OPERATIONAL ACTIONS OF SHIPPING COMPANIES TO DECREASE CO2 EMISSIONS

Professor Ulla Tapaninen, Dr Tech

Estonian Maritime Academy

20.5.2025

CONTENTS

ULLA TAPANINEN

She has experience in three different fields of expertise related to maritime field: **academic, business and public administration.**

PhD from **Helsinki University of Technology** (later Aalto University) 1997

Professor of maritime logistics in **University of Turku** 2005 -2012, Centre for Maritime studies. Adjunct Professor/Docent of maritime economics and logistics of University of Turku since 2010.

Key positions in two Finnish shipping companies: a development and environmental manager in **Finnlines** (1996-2005) and member of board in **ESL Shipping** (2012 - 24) and member of the board of **Port of Helsinki** 2025 -

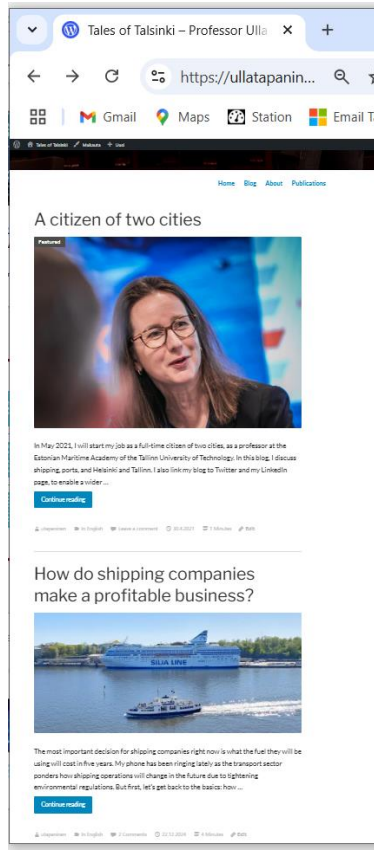
City of Helsinki, varius positions related to transport, City logistics, port operations, head of unit in city economic development department (2012-2021).

Tallinn University of Technology, **Estonian Maritime Academy**, tenured associate professor, maritime transport (2021-).

She has carried out dozens of research projects in academic, business and public administration, published dozens of academic journal articles, written several text books, is keen writer of blogs and invited speaker in seminars.

She is also particularly well connected to Finnish and European maritime field, European Union, academies and business sector. Member of Finnish Intelligent Transport Society (ITS-Finland), Finnish Association of Purchasing and Logistics LOGY and The Finnish Maritime Society – Meriliitto.

Vuoden logistikko 2022 (Logistics professional in Finland).



Full tenured professor *Ulla Pirita Tapaninen*
Book: *Maritime Transports 2020, Kogan Page*
Blog: *ullatapaninen.net*

MARITIME TRANSPORT RESEARCH GROUP ESTABLISHED 2022

							
Ulla Tapaninen Tenured Professor	Olli-Pekka Hilmola Adjunct Professor	Jonne Kotta Adjunct Professor	Kristine Carjova Senior Researcher	Seçil Gülmez Post-doc Researcher	Tõnis Hunt Early Stage Researher	Riina Otsason Early Stage Researher	Mari-Liis Tombak Early Stage Researher
							
Eliise Toomeoja Early Stage Researher	Kadi Kasepõld Early Stage Researher	Ekku Heljanko Early Stage Researher	Suvi-Tuuli Lappalainen Industrial PhD	Andres Laasma Industrial PhD	Kristin Kerem Early Stage Researher	Deniece Melissa Aiken Post-doc Researcher	Kristel Rauk Research assistant

TAL TECH

MISSION OF THE RESEARCH GROUP

We produce Ph.D's. To be able to do that, we apply external funding and carry out external reserach projects. The projects also provide reserach questions and real-world data.

"In the maritime transport research group, we focus on the collaboration among the research group members. All the scientific work is done by combining expertise of the more senior members of the group with the younger members and their research problems. This way we guarantee the smooth research process and required quality.

We have bi-weekly research meetings, where each research group member shows their progress, and general issues, like ethics, are discussed.

The basis of the research group work is tight collaboration with business world focusing on contemporary problems in tightly structured projects together with our international partners."

MARITIME TRANSPORT RESEARCH GROUP
ESTONIAN MARITIME ACADEMY

- **Smart and Energy Efficient Environments (business studies)**

  How tightening environmental regulations affect shipping companies, ports and maritime markets?
  The studies analyse the present shipping business, and study how the new fuels, vessel design and operative changes will affect the shipping business models and operations.

- **Maritime and Port Governance (social sciences)**

  The functioning and competitiveness of maritime cluster: shipping companies, port and maritime sectors in various shipping market situations: cargo and passenger volumes, economics, policies, law and public opinion.

9 Ph.D students, 3 post-docs, 2 adj. prof., 3 assistants
5 large international projects (Horizon + CB)

Full tenured professor *Ulla Pirita Tapaninen*
Book: *Maritime Transports 2020, Kogan Page*
Blog: *ullatapaninen.net*

PUBLISHED ARTICLES IN 1-5/2025

Methods for calculating greenhouse gas emissions in the Baltic Sea ports: a comparative study. Tombak, M.-L.; Tapaninen, U.; Kotta, J. Sustainability, 17 (2), #639. DOI: 10.3390/su17020639. 2025

Success Factors in Commercialization of Wing-in-Ground Crafts as Means of Maritime Transport: A Case Study. Kerem, Kristin; Carjova, Kristine; Tapaninen, Ulla Pirita, Future Transportation, 5 (1), #13. DOI: 10.3390/futuretransp5010013. 2025

Comparative analysis of the alternative energy: Case of reducing GHG emissions of Estonian pilot fleet. Otsason, R.; Laasma, A.; Gülmez, Y.; Kotta, J.; Tapaninen, U. Journal of Marine Science and Engineering, 13 (2), #305. DOI: 10.3390/jmse13020305. 2025

Data-Driven Propulsion Load Optimization: Reducing Fuel Consumption and Greenhouse Gas Emissions in Double-Ended Ferries Laasma, Andres; Aiken, Deniece M.; Kasepõld, Kadi; Hilmola, Olli-Pekka; Tapaninen, Ulla Pirita. Journal of Marine Science and Engineering, 13 (4), #688. DOI: 10.3390/jmse13040688. 2025

Differences in port pricing strategies: case of port and fairway fees in northern Baltic Sea countries Hunt, T.; Tapaninen, U.; Kotta, J. Sustainability, 3275. DOI: 10.3390/su17073275. 2025

Predicting cargo handling and berthing times in bulk terminals: A neural network approach Gülmez, S.; Gülmez, Y.; Tapaninen, U.P. Case Studies on Transport Policy, 19, #101351. DOI: 10.1016/j.cstp.2024.101351. 2025

Exploring the multifaceted challenges and complexities involved in the effective implementation of maritime conventions Aiken, D.; Kotta, J.; Tapaninen, U. P. Sustainability, 17 (2), 478. DOI: 10.3390/su17020478. 2025

TAL TECH

ONGOING PROJECTS

Funded by the European Union

Interreg Central Baltic Programme — Co-funded by the European Union

Sustainable Flow- Sustainable flow of goods and reduction of CO2 emissions from transport

- The project will reduce CO2 emissions from intermodal/multimodal freight flows and developed a digital tool for CO2 reduction measures.

REISFER – Reducing CO2 emissions in island ferry traffic

- The island ferry traffic forms a unique transport area in the Central Baltic region, as ferry connections between mainland and islands are an important part of the intermodal transport chain linking islands to urban centers.

BALTIC-FIT - Twinning to enable Baltic Sea vessels to meet Fit-for-55 regulations

- The project will build a network of excellence between organizations from Baltic Sea Region to enable Baltic Sea maritime transport meet 'Fit for 55' regulations in decarbonisation. The BALTIC-FIT will achieve this goal by implementing a three-year Innovation strategy comprising five objectives, which are focused on strengthening the TalTech's position in the field of maritime decarbonization.

AIRSHIP- Autonomous Flying Ships for inter-island and inland waterway transport

- The main objective is to lay the foundations for a new class of fully electric unmanned aircraft system UWV combining speed, flexibility and energy efficiency.

Starting: CARGORES - Sustainable Handling of Cargo Residues

TAL TECH

CONTENTS

WE HAVE A MISSION!

"In the next 20 years the maritime industry must rebuild its cargo fleet. If this is done with the radical technologies now available, it will lead to the biggest change in ship design since steam replaced sail in the 19th century."

TAL TECH

Levels of ambition directing the 2023 IMO GHG Strategy are as follows:

.1 carbon intensity of the ship to decline through further improvement of the energy efficiency for new ships

to review with the aim of strengthening the energy efficiency design requirements for ships

.2 carbon intensity of international shipping to decline

to reduce CO2 emissions per transport work, as an average across international shipping, by at least 40% by 2030,compared to 2008;

.3 uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to increase

uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources to represent at least 5% striving for 10% of the energy used by international shipping by 2030; and

.4 GHG emissions from international shipping to reach net zero

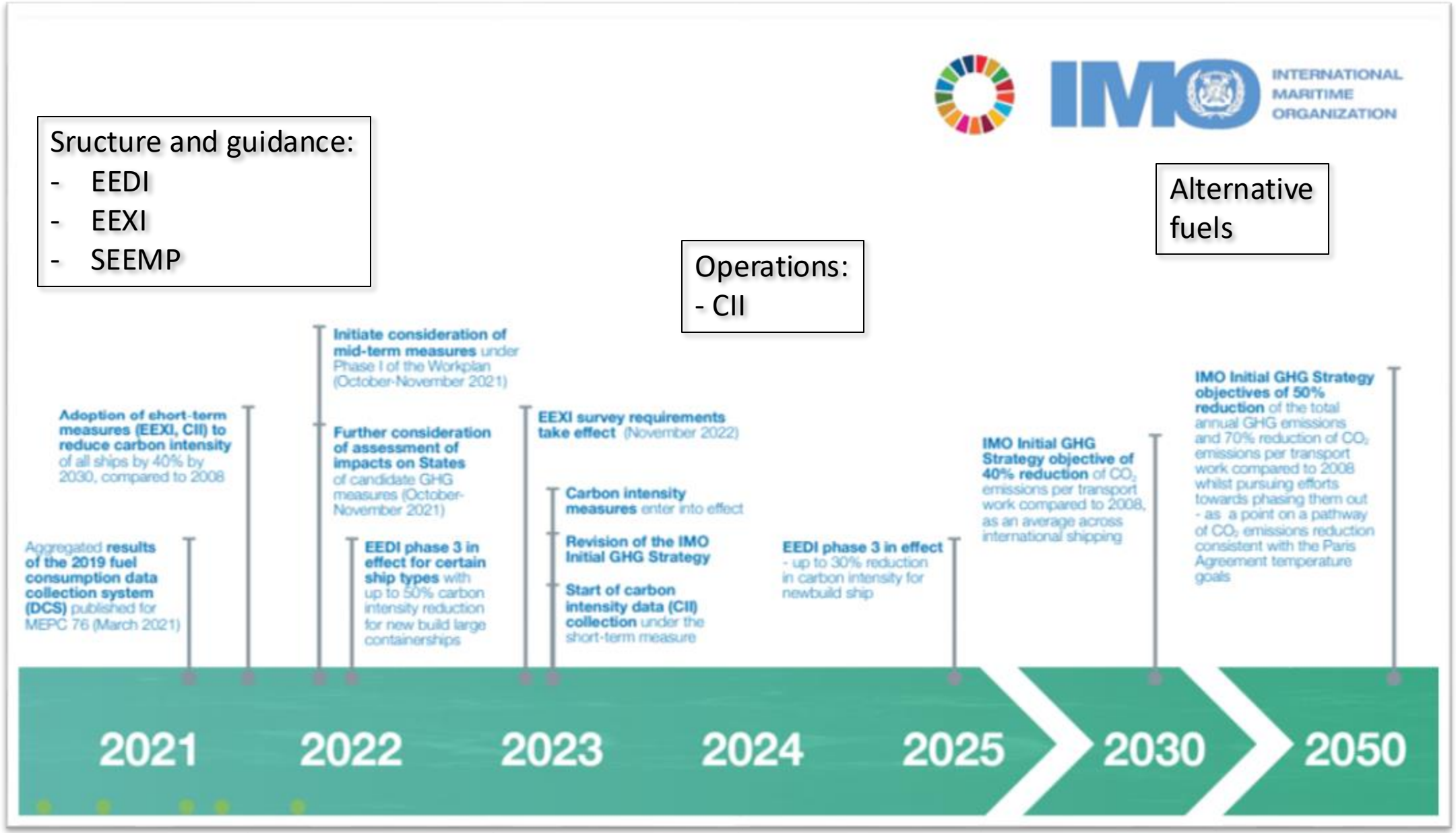
to peak GHG emissions from international shipping as soon as possible and to reach net-zero GHG emissions by or around, i.e. close to, 2050, taking into account different national circumstances, whilst pursuing efforts towards phasing them out as called for in the Vision consistent with the long-term temperature goal set out in Article 2 of the Paris Agreement.

