Tug that moves trailers in the terminal area. In addition to rearranging trailers, the planned routes include gate transits to and from public road and also loading and unloading of a ship. pg35
	https://award-h2020.eu/wp-content/uploads/2022/01/AWARD-WP7-D7.1_Test_and_Evaluation_Plan.pdf
	Deliverables:
	https://award-h2020.eu/index.php/public-deliverables/
	Publications:
	https://award-h2020.eu/index.php/publications/

Project	COREALIS - Capacity with a pOsitive enviRonmEntal and societAL footprInt: portS in the future era
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Port of the future
Field of research/Keyword	transport, multimodal, data analytics, 5G, information, big data, innovation management, climate change
Budget	5,150,540.00 €
Status/ Start date/End date	Closed project - May 2018 - April 2021
Web site /	https://www.corealis.eu/#about
Lead Partner	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS, Greece
Partners	Piraeus container terminal single member sa, Greece; Naytiliakes metaforikes kai epikoinoniakes epixeiriseis seability epe, Greece; Seability (cyprus) ltd, Cyprus; European road transport telematics, Belgium; Fundacion de la comunidad valenciana para la investigacion, promocion y estudios comerciales de valenciaport, Spain; Teknologian tutkimuskeskus vtt oy, Finland; Nec laboratories europe gmbh, Germany; Sgs societe generale de surveillance sa, Switzerland; Swarco mobility nederland b.v. , Netherlands; Haven van antwerpen-brugge, Belgium; Consorzio nazionale interuniversitario per le telecomunicazioni, Italy; North Tyrrhenian Sea Port Authority, Italy; Ericsson telecomunication spa, Italy; Marlo poland spolka z ograniczona odpowiedzialnoscia; Poland; STEVECO OY, Finland
Project description/ objective	COREALIS proposes a strategic, innovative framework, supported by disruptive technologies, including Internet of Things (IoT), data analytics, next generation traffic management and emerging 5G networks, for cargo ports to handle upcoming and future capacity, traffic, efficiency and environmental challenges. The ultimate ambition of COREALIS is to achieve a significant step forward for future ports to maximize their capacity and efficiency with minimum infrastructure upgrades, while at the same time ameliorating the port-city relation. COREALIS project is expecting to have a multi-dimensional impact and a high innovation potential: Impact on environment - COREALIS innovations aim for a lower environmental impact of port operations, to achieve significant reduction of the CO2 port emissions and noise. Impact on operations - COREALIS palette of ICT components are focused on meeting the capacity and efficiency targets. The proposed framework aims to improve the terminal operations efficiency, maximise the use of the infrastructure and equipment and decrease operational costs as well as external costs such as congestion, waiting and idle times. Impact on society - COREALIS aims to establish efficient connections with

	hinterland transport network and promote the use of the most energy-efficient transport modes (e.g. railway and inland waterways).
Result/Highlights	COREALIS proposes a strategic, innovative framework, supported by disruptive technologies, including Internet of Things (IoT), data analytics, next generation traffic management and emerging 5G networks, for cargo ports to face current and future challenges regarding: limited port capacity (towards embracing circular economy models), reduction of environmental footprint (associated with intermodal connections for three major transport modes, road/truck, rail and inland waterways), increase of efficiency & reduction of traffic within and around ports (by optimising yard capacity and streamline cargo flows without additional infrastructural investments), sustainability of the socioeconomic development of the port and its surrounding area (by Enabling the port to become an innovation hub of the local urban space). **DELIVERABLE** "State of the Art of Port-Hinterland Connections" deliverable is to provide an overview of the hinterland connections (road, railway and inland waterways) of the COREALIS ports: https://www.corealis.eu/wp-content/uploads/2020/02/D.2.1-State-of-the-Art-of-Port-Hinterland-Connections.pdf **Report**: A comprehensive and systematic recording of current, mid-term and long-term challenges, enablers and barriers in European ports: https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5bf625369&appId=PPGMS *COREALIS promotes several interesting Technologies:* -Port of the Future Serious Game (simulation tool for decision making) -RTPORT (5G-enabled smart terminal operations, IoT) https://www.corealis.eu/wp-content/uploads/2021/09/D.3.4-RTPORT-for-5G-enabled-smart-terminal-operation.pdf -Brokerage Platform (cloud based marketplace for leasing intra-CT trucks) -PORTMOD (optimization planning tool for CT operations) -Truck Appointment System (reservation system including real-time traffic data) -Just-In-Time Rail Shuttle Service (feasibility study for key port-hinterland corridors) https://www.corealis.eu/wp-content/uploads/2020/02/D.2.2-Just-In-Time-Rail-Shuttle-Service-Feasibility-Study.pdf -Cargo Flow Optimiser (optimization of cargo flows ocean/rail/inlandwaterway) https://www.corealis.eu/wp-content/uploads/2021/09/D.2.5-Cargo-flow-Optimiser.pdf -Predictor for Asset Management (machine learning based Just in Time inventory) This document aims to describe in detail the progress of the LLs and the final outputs of reallife tests performed in each Living Lab https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5dc19722d&appId=PPGMS

Project	DATA PORTS - A Data Platform for the Cognitive Ports of the Future
Programme	H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)
Topic/Priority	Supporting the emergence of data markets and the data economy
Field of research/Keyword	Industrial technologies, ICT, Big Data, Ports
Budget	6 675 951,75 € Total (5 740 586,63 € EU)
Status/ Start date/End date	Ongoing - January 2020 - March 2023
Web site	https://www.dataports-project.eu/
Lead Partner	TECHNOLOGICAL INSTITUTE OF INFORMATICS, Spain
Partners	Traxens, France; Prodevelop Sl, Spain; Ibm Israel - Science And Technology Ltd, Israel; Organismos Tilepikoinonion Tis Ellados Ote Ae, Greece; Ntt Data Spain, Sl, Spain; Universitat Politecnica De Valencia, Spain; Institute Of Communication And Computer Systems, Greece; Universitaet Duisburg-Essen, Germany; Ethniko Kentro Erevnas Kai Technologikis Anaptyxis, Greece; Fraunhofer Gesellschaft Zur Forderung De; Angewandten Forschung Ev, Germany; Organismos Limenos Thessalonikis Anonymi Etairia, Greece; Fundacion De La Comunidad Valenciana Para La Investigacion, Promocion Y Estudios Comerciales De Valenciaport, Spain
Project description/ objective	Hundreds of different European seaports collaborate with each other, exchanging different digital data from several data sources. However, to achieve efficient collaboration and benefit from AI-based technology, a new integrating environment is needed. The EU-funded DataPorts project will design an Industrial Data Platform. The Cognitive Ports Data Platform will connect existing digital infrastructures of seaports and their systems, will set rules on safe and reliable data sharing and trading, and offer powerful services of data analytics. That will allow to create different smart applications according to related requirements. Before full implementation in European ports, the platform will be implemented in two European seaports. The platform will make European seaports trusted, strong and integrated.
Result/Highlights	The ultimate goal of DataPorts is the development, set-up and operation of a Cognitive Port Data Platform that will entail the interconnection of a wide variety of systems into a tightly integrated ecosystem, so that seaports all across Europe could benefit from the results of this project in order to create an even more trusted, reliable and efficient way of conducting businesses in Europe and reinforce the European Single Market. DataPorts includes the deployment,

testing and showcase of the data platform in two relevant European ports (Valencia, Thessaloniki), where it will be connected to the existing digital platforms to collect data, will provide sharing rules and added value to data owners, and on top of which the pilots will develop AI and cognitive applications to solve specific problems and improve processes for each pilot.

The main results achieved so far.

• Data Platform Implementation and Services (WP3): Several components were developed: the Data Acquisition Component, a Semantic Middleware Layer, Data Abstract and Virtualization, the Process-based Analytics, and the Automatic Model Training Engine. These components provide the technical tools for acquisition, aggregation, processing, and analysis of data.

• Data Governance and Security (WP4): Significant advances have been carried out to provide a data governance framework in DataPorts. The business processes for data access are realised through smart contracts, which ensure permissioned access control. The data governance services define and enforce access rules to datasets in a transparent, verifiable, trackable, and immutable manner. A data governance front-end has been developed and integrated, which can utilise the smart contracts and allow the data stakeholders to interact with each other. In addition, DataPorts platform was subject to a comprehensive risk assessment exercise where the main security measures have been derived.

• Deployment, piloting, and evaluation (WP5): Use cases definition are completed and reported in D5.1 Integration, software quality assurance and deployment plan. An evaluation plan has been drafted and is available in D5.2 Evaluation plan. Plans and arrangements are being made at ports to have final real-worlds scenarios by the end of the project.

• Impact (WP6): Impact creation is an ongoing task, and a set of activities are being performed e.g. a continuous update of DataPorts progress in social media and increased participation in conferences, events in shipping and maritime as well as, papers publications. DataPorts has established collaboration with Big Data Value PPP projects and other initiatives like the ALICE ETP and the Ammitec co-organising workshops. The execution of KPIs has been started and M18 Milestones have been accomplished.

https://www.dataports-project.eu/deliverables/

USE CASES

https://www.dataports-project.eu/port-of-valencia/
https://www.dataports-project.eu/port-of-thessaloniki/
https://www.dataports-project.eu/smart-containers/
https://www.dataports-project.eu/port-management-integration/

Research papers

https://www.dataports-project.eu/papers/

Project	DockTheFuture - Developing the methodology for a coordinated approach to the clustering, monitoring and evaluation of results of actions under the Ports of the Future topic
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Port of the future
Field of research/Keyword	Freight transport, renewable energy, port and harbor engineering, bussines models, employment
Budget	1.275.562 €
Status/ Start date/End date	Closed project - January 2018 - June 2020
Web site	https://cordis.europa.eu/project/id/770064/results
Lead Partner	CIRCLE SPA, Italy
Partners	Institute of Shipping Economics and Logistics , Germany; ports and terminals cvba, Belgium; Universita degli studi di Genova, Italy; Magellan-associacao para a representacao dos interesses portugueses no exterior, Portugal;
Project description/ objective	The EU maritime transport constitutes a crucial link in the global logistic chains and plays a leading role in international freight transport. Serving 40% of the EU's internal trade and 75% of its external trade, maritime transport is an essential element in supporting Europe in maintaining its Number 1 position in global trade. Therefore, as a key node of the EU's TEN-T ports have the ultimate objective to fully integrate maritime transport into the global logistics chain. Within this framework, DocksTheFuture aims at defining the vision for the ports of the future in 2030, covering all specific issues that could define this concept including among others, dredging, emission reduction, energy transition, electrification, smart grids, port-city interface and the use of renewable energy management. The proposal already addressed a preliminary research on the Port of Future concept, the definition of several Port of the Future topics to be addressed and their related targets in 2030 and a preliminary list of projects that could be potentially clustered together with the RIA retained proposals.
Result/Highlights	Maritime ports increasingly shift to a commercialised entity under the form of a public limited company, or an independent public body. The consequence is that the more 'classical' business topics are now better attended. With increasing public and political pressure maritime ports have to justify their use of the public funds allocated to them. This is reflected through various aspects in reporting obligations, permission procedures (such as CBA for infrastructure), revenue generating aspect of investments, and the aforementioned reporting on environmental impact. Business models of ports also adapt to the changing

market conditions, and gradually shift from the classic landlord model to the more entrepreneurial business model, in which the port authority undertakes an active role in attracting companies to fit in the existing clusters policy, invest in fore-and hinterland economic actors (other ports, hinterland terminals, railway companies), and recently also in digitization (appointment of Chief Digital Innovation Officer Officers, IT companies, applications). A persistant contradiction that remains stubbornly alive is the issue of project financing. All stakeholders confirm the need for more funds. Never in history this much money was available for projects (including transport). Yet, especially the transport sector compared to other sectors is not making use of these financial resources. When combining both public and private financing, the project has to meet certain financial and technical goals, which may pose a problem to some initiatives. Should these remain getting financed if they fail for example the test of a Cost Benefit Analysis.In the final period,the exploitation plan was completed and includes:

-DSS Decision Support System (DSS) that allows users to interrogate a software in order to understand potential initiatives aiming at achieving specific users' goals.

