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INTERNATIONAL MARITIME AND PORT TECHNOLOGY AND DEVELOPMENT CONFERENCE
ICMASS 2022
THE 4TH INTERNATIONAL CONFERENCE ON MARITIME AUTONOMOUS SURFACE SHIPS (ICMASS)

AEGIS

Development of an advanced, efficient and green intermodal system with autonomous inland and short sea shipping

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The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement Nº859992.

Image: MacGregor/Cargotec

AEGIS Partners

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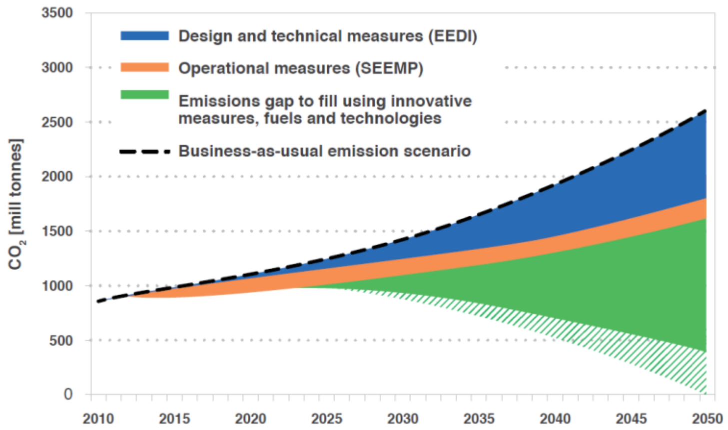
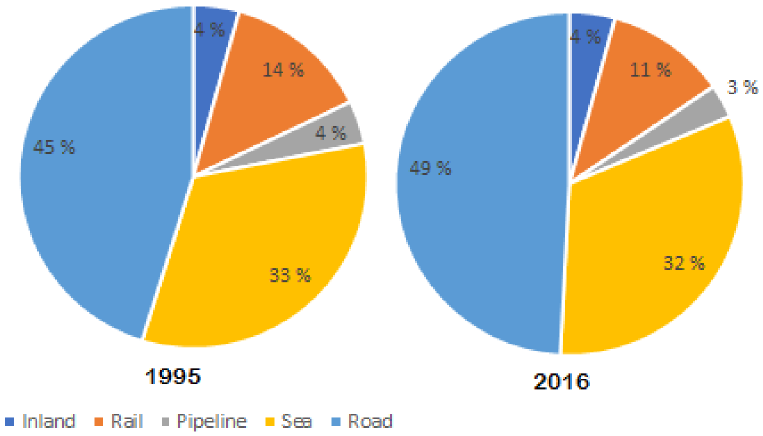
Motivation of AEGIS

- Importance of waterborne transport system for sustainable growth in Europe
- Transport White Paper: 30% of road freight over 300 km should shift to rail or waterborne transport by 2030, and more than 50 % by 2050
- IMO initial strategy for reducing Greenhouse Gas (GHG) emissions: 50% reduction of total annual GHG emissions by 2050, Zero GHG emissions before 2100