IMO REGULATIONS

Sructure and guidance:
- EEDI
- EEXI
- SEEMP

Operations:
- CII

Alternative fuels



TAL TECH

Press release | 14 July 2021 | Brussels

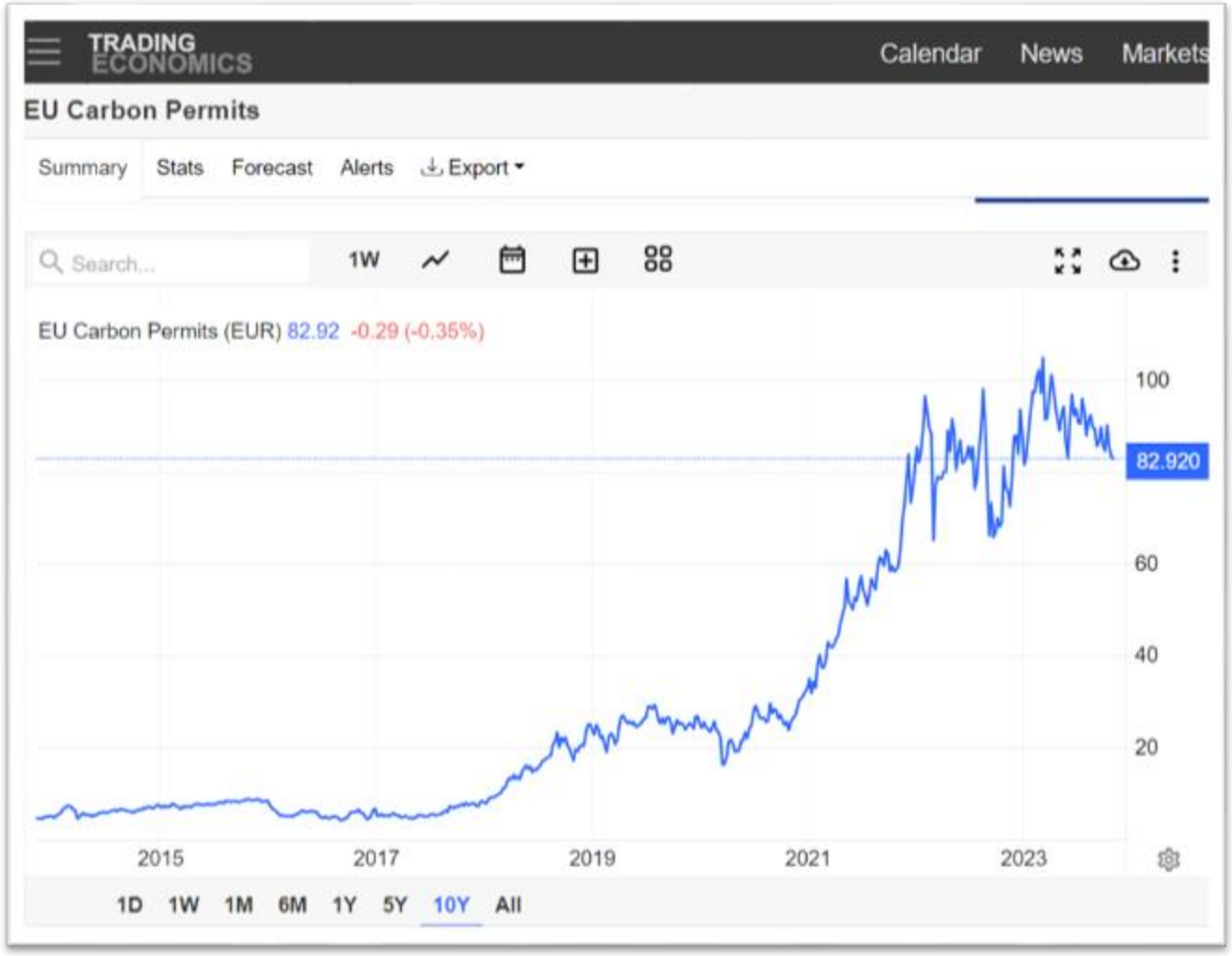
European Green Deal: Commission proposes transformation of EU economy and society to meet climate ambitions

Page contents

Today, the European Commission adopted a package of proposals to make the EU's climate, energy, land use, transport and taxation **policies fit for reducing net greenhouse gas emissions by at least 55% by 2030**, compared to 1990 levels. Achieving these emission reductions in the next decade is crucial to Europe becoming the world's first climate-neutral continent by 2050 and making the European Green Deal a reality. With today's proposals, the Commission is presenting the legislative tools to **deliver on the targets agreed in the European Climate Law** and fundamentally transform our economy and society for a fair, green and prosperous future.

EU: FIT FOR 55

1. FuelEU Maritime,
   carbon intensity of fuels
2. EU ETS, Emission trading system
3. ETCD - Energy Taxation Directive
4. (AFIR)- Shore-side electricity



CONTENTS

SHIPPING EMISSIONS

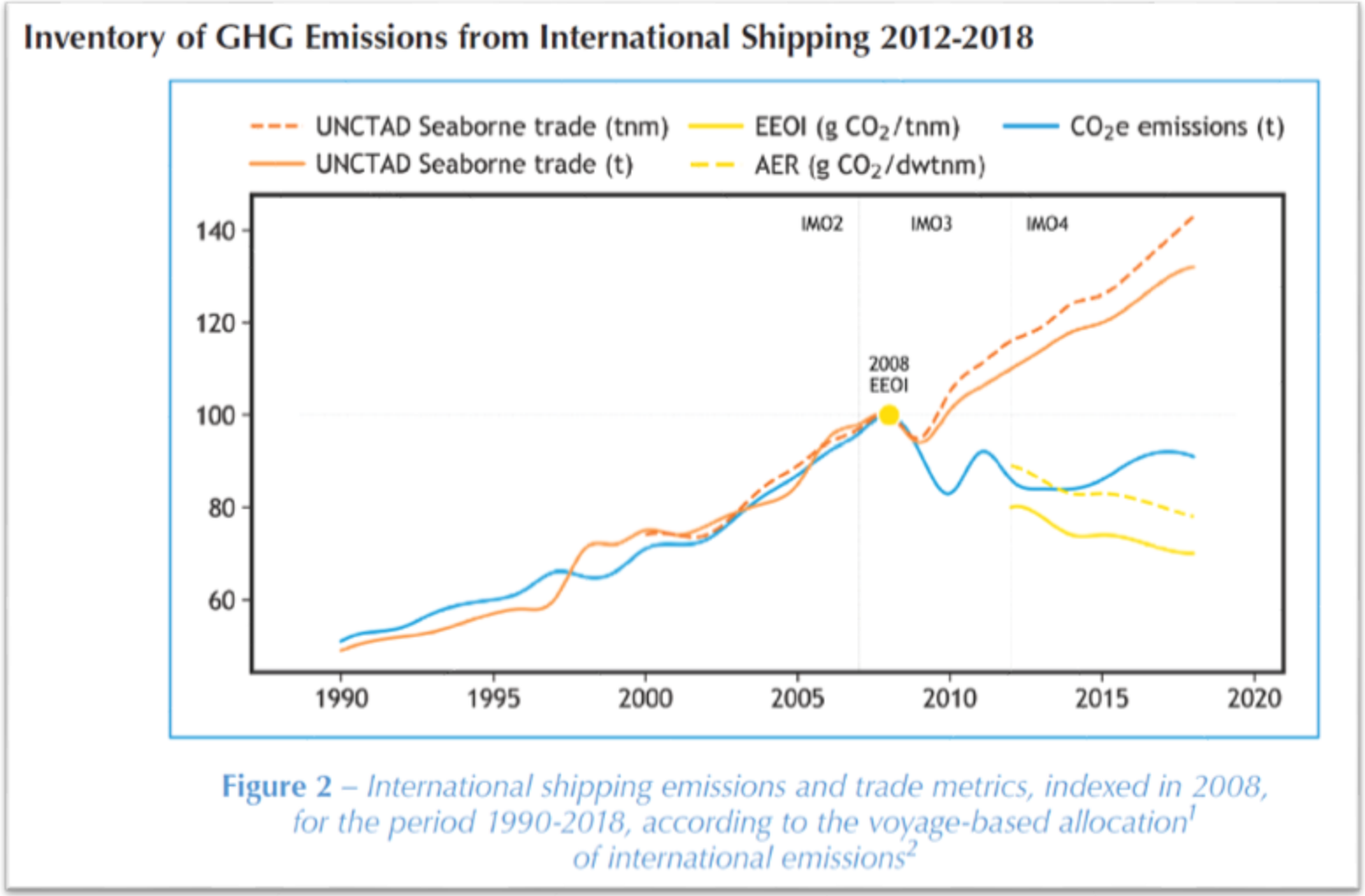
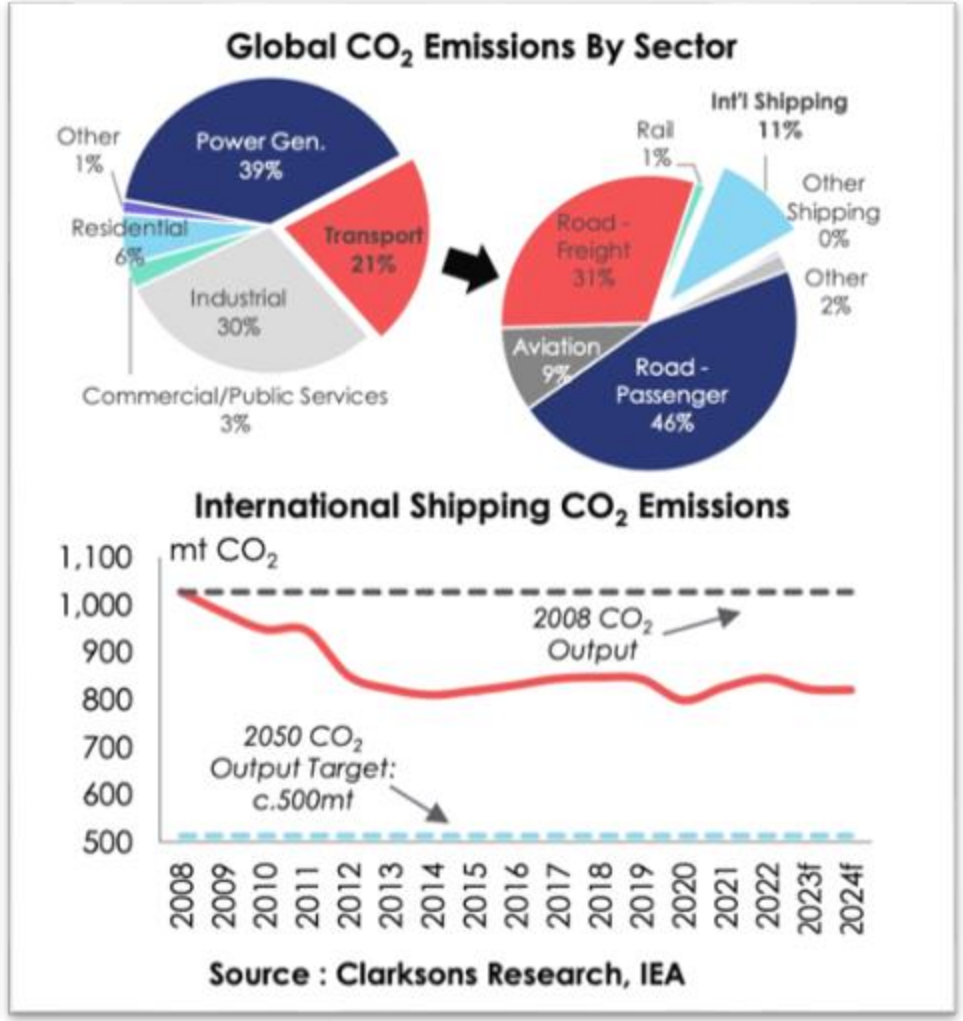
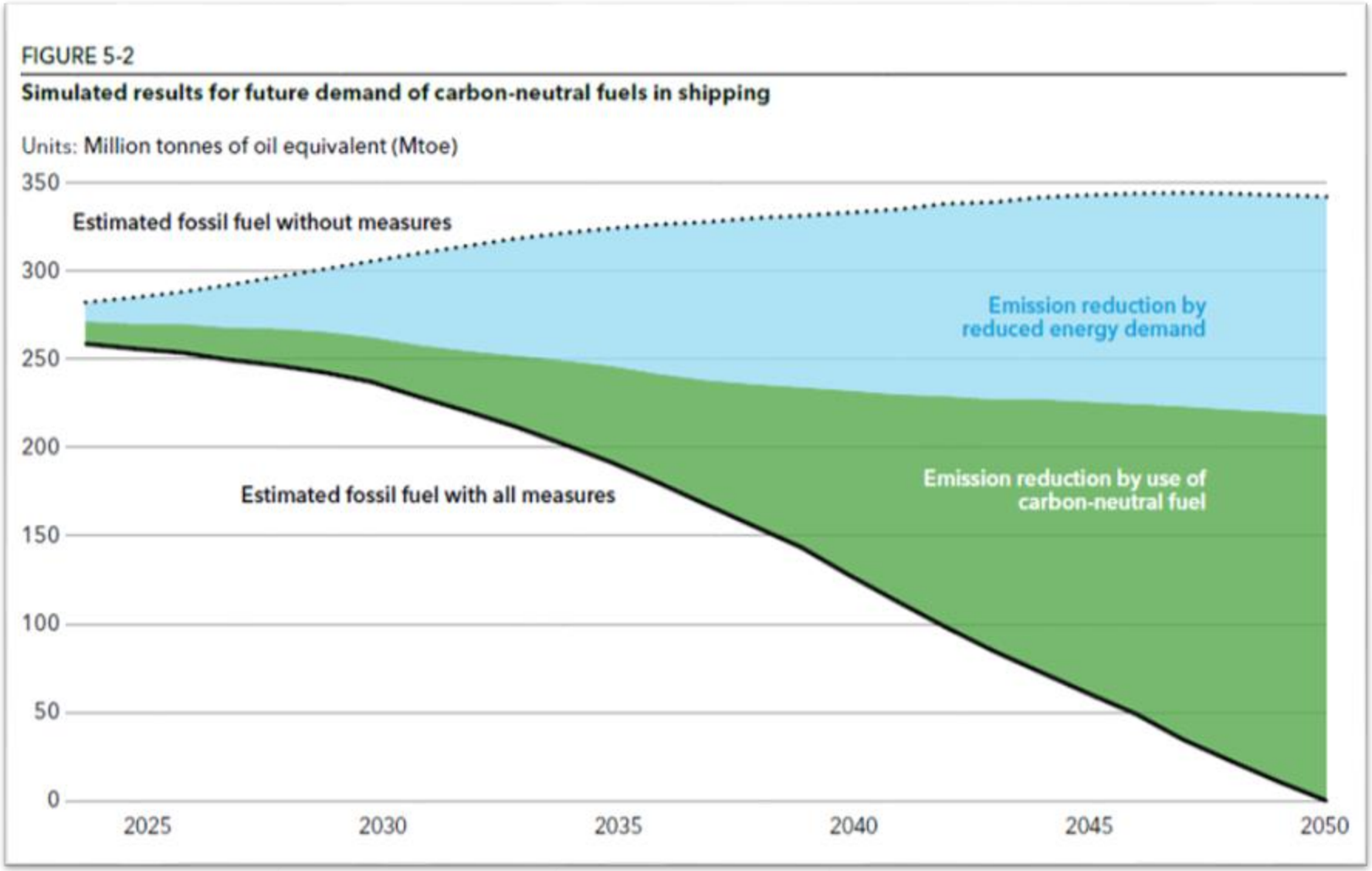


