The AEGIS project: Discussion on Standardization Needs

Harilaos N. Psaraftis
Professor, DTU

09.11.2021

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Image: MacGregor/Cargotec

Talk overview

- Introduce the AEGIS H2020 project
- Introduce the AEGIS task on standardization
- Report some preliminary results

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

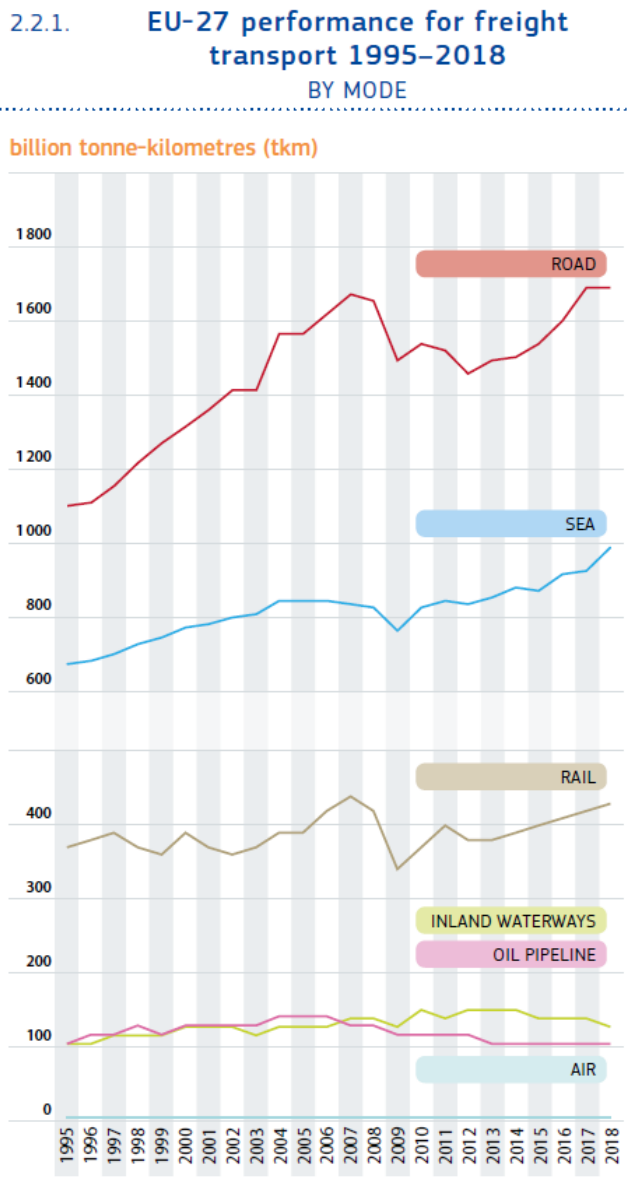
EU ambitions: Shift from road to rail/water

	vs	
Price		
Timeliness		
Transport time		
Flexibility		
Environment		
Frequency		
Security controls		

Riksrevisjonen
Office of the Auditor General of Norway

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Intra EU-27 freight by transport mode



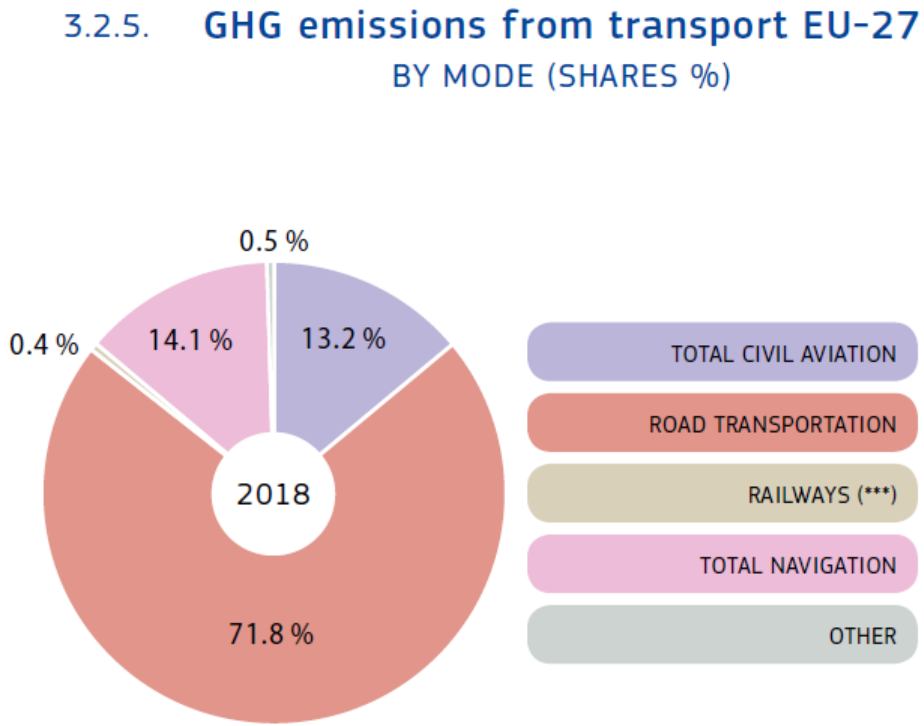
- Source: EU Statistical Pocketbook 2020

GROWTH 1995-2018

- **ROAD 51.6%**
- **SEA 45.8%**
- **RAIL 12.9%**

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Watch out!



- Road emits more GHGs
- How that can be reduced?

