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DANUBE Ports Network

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Welcome & Introduction

Herfried Leitner
President,
Pro Danube International


Green Inland Ports
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Welcome Session
proDANUBE

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Welcome Speech

Cristina Rizea

Head of Port Community Department,
Maritime Ports Administration Constanta,
Romania

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PIONEERS

Portable Innovation Open Network for
Efficiency and Emissions Reduction Solutions

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Keynote Speech

Mutien Marchandise
Policy Officer, European Commission,
DG MOVE, Ports And Inland Navigation Unit

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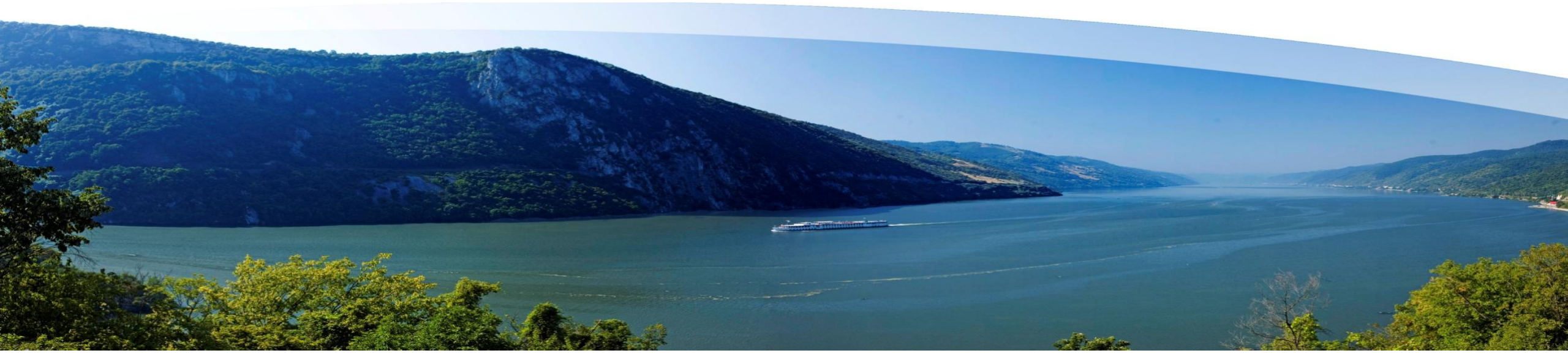
Keynote Speech

Monica Patrichi
Ministry of Transport and Infrastructure of Romania

EUSDR PA1a

Danube Ports Days 2025, 16 – 17 September, Constanta



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Keynote Speech

Matej Zakonjšek
Transport Community

Transport Community

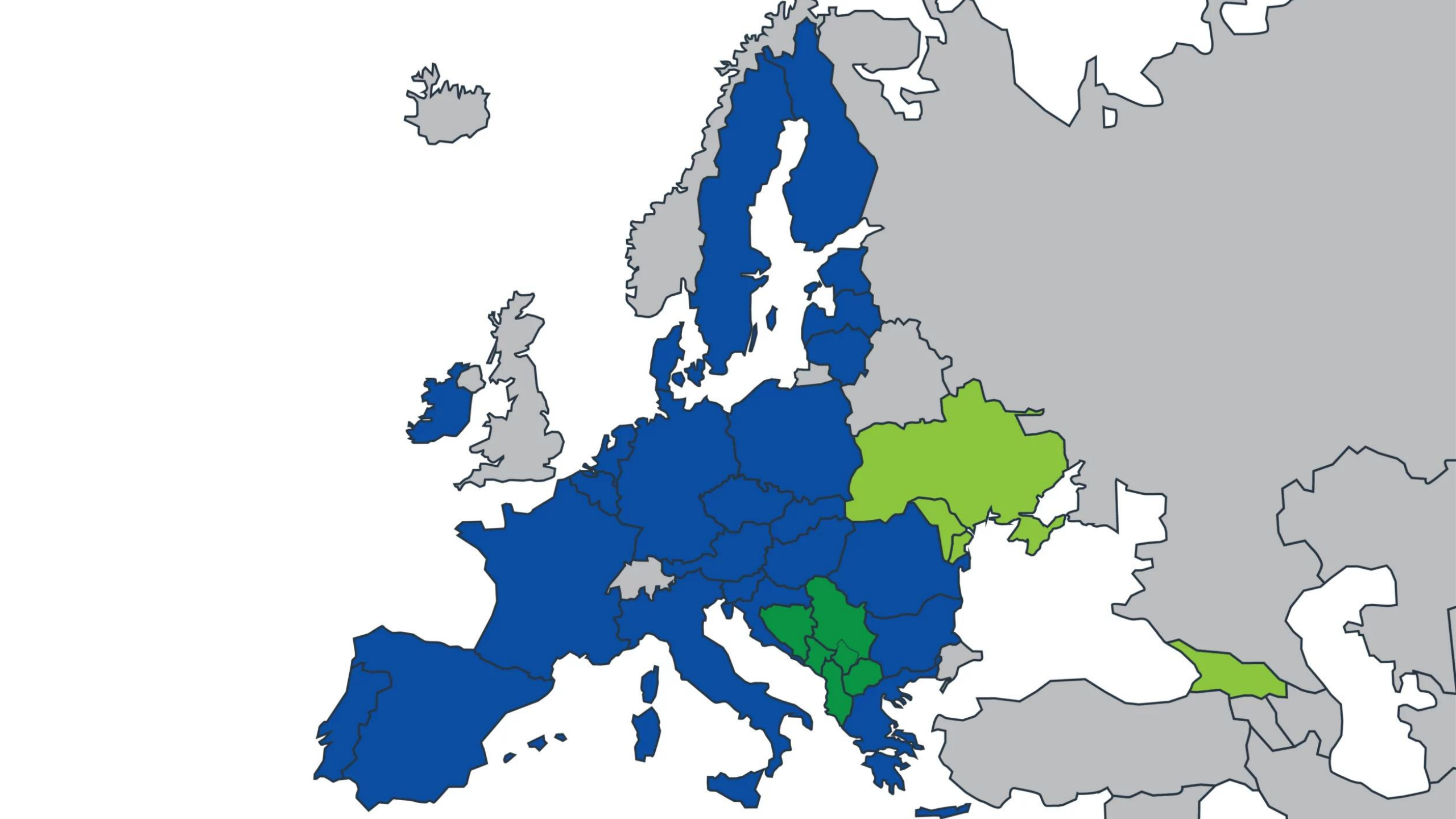
Danube Ports Days 2025

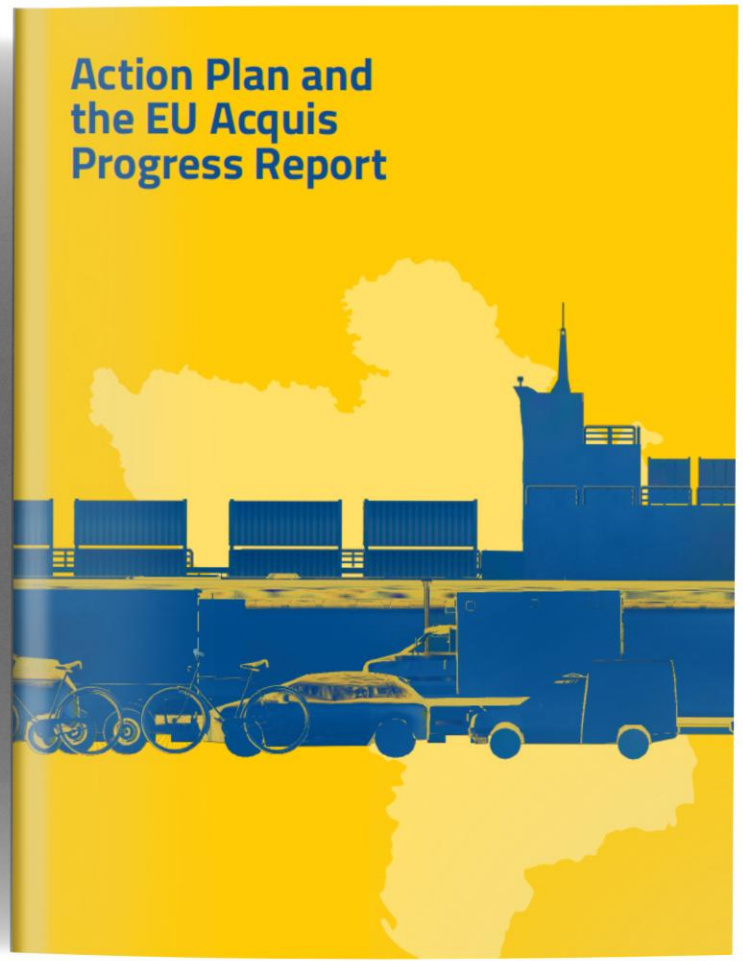
Matej Zakonjšek
Director

Constanta, Romania
16 September 2025

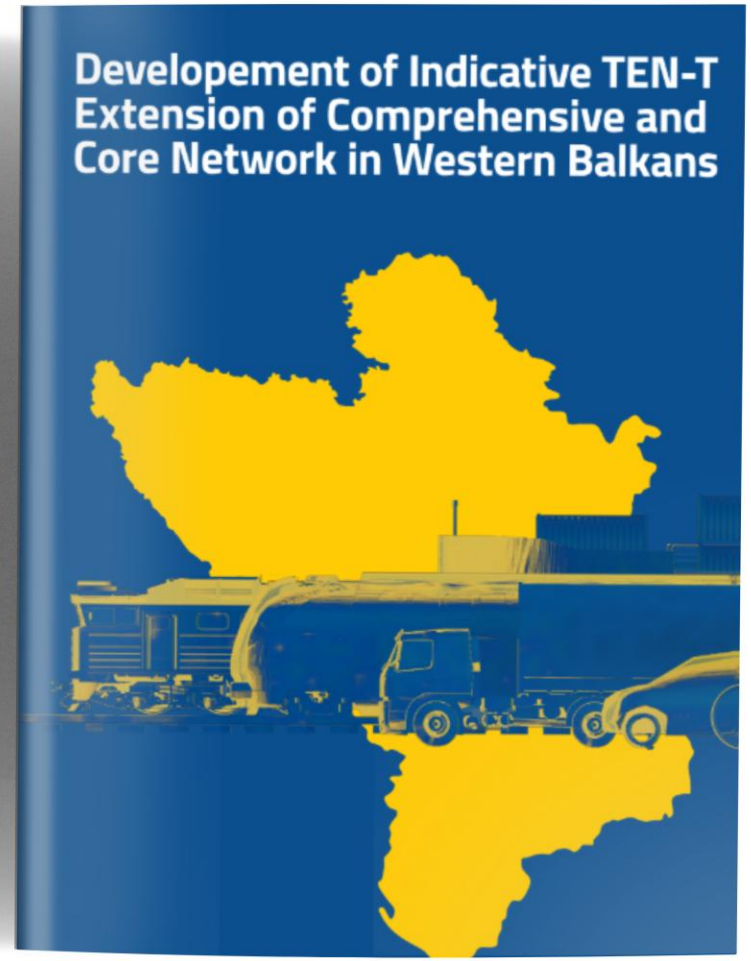
TRANSPORT COMMUNITY


TRIESTE
SUMMIT
12·JULY·2017
WESTERN
BALKANS





SCAN ME!



SCAN ME!

Next Generation Action Plans 2025 - 2027 for the Western Balkans

4. Next Generation Waterborne and Multimodality Action Plan

Waterborne transport has been a crucial driver of economic development, facilitating trade and connections between nations, ensuring the secure supply of energy, food, and commodities, and serving as a key means of transport for imports and exports. In the Western Balkans, enhancing waterborne transport and multimodality is vital for regional integration, economic growth, and sustainable development.

The first Action Plan for Waterborne Transport and Multimodality provided a list of short and medium-term activities aimed at addressing critical issues in maritime transport, Inland waterways as well as multimodality aspects and promoting their efficient use by targeting appropriate measures per the Transport Community Treaty and its Annexes I.4 and I.5.

The overall progress in implementing the first-generation Action Plan for Waterborne Transport and Multimodality was slow to moderate.

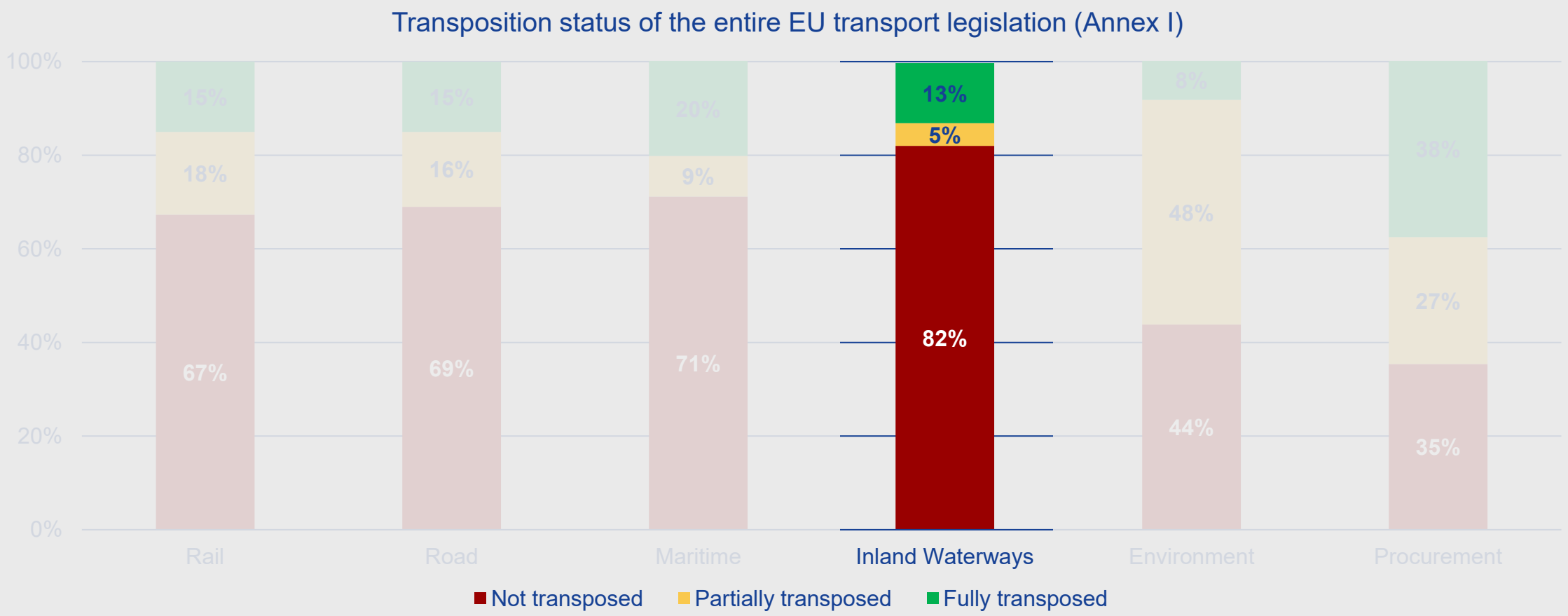
Regarding actions related to infrastructure, digitalisation, and green initiatives in ports, 30% of the planned measures for maritime ports have been implemented. Key achievements include the establishment of the Centre of Excellence for Maritime Affairs (CEMA), improvements to the Port Community Systems (PCS) in the ports of Durres and Bar, the establishment of the Vessel Traffic Monitoring and Information System (phase I) in Montenegro, Montenegro's full membership in the Paris Memorandum of Understanding on Port State Control (Paris MoU), and the improved performance of the Albanian fleet, leading to its removal from the Paris MoU Blacklist.

For inland waterways, 20% of the planned actions have been implemented. Notable progress includes the reconstruction and modernisation of the River Port of Brčko in Bosnia and Herzegovina, the commencement of the project to remove sunken vessels in the Danube River, the implementation of Aids to Navigation (ATON), River Information Services (RIS), and Vessel Traffic Monitoring Systems (VTS) in Serbia, as well as the upgrade of the Iron Gate II Lock.

This Next Generation Action Plan outlines the priorities for the transposition of the EU Acquis outlined in Annex I.4 and I.5 of the Treaty, upgrade of port infrastructure, protection of the environment including decarbonisation, improvement of digitalisation, sustainability, human elements, and multimodal transport for Western Balkan Regional Partners, in full implementation of the Transport Community Treaty and its Annex I.

SCAN ME!

Overall Progress – Annex I of the TCT



TEN-T Danube Ports in Western Balkans

Inland Waterway Core Ports

Port name	Rail connection	Road connection	CEMT Requirement	Alternative fuels availability	Multimodal Terminal availability	Environmental Facilities
Belgrade	No	Yes	Yes	No	Yes	No
Novi Sad	Yes	Yes	Yes	No	Yes	No
Pančevo	Yes	Yes	Yes	No	Yes	No

Inland Waterway Comprehensive Ports

Port name	Rail connection	Road connection	CEMT Requirements	Clean fuels availability	Terminal availability	Port Reception Facilities
Smederevo	Partially	Yes	Yes	No	Yes	No
Prahovo	Yes	Yes	Yes	No	Yes	No

Thank you!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PROJECT PRESENTATIONS
DANUBE

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Green Inland Ports

Jasper Tanis
Ecorys

Green Inland Ports

The Sustainability Journey of Port of Venlo

Danube Ports Days, Constanta 2025

Funded by the European Union

Agenda

- Introduction and environmental objectives
- Emissions calculation
- Environmental maturity
- Digital maturity
- Next steps and lessons learnt

Green Inland Ports

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Short introduction

Peter van Wijlick, City of Venlo

- Projectmanager Port of Venlo
- Policy Advisor Mobility and Logistics
- Chair BluePorts Limburg
- Programme-manager Pioneers
- Projectmanager Realisatiepact Venlo

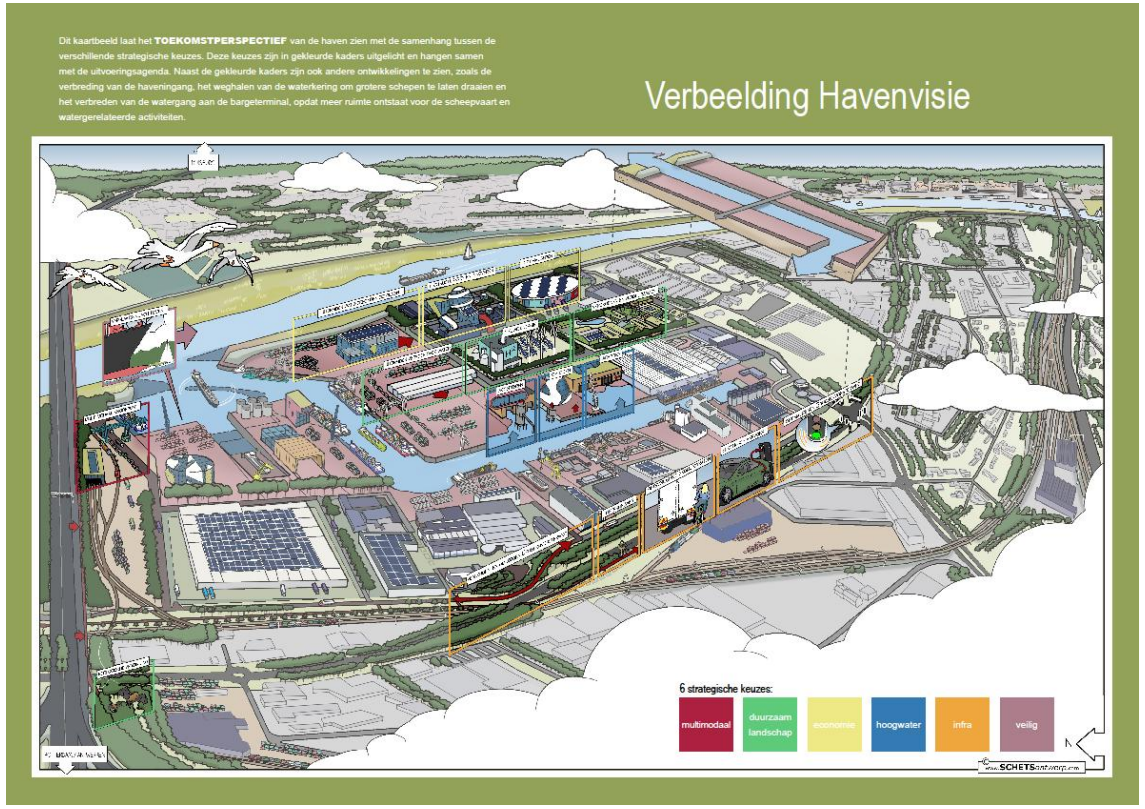
Located on the North Sea-Rhine-Mediterranean Corridor

Our partners

ECORYS · CE Delft · Panteia · pro DANUBE · Erasmus · plan co · EICB

The Environmental Objective of Port of Venlo

The key objective of Green Port Master Plan Venlo is to become a climate-neutral port by 2050 at the latest, facilitating an efficient and zero-emission flow of goods, with sustainable and healthy buildings and environment, and facilitating sustainable manufacturing processes thus creating social value, broad prosperity and spatial integration into its surroundings.