Figure 2 – *International shipping emissions and trade metrics, indexed in 2008, for the period 1990-2018, according to the voyage-based allocation[1] of international emissions[2]*



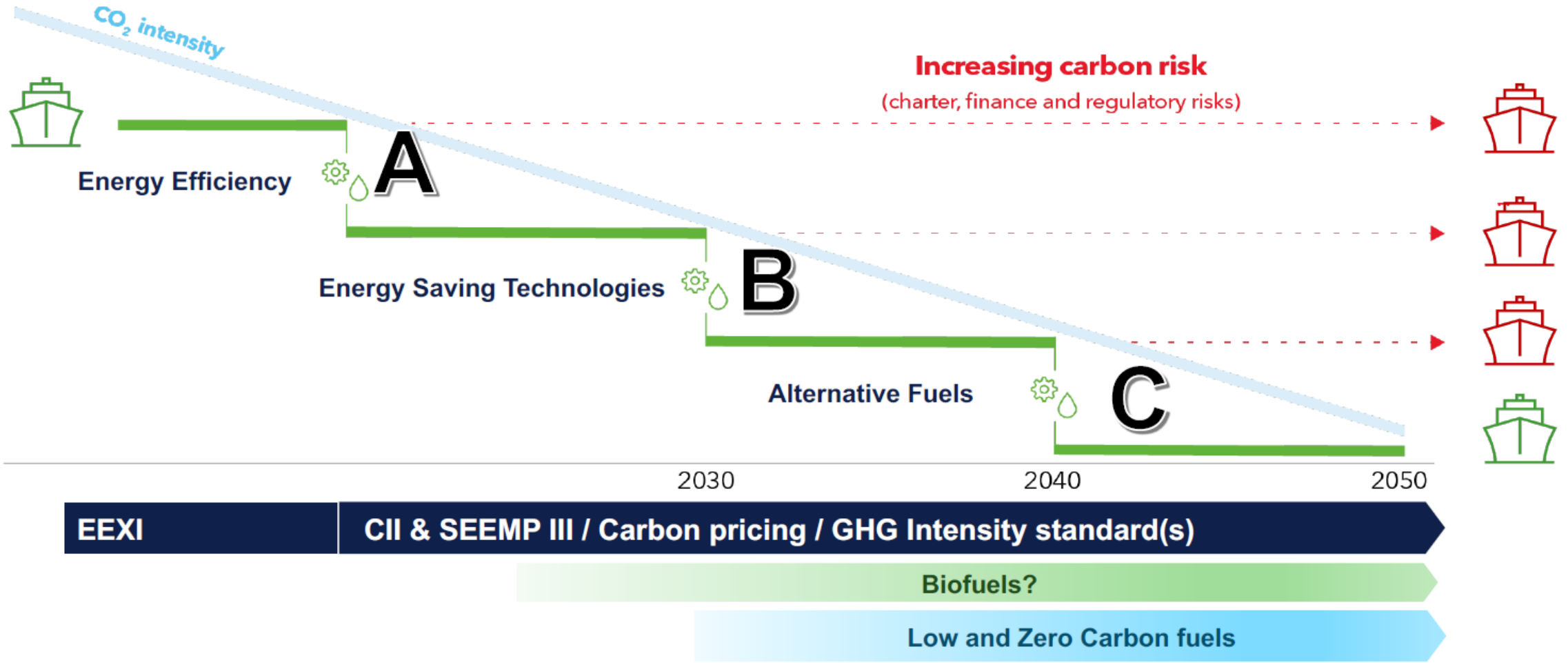
Source: Fourth IMO GHG Study 2020 and Splash 24/7 29/6-23

THE FUTURE?

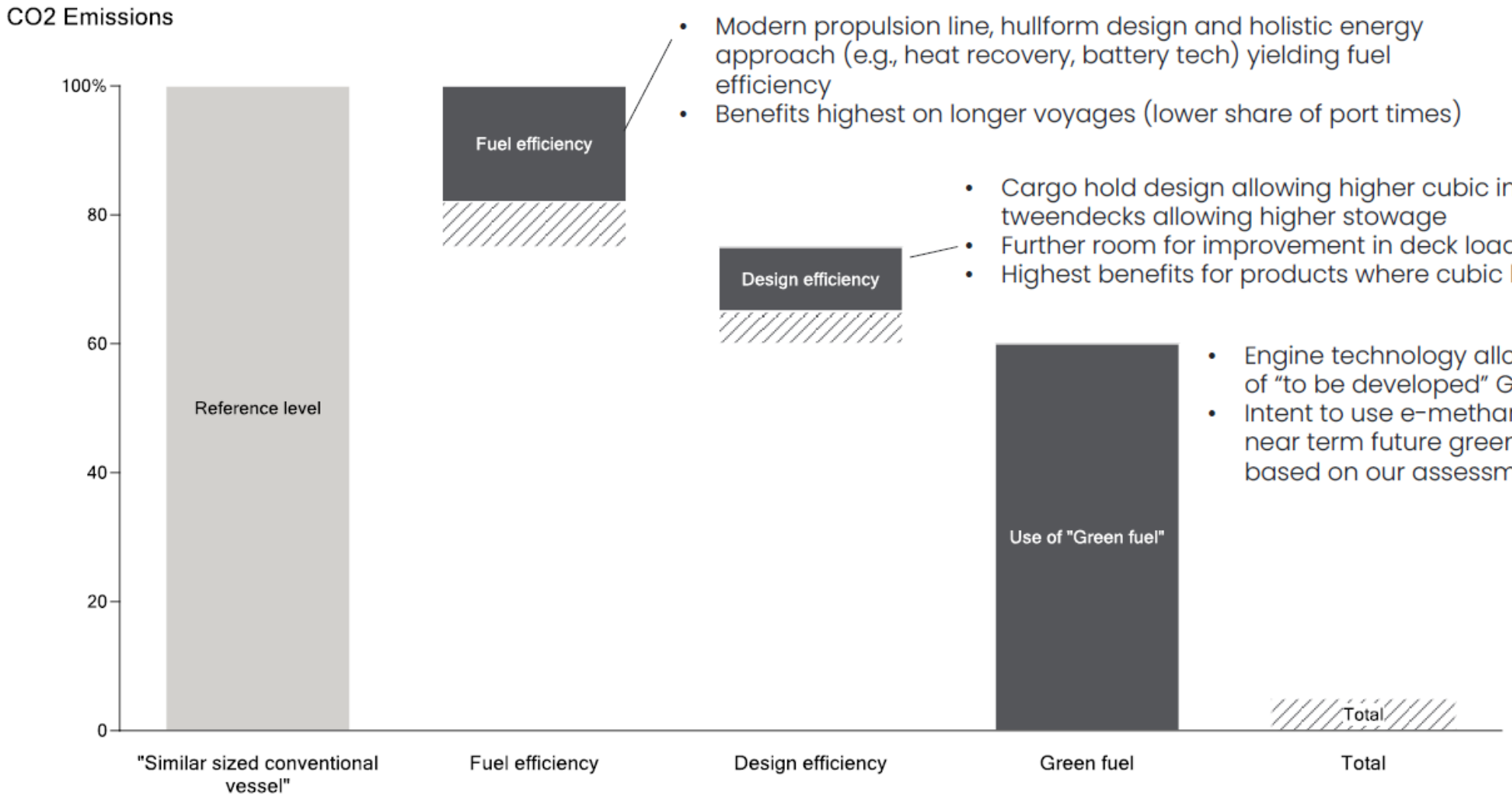


Source: DVN: Energy Transition Outlook 2023

Develop your future readiness – ***as a muscle***



ESL Green Shipping concept brings GHG efficiency in variety of ways – illustrative example

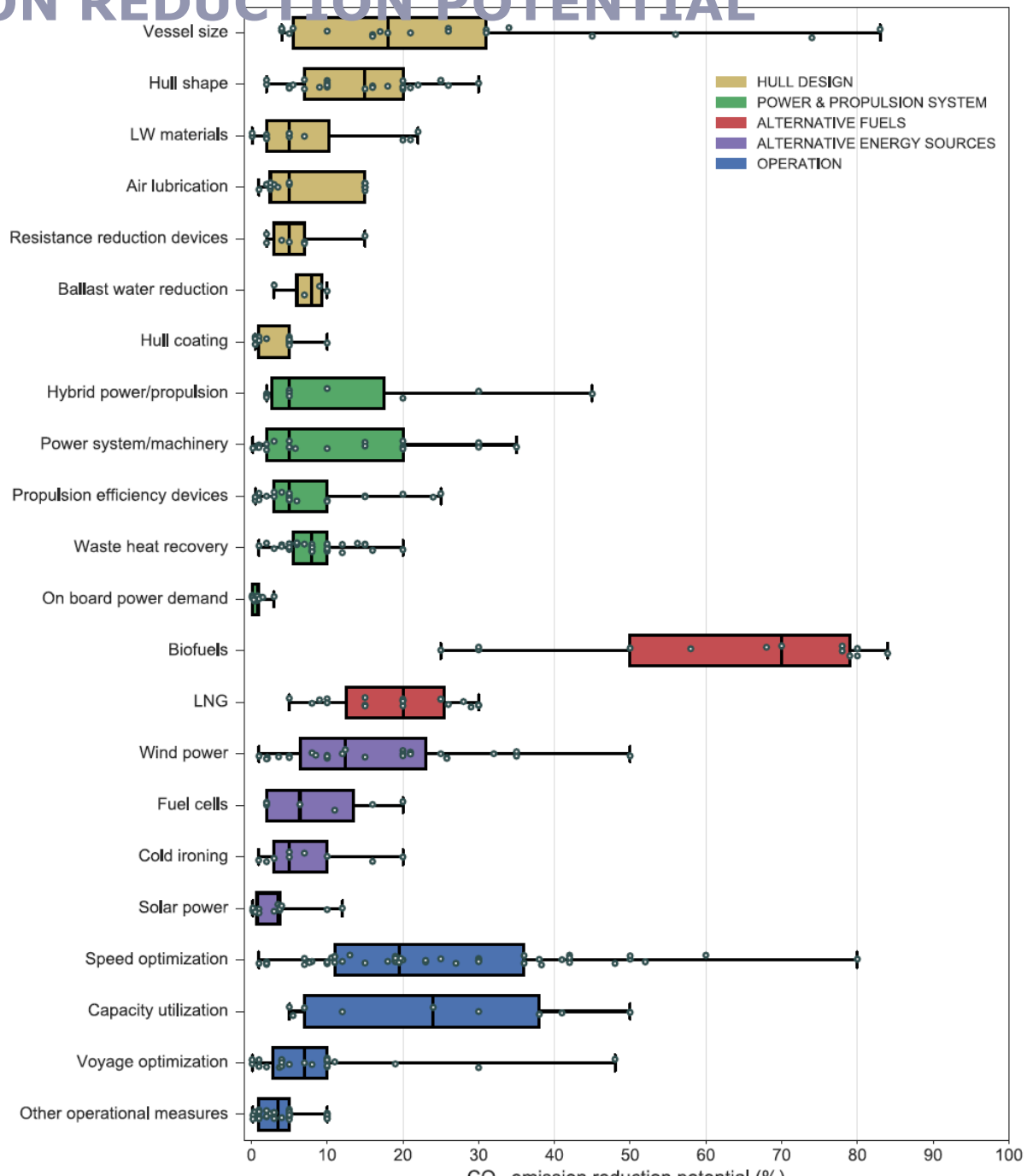


- Modern propulsion line, hullform design and holistic energy approach (e.g., heat recovery, battery tech) yielding fuel efficiency
- Benefits highest on longer voyages (lower share of port times)

