3 Challenges for Inland Waterway transport

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Zulu Associates Group

ZULU Associates Group is active as an initiator, developer and operator of innovations in the marine component of logistic chains.

It develops a fleet of **zero emission** commercial vessels on **short sea**, **coastal** and **inland waterways** routes through **autonomous operation** combined with **alternative propulsion.**

These vessels are offered to shippers on a "**Ship As A Service"** basis: the availability of cargo capacity in a predetermined geographical area, based on a time charter concept combined with all necessary operational services .

www.zulu-associates.com

Zulu Associates Group

Who we are

Antoon van Coillie Chief Executive Officer

Entrepreneur, presently active as director of Blue Line Logistics, an inland shipping company, as well as director ZULU Associates and Anglo Belgian Shipping Company.
He holds an MBA degree of the Anderson Graduate School of Management at UCLA and is an alumnus of the Belgian American Educational Foundation. He also holds a degree of Commercial Engineer (Solvay) of the Free University Brussels.

Before being active in the inland waterway and marine industries, he acquired a wide experience in the construction and the financial industry in different capacities.

He founded Blue Line Logistics in 2011 conceiving and developing the Pallet Shuttle Barge (aka ZULU) concept for moving palletized goods on inland waterways. Since then, he has initiated programs to develop autonomous vessels for inland and short sea freight.

He served as Reserve Officer in the Belgian Navy, minesweeping, fishery protection.

James Fanshawe CBE Director

James Fanshawe retired from the Royal Navy in 2005 after five commands and an appointment as the Director of Plans at the UK Permanent Joint Headquarters.

James works within a mixed commercial portfolio. He is a Director of the Anglo Belgian Shipping Company and is on the board of Drone Major Group and SEA-KIT International. He is a frequent conference chairman and speaker. He chairs the UK's Maritime Autonomous Systems Regulatory Working Group, which has released Codes for the safe operation of Maritime Autonomous Surface Ships. He is a member of the UK Maritime Autonomous Systems Steering Group and the MAS Council and is a moderator for the UNECE work on Autonomy on Inland Waterways.

He is the Chairman of Care for Veterans.

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Who we are

Jan Tellkamp Chief Technology Officer

Jan is a Naval Architect with over 20 years of experience in the marine industry.

Graduating from Hamburg University, he spent more then a decade with Flensburg Shipyard. Being a part of the yard's R&D team, he initiated and managed significant research projects on various topics affecting ship safety and ship performance.

From there Jan joined Det Norske Veritas in Germany to support the German marine industry in their innovation activities towards using fuel cells and low emission fuels. The result of this was the first installation of a fuel cell on a passenger vessel on international voyage, and in the first recommended practices for bunkering of LNG. Following the merger of DNV and GL to DNV GL, Jan was given the responsibility to develop the new company's international consultancy business along the LNG value chain.

In 2019 Jan founded his own company Juliet Tango Charlie, and in 2020 he joined ZULU Associates to guide oversee the groups integration of technologies into zero emission, autonomous ships and supporting infrastructure.

3 Challenges for Inland Waterway transport

- Sustainability
- Modal Shift
- Crew Shortages

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SUSTAINABILITY

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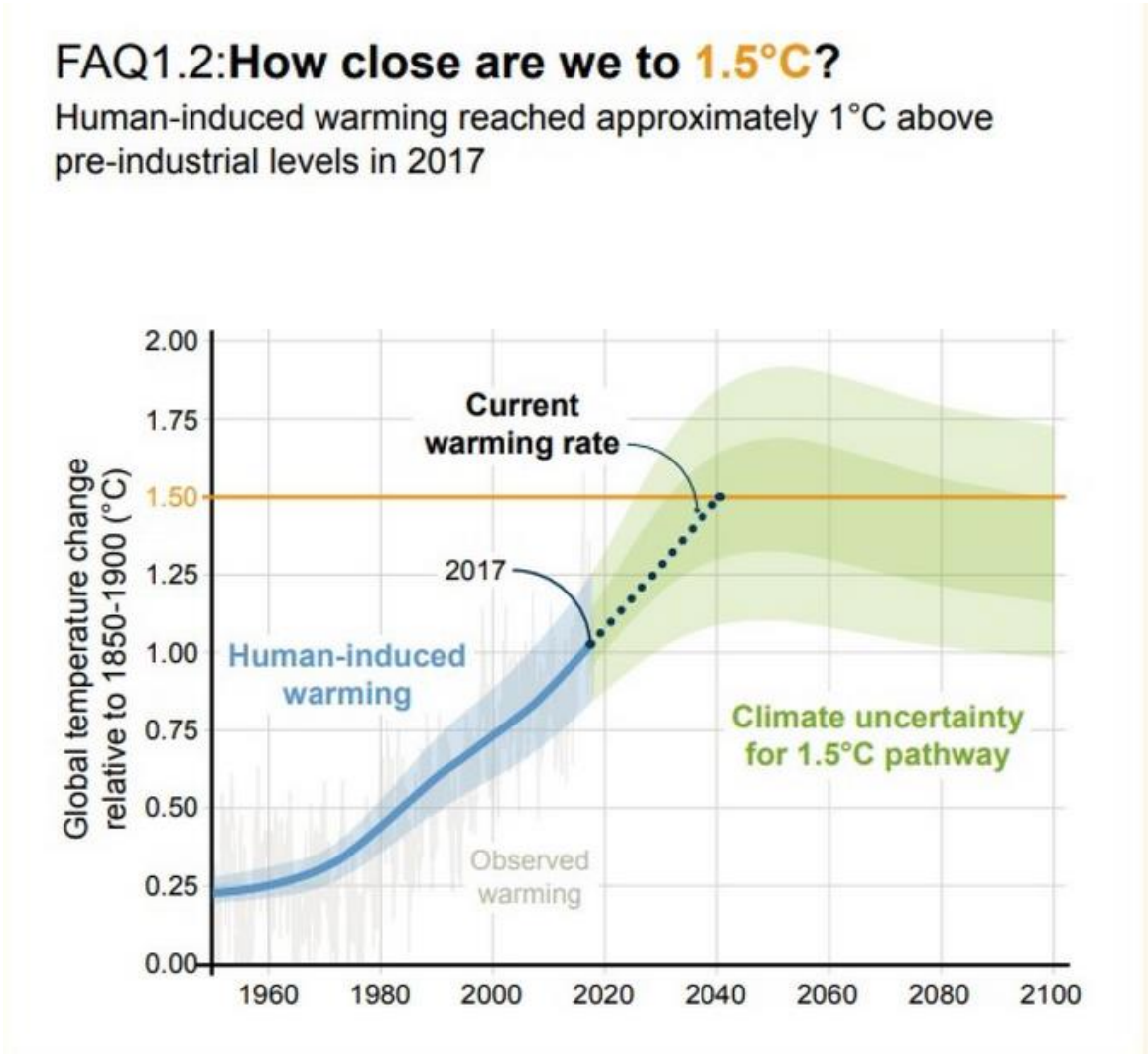
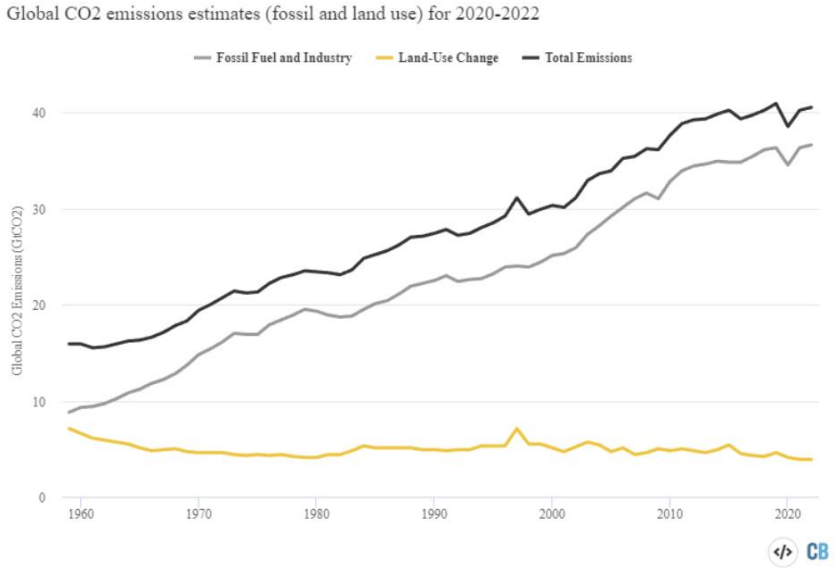
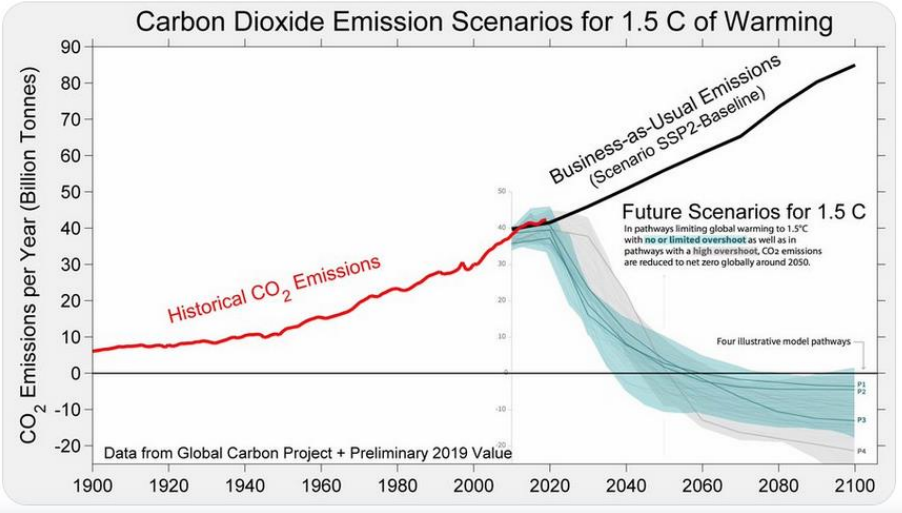
Sustainability:





