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DIONYSUS

Integrating Danube Region into Smart & Sustainable Multi-modal & Intermodal Transport Chains

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2 Abbreviations

Abbreviation	Explanation
CEF	Connecting Europe Facility
CESNI	European Committee for Drawing Up Standards in the Field of Inland Navigation
DPN	Danube Ports Network
EC	European Commission
EU	European Union
IWT	Inland Waterway Transport
PDM	Pro Danube Management GmbH
RIS	River Information Services

3 Introduction

Being the second of a series of 3 Yearly Activity Reports elaborated in the frame of **WP T2 Danube Inland & Sea Ports Analysis & Recommendations, A.T2.4 Danube Port Digitization (Strategy & Action Plan)**, the aim of this document is to discuss and identify digitalisation initiatives along the logistics chains in line with RIS deployments and to present EU digitalisation policy goals, legislation and measures that have an immediate impact on IWT. This report covers the entire year 2021 (Period 2 and Period 3) of the DIONYSUS project.

The first part of this report is dedicated to the specific European legislation, policy initiatives and other relevant documents linked to the digitalisation of IWT, providing a comprehensive policy analysis discussing the expected effects as well as the challenges that lie ahead of this endeavour. Likewise important to mention is the fact that digitalisation is an indispensable prerequisite to implement the goals enshrined within the European Green Deal and its supporting legislation, playing as such a major role in adapting IWT to the requirements of a much "greener" European transport system.

The second part of the deliverable provides an overview on the most important events and expert groups dedicated to digitalisation aspects of IWT.

The third part of this report is dedicated to the know-how promotion e-tool – the Digital Initiatives Observatory – which became fully operational on the DPN website (www.danubeports.eu) during the second project implementation period (01-06/2021). The Digital Initiatives Observatory serves as an interactive search engine having the core objective to collect information on relevant aspects related to the digitalisation of IWT such as projects, policy initiatives & relevant legislation as well as dedicated expert groups. Continuing the goals set during Period 1 of DIONYSUS, proceedings were undertaken to identify further digitalisation projects linked to waterborne transport which were either not identified during Period 1 or have started during Periods 2 or 3.

2 An Analysis of Policies and Initiatives Relevant for IWT Digitalisation

Digitalisation is indispensable for the future of IWT, for its efficient and enduring integration in the transnational transport and logistics system as well as for its degree of competitiveness. It represents a viable solution to considerably reduce administrative costs and to make a more systematic use of the existing resources of IWT infrastructure. Furthermore, digitalisation facilitates the expansion of new businesses, making IWT a more attractive mode of transport. With digitalisation undisputedly having an essential role in adequately adapting IWT to the most recent EU legislative framework in terms of climate neutrality, the goal of this chapter is to provide an overview on the existing policies linked to digitalisation. This policies and initiatives thoroughly analysed here are reflected in the **Digital Initiatives Observatory,** an interactive e-tool accessible on the DPN website which became fully operational in Period 2 of DIONYSUS.

2.1 The European Green Deal

Introduced in December 2019, the European Green Deal is at the heart of the European Union's ambitious goal to become the first climate-neutral continent by 2050. It is a roadmap meant to foster the transition of the European Union towards a climate-neutral economy by reducing climate emissions towards 55% by 2030 and achieving carbon neutrality by 2050. The core objective of the Green Deal is to serve as "(…) a new growth strategy that aims to **transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy** where there are **no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use**" (European Commission 2019: 2, bold in the original).[1] The main objectives of this policy framework can be summarized as follows:

1) Increasing the EU's climate ambition for 2030 and 2050;
2) Supplying clean, affordable, secure energy;
3) Mobilising industry for a clean and circular economy;
4) Building and renovating in an energy and resource efficient way;
5) A zero-pollution ambition for a toxic-free environment;
6) Preserving and restoring ecosystems and biodiversity;
7) Farm to Fork: a fair, healthy and environmentally friendly food system;
8) **Accelerating the shift to sustainable and smart mobility.**

The highlighted objective is of particular importance for the digitalisation process of the Danube IWT sector. A shift towards smart and sustainable mobility can only be achieved by dedicated actions and measures to adequately support the efficient integration of IWT in the new digital era.