- Cargo hold design allowing higher cubic intake, tweendecks allowing higher stowage
- Further room for improvement in deck loading
- Highest benefits for products where cubic bottleneck

- Engine technology allowing use of "to be developed" Green fuels
- Intent to use e-methanol (best near term future green fuel based on our assessment)

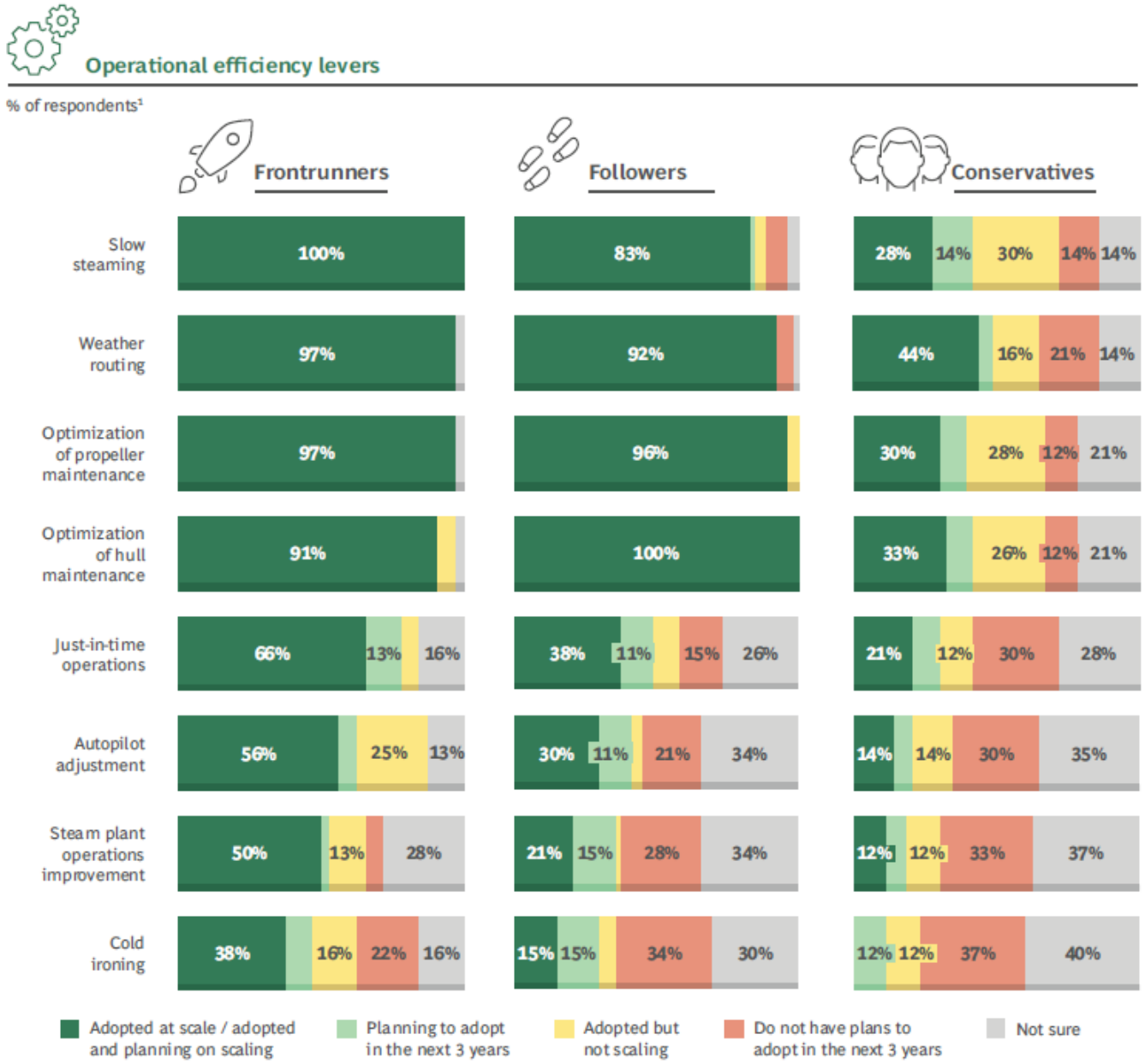
CO2 EMISSION REDUCTION POTENTIAL



Source: Bouman, E. A., Lindstad, E., Rialland, A. I. and Strømman, A. H. (2017). State-of-the-art technologies, measures, and potential for reducing GHG emissions from shipping – A review. *Transportation Research Part D: Transport and Environment.* 52. pp. 408-421.

TAL TECH

Exhibit 7 - Frontrunners lead the industry in the adoption of efficiency levers, Conservatives yet to adopt established levers



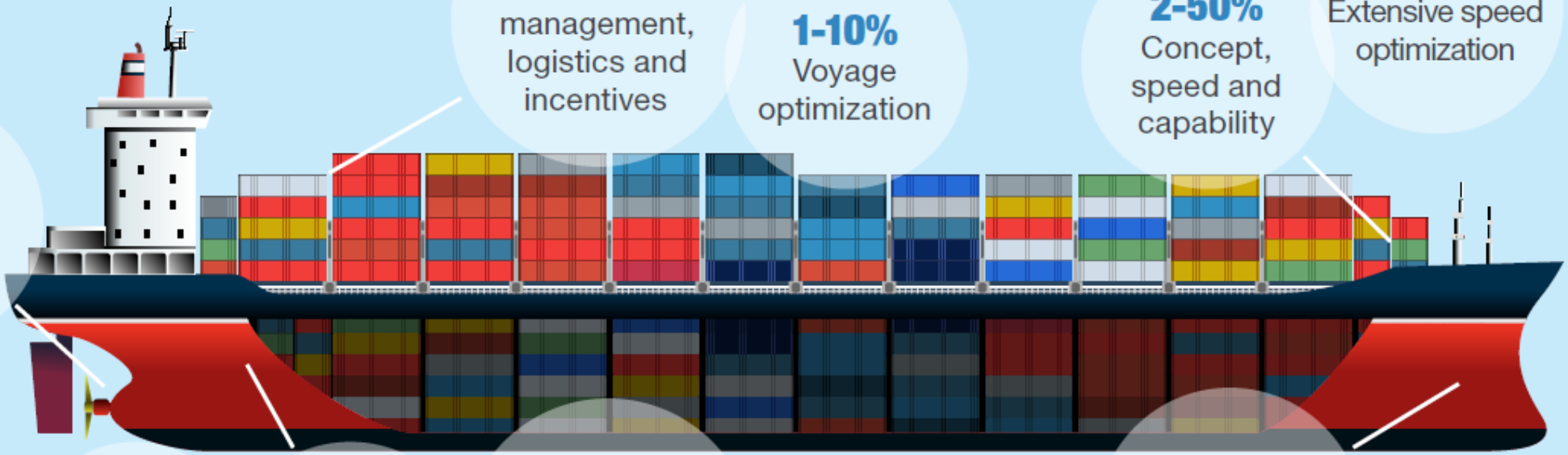
[1] N=128

Source: BDG 2023: Voyaging Toward a Greener Maritime Future

Source: BDG 2023: Voyaging Toward a Greener Maritime Future

A wide variety of design, operational and economic solutions

Achieving the goals of the Initial IMO GHG Strategy will require a mix of technical, operational and innovative solutions applicable to ships. Some of them, along with indication on their approximate GHG reduction potential, are highlighted below.



5-50% Fleet management, logistics and incentives

1-10% Voyage optimization

2-50% Concept, speed and capability

up to **75%** Extensive speed optimization

5-15% Power and propulsion systems

50-90% Full electric

35% Bio-LNG/LPG

90% Biofuel 3rd generation

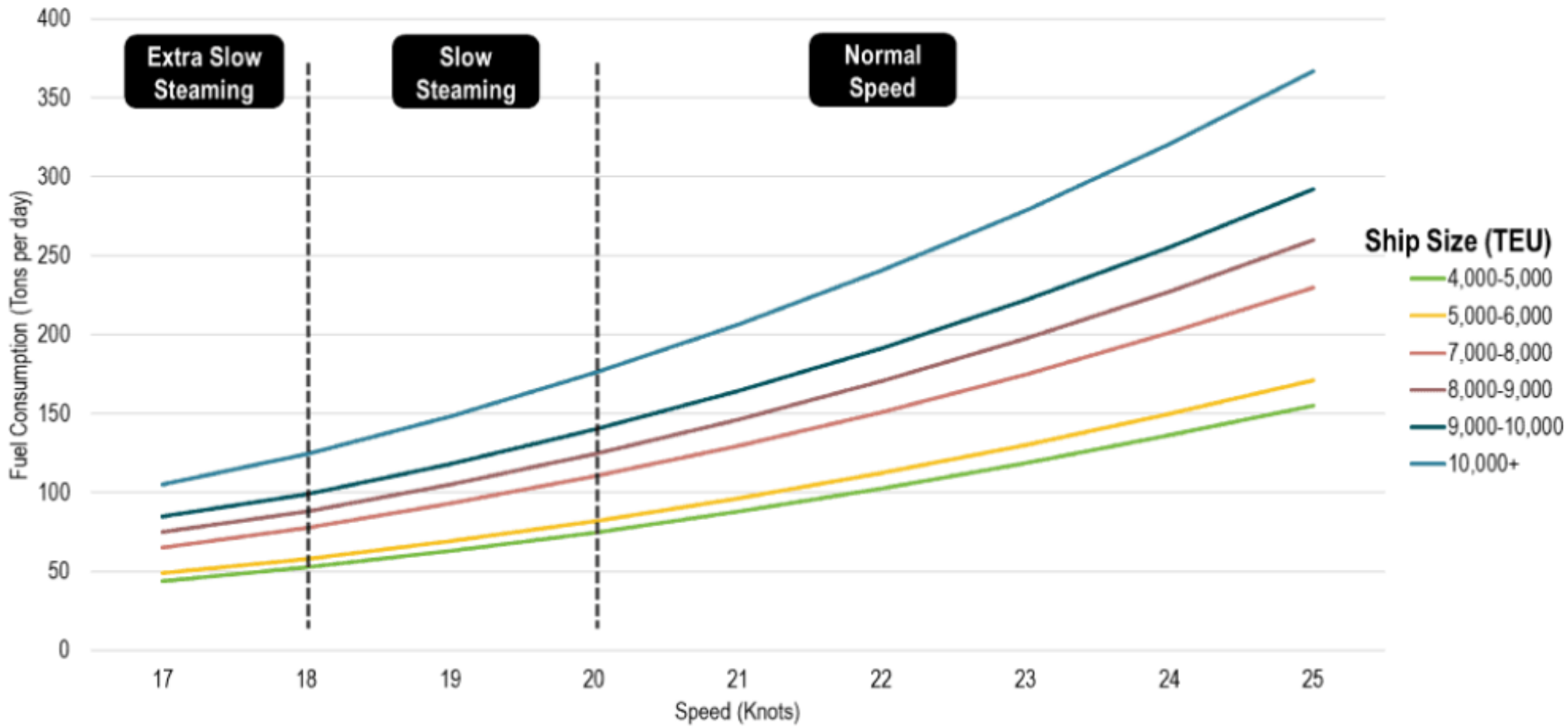
80-100% Hydrogen and other synthetic fuels

1-10% Energy management

2-20% Hull and superstructure

@IMO

Fuel Consumption by Containership Size and Speed



Fuel Consumption by Containership Size and Speed

The Geography of Transport Systems
Jean-Paul Rodrigue (2020)

