European Green Deal – Fit for 55 - Shipping

Futuros combustibles marinos neutros en carbono

CONAMA, Madrid, 21 de noviembre de 2022

TRANSPORT & ENVIRONMENT

T&E:

26 Countries

61 Members

6 National offices

Founding member of CSC

CLEAN SHIPPING COALITION

AirClim
Air Pollution & Climate Secretariat

BELLONA

CLEAN AIR TASK FORCE

Carbon Market Watch

eia environmental investigation agency

NABU

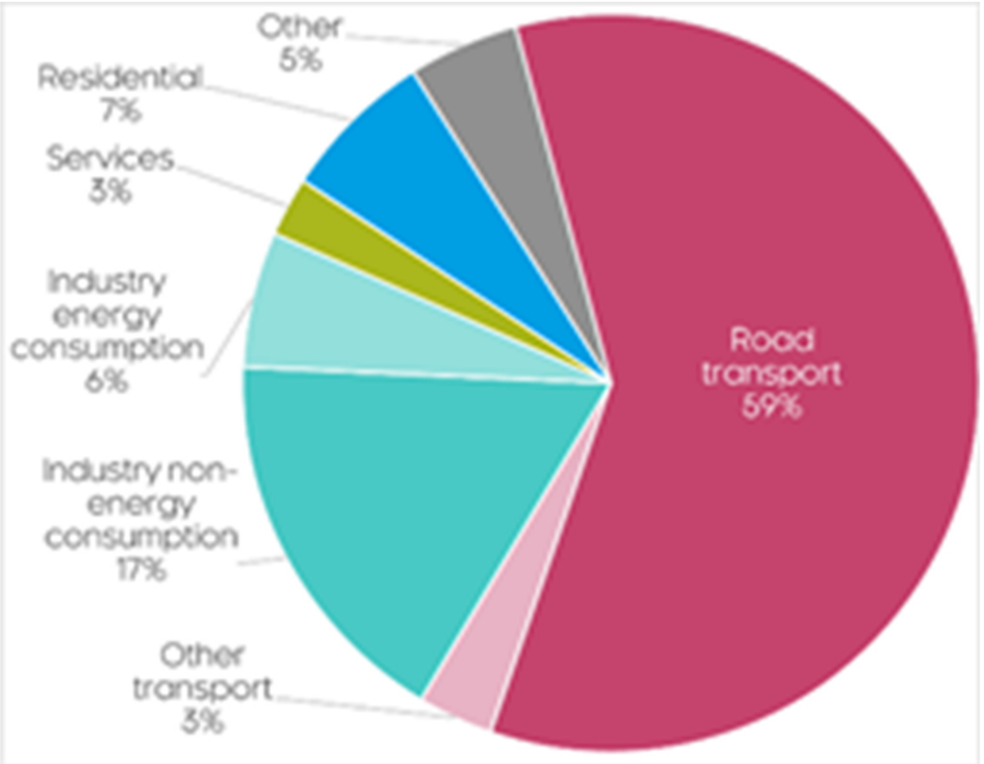
Stichting De Noordzee

SEAS AT RISK

Ocean Conservancy®

TRANSPORT & ENVIRONMENT

Shifting away from oil



- Nearly two thirds of final demand for oil comes from the transport sector.
- **Around 95% of EU's transport energy comes from oil products.**

Ships owned by Carnival corporation emit 10 times more SO_x than all European cars

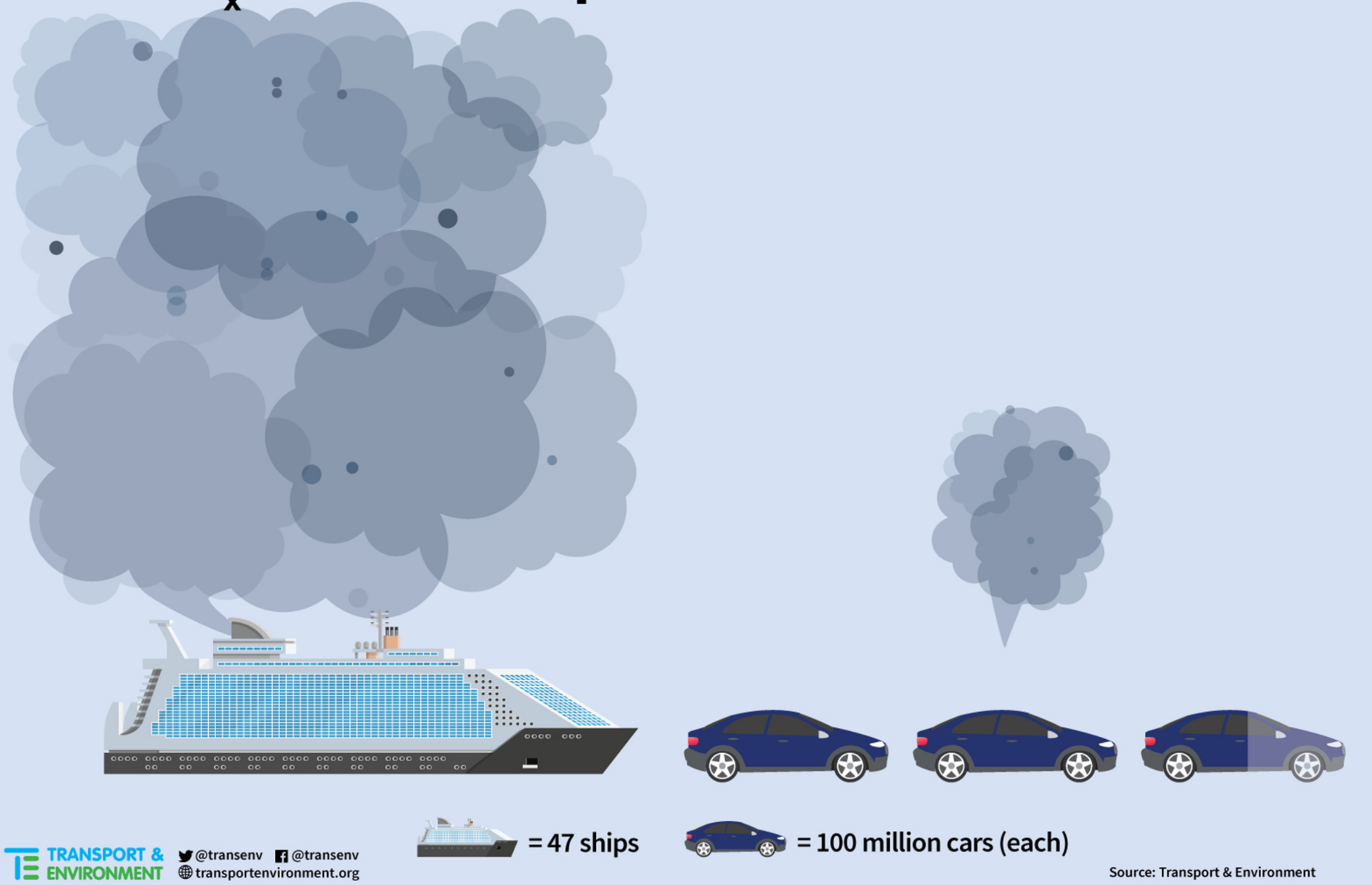
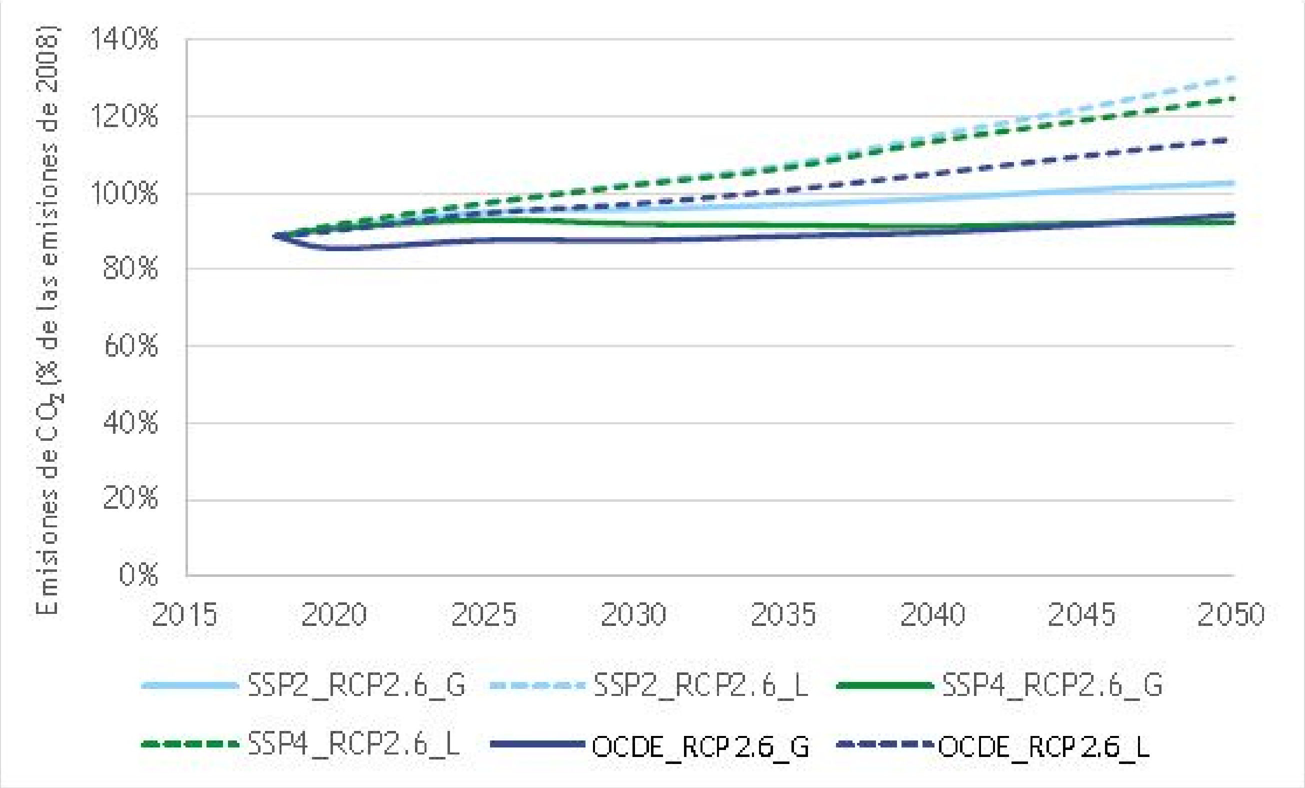
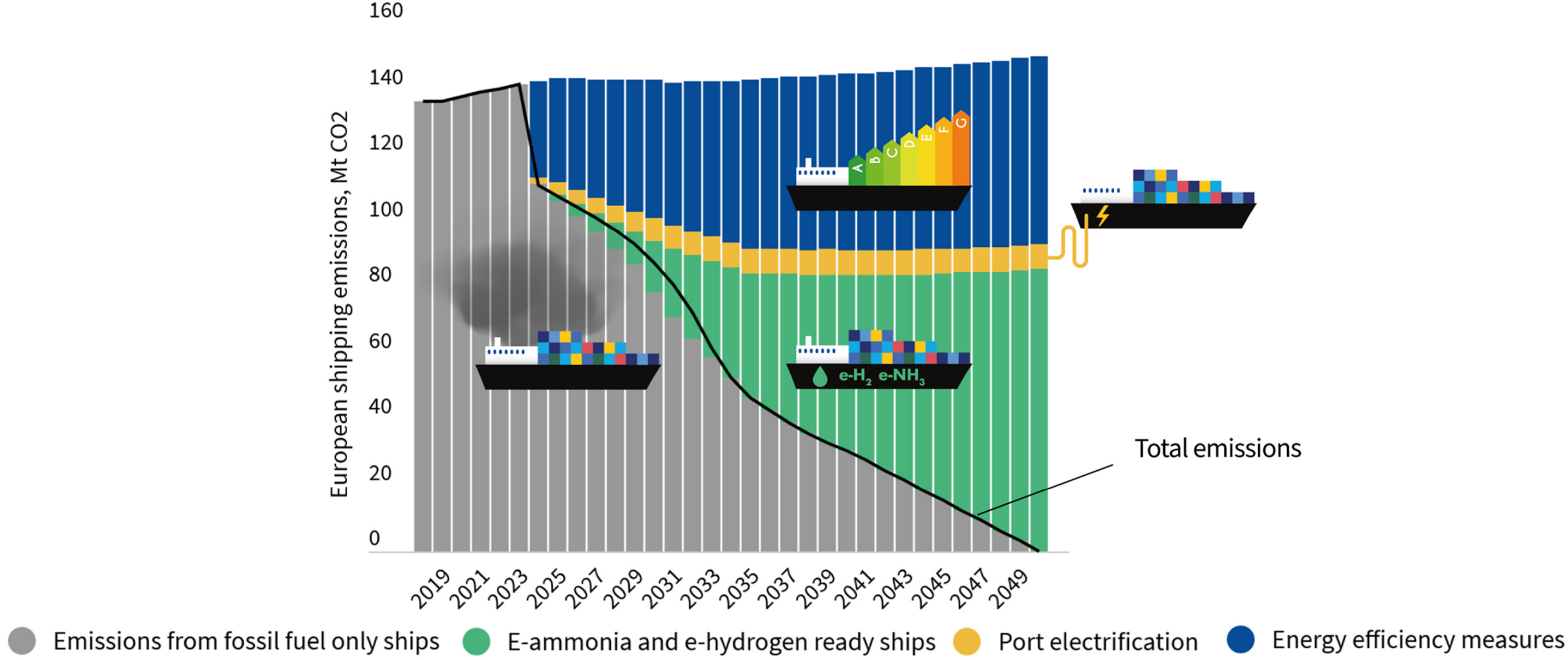


Gráfico 1 - Previsión de las emisiones procedentes de los buques en el transporte marítimo (% de las emisiones de 2008)



Shipping's path to zero



[T&E 2021 study Shipping Decarbonisation Roadmap]

Source: Transport & Environment

Table 77 - 4 Cost efficiency and abatement potential (interest rate: 4%, lifetime: 25 years, price of fuel oil: 375 USD/tonne) - (a) Calculated results for 2030