Our partners

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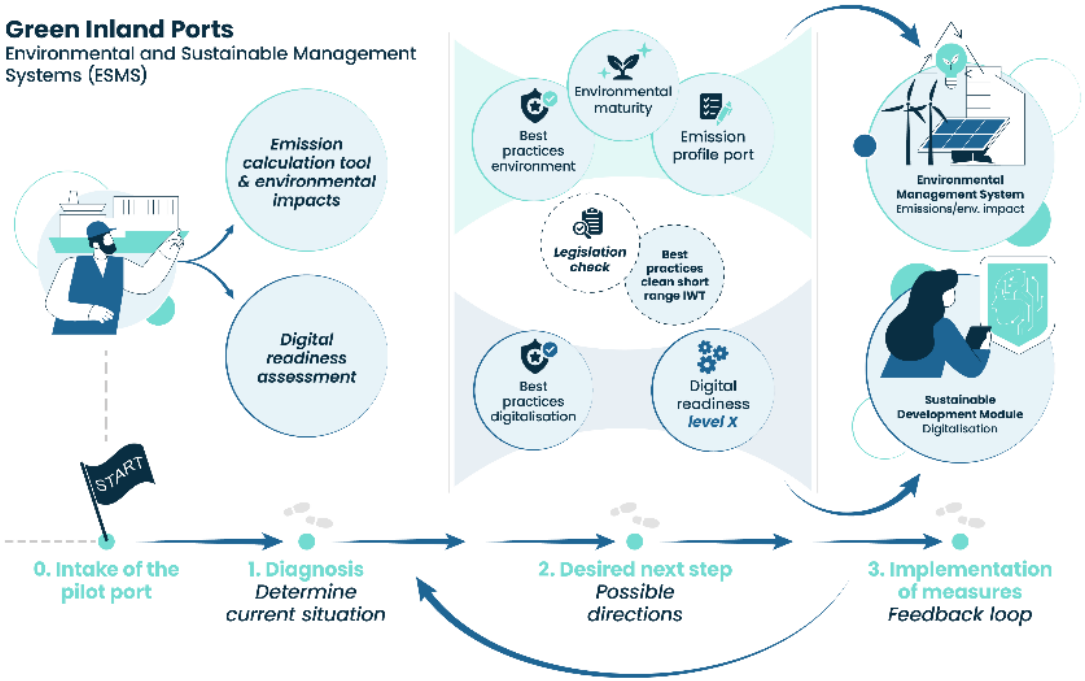
Towards the development of the GPMP and Roadmap

- Green Inland Ports Project
  - Input to the roadmap
    - Emissions calculation from the Environmental Impact Calculator
    - Environmental Maturity – Guidelines and actions to improve environmental performance.
    - Digital Maturity- Guidelines and actions to improve digital performance.
  - GRIP outputs applied in the GPMP developed in PIONEERS



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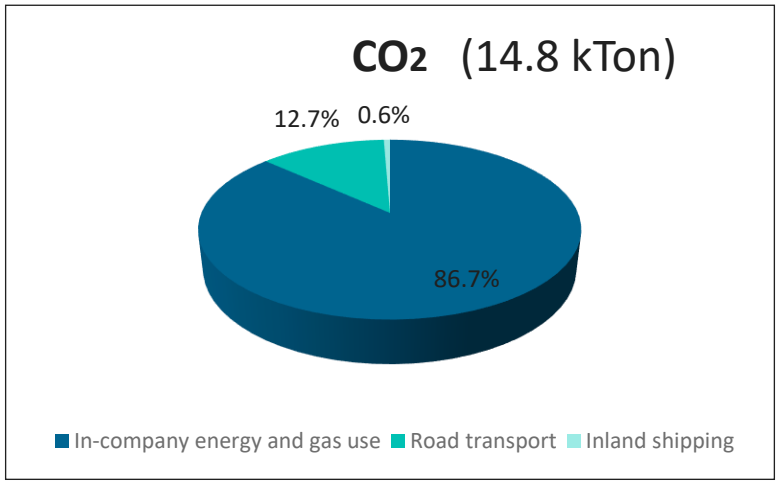
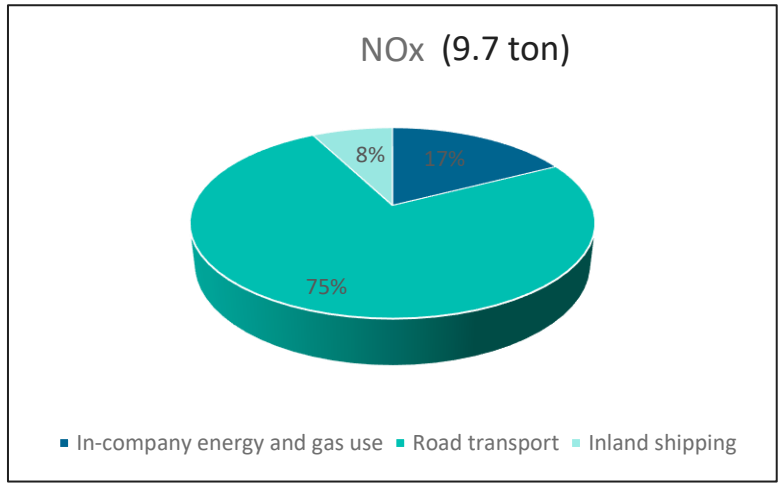
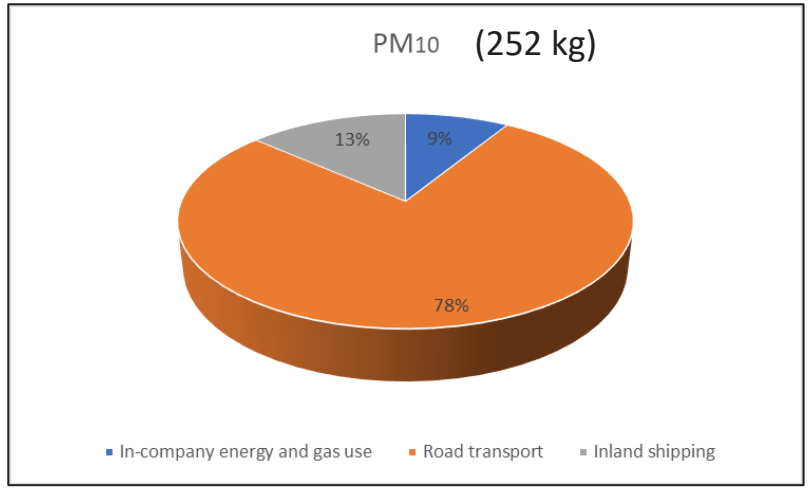
Emissions in the port of Venlo

- 14.8 kTon CO2 → especially energy consumption by industrial companies
- 9.7 ton NOx → Mainly road transport (freight)
- 252 kg PM10 → Mainly road transport (heavy goods)







Environmental Maturity Level

Venlo currently:

- Has clear goals and objectives.
- Strengthening and developing its monitoring processes.
- Working close with stakeholder to develop a roadmap of actions.
- Aims to transition to level 4 of the implementation of actions.

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High level measures to advance environmental maturity

- ***Measure 1: Continuous stakeholder consultation identification and prioritization of measures.***
    - Reduce energy consumption by employees commuting
    - Provide incentives for development of eco-friendly buildings
    - Offer alternative fuels (hydrogen, vegetable oil etc.) infrastructure and promote energy transition in the port
        - Port as an energy hub
    - OPS installation
    - Incentivise clients to shift to green energy sources
    - Promote modal shift and multimodality
- ***Measure 2: Operationalisation of the GRIP Environment Impact Calculation***
- ***Measure 3: Lightweight KPI Data Collection and Environmental Monitoring Framework***
- ***Measure 4: Strengthen Systematic Stakeholder Engagement***
- ***Measure 5: Light Environmental Monitoring and Public Sharing***

Digital Maturity Level

Port of Venlo

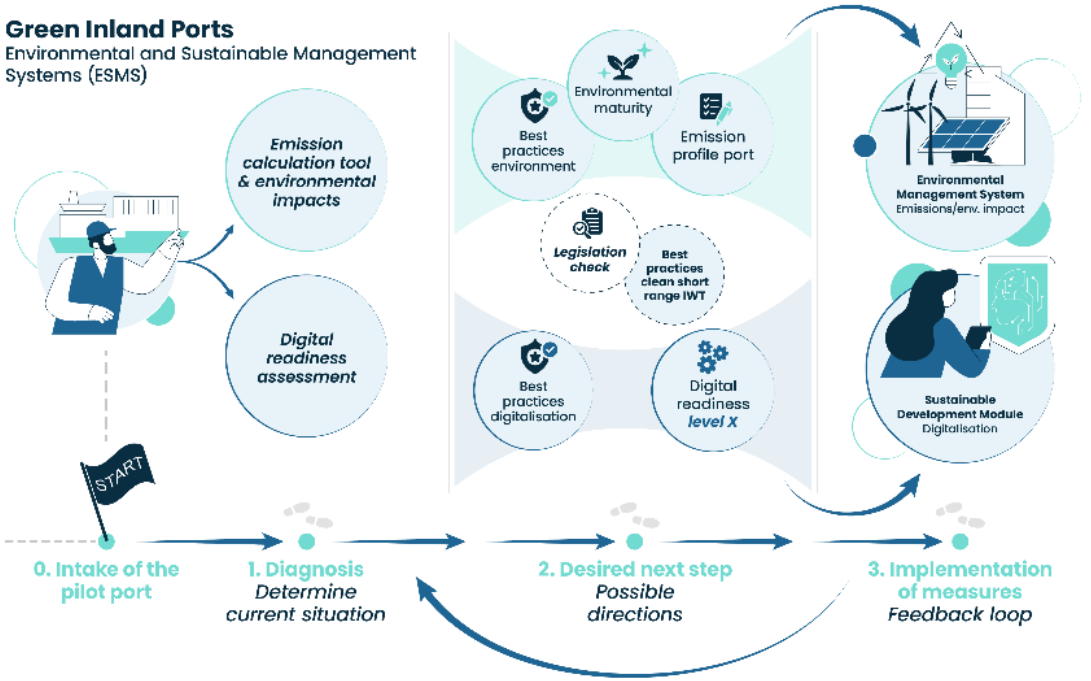
- Digitalisation of administrative functions
  - Electronic Fee Collection System
  - Mobile payment application
- Two IoT sensors already implemented
- Vision to improve its digitalisation and develop both a PCS and a digital Twin.

Relevance to Danube ports

- In Venlo, the port is part of the municipality. The city relies on citizens and businesses inside the port area to develop of a **common sustainability vision** for the port.
  - How does it achieve that?
    1. Engages a broad range of stakeholders, including terminal operators, logistics providers, municipalities, and local communities, to co-develop sustainable solutions.
    2. Regular workshops and consultation sessions are organised to gather feedback, align priorities, and ensure stakeholder needs are integrated into planning.
    3. Transparent communication of progress and results builds trust and supports long-term collaboration.
    4. Stakeholder input is used to guide both environmental initiatives and operational improvements, balancing sustainability with business efficiency.
    5. The port encourages joint investments and partnerships to accelerate the adoption of green infrastructure and innovative technologies.

Lessons learnt

1. **Now it is the time for action.**
    1. Based on the maturity levels there is still many measures and a lot of actions to improve.
2. **Prepare** for upcoming EU and national legislation
    1. *License to operate is at risk!*
3. EU projects can work complementary: one providing input to the other.



Green Inland Ports

THANK YOU !

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PIONEERS & Insights

Timothy Durant, *SLR Consulting Limite*
Peter van Wijlick, *Gemeente Venlo*

Green Port Masterplanning & Technology Transfer

PIONEERS

Portable Innovation Open Network for Efficiency and Emissions Reduction Solutions

Co-funded by the Horizon 2020 programme of the European Union

Contents

Item
Introduction to PIONEERS
Green Port Masterplanning – PIONEERS methodology and adjusting the approach for inland ports Peter van Wijlick, Gemeente Venlo
Selected technology demonstrators Tim Durant, SLR Consulting
Stay in contact! We would like to hear from you about technology transfer opportunities

PIONEERS

PIONEERS – H2020 project

Portable **I**nnovation **O**pen **N**etwork for **E**fficiency and **E**missions **R**eduction **S**olutions

- Reduce GHG emissions in ports while safeguarding their competitiveness
- Cross-border consortium: Port of Antwerp Bruges lighthouse port & 47 partners
- Sister project: Magpie (Rotterdam) – www.magpie-ports.eu
- Duration: 2021-2026

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement 101037564.

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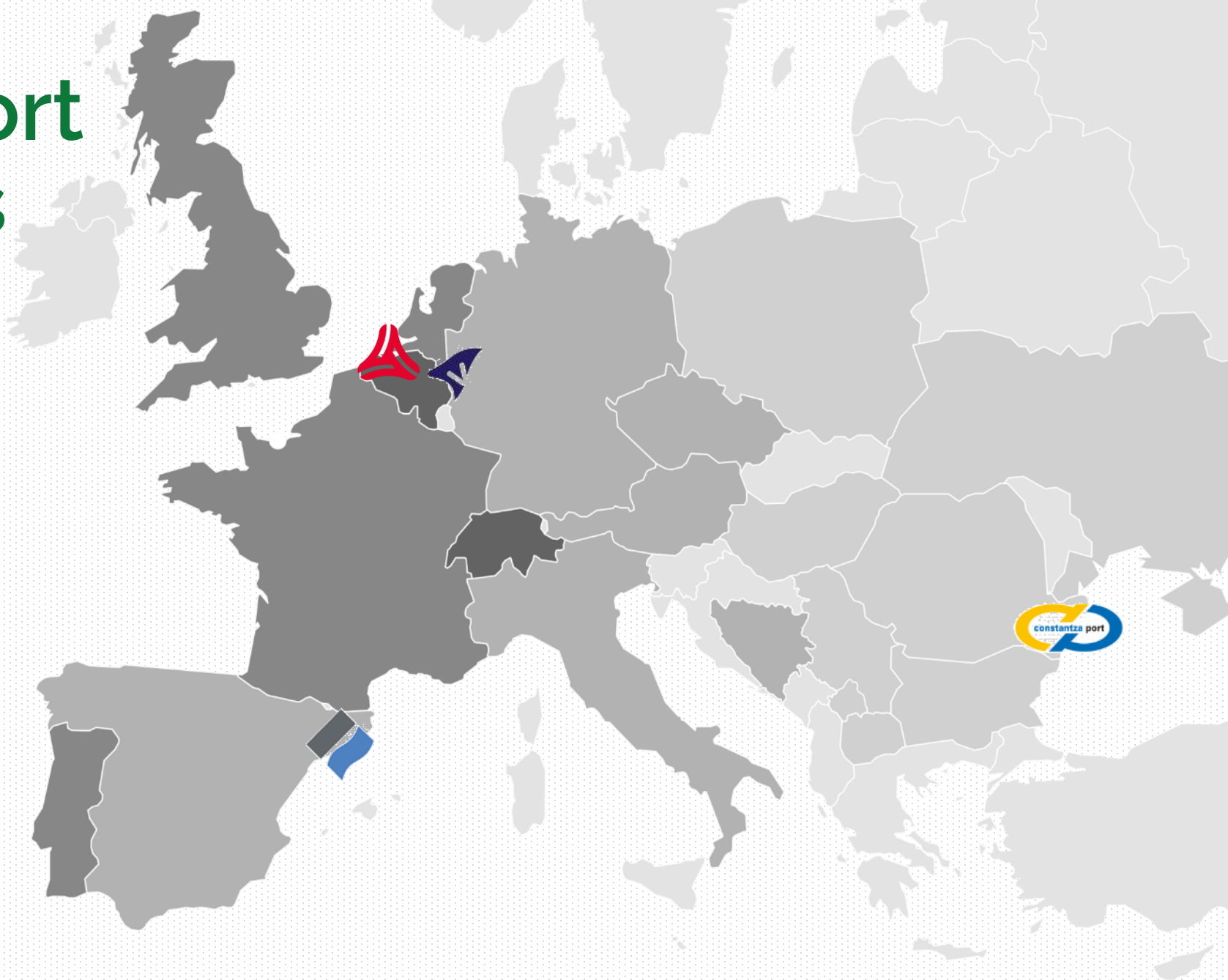
Lighthouse port & fellow ports

Port of Antwerp Bruges

Port de Barcelona

constantza port

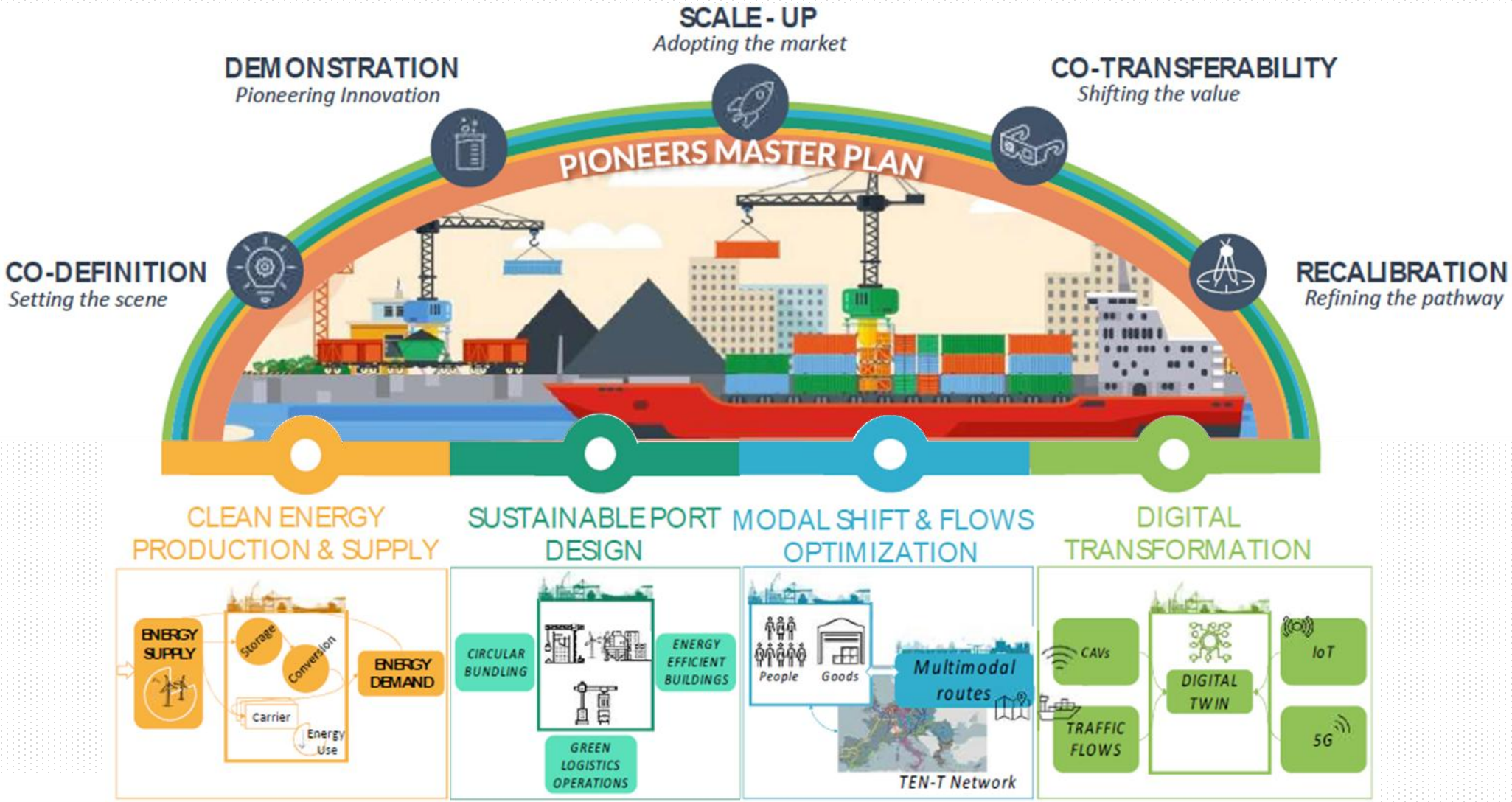
venlo



PIONEERS

PIONEERS' PARTNERS

PIONEERS: 19 demos and 1 Green Ports Master Plan



PIONEERS

The Multi-Level Perspective (MLP)