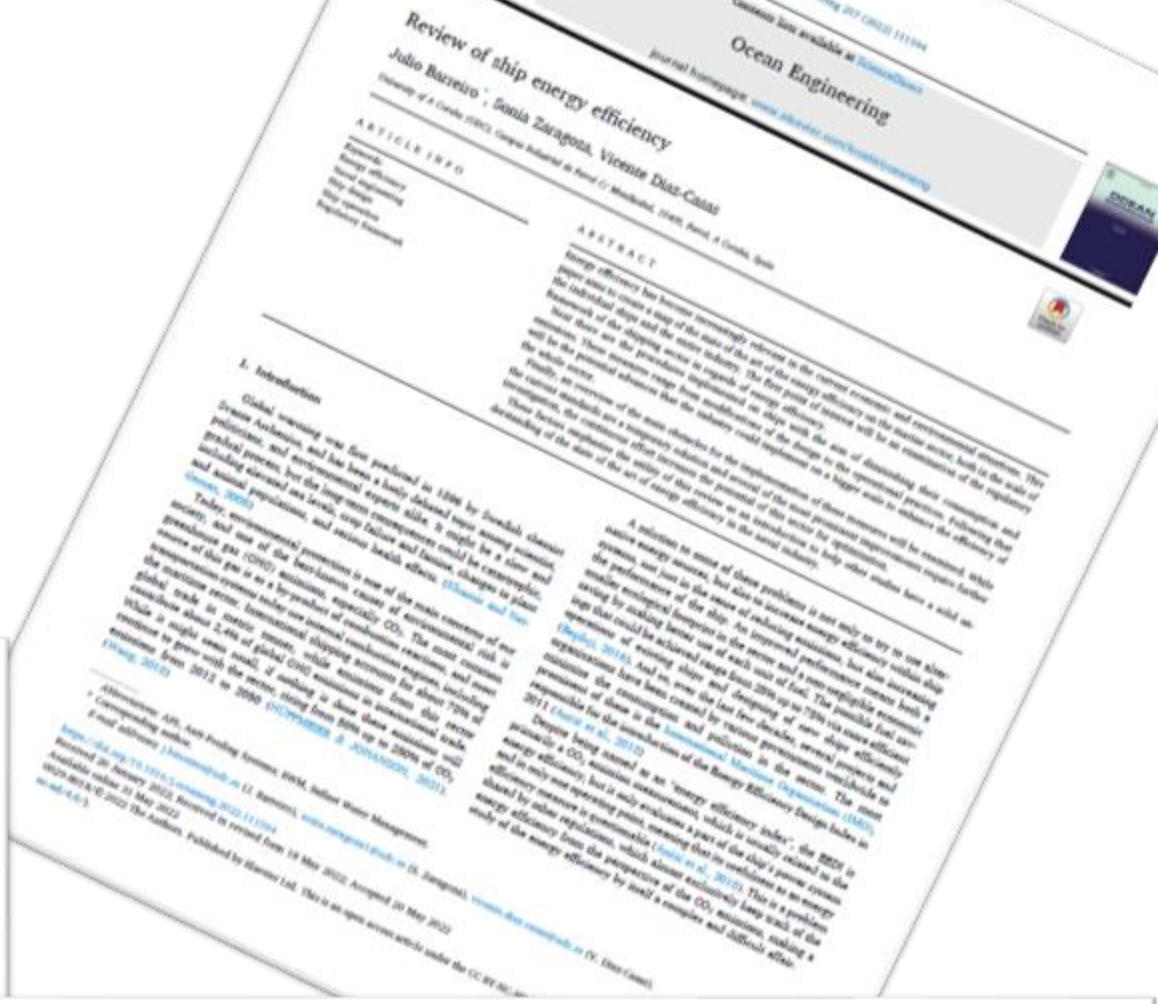
SHIP ENERGY EFFICIENCY

Table 3
Energy efficiency trends on differen types of cargo ships.

Type of cargo ship	Efficiency improvements of new ships relative to the baseline EEDI value of 2013.	Share of ships built in 2013–2017 already complying with the post-2025 EEDI target.
Containerships	58% more efficient	71% of built containerships
General cargo ships	57% more efficient	69% of built general cargo ships
Gas carriers	42% more efficient	13% of built gas carriers
Oil Tankers	35% more efficient	26% of built oil tankers
Bulk Carriers	27% more efficient	1% of built Bulk Carriers

Table 7
Design measures that assesed their impact using the EEDI.

Type of modification employed	Description of the method	Type of ship examined	Impact	Source
Modification of hull parameters	Restoring historical adimensional design parameters like block coefficient.	Tankers and bulk carriers of all sizes.	The EEDI values are reduced between 10 and 15% in the fleets examined.	(Kristensen and Lützen, 2012)
	Reduction of main ship dimensions like length and beam	Panamax tankers with influence of bulk carriers.	The EEDI values diminish between 2.5% and 0.7% per meter subtracted.	(Lützen and Kristensen, 2012)
Propulsion system optimization	Innovative propulsion methods like the Organic Rankine Cycle	LNG carriers.	The EEDI diminishes up to 0.3 below the reference case in the best systems.	(El Gohary, 2018)
	Electric propulsion systems.	Passenger vessels.	Both structures examined comply with phase 3, but the COGES system has greater margin of error.	(Ammar and Seddiek, 2021)
	Specific LNG carrier propulsion	LNG carriers exclusively.	Of the systems examined, only the diesel electric complies with phase 3, but with a heavy methane slip.	(Attah and Bucknall, 2015)
Hybrid propulsion systems	Hybrid systems on general cargo carriers	Small and fast general cargo carriers.	Two of the investigated cases comply even with the strictest phase of the EEDI.	
	Fleets of hybrid systems	Ro-Ro and Passenger ships.	Both types of systems examined have EEDI values below the reference of the ship.	
Alternative fuel sources	Varied array of alternative technologies like shaft generators.	Very large crude carrier.	The combined effects of innovative technologies produces a drop in the EEDI of up to 0.34, around 16%.	
	Propulsion for Liquid hydrogen tankers.	Liquid hydrogen tankers exclusively.	The optimal system analysed was a steam turbine with a hydrogen boiler and complies even with phase 3 of the EEDI.	


Ocean Engineering

Review of ship energy efficiency

Julio Barreiro, Sonia Zaragoza, Vicente Diaz-Casas

Table 9
Operational measures.

Type of modification employed	Description of the method	Type of ship examined	Impact	Source
Slow steaming	Reduction of travel speed.	Bulk carriers, tankers, and containerships	For a speed reduction of 5%, bulk-carriers and tankers have fuel savings of 13% and containerships of 16–19%	(Hochkirch and Bertram, 2010)
	Auxiliary system compliance to slow steaming.	Containership	The coordination of the auxiliary systems reduces the CO_2 emissions by 940 t/year and fuel consumption by 296.2 tons per year.	(Dere and Deniz, 2019)
Route optimization	Optimal speed under varying sea conditions.	Inland Cruise ship but is specifically noted to work on different ships.	Both fuel consumption and emissions can be reduced by about 28% in ideal cases, saving around 2961 kg/trip.	(Wang, 2018)
Trim optimization	Optimal trim configuration.	Bulk carriers	The highest reduction in resistance was almost 14%, depending on the draft and the speed.	(Moustafa et al., 2015)

TAL TECH

Source: Julio Barreiro, Sonia Zaragoza, Vicente Diaz-Casas, 2022, Review of ship energy efficiency, Ocean Engineering, 257, https://doi.org/10.1016/j.oceaneng.2022.111594.

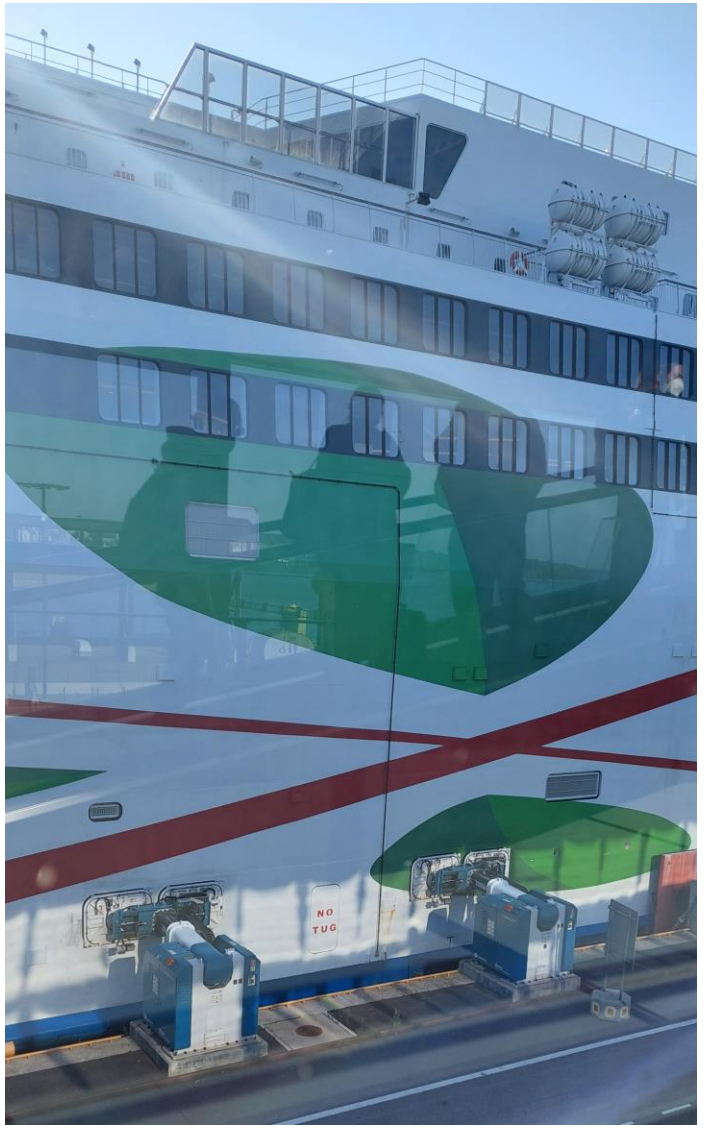
AUTOMOORING SYSTEM IN HELSINKI AND TALLINN

Tallinn's Old City Harbour to introduce automated mooring system

Port of Tallinn has signed contracts with maritime engineering companies Trelleborg and Cavotec for the instalment of automated mooring systems at quays 5, 12 and 13 of the Old City Harbour, which is used by passenger vessels serving the Tallinn-Helsinki route.

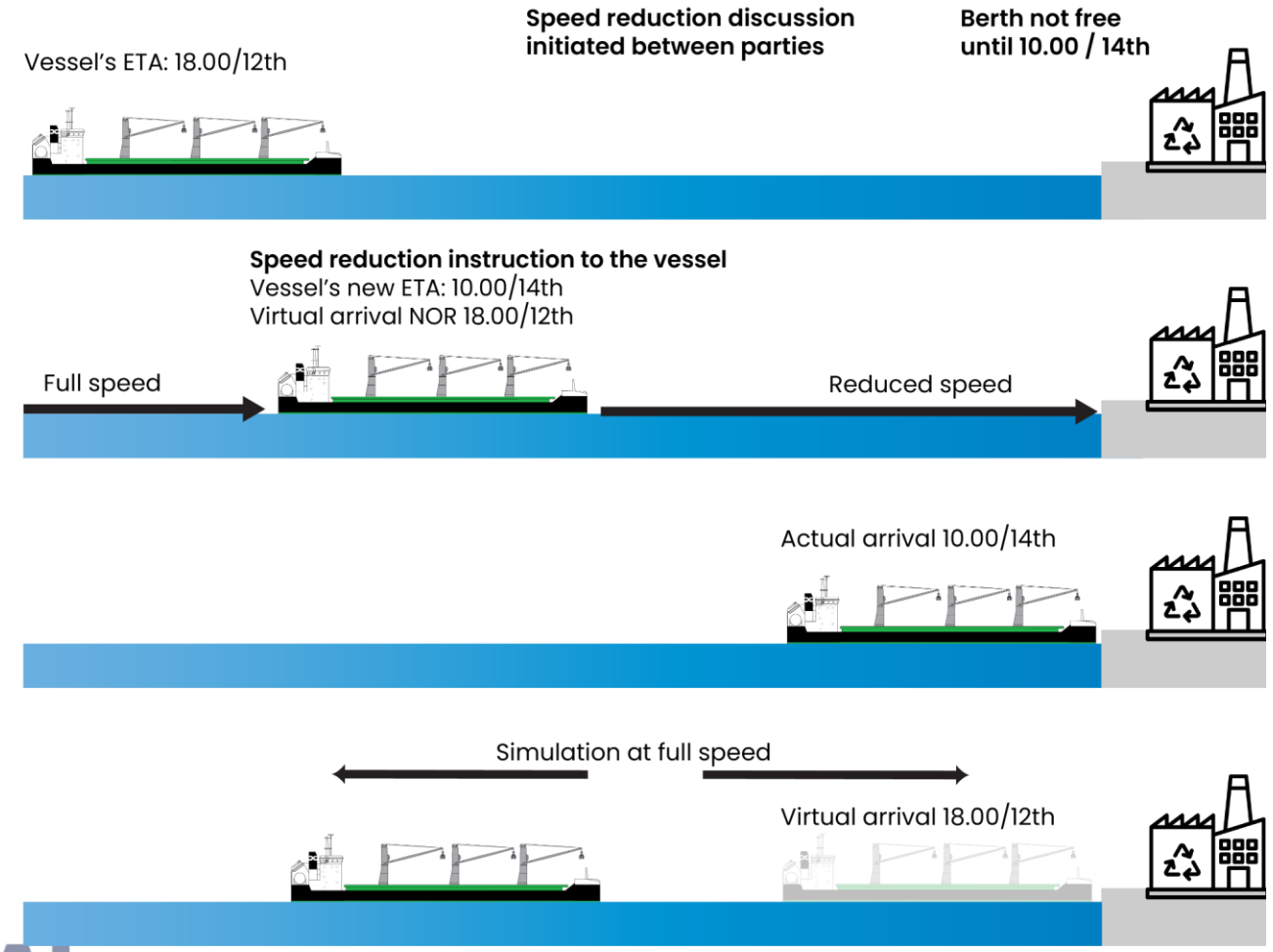
According to Peeter Nõgu, head of the infrastructure development division of Port of Tallinn, technological development has greatly contributed to the maritime sector, including the mooring processes of ships. "The new automated mooring equipment installed in the Old City Harbour will fasten our mooring operations while also requiring less man-hours and contributing to environmental sustainability. The new systems are primarily used by the ships sailing on our busiest route between Tallinn and Helsinki, where every extra minute saved either at sea or in port is highly valued."