- Greener vehicles
- Shift traffic to greener modes

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

The European Green Deal

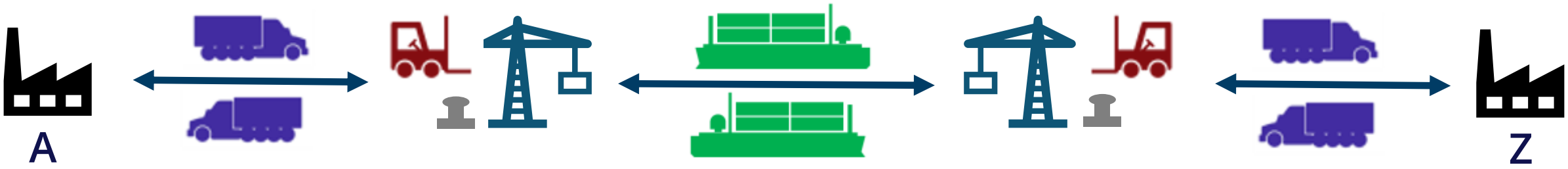
The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Central pillar of the Green Deal

Research and innovation program under Grant Agreement N°859992.

The logistical challenge

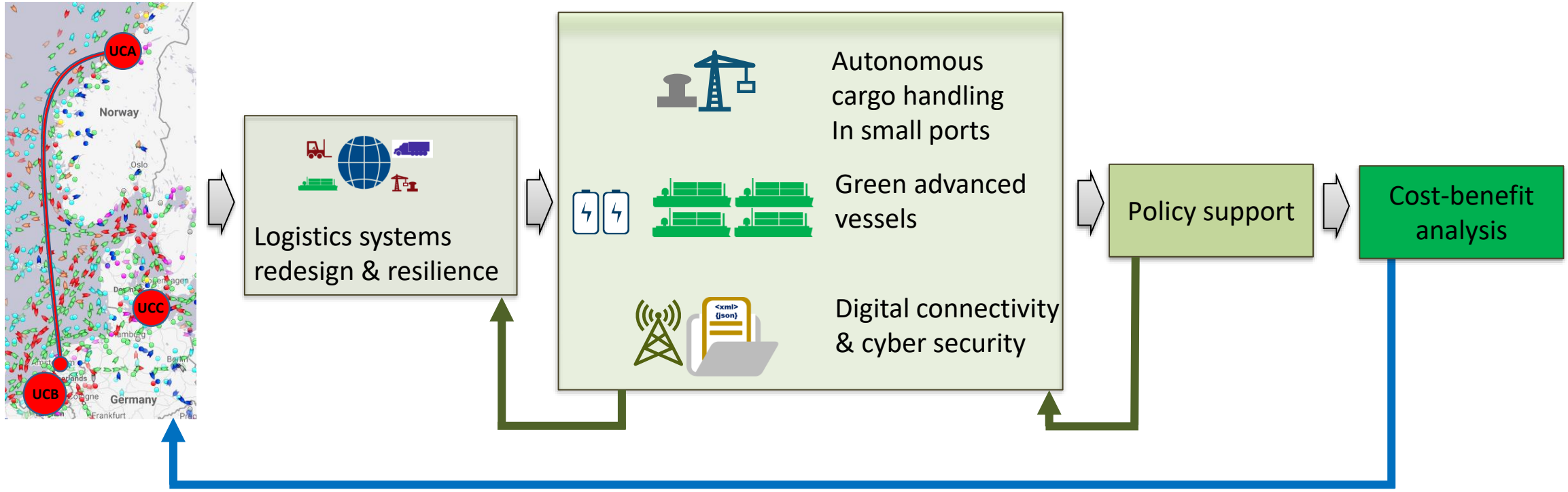
How?



Advanced, Efficient and Green Intermodal Systems

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

The AEGIS project



The project has received funding from the European Union's Horizon 2020
Research and innovation program under Grant Agreement N°859992.

Project data

- EU Horizon 2020 call:
  MG-2-6-2019: Moving freight by Water: Sustainable Infrastructure and Innovative Vessels
- Budget: EUR 7.5 Million
- Start: June 1st 2020
- End: May 31st 2023 (36 months)
- http://aegis.autonomous-ship.org/

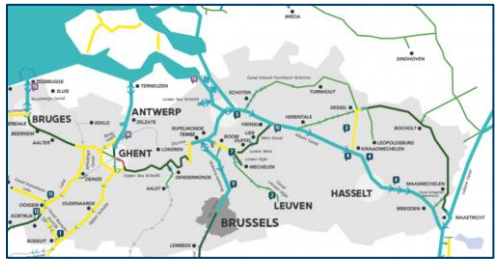
The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

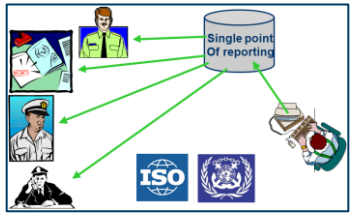
Partners

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Critical technologies and operations

- Logistics system redesign
- New terminal concepts
- Automatic cargo handling
- Autonomous and green shuttle
- Digital connectivity
- Policy measures
- Safety, security and resilience