-The Transferability Analysis, developed for assessing the ease of transferability of Port of the Future innovative concepts

-The Training Package has been developed as a three-part online module in which PCI, TA, and DSS. https://www.docksthefuture.eu/courses/

-R&D Policy Recommendations that aims to translate political visions into initiatives and actions to deliver 'outcomes'

-Set up a new Network of Excellence, to support the maritime community achieving the UN 2030 SDGs, using the opportunities given by International and funding programmes.

Port of the Future concepts, topics and projects - draft for experts validation
This report gathered the main thematics of the project. The desktop analysis of the concept including EU policies, stakeholders consultation, The Maritime traffic analysis and forecast review. The most important trends affecting the ports of the future are the climate change, the use of alternative fuel, the growing population and urbanisation, introduction of new technologies, shift of trade to non-OECD countries, and the increase of public debt. Table 18: Assessment results for topic T90: Digitization, digitalization and digital transformation pg 84/268
https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5d75540a3&appId=PPGMS

Project	EPICENTER - Enhanced Physical Internet-Compatible Earth-frieNdly freight Transportation answER
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	InCo Flagship on Integrated multimodal, low-emission freight transport systems and logistics
Field of research/Keyword	Freight transport, internet, autonomous robots, ecosystems,
Budget	7 373 575€ Total (6 848 575 € EU)
Status/ Start date/End date	Ongoing - Julne 2020 - November 2023
Web site	https://epicenterproject.eu/
Lead Partner	PORT OF ANTWERP-BRUGES , Belgium
Partners	Administration Portuaire De Montreal, Canada; Panasonic Business Support Europe Gmbh, Germany; Continental Dack Sverige Ab , Sweden; Autoridad Portuaria De La Bahia De Algeciras Mopt , Spain; Total Terminal International Algeciras Sa , Spain; To-Be-Now-Logistics-Research-Gmbh , Germany; Logistik-Initiative Hamburg Management Gmbh , Germany; Duisburger Hafen Aktiengesellschaft, Germany; Anheuser-Busch Inbev , Belgium; Aker Arctic Technology Oy , Finland; Mjc2 Limited , United Kingdom ; Gvz Entwicklungsgesellschaft Wolfsburg Mbh , Germany; Einride Ab, Sweden; Tis Pt, Consultores Em Transportes, Inovacao E Sistemas, Sa , Portugal; Effective Seaborne Engineering Solutions Sl, Spain; Vilniaus Gedimino Technikos Universitetas, Lithuania; Transporta Un Sakaru Instituts, Latvia
Project description/ objective	The ePIcenter project unites 36 partners (port authorities, logistic service providers, manufacturers, academic institutions, technology partners,…) throughout Europe and beyond to develop and test AI driven logistic software solutions, new transport technologies and supporting methodologies to increase the efficiency of global supply chains and reduce their environmental impact. ePIcenter is major technology-driven initiative to massively improve the efficiency of logistics operations while reducing congestion in ports and terminals. ePIcenter includes many technologies: synchromodal logistics algorithms, artificial intelligence, autonomous systems, dynamic modularisation and cybersecure data sharing platforms. ePIcenter also has an eye on the future, with technologies such as Hyperloop and the Physical Internet also considered. The first aspect is visibility and collaboration, making the supply chains or logistic processes more transparent through cyber secure data exchange and sharing. The second aspect is optimisation, using new data and emerging technologies

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	in a smart way, developing AI algorithms and simulation techniques that can optimise the real life logistics and synchromodal planning processes end users are facing daily. In combination, the work on these two themes will take a major step towards the Physical Internet concept and seamless sustainable global freight flows.
Result/Highlights	Progress beyond the state of the art and expected potential impact. The immediate impacts in terms of expected measurable benefits: 20% increase in port/terminal throughput; 25% reduction in GHG emissions; 15% reduction in logistics costs 50% reduction in whale strikes; 40% reduction in administration effort. The quantification of these benefits will be based on the results of implemented use cases within the demonstrators. The identification and definition of relevant use cases with the end-users (subject of WP4 Demonstrators, showcases and lessons learned) has already started. In fact a first version of the ePI-link and ePI-node use case descriptions were co-created with the technology providers and the end-users. This report maps the current challenges regarding the development of logistics activities in Epicenter consortium regions, considering that the most critical components in the region are related to extensions and conditions of roads network, the performance of road freight transportation, and the current operations at ports and freight railways. https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5e531ae05&appId=PPGMS **Scientific Pubblications:** https://epicenterproject.eu/educational-material/scientific-publications **Videos & Webinars:** https://epicenterproject.eu/educational-material/videos **Why ePIcenter?** https://epicenterproject.eu/news-events/why-epicenter-2 Interview with our partner E.S.E.S. in Port Technology magazine https://wpassets.porttechnology.org/wp-content/uploads/2022/06/10100543/017-020_PTI121_Connectainer_v4.pdf **Streamlined logistics through ePIcenter** The Port of Antwerp is spearheading an ambitious new project to transform global supply chains through the use of new and emerging technologies. https://fathom.world/streamlined-logistics-through-epicenter/ **ePIcenter Project Movie:** https://www.youtube.com/watch?v=i0NwZGaPZdw **The new project:** - Optimisation of electric vehicles for freight operations – Sweden - Hyperloop scenario to improve the efficencies in local distribution- Germany https://epicenterproject.eu/news-events/european-hyperloop-technology - Innovative modular containers, project terminal operations are addressing the issue of equipment imbalance with modular containers.

	https://wpassets.porttechnology.org/wp-content/uploads/2022/06/10100543/017-020_PTI121_Connectainer_v4.pdf
Project	**MOSES - AutoMated Vessels and Supply Chain Optimisation for Sustainable Short SEa Shipping**
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Moving freight by Water: Sustainable Infrastructure and Innovative Vessels
Field of research/Keyword	autonomous vehicles, machine learning
Budget	8 122 150 € Total
Status/ Start date/End date	Ongoing - July 2020 - June 2023
Web site	https://moses-h2020.eu/
Lead Partner	Heroon Polytechniou 9 Zographou Campus, Grece
Partners	17 Partner: Engitec Systems International Limited, Cyprus; Core Innovation And Technology Oe, Greece; Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek Tno, Netherlands; Stichting Maritiem Research Instituut Nederland, Netherlands; Elliniki Enosi Plioktiton Rimoulkon, Nayagosostikon, Antiripantikon Kai Plion Ipostirixis Iperaktion Egkatastaseon, Greece; Danaos Shipping Company Limited, Cyprus; Fundacion De La Comunidad Valenciana Para La Investigacion, Promocion Y Estudios Comerciales De Valenciaport, Spain… https://moses-h2020.eu/about-moses/consortium/
Project description/ objective	Ports play a decisive role in the EU's external and internal trade, as about 74% of imports and exports and 37% of exchanges go through ports. Although ports and especially Deep Sea Shipping (DSS) ports are integral nodes within multimodal logistic flows, Short Sea Shipping (SSS) and inland waterways are not so well integrated. Short Sea Shipping (SSS) is a major priority for cargo transportation. The EU-funded MOSES project will significantly enhance the SSS component of the European container supply chain by reducing total time to berth for TEN-T Hub Ports and by promoting the use of SSS feeder services to small ports with limited or no infrastructure. MOSES includes an innovative SSS feeder vessel outfitted with a robotic container handling system. It also includes a swarm of autonomous tugboats, an automated docking system for Hub Ports, and a machine learning-driven digital collaboration platform for logistics stakeholders. Moreover, MOSES will deliver concrete policy recommendations regarding SSS in Europe.

Result/Highlights	**MOSES concept and Innovations** MOSES overall concept lies on its strategic vision to enhance the Short Sea Shipping (SSS) component of the European supply chain, by addressing the vulnerabilities and strains that relate to the concentration of the main container traffic in hub ports, via introducing a constellation of innovations including innovative vessels and the optimisation of logistic operations. MOSES aims to reduce the total time to berth for TEN-T Hub Ports and to stimulate the use of SSS feeder services in small ports that have limited or no infrastructure. **Deliverable: use cases and scenarios** This document describes scenarios and Use Cases, which are related to MOSES innovations (concept in form of a narrative) https://moses-h2020.eu/wp-content/uploads/2022/07/2.2.pdf **Pilot 1: AutoDock** This pilot aims to showcase the automated maneuvering, docking, and mooring scheme for large ports proposed by MOSES. This is achieved by demonstrating the way that a swarm of autonomous tugboats may intelligently cooperate to maneuver a large container ship and direct it into an available berth at the port and the way that tugboats may collaborate with an automated mooring system that will efficiently complete the process. READ MORE - "MOSES auto dock" on page https://moses-h2020.eu/innovations/ **Pilot 2: Innovative Feeder Vessel** The objective of this pilot is to showcase the innovative characteristics of the MOSES feeder vessel by demonstrating its seakeeping and energy performance capabilities. This activity will include testing a scaled ship model for one – out of the 3 total – vessel designs conceptualized within MOSES. The ship models will be constructed by MARIN at their facilities and the design properties include service speed, maneuvering and seakeeping performance in various operational conditions and scenarios. Innovative feeder vessel pilot will be conducted at MARIN's Seakeeping and Maneuvering Basin (SMB) in the Netherlands. READ MORE -"Innovative Feeder Vessel" on page https://moses-h2020.eu/innovations/ **Pilot 3: Robotic Container Handling System** This pilot demonstration aims to showcase the (semi)autonomous operation for (un)loading containers from the MOSES innovative feeder with the Robotic Container-Handling System that will be developed. This will be accomplished by demonstrating the autonomous container handling capability of the system, the shared control between the human (remote) driver and the robotic crane system. Intervention options for the remote operator through the remote supervisory Shore Control Station (SCS) will be also demonstrated. This pilot demonstration will be conducted at the MacGregor test facility in Örnsköldsvik (Sweden), where the crane itself will be mounted on the shore (instead of onboard a vessel) for cost-efficiency reasons. READ MORE on page https://moses-h2020.eu/innovations/