The figure below illustrates the central elements of the European Green Deal:

[1] resource.html (europa.eu)

Figure 1: The European Green Deal. © European Commission

2.2 Sustainable and Smart Mobility Strategy

The Sustainable and Smart Mobility Strategy presented by the European Commission on 9 December 2020 lays the foundation for how the European transport system can achieve its green and digital transformation as outlined in the European Green Deal. The document outlines the development direction of the European transport policy in order to reduce greenhouse gas emissions and transport's reliance on fossil fuels. The successful implementation of the goals set by the European Green Deal depends on the sustainability of the transport system. Digitalisation is in this regard an indispensable driver for climate neutrality.

Important to highlight is the fact the European Commission recognizes the challenges faced by waterborne transport in terms of decarbonization due to the limited uptake of innovative technologies, an issue affecting both ports and vessels. Moreover, the document stresses the importance of ports as key facilitators of international connectivity and their capacity to become multimodal mobility and transport hubs.

The strategy is structured around three key objectives:

- Sustainable mobility: shift to zero emission mobility by making all transport modes more sustainable.
- **Smart mobility:** supporting sustainable choices by taking **advantage of digitalisation and automation** to achieve seamless, safe and efficient connectivity. Another ambitious plan is to **boost innovation and the use of data and artificial intelligence** for smarter mobility.
- Resilient mobility: reinforce the Single Market, make mobility fair and just for all, increase transport safety and security across all modes.

Of particular interest for the process of digitalisation of the Danube IWT sector is the objective **Smart Mobility**. To make "smart mobility" a reality, the strategy proposes the following flagships (key areas for action):

- Making Connected and Automated Multimodal Mobility a Reality
  - Take full advantage of smart digital solutions and intelligent transport systems (ITS).
  - Support the development of connected, cooperative and automated mobility.
  - Paperless options in all modes of transport.
  - Efficient capacity allocation and traffic management: further development of Vessel Traffic Monitoring and Information Systems (VTMIS).

- Innovation, Data and Artificial Intelligence for Smarter Mobility
  - Favourable conditions for the development of new technologies and services.
  - Research and deployment of innovative and sustainable technologies in transport.
  - Highest level and performance of digital infrastructure.
  - Data availability, access, and exchange.
  - European Common Mobility Data Space.

2.3 NAIADES3

The NAIADES3 action plan seeks to "(...) shift more freight transport on inland waterways, and set the sector on an irreversible path to zero-emissions, underpinned by a **paradigm shift towards further digitalisation**, as well as accompanying measures to support the current and future workforce. Meeting these core objectives will require an integrated approach and a basket of measures incorporating transport, environmental, digital, energy and fiscal policies, backed up with financial incentives (...)".[2] It was tailored to accomplish the ambitious climate goals of the European Commission, acting as the pillar of the pathway towards a climate-resilient, digital, and reliable inland waterborne transport system. Digitalisation plays in the frame of NAIADES3 a central role with a dedicated action plan to support the development of a smart inland waterway transport. It foresees the following objectives:

- Revision of the RIS Directive (in 2022);
- Technical assistance for a permanent operational structure for a single point of access for the provision of RIS-based Corridor Information Services (in 2024);
- An integrated and operationalized vision for the digital transformation of the current traffic and transport related business models and processes in the sector (in 2023);
- CEF technical assistance project to strengthen public-private cooperation in inland waterway transport and facilitate implementation of the digital vision (in 2023);
- Facilitate the development, demonstration and the deployment of holistic Smart Shipping Concepts for the digital integration of inland waterway transport in the synchromodal supply chain, including RIS, through Horizon Europe and CEF (from 2022).[3]

[2] NAIADES3, page 2.

[3] NAIADES3, page 16.

2.4 Report "Towards Future-Proof Inland Waterway Transport in Europe"

The report initiated by MEP Caroline Nagtegaal and adopted by the European Parliament recognizes IWT's crucial role in achieving the ambitious objectives of the European Green Deal. In achieving IWT's ultimate goal in becoming climate neutral, the report stresses that adequate "investments in expanding, updating and upgrading the physical and digital infrastructure of inland waterways" are essential prerequisites. Likewise important is the development of inland and seaports as multimodal nodes in the transnational logistics system as well as the human-resources aspects in providing appropriate working conditions, modernising the inland navigation education and training system, and last but not least, to encourage the development of research and innovation within the sector. The report dedicated a section to digitalisation and automation, highlighting that "(…) digitalisation and data collection can contribute to a cleaner environment and improved safety on board". Equally important, digitalisation is seen as a contributor to emission reduction stressing the need to provide adequate funding opportunities.