The shipping industry uses either automated vacuum mooring or automated magnetic mooring systems. According to Peeter Nõgu, Port of Tallinn opted for a vacuum-pad based system, while the magnetic mooring systems are still at an early stage of development and usage. For this reason, the full impact of the electromagnetic waves on either a ship's electronics or the surrounding environment isn't yet fully known.



TAL TECH

VIRTUAL ARRIVAL



Benefits of Virtual arrival

- reduced energy consumption
- reduced emissions
- less congestion in the port and anchorage area
- more reliable scheduling and line-up of vessels in port
- more efficient resource planning for port operators
- savings are shared between owners and charterer

−24%

Average reduction of CO_2-emissions

TAL TECH

05.11.2021 | **Rahtiliikenne**

HansaLink to take environmental measures

HansaLink to take environmental measures

Grimaldi as a corporate group is determined to continue the fight against climate change. In this battle the environmental performance of the vessels is gaining more and more importance.

One of the effective measures shipping companies can do in order to contribute to actual climate crisis is to slow down the speed. Already a small adjustment helps us and our customers to decrease the CO2 emissions.

That in mind and trying keep our service level as unaffected as possible the schedule of the HansaLink Service will be altered as follows.

SIX STEPS TO PROMOTE SUSTAINABLE MOBILITY OF GOODS AND PEOPLE

1. Improve the energy efficiency in newbuildings.
2. Pilot various technical solutions to increase energy efficiency, e.g. rotor sails; smart IT- solutions to manage data for maintenance, bunker optimization and safety; air lubrication systems; use of batteries in ports and fairways; information for port arrivals, etc.
3. Reduce speed and improve port operations.
4. Be prepared for the new low or zero carbon fuels.
5. Shippers: evaluate alternative transport modes and operations.
6. Regulators: introduce rules and support mechanisms and carbon taxes to help shipping industry to move towards carbon-neutrality

TAL TECH

U. 2021 "Six steps to reach carbon-free shipping" in K. Liuhto (ed.) Baltic Rim Economies, oundation, 5/2021. https://sites.utu.fi/bre/six-steps-to-reach-carbon-free-shipping/

CONTENTS

Table 1: Emissions reported in MRV for different shipping segments

Ship type	Emissions	Emission per distance	Emissions per transport work
	Mtonnes CO_2	kg CO_2/NM	g CO_2 / tonne-NM
Bulk	18.1	290	8.48
Container	44.4	570	20.13
General cargo	6.13	185	28.02
Oil Tanker	18.1	435	8.82
Ro-ro	6.06	338	91.03

Source: Mellin *et al*. 2020

Publication of information in accordance with Article 21 of Regulation (EU) 2015/757 on the monitoring, reporting and verification of CO_2 emissions from maritime transport. Information is accessible through the search tool or can be exported in a spreadsheet for further analysis. Since 30 June 2020, all the verified information submitted by companies to the European Commission for the reporting year 2019 is accessible.

It should be noted that 2021 is the first year for which THETIS-MRV data reflect the impact of the United Kingdom's withdrawal from the EU (see notice to stakeholders)

IMO Number | Ship Name: AURORA BOTNIA | Reporting Period | Ship type

Search | Reset

	IMO	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	(gCO_2/t-nm)				
Actions	9878319	AURORA BOTNIA	Ro-pax ship	Not Ap...		2022	16003.65	266.21	281.77 g CO_2 / pax · n miles 267.68 g CO_2 / m tonnes · n m...

	IMO	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	(gCO_2/t-nm)				
Actions	9827877	VIKING GLORY	Ro-pax ship	EIV	3.5	2022	48797.78	460.36	71.48 g CO_2 / pax · n miles 293.64 g CO_2 / m tonnes · n m...

	IMO	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	(gCO_2/t-nm)				
Actions	9892690	MYSTAR	Ro-pax ship	EIV	2.3	2022	3633.88	797.74	583.81 g CO_2 / pax · n miles 137.82 g CO_2 / m tonnes · n m...

15 FINANCIAL INSTITUTIONS DISCLOSE THE CLIMATE ALIGNMENT OF THEIR SHIP FINANCE PORTFOLIOS

In a first-of-a-kind climate finance report, 15 Signatories of the Poseidon Principles disclose the climate alignment score of their ship finance portfolios. The Poseidon Principles Annual Disclosure Report 2020 shows that 3 banks' ship finance portfolios are aligned with UN decarbonization targets while 12 banks' portfolios are not. The climate assessment offers banks new insight into their lending decisions and provides opportunity to work with their shipping clients to meet society's goals.

International ship finance confirms its leadership role in global climate finance. Announced in June 2019, the Poseidon Principles became the first sector-specific climate alignment agreement for financial institutions. Today, Signatories deliver on their commitment and publish the Poseidon Principles Annual Disclosure Report 2020 – the first sector-specific climate alignment report of its kind.The Poseidon Principles establish a global framework to quantitatively assess and disclose whether financial institutions' lending portfolios are in line with climate goals set by UN maritime agency, the International Maritime Organization (IMO). The IMO's initial GHG strategy prescribes that international shipping must reduce its total annual greenhouse gas emissions by at least 50% of 2008 levels by 2050, whilst pursuing efforts towards phasing them out as soon as possible in this century.

"This report marks a significant milestone for global ship finance and for climate finance reporting as a whole. I commend my fellow Signatories for their pioneering efforts to be transparent and accountable for their role in promoting responsible environmental behavior. I encourage other serious banks and export credit agencies to join us in supporting global seaborne trade in a sustainable manner," says **Michael Parker, Chairman, Global Shipping, Logistics and Offshore, Citi, and Chair of the Poseidon Principles Association.**

Climate assessment will inform future decision-making

The Poseidon Principles Annual Disclosure Report 2020 includes climate alignment reporting from 15 financial institutions, most of which became Signatories in 2019, including **ABN Amro, Amsterdam Trade Bank, BNP Paribas, Bpifrance Assurance Export, CIC, Citi, Credit Agricole Corporate and Investment Bank, Danish Ship Finance, Danske Bank, DNB, Eksportkreditt Norge, ING, Nordea, Sparbanken Vest,** and **Societe Generale**. Financial institutions that joined the Poseidon Principles in 2020 are not required to report before 2021. The assessment by each Signatory includes emissions data collected from clients and the portfolio information from 2019, compared to a decarbonization trajectory for the same year. It shows that 3 financial institutions' ship finance portfolios are aligned with the IMO's initial GHG strategy while 12 banks' portfolios are not. More importantly, the report includes commentary from financial institutions on key takeaways from their climate assessment, and reflections on how it will inform their business activities and decision-making in the future.

TAL TECH

CONTENTS

ENERGY

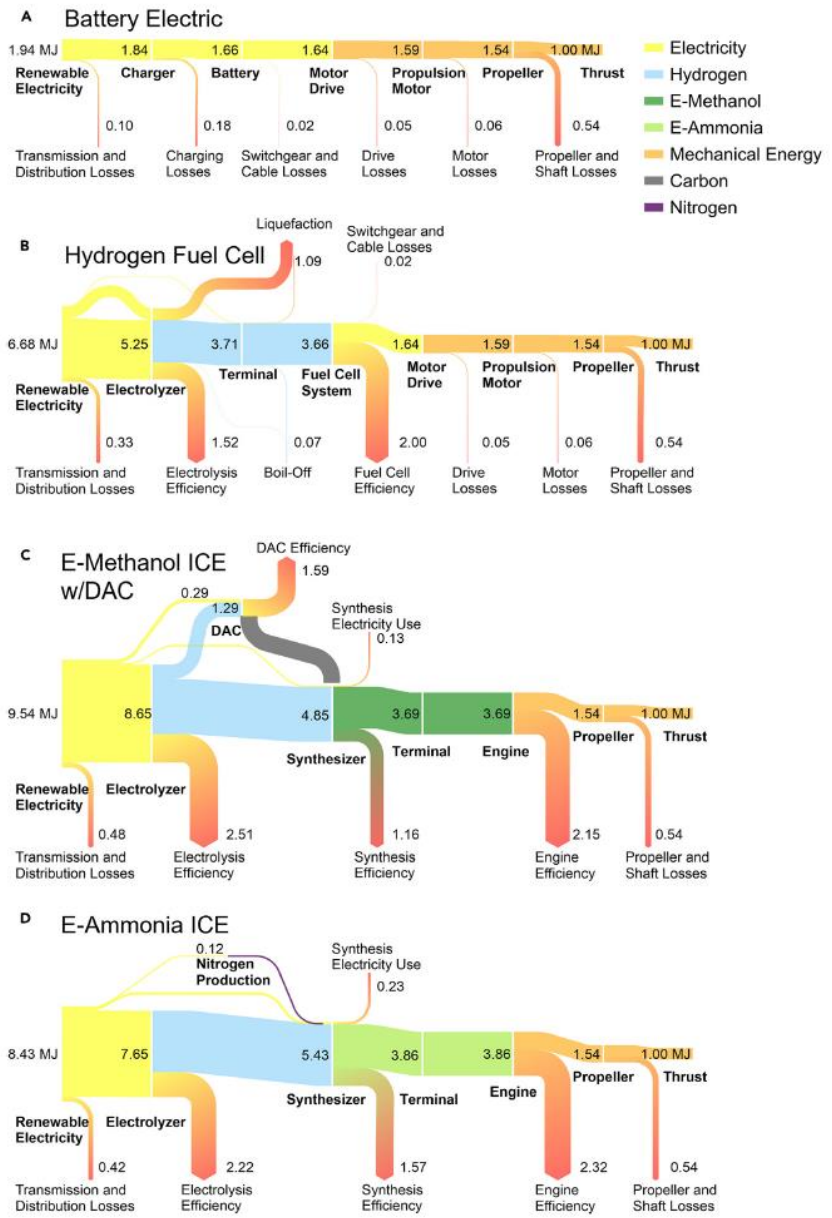
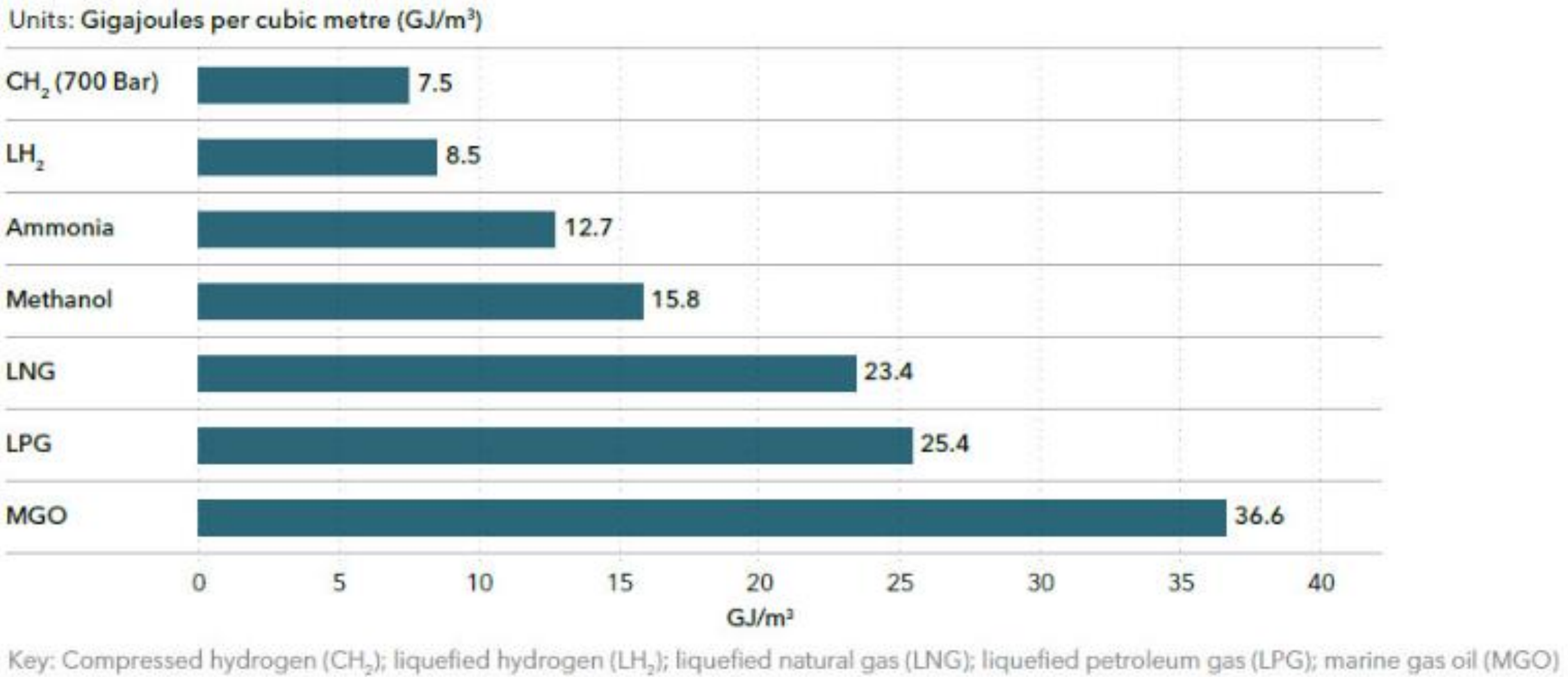


Figure 6. Marine Sankey diagrams

Sankey diagrams illustrating the renewable electricity input needed to provide 1 MJ of thrust for the following powertrain options: (A) battery electric, (B) liquid hydrogen fuel cell, (C) internal combustion engine running on e-methanol including direct air capture (DAC) of CO_2, and (D) internal combustion engine running on e-ammonia.