Code	Technology group	Scenario 1		Scenario 2	
		MAC (USD/tonne -CO_2)	CO_2 abatement potential (%)	MAC (USD/tonne -CO_2)	CO_2 abatement potential (%)
Group 10	Optimization water flow hull openings	-119	1.64%	-119	0.15%
Group 3	Steam plant improvements	-111	1.30%	-111	0.12%
Group 6	Propeller maintenance	-102	2.20%	-102	0.21%
Group 9	Hull maintenance	-92	2.22%	-92	0.22%
Group 12	Reduced auxiliary power usage	-61	0.40%	-61	0.04%
Group 8	Hull coating	-53	1.48%	-53	0.15%
Group 2	Auxiliary systems	-41	0.87%	-41	0.08%
Group 1	Main engine improvements	-35	0.25%	-35	0.02%
Group 13	Wind power	6	0.89%	6	0.08%
Group 16	Speed reduction	17	7.38%	17	7.81%
Group 5	Propeller improvements	21	1.40%	21	0.14%
Group 11	Super light ship	54	0.28%	54	0.03%
Group 4	Waste heat recovery	69	1.68%	69	0.16%
Group 7	Air lubrication	105	1.35%	105	0.14%
Group 15A	Use of alternative fuel with carbons	258	5.54%	258	0.01%
Group 15B	Use of alternative fuel without carbons	416	0.10%	416	0.05%
Group 14	Solar panels	1,186	0.18%	1,186	0.02%

Table 78 - (b) Calculated results for 2050

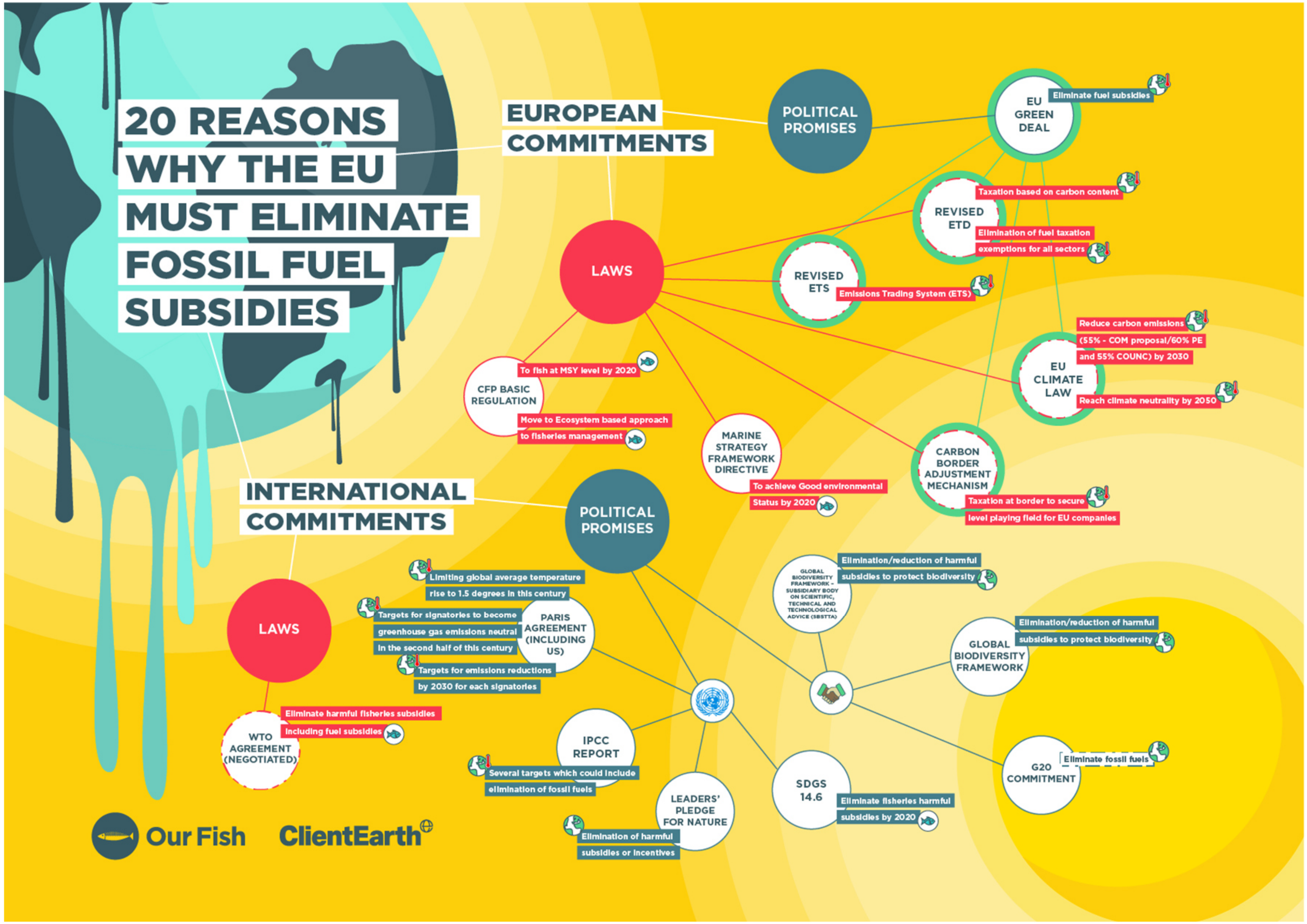
Code	Technology group	Scenario 1		Scenario 2	
		MAC (USD/tonne -CO_2)	CO_2 abatement potential (%)	MAC (USD/tonne -CO_2)	CO_2 abatement potential (%)
Group 10	Optimization water flow hull openings	-119	3.00%	-119	0.90%
Group 3	Steam plant improvements	-111	2.13%	-111	0.64%
Group 6	Propeller maintenance	-102	3.95%	-102	1.22%
Group 9	Hull maintenance	-91	3.90%	-91	1.24%
Group 12	Reduced auxiliary power usage	-59	0.71%	-59	0.21%
Group 8	Hull coating	-50	2.55%	-50	0.83%
Group 2	Auxiliary systems	-39	1.59%	-39	0.48%
Group 1	Main engine improvements	-34	0.45%	-34	0.14%
Group 13	Wind power	2	1.66%	2	0.50%
Group 16	Speed reduction	10	7.54%	10	8.18%
Group 5	Propeller improvements	18	2.40%	18	0.80%
Group 11	Super light ship	54	0.39%	54	0.12%
Group 4	Waste heat recovery	54	3.09%	54	0.93%
Group 7	Air lubrication	93	2.26%	93	0.77%
Group 15A	Use of alternative fuel with carbons	-	-	249	2.03%
Group 15B	Use of alternative fuel without carbons	416	64.08%	416	20.00%
Group 14	Solar panels	1,048	0.30%	1,048	0.09%

Table 97 - Cost efficiency and abatement potential in 2030 (interest rate: 4%, Change of conventional fuel price from base price: -50%/0%/+100%)

Code	Technology group	Conventional fuel price (% change from base price)			CO_2 abatement potential (%)
		-50%	0%	+100%	
		MAC (USD/tonne-CO_2)			
Group 10	Optimization water flow hull openings	-57	-119	-243	1.64%
Group 3	Steam plant improvements	-49	-111	-235	1.30%
Group 6	Propeller maintenance	-40	-102	-226	2.20%
Group 9	Hull maintenance	-30	-92	-216	2.22%
Group 12	Reduced auxiliary power usage	1	-61	-185	0.40%
Group 8	Hull coating	9	-53	-176	1.48%
Group 2	Auxiliary systems	21	-41	-165	0.87%
Group 1	Main engine improvements	27	-35	-159	0.25%
Group 13	Wind power	68	6	-118	0.89%
Group 16	Speed reduction	79	17	-107	7.38%
Group 5	Propeller improvements	83	21	-103	1.40%
Group 11	Super light ship	116	54	-70	0.28%
Group 4	Waste heat recovery	131	69	-54	1.68%
Group 7	Air lubrication	167	105	-19	1.35%
Group 15A	Use of alternative fuel with carbons	320	258	134	5.54%
Group 15B	Use of alternative fuel without carbons	478	416	292	0.10%
Group 14	Solar panels	1,248	1,186	1,062	0.18%

Table 98 - Cost efficiency and abatement potential in 2050 (interest rate: 4%, Change of conventional fuel price from base price: -50%/0%/+100%)

Code	Technology group	Conventional fuel price (% change from base price)			CO_2 abatement potential (%)
		-50%	0%	+100%	
		MAC (USD/tonne -CO_2)			
Group 10	Optimization water flow hull openings	-57	-119	-243	3.00%
Group 3	Steam plant improvements	-49	-111	-235	2.13%
Group 6	Propeller maintenance	-40	-102	-226	3.95%
Group 9	Hull maintenance	-29	-91	-215	3.90%
Group 12	Reduced auxiliary power usage	3	-59	-183	0.71%
Group 8	Hull coating	12	-50	-174	2.55%
Group 2	Auxiliary systems	23	-39	-163	1.59%
Group 1	Main engine improvements	28	-34	-158	0.45%
Group 13	Wind power	64	2	-122	1.66%
Group 16	Speed reduction	72	10	-113	7.54%
Group 5	Propeller improvements	80	18	-106	2.40%
Group 11	Super light ship	116	54	-70	0.39%
Group 4	Waste heat recovery	116	54	-70	3.09%
Group 7	Air lubrication	155	93	-31	2.26%
Group 15B	Use of alternative fuel without carbons	478	416	292	64.08%
Group 14	Solar panels	1,110	1,048	924	0.30%
Group 15A	Use of alternative fuel with carbons	-	-	-	-

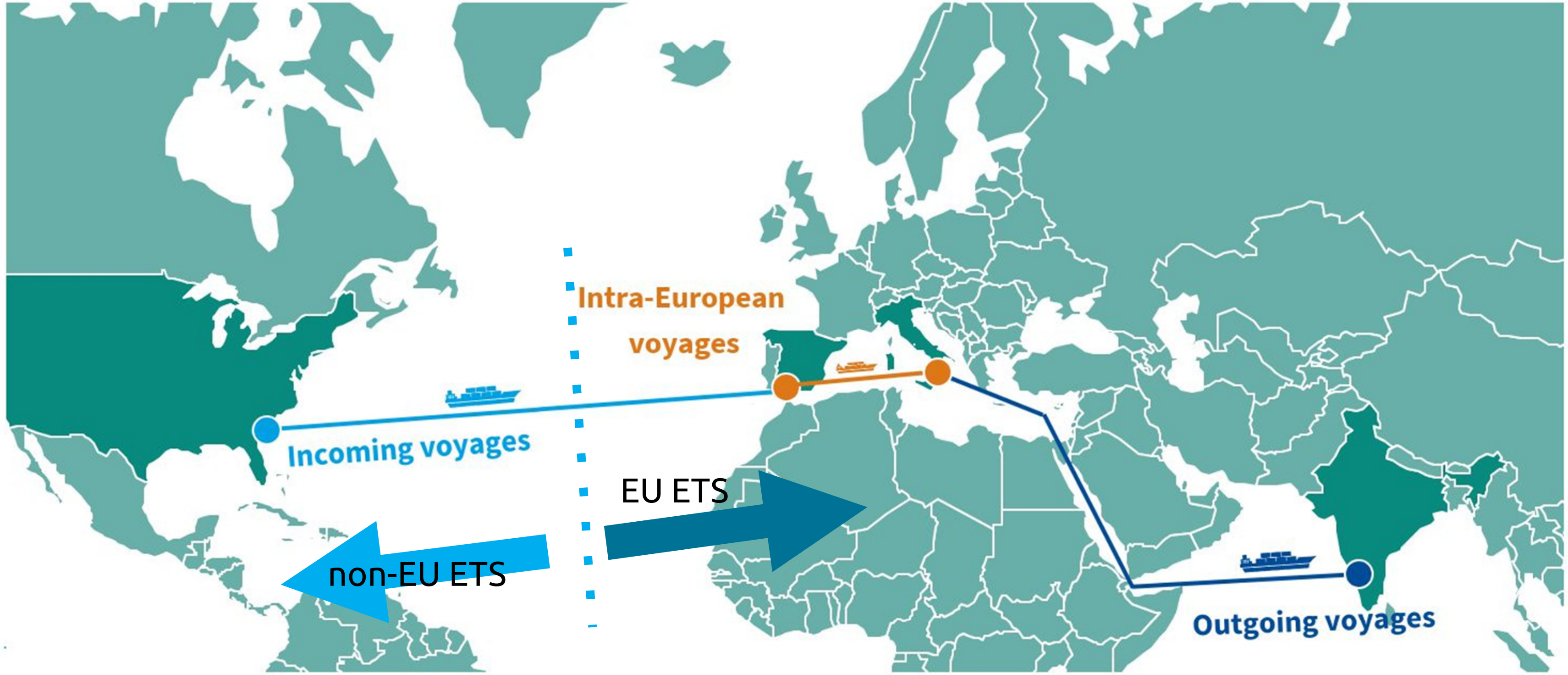


la Unión Europea destina más de 24.000 millones de euros anuales a diferentes ayudas al sector marítimo en forma de ***exenciones de impuestos en el pago de los combustibles fósiles***.

ETS

Applying "polluter pays principle" to shipping

Full scope of MRV emissions

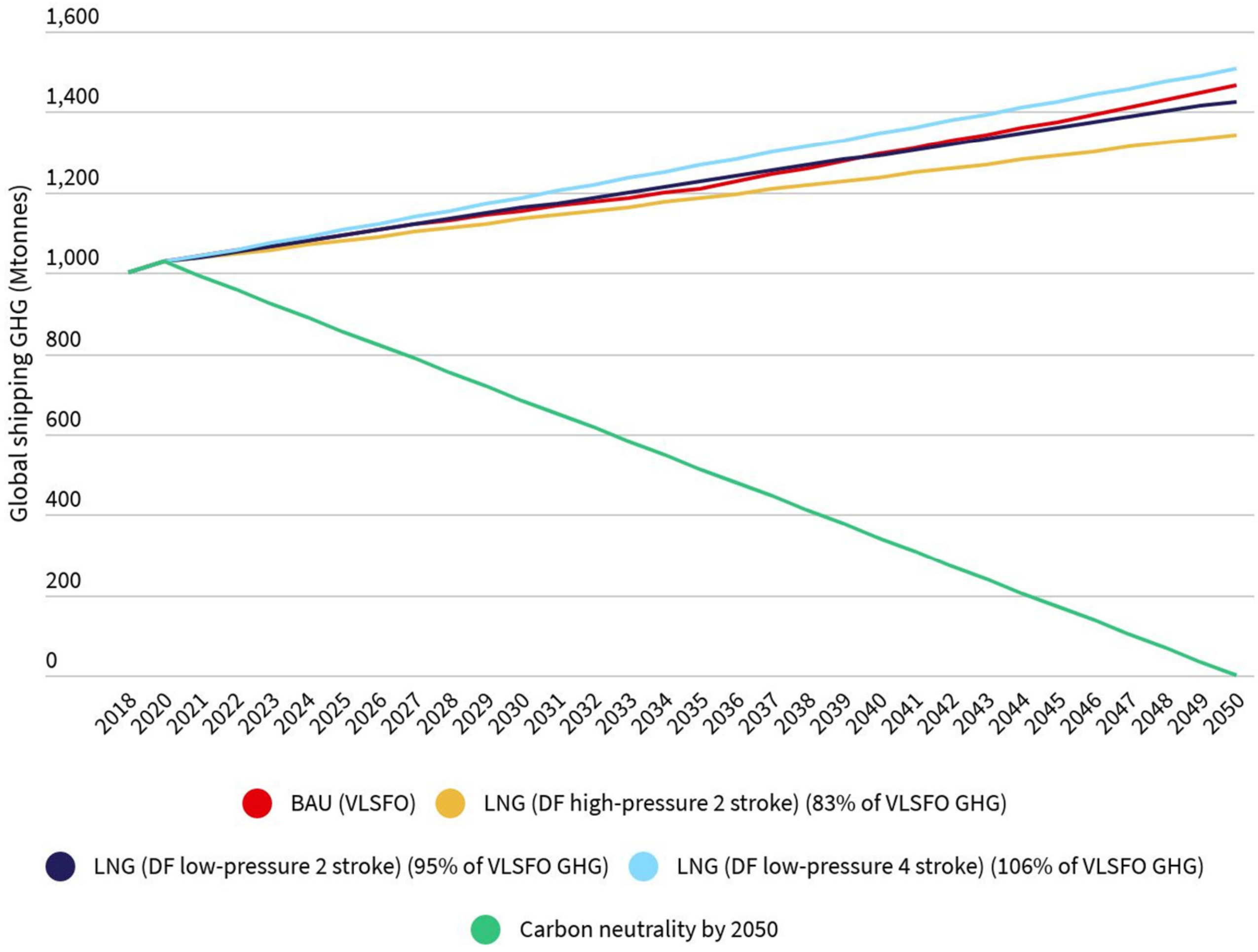


50:50 - EU regulates its share and leaves rest for other systems

‘Methanegate’