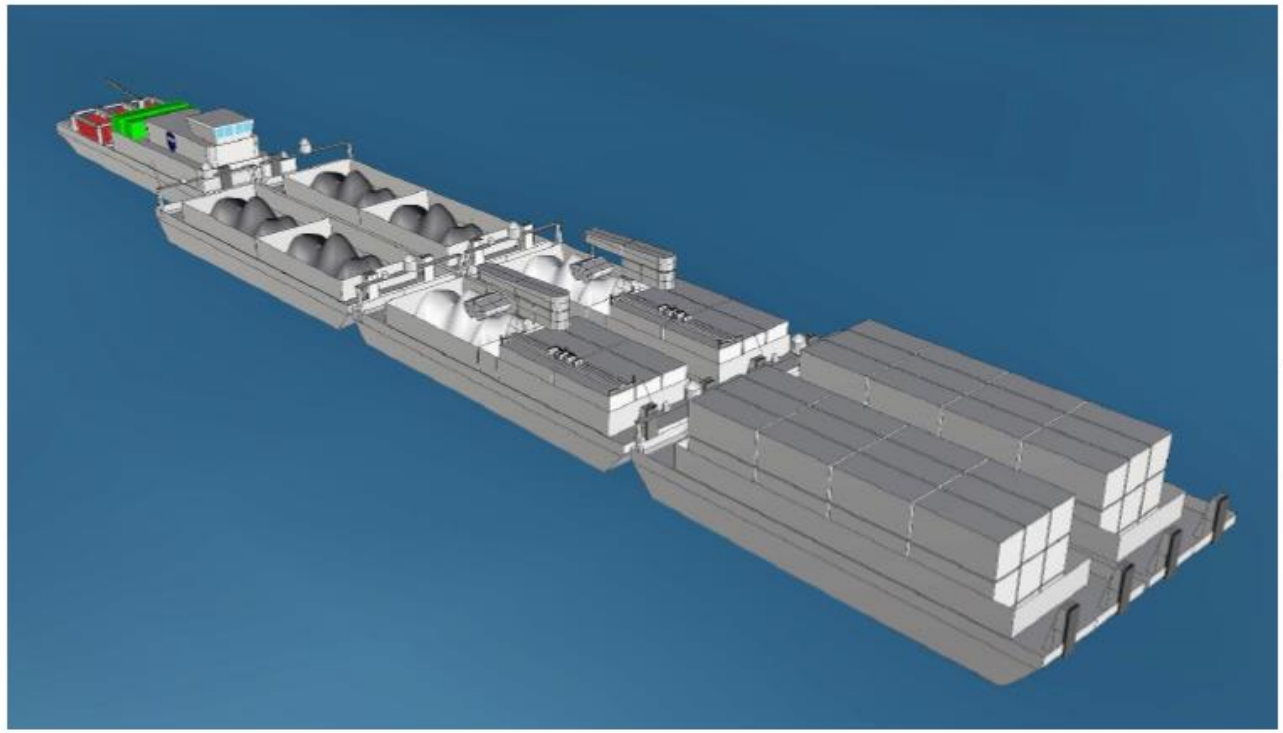
The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

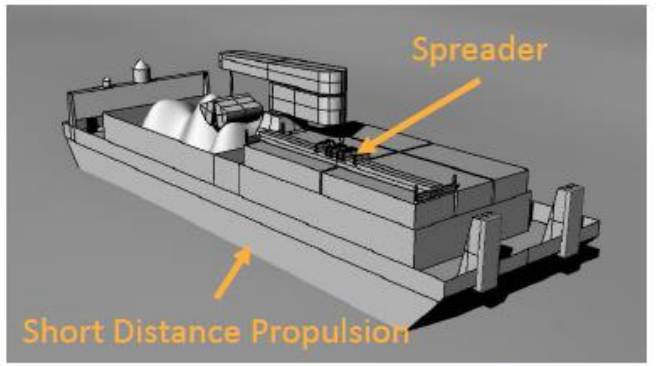
Use-case A: Short sea terminals in Norway

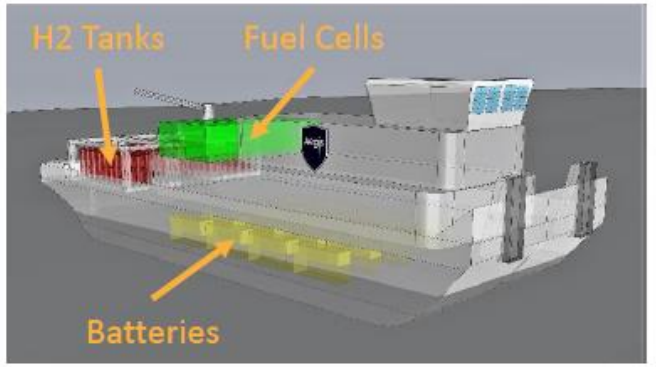
The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Use-case A

Daughter vessel – Trondheim Fjord Area (Scenarios 1 & 2)







Pushed convoy – Barges

- Capacity: **36 TEU** or 875 m3 bulk
- Loa: 33.00 m
- Boa: 9.80 m
- Draft: 3.00 m
- Draught: 2.05 m
- Cargo handling: C-design gantry crane (spreader + bulk grabber)
- Propulsion: fully electric (batteries); small, foldable, centred propellor (useable as generator)
- Autonomy level: high (3–4)