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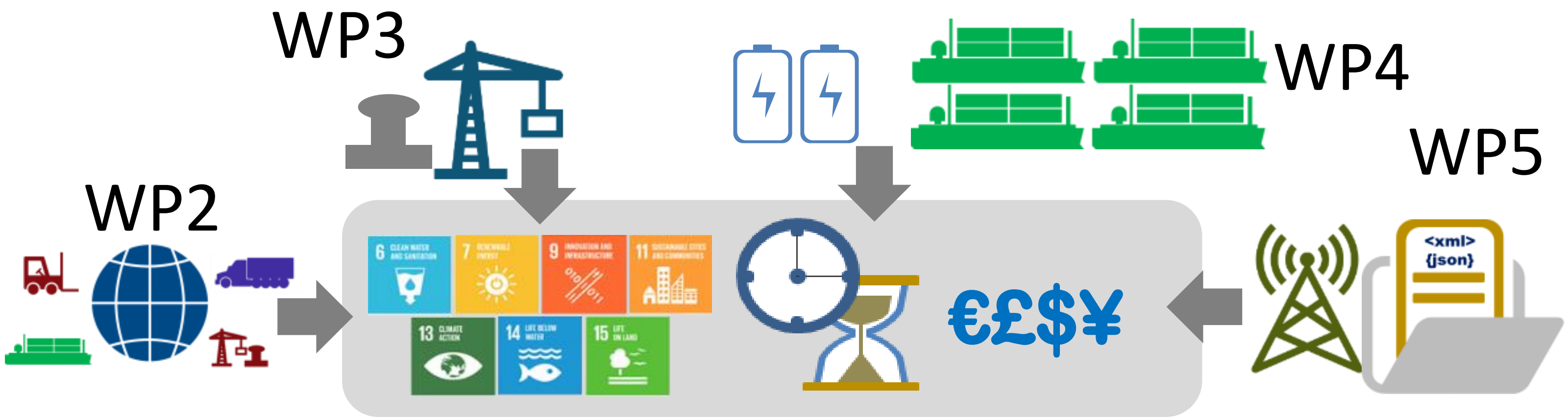
AEGIS approach

- AEGIS will leverage a multidisciplinary team to integrate new innovations from the area of ***Connected and Automated Transport (CAT)***, including more ***diverse sizes of ships*** and more ***flexible ship systems***, ***automated cargo handling***, ***ports and short sea shuttles***, standardized ***cargo units*** and ***new digital technologies*** to design the next generation sustainable and highly competitive waterborne transport system in Europe.



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AEGIS Objectives

- AEGIS specific objectives:

SO1 Minimum GHG emissions, pollution and noise from ship transport and terminals: **Green transport**.

SO2 Resilience, safety and cyber security in highly physically and digitally integrated transport systems: **Robust transport systems**.

SO3 More flexible ship transport by combining smaller and automatic lightweight shuttle vessels with faster medium to long distance ships: **Higher speed, timeliness and frequency**.

SO4 Transport to smaller quays and ports, also outside ISPS areas: **Rural connectivity**

SO5 Automated short distance transport from terminals to end users where possible: **Last mile automation**.

SO6 Enabling ship transport into city centres with no terminal storage space by using small lightweight automated shuttle vessels and just in time arrival: **Urban connectivity**.

SO7 Improved access to waterborne transport for all transport users, minimum administrative hassle: **User centred services**.

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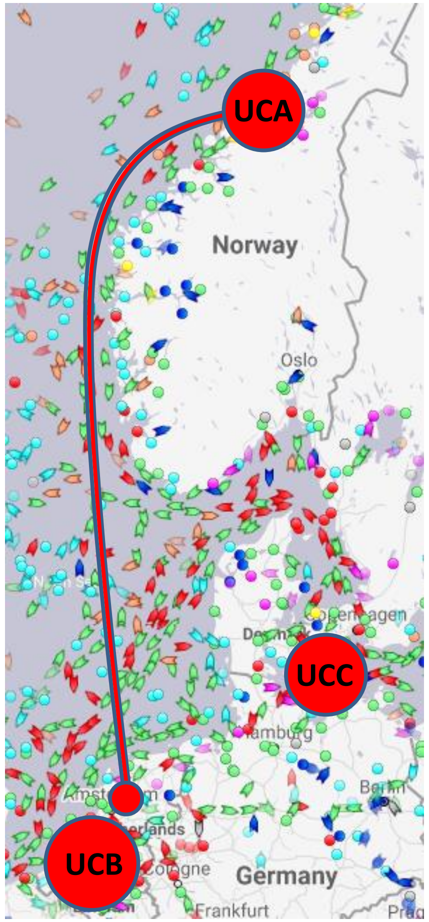
AEGIS Use-cases



- **Use-Case A:** Efficient connection/ interaction between *short sea shipping* and *local* rural and urban *cargo distribution*.
- **Use-Case B:** Creation of an interface between *RoRo transport from several West European ports and inland navigation*. Establish waterway connections between ports and smaller inland destinations. *Automated IWW transportation* system with *zero emission vessels*.
- **Use-case C:** *Revitalizing regional ports* and *city centre terminals*. Key elements are *lower overall costs*, *higher feeder frequency* and a more *competitive RoRo segment*. *Multimodal green logistics solutions* are possible with a combined short-sea shipping an rail transport.