= Landscape, Regime, Niches

Landscape

Megatrends

Regime

Green port

Niches

Emergence

Diffusion

Reconfiguration

PIONEERS

The Multi-Level Perspective (MLP)

= Landscape, Regime, Niches

Landscape

Megatrends

Regime

Science

Policy

Techno

Regime

Consumer

Industry

Culture

Green port

Niches

Emergence

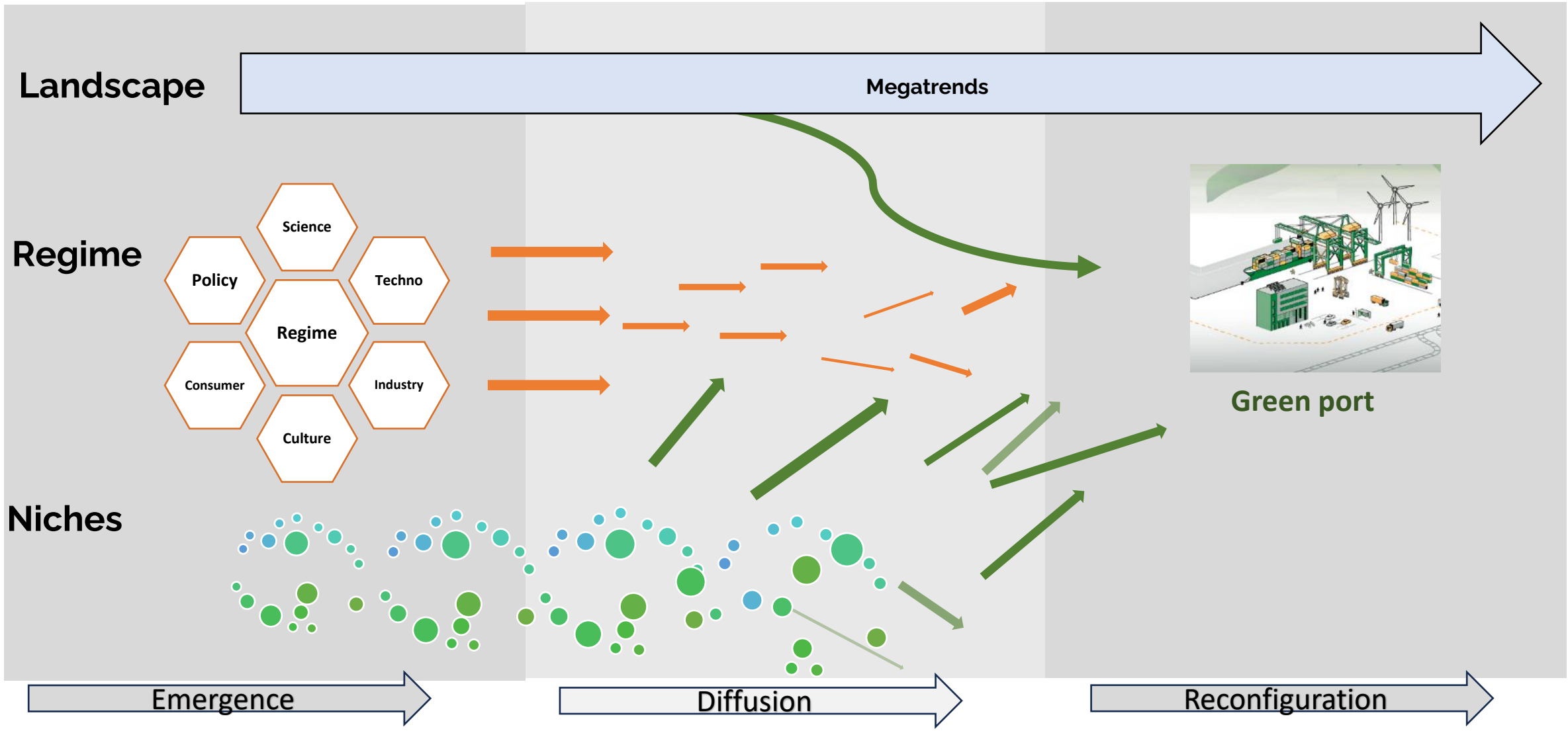
Diffusion

Reconfiguration

PIONEERS

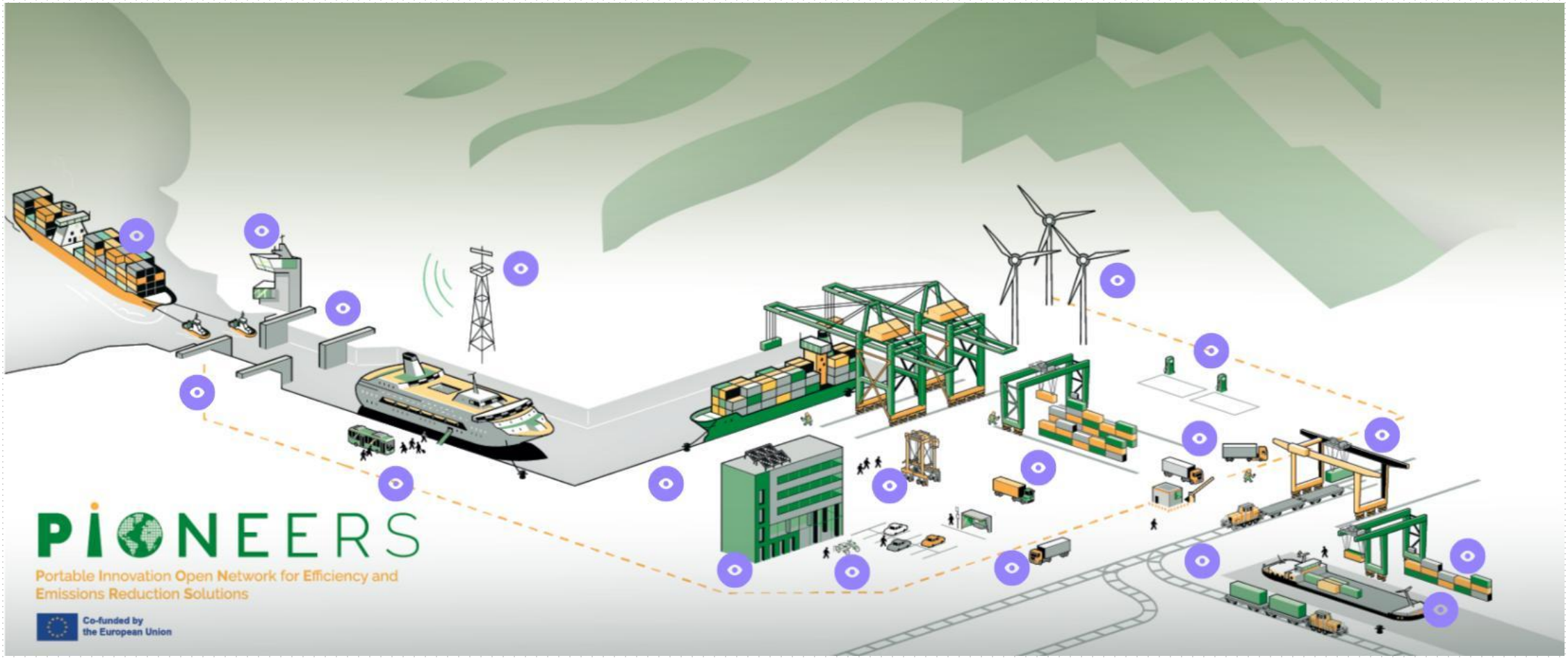
The Multi-Level Perspective (MLP)

= Landscape, Regime, Niches

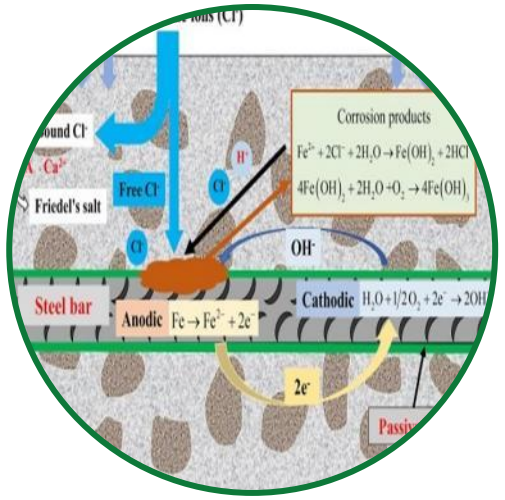


PIONEERS

PIONEERS demonstrators' showcase – 19 pilots

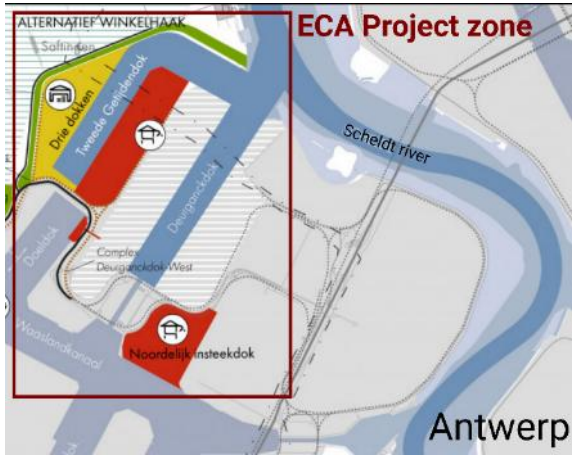


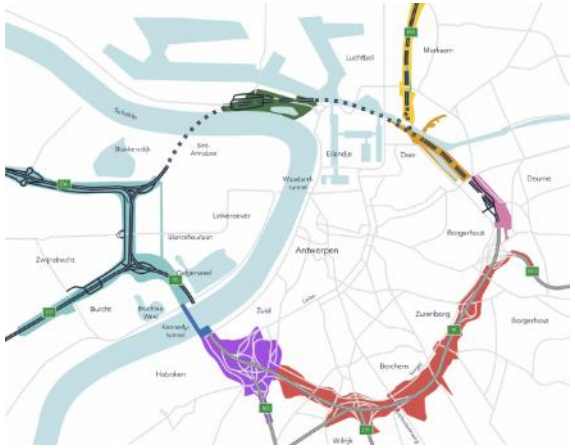
www.pioneers-ports.eu



Local resource recovery for green circular concrete

- Aim to showcase the possibilities of specifying concrete made from 40% locally sourced, upcycled sand.
- ECA project requires excavation 33mil m³ of spoil and construction of 3km of new quay wall.
- Challenges included use of very fine sand and presence of glauconite and sea shells
- Testing for strength, and resistance to carbonation and freeze-thaw processes were successful. Further uses for concrete foreseen.





vito

Buildwise

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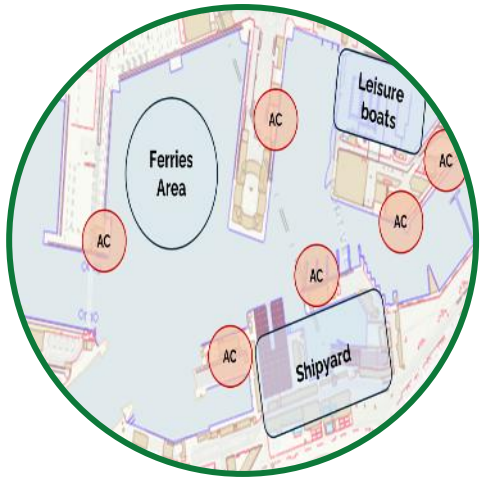

Intelligent vessel location using 5G and AI

- Demo addresses weaknesses of current radar and AIS systems: detection of smaller vessels and vessel dimensions, boats without AIS,
- Demo utilises Multi-camera system, connected through new 5G network.
- AI algorithm is used to detect vessels, informing GIS dashboard of vessel movements.
- Successful demonstration. Challenges include 24hr vessel detection in different weather and light conditions; and privacy concerns

Port de Barcelona

ctrl4enviro

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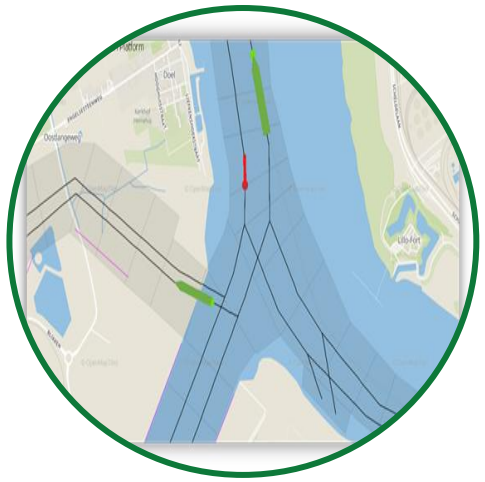
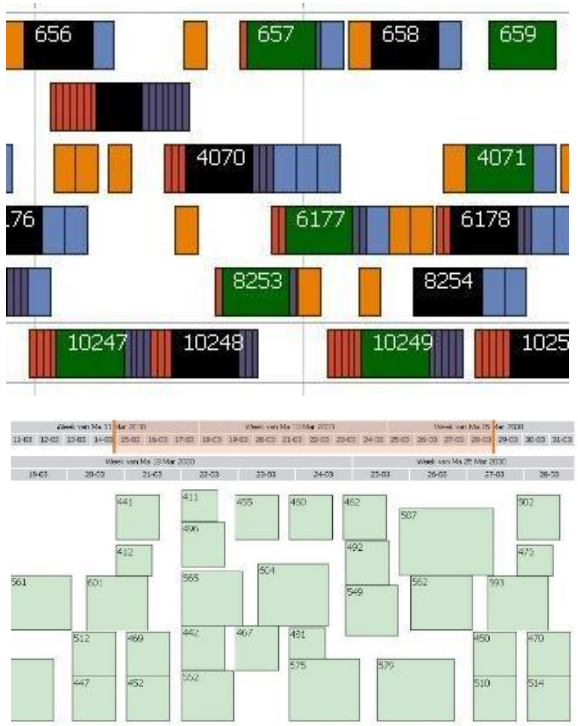


Vessel traffic optimisation

- Objective to optimize traffic flows, by reducing waiting times in busy and complex port environments, and by supporting berth planning
- PortGenie platform facilitates short, medium and long term vessel modelling, and the planning of infrastructure and traffic management
- Demo at the Port of Antwerp focussed on: optimal lock planning; and improved design of new berths for vessels



Port of Antwerp Bruges

MACOMI

PIONEERS

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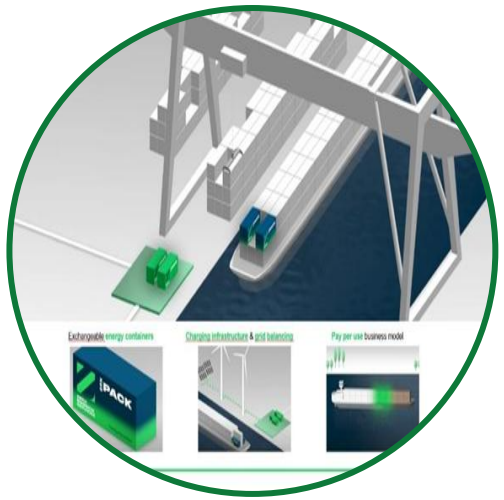


Electric propulsion of barges using modular battery containers

- Based on experience from operating the 62km Alphen – Moerdijk route, the demo assessed feasibility of navigation on a new corridor.
- The Antwerp-Willebroek-Venlo corridor is 270km, with 6 potential battery swapping locations. Docking stations assessed in terms of space, grid capacity and on-site renewables.
- Alongside electric propulsion of barges, modular batteries can perform grid balancing and EV charging functions, generating revenue. But at present, subsidy for scheme is required.

ZERO EMISSION SERVICES

danser

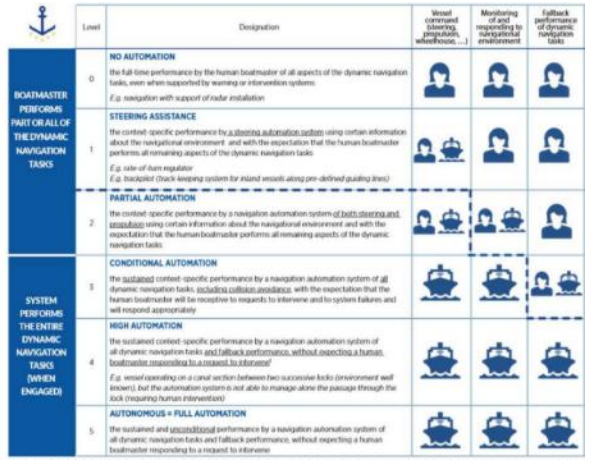
HUTCHISONPORTS

PIONEERS

Co-funded by the Horizon 2020 programme of the European Union

Semi-automated inland vessels

- Automation helps to address: crew shortages; improve operational efficiency (reducing idle time); and reduce safety risks.
- The successful demo between Antwerp and Willibroek integrated real-time remote control, AI-powered object detection, and situational awareness tools.
- Upfront investments in sensor suites and vessel remote control systems are outweighed by scalable operational savings, including crew cost reductions of 40-60%

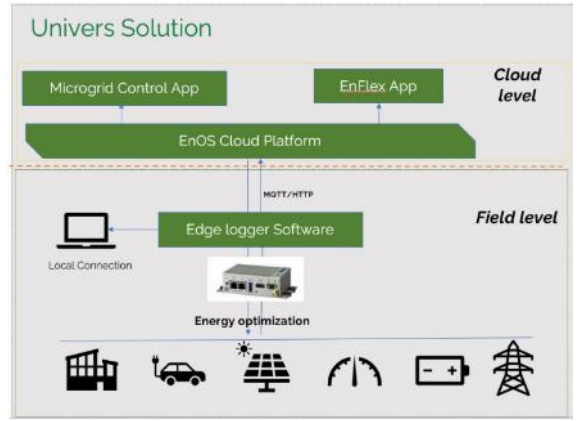


Remote Captain Assistance System

Co-funded by the Horizon 2020 programme of the European Union

Terminal energy management and battery storage systems

- Smart terminal energy hub seeks to optimize energy use, reduce grid dependency, and support AET's net zero goals.
- Renewable energy sources at the terminal comprise 3 wind turbines (~10MW) and a solar photovoltaic system (~3.5MW).
- The demo was successful in: increasing use of low-cost and sustainable wind and solar energy; achieving grid independence of around 50%; and reducing grid import charges.



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Green powering of cargo handling equipment (CHE)

- Transfer discussions held with terminal operators: APM Terminals, DP World, Hutchisons Ports and PSA International.
- Strong shift towards electrification of CHE on the basis of energy efficiency, cost of equipment, and cost and availability of green hydrogen.
- Hydrogen fuelling may be an option at import locations and ports located on planned pipelines, where grid connections and capacity are poor, or in order to limit reliance on single green powering source.