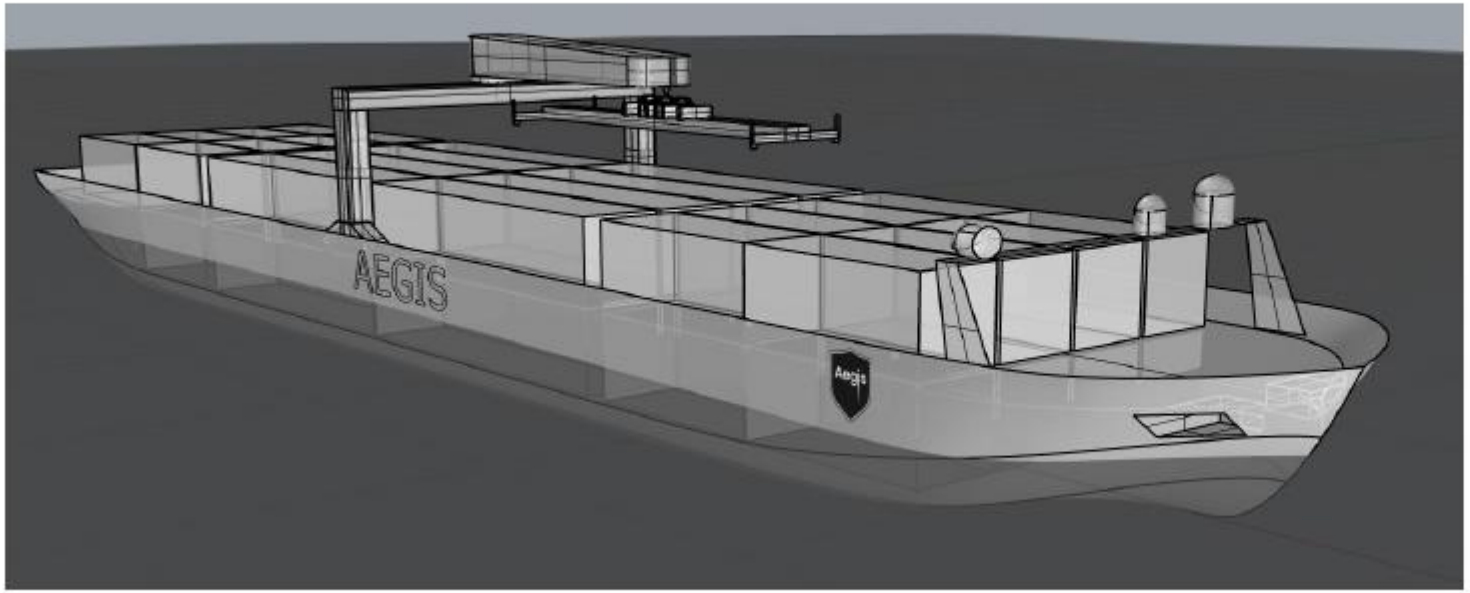
Pushed convoy – Pusher

- Capacity: 3 TEU (H2 bottles in cage)
- Loa: 33.40 m
- Boa: 10.80 m
- Draft: 4.00 m
- Draught: 2.00 m
- Cargo handling: none
- Propulsion: fully electric (H2 FC + batteries; LOHC as option);
  2 x Azimuth thruster á 250 kW
- Autonomy level: medium/high (2–3)

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Use-case A

Daughter vessel – Trondheim Fjord Area (Scenario 2 & 3)

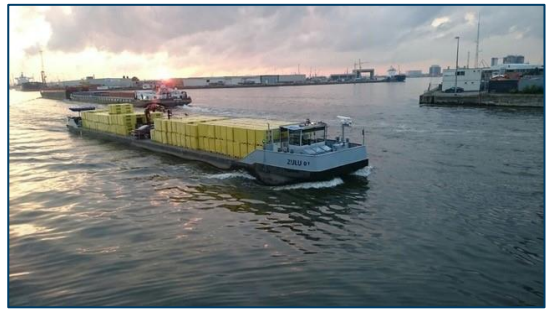


Daughter vessel (Shuttle)

- Capacity: **60 TEU**
- Loa: 61.0 m
- Boa: 12.40 m
- Draught: 3.30 m
- Cargo handling:
  C-Design gantry crane with telescopic legs and telescopic spreader
- Propulsion: Battery
- Autonomy level: high (3 to 4)

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

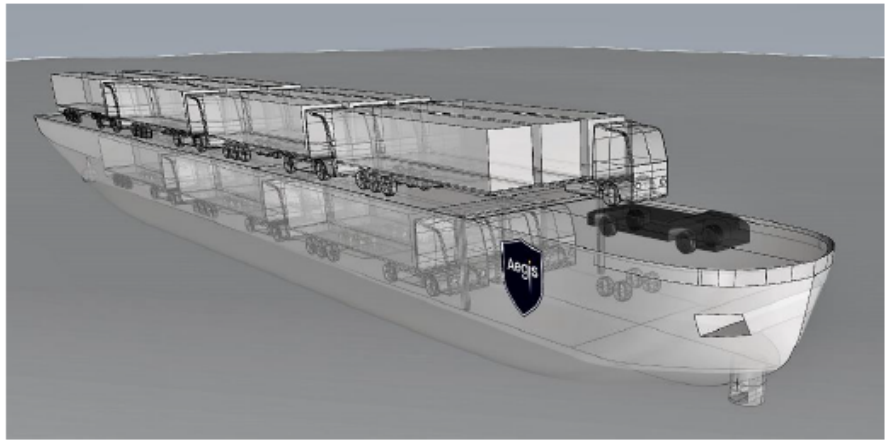
Use-case B: RORO Short sea and inland shipping in Belgium and Netherlands



The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Use-case B

CEMT IV and CEMT VI concepts



RoRo vessel CEMT IV – longitudinal

- Capacity: **21 trucks/trailers** (12 weather deck, 9 lower deck) -updated-
- Loa: 85.00 m
- Boa: 9.50 m
- Draft: 7.00 m
- Draught: 2.50 m
- Cargo handling: lift + ramp (not shown); autonomous vehicle (optional)
- Propulsion: fully electric (Fuel Cell and/or batteries); 2 x Azimuth thruster + 1 x rotatable bow thruster
- Autonomy level: high (3–4)