Global emissions for land use had a steady decrease over the years Image: Carbon Brief



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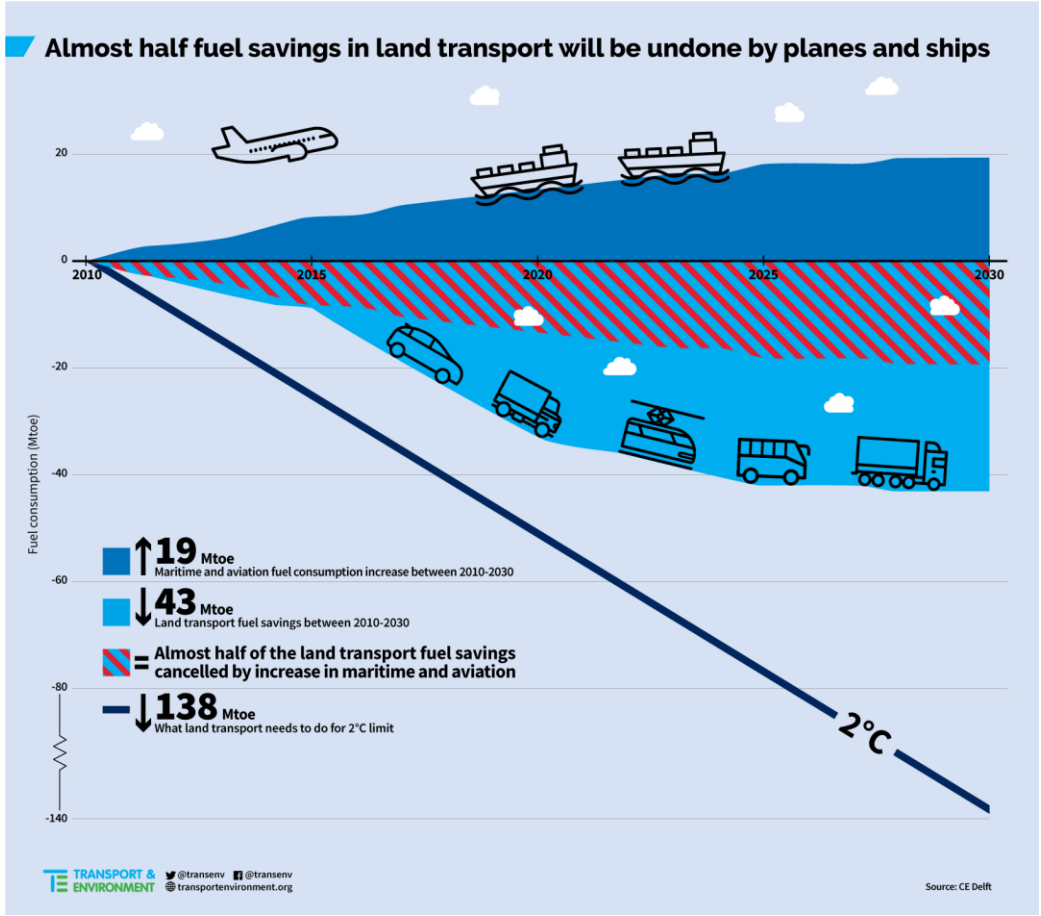
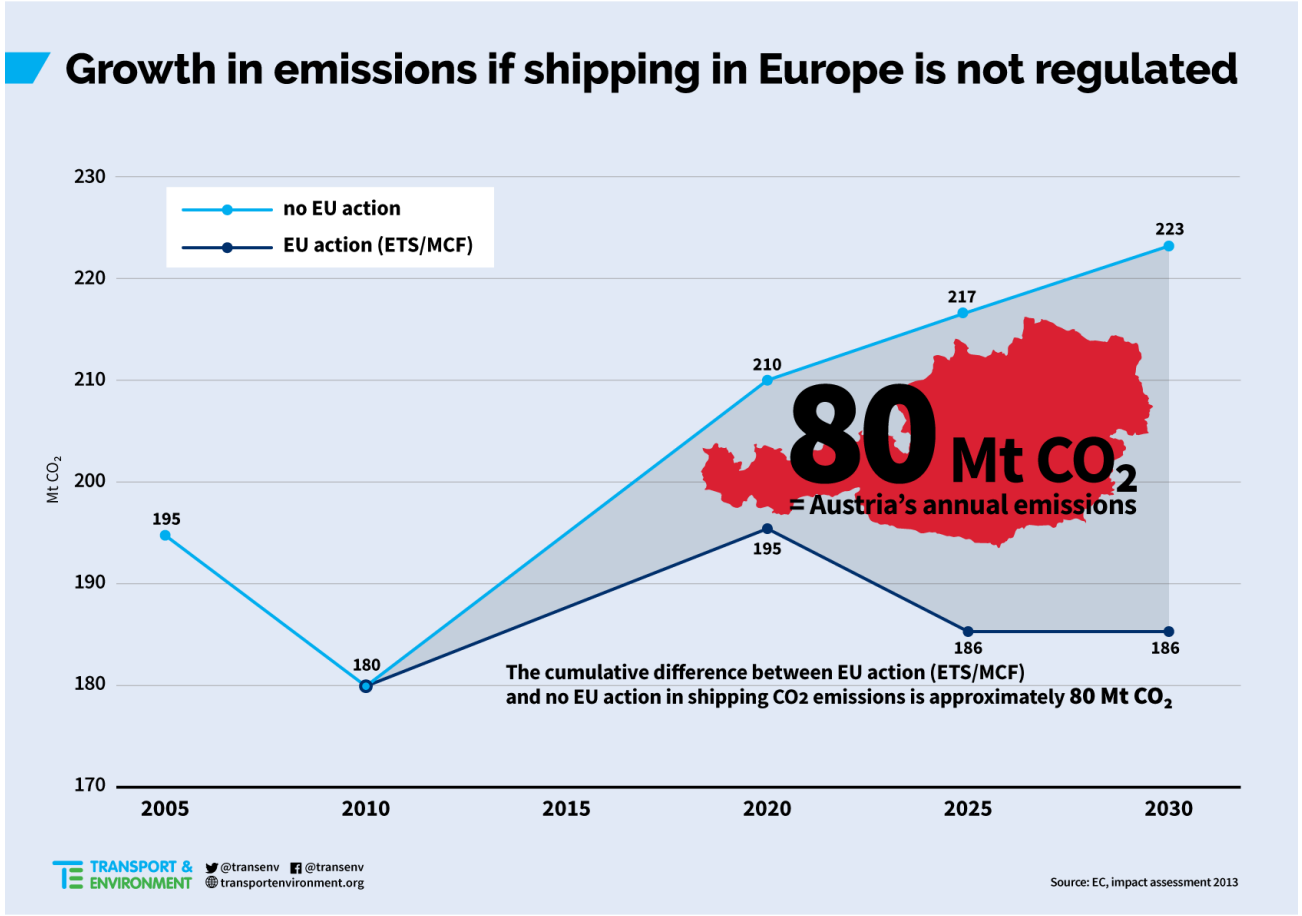
Sustainability: Emissions from Shipping