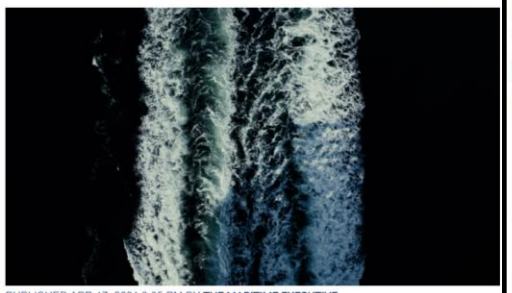
TAL TECH

Volumetric energy density of alternative fuels



Source: DNV

Industry Leaders Collaborate to Develop Ammonia Shipping Fuel Guidance



PUBLISHED APR 17, 2021 3:05 PM BY THE MARITIME EXECUTIVE

This week, Lloyd's Register's Decarbonization Hub, A.P. Moller-Maersk, MAN Energy Solutions, Mitsubishi Heavy Industries, NYK Line, Total and the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping are joining forces in a new project with the purpose of guiding safe use of ammonia as a fuel for shipping.

marine insight

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World's First Liquid Hydrogen-Powered Ship Delivered

By MI News Network | In: Shipping News | Last Updated on July 30, 2021

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Engineering and design services provider LMG Marin has confirmed that HYDRA, the world's first liquefied hydrogen-powered ship, has been delivered to Norway's ferry operator Norled.

Image Credits: LMG Marin

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Norsepower will fit Vale's VLOC charter with rotor sails

MAY 28, 2021

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Bill Gates joins nuclear-powered shipping push

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Maersk orders up to twelve methanol-fuelled 16,000 teu ships at Hyundai Heavy

VESSEL PERFORMANCE OPTIMISATION

New concept design for ammonia-fuel ready LNG-fuelled ship

SHIP DESIGN | SEPTEMBER 9, 2021

Check out the Netherlands' first electric – and it's got swappable batteries

The electric inland ship Alphenaar today sailed its maiden voyage, from Alphen aan den Rijn to Moerdijk in the Netherlands, for Dutch beer giant Heineken. The Alphenaar is the first electric inland shipping vessel in the Netherlands to launch – and it uses swappable batteries.

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Norwegian duo set out to build ammonia bunkering terminals

Copenhagen, 26 November 2020

Partnership aims to develop hydrogen ferry for Oslo-Copenhagen

DFDS and its partners have applied for EU support for development of a ferry powered by electricity from a hydrogen fuel cell which only emits water.

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World's first hydrogen cargo vessel set for Paris debut

The European innovation project Flagships will deploy the world's first commercial cargo transp operating on hydrogen later this year, plying the river Seine in Paris, gliding passed the Eiffel To

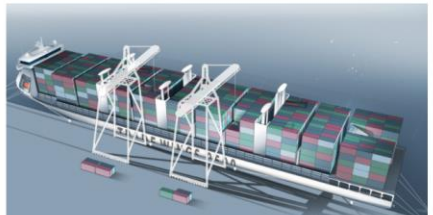
Wind-assisted, LNG-electric containership Trade Wings 2,500 wins BV's AiP

BUSINESS DEVELOPMENTS & PROJECTS

May 17, 2021, by Fatima Bahtić

The 2,500 TEU vessel, which has been designed jointly by VPLP Design, Alwena Shipping, SDARI and AYRO, received an Approval in Principle (AiP) from the classification society Bureau Veritas.

With an overall length of 197 meters and a breadth of 32 meters, Trade Wings 2,500 features six Oceanwings wingsails installed on a vertical sliding mechanism so that they can be retracted partially while the vessel is in port, thus minimising the impact on cargo operations.



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STENA ELEKTRA © Stena Line

Stena´s pathway to decarbonise its shipping operations

The scale of shipping's challenge to transition from fossil-based fuels to renewables must not be underestimated. We are a global industry, and ships must be able to serve all ports. There is still no easy answer on which technology to use and vessels built today could operate for up

Cruise&Ferry

THE GLOBAL GUIDE TO PASSENGER SHIPPING

INTRODUCING THE NEXT CLEANSEWAGE MEMBRA

Ulstein develops new concept for zero-emission vessel

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Ulstein Thor and Sif will be able to generate clean electricity using a Thorium Molten Salt Reactor

By Alice Chambers
28 April 2022

Ulstein has created a new zero-emission concept vessel, called Ulstein Thor, which will feature a Thorium Molten Salt Reactor (MSR) to generate clean electricity that can be used to power cruise ships.

World's First Zero-Emission Wind and Hydrogen Power Cargo Ship

Concept design for the zero-emmission buler (Egil Ulvan Rederi)

PUBLISHED MAR 26, 2021 7:44 PM BY THE MARITIME EXECUTIVE

A Norwegian partnership is moving forward with the development of what they are calling the world's first zero-emission cargo ship. After a six-month competition, with more than 31 ship owners bidding on the project, the contract for the construction has been awarded. The team expected to complete the design this year so that the vessel can enter service by 2024.

ANALYSIS OF 2 FERRIES WITH DIFFERENT ENERGY SYSTEM

Figure 1. Ferry line route map

sustainability

MDPI

Article

Decarbonizing City Water Traffic: Case of Comparing Electric and Diesel Powered Ferries

Riina Otsason [1,*] and Ulla Tapaninen [2]

[1] Ph.D. student-junior researcher, Estonian Maritime Academy, Tallinn University of Technology, Kopli 101, 11712 Tallinn, Estonia; E-mail: riina.otsason@taltech.ee
[2] Tenured Associate Professor, Estonian Maritime Academy, Tallinn University of Technology, Kopli 101, 11712 Tallinn, Estonia; E-mail: ulla.tapaninen@taltech.ee
* Correspondence: riina.otsason@taltech.ee

Abstract: The maritime sector is aiming to achieve carbon neutrality by 2050. Shipping companies are therefore investigating efficient and optimal ways to minimize their greenhouse gas emissions. One of the measures is using vessels that operate on alternative non-carbon fuels. This study compares greenhouse gas (GHG) emissions of a diesel fuelled catamaran and its fully electric sister vessel that operate on the same line. The study shows that the GHG emissions of the electric vessel are only 25% of its diesel-powered sister vessel. However, this figure is highly dependent on the source of electricity in the operating country. In this case, energy costs of the fully electric vessel were 31 % cheaper than costs of diesel energy. The payback time without possible subsidy for replacing diesel ferry with electric one for the case would be 17 years and 6 months. We also show that even in winter, when there is very low solar energy production, the additional energy from solar panels is sufficient to cover several options of applications or consumers. This study brings more insight to academic literature on decreasing maritime CO_2 emissions of city water traffic. As managerial implications, it can be used when shipping companies evaluate options to reduce their emissions. The results of the study show that using fully electric vessels have major benefits concerning the carbon emissions but also financial advantages.

Keywords: carbon neutrality, GHG emission reduction, full electric ferry, diesel ferry

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DFDS to Invest EUR 1 billion in battery electric ships for the Channel

FERRY In the future, maritime traffic in the Channel will be electric. DFDS is announcing an expected EUR 1 billion investment in six battery electric ships that will be deployed on the Dunkirk-Dover and Calais-Dover routes to carry passengers and freight between the UK and the European Union.

TALOUSSANOMAT

TS: Viking Line harkitsee sähkölaivaa Helsinki–Tallinna -reitille

Viking Line tutkii sähköllä kulkevan laivan mahdollisuuksia Helsingin ja Tallinnan välisessä liikenteessä.

JAA TALLENNA

KUVA: PETE AARRE-AHTIO / IS

Kuuntele juttu

Perttu Pitkänen
2.12.2024 9:22

VARUSTAMOYHTIÖ Viking Line harkitsee sähköllä toimivan laivan hankkimista Helsingin ja Tallinnan väliseen liikenteeseen, kertoo Turun Sanomat. Syynä on merenkulun päästökaupan ehtojen kiristyminen vuoden päästä.

CONTENTS

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Swedish Environmental Research Institute

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Government bans scrubber discharge in Swedish waters

The Swedish government has decided to ban discharge from scrubbers – systems that shower exhaust gases on ships. The ban will apply to all ships in Swedish waters.

Maria Granberg

“This is very welcome news, and an important step to protect the marine environment and marine ecosystems along Sweden's coasts. Scrubber water from ships is a significant and completely unnecessary source of environmentally hazardous substances in the marine environment, and something that all countries should address urgently”, says Maria Granberg, marine ecotoxicologist at IVL Swedish Environmental Research Institute.

For many years, IVL has been studying the effects of discharge from scrubber systems to both air and water. The research shows that ships' scrubber water is already toxic at very low concentrations.

TAL TECH

LNG AS A MARINE FUEL

Table 2: Well-to-hull emissions for LNG and a selection of conventional marine fuels, in grams (g)/megajoule (MJ)

	HFO	VLSFO	MGO	LNG
CH_4	0.1	0.1	0.1	0.3
N_2O	0.0	0.0	0.0	0.0
CO_2	10.7	12.9	13.5	11.0
CO_2e (100-year)	**14.3**	**16.8**	**17.4**	**21.5**
CO_2e (20-year)	**19.2**	**22.0**	**22.7**	**35.6**

Source: GREET (2018)
Note: GWP values from IPCC AR5 (IPCC, 2013)

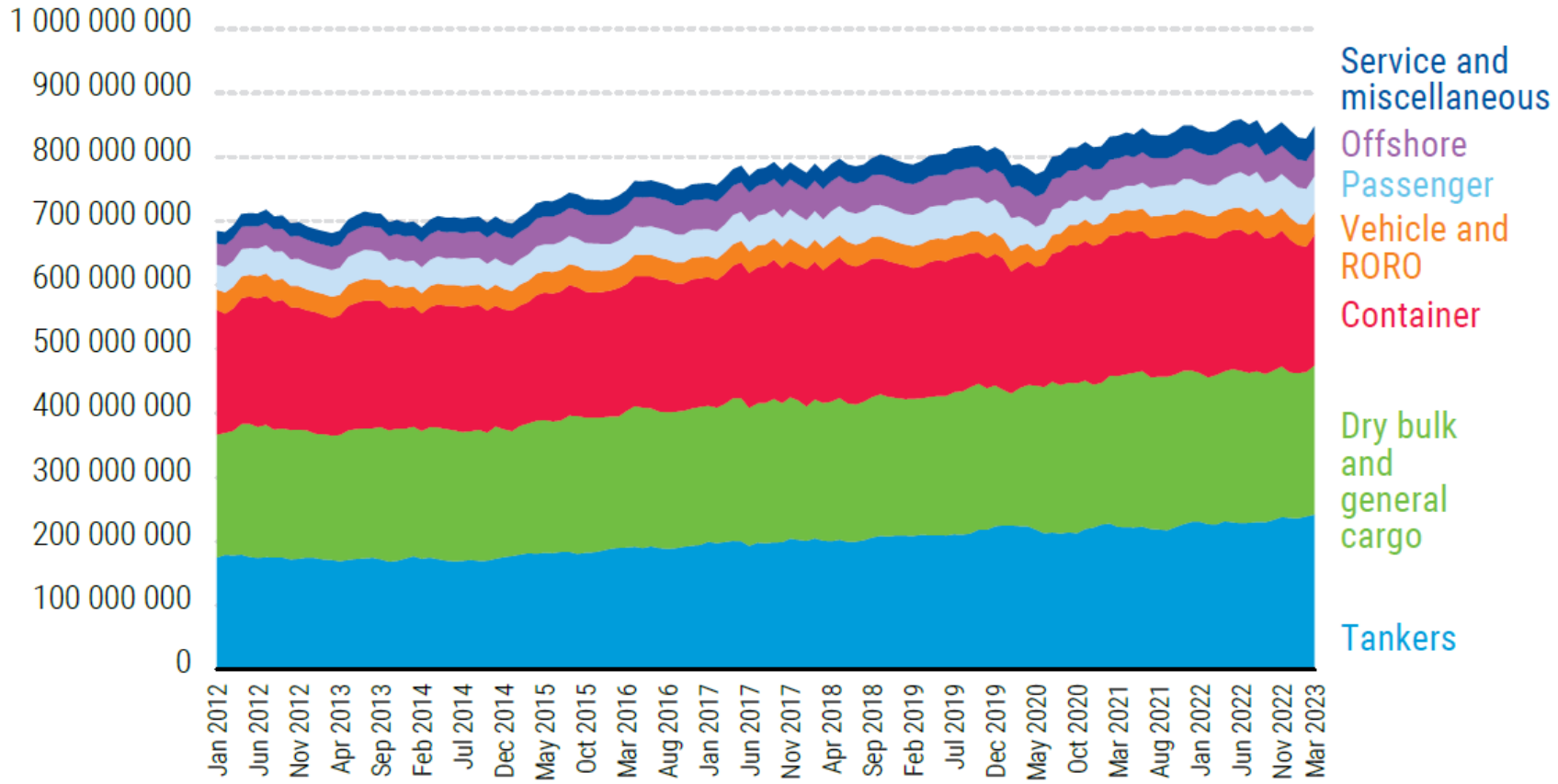
2 This analysis does not assume that all LNG would be sourced from the United States; rather, we use the upstream emission factor associated with LNG produced in the United States as our base case because it falls in the middle of the range of upstream emission factors described in Appendix A.