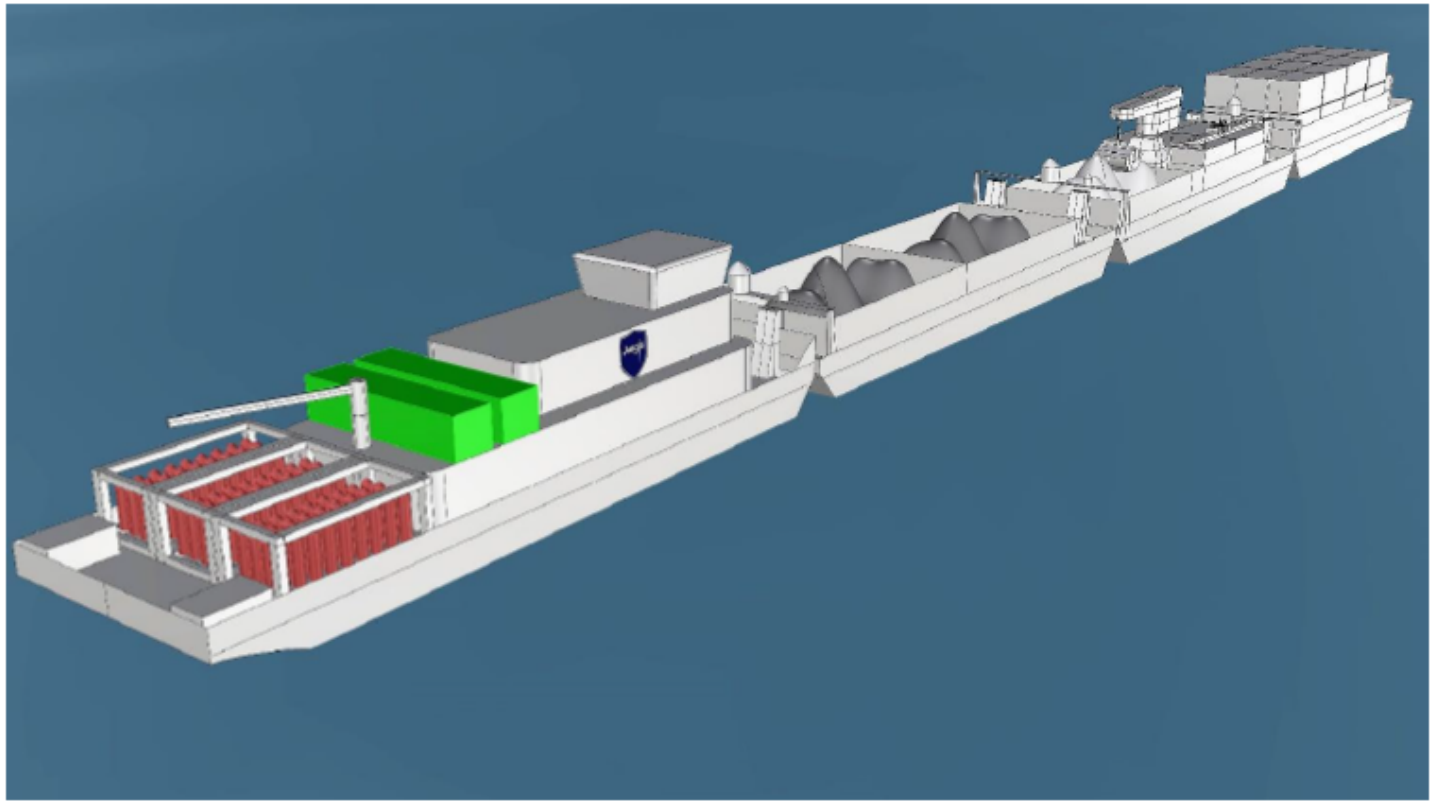
RoRo vessel CEMT VI – transversal

- Capacity: **38 trucks/trailers** (20 weather deck, 18 lower deck)
- Loa: 85.00 m
- Boa: 18.10 m (15.00 m, if just trailers + AGV)
- Draft: 7.00 m
- Draught: 2.50 m
- Cargo handling: lift + ramp (not shown); autonomous vehicle (optional)
- Propulsion: fully electric (Fuel Cell and/or batteries); 2 x Azimuth thruster + 1 x rotatable bow thruster
- Autonomy level: high (3–4)

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Use-case B

Convoy with Pusher

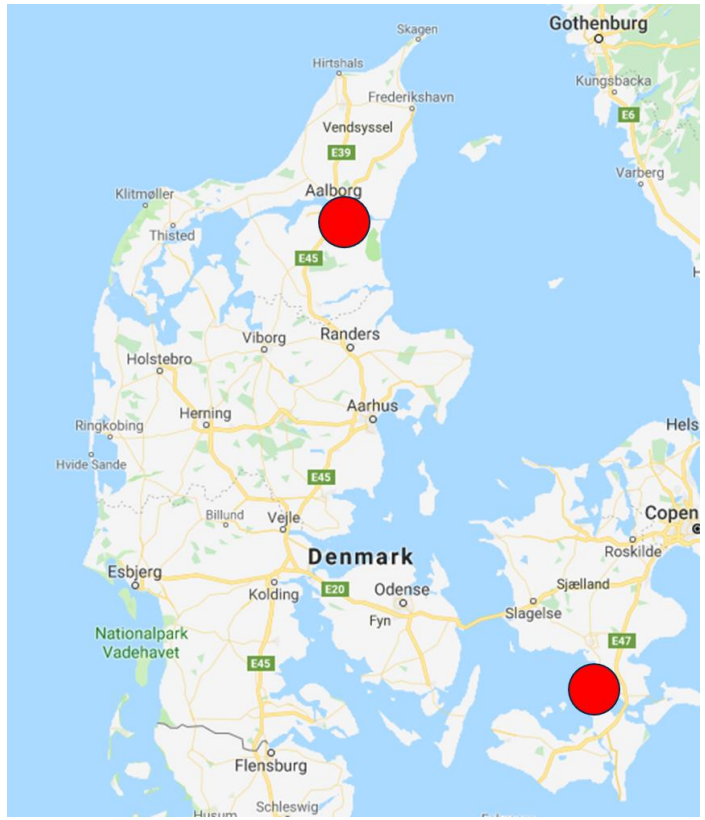


Pushed convoy – adopted size

- Synergies from UC-A
- Size of pusher and barges scaled-down to CEMT II → width of 2 TEU
- Adopted number of barges (behind + besides) according to available CEMT class on route and cargo volume
- Barges with own short distance propulsion
- Flexible coupling/decoupling
- High level of autonomy (3–4)

Research and Innovation program under Grant Agreement N°859992.