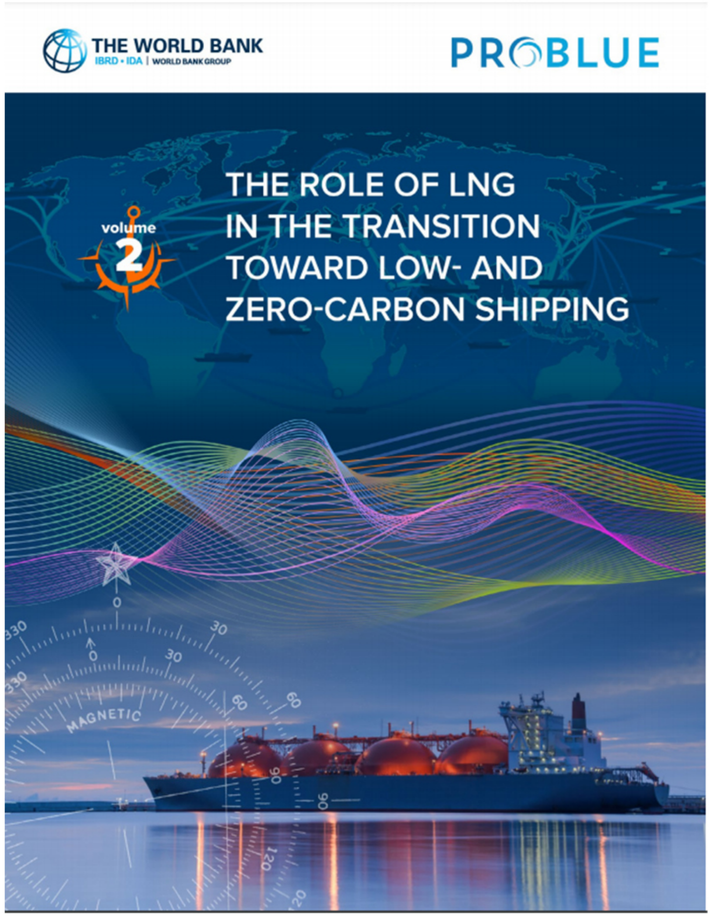
T&E investigation : finding the invisible

What if half of global fleet were to switch to LNG by 2050? Here is why it is a dead-end fuel.



How can LNG be a transitional fuel if emissions go in the opposite direction?

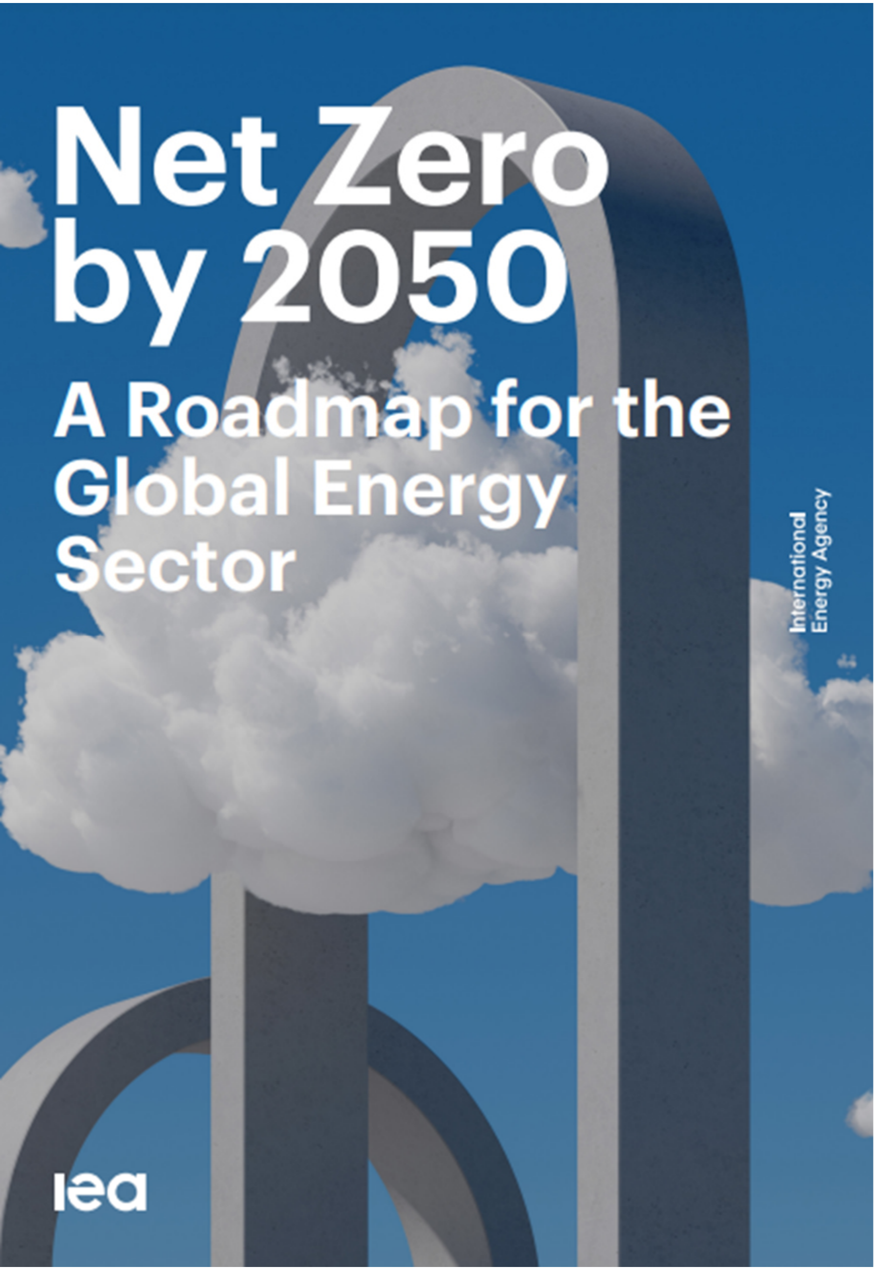
World Bank calls on regulators not to support LNG



April 2021

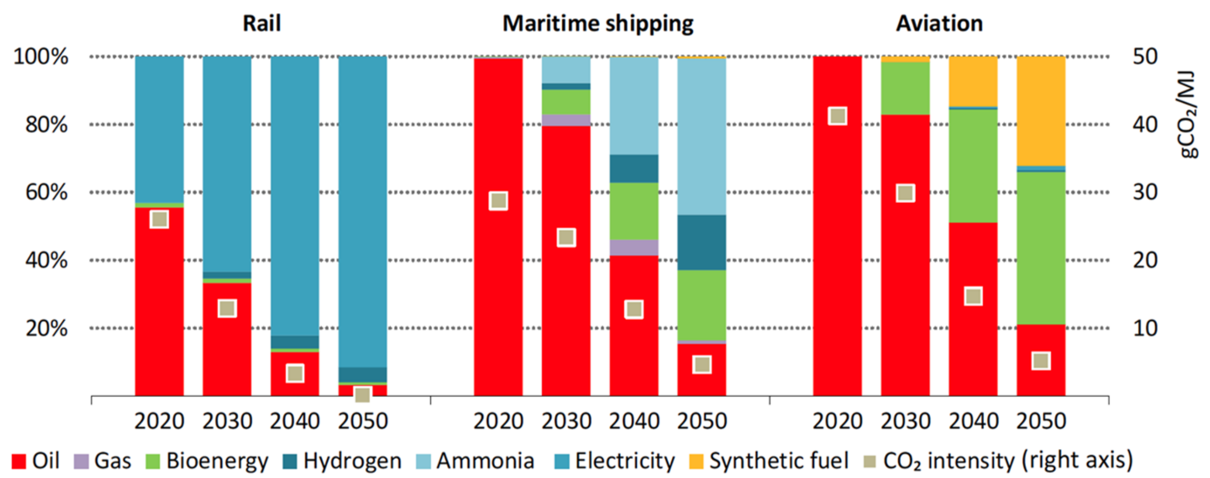
"Over concerns about methane leakage, which could diminish or even offset any GHG benefits associated with LNG, and additional capital expenditures, the **risk of stranded assets as well as a technology lock-in**, the report concludes that LNG is **unlikely to play a significant role in decarbonizing** maritime transport."

"The research further suggests that **new public policy in support of LNG as a bunker fuel should be avoided**, existing policy support should be reconsidered, and methane emissions should be regulated."



IEA: shuns LNG, thumbs up hydrogen/ ammonia, sees limited role for bio

Figure 3.25 ▷ Global energy consumption by fuel and CO_2 intensity in non-road sectors in the NZE



Food crops
(palm, rapeseed, etc)