3 Liquefaction is a process that cools natural gas to liquid form. Emissions from this process are described in Appendix A.

TAL TECH

CRUISE SHIPPING AND LNG

Figure 10 Carbon dioxide emissions by main vessel types, tons, January 2012–March 2023



Source: UNCTAD based on data provided by Marine Benchmark, June 2023.

Notes: Carbon dioxide emissions from vessels' main and auxiliary engines calculated bunker fuel from AIS.

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Source: Review of Maritime Transport, 2023

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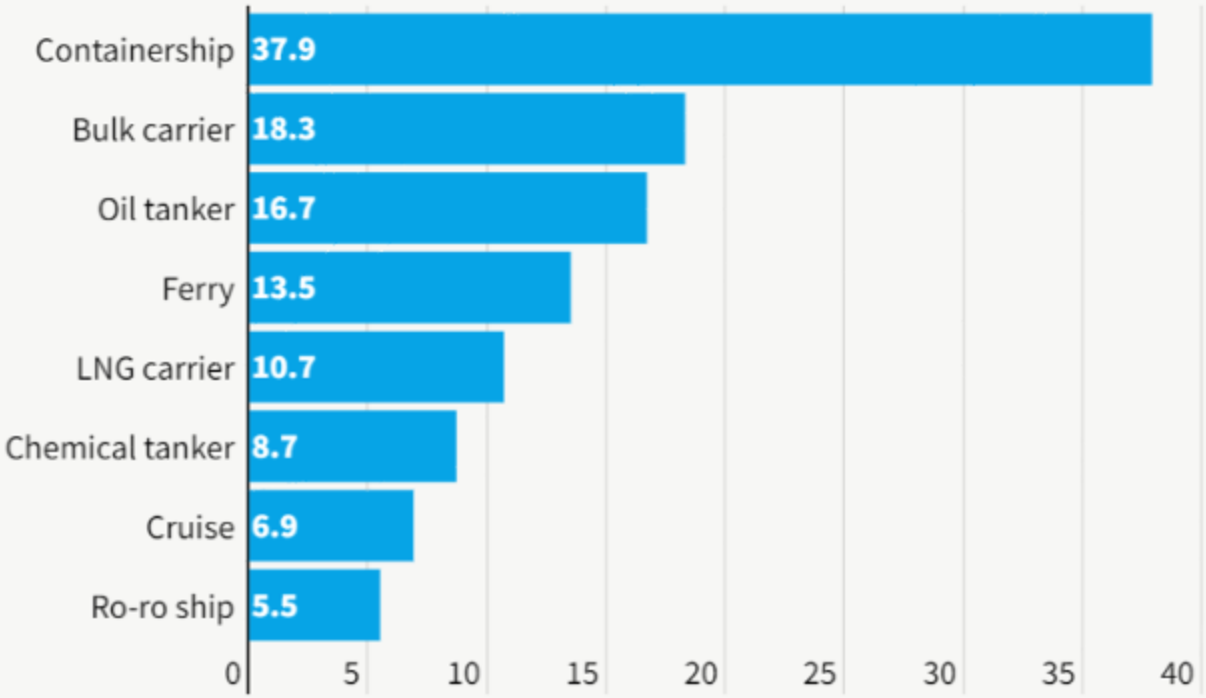
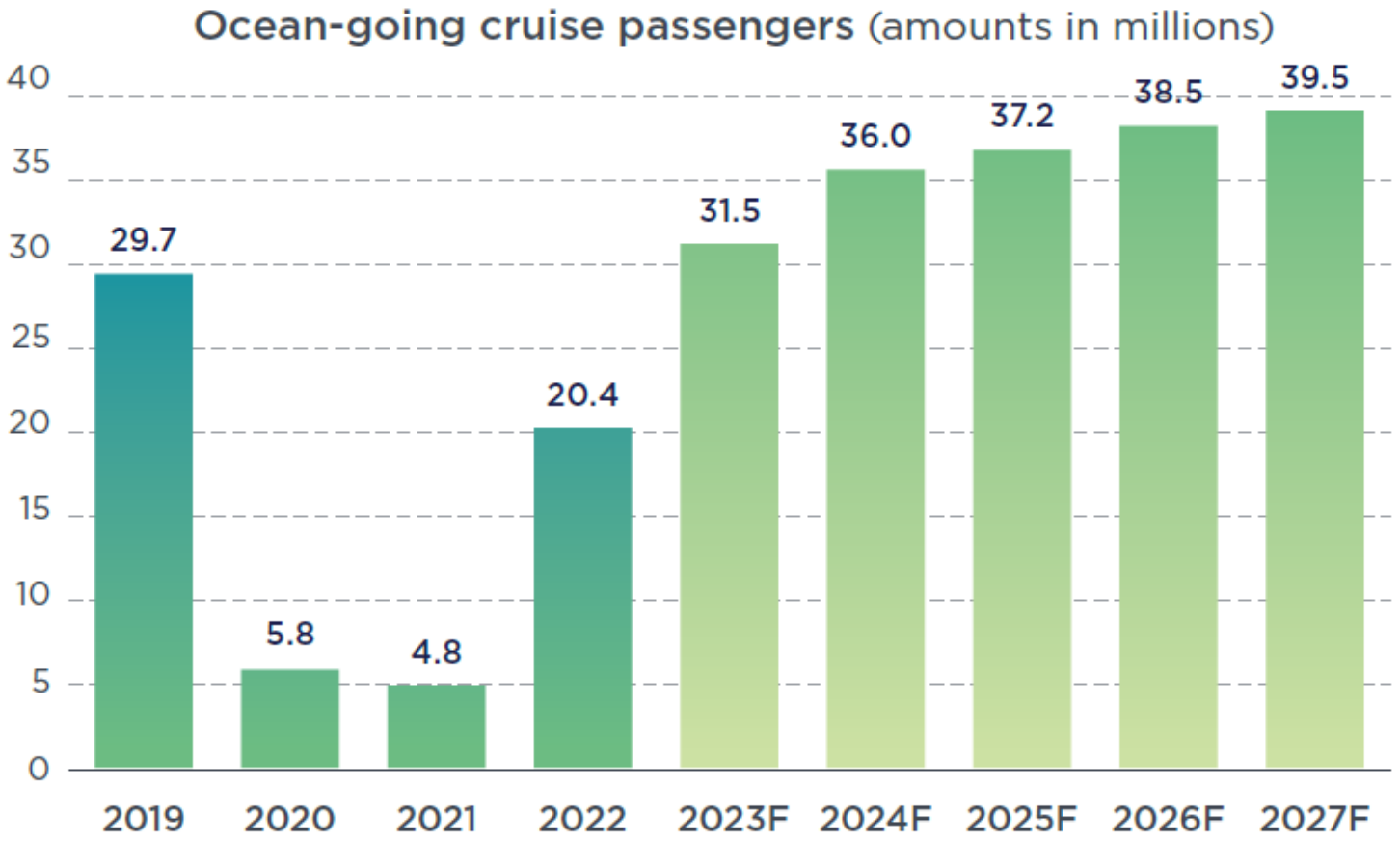
Most polluting ship types 2022 ($MtCO_2$)



Note: MRV 2022 v73. MRV data excludes CH4, N2O and emissions from ships below 5000GT. Emissions 2018-2020 adjusted for EU27.

Cruise continues to be one of the fastest-growing sectors of tourism



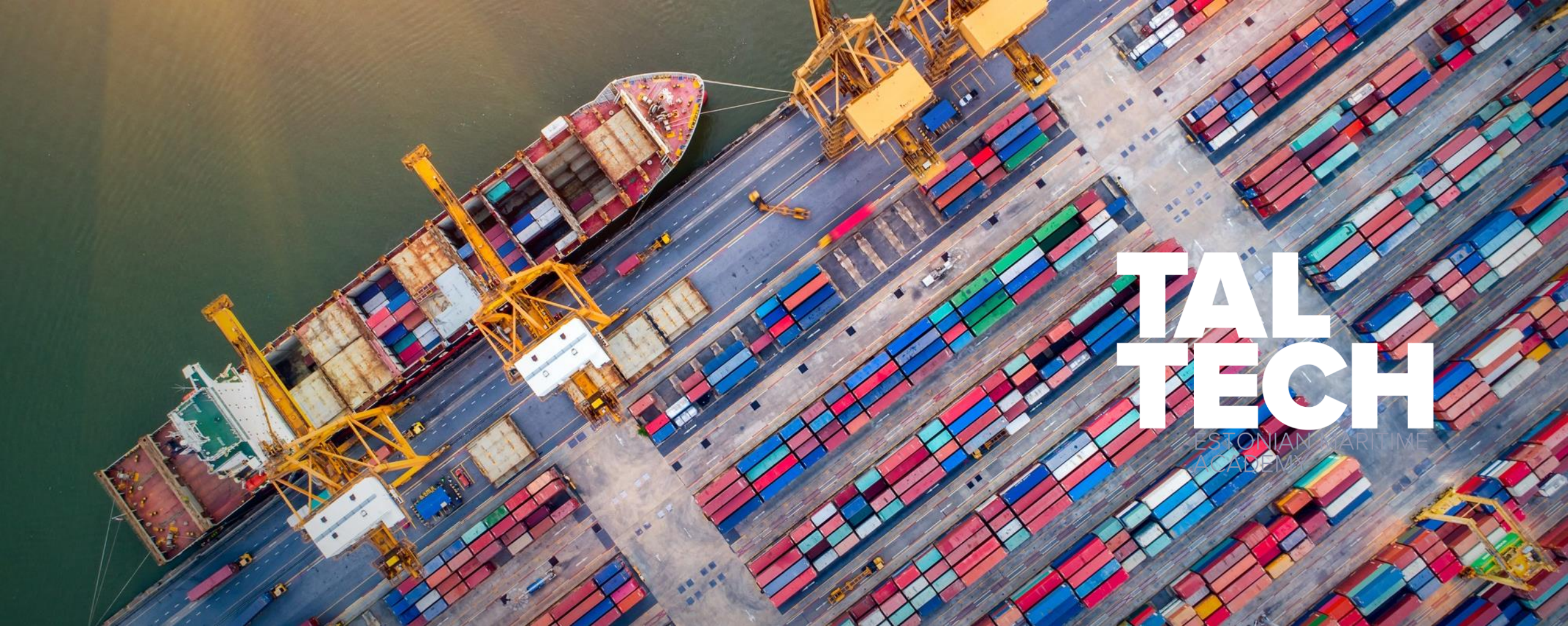
Source: CLIA Passenger Data, 2019 – 2021 and CLIA Cruise Forecast/Tourism Economics (December 2022)

Cruise lines are investing in fuel flexibility, including LNG, a fuel in transition

- LNG is currently the cleanest fuel available at scale while cruise lines are exploring the use of sustainable marine fuels, including advanced biofuels and other renewable energy solutions, such as synthetic fuels, methanol, hydrogen, fuel cells and batteries.
- Ships designed with LNG engines and fuel supply systems will be able to switch to more sustainable, alternative fuels such as bio or synthetic LNG in the future, with little or no modifications.
- The LNG engine technology and infrastructure of today offers a clear pathway to more sustainable cruising in the future.

15% of ships launching between 2023 and 2028 will have battery storage and/or fuel cells for hybrid power generation

60% of ships scheduled to debut between 2023 and 2028 will rely on LNG fuel for their primary propulsion



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