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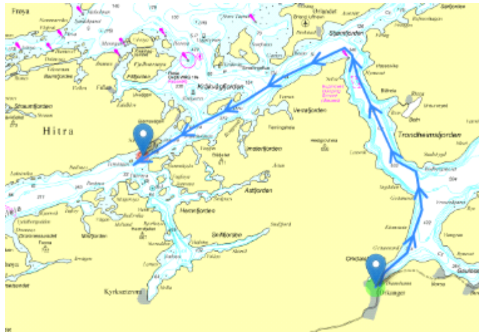
Use-case A

Short sea, urban and rural terminals in Norway

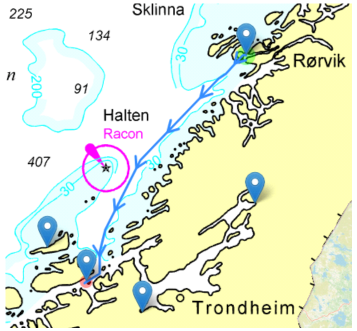
- Short sea transport from Rotterdam along the West Coast of Norway
  - Distance about 850 nm, open sea transport, 6000-7000 TEU weekly
- Hinterland transport within Trondheimsfjorden
  - 4 different scenarios, various characteristics of environment and potential customers (cargo)



Sandstad – Orkanger
- Distribution/collecting for main route from/to Rotterdam
- About 45 nm, TA2-3

Orkanger – Steinkjer
- Distribution within Trondheimsfjorden
- About 75 nm, TA1-2

Frøya – Sandstad
- Frozen fish for Rotterdam
- About 40 nm, TA1-3



Sandstad – Rørvik
- Frozen fish and cargo for further distribution
- About 110 nm, TA3 up to SC

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Use-case A

Mother vessel concepts

	Cargo type	Capacity [TEU]	Propulsion	Cargo Handling	Autonomy level (IMO)
1	Container	900-1000	Hybrid propulsion system (electrical + methanol, ammonia, bio-/e-fuels)	Triple-Joint cranes (SWL 45t) high internal stability, space saving design, anti-sway system	lvl 1-2: automated processes and decision support
2	Container	200	Hybrid propulsion system (electrical + methanol, ammonia, bio-/e-fuels)	On-board cranes (SWL 35t) located on PS to not interfere with potential port side cranes	lvl 2-3: remotely controlled crew on/off board

1: L_{oa}=143.8m | B=25.5m | T_{design}=8.2m

2: L_{oa}=103.5m | B=13.4m | T_{design}=2.7m

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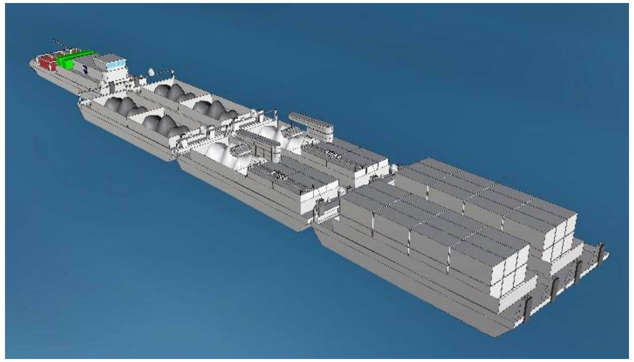
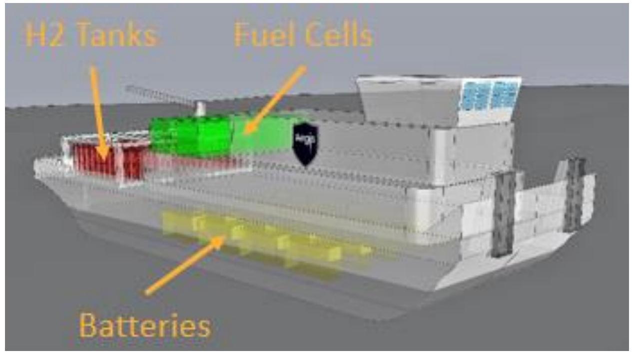
Use-case A