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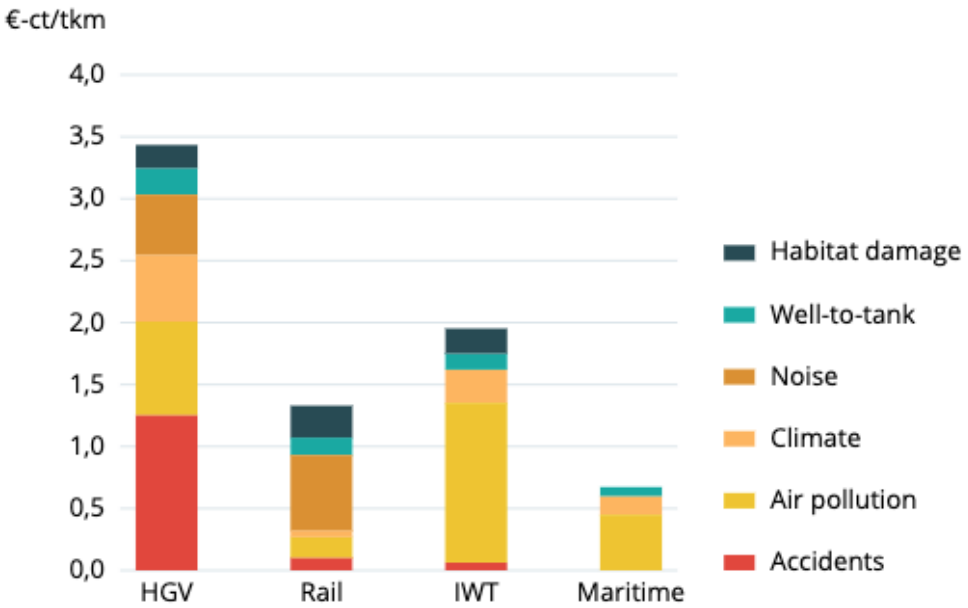
Sustainability

- Inland shipping is a more sustainable transport mode than trucks….in 2016…. now ?



2016 Source EC

Volvo Trucks test e-trucks op waterstof op openbare weg

Nieuws, Transport

Yannick De Spiegeleir 8 mei 2023 om 11:05

MODAL SHIFT

Panteia: wegvervoer tegen 2045 op alle fronten schoner dan binnenvaart

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Sustainability: Inland Waterway Transport

- Euro stage 2 diesels and even Eurostage 5 diesels are less sustainable than Euro stage 6 diesel truck, not to mention e-trucks or H2 powered trucks
- IWT barges on Rotterdam-Duisburg corridor emit today more nitrogen per container moved than trucks
- Many ships are outdated both technically and in terms of performance
  - The dry cargo fleet remains the oldest one within all categories, with 84% of the fleet being built in the 20th century and 16% in the 21st century.(CCNR)
  - In France, 98% of the dry cargo vessels were constructed before the 21st century. (CCNR)
  - In fact 70% of Dutch container fleet is older than 44y. (KMI)
- An existing urgent need for fleet renewal or costly refurbishment programmes driven by higher expectations from transport customers and tougher regulations such as Euro Green Deal emissions targets
- Ever bigger barges need 60/80% more energy in constrained waterways
- ETS voted this year is expected to be extended to vessels from 400GT upwards

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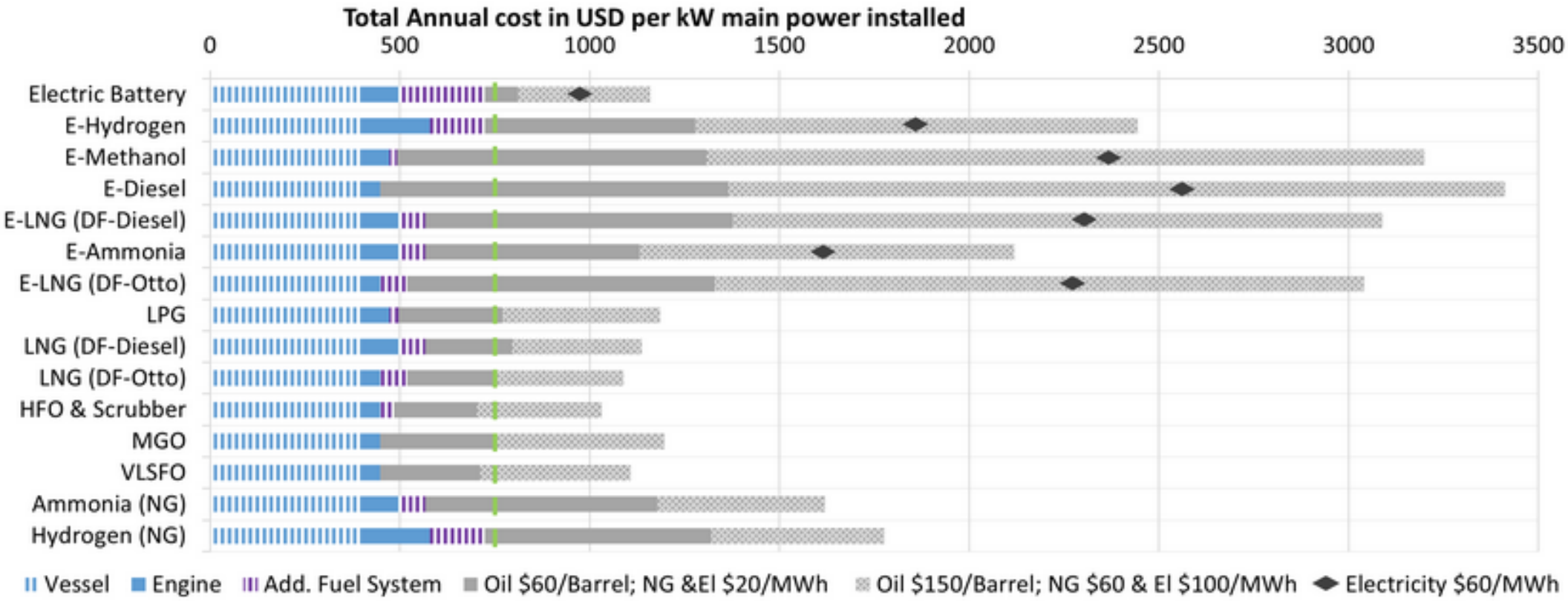
Reducing emissions from Shipping: issue the economics



https://blog.sintef.com/sintefocean/zero-carbon-e-fuels-are-they-sustainable-for-maritime-transport/

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Reducing emissions from Shipping: issue the economics