Phase-out

Advanced biofuels - waste & residues

Constrain

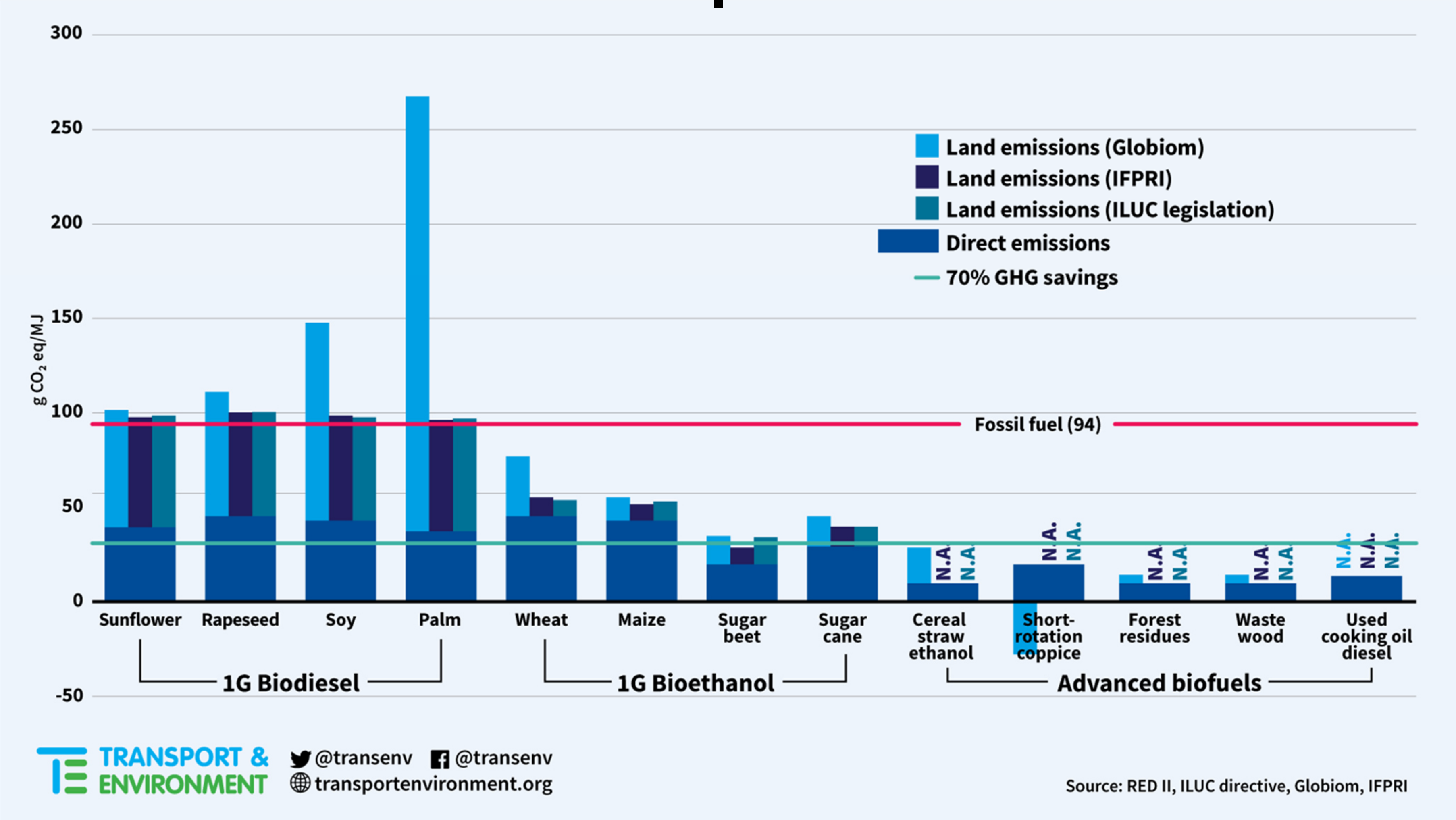
Renewable Electricity

Support

H_2 and efuels

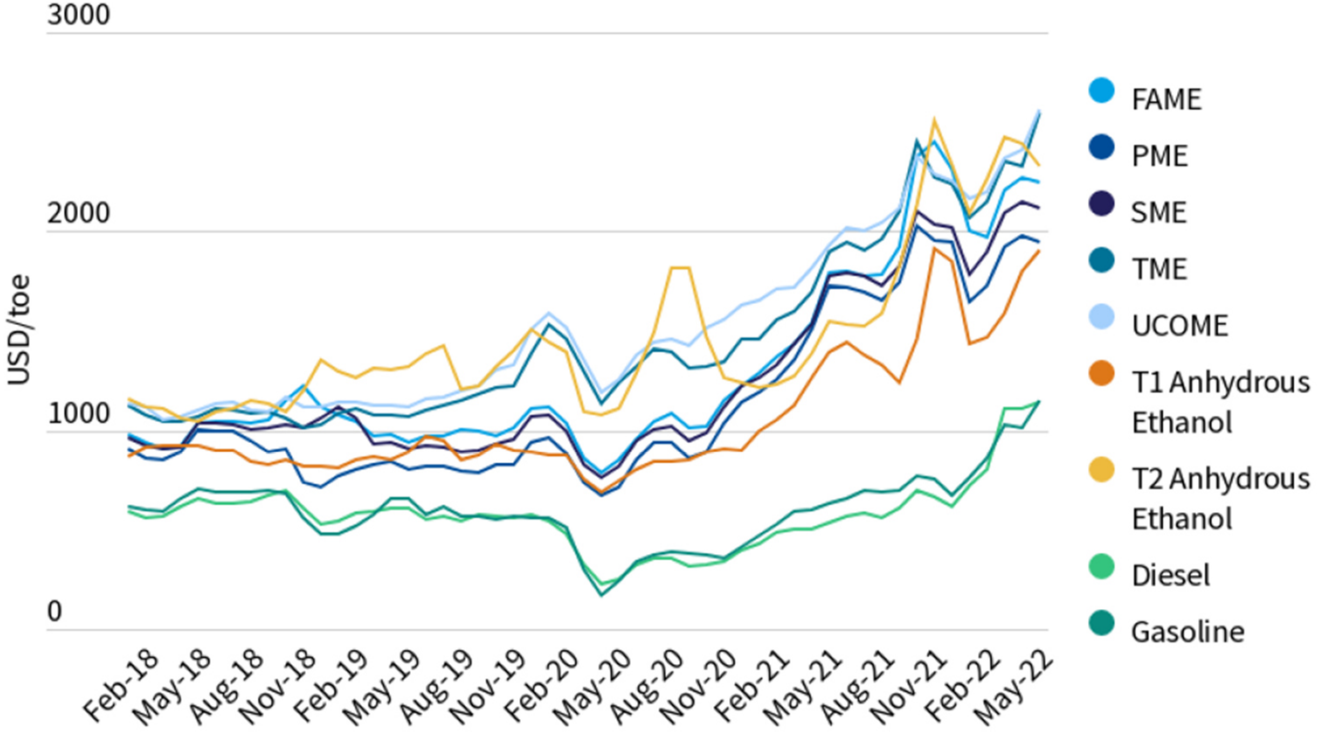
Differentiated support

Direct emissions plus land emissions



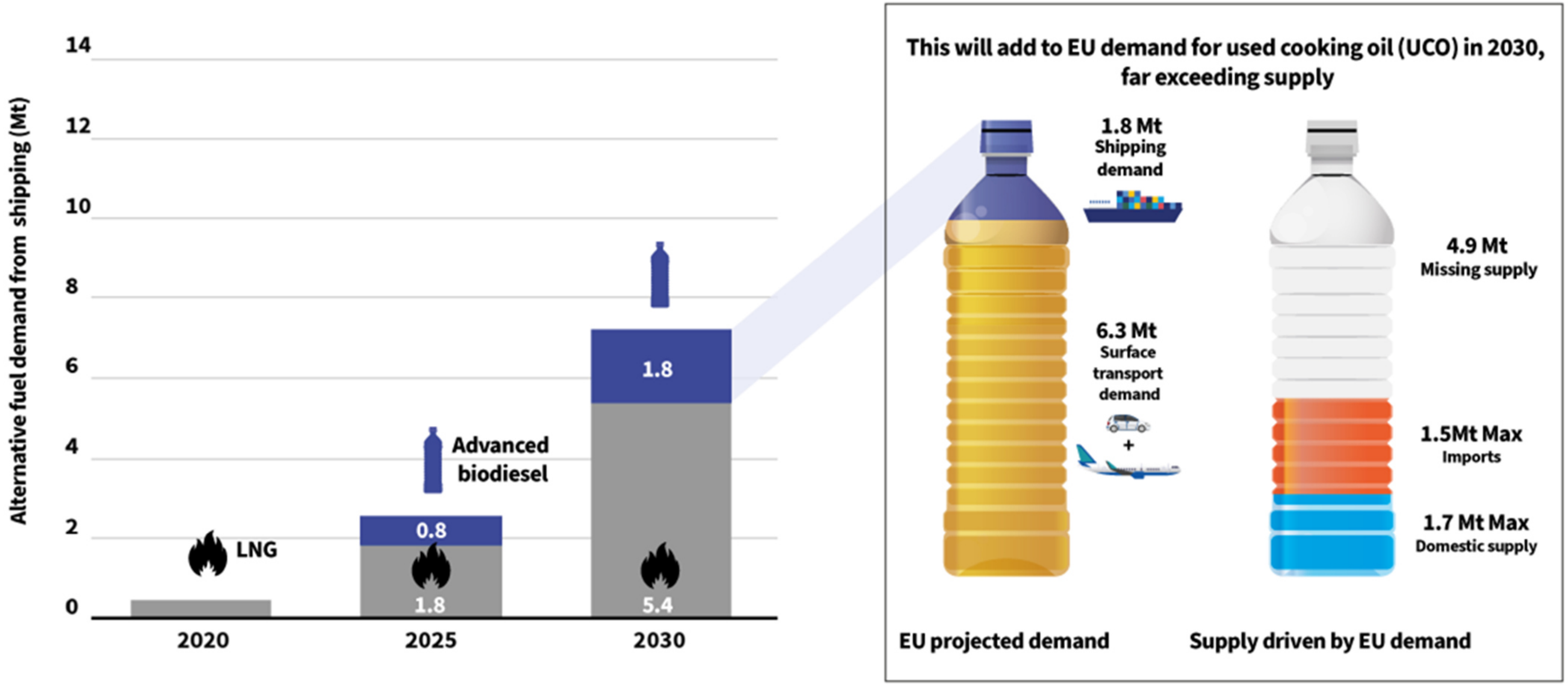
1. Biofuels add to high fuel costs in transport

In recent years, biofuels have consistently been more expensive compared to fossil fuels in Europe. Figure 1 presents biofuels and fossil fuels wholesale prices on an energy basis (in USD per tonne of oil equivalent, toe).[1]



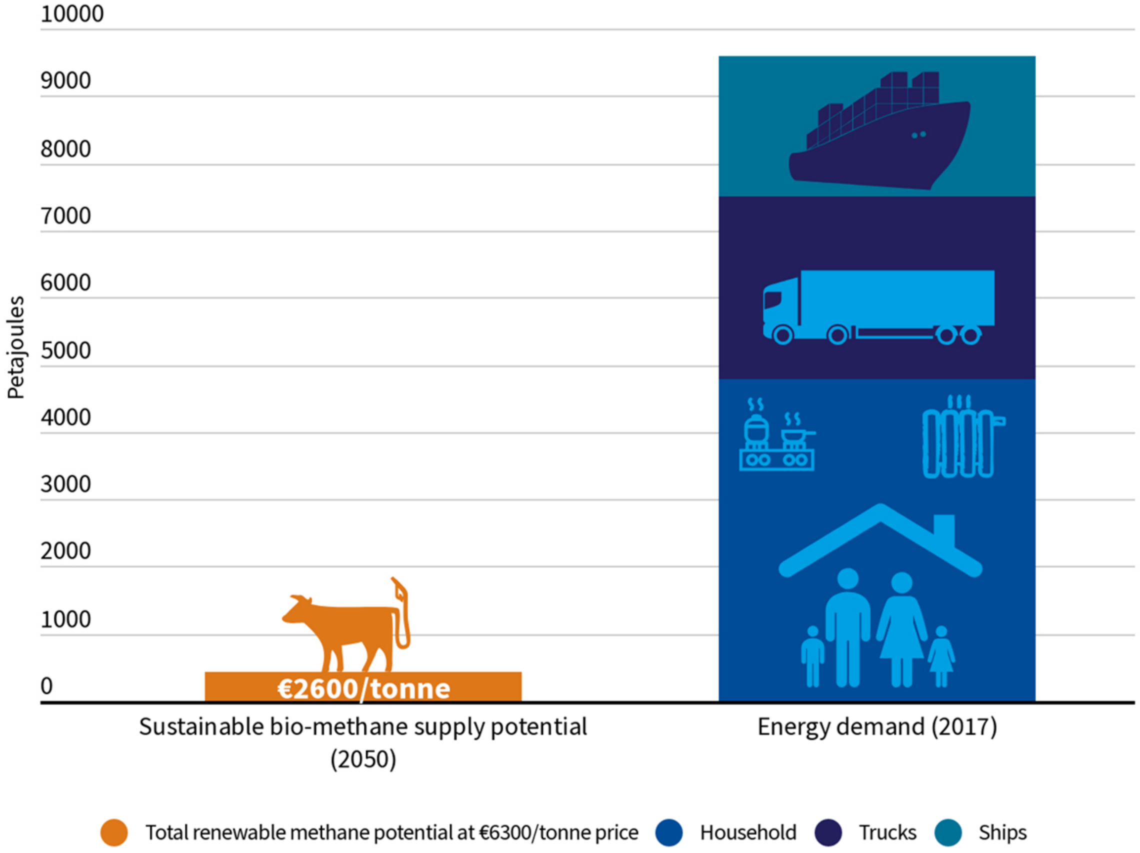
Source: T&E analysis based on data provided by Stratas Advisors

If EU incentivises Used Cooking Oil, can supply match demand?



Source: Oilworld (2020), CE Delft (2021) and T&E (2021)

EU 2050 bio-methane potential not even enough for households



EU 2050 bio-methane potential not even enough for households

Notes: The chart is conservative as it compares 2050 supply with 2017 demand. This supply would only be feasible at a retail price of €6300/t (excluding taxes), which is more than 10 times higher than the current LNG prices. Energy demand for households is limited to natural gas demand only.

Sources: ICCT (2018), Eurostat (2017), UNFCCC (2017).

EU energy

Europe's biggest biogas producer warns EU targets unachievable

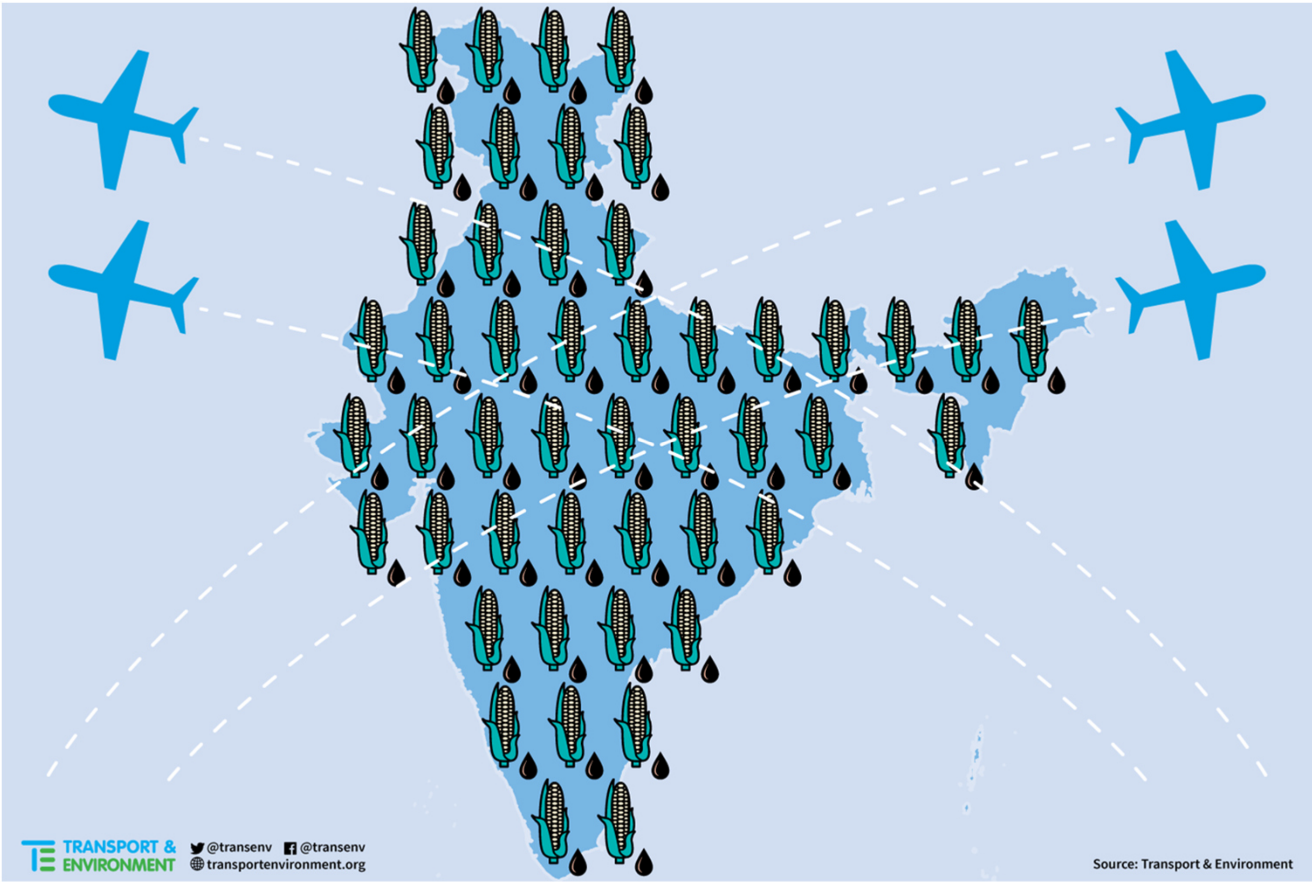
Head of Denmark's Nature Energy says it will take years to ramp up capacity

Biomethane is chemically identical to natural gas but produced through the controlled decomposition of animal and industrial waste © John MacDougall/AFP via Getty Images

Harry Dempsey and Alice Hancock in London 4 HOURS AGO

Europe's largest biogas producer has warned that it will take years to significantly boost production despite the EU pushing for a rapid increase in output to reduce reliance on Russian gas.