PSA ANTWERP

FIER SUSTAINABLE MOBILITY

SUPPLY CHAIN VALLEY

VDL

MEDREPAIR N.V. ANTWERPEN REPAIR · STORAGE · SERVICE

AKKODIS
Engineering a Smarter Future Together

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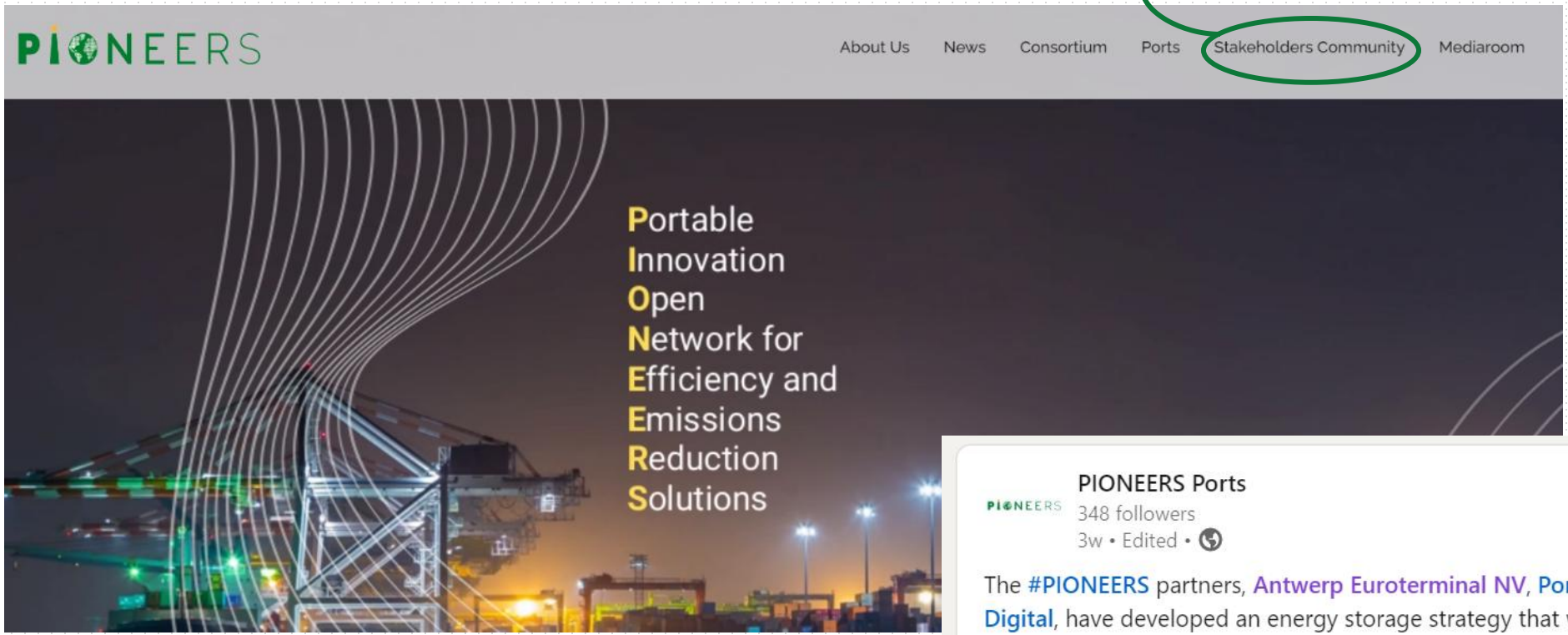
FOLLOW PIONEERS!

Receive updates on the project through our stakeholder community network!



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Next PIONEERS Trainings Sep/Oct 2025

Wave 2 - June	Wave 1 - March & April	Wave 3 - September

- Green cargo handling equipment fuelled with hydrogen
- Green cargo handling equipment – electrification and automation
- Energy generation from water currents
- Digital Twin applications in ports, included GHG emissions monitoring
- Tools for operational efficiency and data-driven decision making

PIONEERS

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SYNERGETICS

Benjamin Friedhoff
DST

Innovation Action **SYNERGETICS**

SYNERGETICS | Synergies for Green Transformation of Inland and Coastal Shipping

Danube Ports Days | Constanta, September 16, 2025

Funded by the Horizon Europe Programme of the European Union under grant agreement No 101096809
Funded by the Horizon Europe guarantee of the United Kingdom, under project No 10068310
Funded by the Swiss State Secretariat for Education, Research and Innovation

synergetics

16 partners and two associated partners from eight countries selected to take full advantage of concepts of Synergies.

The Coordinator is DST – Development Centre for Ship Technology and Transport Systems from Germany.

The project runs from January 2023, to June 2026.

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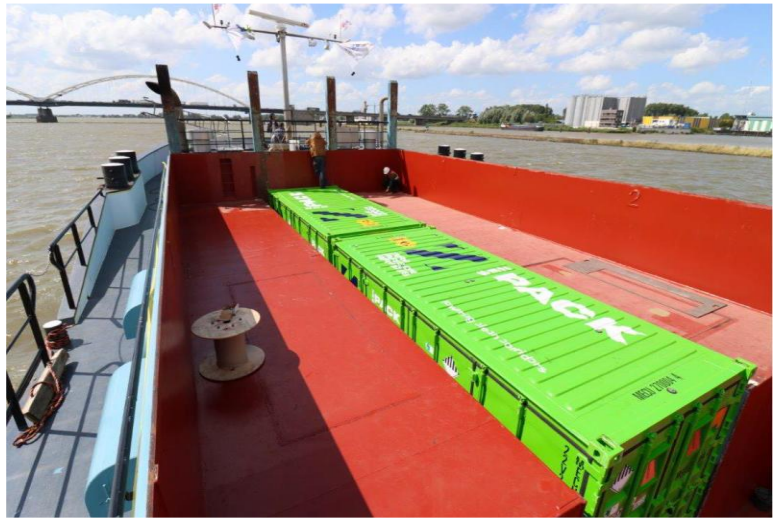
Innovation Action SYNERGETICS

Demonstration

Full scale

[Images: CMB.TECH / ZES]

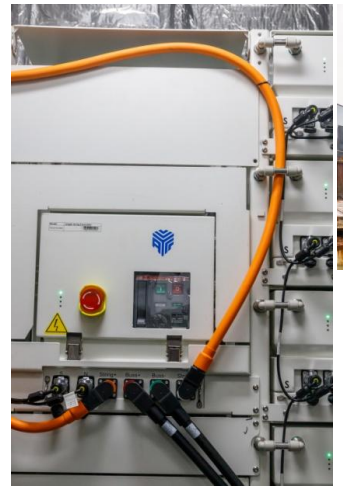


Model scale

[Images: DST / ViaDonau]

System

[Images: ScandiNAOS / DST]



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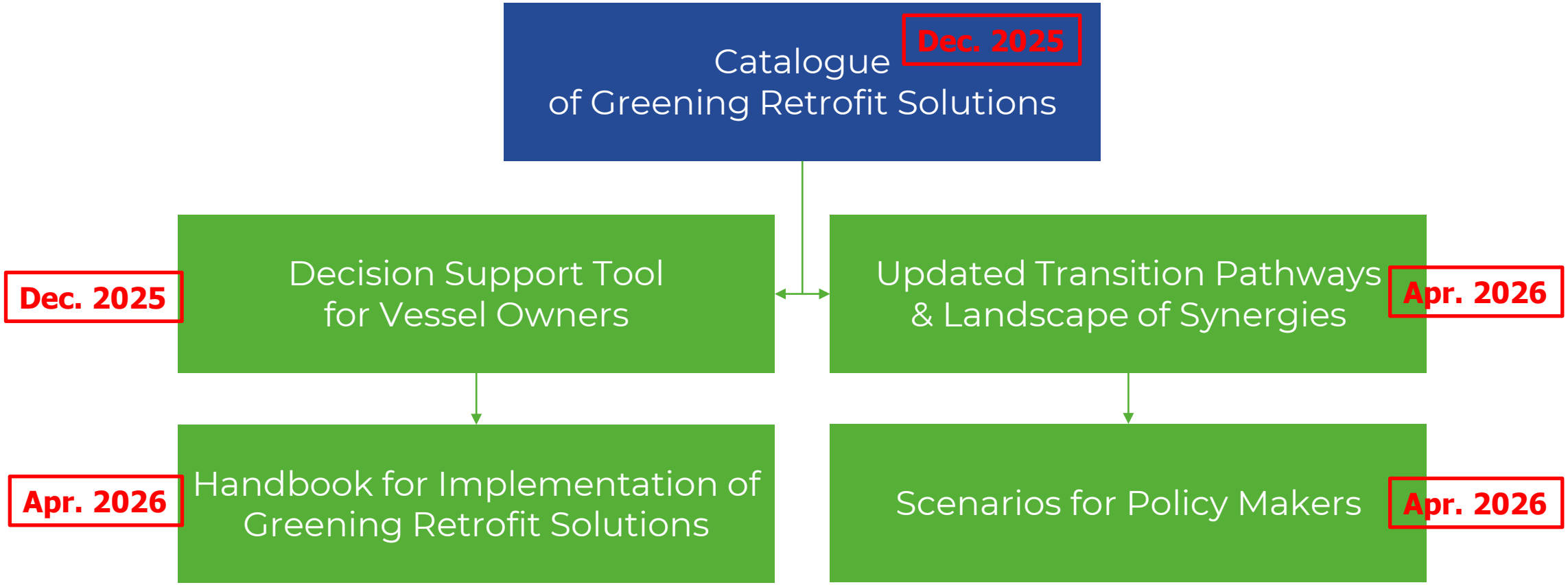
Innovation Action SYNERGETICS

SYNERGETICS Tools



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Innovation Action SYNERGETICS

The Catalogue

Eight fact sheets covering the following greening solutions:

- Methanol in internal combustion engines
- Hydrogen in internal combustion engines
- Drop-in fuels / Hydrogenated vegetable oil (HVO)
- Batteries
- Energy-saving devices / Aft-ship replacement
- Solar energy
- Electrification of propulsion
- Fuel cells

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What is innovative?

- Impact of **weight and dimensions** of energy convertor and energy storage
  - Does it fit on board?
  - What is the loss of payload and productivity?
- Impact of **bunker-time** for renewable energy
- Forecast for the **Total Cost of Ownership** and comparison with reference situation
  - Including impact on productivity of the vessel
  - Including expected energy cost development (OPEX)
  - Including choice when to do the investment and related capital cost (CAPEX)
- Updated estimated economic and environmental performance of different retrofit solutions

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Fleet family options

- Motor vessels dry cargo
  - L ≥ 110 m
  - 80 m ≤ L < 110 m
  - L < 80 m
- Motor vessels liquid cargo
  - L ≥ 110 m
  - 80 m ≤ L < 110 m
- Push boats
  - P < 500 kW
  - 500 ≤ P < 2000 kW
  - P ≥ 2000 kW

- Coupled convoys
- Ferries
- Large cabin vessels
- Day trip and small cabin vessels

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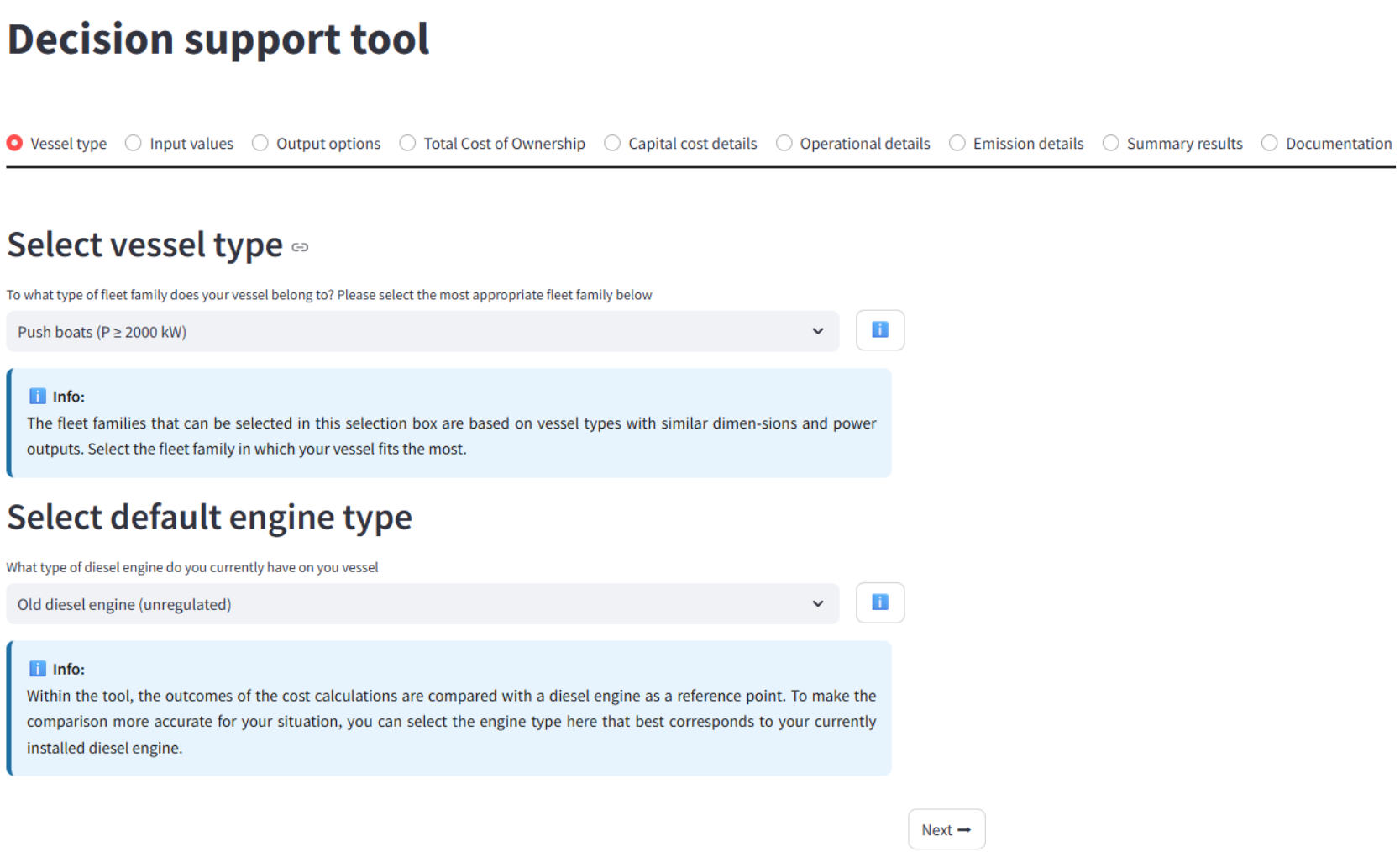
Fleet family options



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Options for retrofit solutions

- SCR&DPF to reduce air pollutant emissions (NOx and PM)
- Engine renewal: New Stage V diesel engine
- HVO (renewable drop-in fuel)
- (Bio-)LNG fuel combustion engine
- Methanol single fuel or dual fuel combustion engine
- Hydrogen combustion engine (single fuel)
- Hydrogen Fuel Cell system, including battery
- Full battery electric
  - Swappable batteries
  - Fixed batteries

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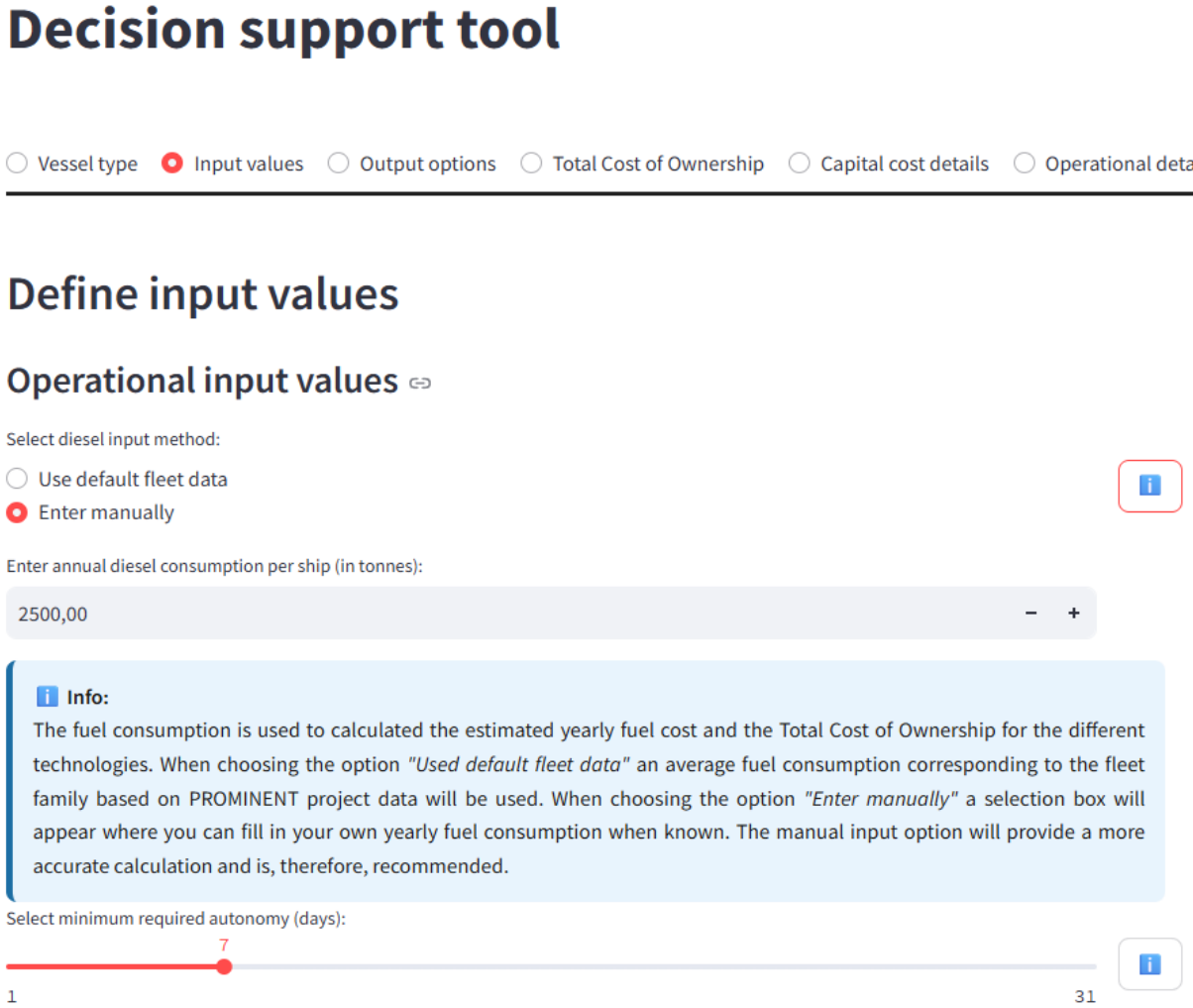
Operational input values



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Additional input values

Additional input values

Select the desired Installed Power here (kW):

2800

100 5000

Average Installed Power: 3458 kW

The selected power (2800 kW) is lower than the average installed power for Push boats (P ≥ 2000 kW).

Select the interest rate of the Capital investment here [%]:

6

3 9

Default interest rate: 6 %

The selected interest rate matches the default value.

Select the depreciation Period of the capital investment here (Years):

20

15 25

Default depreciation period: 20 years

The selected depreciation period matches the default value.

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Emission reduction filters

Emission requirements

Info:

Not all renewable technologies achieve the same emission reductions. Using the filters here, you can select the minimum emission reduction you would like to achieve compared to diesel emissions. By selecting an emission reduction value, the tool will filter out technologies that have a lower reduction than the chosen value. The tool includes three types of emissions: CO_2 equivalent (CO_2e, which includes carbon dioxide and methane emissions), NO_x, and Particulate Matter (PM).