	Deliverables: https://moses-h2020.eu/material-hub/#
	Scientific materials
	https://moses-h2020.eu/material-hub/#

Project	PASSPORT - Operational Platform managing a fleet of semi-autonomous drones exploiting GNSS high Accuracy and Authentication to improve Security & Safety in port areas
Programme	H2020-EU.2.1.6. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies – Space
Topic/Priority	EGNSS applications fostering green, safe and smart mobility
Field of research/Keyword	Drones, sensors, pollution, global navigation satellite system
Budget	3 686 222,50 € (2 868 239,90€ EU)
Status/ Start date/End date	Ongoing - December 2020- November 2023
Web site	https://h2020-passport.eu/
Lead Partner	SISTEMATICA SPA, Italy
Partners	University Of Florence, Italy; Deutsches Zentrum Fur Luft - Und Raumfahrt Ev, Germany; Gmv Aerospace And Defence Sa, Spain; Fundacio Eurecat, Spain; Digi One Srl, Italy; G7 International Srl, Italy; Politechnika Morska W Szczecinie, Poland, Bergmann Frank, Germany; Fundacion De La Comunidad Valenciana Para La Investigacion, Promocion Y Estudios Comerciales De Valenciaport, Spain; Deep Blue Srl, Italy; Centre D Etudes Et D Expertise Sur Les Risques L Environnement La Mobilite Et L Amenagement, France; Alcina Doo Za Projektiranje Nadzori Poslovne Usluge, Croatia; Topview Srl, Italy; Ravenna Port Authority, Italy
Project description/ objective	The purpose of the PASSport (Operational Platform managing a fleet of semi-autonomous drones exploiting GNSS high Accuracy and Authentication to improve Security & Safety in port areas) is to engineer and qualify a solution extending situational awareness to improve safety and security in port areas. The need comes from the directive 2005/65/CE asking to complement surveillance systems for all of the port area, in order to ensure a high and equal level of safety and security for all European ports. Around one thousand European ports fall within the scope of the directive. As a consequence, PASSport responds to the needs expressed by port authorities, harbour master and border control authorities which are active parties in the consortium and will be directly involved in the definition of the proposed solutions. Indeed, the proposed solution is about to complement already operational platforms extending the surveillance perimeter using a fleet of drones to provide innovation and operational support to the safety and security aspects of daily operations.

Result/Highlights	The purpose of the PASSport (Operational Platform managing a fleet of semi-autonomous drones exploiting GNSS high Accuracy and Authentication to improve Security & Safety in port areas) is to engineer and qualify a solution extending situational awareness based on aerial fixed/ rotary wing and underwater drones to improve safety and security in port areas. The need stems from the directive 2005/65/CE asking to complement surveillance systems for the whole port area, in order to significantly improve security and safety for daily operations implanted in port area. This result also in saving citizen lives ensuring a high and equal level of safety and security for all European ports. Around one thousand European ports fall within the scope of the directive. As a consequence, PASSport responds to the needs expressed by port authorities, harbour master and border control authorities which are active parties in the consortium and will be directly involved in the definition of the proposed solutions. The proposed solution is intended to complement already operational platforms by extending the surveillance perimeter using a fleet of drones to provide innovation and operational support to the recognition, management and analysis of safety and security aspects of daily operations with particular attention to: Pollution monitoring (safety), Support to e-navigation (safety), Critical buildings/ Infrastructures protection (security), Protection against non-cooperative small craft approaching the port areas (security) Underwater threats monitoring (security) **Deliverable of System Verification Plan** https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5ea55869a&appId=PPGMS **Deliverable of PASSport Specifications and Design** https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5ea557b59&appId=PPGMS **Deliverable of Use cases definition** This document aims to describe the use of drones in identified use cases. For each use case the following information is pointed out the scope, identifying the need and the rationale for session implementation; the identified areas, underlining peculiar needs for each port; the logistics, the authorization request in order to operate the proposed fleet of drones. https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5ea5573c8&appId=PPGMS The project is expected to activate commercialisation channels based on the novelty represented by the usage of a fleet of semi-automated drones integrating Galileo services (and other sensors) for a safe and efficient guidance, navigation and control (GNC) even in a challenging environment in presence of obstacles - including buildings and other ground assets - and potentially unfavourable weather conditions.

Project	PIXEL - Where IoT meets the Port of The Future
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Port of the future
Field of research/Keyword	data analytics, Interbet of thing, information , big data, innovation management, hydrology, smart sensor
Budget	4 890 222,50 €
Status/ Start date/End date	Closed project - May 2018 - April 2021
Web site	https://pixel-ports.eu/
Lead Partner	POLYTECHNIC UNIVERSITY OF VALENCIA , Spain
Partners	Prodevelop, Spain; s.l. Xlab Spain; Insiel, Italy,; Centre aquitain des technologies de l'information et électroniques, France; Orange, France; Creocean sveuciliste u rijeci, France; Medicinski fakultet, Croatia; Intermodal terminal of gorizia (sdag), Italy; Piraeus port authority, Greece; Port network authority of the eastern adriatic sea, Italy; Grand port maritime de bordeaux, France; People technology solutions ltd, United Kingdom; Ethniko kentro erevnas kai technologikis anaptyxis, Greece
Project description/ objective	PIXEL enables a two-way collaboration of ports, multimodal transport agents and cities for optimal use of internal and external resources, sustainable economic growth and environmental impact mitigation, towards the Ports of the Future. Built on top of the state-of-the art interoperability technologies, PIXEL centralises data from the different information silos where internal and external stakeholders store their operational information. PIXEL leverages an IoT based communication infrastructure to voluntarily exchange data among ports and stakeholders to achieve an efficient use of resources in ports. The main outcome of this technology will be efficient use of resources in ports, sustainable development and green growth of ports and surrounding cities/regions. Built on top of the state-of-the art interoperability technologies, PIXEL will centralise data from the different information silos where internal and external stakeholders store their operational information.
Result/Highlights	PIXEL is a secure IoT platform that evaluates the environmental performance of the port based on the data collected through plugged-in agents, enabling energy and environmnetal modelling, as well as vessel traffic and intermodal transport optimization through advanced predictive algorithms. This big data engine fits the most demanding data needs of ports, terminals and shippers in the pursue for environmental efficiency through a digital trasformation that will have on them a positive impact in the optimisation of operations. The Pixel Products are:

	The Port Environmental Index (PEI) is a global quantitative environmental index fed on a variety of data types (including real-time), allowing ports to access the progress of their own environmental performance. This tool enables flexibility and scalability in monitoring environmental performance in real-time through the IoT infrastructure at the port. PEI is able to use the complex algorithms.It allows the user to analyse in real-time the factors that most affect its own enviornmental efficiency and compare the progress of that based on a dashboard easy to use and understand. https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/30155;keyword=pixel **The Port Activity Scenario (PAS)** is an ICT toolset based on computational models port activities based on vessels calls and use of handling equipment specifications in order to establish an operational description of the port activities related to cargo handling. This digitalisation of the port activities and know-how over time enables simulation through what-if scenarios, allowing for specialized computational models for energy consumption and production, environmental pollution, or COVID-19 restrictions. It also allows for the integration of new computational models to address other priorities. https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/30186;keyword=pixel **The Maritime Data Analytics (MDA)** is an ICT toolset based on powerful algorithms feeding on different types of data sources (AIS, FAL forms and smart cameras) that improve the business intelligence at the port from the traffic at the sea (enhancing ETA/ETD and other optimizations of vessel traffic and manouvering) and on the road (forecasting and avoiding congestion at the port gate) with machine learning methods. https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/30194;keyword=pixel **The Big Data Engine (BDE)** is the underlying software infrastructure of PIXEL fitting the most demanding data needs of all stakeholders in the maritime industry, modular and flexible by plug'n'play FIWARE data collection agents, and ready for 3rd party integration through REST API and integration with Port Community Systems. It was built in a lean product development process with decision-makers of small, medium and large ports to fit the data challenges of most European ports. https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/30203;keyword=pixel **Deliverable** https://pixel-ports.eu/?page_id=30 **Use case intermodal trasport** - Port of Monfalcone, Gorizia Interporto http://pixel-ports.eu/wp-content/uploads/2019/09/PIXEL_UC_Transport.pdf

Project	**PORTFORWARD - Towards a green and sustainable ecosystem for the EU Port of the Future**
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Port of the future
Field of research/Keyword	Smart port, interconnected, innovation management, Internet of things, ecosystem
Budget	4.994.311,25 €
Status/ Start date/End date	Closed project - July 2019 - June 2022
Web site	https://www.portforward-project.eu/
Lead Partner	FRAUNHOFER SOCIETY FOR THE ADVANCEMENT OF APPLIED RESEARCH EV, Germany
Partners	Acciona Construccion Sa, Spain; Interuniversitair Micro-Electronica Centrum,Belgium; Brunel University London,United Kingdom; Acondicionamiento Tarrasense Associacion,Spain; Teamviewer Germany Gmbh, Germany; Core Innovation And Technology Oe, Greece; Autoridad Portuaria De Vigo, Spain; Autoridad Portuaria De Baleares, Spain; North Tyrrhenian Sea Port Authority, Italy; Aggregazione Pubblico Privata sulla Logistica Mare Terra Societa Consortile A Responsabilita Limitata, Italy; Kristiansand Havn Kf, Norway; TRANSPORTWERK MAGDEBURGER HAFEN GMBH, Germany
Project description/ objective	The Port of the Future will be able to enhance sustainable development and to manage the resources to be invested and their employment for a competitive advantage. Therefore, the port of the future must be oriented to port community and have an operative strategic capability to work, in line with European purposes, on the following: - Smart, through ICT solutions, because it is important to improvement exchange of information flows between port and port community; - Interconnected with the use of a combination of different modes of transport and the integration of different technologies, because it is important to achieve better monitoring and controlling of the freight flows; - Green through the adoption of green technologies because it is important to reduce the environmental impact of port operations saving the resources.
Result/Highlights	The project's results are twofold: services developed showing high potential and whose implementation is already being explored in ports, and IT infrastructure components to be further exploited. One of the services that has been successfully tested is the **Green Yard Scheduler**. https://www.youtube.com/watch?v=2q6uNltvGwY

This is a decision support tool optimising processes in container terminals. It integrates energy consumption and emissions of container handling equipment as optimisation criteria. This service was trialled in the Port of Vigo, Spain. Another service, the **Port Authority Dashboard.** It provides a holistic overview on port performances to port authorities and was successfully trialled by the port authority of Naples and Salerno, Italy. https://www.youtube.com/watch?v=qIaF79jEPe4

One more to highlight is the **AR-based Assistance of Container Inspection**. In this use case, port operating personnel are supported by an augmented reality application using smart glasses. Relevant information for container inspection processes is displayed to the operators, and remote support can be given via the application to enable more efficient and smooth inspection processes. This service was trialled in the Port of Livorno, Italy. https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5cd729f23&appId=PPGMS

Another relevant IT solution is the so-called **Virtual Twin.** It developed for the Port of Magdeburg, Germany. It consists of a complete spatial 3D model of the port and integrates dynamic real-time information of the three use cases developed at the port. This way, information of different port processes and port infrastructures are visualised in an intuitively understandable user interface.