3 Events and Expert Working Groups Dedicated to Digitalisation in 2021 with Direct Involvement of the DIONYSUS Project

This chapter is dedicated to relevant events and expert groups which are an integral part of the **Digitalisation Initiatives Observatory** and as such facilitate knowledge-creation and transfer.

3.1 The Role of Inland Waterway Transport in European Synchromodal Logistics Chains

Organised on the 8 April 2021 within the frame of the first PLATINA3 Stage Event, session 6 entitled **"Let's make IWT a reliable partner of synchromodal logistics chains using smart waterways"**, discussed the needs and requirements for integrating IWT into synchromodal logistics chains touching upon digital & automation tools for inland navigation, inland & seaports.

Pro Danube Management GmbH together with the Austrian waterway administration viadonau held a three and a half hour interactive session with highly experienced speakers representing both the policy perspective as well as the industry needs & trends, speakers that have agreed to join forces and reflect on the challenges and opportunities to achieve a fully integrated transport system within a well synchronized and smart European transport network, with IWT being a reliable partner in the logistics chains.

In this sense, the perspectives of several speakers representing four focus areas have been successfully introduced, such as:

- the policy framework side: the speaker from the European Commission/DG MOVE provided an insight into several relevant EU policies & actions in relation to transport & digital related initiatives, taking into account the environmental targets, initiatives meant to support - for example - the use of smart technologies that provide reliable fairway & port information and hence contribute to attracting new cargoes and volumes.
- the branch organisation ALICE, the alliance for logistics innovation in Europe – representing the bridge towards the logistics sector arena, introducing the prerequisites for manufacturers/shippers and their supply chains to promote synchromodality and include IWT in their distribution network as well as to promote a smooth integration with the other modes of transport.
- the third area covered was the industry side, having a dedicated focus on supply chain solutions – three top actors from the Danube Region active along European supply chains (among which the oil&gas company OMV, the trimodal container terminal WIENCONT & the logistics service provider Rhenus Logistics) reflected on smart technologies, tools and applications they are currently using in their daily operations as well as various requirements for - depending on which side of the supply chain they are - making use/providing fully integrated supply chain solutions & services.
- the project side & their contributions – Besides the introduction to the PLATINA 3 project, the session presented three other funded projects (DIWA, PhysICAL, RIS COMEX) looking into solutions to support the sector in the digital development, giving the audience an insight to their research results.

3.2 Transnational Workshop on Digitalisation in IWT

On the 23 of November 2021 more than 100 stakeholders from the public and the private sector participated in the transnational workshop on digitalization in Inland Waterway Transportation (IWT). The workshop was a joint initiative of the European projects Platina 3, Masterplan DIWA, RIS COMEX and DIONYSUS and the sector organizations Pro Danube Management, EICB and the IWT Platform.

The workshop focused on how digital transformation can support business activities and reporting formalities in the upcoming years. Participants provided valuable inputs regarding further requirements on synchromodality, ICT infrastructure, River Information Services and Smart Shipping, data sharing & integration, cybersecurity and compliance.

During the plenary part of the workshop, the 4 projects were introduced by short interviews moderated by the Master of Ceremony Henk van Laar. The workshop perfectly fitted into the timelines of each project, as currently project partners of PLATINA3, DIONYSUS and DIWA are working on collecting input for their dedicated studies, yet at the same time giving them the chance to share intermediate results with a wide range of experts. The RIS COMEX project will launch its European fairway information portal 'EuRIS' in the course of 2022.

Four themes

The participants joined either one of the four break-out rooms to go into more detail and moreover to share opportunities, requirements and discuss how relevant authorities together with the industry representatives can support a successful digital transformation in IWT.

The themes of the four break out rooms were:

- Smart Shipping
- Synchro modality
- River Information Services
- Sea and inland ports

This thematic approach resulted in lively discussions and new expert inputs relevant for all of the European projects. The event was organised back-to-back with the Danube Ports Day 2021.