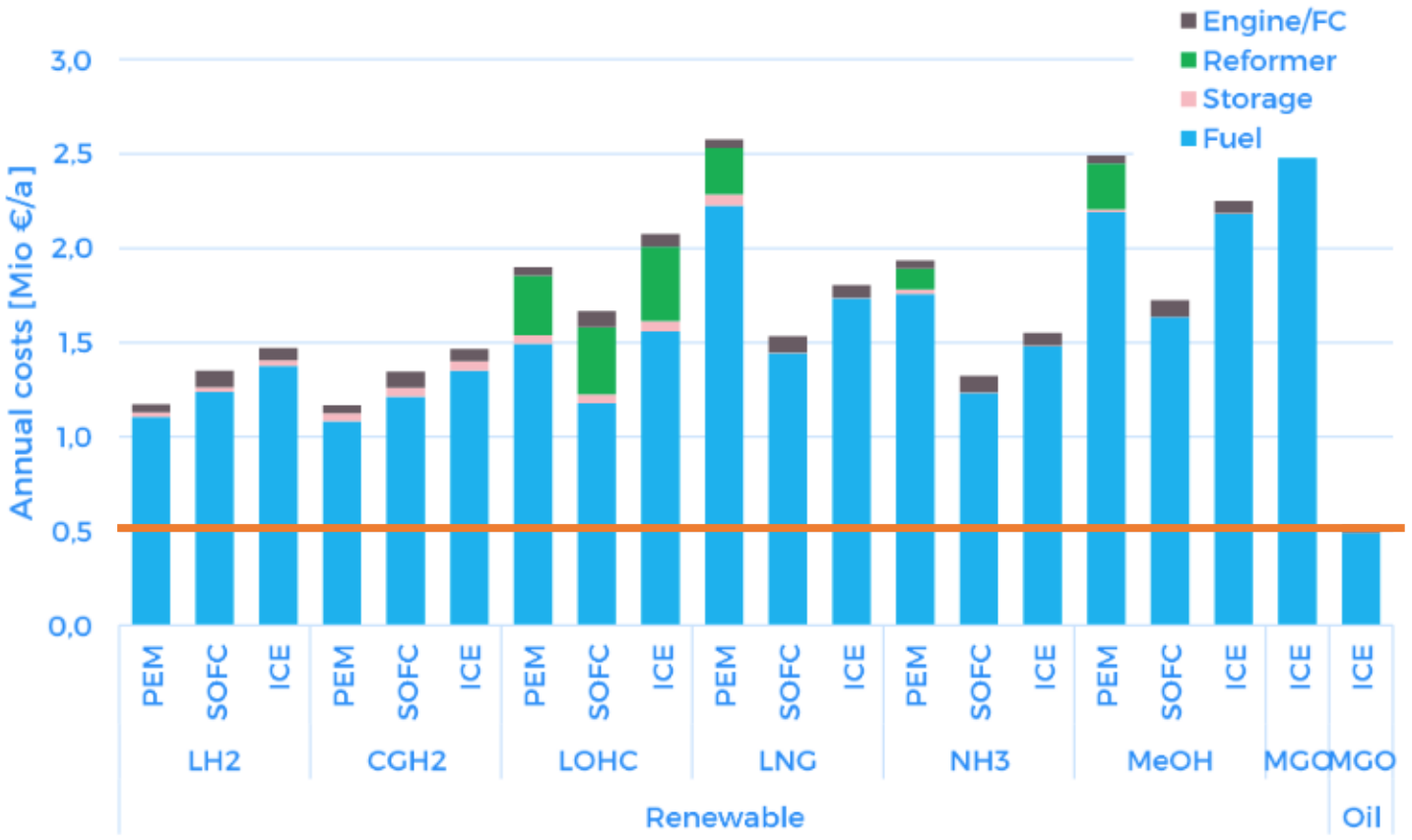

Figure 25. TCO analysis (in M€ p.a.) for a PSV vessel

Source H2SHIPS

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Sustainability: Inland Waterway Transport

Choice of propulsion system ?
Innovation cycle ? Barges vs trucks

- Hydrogen ICE
- Hydrogen Fuel Cell
- Batteries
- Methanol
- Ammoniac
- …..

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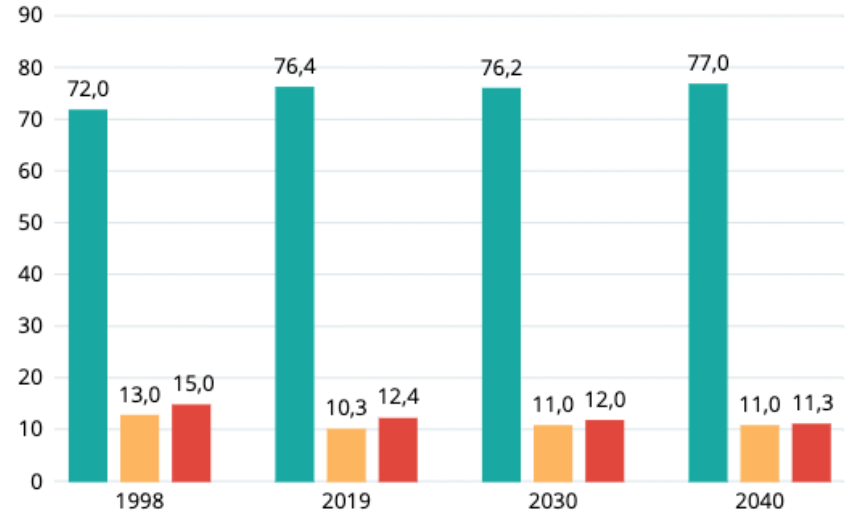
MODAL SHIFT

Modal Shift: expected modal split in Belgium 1998 - 2040

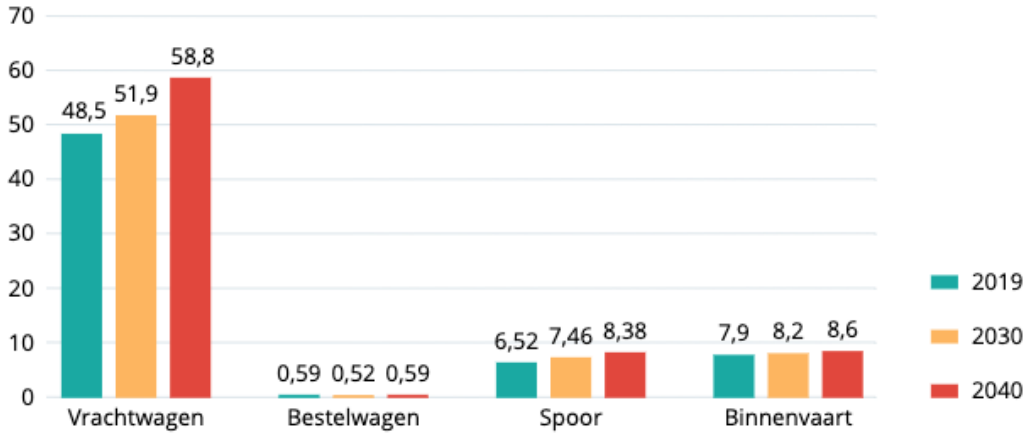
MORA study 2022

Figuur 15: Prognose modale verdeling goederenvervoer (op basis van tonkm)



Bron: Federaal Planbureau + Ontwerp mobiliteitsplan Vlaanderen 2001

Figuur 14: Evolutie van de vervoersvraag in het goederenvervoer per modus (miljard tonkm)



Bron: Federaal Planbureau

It is not happening

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Inland Waterways modal shift

Present system

- Large vessels – economies of scale paradigm vector
- Consolidation hubs
- Minimum ‘’call’ sizes for container handling
- Use of same cranes/quaysides for ocean ships and IWT
- No comprehensive and effective sail planning by IWT due to size, human operation and non standardised barges

No modal shift

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Smaller barges

Key factors:

- Shorter berth occupancy due to lower number of containers
- Faster loading/unloading per container

Resulting in:

- Shorter logistic cycle
- Productivity gain of quayside
- Increased resilience of logistic chain
- Planning with shorter review cycle
- Sustainable propulsion

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Shorter Logistic Cycle – Time Competitiveness

E.g. freight from Genk to Port of Antwerp

300 TEU vessel			80 TEU vessel	
300 TEU load x 3 min	= 15 hrs		80 TEU load x 2 min	= 3 hrs
Sailing (Genk – A'pen)	= 10 hrs		Sailing (Genk – A'pen)	= 10 hrs
300 TEU unload x 3 min	= 15 hrs		80 TEU unload x 2 min	= 3 hrs
Total	= 40 hrs	vs	Total	= 16 hrs