Sensitising ports about the potential of digitalisation. https://www.youtube.com/watch?v=2yM08uFEvig https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c5595130&appId=PPGMS

The economic potential of digitalisation and data integration were demonstrated to the ports and related stakeholders. **PortForward** also increased the ports' awareness of their environmental impact, and of the project's solutions and technical approaches to help reduce this impact. The project helped to demonstrate and validate the potential of digitalisation. The experiences gained by the ports, using the project solutions, will further boost the digitalisation of port processes and of port communities, and thus also enable a quicker and easier adoption of other novel digital solutions.

Cloud Platform Integration concept and guidelines

The so called "IoT Stack" provided by IMEC is a state-of-the-art cloud platform designed to securely ingest, store and retrieve historical data from its connected devices, supporting multiple IoT protocols. It acts as a middleware layer by decoupling and shielding the data producer from the data consumer (and vice-versa); consequently easing integration, accessibility and future evolution of the connected systems. https://www.portforward-project.eu/wp-content/uploads/2018/09/190430_PortForward_D3.1_Cloud_Platform_Integration_Concept_and_Guidelines_FINAL_sm.pdf

Project	**RAPID - Risk-aware Automated Port Inspection Drone(s)**
Programme	H2020-EU.3.4. - SOCIETAL CHALLENGES - Smart, Green And Integrated Transport
Topic/Priority	Innovative applications of drones for ensuring safety in transport
Field of research/Keyword	automation, drone, transport
Budget	4 997 133,75 € Total
Status/ Start date/End date	Ongoing - June 2020 - May 2023
Web site	https://rapid2020.eu/
Lead Partner	UNIVERSITY OF THE WEST OF SCOTLAND, United Kingdom
Partners	University Of Limerick, Ireland; Hamburg Port Authority, Germany; Xocean Limited, Ireland; Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung Ev, Germany; Revolve Water, Belgium; Sintef As, Norway; University Of Dundee, United Kingdom; Thales, France
Project description/ objective	Risk Aware Port Inspection Drones, RAPID, is a consortium founded to increase efficiency on tasks undertaken within a City port environment (HPA - Port of Hamburg) and increase productivity of those tasks when resources are allocated to perform them. The Ports around Europe are part of the arterial transport system and connect the maritime and landside spheres. Ports are constantly looking to ensure that the infrastructure of their internal transport systems (roads, bridges, ships, and canals) are safe and compliant with safety standards within the different transport spheres. The inspections undertaken by the Ports are non destructive visual inspections completed by their on site engineers. RAPID looks to further the use of Unmanned Aerial Systems (UAS) to complete these tasks and reduce the time taken to complete the inspection to 10% of the current time. Freeing up the engineer for anaylsis. Early warning systems are essential for disaster prevention. To minimise disruption and delays to critical supply chains, it is important to detect any deterioration in transport system infrastructure. The EU-funded RAPID project will combine and extend drone technology to deliver a fully automated and safety-assured maintenance inspection service for bridges, ship hull surveys and more.
Result/Highlights	The integrated RAPID innovations improve remote UAS inspection survey productivity, and extend the addressable market to all maritime accessible transport infrastructure, thus improving the safety of the transport system by enabling more frequent structural inspections for earlier detection of faults. The

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automated service is designed to conduct condition monitoring of over 85% of bridges in the transport system bridges using waterway access, as well as all coastal zone shipping (cargo and passenger) and port infrastructure.

The Hamburg Port Authority (HPA) identified the best test sites for the RAPID prototype to be deployed and gathered and labelled a database of known cracks for their Thales partners. HPA also undertook the Initial tasks of defining service needs, costing them, and compare them to the proposed RAPID objectives. The University of the West of Scotland (UWS) are investigating the cyber-physical approaches to performance prediction and optimisation of smart drone perception that combine high-fidelity sensor simulation with scenario digital twins and artificial intelligence. Modelled some of the expected dynamic agents that could be a hazard for drone flight using animation software, birds, small aircraft, and other drones etc. One of the ambitions of RAPID will be to see the Drone combine with a Unmanned Surface Vehicle (USV) and allow the waterways within the Port of Hamburg to be utilised fully. The University of Limerick is developing a take-off and landing system that looks to be accurate within 5cm as a prototype. UL have also Investigated detect and avoid sensors for close range (50m) and long range agents (2km).

Use Case 1 – Ship emission monitoring
Purpose: To increase the accuracy of ship emission monitoring.
Use Case 2 – Bridge Inspection
Purpose: To reduce inspection costs and develop a predictive maintenance service.
Use Case 3 – Ship hull inspection
Purpose: To reduce downtimes, ship inspection costs and develop a predictive maintenance service.
Use Case 4 – Collision / Disaster response
Purpose: Fast tactical situation image of accidents.
https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5d5467b9f&appId=PPGMS
Deliverables
https://cordis.europa.eu/project/id/861211/results

Project	RESPOND-A - Next-generation equipment tools and mission-critical strategies for First Responders
Programme	H2020-EU.3.7. - Secure societies - Protecting freedom and security of Europe and its citizens
Topic/Priority	Technologies for first responders
Field of research/Keyword	sensors, data science, drones, virtual reality
Budget	7 666 225,30 € Total
Status/ Start date/End date	Ongoing - June 2021 - May 2023
Web site	https://respond-a-project.eu/
Lead Partner	EUROPEAN UNIVERSITY - CYPRUS LTD, Cyprus
Partners	34 Partner: Athonet Srl, Italy; Nifakos Sokratis, Sweden; 0 Infinity Limited, United Kingdom; Hellenic Instruments Ike, Greece; Prometech Bv, Netherlands; Eight Bells Ltd, Cyprus; Sidroco Holdings Limited, Cyprus; Cyberlens Bv, Netherlands; Vallfirest Tecnologias Forestales Sl, Spain; Csi Center For Social Innovation Ltd, Cyprus; Fundacio D'ecologia Del Foc I Gestio D'incendis Pau Costa Alcubierre, Spain; Fundacion De La Comunidad Valenciana Para La Investigacion, Promocion Y Estudios Comerciales De Valenciaport, Spain; Public Safety Communication Europe Forum Aisbl, Belgium; Ayuntamiento De Valencia, Spain; Cyprus Police, Cyprus; Dimos Egaleo, Greece; Institut Po Otbrana, Bulgaria; Smartex Srl, Italy …
Project description/ objective	Climate change and industrial accidents can create challenging environments for first responders when they are called in to deal with an incident or crisis. The EU-funded RESPOND-A project aims to develop technologies based on 5G wireless communications, augmented and virtual reality or autonomous robots to optimise first responders' work. Thanks to RESPOND-A, first responders will have the opportunity to test these technologies and see how efficiently they can be applied within the framework of diverse disaster scenarios. With these technological advances, first responders will be able to better predict and assess the incidents and to safeguard themselves before, during and after disasters. To match with current trends, the RESPOND-A project aims at developing holistic and easy-to-use solutions for First Responders by bringing together the complementary strengths of its Investigators in 5G wireless communications, Augmented and Virtual Reality, autonomous robot and unmanned aerial vehicle coordination, intelligent wearable sensors and smart monitoring, geovisual

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	analytics and immersive geospatial data analysis, passive and active localisation and tracking, and interactive multi-view 360o video streaming.
Result/Highlights	The RESPOND-A consortium has been working hard to design and develop innovative solutions that enhance the capabilities and safety of first responders. The final and third year of the project will be marked by the project pilots, and the testing and integration of RESPOND-A technologies using lifelike simulation scenarios (Forest Fire in Cyprus/ Earthquake in Greece/ Oil& Fire Spill in Spain). The technologies adapted to the project are any European Environment Agency (EEA)-type disaster scenario. The entirety of the products & services developed in RESPOND-A can be sorted into 4 broad categories (Augmented Reality/ Sensors, Wearables and Mobile Devices/Mission Critical Systems/Robotics and Unmaned Vehicles). **Augmented Reality**: https://respond-a-project.eu/augmented-and-virtual-reality/ **Sensors, Wearables and Mobile Devices**: https://respond-a-project.eu/sensors-wearables-and-mobile-devices/ **Mission Critical Systems:** https://respond-a-project.eu/mission-critical-systems-c2-and-communications/ **Robotics and Unmaned Vehicles:** https://respond-a-project.eu/robots-and-unmanned-vehicles/ **PILOT SESSION/USE CASES** **Pilot Session 1: Forest Fire (Cyprus)** https://respond-a-project.eu/use-case-1/ **Pilot Session 2: Earthquake (Greece)** https://respond-a-project.eu/use-case-2/ **Pilot Session 3: Maritime incident (Spain)** Between 75 and 96 % of marine accidents are a result of human error (e.g. fatigue). Over 50% of all the oil spills happen in port areas. In the past years, approximately 71% of all the attacks on ships registered by the International Maritime Bureau took place on vessels in ports (vessels berthed or anchored). Big ports such as the Port of Valencia require a specific protection plan to respond rapidly against natural and provoked disasters in the port area and surroundings. The Port Authority of Valencia has a Self-Protection Plan (SPP) which plans the necessary intervention actions in emergency situations. Cutting-edge technologies such as 5G, smart health or the usage of UAVs boost the save and rescue actions while increasing the First Responders' safety https://respond-a-project.eu/use-case-3/ https://respond-a-project.eu/wp-content/uploads/2021/02/RESPOND-A-training-1-3.pdf **D2.3 Use Cases and Evaluation Strategy** Spanish case - Smart Communications for SAR Operations Against Oil Spill and Fire in the Port and City Areas. Pg32 https://zenodo.org/record/6976849