3.3 CESNI TI Working Group

CESNI has set up a dedicated working group on information technologies in 2018. Its core objectives are:

- to develop proposals for the development and revision of technical standards in the field of information technologies, in particular for River Information Services (RIS), including proposals for the revision of standards made mandatory by EU regulations;
- to promote the proper implementation of standards in the field of RIS and other areas of information technologies;
- to provide advice and analysis on information technology standards (including RIS), in particular to support policy initiatives on digital instruments in inland navigation and the gradual introduction of electronic documents.

3.4 CESNI Hearing on RIS Standards

The scope of the Hearing organised on 9 September 2021 was to identify how the River Information Services (RIS) could better help the integration of inland navigation into logistic chains. DIONYSUS's role in identifying the challenges RIS is facing in the Danube IWT system were presented and discussed. The hearing concluded that digitalisation and other opportunities given by new technologies represent a significant step forward to a sustainable and efficient transport mode. Given that digitalisation lags behind in the Danube IWT sector, DIONYSUS strives to provide effective solutions to overcome this issue.

4 Digital Initiatives Observatory

The Digital Initiatives Observatory collects information about digitalisation initiatives along the logistics chains in line with RIS deployments, EU digitalisation policy goals, legislation, and measures in relation to IWT. Hosted by the DPN website, the Observatory enables the visitor a fast and easy access to the most relevant information. By means of digital filters, the visitor can select the information which interest him/her the most, choosing between the following pre-defined categories: country, transnational projects, policy initiatives, dedicated working groups and funding opportunities. The Digital Initiatives Observatory is fully operational on the DPN website since Period 2 of DIONYSUS and is continuously being updated by the team of PDM based on own research activities as well as on the input provided by project partners.

The figure below illustrates the Digital Initiatives Observatory which is available on the DPN website (www.danubeports.eu):