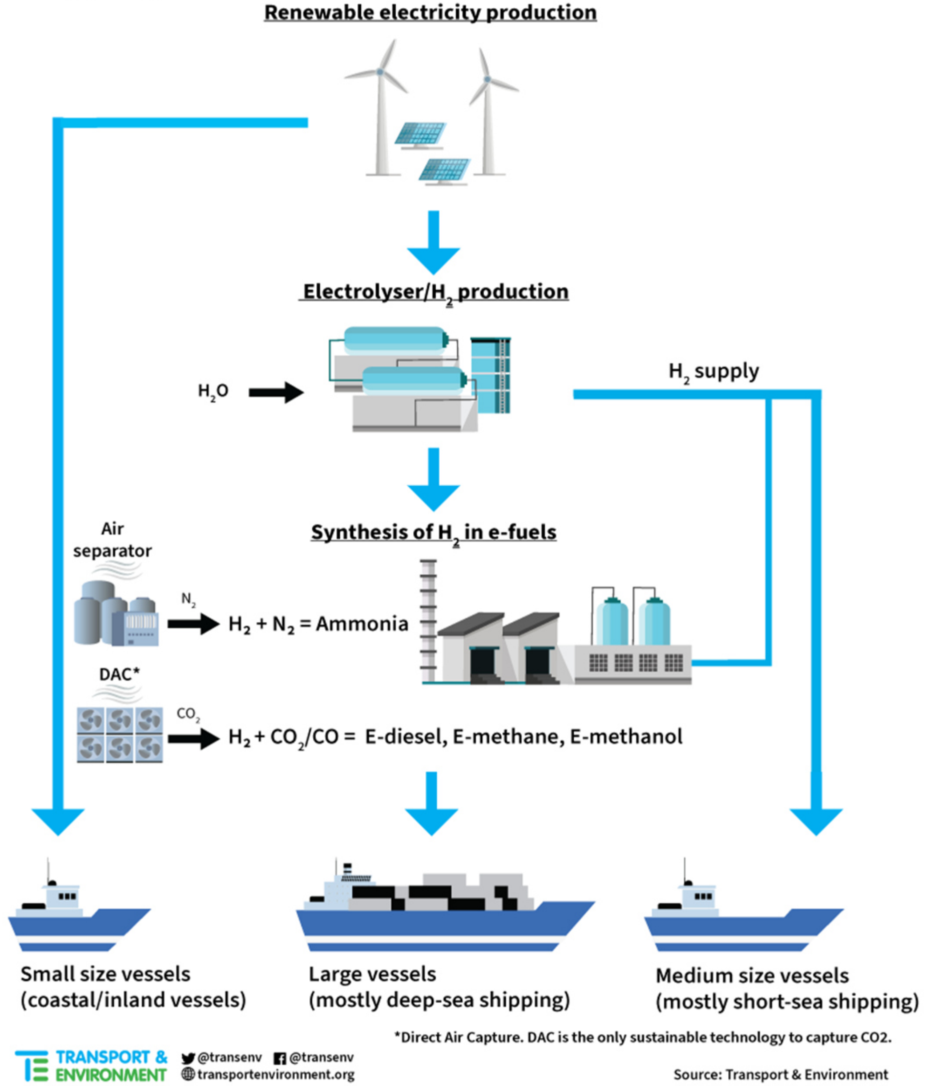
Area the size of India required to fuel aviation with biofuels



3S principles for shipping fuels/energy

	Suitable	Sustainable	Scalable
Batteries	Orange	Green, red-hatched	Green
e-Hydrogen	Orange	Green, red-hatched	Green
e-Ammonia	Green	Green, red-hatched	Green
e-Methanol	Green	Green, red-hatched	Green
e-Methane	Green	Green, red-hatched	Green
e-Diesel	Green	Green, red-hatched	Green
Biofuels	Green	Green, red-hatched	Red

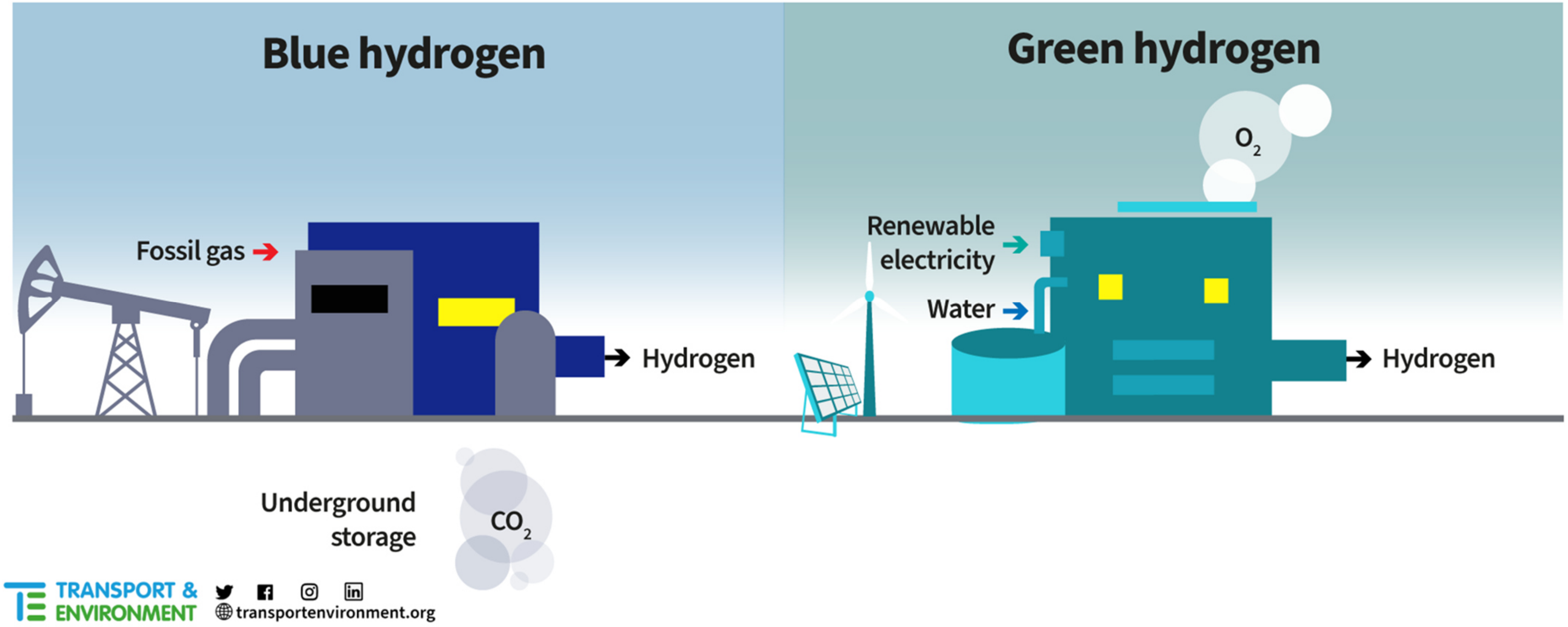
Production pathways for sustainable and scalable shipping fuels



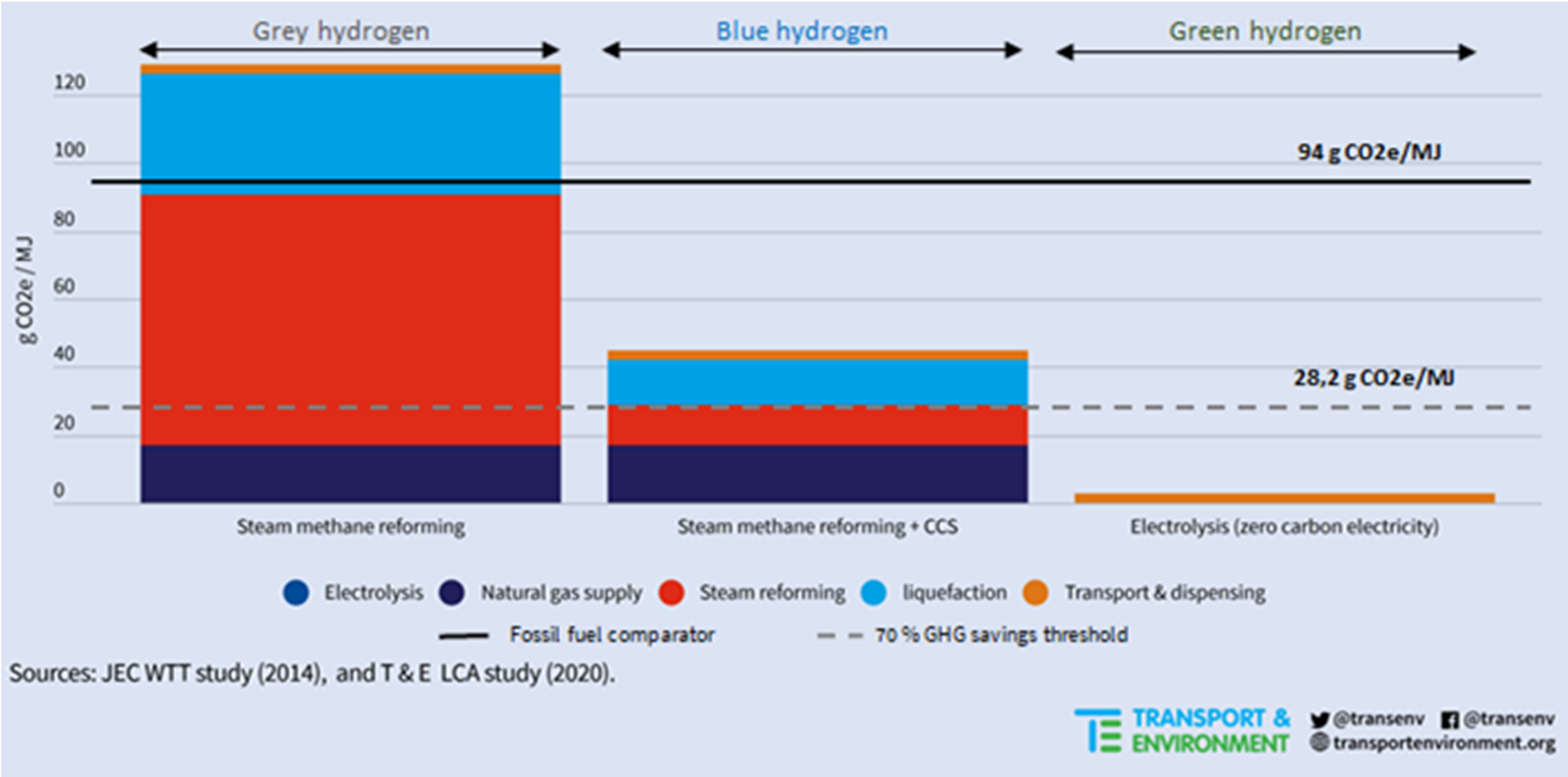
Need to promote green electricity & e-H2-based fuels

Hydrogen

Only green hydrogen is zero-carbon hydrogen



Life cycle emissions of liquid hydrogen production



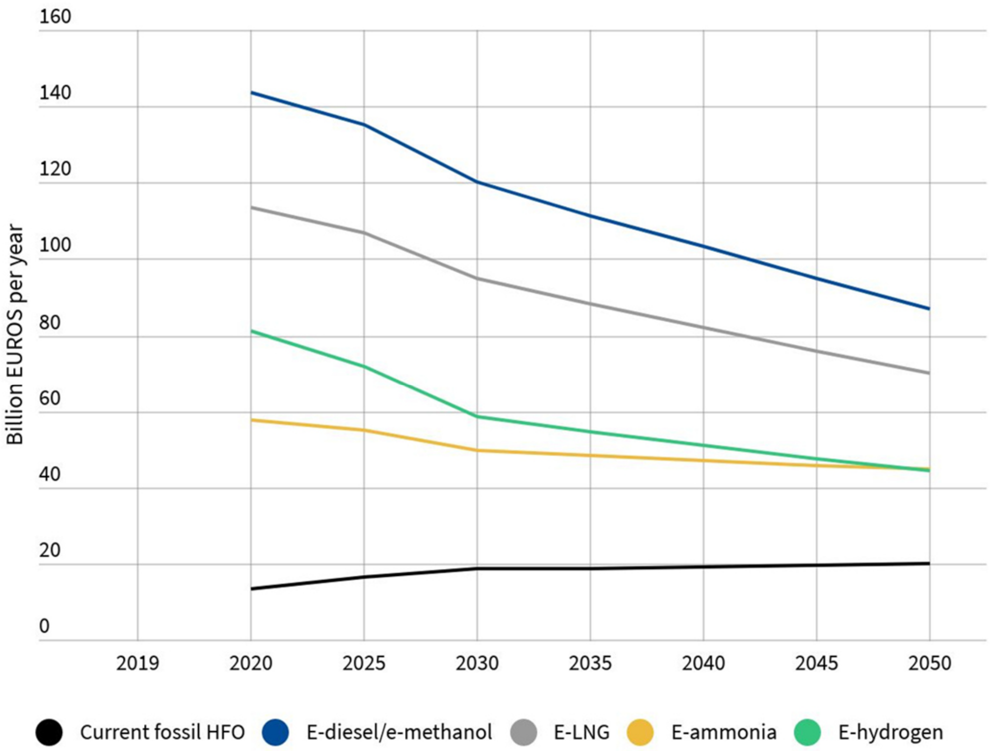
Hydrogen - Key principles

- **Renewable hydrogen** technology part of the Zero Emissions Solutions needed to decarbonise transport - ZEV mandates.
- **'Blue' Hydrogen** is a distraction - hydrogen strategy still sees a role for it & Clean Hydrogen Alliance covers it as well.
- **Lead markets** for green hydrogen in long-distance shipping and e-fuels in aviation. Jury is still out for H2 for long-distance trucks.
- **Robust sustainability framework needed to:**

- ensure highest climate performance of hydrogen & e-fuels
- renewable electricity needs to be 'additional'

How much would e-fuels cost to EU shipping?