Project	VITAL 5G - Vertical Innovations in Transport And Logistics over 5G experimentation facilities
Programme	H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)
Topic/Priority	5G innovations for verticals with third party services
Field of research/Keyword	5G, ecosystem, logistic, transport
Budget	6 494 425 € (4 777 525€ EU)
Status/ Start date/End date	Ongoing - January 2021- December 2023
Web site	https://www.vital5g.eu/
Lead Partner	Wings Ict Solutions Information & Communication Technologies Ike, Greece
Partners	Beia Consult International Srl, Romania; Dhl Exel Supply Chain Spain Sl, Spain; Diakinisis A.E Apothikefseis-Metafores –Syskevasies, Greece; Digitrans, Belgium; Ebos Technologies Limited, Cyprus; Asociatia Tehnopol – Galati, Romania; Interuniversitair Micro-Electronica Centrum, Belgium; Incelligent Idiotiki Kefalaiouchikietaireia, Greece; Inlecom Group, Belgium; Compania De Navigatie Fluviala Romana Navrom Sa, Romania; Nextworks, Italy; Telenet Group, Belgium; Orange Romania Sa, Romania; Organismos Tilepikoinonion Tis Ellados Ote Ae, Greece; Seafar, Belgium; Inlecom Commercial Pathways Companylimited By Guarantee, Ireland
Project description/ objective	The VITAL-5G project has the vision to advance the offered transport & logistics (T&L) services by engaging significant logistics stakeholders (Sea and River port authorities, road logistics operators, warehouse/hub logistic operators, etc.) as well as innovative SMEs and offering them an open and secure virtualized 5G environment to test, validate and verify their T&L related cutting-edge Network Applications (NetApps). The obiectives are:
Result/Highlights	The VITAL-5G proposal plans to showcase the added-value of 5G connectivity for the European T&L sector by adopting a multi-modal approach containing major logistics hubs for freight and passengers (sea ports, river ports, warehouse / logistics hubs, highways, etc.) as well as the respective stakeholders (road operators, port authorities, 3rd party logistics (3PL) operators), thus creating an end-to-end chain of connected T&L services accommodating the entire continent. https://www.vital5g.eu/target-use-cases/ **Use Case 1** Automated vessel transport (Antwerp Port) This use case will be executed in the Port of Antwerp. 5G connectivity and slicing will be used to control semi-autonomous vessels in the challenging environment of a port area. High-bandwidth

camera feeds and sensor data are sent in real-time from the vessels to the command centre, and real-time steering commands are sent to the remote vessel. With the current 4G-networks, reliability (in terms of coverage, throughput and latency) and redundancy are pertinent shortcomings to reliably deploy remotely controlled vessels in a port area. As connectivity is currently a main bottleneck, 5G will be able to fulfil these challenging requirements where 4G currently falls short owed to bandwidth, latency and throughput limitations. We aim to build up a real-time digital twin around the vessel to support the remotely controlled (and later on autonomous) vessels. Use case explanation: https://www.vital5g.eu/wp-content/uploads/2021/07/VITAL-5G_UC_BE.pdf

Use Case 2

This use case, which is realised in collaboration with Romanian partners (ORANGE RO and NAVROM S.A.) and Greek partner Incelligent (INCE), is focused on the implementation of a data-enabled assisted navigation application using IoT sensing system and video cameras installed in Galati port and on a ship and barges (cargos). The T&L application will permit a safer port operation and more security regarding navigation of ships with the help of assisted operation / navigation even in severe weather and water conditions. All sensors and cameras will enable the interoperable wireless protocols over a private 5G network and will permit the extension of Internet connectivity of the sensing system. Several sensors, such as GPS, humidity, smoke, engine power sensors located in the machine room, will be installed on the ship and barges. These sensors provide relevant information, such as velocity, heading, water and wind speed, etc. to the ship local monitoring equipment, allowing the captain and crew to take proper decisions and supporting on-board diagnosis. The crew will also have access to live video streaming from the surroundings through high definition video cameras in order to achieve high-resolution video streams, high connectivity and low latency that is uniquely offered by 5G. Use case explanation: https://www.vital5g.eu/wp-content/uploads/2021/07/VITAL-5G_UC_RO.pdf

Use Case 3

Automation & remote operation of freight logistics (Warehouse logistics)

Diakinisis S.A. is a 3rd party Logistics provider with many depots across Greece. The depot that will be used in the framework of the VITAL-5G project incorporates all daily operations met in a typical warehouse, namely, receiving, put-away to stock, picking (and replenishment of picking from stock locations), checking - final preparation of orders (packaging and labelling), shipping and value-adding services, such as co-packing. This use case intends to demonstrate the feasibility of applying the 5G technology in an overall Logistics context, for optimizing warehousing operations through an integrated state-of-the-art operational system based on Automated Guided Vehicles (AGVs) as used by NetApp VS1. This system will make use of the 5G-EVE Athens testbed, which will be upgraded to stand-alone and extended at the warehouse premises. The operation of AGVs can be automated and remotely assisted using HD video streaming functionality to enable human interaction (NetApp VS2), while additional AI/ML techniques will be introduced for post-processing operational data in order to improve the end-to-end functionality of the warehouse ecosystem (NetApp VA1). Use case explanation:
https://www.vital5g.eu/wp-content/uploads/2021/07/VITAL-5G_UC_GR.pdf

Document and deliverable

https://www.vital5g.eu/public-deliverables-2/

Pubblications

https://www.vital5g.eu/publications/

Project	**SPEED - Smart Ports Entrepreneurial Ecosystem Development**
Programme	INTERREG - 2SEA
Topic/Priority	Technological and Social Innovation
Field of research/Keyword	Port and harbor, Framework Conditions for Innovation innovation trasport
Budget	4 154 162 € total (2 457 654 € ERDF)
Status/ Start date/End date	Closed project - July 2018 - May 2022
Web site	https://www.smartportsecosystem.com/
Lead Partner	Antwerp Management School, Belgium
Partners	University Antwerpen, Belgium; University Lille, France; Stichting Katholieke University Brabant, Netherlands; WSX Enterprise, United Kingdom; University of Bournemouth, United Kingdom; Portsmouth City Council, United Kingdom Nxtport, Belgium; CITC-EuraRFID Centre innovations of technologies, Netherlands; Haven van Moerdijk, Netherlands; Startups.be, Belgium; Poole Harbours Commissioners, United Kingdom; Portland Port Limited, United Kingdom; Borough of Poole, United Kingdom
Project description/ objective	Global competitiveness is putting pressures on Western European ports to be more efficient and innovative. Especially in large and complex port environments there are numerous opportunities for efficiency gains in the logistic chain. Simultaneously, new advances in data science and the Internet of Things (IoT) technologies are enabling more efficient ways to communicate and integrate entire supply chains. High-tech start-ups and SMEs are leading the way in these technological developments. Currently, port environments do not fully take advantage of data science / IoT technologies. Further, high-tech start-ups / SMEs often struggle with professionalization of their technological ideas and business activities. As a result, performance of the Western European ports is hampered. Similarly, the full development potential of high-tech start-ups and SMEs and their subsequent economic contributions are not realised. performance.
Result/Highlights	Towards its overall aim of creating the ecosystem conditions for accelerated smart port innovation in the 2 Seas area, SPEED is increasingly creating an impact and generating spontaneous interest in the European - and global - smart port community. The main outputs are on: 1) Mobilizing a network connecting 2 Seas regional data science high-tech start-ups and SMEs, data science and maritime experts and knowledge centres and port stakeholders, to support the

	Western European ports and port stakeholders who are in need of data science solutions; 2) Building a common approach to facilitate the development of data science applications for port logistics problems, supporting the Western European ports and port stakeholders who benefit from improved technology adoption and a joint technology roadmap.3) Building a common approach to develop and improve the technical value delivering, commercialisation capacities and professionalization of smart port entrepreneurs and for the adoption of smart port solutions, to the benefit of (internationalizing) high-tech start-ups and SMEs, and port application users. SPEED Smart Ports Portal is an open community platform to connect and bridge the worlds of port operations and smart technologies. SPEED (Smart Ports Entrepreneurial Ecosystem Development) is a project that aims to develop the conditions for a leading smart ports innovation ecosystem that bridges the port logistics networks and (mostly SME) data science networks in the European 2 Seas region. https://speed.wazoku.com/community/b6e9b42e2627478ba8cc9b5a17357428/home-page A common innovation ecosystem vision and roadmap toward global leadership in market niches with smart ports solutions for the 2 Seas port area https://www.interreg2seas.eu/en/download/file/fid/47370 Two joint tool kits to diagnose and improve value creation, value delivery and personality development of SP-App entrepreneurs https://growthtool.io/ - /intro **Tool – Smart Port Barometer** Guidance for individual port companies and port authorities in your digital transformation. Map your digital maturity and benchmark it against captains of industry Bring your port community together to prioritise and develop digital transformation projects https://www.smartportsecosystem.com/the-smart-port-barometer/

Project	COMODALCE - Coordination among multimodal freight transport stakeholders in Central Europe
Programme	INTERREG Central Europe
Topic/Priority	Transport and mobility
Field of research/Keyword	transport, multimodal, data analytics, ICT , mobility, big data
Budget	1.9 ml € (ERDF 1.6 ml €)
Status/ Start date/End date	Closed project - April 2019 - March 2022
Web site	https://www.interreg-central.eu/Content.Node/COMODALCE.html
Lead Partner	Port Authority of the Eastern Adriatic Sea, Italy
Partners	ZAILOG scarl, Italy; Port Authority of the Eastern Ligurian Sea, Italy; ROSTOCK PORT GmbH, Germany; Luka Koper, pristaniški in logistični istem, d.d., Slovenia; ADRIA KOMBI, DRUŽBA ZA KOMBINIRA NI TRANSPORT, d.o.o., Slovenia; Zarząd Morskiego Portu Gdynia S.A., Poland; BCT – Bałtycki Terminal Kontenerow , Sp. z o.o., Poland; Rádiós Segélyhívó és Infokommun ikációs országos Egyesület, Hungary; Mahart Container Center Kft, Hungary
Project description/ objective	The COMODALCE Interreg project aimed to increase the cooperation and Coordination among multimodal freight transport stakeholders in Central Europe through the use of Innovative ICT systems. The intermodal transport has been developed very dynamically and needs desperately digitalization for further development and growth. Inefficient and slow communication hinders the increase of transport volumes. Old fashioned procedures, complicated models of communication and a lack of modern tools become a great obstacle for further development. It aimed at developing multimodality in CE Ports as strategic nodes and hubs for the whole Central Europe Region by setting up strategies, a transnational multimodal cooperation network and a joint action plan to improve hinterland intermodal connections through the experiences of ICT solutions developed within the project, pushing in particular for an increase of rail freight transport, moving the freights from road to railway. At the same time, the development of port's hinterland and hubs is not be possible without the parallel increase of new infrastructures, linking in a better way the maritime logistics and the continental logistic centres. In this way, COMODALCE project's activities were focused on evaluating possible ICT solutions to overcome the lacks in digitization of logistic and administrative operations. The project

	involved 10 among the public authorities and private companies operating in some of the most important ports and terminals in Central Europe.
Result/Highlights	From the final report the general and main proposals for possible solutions until year 2030 are: development of PCS through modular solutions allowing to integrate the system with new ICT tools from different software providers; [SEP] digitization of processes through the purchase of scanning equipment which is able to provide and share instantly the data about wagons and containers; [SEP] unification of interfaces of the systems of different stakeholders under common standards all over CE, for a unique model to be used for the same processes and types of data to be shared through the same logistic chain. [SEP] The pilot actions in the COMODALCE project have proven that the implemented measures for improvements in a digitized and automated data exchange between stakeholders in the multimodal transport chain led to more efficiency, transparency and safety in transport processes. The activities were not only a success and a further step in the development of each single partner towards more digitization and automatization but they are also best practice examples for actors in the transport sector with similar questions. **HINT**→Link to some Pilot actions* and strategy/goals in medium/long term**: **Trieste: upgrade of the train module of the PCS:** *https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.2-LP-final.pdf- **https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.2-AP-Trieste.pdf **La Spezia: upgrade of the corridor management platform connected with the rail/road terminal of Verona:** *https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.4-PP03-La-Spezia.pdf - **https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.4-AP-La-Spezia.pdf **Verona: upgrade of the IT platform used by the [SEP]intermodal terminals:** *https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.3-PP02-VERONA.pdf- **https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.3-AP-Verona.pdf[SEP] **Rostock: preliminary study for the installation of a scanner for freight units**: * https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.5-AP-ROS.pdf **https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.5-PP04-Port-of-Rostock.pdf **Koper/ 2: IT interface to exchange data related to [SEP]the position, composition and content of the train:** * https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.7-AP-LK.pdf- **https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.7-PP05-LK.pdf **Hungary / 2: IT platform as to enable one-to-one data exchange with the Port of Trieste:** *https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T3.2.10-AP-MCC.pdf- ** https://www.interreg-central.eu/Content.Node/COMODALCE/COMODALCE-D.T2.2.11-PP10-MCC.pdf