Select the minimum desired CO_2e saving here (%)

0 — 0 — 100

Select the minimum desired NO_x saving here (%)

0 — 0 — 100

Select the minimum desired PM saving here (%)

0 — 0 — 100

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Cost inputs

Cost input values

Yearly profit (€)

250000,00 − +

Yearly personnel costs (€)

350000,00 − +

Yearly insurance costs (€)

100000,00 − +

CAPEX subsidies (if applicable) (€)

0 − +

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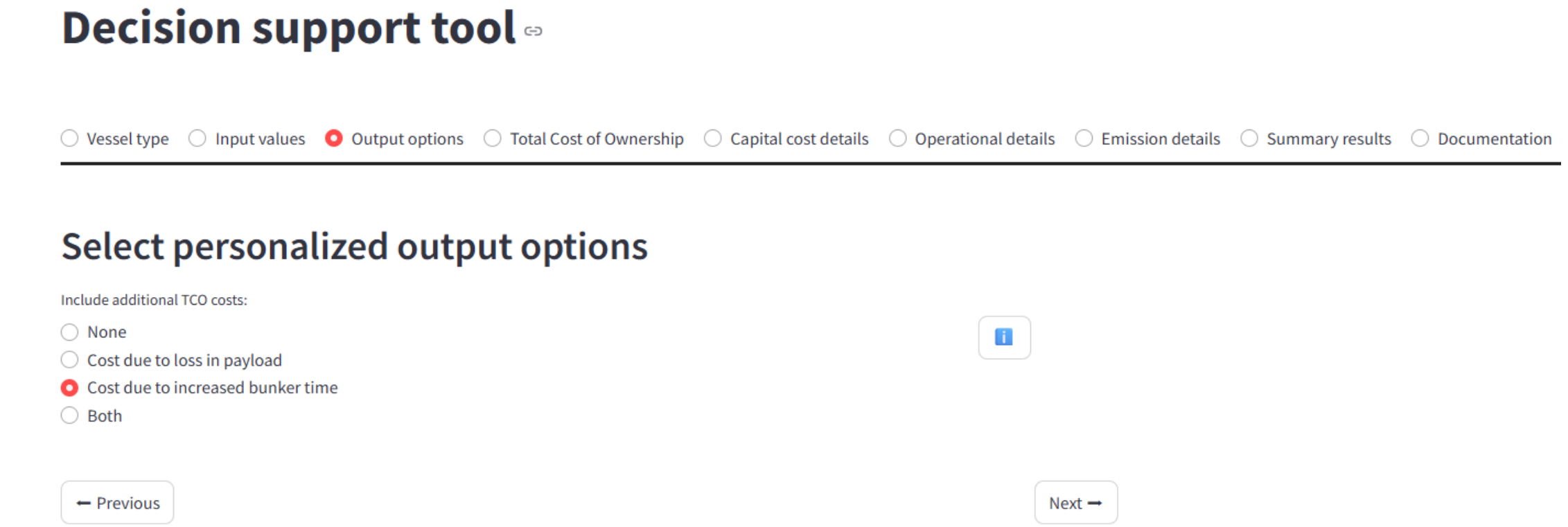
Inputs for payload and bunker time impacts



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Output results

- Total Cost of Ownership
- CAPEX
- OPEX
  ⇒ Compared to reference (index) and values per day

- Emission reduction levels
  - CO2e WTW / TWT
  - NOx
  - PM

- Ranking: best values per KPI

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Summary Results: emission reduction

Technology	CO2e WTW reduction [%]	NOx reduction [%]	PM reduction [%]
Existing engine, diesel	0	0	0
Existing Engine, HVO100	86	12	22
Stage V engine, diesel	9	87	96
Stage V engine, HVO100	88	87	96
Stage V, MeOH green	100	87	96
Stage V DF MeOH green / diesel	73	87	96
Retro SCR& DFP, Diesel	0	86	96
Retro SCR& DFP, HVO100	86	86	96
Stage V, LNG	15	85	96
Stage V, Bio-LNG	100	85	96

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Summary Results: CAPEX large pusher

Capital Expenditure: 2025 price levels			
Technology	minimum prices	maximum prices	average prices
Overhauling existing diesel engine (20 yrs)	€ 566,965	€ 765,751	€ 666,358
Overhauling plus DPF and SCR retrofit	€ 874,465	€ 1,131,251	€ 1,002,858
New Stage V Diesel Engine	€ 1,406,965	€ 2,277,751	€ 1,842,358
Methanol Stage V engine + storagetank	€ 2,352,644	€ 3,659,537	€ 3,006,091
Methane Stage V engine + storagetank	€ 4,410,000	€ 4,630,000	€ 4,520,000

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Summary Results: CAPEX large pusher

Capital Expenditure index: 2025 price levels			
Technology	minimum prices	maximum prices	average prices
Overhauling existing diesel engine (20 yrs)	100	100	100
Overhauling plus DPF and SCR retrofit	154	148	150
New Stage V Diesel Engine	248	297	276
Methanol Stage V engine + storagetank	391	451	425
Methane Stage V engine + storagetank	778	605	678

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Summary Results: Energy costs large pusher

Energy costs: 2025-2045			
	minimum prices	maximum prices	average prices
Existing engine, diesel	€ 67.2 mln	€ 86.8 mln	€ 76.9 mln
Existing Engine, HVO100	€ 68.1 mln	€ 101.1 mln	€ 84.6 mln
Stage V engine, diesel	€ 62.3 mln	€ 81.3 mln	€ 71.8 mln
Stage V engine, HVO100	€ 63.1 mln	€ 94.3 mln	€ 78.7 mln
Stage V, MeOH green	€ 51.9 mln	€ 131.9 mln	€ 91.9 mln
Stage V DF MeOH green / diesel	€ 63.6 mln	€ 120.3 mln	€ 92.0 mln
Retro SCR& DFP, Diesel	€ 68.5 mln	€ 89.4 mln	€ 78.9 mln
Retro SCR& DFP, HVO100	€ 69.4 mln	€ 103.7 mln	€ 86.5 mln
Stage V, LNG	€ 42.4 mln	€ 64.8 mln	€ 53.6 mln
Stage V, Bio-LNG	€ 45.3 mln	€ 136 mln	€ 90.7 mln

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Summary Results: Energy costs large pusher

Energy costs: 2025-2045			
Index reference diesel	minimum prices	maximum prices	average prices
Existing engine, diesel	100	100	100
Existing Engine, HVO100	101	117	110
Stage V engine, diesel	93	94	93
Stage V engine, HVO100	94	109	102
Stage V, MeOH green	77	152	119
Stage V DF MeOH green / diesel	95	139	119
Retro SCR& DFP, Diesel	102	103	103
Retro SCR& DFP, HVO100	103	120	112
Stage V, LNG	63	75	70
Stage V, Bio-LNG	67	157	118

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Summary Results: Total Costs of Ownership

TCO: 2025 CAPEX, OPEX 20 years per day (2025-2045), 2800 kW pusher, 3 engines						
	minimum prices		maximum prices		average prices	
Existing engine, diesel	€	9,451	€	12,211	€	10,831
Existing Engine, HVO100	€	9,571	€	14,182	€	11,877
Stage V engine, diesel	€	9,193	€	12,205	€	10,699
Stage V engine, HVO100	€	9,299	€	13,991	€	11,645
Stage V, MeOH green	€	7,958	€	19,370	€	13,664
Stage V DF MeOH green / diesel	€	9,565	€	17,775	€	13,670
Retro SCR& DFP, Diesel	€	9,635	€	12,557	€	11,096
Retro SCR& DFP, HVO100	€	9,752	€	14,521	€	12,136
Stage V, LNG	€	7,022	€	10,148	€	8,585
Stage V, Bio-LNG	€	7,419	€	19,910	€	13,664

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Summary Results: Total Costs of Ownership

TCO index: 2025 CAPEX, OPEX 20 years (2025-2045), 2800 kW pusher, 3 engines
Reference diesel = 100

	minimum prices	maximum prices	average prices
Existing engine, diesel	100	100	100
Existing Engine, HVO100	101	110	101
Stage V engine, diesel	97	99	97
Stage V engine, HVO100	98	108	98
Stage V, MeOH green	84	126	84
Stage V DF MeOH green / diesel	101	126	101
Retro SCR& DFP, Diesel	102	102	102
Retro SCR& DFP, HVO100	103	112	103
Stage V, LNG	74	79	74
Stage V, Bio-LNG	78	163	126

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Work in Progress - Next steps

- Validation and further refining the model
- User-friendly presentation of results
- Guidance and information boxes
- Versions in multiple languages

- Integration of representative coastal vessels

- Presentation at Stage Event PLATINA4Action 4 November, Budapest

- Publication of the tool end of 2025

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Questions

- Do vessel owners have information on available space on board to accomodate energy and storage system?
- How to set the price scenarios for fuel? E.g. option to include CO2 costs (ETS / RED3)?
  Stable price level, or evolution 2025-2050?
- What other expectations or suggestions would you have?

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Get the demo presentation

Contact us to get further information and a demonstration of the tool

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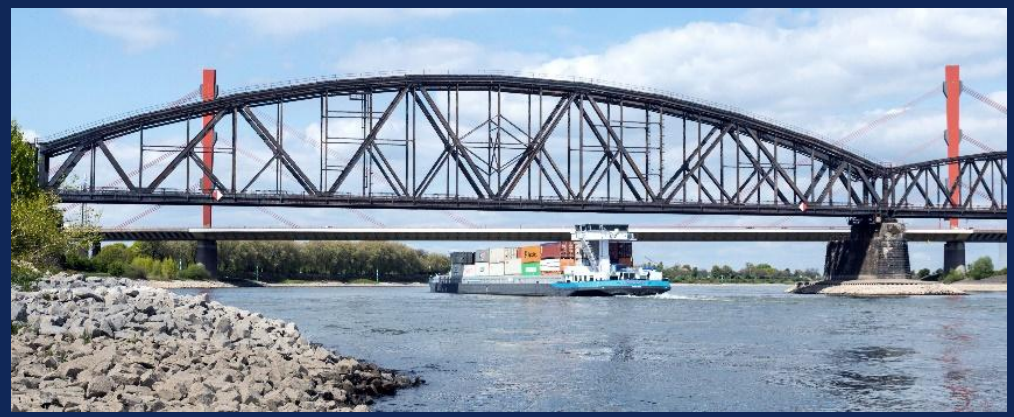

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Thank you for your attention!

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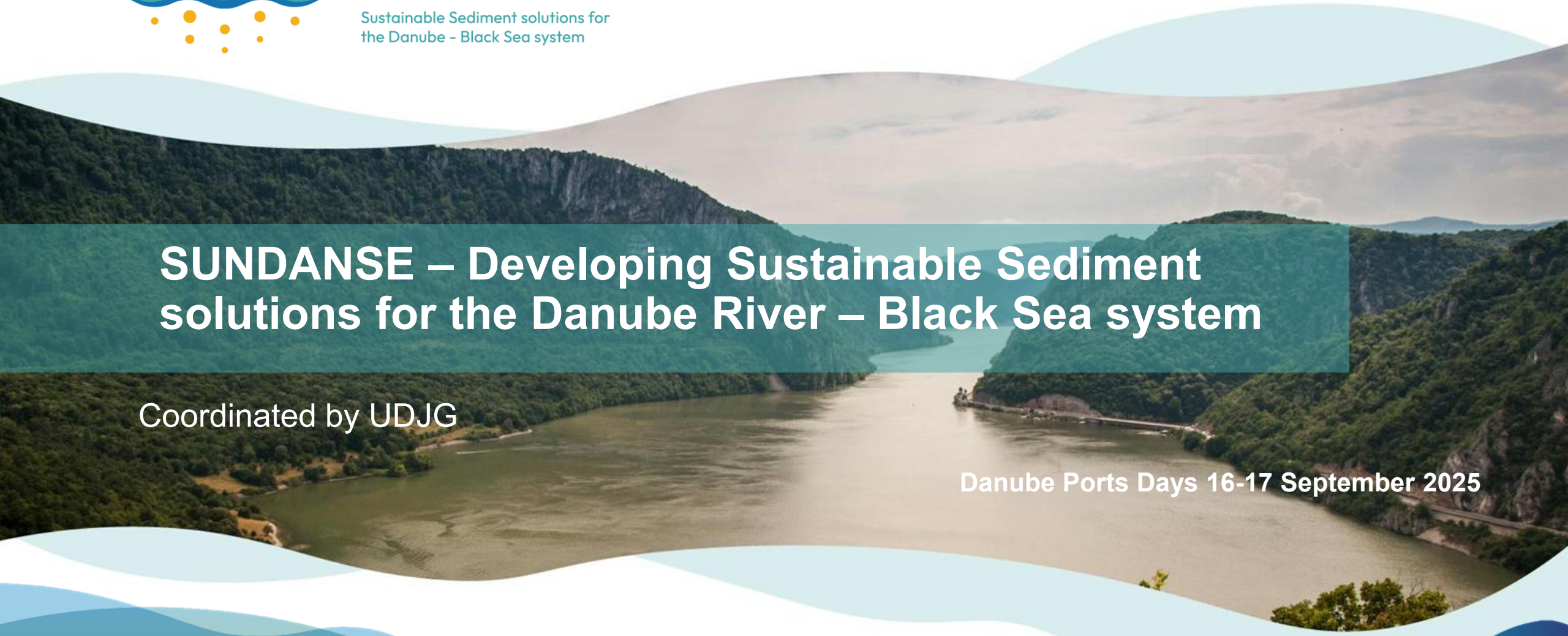
SUNDANSE

Sorina Pacuraru *and* ***Mihaela Timofti***
UGAL

sundanse

Sustainable Sediment solutions for the Danube - Black Sea system

www.sundanseproject.eu



SUNDANSE – Developing Sustainable Sediment solutions for the Danube River – Black Sea system

Coordinated by UDJG

Danube Ports Days 16-17 September 2025

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Sustainable Sediment solutions for the Danube - Black Sea system

SUNDANSE´s overall Objective is to **develop innovative and sustainable sediment solutions for the Danube River - Black Sea system.** The project aims to create a Sediment Management Handbook, develop and validate a Sediment Prediction Tool, and engage key Stakeholders in Europe.

48
MONTHS

€9M
BUDGET

20
PARTNERS

3
USE CASES

Partners

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Sustainable Sediment solutions for the Danube - Black Sea system

Project Goals

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- Create a Sediment Management Handbook for the Danube River basin, including intervention strategies.
- Develop and validate a Sediment Prediction Tool using measurement and monitoring to better predict sediment transport and impacts.
- Enhance measurement and monitoring infrastructure to improve the accuracy of sediment quantity and quality data for management frameworks.
- Test and validate sediment management solutions in three different locations to improve both sediment quantity and quality.
- Assess the applicability of solutions to other regions and EU river basins, and create an Action Plan and Roadmap for their use.
- Engage key stakeholders in European water and sediment management.

Uses cases

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Bulgaria

Sediment and flow management in the Danube River from Ruse to Tutrakan

Romania

Sediment management and navigation challenges in the Danube River from Corabia to Turnu Magurele

Serbia

Impact of sediment management solutions downstream of the Srpski Itebej Lock

Romania Use-case – Corabia – Turnu Magurele – November 2024

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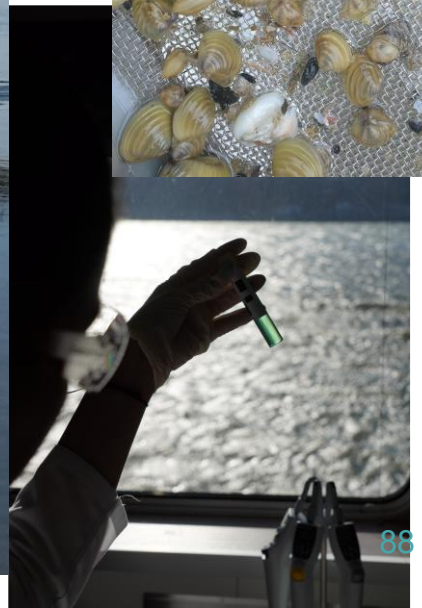

PR Mission Galati – Vienna Galati – July/August 2025

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#REXDAN vessel is ready for doing the *sun-dance* (read: #SUNDA
today from Galați, Romania 🚢
⚓ Next stop: 📍 Ruse, Bulgaria
🗓️ Tuesday, July 15, 2025
⏰ Visiting hours (local time): 11:00 AM – 5:00 PM

Coordinated by the Universitatea „Dunărea de Jos" din Galați res
primary objectives of this #regional mission includes:
💧 In-depth analyses of the #Danube ecosystem,
🤝 Stakeholder engagement and #networking,
📗 Academic and #international outreach.

More information 🔗 https://lnkd.in/e9RyW5eY

#HorizonEU #HorizonProject #HorizonEurope #Sedimenation #R
#DanubeProtection #WaterManagement

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Yesterday was an interesting day at #REXDAN research vessel in Ruse, Bulgaria. 🚢
Diverse set of visitors, including #EU initiatives, media, academia and industry players joined aboard to explore #REXDAN laboratories! 🔬

⚓ Next stop: 📍 Belgrade, Serbia
🗓️ Monday, July 21, 2025
⏰ Visiting hours (local time): 8:00 AM – 11:00 AM

More information 🔗 https://lnkd.in/e4bEGxiN

#HorizonEU #HorizonProject #HorizonEurope #Sedimenation #RiverProtection #DanubeProtection #WaterManagement

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3w •

A productive day for the #SUNDANSE team in Giurgiu
On August 8, together with AFDJ Giurgiu, we organised
#REXDAN research vessel and welcomed representativ
including ABA Prut, ABA Somes-Tisa, ABA Siret, ABA Cr

The visit provided a fantastic opportunity to showcase
and hold engaging discussions on the vital environmer
during our recent Galați-Vienna expedition.

Thank you to all our visitors for the insightful conversations and for their ongoing commitment to a healthier #Danube!

#HorizonEU #HorizonProject #HorizonEurope #Sedimenation #RiverProtection #DanubeProtection #WaterManagement

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Last Friday, #REXDAN was in Budapest, Hungary! 🚢 We had the honor of welcoming a diverse group of key stakeholders and experts during visiting hours. Among many others, representatives from institutions like Budapest University of Technology and Economics (BME), Budapest Metropolitan University, the General Directorate of Water Management (GDWM), the Romanian Embassy, and the Budapest Dock Freeport Logistics and Industrial Park gathered onboard. ✨

#SUNDANSE team talked about the Danube's #hydrology, morphological characteristics, critical navigation points, and the impact of low water levels on commercial shipping. A huge thank you to all who joined us and participated to collaborative discussions! 🤝

Currently, we are in #Bratislava, so #staytuned for insights from #Slovakia!
⚓ Next stop: 📍 Vienna, Austria
🗓️ Wednesday, July 30 and Thursday, July 31, 2025
⏰ Visiting hours (local time): Thursday, July 31, 10:00 AM - 4:00 PM

More information 🔗 https://lnkd.in/e4bEGxiN

#HorizonEU #HorizonProject #HorizonEurope #Sedimenation #RiverProtection #DanubeProtection #WaterManagement

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The #REXDAN research vessel has successfully completed its Galați-Vienna-Galați voyage, arriving back in its home port on Sunday, after a month of intensive research and collaboration with key stakeholders in Romania, Bulgaria, Serbia, Slovakia, Hungary and Austria! 🤝 What an epic journey! 🚢

But the work doesn't stop here! The #SUNDANSE team is already preparing #REXDAN for its next mission which will be crucial for the project's ongoing research and dedication to sustainable #river management. #StayTuned

SUNDANSE is brought to you by:
Universitatea „Dunărea de Jos" din Galați | Eden Tech | Romanian River Transport Cluster Association | University of Vienna | European Shippers' Council | Ben-Gurion University of the Negev | Faculty of Technical Sciences, University of Novi Sad | University of Novi Sad, Faculty of Sciences | Edentify Foundation | Flanders Hydraulics - Waterbouwkundig Laboratorium | Apele Române | National Ecological Centre of Ukraine | F6S Innovation | MARINE RESEARCH | JVP Vode Vojvodine | **Administratia Fluviala a Dunarii de Jos Galati** | **Waterbouwkundig Laboratorium** | **Hydro Proiect Invest** | **Executive Agency "Exploration and Maintenance of the Danube River"** | **Danube hydro-meteorological observatory**

#SUNDANSE is a part of the #DanubeLighthouse within the #EU Mission: "Restore our Ocean and Waters" which aims to protect and restore the health of our ocean and waters through research and innovation, citizen engagement and blue investments.

ℹ️ Mission Ocean
ℹ️ CINEA - European Climate, Infrastructure and Environment Executive Agency

Romania Use-case – Corabia – Turnu Magurele – August/September 2025

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The #SUNDANSE **second Field Research Mission** has officially begun! 🚀 #REXDAN vessel embarked on its upstream voyage on the #DanubeRiver in #Romania. 🚢

Our expert team is now on a mission to collect crucial data for the Romanian use case, a key step in refining our project models and advancing #sustainable #sediment management. 🔬

Stay tuned to follow our progress as we work for a healthier #Danube! 🙌

More information in our latest #PressRelease 🗞️
🔗 https://lnkd.in/eWK5W7R5

#HorizonEurope #HorizonEU #EUProject #Sedimentation #RiverManagement #RiverResearch #RiverProtection #Sustainability #TeamWork

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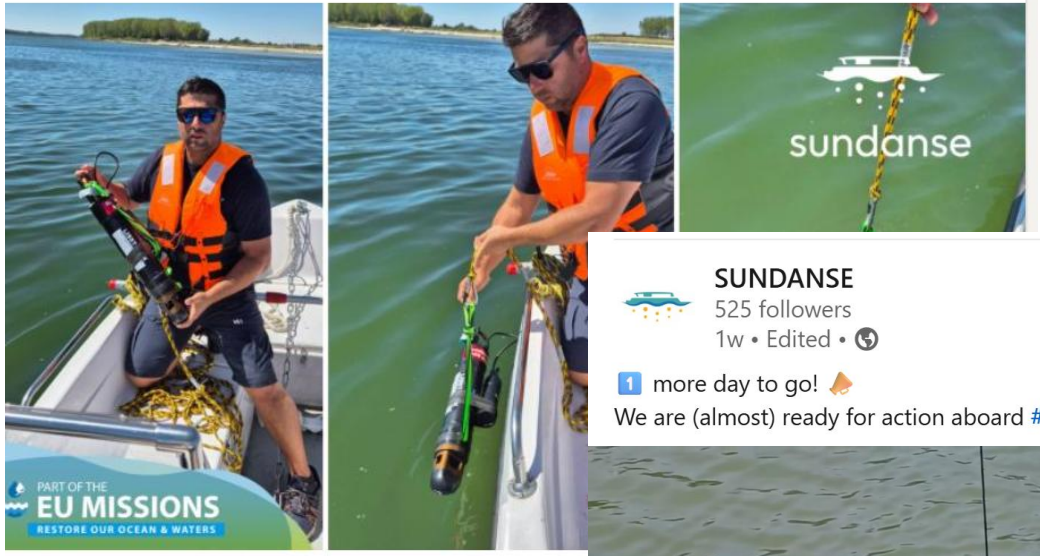
The #REXDAN vessel is uncovering the Danube's secrets as we speak! 🚢 During our **second Field Research Mission**, the #SUNDANSE team carried out intensive sediment sampling between Turnu Măgurele and Corabia. 📍 ...more



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1️⃣ more day to go! 🤙
We are (almost) ready for action aboard #REXDAN research vessel! 🚢 ...more

Join the SUNDANSE newsletter for exclusive updates and insights!