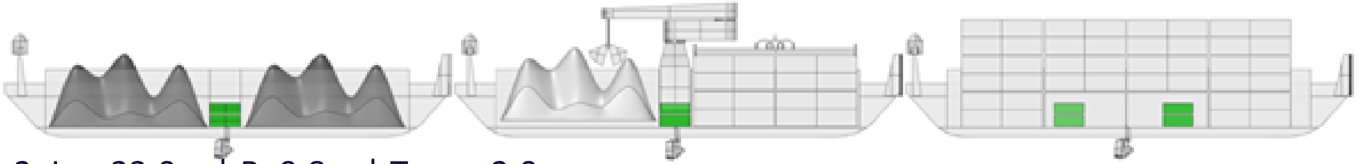
Daughter vessel concepts





1: L_{oa}=33.4m | B=10.8m | T_{design}=2.0m

- Convoy concept powered by fuel cells and batteries
- Highly autonomous push barge lvl 3-4 (1)
  - Without crew on board, remotely controlled or fully autonomous
- Unpropelled/ self-propelled barges (2)
  - For different types of cargo (capacity of 36 containers),
  - optional on board-handling system with triple-joint crane and proper handling equipment
  - Battery room midships above propeller (green)



2: L_{oa}=33.0m | B=9.8m | T_{design}=2.0m

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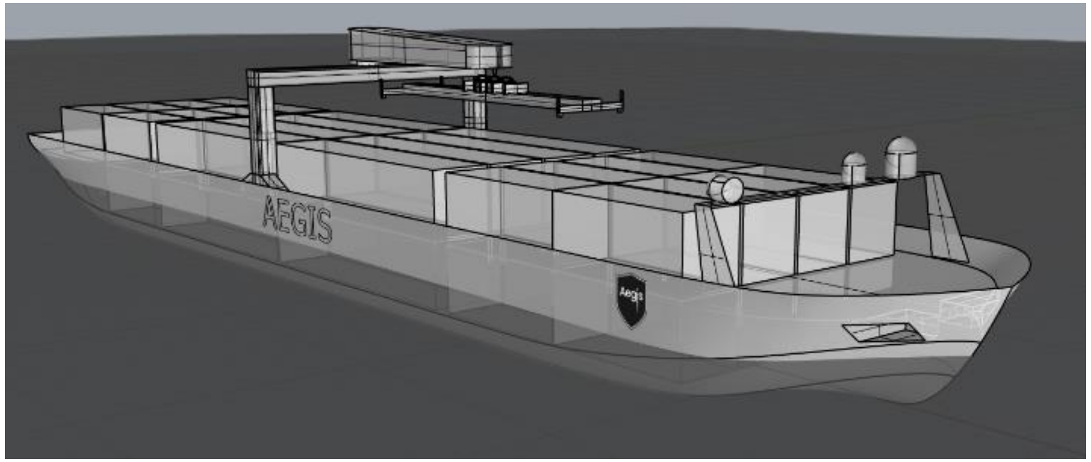
Use-case A

Daughter vessel concepts

- Self-propelled shuttle powered by battery or regional bio-fuels (LBG)
- Highly autonomous (lvl 3-4)
  - Without crew on board, remotely controlled or fully autonomous
  - Multiple sensors, like LIDAR, RADAR, cameras and GPS
  - Automated mooring system
- On-board cargo handling system
  - Fully automated, lightweight build gantry crane
  - Telescopic legs and moveable on guide rails along the vessel length
  - Telescopic spreader for 20 to 45 ft container