Project	TALKNET - Transport and logistics stakeholders network
Programme	INTERREG Central Europe
Topic/Priority	Transport and mobility
Field of research/Keyword	multimodal, multistakeholder, logistic, ICT , mobility,
Budget	2 536 520 €
Status/ Start date/End date	Ongoing - October 2021 – September 2026
Web site	https://www.interreg-central.eu/Content.Node/TalkNET.html
Status/ Start date/End date	Ongoing - October 2021 – September 2026
Web site	https://www.interreg-central.eu/Content.Node/TalkNET.html
Lead Partner	Port Authority of the Nord Adriatic Sea, Italy
Partners	Port of Rijeka Authority, Croatia; Regional Development Agency of Ústí Region, Czech Republic; Freeport of Budapest, Hungary; Logistics Ltd Rail Cargo Hungaria Goods Transport Private Limited Company, Hungary; Szczecin and Swinoujscie Seaports Authority S.A., Poland; Westpomeranian Region, Poland; CODOGNOTTO POLAND, Poland; Public Ports, JSC., Slovakia; Luka Koper, port and logistic system, public limited company, Slovenia; Italian-German Chamber of Commerce in Munich; Germany; Lokomotion Gesellschaft Für Schienektraktion mbH, Germany; Port Network Authority of the Eastern Adriatic Sea, Italy; Consorzio ZAILOG Quadrante Europa Freight Village, Italy; Veneto Strade S.p.A, Italy
Project description/ objective	In order to strengthen environmentally-friendly multimodal transport in central Europe it is essential to develop harmonised mechanisms of cooperation among freight transport stakeholders. The TalkNET project encourages and improves coordination among key stakeholders to strenghten the integration between ports, inland terminals, transport operators and policy makers. Multimodality optimization and eco-innovation solutions were in the focus of the project as the two main fields of cooperation to establish transnational stakeholders' networks for freight transport. Project actions supported investments on last mile connections, terminal management efficiency, new intermodal services and on the deployment of alternative fuels and energy efficiency solutions.

Result/Highlights	Results achieved by the project TalkNET - Transport and Logistics Stakeholders Network - focuses on a better coordination between international stakeholders to foster the integration between ports, inland terminals and transport operators and efficient and sustainable multimodal logistic nodes and services. **Project - Booklet** https://www.interreg-central.eu/Content.Node/TalkNET-summarybook.pdf Output and results of Multimodality part: - designing of new last mile infrastructures, improving connectivity to the main transport networks - implementation of new intermodal innovative and sustainable services road-rail; - development of specific IT tools for the optimization of management and logistic processes/operations in the rail sector; - development of new concept for the digitalisation in transport and logistics. **Last Mile Connections** https://www.interreg-central.eu/Content.Node/O.T1.3.1-Output-fact-sheet-KT-last-mile-connections.pdf **Node Management Optimization** https://www.interreg-central.eu/Content.Node/O.T1.4.1-Output-fact-sheet-KT-node-management-optimization.pdf **Assessment Of Multimodal Services** https://www.interreg-central.eu/Content.Node/O.T1.5.1-Output-fact-sheet-KT-multimodal-services.pdf **Multimodality Pilot action:** Feasibility Study For A New Rail Terminal (Verona Freight Village) | Output Factsheet https://www.interreg-central.eu/Content.Node/Zailog-Pilot-action-final-report-D.T3.2.1-1.pdf Innovative Control Shunting System – Railway Datamart (Port Of Venice) | Output Factsheet https://www.interreg-central.eu/Content.Node/OT3.2-Output-Factsheet-Pilot-action-LP-def.pdf It Railway-Linked Programme To Optimize The Cargo Schedule (Port Of Rijeka) | Output Factsheet https://www.interreg-central.eu/Content.Node/Port-of-Rijeka-Pilot-Action-final-report---D.T.-3.2.4.pdf New Model For The Warehouse Management System Integrated Platform (Codognotto Polska) | Output Factsheet https://www.interreg-central.eu/Content.Node/Codognotto.-Pilot-action-final-report-def-3-2-5-def.pdf

Project	**SMOOTH PORTS - Reducing CO2 Emissions in Ports**
Programme	INTERREG Europe
Topic/Priority	Low-carbon economy
Field of research/Keyword	transportation, green transition, climate change, C02 emission, port
Budget	1 139 601 €
Status/ Start date/End date	Ongoing - August 2019 - January 2023
Web site	https://projects2014-2020.interregeurope.eu/smoothports/
Lead Partner	Free and Hanseatic City of Hamburg, Ministry of Economy and Innovation, Germany
Partners	Port Authority Network Northern Tyrrhenian Sea, Italy; Port of Nantes Saint-Nazaire Authority, France; Municipality of Monfalcone, Italy; Regional Administration Varna, Bulgaria
Project description/ objective	Ports have been vital gateways for prosperity and engines for growth over centuries. Inefficient road traffic in port areas causing CO2 emissions has been much overlooked in the past It involves a complex network of different stakeholders engaged in various kinds of daily port activities, in particular in the course of transporting goods, operational and clearance procedures – all powered by CO2 intensive fuels. Optimizing road traffic in port areas and developing strategies for smooth and efficient transport flows has been a crucial challenge for policy makers in order to reduce CO2 emissions. By engaging stakeholders from administration, port related business' and logistic business' along the supply chain, SMOOTH PORTS' aims to reduce CO2 emissions from port-related road traffic by improving regional policy instruments in a holistic manner. To achieve these aims, SMOOTH PORTS wants to utilise the differences of the project partners' ports through an exchange of effective tools and best practices. A key focus lies on finding optimal procedures for the clearance of the goods that are so vital for society and commerce – making their processing speedy and avoiding unnecessary burdens on environment and people.
Result/Highlights	The SMOOTH PORTS partners have come to Phase II of the project, after 2.5 years of mostly digital cooperation and collaboration. Below the links to the Action Plans of the Project: **Action Plan** of the Ministry of Economy and Innovation, Free and Hanseatic City of Hamburg, https://projects2014-2020.interregeurope.eu/smoothports/library/#folder=2584

Action Plan of the Port Authority Network Northern Tyrrhenian Sea
https://projects2014-2020.interregeurope.eu/smoothports/library/#folder=2584
Action Plan of the Port of Nantes Saint-Nazaire Authority
https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1646150001.pdf
Action Plan of the Municipality of Monfalcone
https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1643645130.pdf
Action Plan of the Regional Administration of Varna
https://projects2014-2020.interregeurope.eu/smoothports/library/#folder=2584

Project good practices

Renovation of railway infrastructure: The project detailed concerns the building of a railway line connecting Varna and Ruse – two important port cities in Bulgaria. https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/5012/renovation-of-railway-infrastructure/

Conveyor belt at the port terminal Varna West: The good practice described below deals with the implementation of a stationary rubber conveyor belt system and its positive outcomes. https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/5009/conveyor-belt-at-the-port-terminal-varna-west/

Tuscan Port Port Community System (TPCS): The Tuscan Port Community System (TPCS) is the free platform for port operators to process and manage information on freight transit (both import and export) in
https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/4945/tuscan-port-port-community-system-tpcs/

Slabs Modal Shift: Shifting the traffic of cast iron slabs from the road to the sea and to the rail from the Port of Monfalcone to the San Giorgio di Nogaro area.
https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/4778/slabs-modal-shift/

SIVEP - the Border Inspection Post for the regulatory requirements in Montoir de Bretagne: The one-stop-shop facility for regulatory health checks, customs inspections and import checks facilitates the clearance of goods and avoids unnecessary traffic
https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/4752/sivep-the-border-inspection-post-for-the-regulatory-requirements-in-montoir-de-bretagne/

NGV station in Montoir de Bretagne: The installation of a public natural gas vehicles (NGV) station is a precondition for the shift to a fleet of natural gas vehicles in the port area.
https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/4749/ngv-station-in-montoir-de-bretagne/

E-mobility in the Ports of Trieste and Monfalcone
Replacement of the internal combustion engine vehicles (ICEs) with battery electric vehicle (BEVs) in the Ports of Trieste and Monfalcone
https://projects2014-2020.interregeurope.eu/policylearning/good-practices/item/4743/e-mobility-in-the-ports-of-trieste-and-monfalcone/

The output: https://projects2014-2020.interregeurope.eu/smoothports/library/

Project	NON STOP - New smart digital Operations Needed for a Sustainable Transition Of Ports
Programme	INTERREG North Sea Region
Topic/Priority	Energy & pollution reduction
Field of research/Keyword	transportation, intermodality, ICT , mobility, big data
Budget	4.677.950 € (2.338.975€ ERDF)
Status/ Start date/End date	Ongoing - July 2019 - May 2023
Web site	https://northsearegion.eu/north-sea-connect/
Lead Partner	Port of Zwolle Coöperatie U.A., Netherlands
Partners	Port of Oostende, Netherlands; Niedersachsen Ports GmbH & Co. KG, Germany; - Niederlassung Emden (Port of Emden), Germany; Port of Korsør, Denmark; Port of Helsingør, Denmark; CRESCENT NV, GreenBridge NV, BPK - Rechtsanwaltkanzlei Friederike, Germany; BergPackhäuser & Kollegen, Germany; Port of Narvik, Norway
Project description/ objective	In the last decades Small and Mediums sized Ports (SMP) within the North Sea Region have been working in a more and more complex and rapidly changing world where the society and businesses have experienced a digital transformation in numerous areas. A smart modernisation and eco-innovative approach in port management has therefore become key to allow port authorities to cope with ever growing multifaced challenges and make a step forward, by moving toward a more advanced, as well as environmentally friendly future. The non-stop project aims to implement a green smart digital transition in the management of nsr's ports of regional importance. This will be achieved by introducing, testing and monitoring intelligent technologies and processes in the storage, deployment, sharing and transmission of data related to marine conditions, sea/landside operations and energy production/consumption/distribution in ports.
Result/Highlights	The ultimate goal is to reduce by 10% the time of pre-defined logistical/maintenance port operations and lower by 10% the port energy and pollution by building on collaborative expertise and joint practice. The resulting more efficient, agile and transparent data management among NSR SMP, shipping companies, freight forwarders and other relevant stakeholders will in turn facilitate the ability of ports to effectively serve their

clients, meet the targets of the ever increasing EU/national eco/digital policies and invest in further needed innovation.