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Join us!

Thank you

www.sundanseproject.eu

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FOREMAST

Florin Pacuraru
UGAL

FOREMAST

• Freight volumes transfer from road to waterborne transport, using zero-emission, automated, small, and flexible vessel (SFAZ) prototypes

- Florin Pacuraru
- “Dunarea de Jos” University of Galati

- Danube Ports Days 2025 | Constanta Romania | 16th - 17th of September 2025

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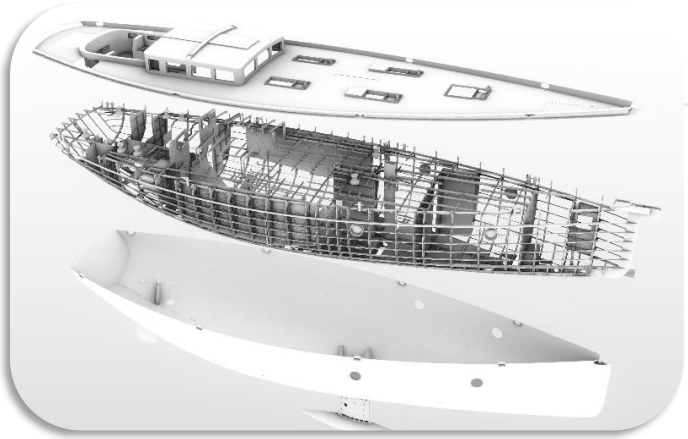
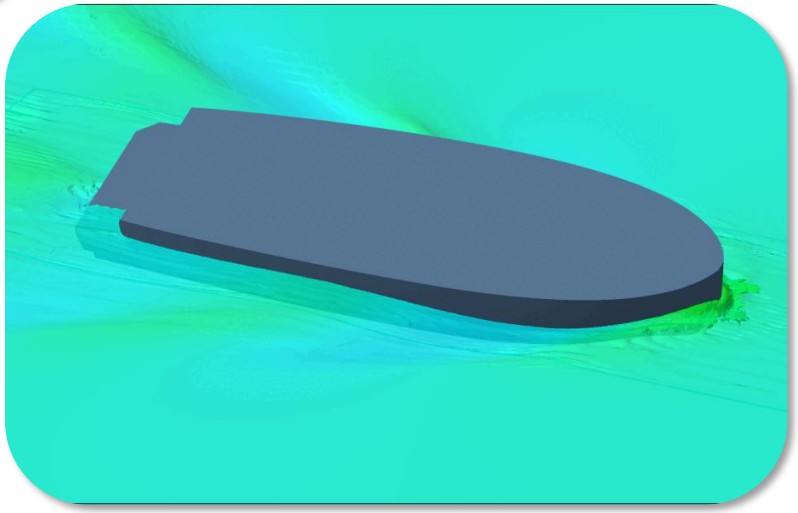
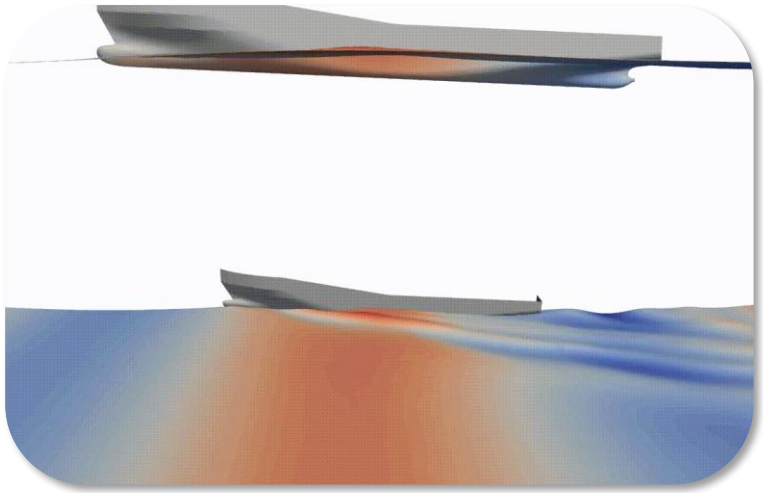
This project has received funding from the Horizon Europe framework programme under Grant Agreement No 101138261



- UGAL – “Dunarea de Jos" University





Funded by the European Union

This project has received funding from the Horizon Europe framework programme under Grant Agreement No 101138261

36 months

16 partners

3 Living Labs

9 countries

SCOPE & OBJECTIVES

Funded by the European Union

FOREMAST facilitate the movement of goods in urban and coastal areas by creating a Small, Flexible, Automated, Zero-emission (SFAZ) vessel that enables the efficient, safe, and sustainable transportation of cargo shift to inland waterways.

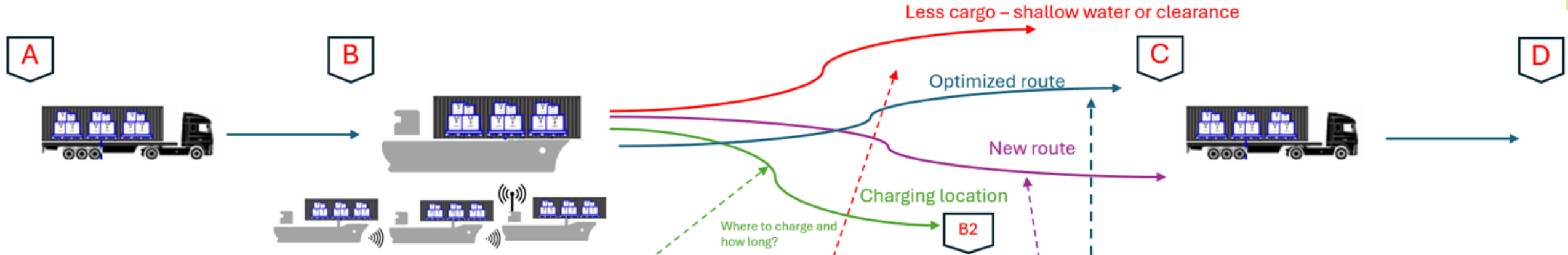
The main objectives of FOREMAST are to:

- examine the **techno-economic aspects** of SFAZ vessels in smart, competitive and green transport systems
- undertake **focused research** in SFAZ design and solution components in line with vessel research
- test and demonstrate the SFAZ vessel concept in the **FOREMAST Living Labs**
- accelerate the **wider deployment** of SFAZ vessels

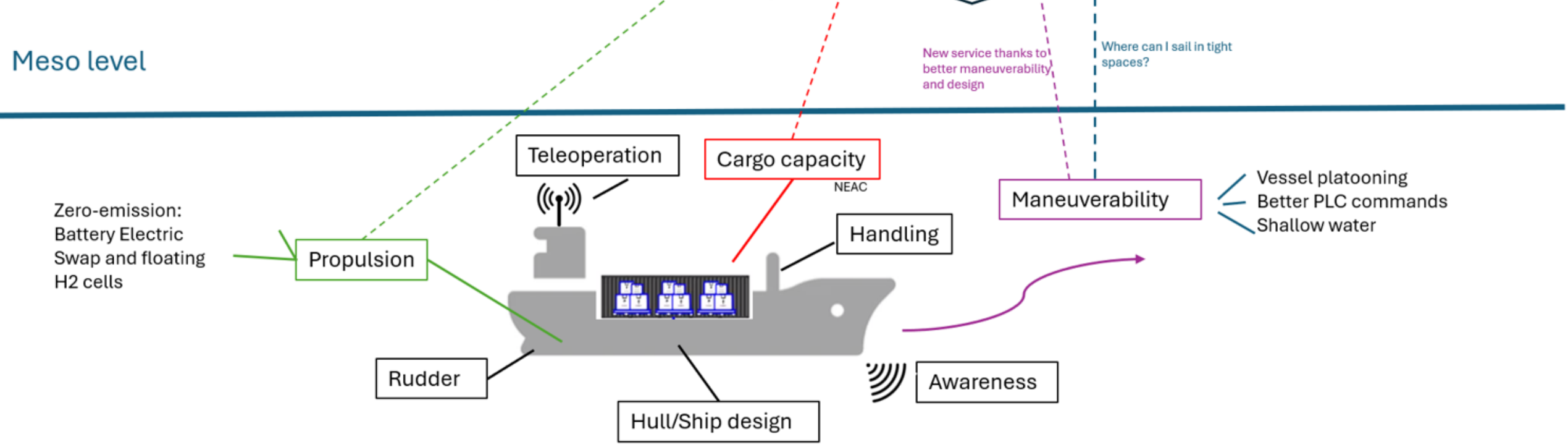
TCO

Infrastructure A B B2 ... C D

Macro level



Meso level



Micro level

Macro Level:

Large-scale infrastructure choices impacting the meso level operations:

- **Charging Stations** for electric vessels.
- **Locations of Terminals** and **Handling Points** for cargo, impacting operational costs in the meso level.

Meso Level:

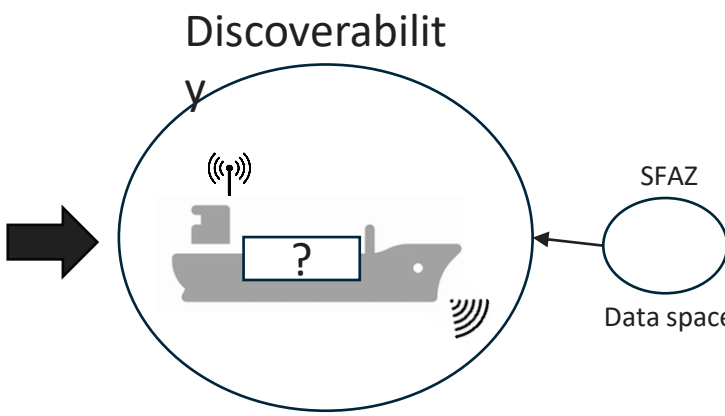
Shows how **micro vessel outputs** influence operational decisions such as:

- **Platooning**: outputs from the micro models to illustrate how vessels group together for efficiency.
- **Economies of Scale**: shifting more cargo from road to inland waterways.
- **Voyage optimization**: Vessels choosing different routes based on Water Depth and Bridge Clearance.
- **Capacity and routing**: new service levels for IWT transport

Micro Level:

Depicts the technical and communication components of the SFAZ vessel (s).

- **Actuators** (for vessel movements).
- **PLCs** (programmable logic controllers for automation).
- **Propulsion Systems** (engine types).
- **Hull Design** (aesthetic and performance factors).



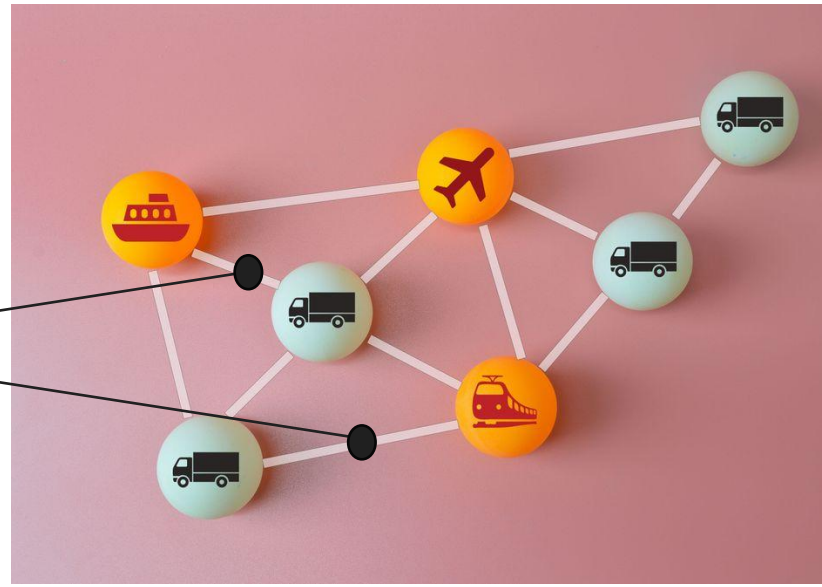
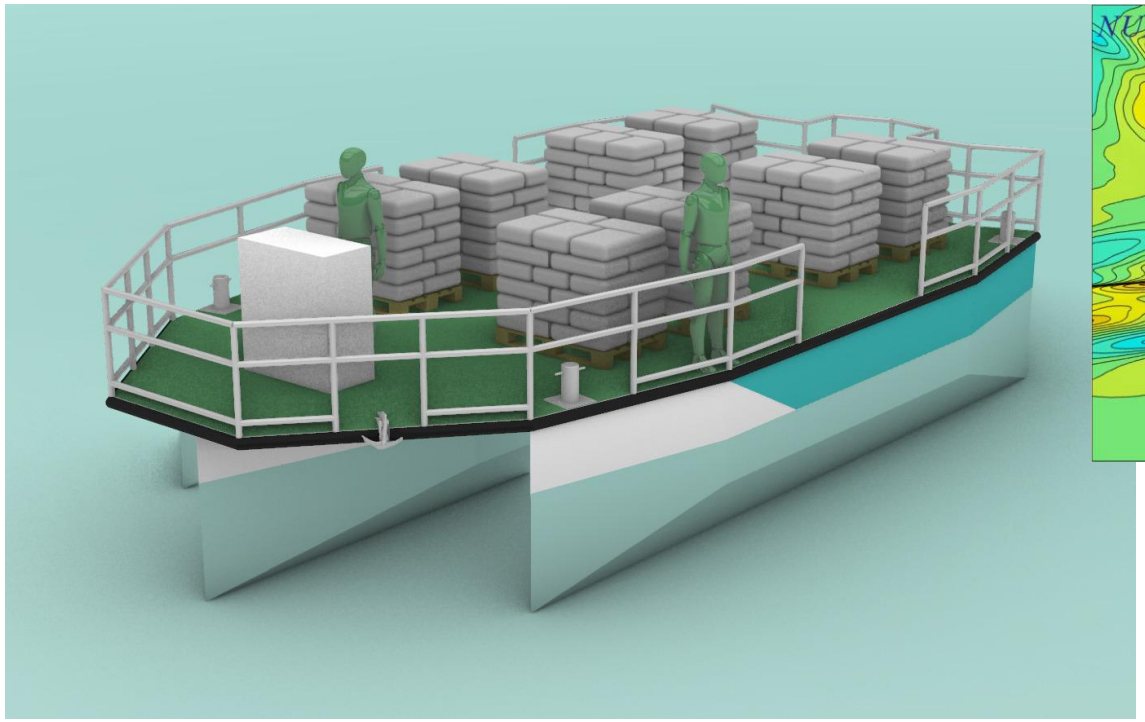
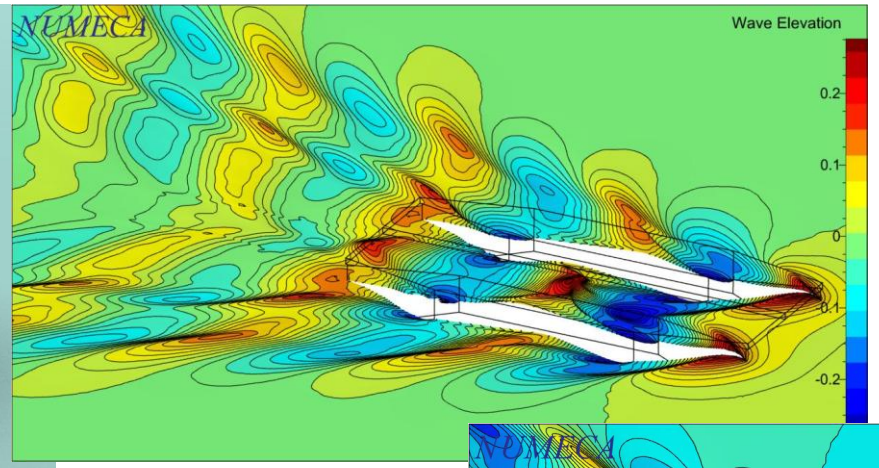


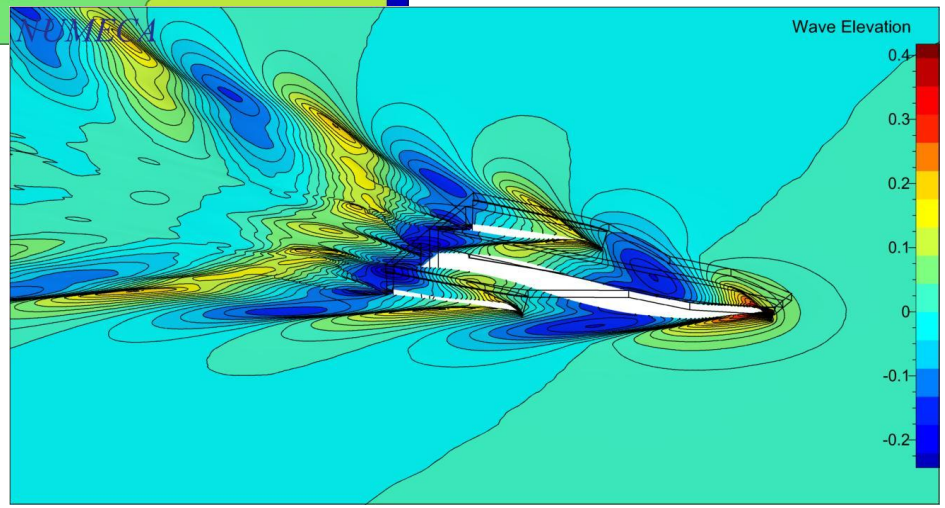
Image by Freepik

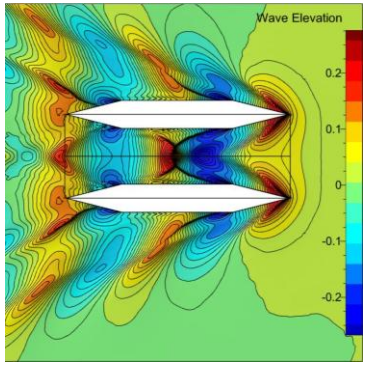
Digital Twin Platform

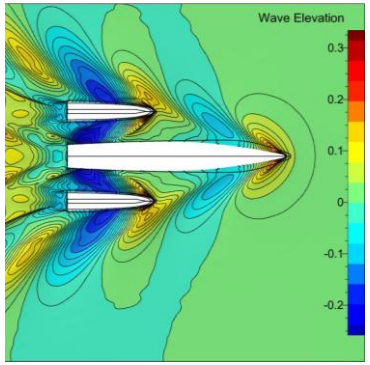
SFAZ design and simulation

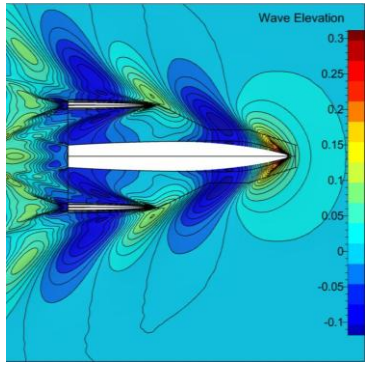


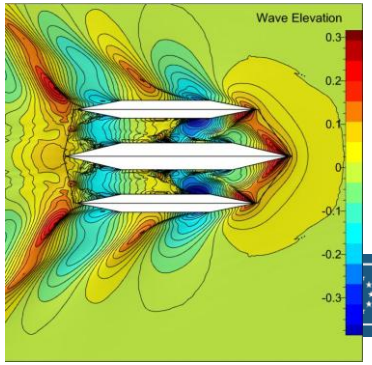












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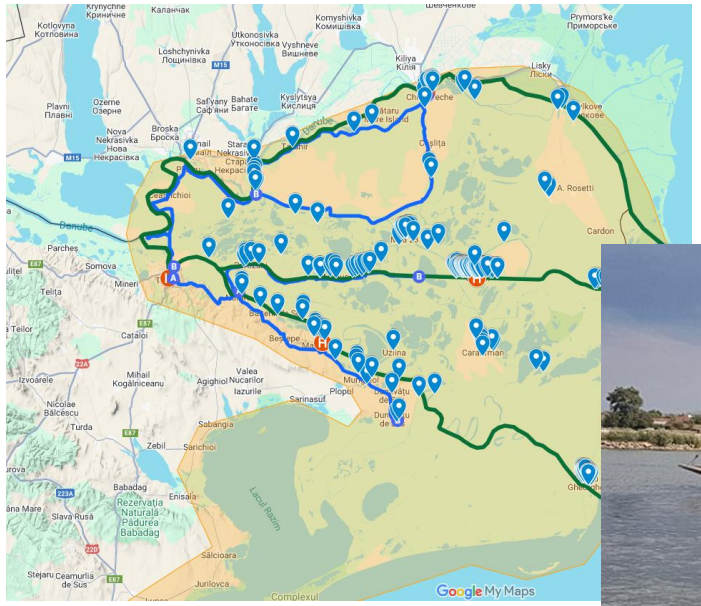
Virtual Living Lab Romania – *Challenges*



Regulatory and environmental constraints

Protected areas under Natura 2000 and UNESCO status limit expansion.