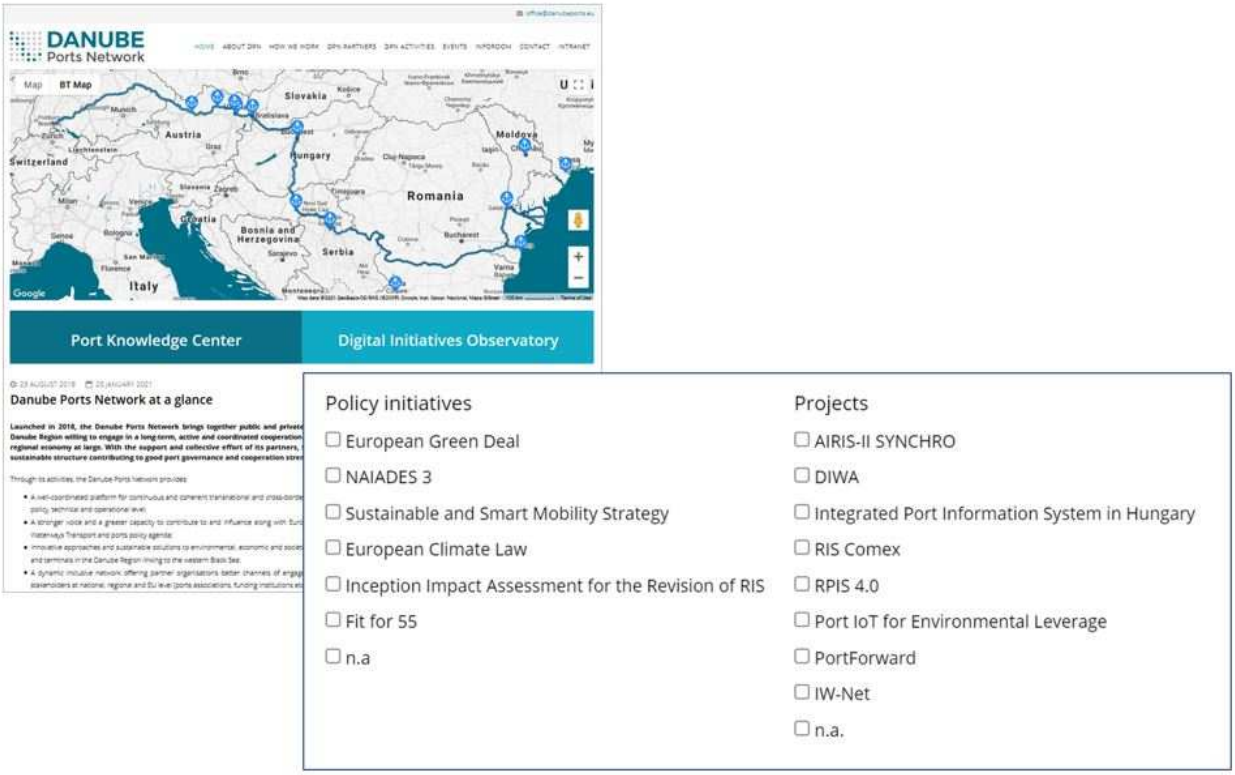

Figure 2: Digital Initiatives Observatory

5 List of Projects

This chapter provides a list of identified projects dealing with digitalisation in IWT and was developed to complete the list elaborated in the framework of the **First Yearly Activity Report 2020**. The list of projects is considered a "living document" and is continuously being updated.

Project name: **Innovation-Driven Collaborative European Inland Waterways Transport Network**

Abbreviation: **IW-Net**

Funding programme: **Horizon 2020**

Timeframe: **2020-2023**

Coordinator: **Institut für Seeverkehrswirtschaft und Logistik (Germany)**

Website: https://www.iw-net.eu/

IW-Net will deliver a multimodal optimisation process across the EU transport system, increasing the modal share of IWT and supporting the EC's ambitions to reduce transport GHG emissions by two-thirds by 2050. Enablers for sustainable infrastructure management and innovative vessels will support an efficient and competitive IWT sector by addressing infrastructure bottlenecks, insufficient IT integration along the chain, and slow adoption of technologies, such as new vessel types, alternative fuels, automation, IoT, machine learning.

The Living Lab will apply user-centered application scenarios in important TEN-T corridors, demonstrating and evaluating the impacts in simulations and tests covering technological, organisational, legal, economical, ecological, and safety/security issues:

1) **Digitalisation**: optimised planning of barge operations serving dense urban areas with predictive demand routing (Brussels-Antwerp-Courtrai-Lille-Valenciennes); data-driven optimisation on navigability in uncertain water conditions (Danube).
2) **Sustainable Infrastructure and Intelligent Traffic Management**: lock forecasting reducing uncertainty in voyage planning; lock planning; management of fairway sections where encounters are prohibited; berth planning with mandatory shore power supply and other services (hinterland of Bremerhaven via Weser/Mittelland Canal).
3) **Innovative vessels**: new barge designs fitting corridor conditions and target markets: barges with a high degree of automation for urban distribution (East Flanders-Ghent); new barge for push boats capable with low/high water levels optimising capacities (Danube from Austria to Romania); use of GALILEO services for advanced driver assistance like guidance, bridge height warning and automatic lock entering (Spree-Oder waterway close to Berlin).

Accompanying activities are stakeholder engagement, capacity building, and the delivery of a European IWT development roadmap with policy recommendations for increasing the IWT share.

Project name: **NOVel Iwt and MARitime transport concepts**

Abbreviation: **NOVIMAR**

Funding programme: **Horizon 2020**

Timeframe: **2017-2021**

Coordinator: **Netherlands Maritime Technology Foundation**

Website: https://novimar.eu/

The NOVIMAR project aimed at adjusting the waterborne transportation such that it could make optimal use of the existing short-sea, sea-river and inland waterways, thus expanding the entire waterborne transport chain up and into the urban environment.

The vessel train was foreseen as enabler for this transport system, providing opportunities for increased flexibility in cargo destinations, use of waterways and crew deployment.

NOVIMAR had a variety of research topics in scope ensuring a balanced evaluation of the foreseen transport system. In addition, NOVIMAR has identified needed boundary conditions for the transport system and ongoing supporting developments in industry and other projects.

Project name: **Novel Inland Waterway Transport Concepts for Moving Freight Effectively**

Abbreviation: **NOVIMOVE**

Funding programme: **Horizon 2020**

Timeframe: **2020-2024**

Coordinator: **TU Delft**

Website: https://novimove.eu/

Inland waterborne transport (IWT) is a major key-holder for unlocking the congestion in seaports, terminals, road networks and access to urban areas, besides being a main factor in reducing CO2 emissions in transport.