Truck(1 or 2 TEU) = 2 hrs + 2/4 hrs + 2 hrs = 6/8 hrs

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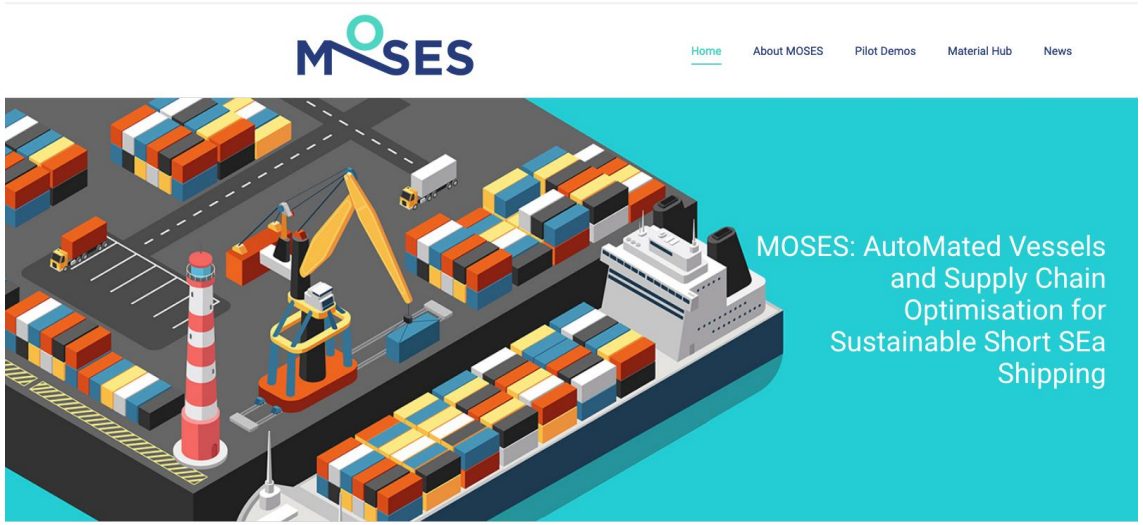
Modal Shift: Efficient Logistics Research



https://moses-h2020.eu/

https://aegis.autonomous-ship.org/

SEAMLESS

https://www.seamless-project.eu/

ReNEW

https://renew-waterways.eu/

Funded by the European Union

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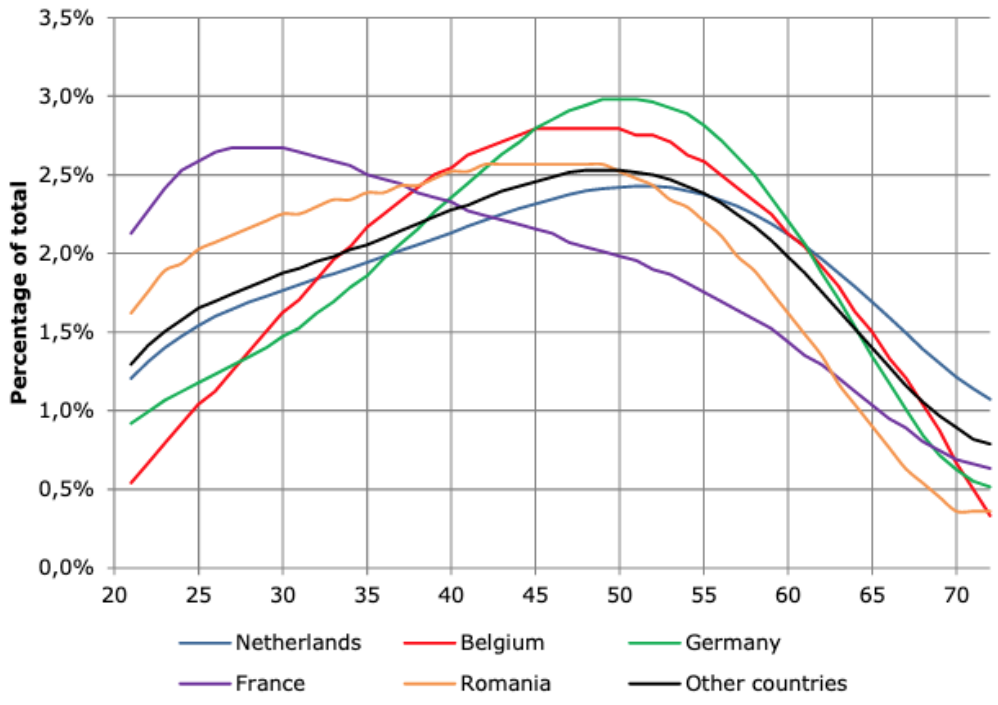
CREW SHORTAGES

Responding to crew shortage

Figure 6.3 Age distributions for the five countries with most workers in IWT for 2013



Source: Panteia (2013) based on data from ITB and Ecorys (2013)

In **2013**, the peak of the average age of crews in European IWT was at 50 years.

Boarding schools for kids of skipper families are closing.

With very little new entrants, this means that in 2022, the peak will have moved towards 60 years, i.e. in 10 years time the peak will be at 70 years !

Young people do not accept present work habits.

The shortage will be very disruptive.

Solutions : allow longer workperiods ? Work beyond pensions age ?

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A different vessel conception for IWT

- Autonomous
- Alternative propulsion
- CEMT Class IV

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Definition of Autonomous operation

- **NO crew** on vessel during passage.
- Autonomous operation equipment on vessel for present waterway infrastructure.

- Remote Control Centres (RCC) in continuous contact for monitoring and control.
- Autonomous equipment capable of situational awareness and complexity analysis (levels).
- Situational awareness communicated from vessel to RCC.
- RCC intervention in steps pending on operational situation & needs for intervention.

- Fall back safety action.
- Data gathering and exchange with RCC and other units.

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Autonomy / Remote Controlled is happening

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Sustainability through Autonomous operation

Alternative, non-fossil-fuelled, propulsion is more expensive per Kwh. In order to be competitive with fossil fueled vessels, additional economic margin is needed.

- Autonomous operation generates this by eliminating crew and related costs (hotel, safety, insurance,...) during passage.
- Autonomy needs redesigned systems hence opportunity to redesign the vessels to be more energy efficient and carry more cargo.
- Autonomy allows for 24/24 operation (specifically in inland navigation).
- Autonomy allows for smaller vessels to be competitive vs bigger vessels.
- Smaller vessels can include more stops using smaller harbours/terminals where energy can be loaded, reducing need for energy storage on board.
- Smaller vessels can also change the other parts of the operations to be more energy efficient (e.g. loading; port handling,..).

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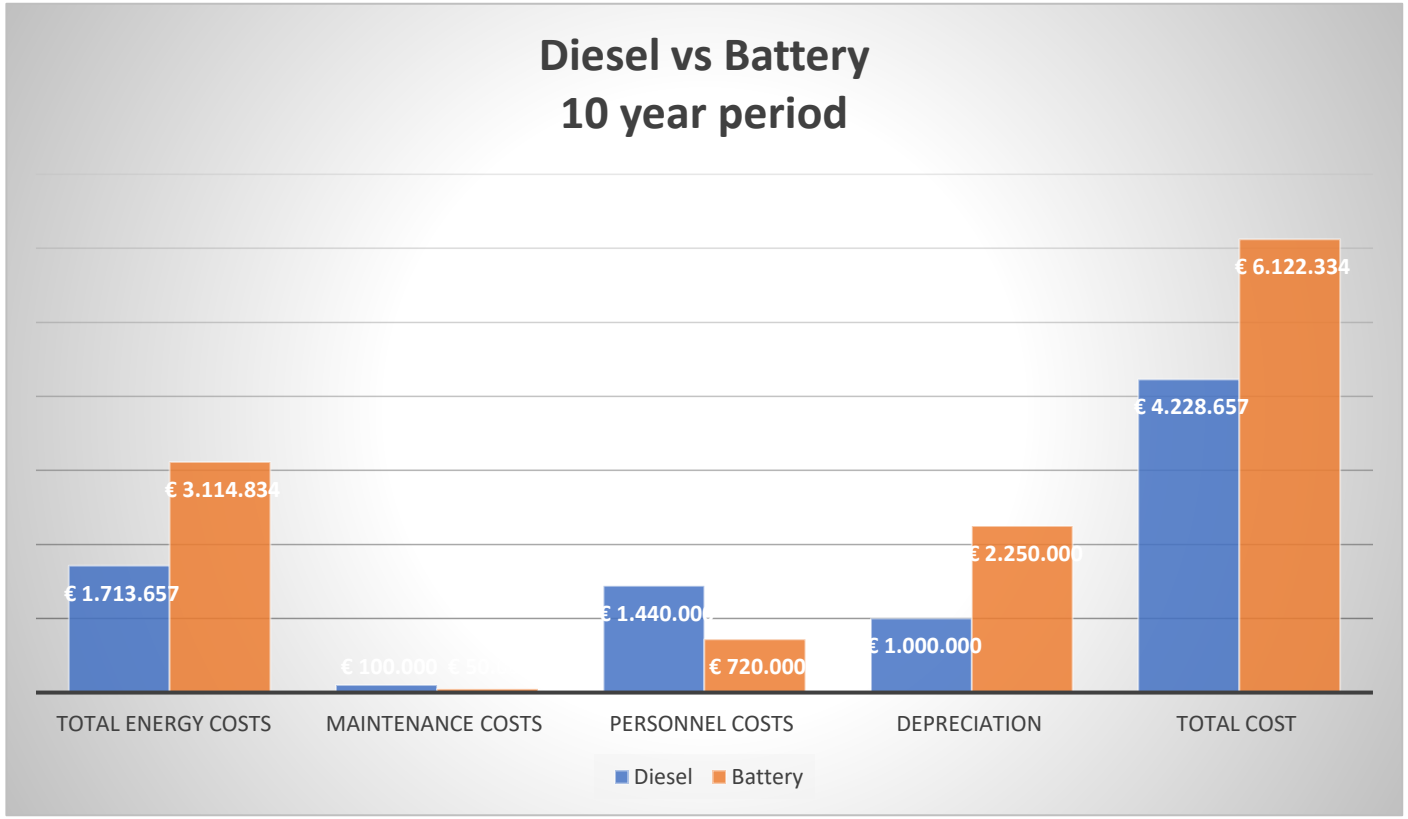
Sustainability through Autonomous operation