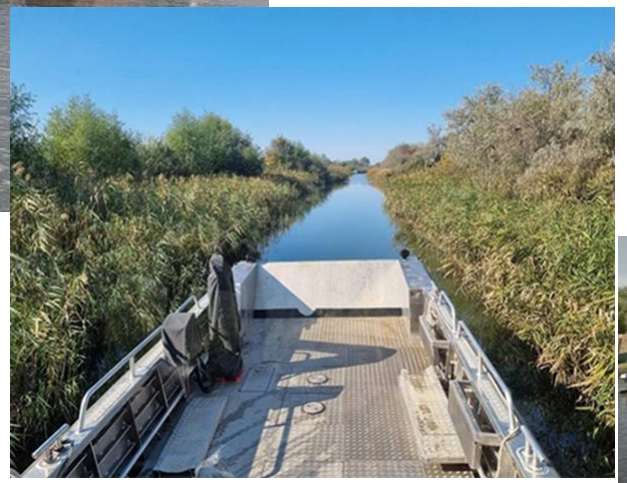
Strict rules on vessel emissions, noise, and wake energy.

Navigability

Seasonal water level fluctuations restrict operations.

Sedimentation in channels reduces navigability.

Limited dredging due to environmental regulations.



Infrastructure limitations

Lack of modern, standardized cargo handling infrastructure in rural piers.

Inadequate intermodal connections.

Economic viability

Low cargo volume due to limited industrial activity.

High operating costs for small-scale.

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Virtual Living Lab Romania – *Opportunities*

In response, the LL3 targets three **priority areas**:

Decarbonized transport solutions: through the **design of SFAZ vessels** with low emissions, noise, and wake impact

Digitalization and smart logistics: by **deploying a Digital Twin** platform to simulate vessel behaviour, optimize routing, and integrate real-time environmental data

Integration with local development goals: by **developing business scenarios** that support essential services including good and medical supply delivery, waste return logistics, and eco-tourism operations

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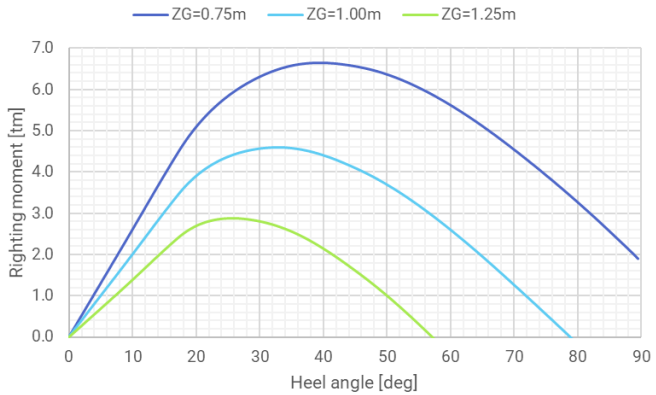
Virtual Living Lab Romania – *DNB SFAZ Design*

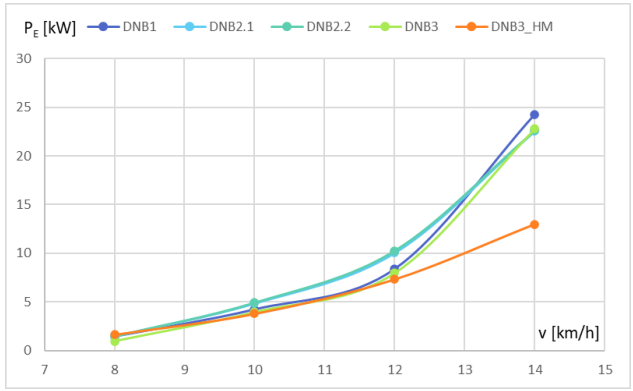
Funded by the FOREMAST

SFAZ designs were evaluated through detailed **hydrodynamic** and **CFD analysis** to assess **maneuverability**, **wake** generation, and **payload** capacity.

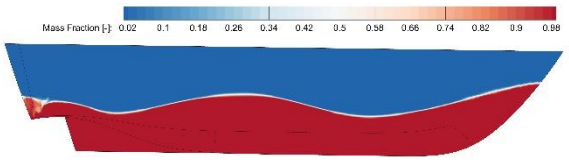
Dimension		Value	Units
Max Overall Length	L_{max}	9.3	m
Length of waterline	L_{WL}	8.3	m
Target Beam	B	3.3	m
Loaded Draft	T	0.8	m
Min Freeboard (Fully Loaded)	F	0.5	m
Design speed	V_D	10	km/h
Maximum speed	v_{max}	14	km/h
Autonomy	A	100 -120	km
Estimated engine power		2 x 14	kW
Payload		7.5	t



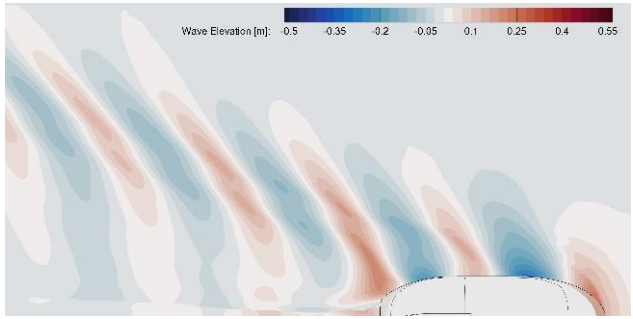
Full load ship loading condition



Effective power curves for 4 hull shapes



Volume fraction distribution on the hull of DNB 2.2 design



Free-surface topology for DNB 2.2

The selected monohull was optimized for shallow-water navigation and environmental compliance, with a target payload of roughly 7.5 tons.

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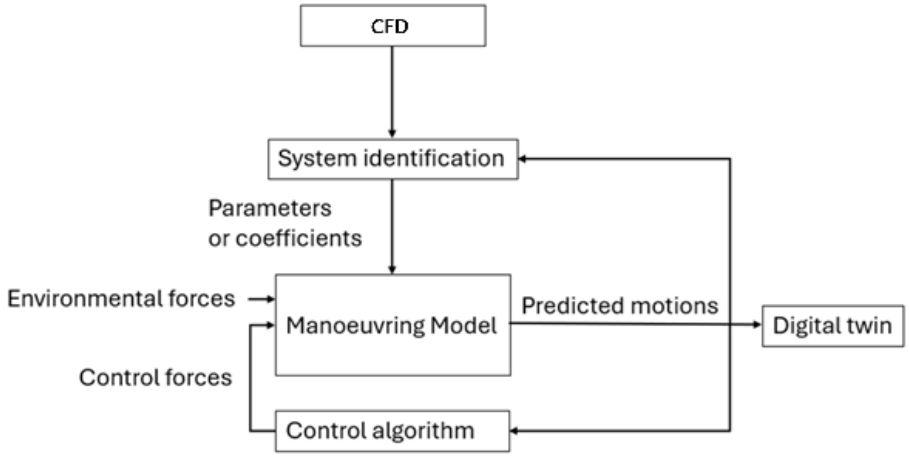
Virtual Living Lab Romania

- A **hybrid energy consumption model** is under development, to estimate energy needs under varied conditions (including payload, charging/swapping infrastructure). This physics-informed module will be fully integrated into the DT platform
- A **3DOF manoeuvring model** has been developed to simulate SFAZ behaviour based on CFD results for resistance, propulsion, and manoeuvrability. The DT environment will enable route analysis, business case planning, and scenario evaluation.
- **An extension of the manoeuvring model** is planned to simulating two virtual SFAZ vessels travelling in close formation using the manoeuvring model.



Workflow of the integration of the manoeuvring model within a DT platform

Nature based solutions - platooning

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FOREMAST

Thank You!

Q&A

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FAIRway II

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FAIRway Danube

FAIRway Danube II

Setting the pace for infrastructure development on the Danube

Andreas Bäck, viadonau, 16.09.2025

Co-funded by
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FAIRway Danube

Overall Achievements in the Danube Region since 2015

New Equipment in the Danube Region



























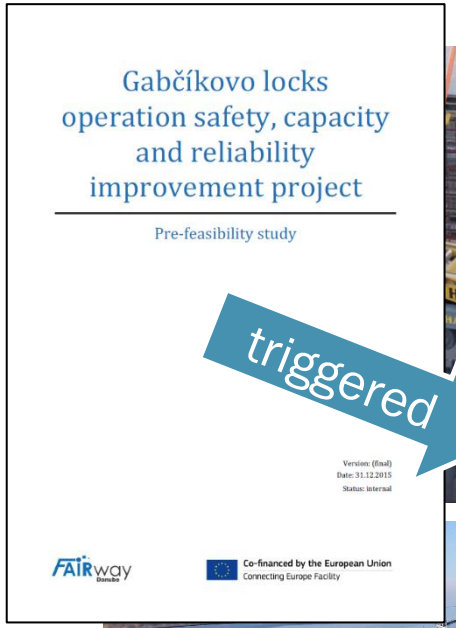

Co-financed by the Connecting Europe Facility of the European Union

European Union
European Structural and Investment Funds

This project is funded by the Instrument of Pre-accession Assistance of the European Union

Lock Upgrades in the Danube Region

Gabcikovo Locks – Slovakia
Budget: 142,6 Mil. €



triggered

Iron Gate I – Serbia
Budget: 30 Mil. €

triggered

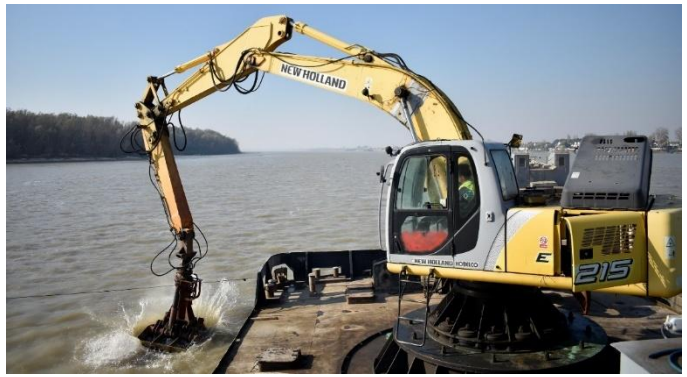
Iron Gate II – Serbia
Budget: 32,5 Mil. €

Co-funded by a framework loan of the EIB and CEF

Co-financed by the Connecting Europe Facility of the European Union

River Engineering Projects

FAST Danube and Maintenance Dredging – Bulgaria & Romania



Removal of the Bottleneck Sotin - Croatia

Serbian Integrated River Engineering Project

Co-financed by the Connecting Europe Facility of the European Union

European Union
European Structural and Investment Funds

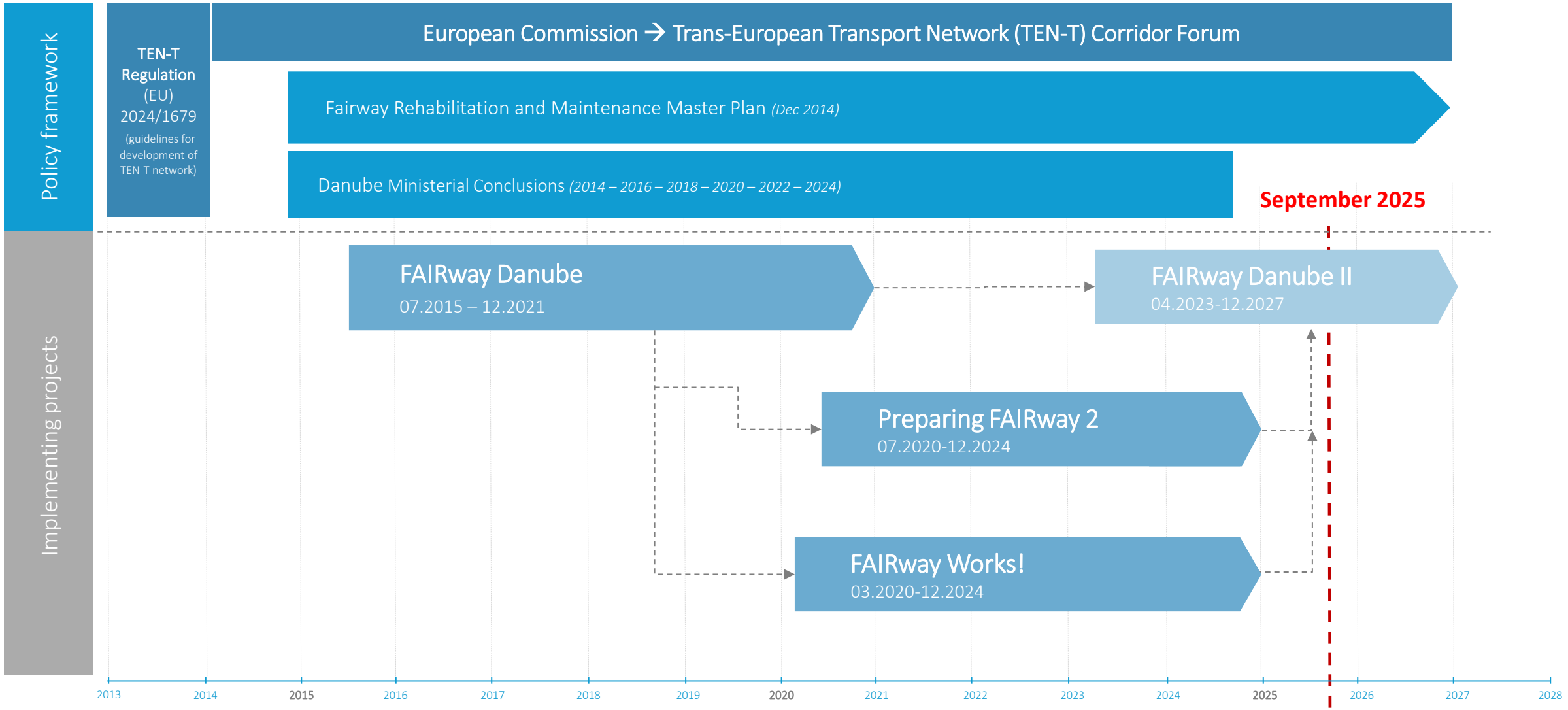
This project is funded by the Instrument of Pre-accession Assistance of the European Union

Co-funded by the European Union

FAIRway Danube II

Project Status as of September 2025

Deployment strategy



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FAIRway Danube

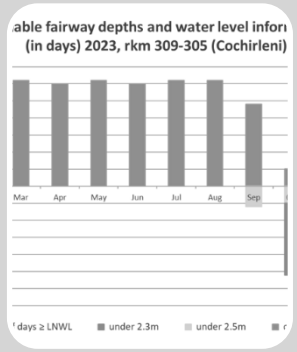
Main activities:

- Monitoring of fairway parameters: (annual) Reports on Good Navigation Status
- 183 buoys (HR, RO), upgrade of 19 gauging stations (BG, RO), bridge clearance sensors (HU, RO)
- new surveying vessels (HU, RO), upgrade sensors in SK, HU, HR, RO, BG
- 6 drones (HU, HR, RO)
- Upgrade of water-level forecast in AT, HU, RO
- Upgrade trans-national waterway monitoring system (WAMOS)
- Pilot flexible infrastructure (AT, HR, RO, BG)
- Upgrade of mooring places in Austria and Romania
- Prepare upgrade of mooring places in Austria, Slovakia and Croatia

Work packages (WP)

FAIRway Danube

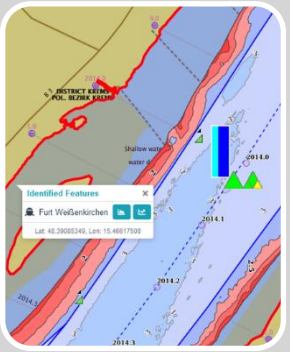
WP2



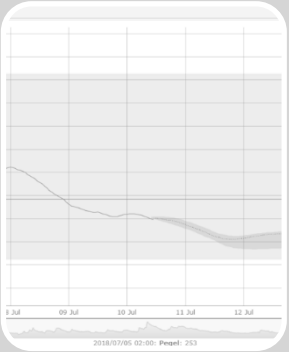
Reports on Good Navigation status (GNS)

Establish Fixed and Mobile Sensors for Measuring the Good Navigation Status (GNS)

WP3



Upgrade of the National Waterway Management Systems **(WAMS) &** the Transnational Waterway Monitoring System **(WAMOS 2.0)**



Extended Water-Level Forecast:

Advancing Planning Reliability

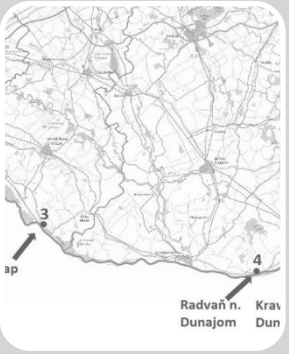
WP4

Innovative Solutions for Enhanced Climate Resilience: Pilot Projects for Flexible Infrastructure Elements

WP5

Enhancing Safety and Sustainability: **Upgrade of Mooring Places in Austria and Romania**

WP6



Expanding Mooring Capacities: **Future Investments in Austria, Slovakia, and Croatia**

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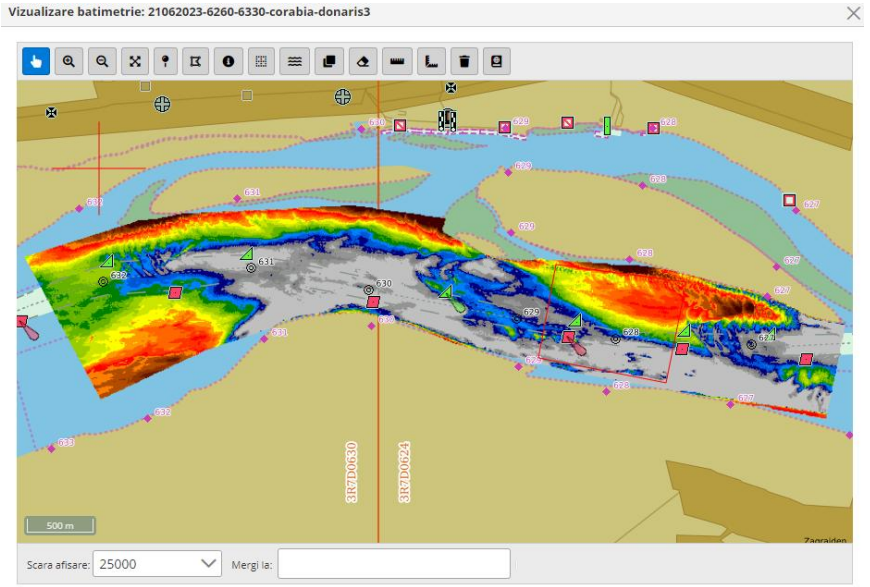
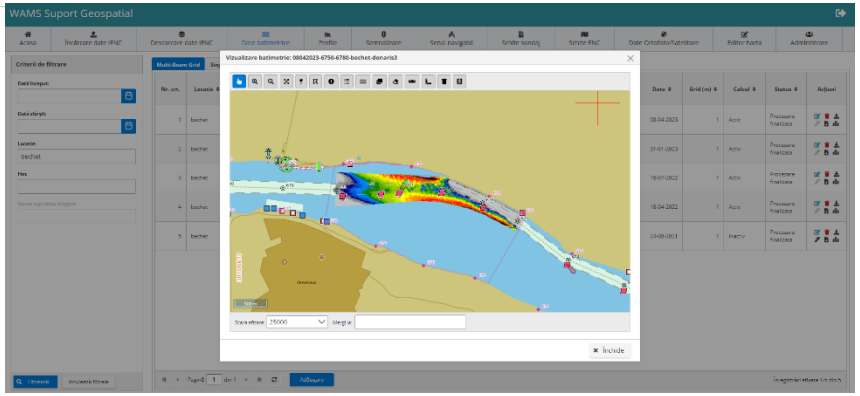
Upgrade of national Waterway Management Systems (WAMSs)