L_{oa}=61.0m | B=12.4m | T_{design}=3.3m

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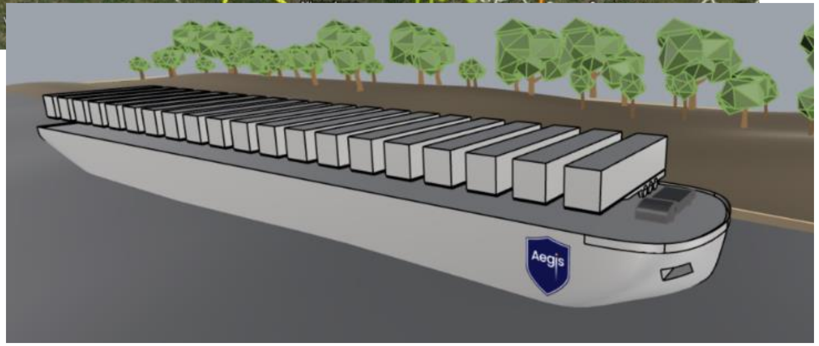
Use-case B

Inland shipping interface in Belgium and Netherlands

- Connection between short sea RoRo-service and RoRo inland waterway transportation
- Cargo flow
  - Rotterdam (1) to Antwerp (3) → fast, direct high cargo volumes
  - Albert-Canal → slower, multiple stops where access to individual cargo is key
- Advantages
  - Last-mile transport closer to customers on waterways
  - Less congestion on roads around the port areas
  - CO_2 emissions are minimalized and offer greener transport chains to the customers



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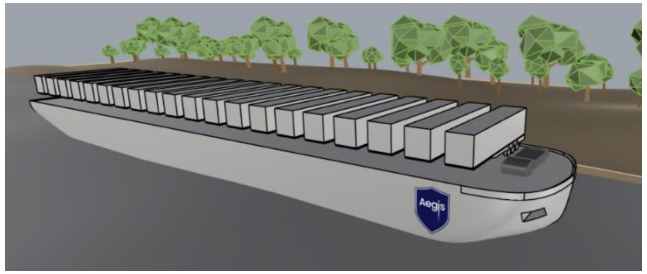
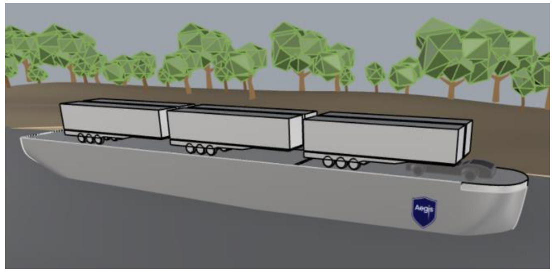
Use-case B

Inland shipping interface in Belgium and Netherlands

- Cargo flow
  - Rotterdam (1) to Ghent (2) → fast, direct, high cargo volumes
  - Ghent – northern part of France → slower, multiple stops, low cargo volumes
- RoRo barges
  - Fully electric propulsion powered by battery
  - No crew on board → remotely controlled or fully autonomous
  - Equipped with lift for double deck loading and integrated ramp



L_{oa}=85.0m | B=15.0m | T_{design}=2.5m
Capacity: 38 Trailer



L_{oa}=55.0m | B=6.6m | T_{design}=2.3m
Capacity: 12-21 Trailer

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Conclusion & Outlook

- Establishment of three use cases and specific user scenarios
- Draft designs of advanced green autonomous vessel according to the specific use-case conditions
  - Daughter vessels, autonomous shuttle and barges
  - RoRo vessels for different inland waterways
- Development of KPIs (economical, environmental, social) for evaluation of draft vessel concepts

- Logistics simulation tool to evaluate vessel designs and user scenarios
- Development of a demonstrator of an autonomous cargo handling system

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Thank you for your attention

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