Example of existing manned 120 TEU diesel barge vs autonomous 90 TEU battery powered barge



Because the autonomous barge operates 24/24, it sails 60 hrs a week and moves 491,400 TEU vs 36 hrs and 280,800 TEU moved for the manned diesel barge.

The cost per TEU is € 12,46 for the autonomous barge and € 15,06 for the manned barge.

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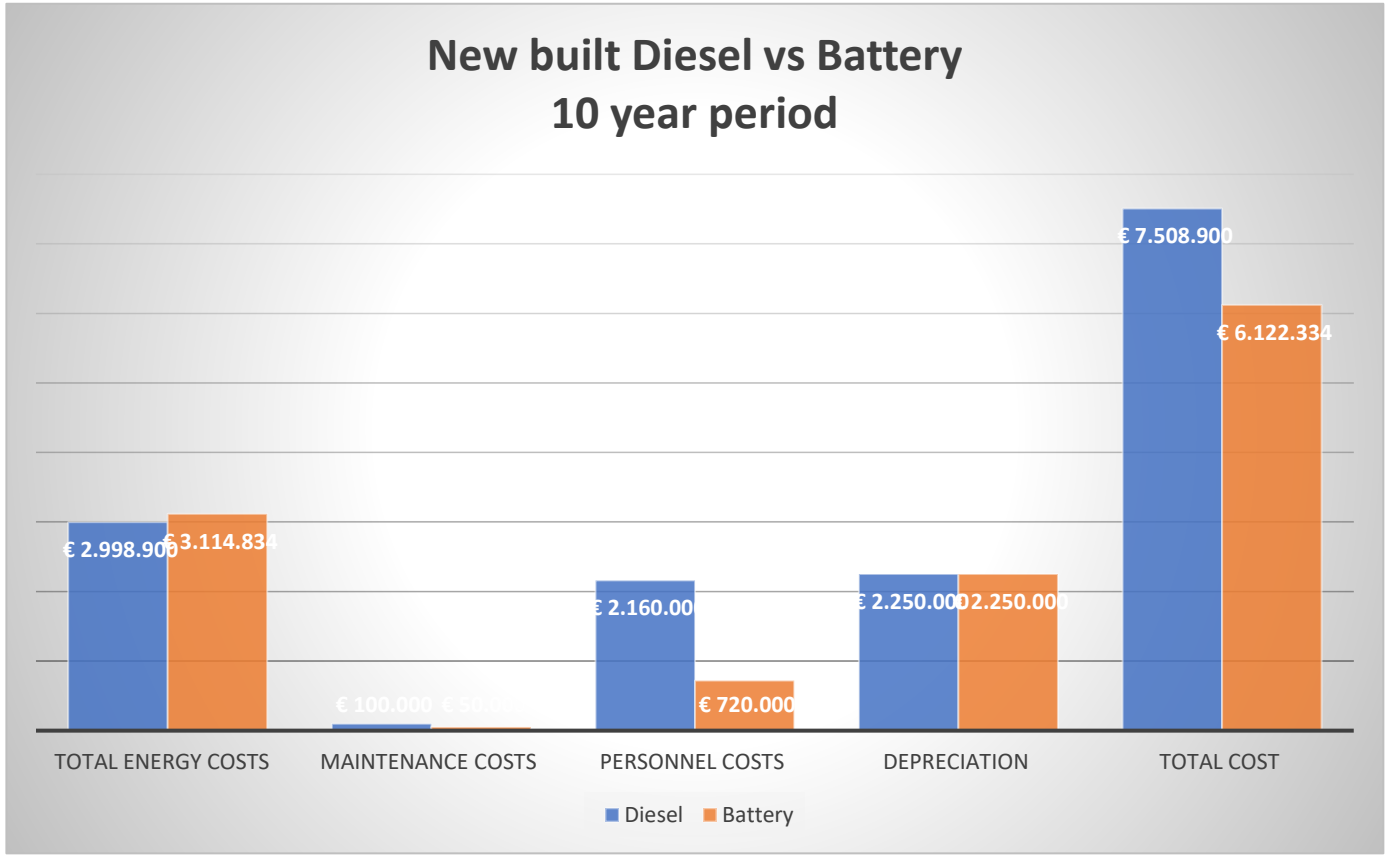
Sustainability through Autonomous operation

Example of newly built manned 120 TEU diesel barge vs autonomous 90 TEU battery powered barge



When a new built diesel barge is considered operating 24/24 then the battery barge has a lower overall cost.

The cost per TEU is € 12,46 for the autonomous barge and € 15,28 for the manned barge.

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Insurance & Autonomous operation

- Reduction/elimination of human error
- Most costly risk (i.e. human) no longer on board
- Standardisation of risk
- Deductible can be higher
- Continuous monitoring/data gathering
- Homogenous risk/no household risks

.

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Retrofitting vs Newbuilt

Retrofitting or updating existing vessels to be autonomous and sustainable is economically and technically not feasible, because of:

- Costs involved in creating digital twin for autonomous operation of each vessel;
- Retrofits need each time to be made to measure as each vessel is different;
- The systems are not designed to operate without crew in transit;
- The hull will not be optimised for propulsion efficiency;
- The useless crew accommodation remains still part of the vessel after the retrofit.