The NON-Stop project delivered:

The Port of Zwolle´s Parkline Aqua App

Port of Zwolle chooses the software company Parkline Aqua to digitalise the collection of port dues. When the port is spread out over different cities, it is important to keep a good overview on the income that might generated by serving the different vessels. As the port of Zwolle is managing 3 different sites, the management has been investigating how they could make the registration of the vessels and the collection of the port dues more efficient. From 1.09.2021 on, the skippers can by a special app, developed by Parkline AQUA (https://www.parklineaqua.nl/). This is a special app that has been developed for the supply of drinkwater, shore power and for the collection of port dues. The app is also used at the ports of Rotterdam, Amsterdam and Antwerp, North Sea port and the Vlaamse Waterweg (Inland canals Flanders), especially in relation to inland shipping. By using this app, the port authority gets a better view on the number of transactions and its reduces the administrative burden, as well as the number of disputes.

Port of Korsør prepares the installation of a smart shore power plant

The port of Korsør (http://korsoerhavn.dk/) is an important hub in Sjaelland for the transport of bulk and raw materials for the production centers in the hinterland. As the port is a city port, the port operations have a direct impact on the city environment. Therefore, the port management has dediced to install a system of onshore power supply. Within the framework of the NON-STOP project, a supplier of OPS-systems "Soft og Teknik AS (https://softogteknik.dk/) has been selected. With the onshore power plant, it will be possible to supply electricity to 80% of the vessels that call at the American quay. The power plant has the capacity to supply 2 vessels and 2 electric cranes simultanously. It is therefore the ambition of the port manager to replace the 2 port cranes, that are actually operation on diesel, by electric cranes.The installation of the OPS-plant contributes largely to the reduction of the CO_2-emissions in the port area.

NEWS: https://northsearegion.eu/non-stop/news/

Project outputs: https://northsearegion.eu/non-stop/output-library/

Project	North Sea CONNECT
Programme	INTERREG North Sea Region
Topic/Priority	Promoting green transport and mobility
Field of research/Keyword	transportation, intermodality, ICT , mobility, big data
Budget	3.665.907 € (1.832.95 € ERDF)
Status/ Start date/End date	Open - October 2019 - March 2023
Web site	https://northsearegion.eu/north-sea-connect/
Lead Partner	Port of Hamburg Marketing, Germany
Partners	Port of Oostende, Belgium; Port of Brussels, Belgium; South East of Scotland Transport Partnership, United Kingdom; The Ministry for Science and Ports, Free and Hanseatic City of Bremen, Germany; SSPA Sweden AB, Sweden; Business Vordingborg, Denmark; Vives University of Applied Sciences, Belgium; Hamburg Port Authority, Germany
Project description/ objective	The NSR is one of the main logistics zones in Europe.The largest seaports, but also many intermodal transportation nodes are located in the NSR. Those intermodal nodes are outstanding for the transportation of goods to and from the supply and demand markets. To increase attractiveness of a location along with its market potential, i.e. the achievable market, efficient, smart, and ecological transportation networks are needed. The intermodality should enable a concentration of transnational traffic and long distance flows, and as a result of their integration, provide for a highly resource efficient infrastructure use. Currently, the Trans-European Network-Transport (TEN-T) policy is putting a strong focus on the development of the Core Network, the major transport axes across Europe. However, the whole trade and business network is not only depending on its major nodes but also on its hinterland. To raise the efficiency of transport flows in a holistic approach, the project will thus include both major and remoter transporation nodes to establish learning opportunities. The overall project objective is to support smart intermodality growth in the NSR through efficiency enhancements. The detailed project objectives are: implementation of new smart processes and tools (smart intermodality) and developing of strategies for smart efficiency enhancements (smart involvement). The perspective of transportation is transnational. New are the instruments for implementation and involvement.

European Regional Development Fund

Result/Highlights	The project output. The NSR CONNECT's third work package fosters the identification of remoter areas' bottlenecks in the intermodal network. The main objective is to identify transnational barriers and bottlenecks in terms of connectivity, smart technologies, and logistics processes, which impede the implementation of the TEN-T Core and Comprehensive Network, more precisely the interface of the core and remoter nodes. The results of studies (e.g., TEN-T corridor studies) and projects (e.g., INTERREG) are considered with a focus on regional/remoter intermodal nodes, which are threatened of being detached from major hubs due to a loss of competitiveness i.e., due to lack of capacity. **Policy Report: How the future connection of the TENT-T Core Network with the comprehensive network in the NSR could be shaped and developed.** The paper is one of three reports in the framework of this activity. It focuses on how the future connection of the TENT-T Core Network with the comprehensive network in the NSR could be shaped and developed. https://northsearegion.eu/media/22047/nsr_connect_policy-report.pdf **Smart Port solutions for remoter areas (2022)** "To become a smart port, we need to develop and show increased maturity in: • Integration and efficiency of port operations • Adaptive, balanced, effective, and synchronized modality shifts • Robust end-to-end cybersecurity • Energy and environmental performance • Digital capabilities: a digital talent pool and growth-supporting factor markets" SMART PORT SOLUTIONS – EXAMPLES PORT OF HAMBURG, smartBridge, Navigation in real-time, Shore power from renewable energies, Intelligent railway point - from pg12 https://northsearegion.eu/media/21970/nsr_connect_report-final-draft.pdf **Identification of remoter area's bottlenecks in intermodal network (2021)** The focus of this report is laid on core and periphery harbours. It is known that each port type has its own bottlenecks that need to be studied. https://northsearegion.eu/media/21971/report-d31.pdf

Project	**E-BRIDGE Emergency and BRoad Information Development for the Ports of GEnoa**
Programme	CEF Transport - Connecting Europe Facility (CEF) for Transpor
Topic/Priority	New technologies and innovation
Field of research/Keyword	Core Network Corridor, interoperability, port, rail
Budget	12 185 050 € Total (6 092 525 € EU)
Status/ Start date/End date	Ongoing - October 2018 - June 2023
Web site	https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2018-it-tm-0134-s
Lead Partner	Italian Ministry of Infrastructure and Transport
Partners	Western Ligurian Sea Port Authority, Italy; UIRNet, Italy; Circle, Italy
Project description/ objective	The Action is located in the Western Ligurian Sea port system (Ports of Genoa and Savona/Vado) on the Rhine-Alpine Core Network Corridor. It is part of Global Project aiming at enhancing the interoperability of transport services to ensure a sustainable and efficient transport system and to optimise the integration of transport modes. The E-Bridge (Emergency and BRoad Information Development for the Western Ligurian Sea port system) consists of a series of studies and pilots to develop a set of 3 innovative modules: Smart port and inland buffer area management; Innovative digital last mile rail; An advanced road gates system. These modules will be fully interoperable with the existing systems. In the long run, the Action will improve road accessibility to the ports by reducing the gate-in gate-out average time in the peak hours from 60 to 40 minutes. It will also increase the port rail potential by 30% additional trains on a yearly basis and it will increase the ports' capacity by 500,000 TEUs/year. The the Project aims to release a web interface between the Port Community System and the Piattaforma Integrata Circolazione ("PIC") di Rete Ferroviaria Italiana (Gruppo FS Italiane) for the sharing of real-time data concerning rail connections among harbour ports and related inland terminals.
Result/Highlights	The project "E-BRIDGE. Emergency and BRoad Information Development for the Ports of GEnoa", has the objective of creating an innovative IT-platform capable of guaranteeing full digital data exchange between the Port Community and operators - both public and private - in the management of the last-mile port rail (and road) transport.

	The first result released under E-BRIDGE is a web interface between the Port Community System (PCS) and the Integrated Traffic Platform (PIC) of Rete Ferroviaria Italiana (Italian Railway Group), for the integrated and real-time exchange of data on rail connections between the Ports of the Western Ligurian Sea and inland terminals. This product is available to port terminals, MTOs, railway companies etc. and marks the first step in the broader development programme of the port rail freight cycle, to be completed over the coming months. E-BRIDGE integrates and extends to all the Ports of the Western Ligurian Sea the know-how developed across the EU-CEF Vamp Up project which focused on innovation and automation of the last-mile railway system currently under completion in the Port of Vado Ligure.

Project	GREEN C Ports - Digitalisation tools and technologies to support port environmental sustainability and performance of port operations in the TEN-T Core Network.
Programme	CEF Transport
Topic/Priority	Marittime
Field of research/Keyword	Innovative tecnologies, information , climate change, artificial intelligence, smart sensor, new port design
Budget	7,155,708€ (3,577,854 € CEF Programme)
Status/ Start date/End date	Ongoing - April 2019 - March 2023
Web site	https://greencportsproject.eu/
Lead Partner	Foundation Port of Valencia, Spain
Partners	Port Authority of Valencia, Spain; dbh Logistics IT AG, Germany; North Adriatic Sea Port Authority. Ports of Venice and Chioggia; Italy; Institute of Communication and Computer Systems, Greece; Baleària Eurolíneas Marítimas S.A., Spain;Vira gas imaging, s.l., Spain;Municipality of Piraeus, Greece; Piraeus Port Authority, Greece; Zen travel touristikes epixeiriseis etairia periorismenis efthinis, Greece; Global Maritime Enterprises LTD, Greece; Gas to Move Transport Solutions S.L., Spain
Project description/ objective	The GREEN C Ports Action will pilot the use of sensors, big data platforms, business intelligence tools and artificial intelligence modelling at the ports of Valencia, Venice, Piraeus, Wilhelmshaven and Bremerhaven, contributing this way to the future roll out of these technologies in the market.The first phase of the project will comprise the design, acquisition, engineering adaptation and installation of the different sensor networks at the participant ports. These sensor networks will gather environmental data of different types (e.g. air quality parameters, meteorological information, noise, congestion at gates, among other), transmitting it to a Port Environmental Performance (PEP) IT platform that will be programmed to receive real time data from the sensor networks and from existing operating systems in the port (i.e. PCS, PMIS and TOS). The second phase of the project will start once the installation of the necessary equipment to build the required environmental sensor network is completed. At this stage, partners of the GREEN C Ports project will develop methods and analytics following big data techniques and advanced modelling, which will allow predictive analyses of ports' environmental performance.
Result/Highlights	*Themes and case of study:* **CS 1 - Decreasing port traffic congestion** - This pilot case study intends to integrate different platforms, sensor networks and sources of information to

predict the date and time of entry and departure of trucks using predictive analytics and business intelligence tools.