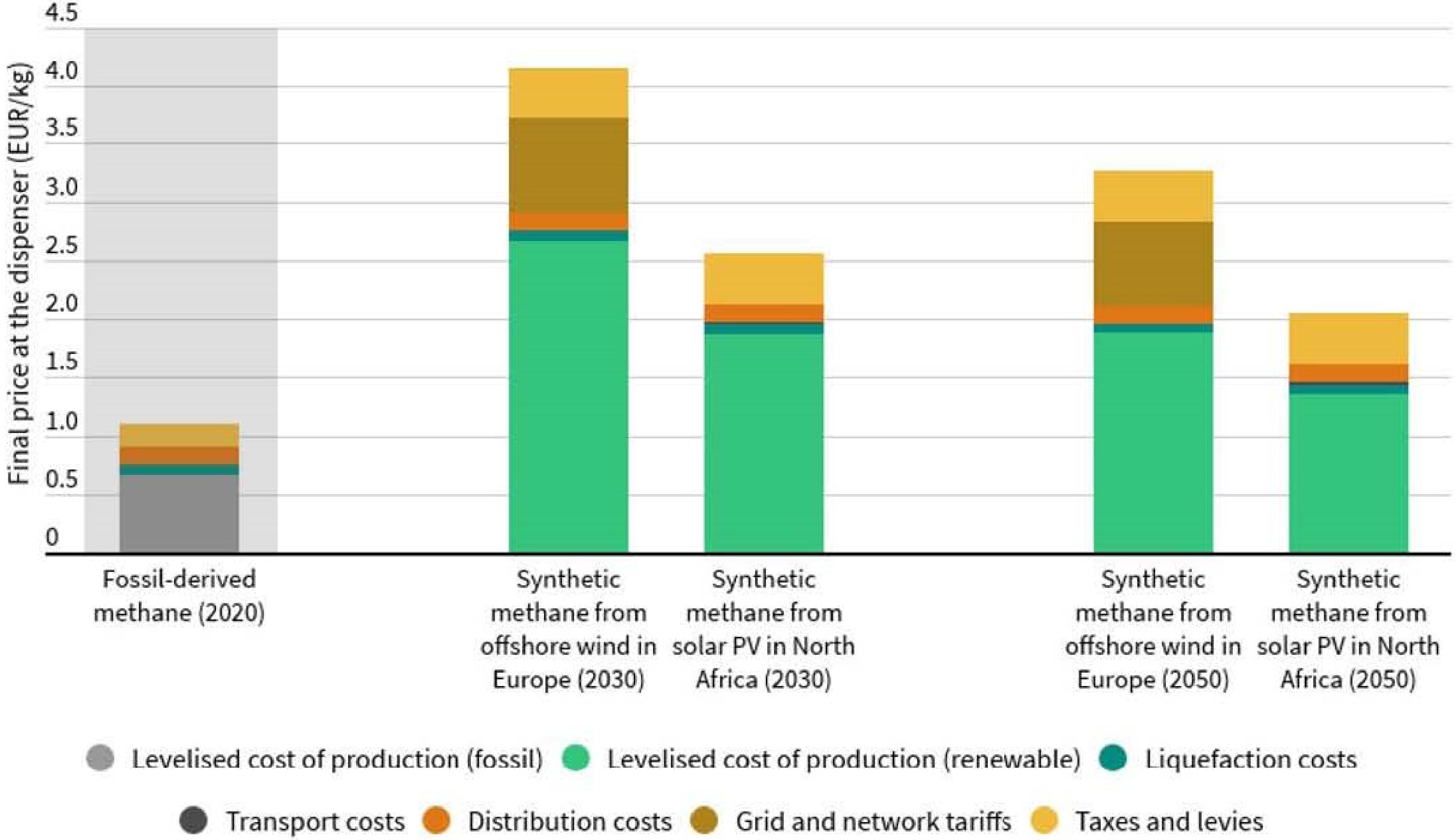
(Ricardo EAE e-fuel cost estimations)



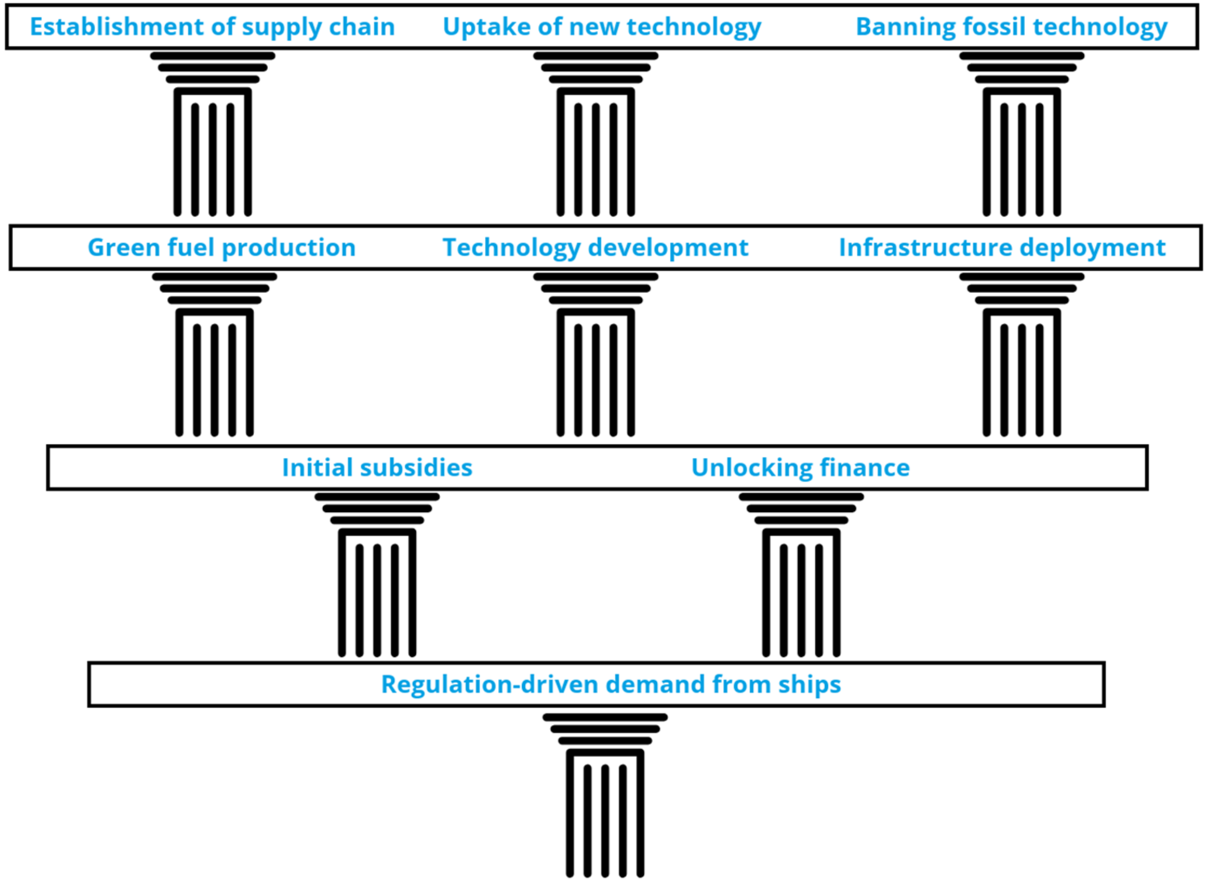
Source: T&E estimations based on fuel consumption projections for EU shipping (full MRV scope) and cost of e-fuel production with high DAC from Ricardo EAE, 2020.

e-Ammonia & e-Hydrogen cheapest e-fuels to decarbonise maritime transport

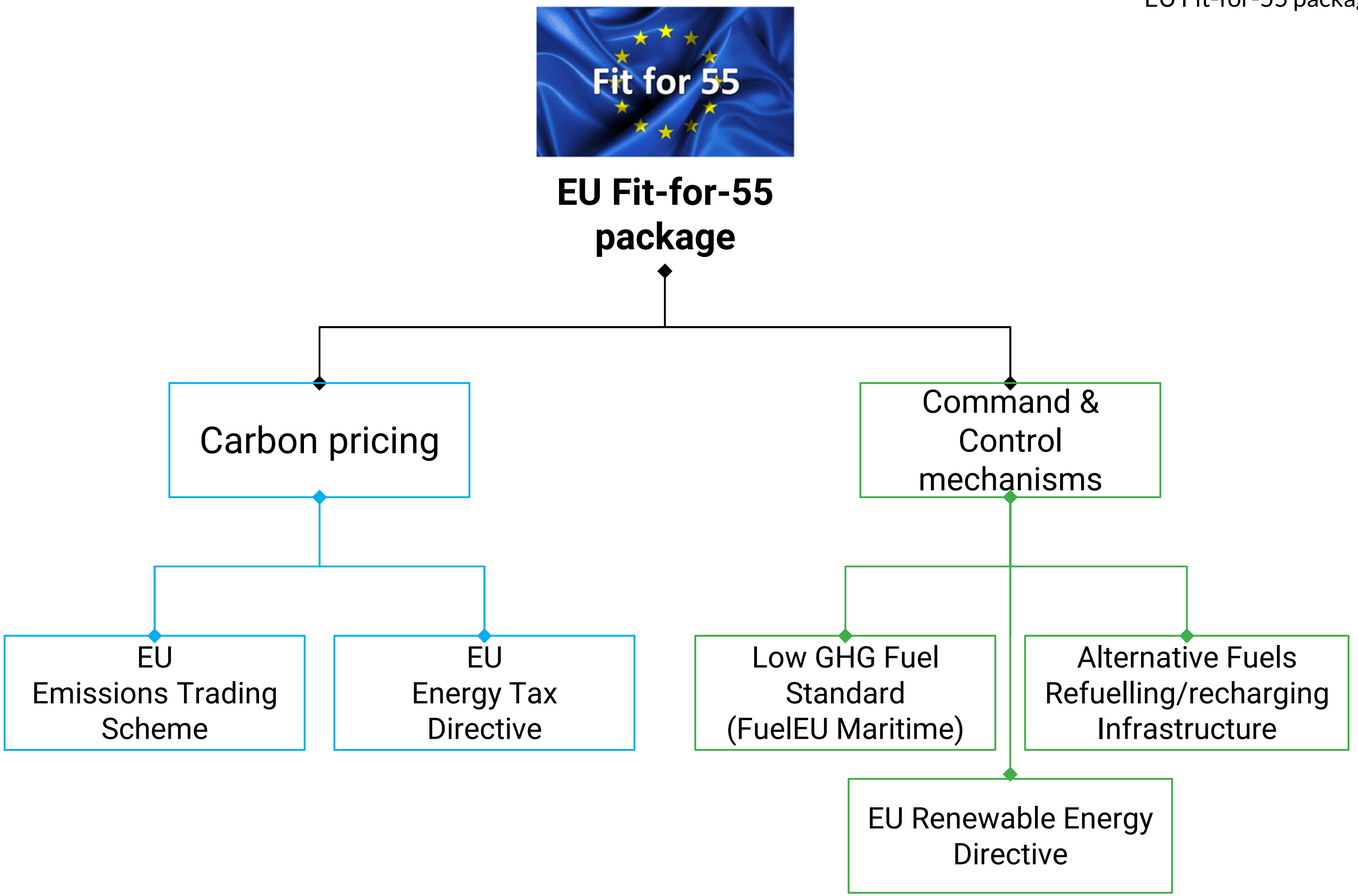
E-methane: expensive, also in the long-term



Policy-driven technological transition



Key is to create guaranteed demand for green fuels in shipping

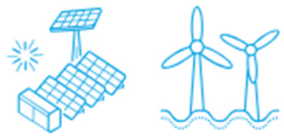

Fit for 55
EU Fit-for-55 package
Carbon pricing
Command & Control mechanisms
EU Emissions Trading Scheme
EU Energy Tax Directive
Low GHG Fuel Standard (FuelEU Maritime)
Alternative Fuels Refuelling/recharging Infrastructure
EU Renewable Energy Directive

How to drive e-fuels uptake in shipping? A supply chain approach

Renewable Energy Directive

Targets and incentives on fuel suppliers

- RFNBO sub-target for shipping under RED III
- Multiplier of 1.2 for RFNBOs supplied to shipping sector



SUPPLY SIDE
(fuel suppliers)

+

FuelEU Maritime Regulation

2 parallel goal-based targets

- Mandate 6% share of RFNBOs by 2030
- Stricter GHG targets (- 13% reduction by 2030)

Incentives for fuel use

- Multiplier of 5 for RFNBOs contribution to GHG target (above e-fuel mandate)
- Pooling of surplus compliance credits between ships

DEMAND SIDE
(ship operators)

+

Alternative Fuels Infrastructure Regulation

Targets on core TEN-ports

- Refuelling infrastructure targets on ports for hydrogen and ammonia

INFRASTRUCTURE
(ports)

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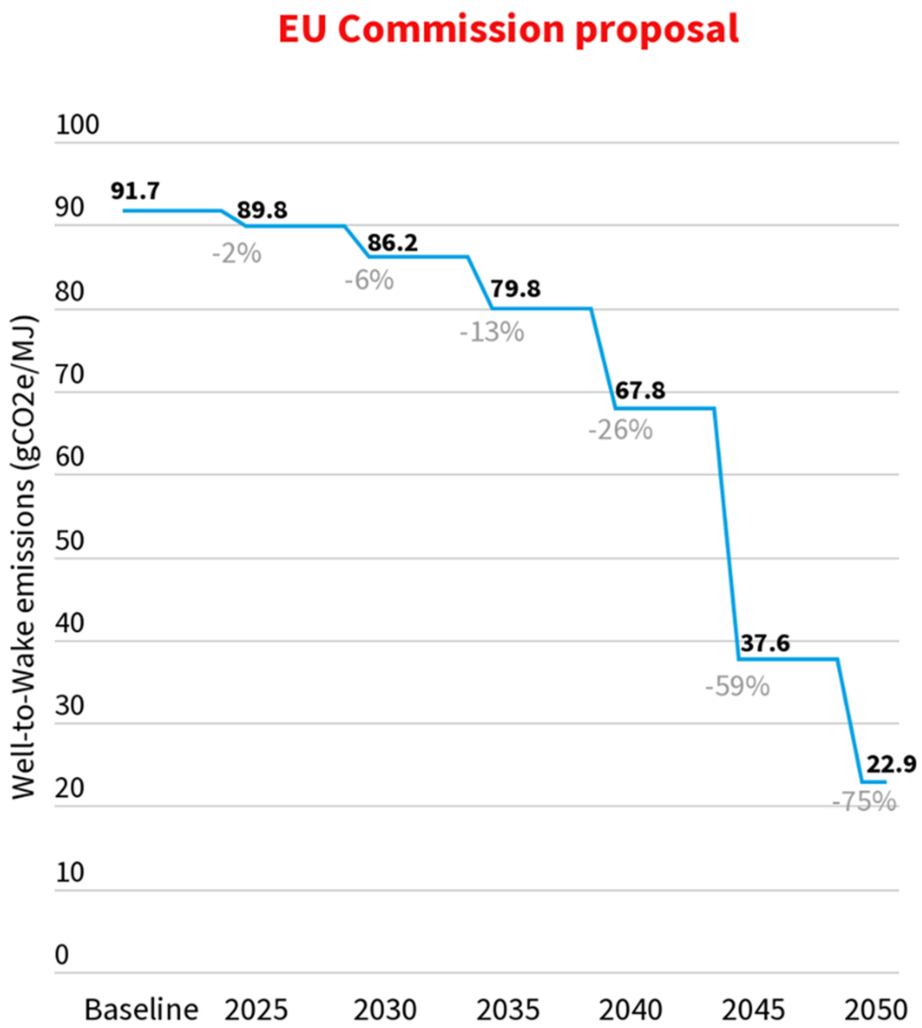
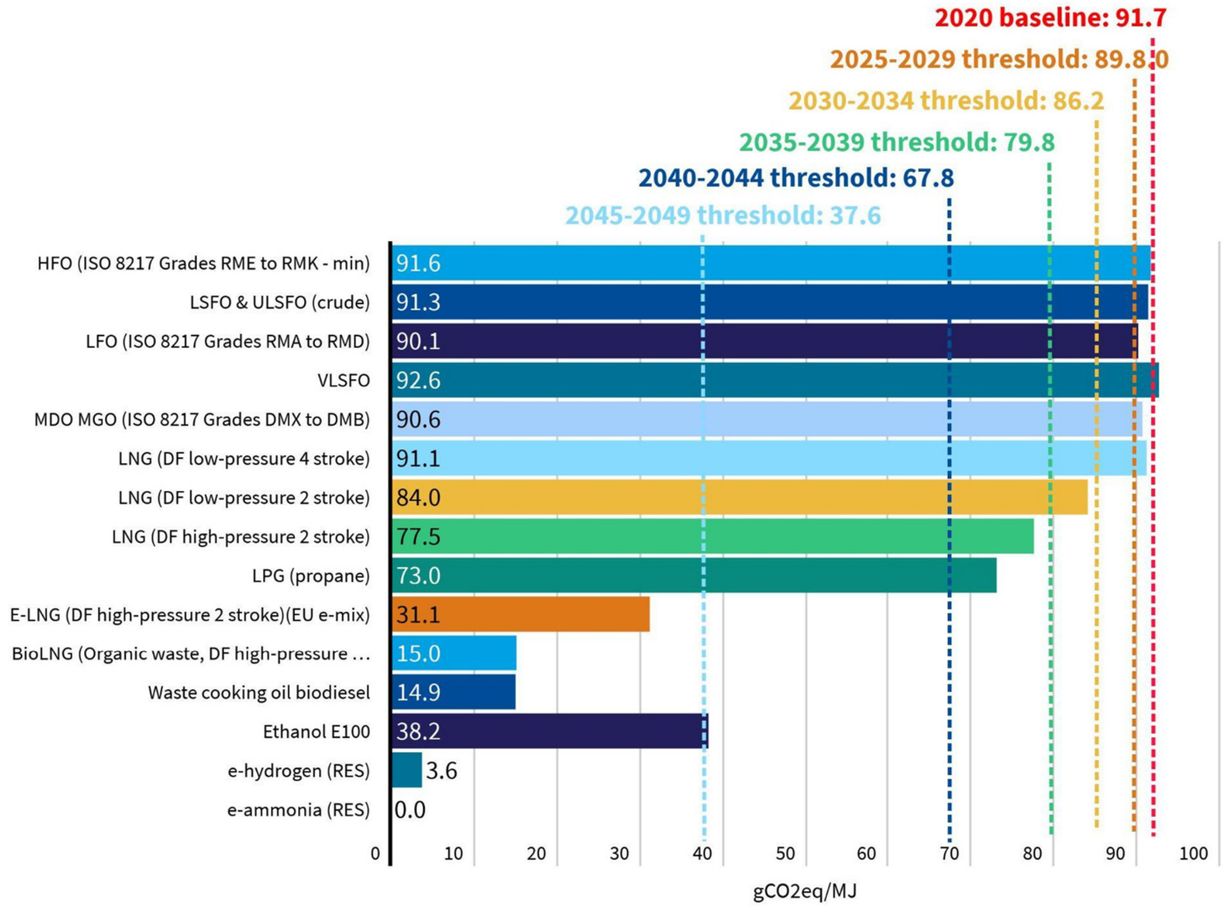
FuelEU Maritime