New design : X- Barge

New built is a tremendous economic lever for Europe

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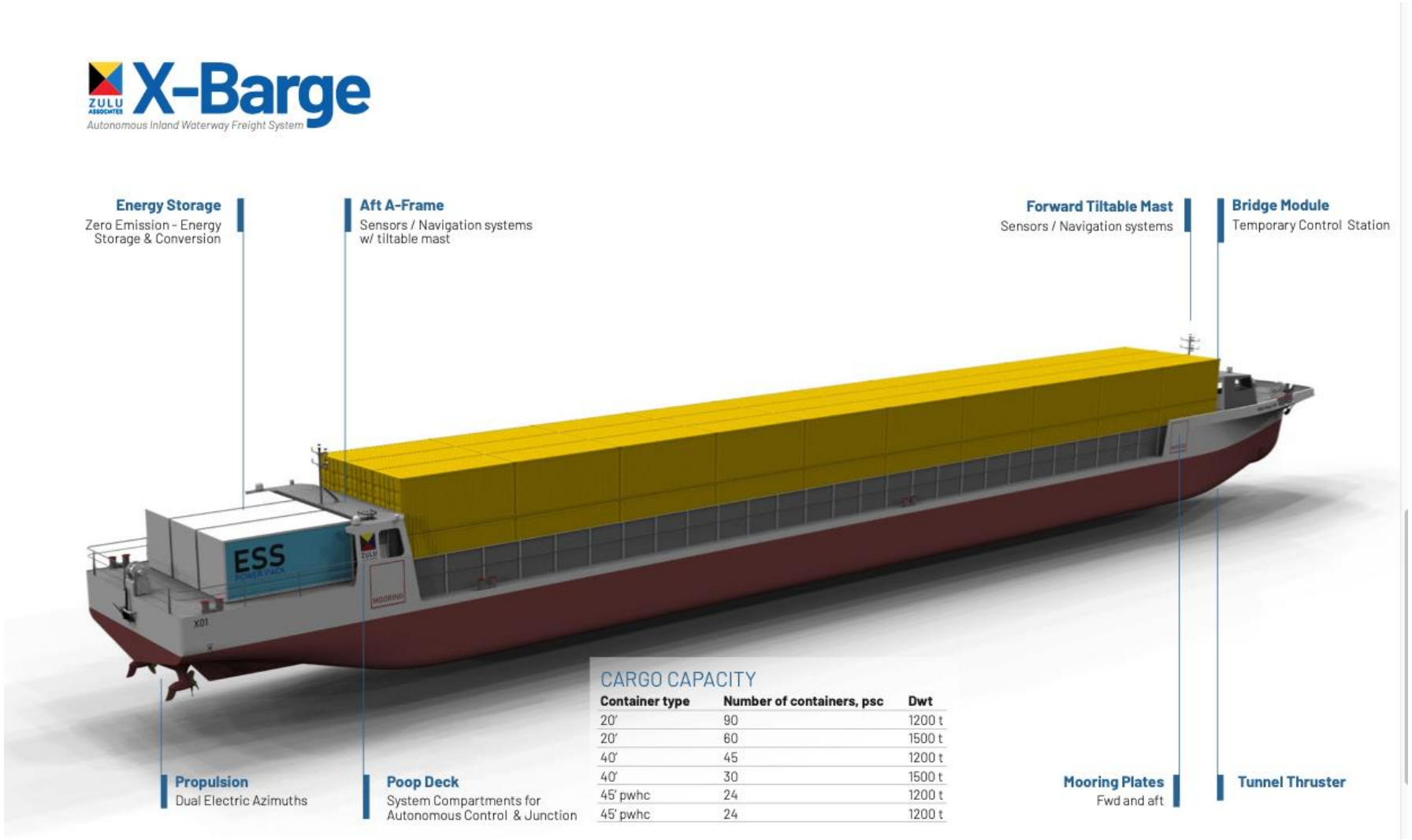
Specifications X-Barge



CARGO CAPACITY

Container type	Number of containers, psc	Dwt
20'	90	1200 t
20'	60	1500 t
40'	45	1200 t
40'	30	1500 t
45' pwhc	24	1200 t
45' pwhc	24	1200 t

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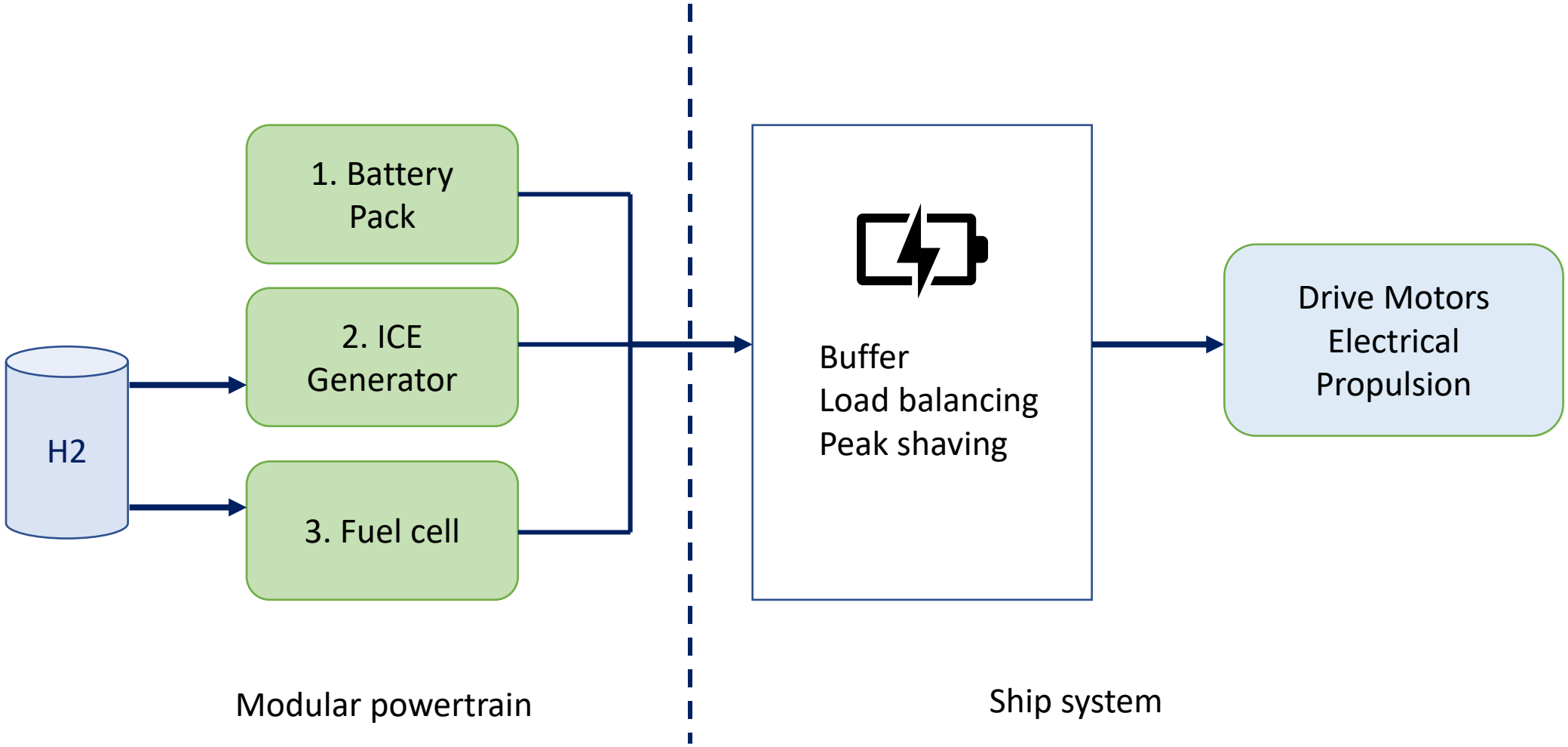
ZERO emission propulsion: 3 alternatives of modular powertrain