Use-case C: Revitalizing regional ports and city center terminals; Aalborg and Vordingborg



- From road to sea
- Use of autonomous feeders?
- Automatic cargo handling
- Improved port logistics

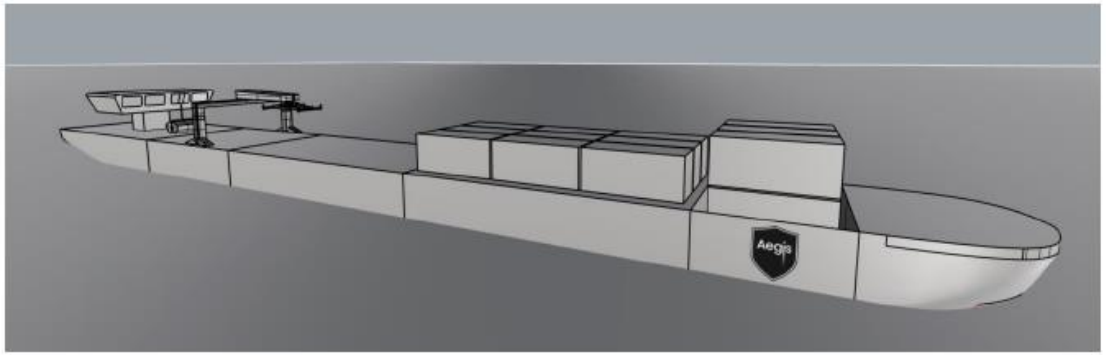
The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Use-case C

Short sea Container and Combi Concept

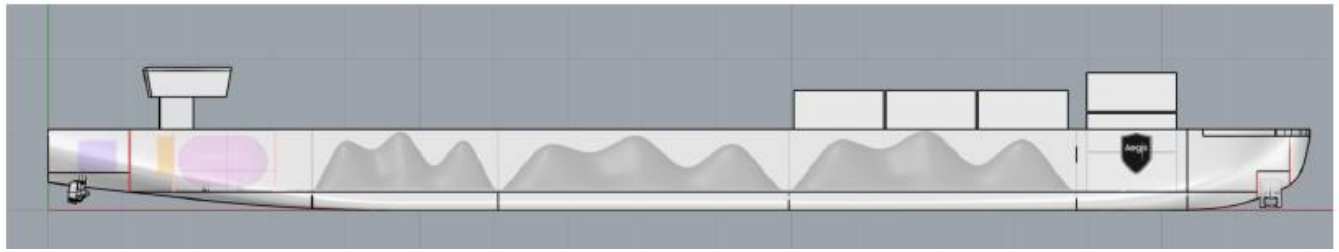
Short sea container concept

- Capacity: 128 TEU
- Loa: 71.00 m
- Boa: 10.90 m
- Draught: 2.80 m
- Cargo handling: Crane with spreader
- Propulsion: fully electric or hybrid solution (Fuel Cell and/or batteries)
- Autonomy level: high (3–4)



Short sea combi concept

- Capacity: about 20TEU and 620t cargo
- Loa: 85.00 m
- Boa: 9.50 m
- Draught: 2.50 m
- Cargo handling: C-Design gantry crane with telescopic legs, telescopic spreader and bulk grabber
- Propulsion: hybrid (LNG/Methanol/Ammonia + Battery); 2 x Azimuth thruster + 1 x rotatable bow thruster
- Autonomy level: medium (2–3)



The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Overall AEGIS methodology