- **Upgrade of national waterway management systems (WAMS)**
  - collecting waterway and fairway related information from fixed and mobile sensors and other sources
  - All the data will support/improve decision-making to waterway management at national level
  - feed the transnational WAMOS 2.0 for monitoring Good Navigation Status
  - data are being provided to fleet operators (improvement until December 2025, bathymetric layer if feasible)





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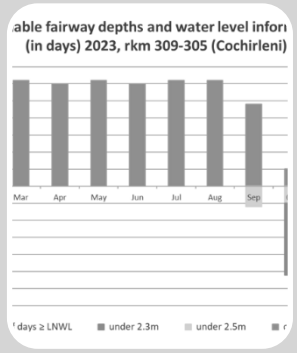
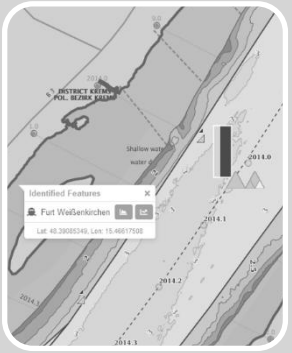
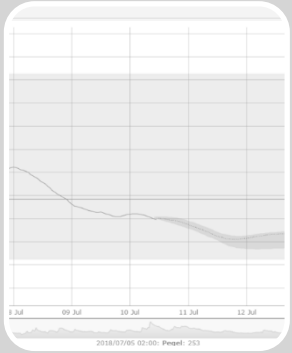
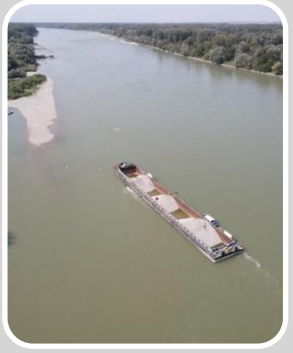
Work packages (WP)

WP2	WP3		WP4	WP5	WP6
					
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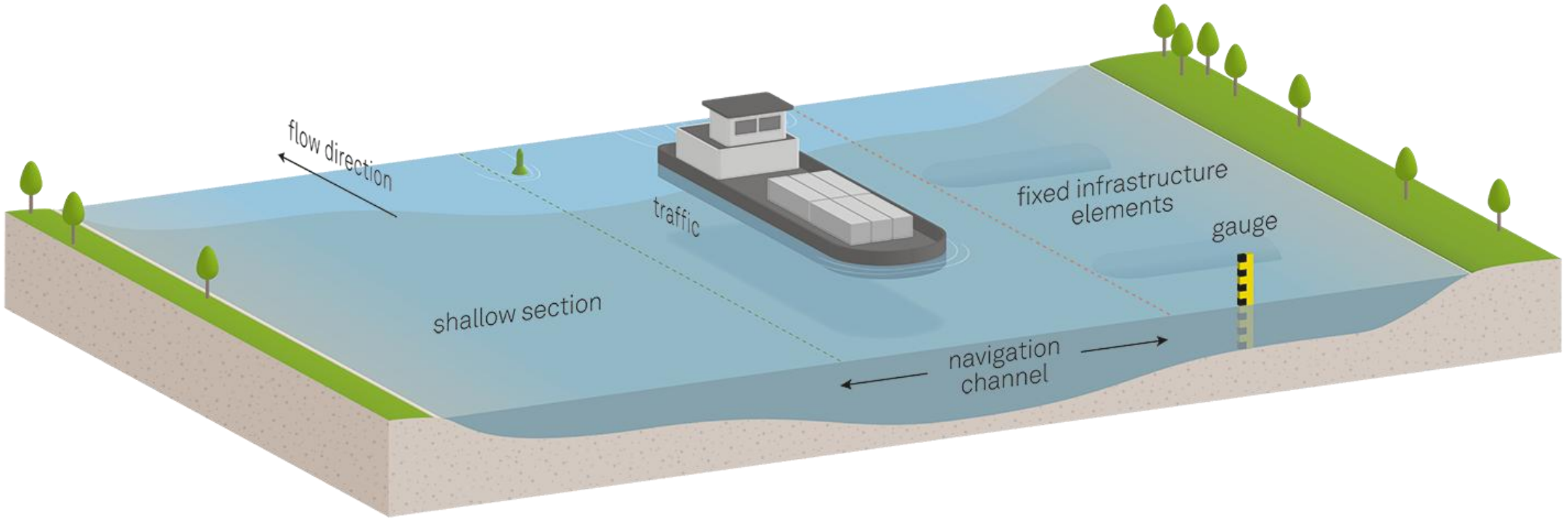
How do flexible infrastructure elements work? (1/4)

Cross section of the Danube at a potential shallow section, schematic illustration at mean water level



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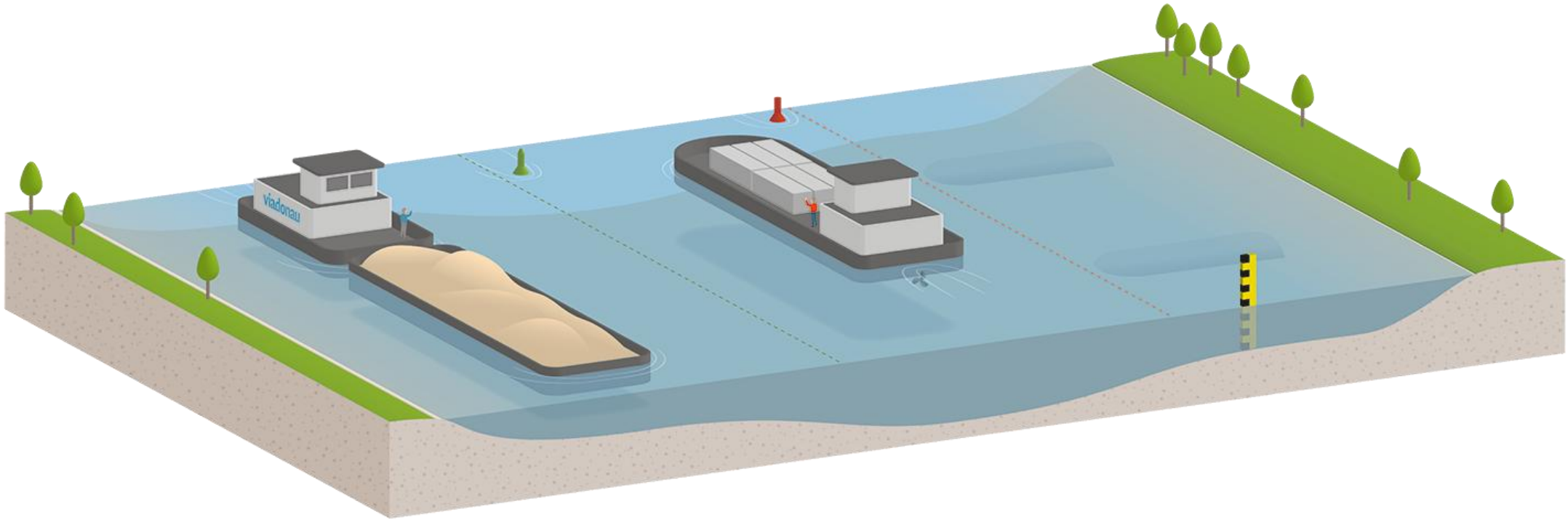
How do flexible infrastructure elements work? (2/4)

Low water level is expected. A barge loaded with gravel reaches the shallow section and is anchored to the bottom



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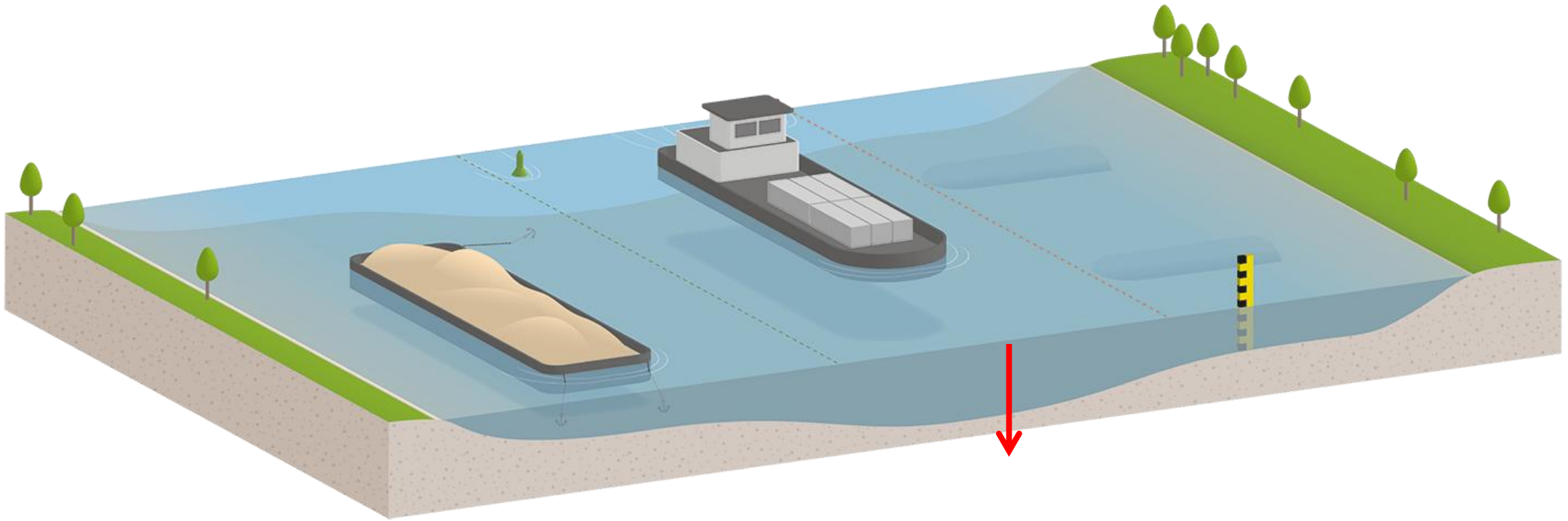
How do flexible infrastructure elements work? (3/4)

Water level is decreasing, the barge takes over the function as a flexible infrastructure element. The river cross-section is reduced and pushes the water towards the navigation channel.



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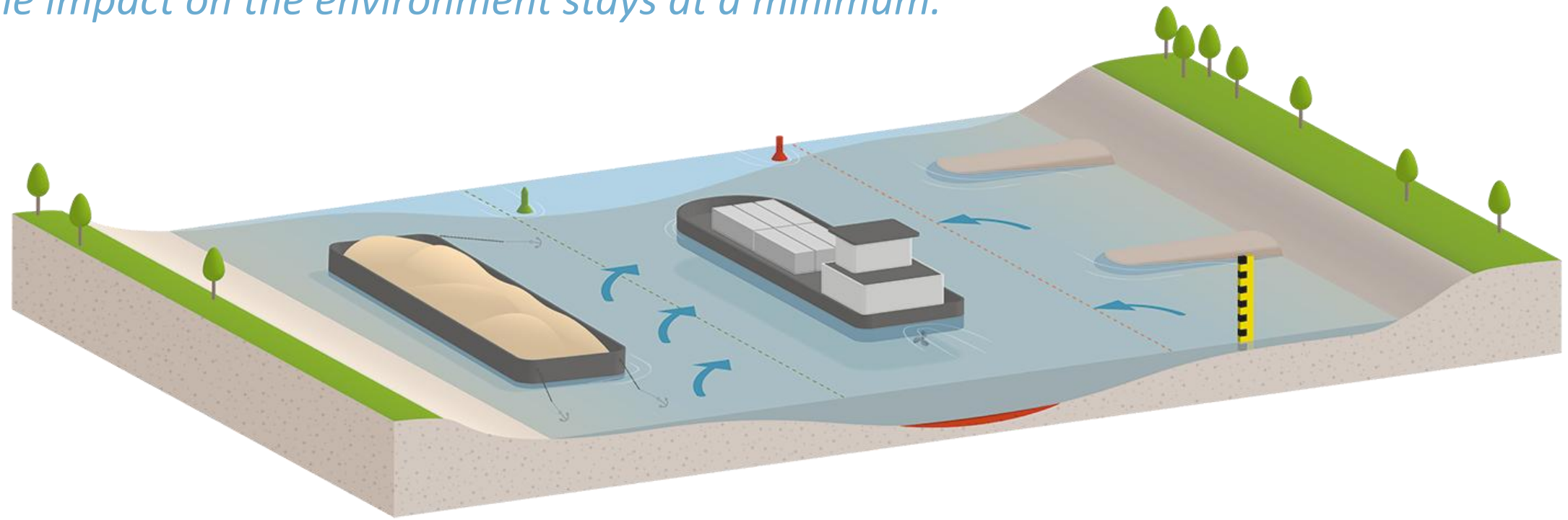
How do flexible infrastructure elements work? (4/4)

Now there is an optimum low water regulation, a combination of the existing fixed and flexible infrastructure elements.

When the water level rises, the flexible infrastructure will be removed again.

The impact on the environment stays at a minimum.



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Example: Rote Werd – Austria (river-km 1896,0)

August 2024

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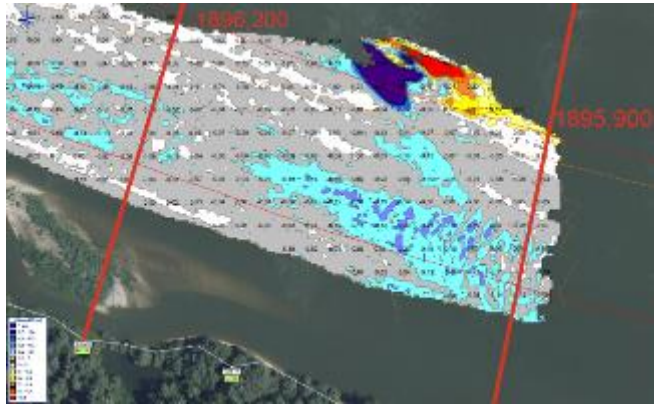
Results & Outlook

Intermediate results of first period of pilot:

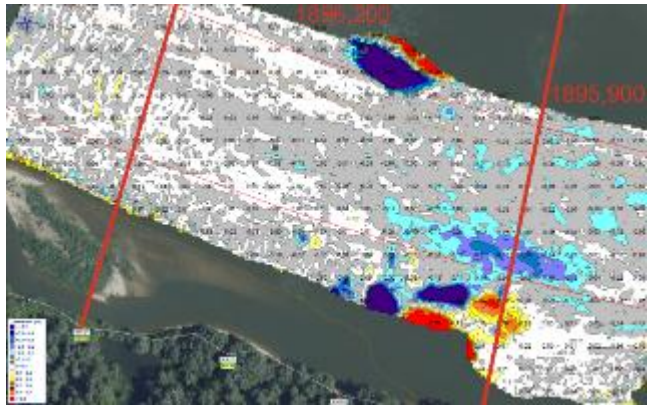
- Successful proof of concept in Austria
- Good basis and lessons learned for further roll-out

Outlook for the rest of the year 2025:

- Pilot in Austria as of July 2025
  - Starting with one barge, not grounded yet due to water levels > Low Navigation Water Level
  - Possible variation of number of barges and angle
- Upcoming pilots in HR/RO/BG:
  - Rental contracts signature until mid September 2025
  - Permits for Romania expected in September 2025
  - Start of pilots planned in fall 2025



11.10. – 28.10.2022 (without barge)



26.08. – 13.09.2024 (after removing barge)

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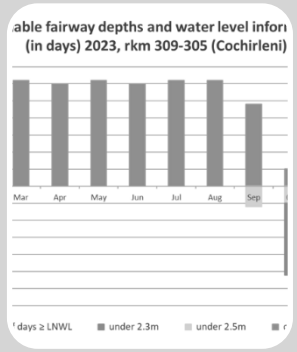
Work packages (WP)

FAIRway Danube

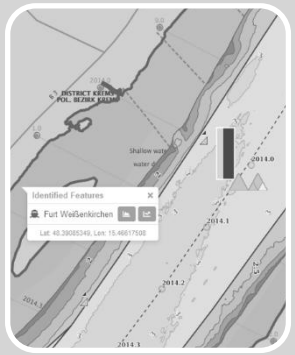
WP2



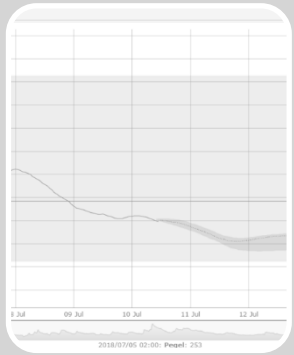
Reports on Good Navigation status (GNS)

WP3

Establish Fixed and Mobile Sensors for Measuring the Good Navigation Status (GNS)



Upgrade of the National Waterway Management Systems **(WAMS) &** the Transnational Waterway Monitoring System **(WAMOS 2.0)**



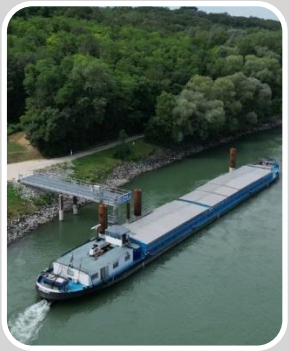
Extended Water-Level Forecast:

Advancing Planning Reliability

WP4

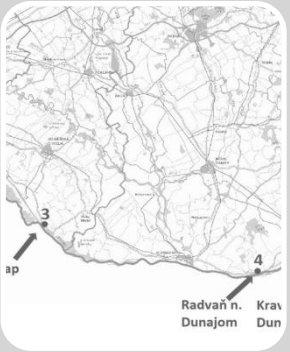
Innovative Solutions for Enhanced Climate Resilience: Pilot Projects for Flexible Infrastructure Elements

WP5



Enhancing Safety and Sustainability: **Upgrade of Mooring Places in Austria and Romania**

WP6



Expanding Mooring Capacities: **Future Investments in Austria, Slovakia, and Croatia**

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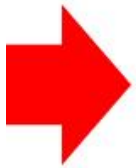
Upgrade of mooring infrastructure

Previous Upgrade in Linz - Austria:



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Upgrade of mooring infrastructure in AT & RO

Planned upgrade at 6 locations:

- **two locations in Aschach - Austria**
- Harbour Krems - Austria
- two locations in Vienna – Austria
- Port Basarabi – Romania
- two locations at Port Medgidia - Romania

construction works started mid **2025**

Upgrade of mooring infrastructure in AT & RO

Planned upgrade at 6 locations:

- two locations in Aschach - Austria
- Harbour Krems - Austria
- two locations in Vienna – Austria
- **Port Basarabi – Romania**
- two locations at Port Medgidia - Romania

3rd Advisory Committee Meeting

Save the Date!

Main Event

📍 *Venue*: **Vienna** TechGate (Donau-City-Straße 1, A-1220 Vienna)

🗓️ *Date*: **5 November 2025**

⏰ *Time*: **10:30 – 16:00 (CET)**

Optional Site Visit & Networking Cocktail

📍 *Location*: River Lab of BOKU University

⏰ *Time*: 16:30 – 19:00 (CET)

Register Now!

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Summary and Conclusion

- **FAIRway projects are drivers for infrastructure development on the Danube**
- FAIRway Danube II is crucial next step for mooring places and flexible infrastructure elements
- Investments of approx. 400 Mil.€ between 2015-2027
  (plus 300 Mil.€ for locks on Danube Black Sea Canal)
- EU-coordination and co-funding is essential for investments

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FAIRway Danube

Thank you for your attention!

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Funded by the European Union

Concluding Remarks

Herfried Leitner
President,
Pro Danube International

Green Inland Ports

THANK YOU

See you tomorrow!