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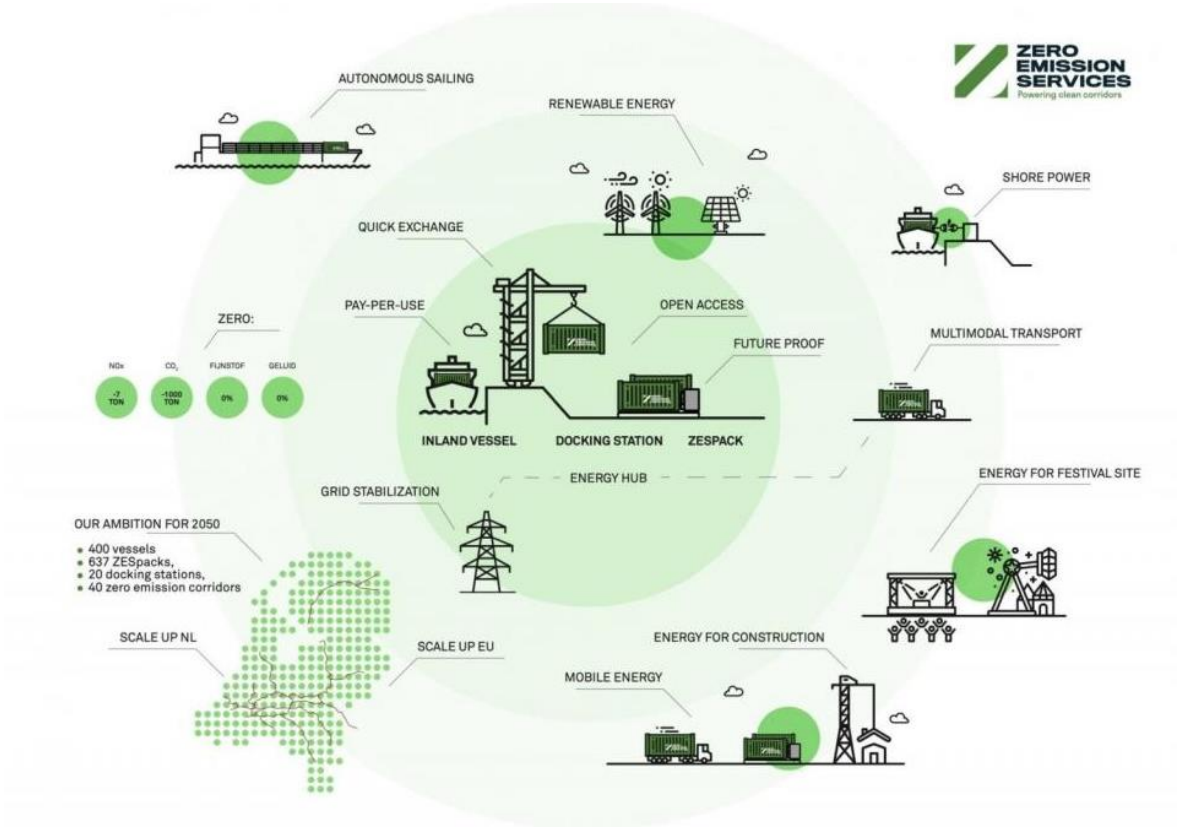
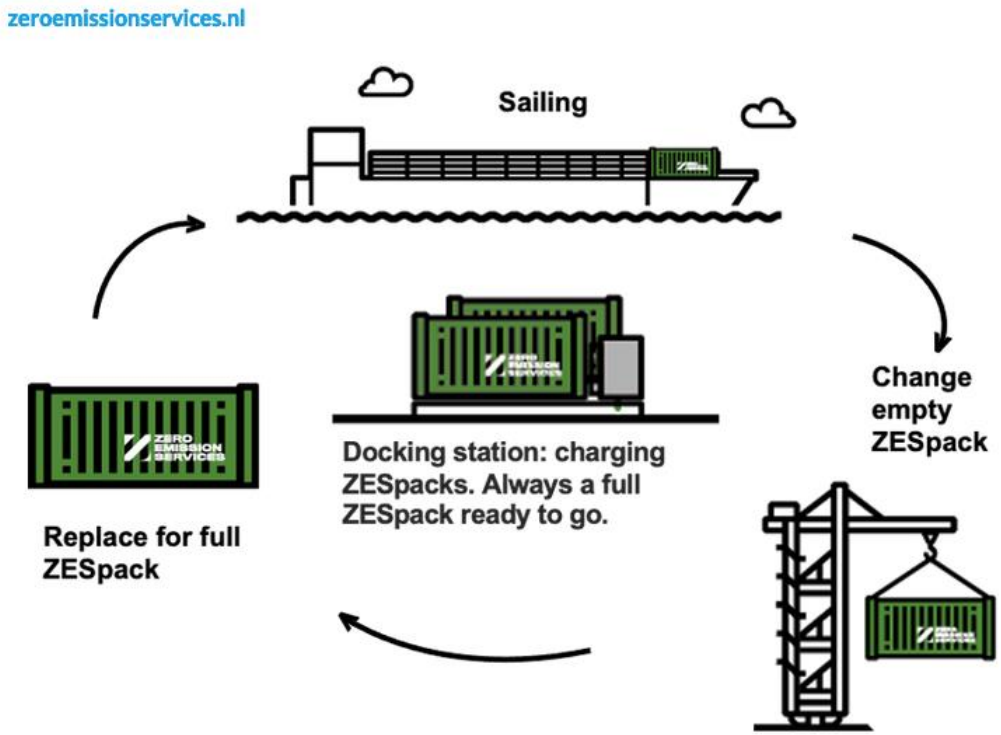
Powering the X-Barge: electrical case





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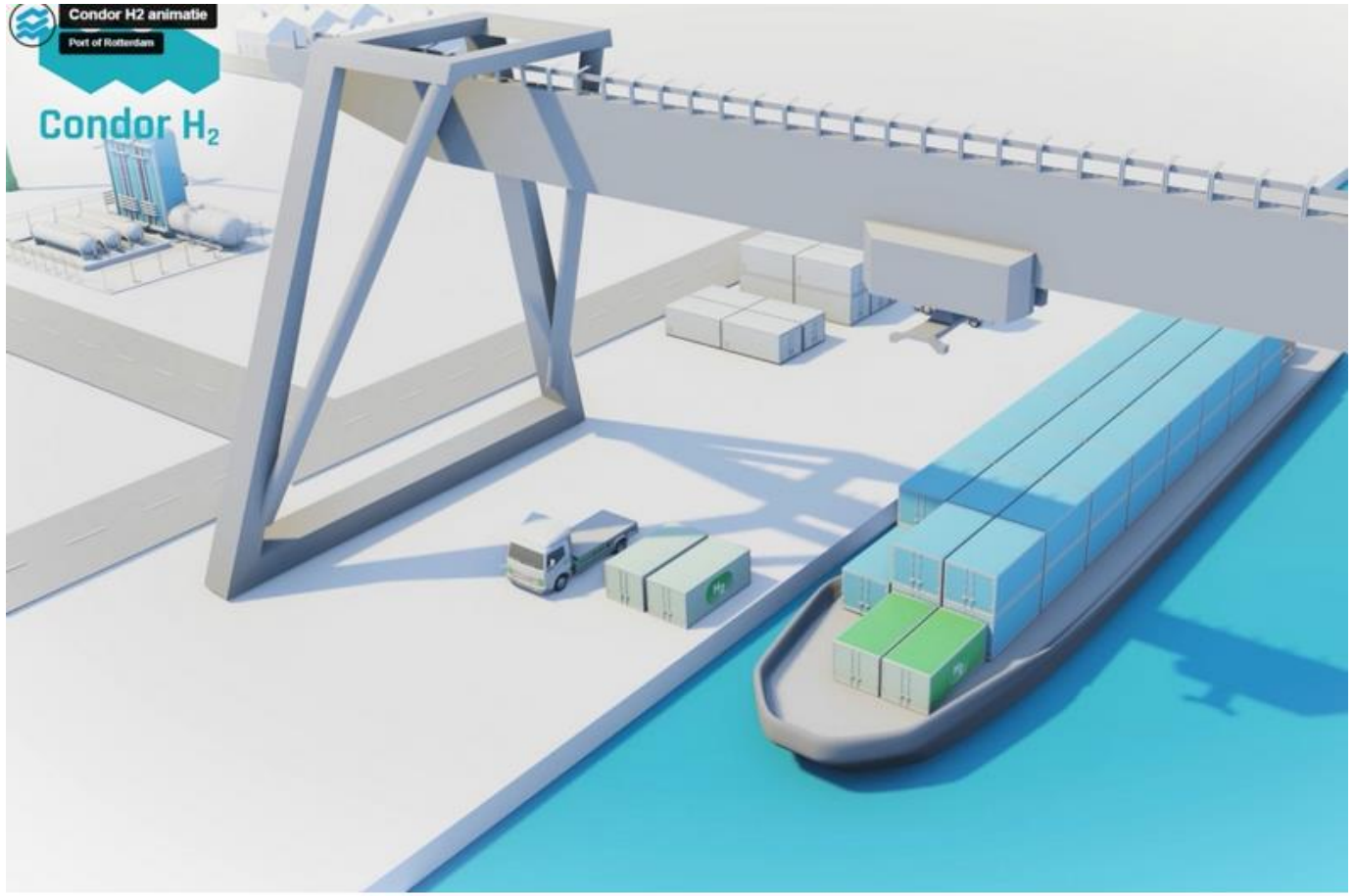
Powering the X-Barge: hydrogen case

Condor H_2

A RH_2INE zero-emission shipping project



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ZULU Associates' proposal

ZULU Associates proposes "**Ships As A Service**" ("SAAS"):

- A fleet of ZULU MASS short sea vessels on time charter basis with full service*.
- A fleet of X barges inland waterway vessels on time charter basis with full service*.
- Expected to be operational with first vessels end of 2023/beginning 2024.
- Zero emission propulsion.

* Remote monitoring & control, energy bunkering, cargo handling, port handling, maintenance, data gathering, etc …

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Autonomy : AUTOSHIP

Funded by the European Union

https://www.autoship-project.eu/

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antoon.vancoillie@zulu-associates.com