CS 2 - Improving maritime accessibility to ports - In this pilot case study, the PEP Platform integrate different platforms, sensor networks and sources of information to predict the closure of the Port of Venice due to tide, wind, fog, and consequently to optimize date and time of entry and departure of ships using predictive analytics and big data tools.

CS 3 - Improving air quality in ports and port neighbouring areas - This pilot case study integrates information from highly-innovative measurement cameras of the different gases emitted by vessels operating in the port of Valencia (first pilot in Europe with this type of technology), air quality measurement sensors (new and existing) both in Valencia and in Piraeus, wind sensors in Valencia and Piraeus, information from the requested port calls made by the shipping companies in Valencia and Piraeus and other shipping information databases. A highly-innovative optical imaging camera system will be piloted in this case study in the core port of Valencia. With the piloted technologies, port managers will be able to know the exact quantity of emissions generated by a particular ship (depending on its gas composition and the total number of hours of stay) through selected queries to the PEP platform. In addition, by modelling three datasets: 1) information on the emissions of vessels that call in the port, 2) the planned windows for the vessels to arrive and operate in the port in the next days / weeks and 3) weather forecast (e.g. wind factor and direction); the PEP platform will be able to predict air quality levels in a near future date and time. These air quality predictions will be of great interest to the port authority, city council and other government institutions. https://greencportsproject.eu/the-gas-monitoring-camera-is-already-measuring-ships-at-the-port-of-valencia/

CS 4 - Reducing noise in ports and port neighbouring areas

CS 5 - Forecasting ship-to-shore crane productivity

CS 6 - Measuring real-time emissions along a multimodal transport chain

This pilot case study evaluates the impact in terms of emissions of a series of goods from the time they are loaded in the warehouse of origin to the time they are unloaded in the warehouse of destination. A series of sensors and emission cameras will be installed so that carbon emissions can be determined for each of the products that are transported. Thanks to this pilot case study, companies in the retailing sector will be able to inform their customers about the door-to-door carbon footprint of the products to be purchased in the company's supermarkets. The notification form will be made through special stickers (i.e. green labelling) that will be downloaded from the PEP Platform and attached to the final products that will be sold in the supermarket. https://greencportsproject.eu/the-7-air-quality-sensors-from-inerco-successfully-installed-at-the-port-of-valencia/

Project	**iTerminal 4 - 5G creating opportunities for LOGistics supply chain INNOVation**
Programme	CEF Transport - Connecting Europe Facility (CEF) for Transpor
Topic/Priority	Marittime
Field of research/Keyword	Port and Terminal Knowledge Landscape, Demonstration/prototyping/Pilot Production, Safety system
Budget	7 400 500 € Total (3 700 250 € EU)
Status/ Start date/End date	Ongoing - March 2019 - December 2022
Web site	https://iterminalsproject.eu/about/
Lead Partner	Valencian Community Foundation For Research, Promotion And Commercial Studies Of Valenciaport , Spain
Partners	TERMINAL LINK SAS, France; Konecranes Finland Corporation, Finland; Hyster-Yale Nederland B.V., Netherlands; PRODEVELOP, S.L. Spain; ZPMC SLU Spain; RBS EMEA UG, Germany; BOLLORE AFRICA LOGISTICS, France; Kho Management BV Netherlands; PSA Antwerp NV, Belgium; Cargotec Finland Oy, Finland
Project description/ objective	The iTerminals 4.0 project comprises a study with pilot deployment in real operations at European port-container terminals, focused on digitisation of port operations and adoption of Industry 4.0 technologies within the container-handling sector. A wide range of transversal benefits is expected from the digital transformation of container port operations in terms of operational efficiency increase, safety and (cyber) security improvement, costs reduction and carbon footprint decrease. New IoT solutions and operational pilots will be developed and performed at eight strategic container terminals based on eight Core Network Ports of the Trans-European Transport Network: Antwerp, Hamburg, Bremerhaven, Wilhelmshaven, Rouen, Malta, Sines and Genoa. Pilot activities will serve to improve, adapt and demonstrate the proposed solutions in order to test their feasibility and sustainability as well as their benefits before deploying them on a large scale. The project will test and evaluate advanced Industry 4.0 pilots applied to the operational environment of port-container terminals including the upgrade of port equipment's sensor networks, the design of advanced big data and predictive analytics, the application of artificial intelligence as well as the provision of business intelligence models and real-time dynamic KPIs reporting.
Result/Highlights	Benefits delivered from digitalisation of port container operations:

	- Operational Efficiency: iTerminals 4.0 will enable real time machine-to-machine communication to detect operational bottlenecks and facilitate decision making to remove them at the right moment. - Operational Safety: iTerminals 4.0 enhances situational awareness based on reliabhe positioning/detection of machines and persons. This concept is currently widely applied in other industrial sectors but never implemented on container terminals. - Operational Sustainability: iTerminahs 4.0 allows real-time calculation of the carbon footprint generated in container terminals, assigning to each manipulated container a unique carbon footprint value generated during its handling. - Operational Maintenance: iTerminals 4.0 improves maintenance management by enabling digital transmission of failure codes to the maintenance areas, thus facilitating better predictive maintenance and increasing efficiency of operations. **Pilot Operations iTerminals4.0 Project** https://youtu.be/Gz7VvUYevzg **Pilot Maintenance iTerminals4.0 Project** https://youtu.be/CcUgSFq8tAM **Deliverable** – White paper – An introduction to the terminal Industry Commitee: https://it.scribd.com/document/507484425/Terminal-4-0-White-Paper-rep-2021

Conclusions

To improve maritime transport and the logistics ecosystem by implementing new technologies, the selected projects reveal multiple significant themes that can be summarized into specific categories.

The first group combines the vision of ports such as *highly complex ecosystems* requiring efficient and constructive collaboration among the different stakeholders of the Port Community (e.g., Terminal Operators, Maritime and Shipping Agencies, Freight Forwarders, and Customs Agencies). For example, **TALKNET** Project aims to develop harmonized mechanisms of cooperation among freight transport stakeholders with multimodality optimization and eco-innovation solutions. Similarly, **SPEED** Project promotes an open community platform to connect and link the worlds of port operations and smart technologies.

There are also some Projects within the *idea of the port of the future* facing the simplification and digitalization of processes related to the maritime transport and logistics hub, also energy transition, electrification, and the use of renewable energy management. **DockTheFuture** Project covers all specific issues for a smarts port, **PORTFORWARD** Project promotes a combination of different modes of transport through the adoption of green technologies and encourages ICT solutions to improve information flows between ports and port communities **COREALIS** Project with a stakeholders-driven approach deals with a modelling tool that improves and optimizes the port infrastructure.

The theme of how ports improve their performance, productivity, and safety, minimizing carbon emissions through *automation and innovative technologies*, is the core of most EU project. Technologies, including artificial intelligence (AI), blockchain, Internet of Things (IoT), Big Data, Digital Twin, and 5G, are considered to have an extraordinary impact on the work process. For Example, **AWARD** Project goes through Autonomous Driving Vehicles based on multiple sensor modalities and an embedded teleoperation system. **EPICENTER** Project develops and tests AI-driven logistics software solutions supporting methodologies to increase the efficiency of global supply

chains and reduce their environmental impact. **MOSES** Project shows an innovative SSS feeder vessel outfitted with a robotic container handling system, also a swarm of autonomous tugboats, an automated docking system for Hub Ports, and a machine learning-driven digital collaboration platform for logistics stakeholders. IoT is a field of action of the **PIXEL** Project, that achieves efficient use of resources in ports through an IoT platform that evaluates the environmental performance of the port based on the data collected through plugged-in agents. **PORTFORWARD** Project studies Virtual Twins, a complete spatial 3D model of the port and solutions that integrate dynamic real-time information. **GREEN C Ports** Project introduces the use of sensors, big data platforms, business intelligence tools, and artificial intelligence to model the ports.

The need to *share information with other transportation systems*, and improve compatibility between different systems for moving goods among countries is the issue that many project answer. **E-BRIDGE** Project realizes with CEF funds an innovative IT platform capable of guaranteeing full digital data exchange between the Port Community and Railway Operators. **North Sea CONNECT** Project identifies transnational barriers and bottlenecks in terms of interoperability, connectivity, smart technologies, and logistics processes. **COMODALCE** Project focuses on evaluating possible ICT solutions to overcome the lack in digitization of logistic and administrative operations. **DATA PORTS** Project works on the Cognitive Ports Data Platform, which connects existing digital infrastructures of seaports and their systems.

The robust use of digital technologies offers substantial *responses to emergencies regarding port system security*. **PASSPORT** Project suggests an operational platform extending the surveillance perimeter using a fleet of drones to provide innovation and operational support to the safety and security port aspects. **RESPOND-A** Project promotes safety solutions through Augmented Reality, Sensors, Wearables, Mobile Devices, Robotics, and Autonomous Vehicles. **RAPID** Project combines and extends drone technology to deliver a fully automated and safety-assured maintenance inspection service for bridges, ship hull surveys, and more.

Digital solutions help increase _the sustainability of the port_ and the **SMOOTH PORTS** Project **aims to reduce road transport emissions in the port environment by making use of three levers: alternative fuels, regulatory procedures, and digital technology. Also,** **NON STOP** Project tries to implement a green smart digital transition in the management of Nord Sea Region's ports, by introducing, testing, and monitoring intelligent technologies and processes in the storage, deployment, sharing, and transmission of data related to marine conditions, sea/landside operations and energy production/consumption/distribution in ports.

The last major topic covered by the European projects is the _5G network_ considered an enabling technology between the hardware and software elements of the port ICT infrastructure. Very low latencies, high bit rates, more connected devices per unit area, a significant reduction in power consumption, and optimization of the network, are some of the features that make 5G technology the best tool to support complex operations in maritime and intermodal transport. **iTerminal 4** Project tests and evaluates advanced Industry 4.0 pilots applied to the operational environment of port-container terminals including the upgrade of port equipment's sensor networks, the design of advanced big data and predictive analytics, and the application of artificial intelligence. **VITAL 5G** Project releases a flexible platform and demonstrates the benefit and showcases _the added value of 5G connectivity for advanced multi-modal logistics services across European roads,_ seas, and rivers, creating a functional value chain for highly automated freight transportation. **5G-Blueprint** Project aims to design and validate the technical architecture and business and governance models for uninterrupted cross-border teleoperated transport based on 5G connectivity**. 5G-LOGINNOV** Project optimizes freight and traffic operations at ports and logistics hubs by using new innovative concepts, applications, and devices supported by 5G technologies, Internet of Things (IoT), data analytics, next-generation traffic management, Cooperative, Connected, and Automated Mobility (CCAM) and the 5G logistics corridor.