Mandating the uptake of green fuels



FuelEU Maritime | Energy GHG intensity reduction trajectory

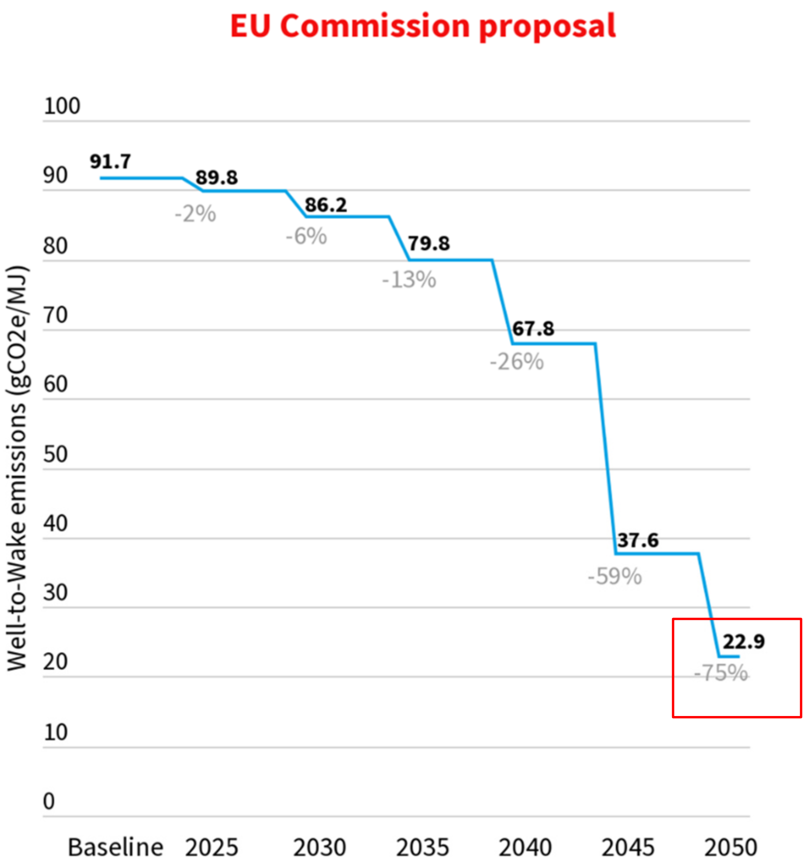
Well-to-Wake carbon intensity of marine fuels



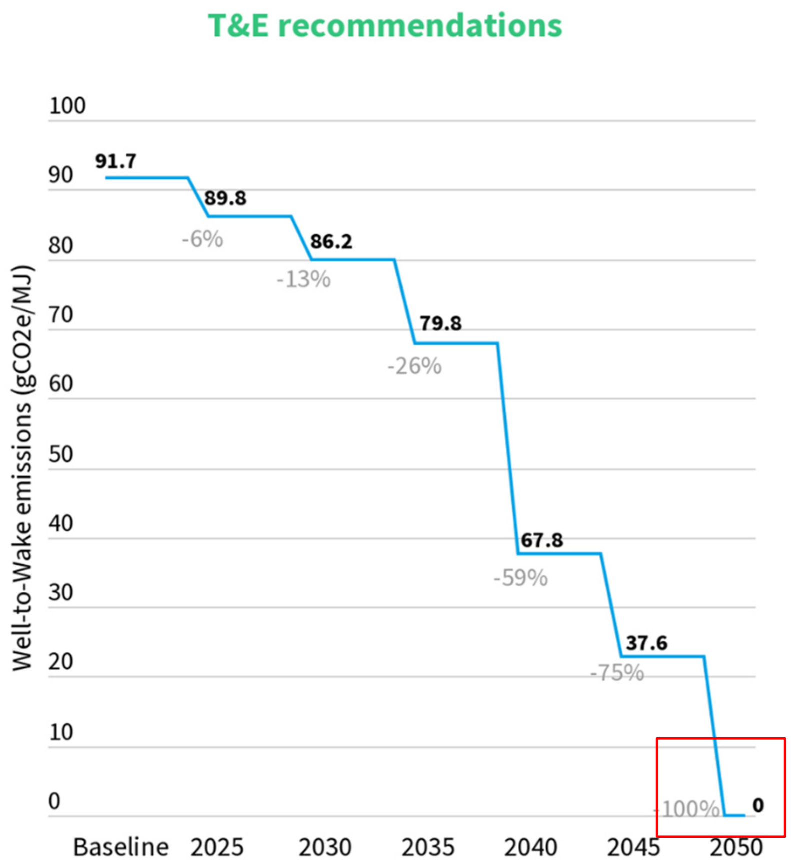
Note: T&E compilation based on the proposed FuelEU Maritime Regulation. Baseline was estimated by T&E using 2020 Rotterdam fuel sales data as a proxy, in the absence of EU 2020 data. LNG WtW also includes pilot fuel. Not shown on this graph: fossil hydrogen, ammonia, methanol all have WtW well above 2025 threshold.

Possible compliance timelines of different fuel types

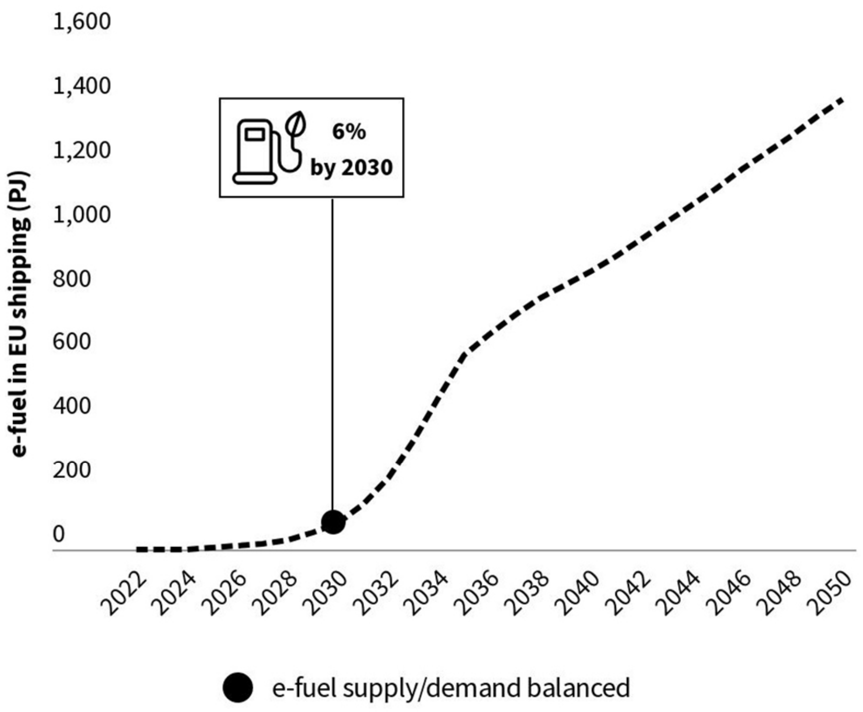
Get the GHG targets on track with Paris Agreement



Shift targets 5 years ahead to get to zero by 2050



e-Fuel uptake pathway for EU shipping



Note: T&E analysis which uses e-ammonia as a "placeholder" for calculations. This does not prejudge other e-fuels uptake by ships. Analysis assumes no regulatory-driven energy efficiency gains by the sector until 2050 and full shore-side electricity use by all vessels at berth. Energy density of e-ammonia: 18.6Mj/kg. **Source**: Decarbonising European Shipping Technological, operational, and legislative roadmap, T&E, 2021.

TRANSPORT & ENVIRONMENT @transenv @transenv transportenvironment.org

Mandate a 6% e-fuels by 2030 in-use target on ships

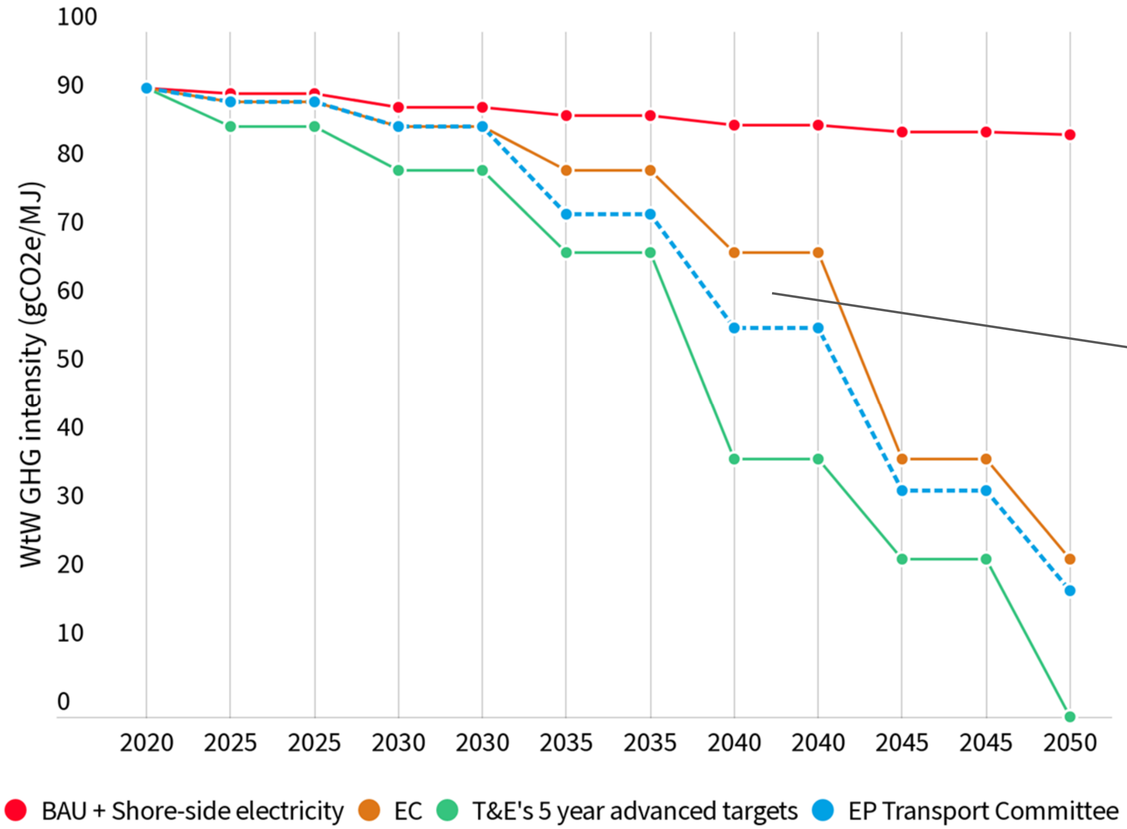
~800 000 tonnes
guaranteed H2 demand from EU shipping by 2030

~8.6 GW Electrolyser
capacity will be required for EU shipping alone

~2 million TOE/2030
dependence reduction on Russian oil & gas

~ $7 billion investment
in green H2 production capacity

Different regulatory pathways under FuelEU Maritime



150 Million tonnes of CO2

Increase the overall GHG targets (FEUM)

What to support under the EP proposal

- **Increase the GHG objectives from 2035 through 2050** (Art. 4)
  - ❑ Even the European Community Shipowners' Associations (ECSA) supports higher targets

Create guaranteed demand/supply for e-fuels/RFNBO investments via RFNBO sub-quota (FEUM/AFIR/RED)