These advantages however are not fully exploited due to inefficiencies in the seaport-inland logistics chain. Think of containers and vessels which are not loaded to their full capacities resulting in a sub-optimal use of the IWT-capacity. Intercontinental and intra-continental cargo (containers) designated for IWT is not yet delivered in large packages causing inland ships calling at many (6-8) terminals to collect a few containers with waiting time at and sailing time between terminals adding-up to 60% of the total time spent in port.

And of course, there are varying water levels limiting ship payloads due to insufficient air draught under bridges, possibly forbidden navigation in extreme high-water periods and raised transport costs at low water.

Another example can be found at volatile water levels and ever-changing riverbed conditions impeding optimal river navigation and cause time losses. Not to forget waiting time at bridges/locks causing additional inefficiencies in IWT-operations.

Thus, the core NOVIMOVE-challenge is: **where, how and with whom to intervene in the logistics system to obtain the largest possible impact at the lowest possible cost?**

Project name: **Inland Waterway Transport Solutions 2.0**

Abbreviation: **#IWTS 2.0**

Funding programme: **Interreg North Sea Region**

Timeframe: **2014-2020**

Coordinator: **Maritieme Academie Harlingen - Stichting Dunamare Onderwijsgroep**

Website: https://project-iwts20.eu/

Inland Waterway Transport (IWT) offers relatively slow, cheap, climate friendly hinterland transport alternatives for commodities transported in large quantities or bulk. The energy input per t/km is superior to rail, road transport. Many waterways in Europe remain widely un-/underused in the past decades.

Addressed challenges:

- Low awareness about small waterway transport opportunities,
- Low innovation in small barge development, transshipment of goods,
- Lack of expertise in using small waterway opportunities,
- Lack of training content and dedicated crews for small waterway sailing.

Partners join forces; mobilise potentials and capacity to move freight to yet under-used waterways by:

- Realising a quick modal shift by introducing new and proven logistic technologies and support logistic managers that decide about modal shifts.
- Make better use of existing waterways by adapting them towards a sufficient standard size vessel.
- Make better use of existing waterways by developing innovative sustainable small barge concepts.
- Modernising IWT education, training with a focus on navigation on smaller waterways.
- IWTS 2.0. facilitates use of IWT on smaller waterways (comprehensive network) in the NSR region linking them to main TEN-T corridors.

By piloting 8 small waterway modal shifts including; innovative barge-, waterway-, transshipment-, (un)loading-, freight flow mapping-, modal shift decision making solutions, we showcase proven concepts that will be adopted by the market.

Project name: **EMMA Extension Project**

Abbreviation: **EMMA Extension**

Funding programme: **Interreg Baltic Sea Region**

Timeframe: **2019-2021**

Coordinator: **Port of Hamburg Marketing**

Website: https://www.project-emma.eu/

The EMMA Extension Project (08/2019-07/2021) aimed to enhance inland navigation in the Baltic Sea Region by supporting digitalization in inland waterway transport (IWT) and by implementing new logistic concepts in the Baltic Sea Region.

The extension project was based on the results and recommendations of project EMMA (2016-2019), which brought inland navigation to a wider national and European agenda, strengthened its voice and successfully demonstrated feasibility of potential inland waterway transport services in the Baltic Sea Region. The EMMA Extension focuses on next steps towards further market deployment of IWT by capitalizing on the results and partnership of project EMMA and implementing practical IWT

solutions. At the end of August, all seven project partners from Germany, Finland, Lithuania, Poland and Sweden gathered to the old pilot station Rosenvik on the waterfront of Stockholm to plan the co-operation in enhancing inland navigation together.

Based on the recommendation given in the EMMA policy paper, EMMA Extension supports the further harmonisation of River Information and Vessel Traffic Services (RIS/VTS) in the BSR. The EMMA Extension project links digitalised data services and functionalities such as real-time data regarding bridge clearance to ELIAS system, which was developed during the EMMA project.

The EMMA Extension also implements new logistic concepts in the Baltic Sea Region. The implementation of commercial pilot services under real business conditions in three Baltic Sea Region countries will showcase the feasibility of IWT services in supply chains and promote IWT to cargo owners and forwarders in emerging IWT markets. The pilot sailings will take place on River Neman in Lithuania, on Vistula River in Poland and on the Lake Mälaren in Sweden, showing the benefits of the IWT: high capacity, reliable transportation, lack of congestion and smaller environmental impacts.