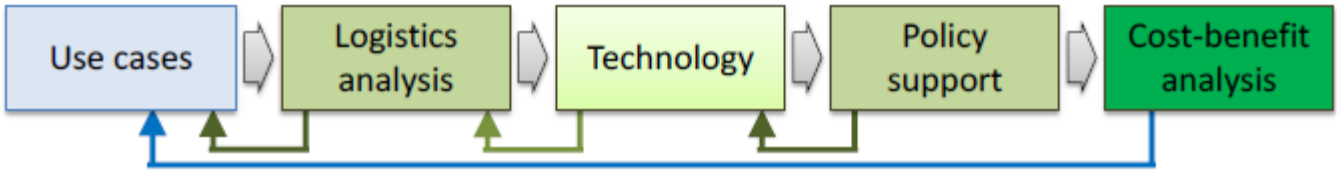


Figure 5: The overall Aegis methodology

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

AEGIS work packages

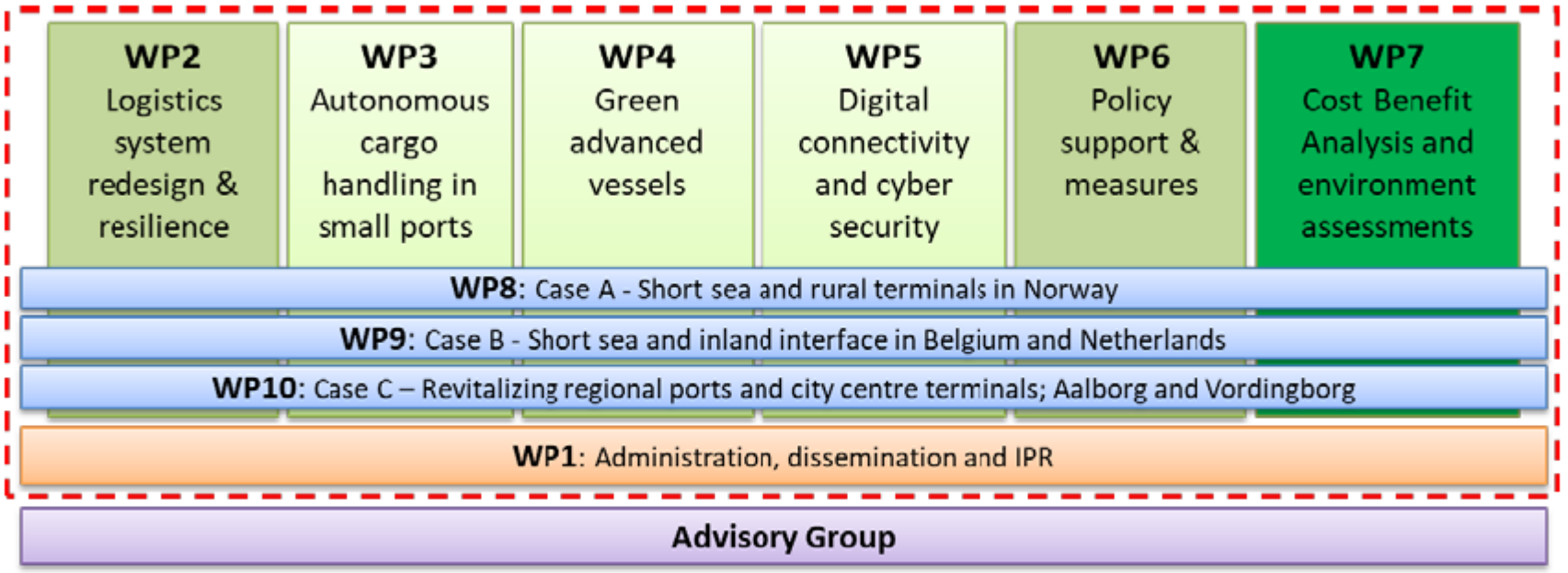


Figure 16 – Work package structure

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

AEGIS work packages

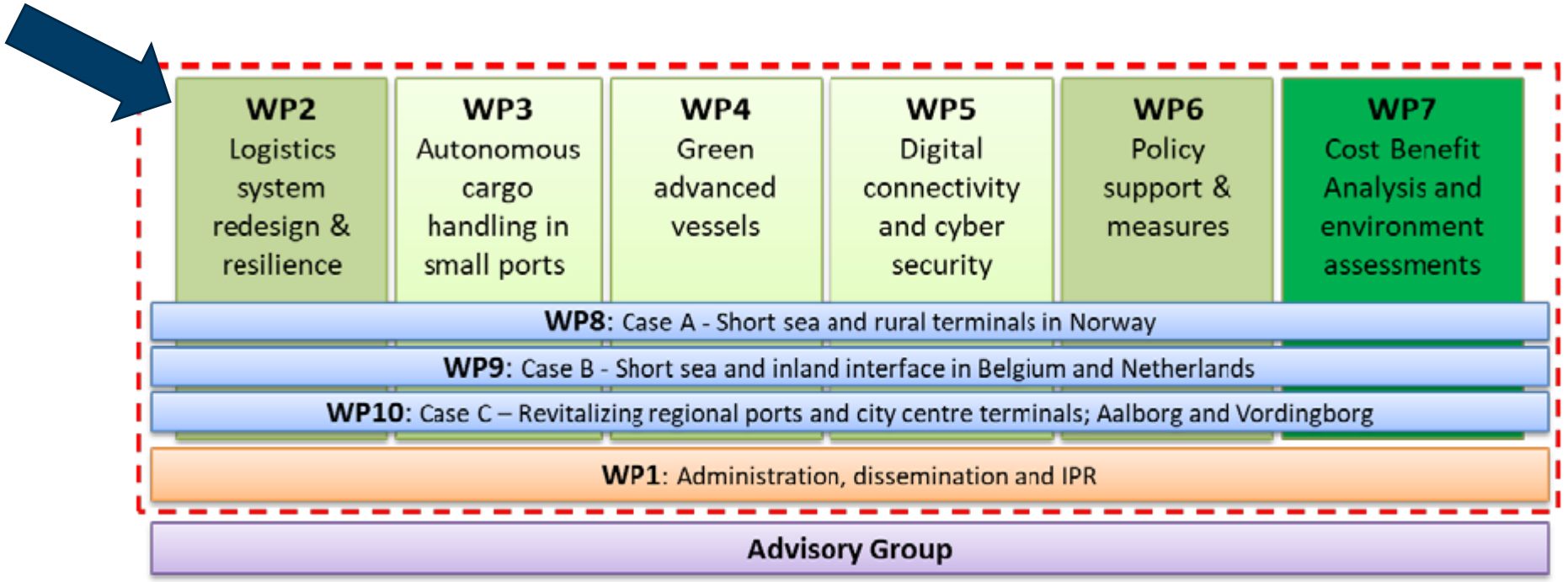


Figure 16 – Work package structure

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Objectives of Work Package 2

AEGIS will develop user-centred logistics systems with new components, better service quality and much lower impact on environment and society. WP2 focuses on:

- Minimizing terminal storage.
- Making better use of remote terminals and complement it with small urban and rural terminals.
- Maximizing automated cargo handling, including standardization of cargo units.
- Increase frequency and overall speed of waterborne transport.
- New automated work processes for digital exchange of data.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

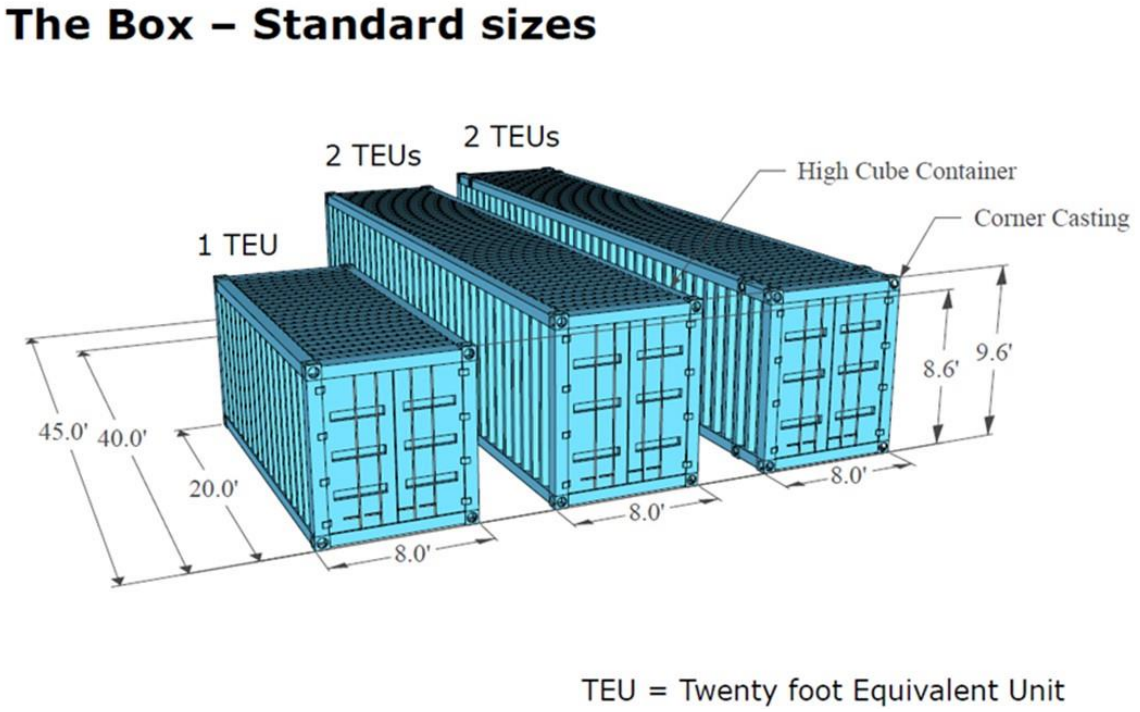
Task 2.2: Effects of Standardized Cargo Units

- Focuses on analysing possibilities for more use of standardized cargo units in maritime and intermodal transport.
- Estimates the positive and negative effects of substantially higher cargo unit standardization using the three use-cases as examples.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Background: maritime containers

- TEU - twenty foot equivalent unit (20”)
- FEU – forty foot equivalent unit
- Also 45 foot, more common in N.America (and some even larger)
- Slight variations in height and width
- Challenge considering intermodality as some larger containers may not be permitted in roads



The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Standardization – harmonization

- EU tried to harmonize dimensions back in 1995
- Short-sea shipping vs deep sea shipping and competition:
  - 13.6 meters trailers (carrying 33 pallets)
- Standards are important for intermodality
- Non-standard container dimensions risk being used only in one mode or even only one trade lane

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Relevant directives

COUNCIL DIRECTIVE 96/53/EC

of 25 July 1996

laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Questionnaire

CIRCULATED INTERNALLY AND TO ADVISORY GROUP

- What types (LoLo/RoRo/other) of loading units are candidates/most attractive for the solutions envisaged in AEGIS?
- What sizes (20/40/45/other) are relevant? Is there an initial preference for any of the above?
- What are the key determinants of storage/cargo handling efficiency? Which are the key parameters that should be studied to make the new AEGIS cargo handling a better solution?
- Is cargo unit standardization key for a more efficient cargo handling operational system? Who would benefit the most from it (small/big terminals…)?
- Any other relevant information?

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Preliminary Results

QUESTION A:

What types (LoLo/RoRo/other) of loading units are candidates/most attractive for the solutions envisaged in AEGIS?

ANSWER: Both trailers and containers.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Preliminary Results ii

QUESTION B:

What sizes (20/40/45/other) are relevant? Is there an initial preference for any of the above?

ANSWER: 45ft fit trucks (it can be an alternative to road freight) and 20ft is easier to handle and automatize.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Preliminary Results iii

QUESTION C:

What are the key determinants of storage/cargo handling efficiency? Which are the key parameters that should be studied to make the new AEGIS cargo handling a better solution?

ANSWER: Cost and Standardization.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Preliminary Results iv

QUESTION D:

Is cargo unit standardization key for a more efficient cargo handling operational system? Who would benefit the most from it (small/big terminals…)?

ANSWER: Yes, it allows automatization. Small terminals.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Task 2.2: Preliminary Results v

QUESTION E:

Any other relevant information?

ANSWER: Automated palletized cargo is interesting.

Lightweight containers are key to reduce costs.

Stuffing and sharing of containers could be key to utilize the containers in a more efficient way.

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.

Thank you very much!

- Looking forward to the discussion!

The project has received funding from the European Union's Horizon 2020 Research and innovation program under Grant Agreement N°859992.