What to support under the EP proposal

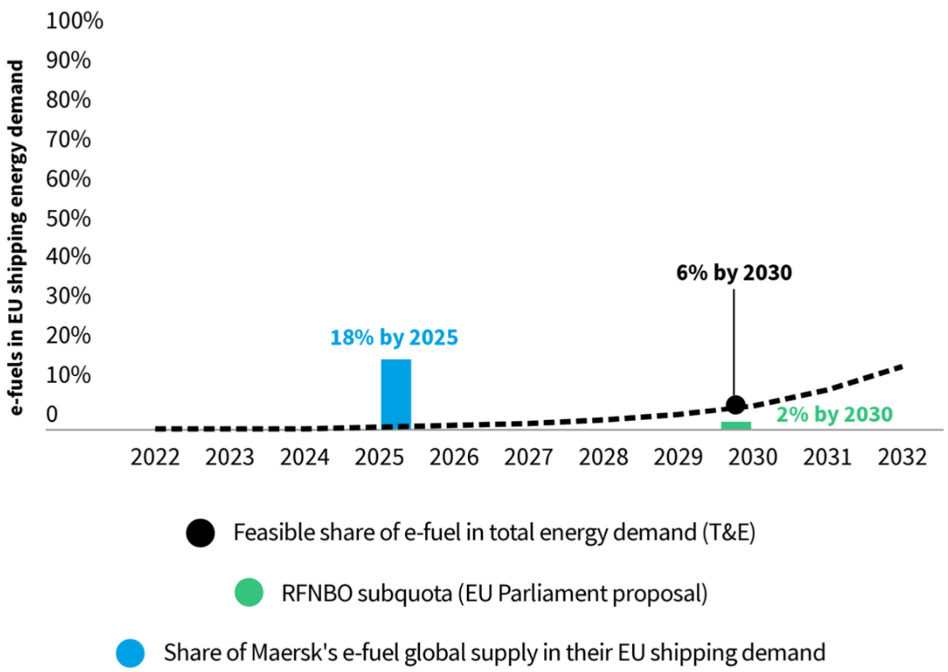
- **Support 2% e-Fuel/ RFNBO sub-quota** (Art. 4a FEUM):
  - ❑ Temporary exemption for companies with <=3 ships | not ideal but affect only 10-15% of energy use
  - ❑ Maintain multiplier of 2 | will reduce costs of using RFNBO

- **Support a demand-based flexible H_2/NH_3 infrastructure mandate under AFIR (**Art. 11 AFIR)

  - ❑ Demand-based mandate - giving flexibility to ports to invest based on demand
  - ❑ Giving credits to ports already planning to invest in alternative fuels (Algeciras/Valencia to Rotterdam e-NH_3/e-CH_3OH exports)
  - ❑ +50 NGOs and industry representatives are on board

- **Support RFNBO supply sub-quota under the Renewable Energy Directive III**
  - ❑ Create supply guarantees for shipping | H_2 supply industry is on board.
  - ❑ 1.2% subquota under REDIII = 9.5% fuel demand under FEUM

e-Fuels pathway for EU shipping & industry plans



Note: T&E analysis which uses e-ammonia as a "placeholder" for calculations. This does not prejudge other e-fuels uptake by ships. Analysis assumes no regulatory-driven energy efficiency gains by the sector until 2050 and full shore-side electricity use by all vessels at berth. Energy density of e-ammonia: 18.6Mj/kg. **Source**: *Decarbonising European Shipping Technological, operational, and legislative roadmap, T&E, 2021.*

RFNBO sub-quota by 2030 by the EP is feasible

~225k tonnes of H2 for shipping

vs.

20 million tonnes of H2 for the EU economy under RePower EU

LA VANGUARDIA

ENERGÍA

Maersk invertirá 10.000 millones en España para desarrollar e-metanol a partir de hidrógeno verde

• El proyecto supondrá la creación de dos centros de producción en Galicia y Andalucía

Un barco de Maersk en Rotterdam, en una imagen de archivo (Jerry Lampen / AFP)

CEPSA

THE COMPANY · OUR BUSINESSES · SUSTAINABILITY · PEOPLE AND TALENT · TECHNOLOGY · INVESTORS · PRESS CENTER · Planet Energy

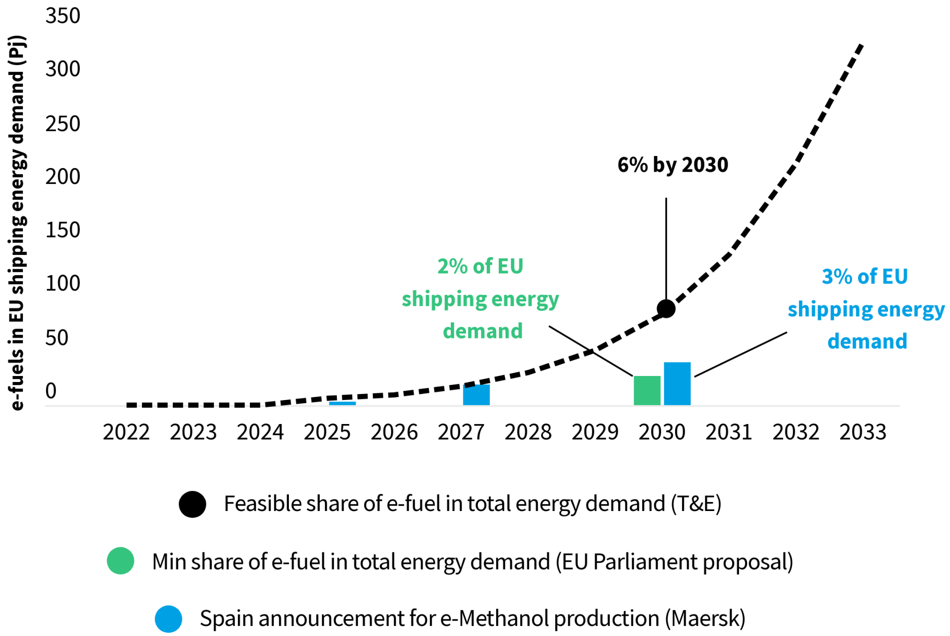
CEPSA AND THE PORT OF ROTTERDAM JOIN UP TO CREATE THE FIRST GREEN HYDROGEN CORRIDOR BETWEEN THE NORTH AND SOUTH OF EUROPE

Tuesday, October 11, 2022 · 2 MINUTES · DOWNLOAD · SHARE

Andalusia · Clean Energies · Global

- The corridor will connect two of Europe's main ports: Rotterdam and Algeciras
- The agreement accelerates the decarbonization of heavy industry and maritime transport and supports Europe's energy independence and security
- The deal strengthens Cepsa's ambition to become a key player in green hydrogen production in Europe and the leader in Spain and Portugal
- The co-operation is part of Rotterdam's ambition to supply Northwest Europe with 4.6 million tonnes of green hydrogen by 2030

Maersk will produce in Spain even more e-methanol than Parliament's proposal for European shipping



Note: Analysis assumes no regulatory-driven energy efficiency gains by the sector until 2050 and full shore-side electricity use by all vessels at berth.

Source: *Decarbonising European Shipping Technological, operational, and legislative roadmap, T&E, 2021.* Calculations for Maersk announcement assumes 200k, 1M and 2M tonnes e-methanol production by 2025, 2027 and 2030 respectively. Source: https://www.lavanguardia.com/economia/20221103/8592023/maersk-inversion-emetanol-hidrogeno-verde-galicia-andalucia-empleo.html

THANK YOU!

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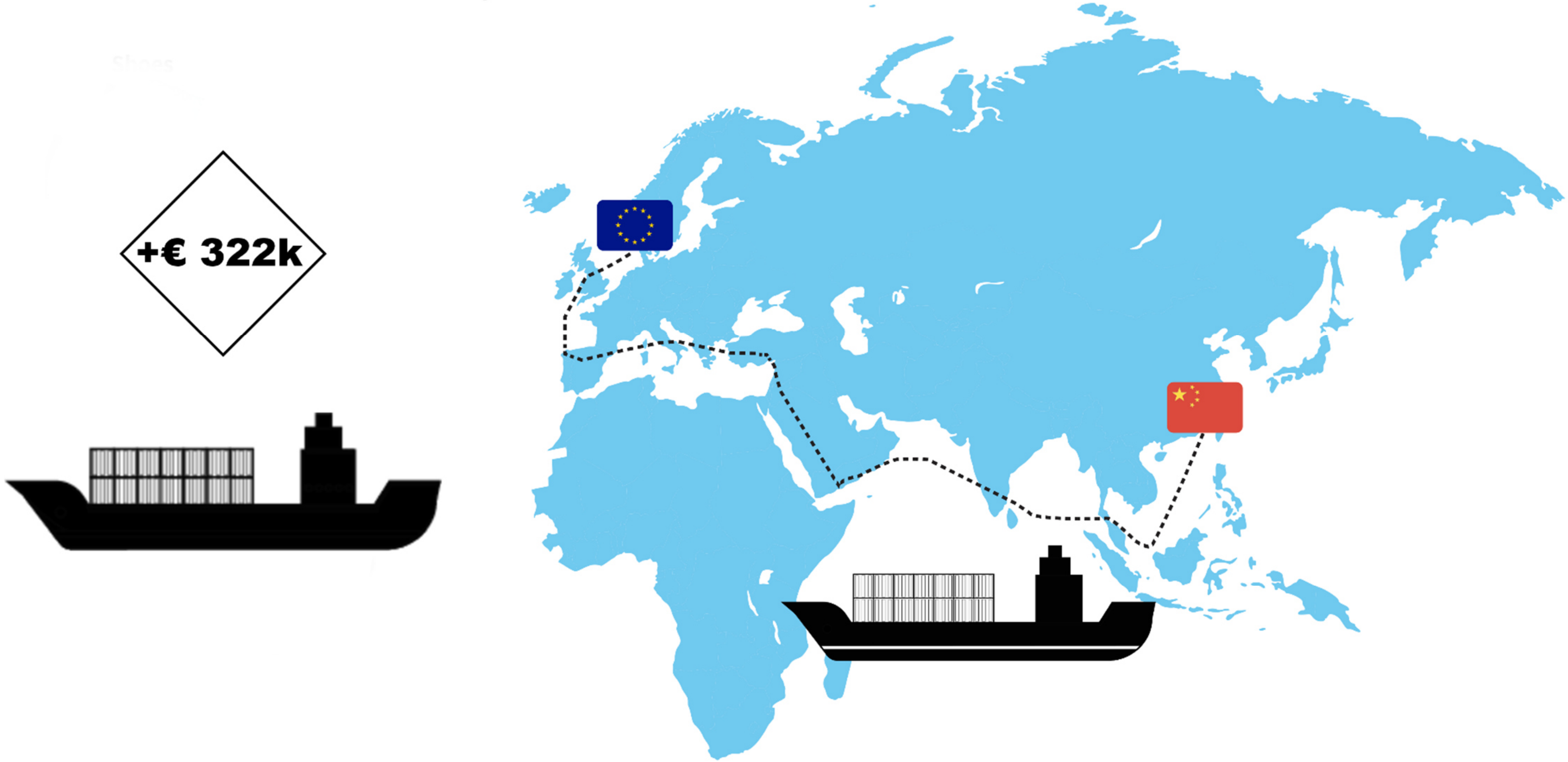
How much will EU shipping policies cost?

- 6% green H2(-based fuels) uptake by 2030
- €80/tonne CO2eq carbon pricing

Ambitious EU Green shipping measures would require switch to cleaner fuels

Added costs from China to Europe



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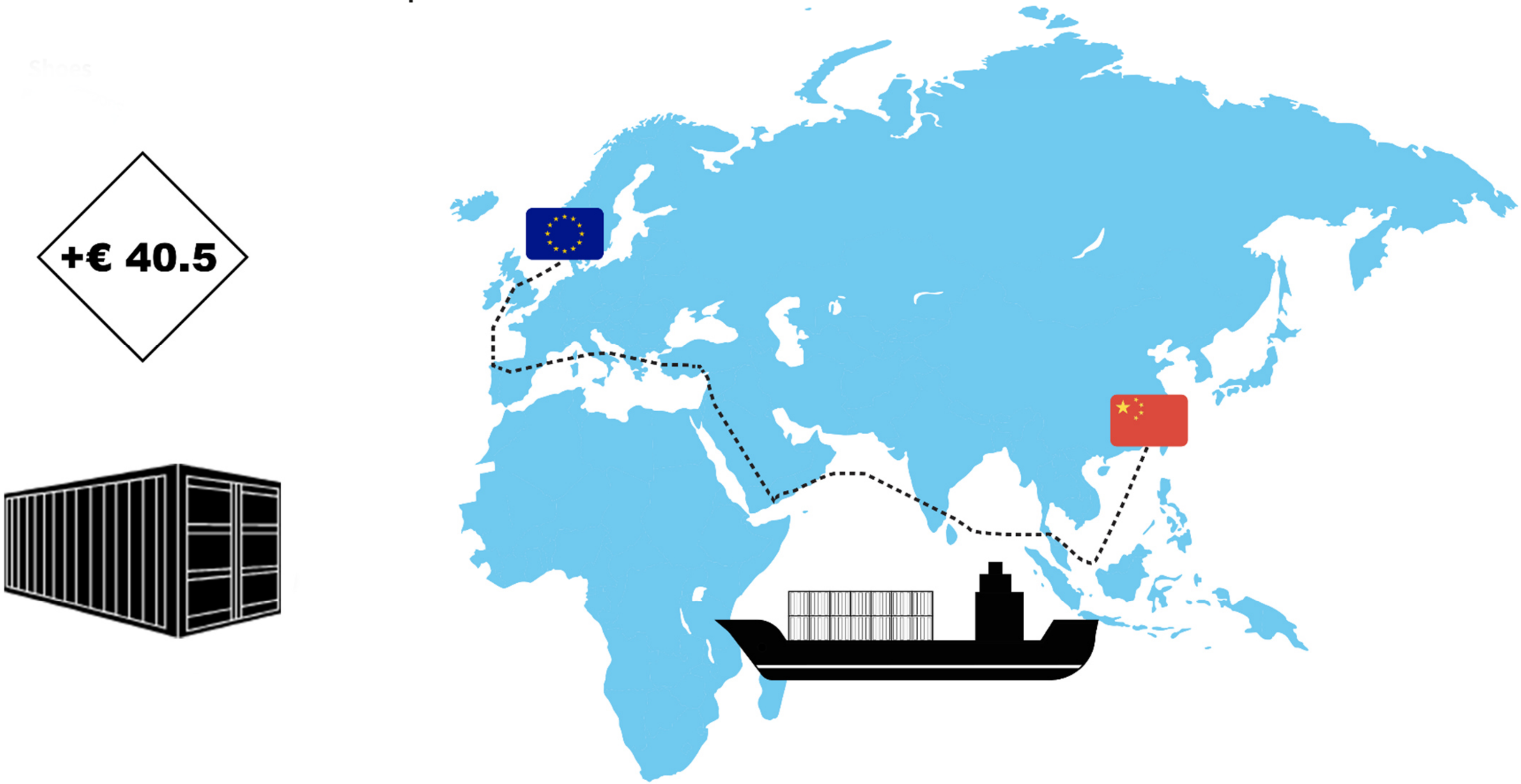
Source: Transport and Environment

Ambitious EU Green shipping measures would require switch to cleaner fuels

Added costs from China to Europe



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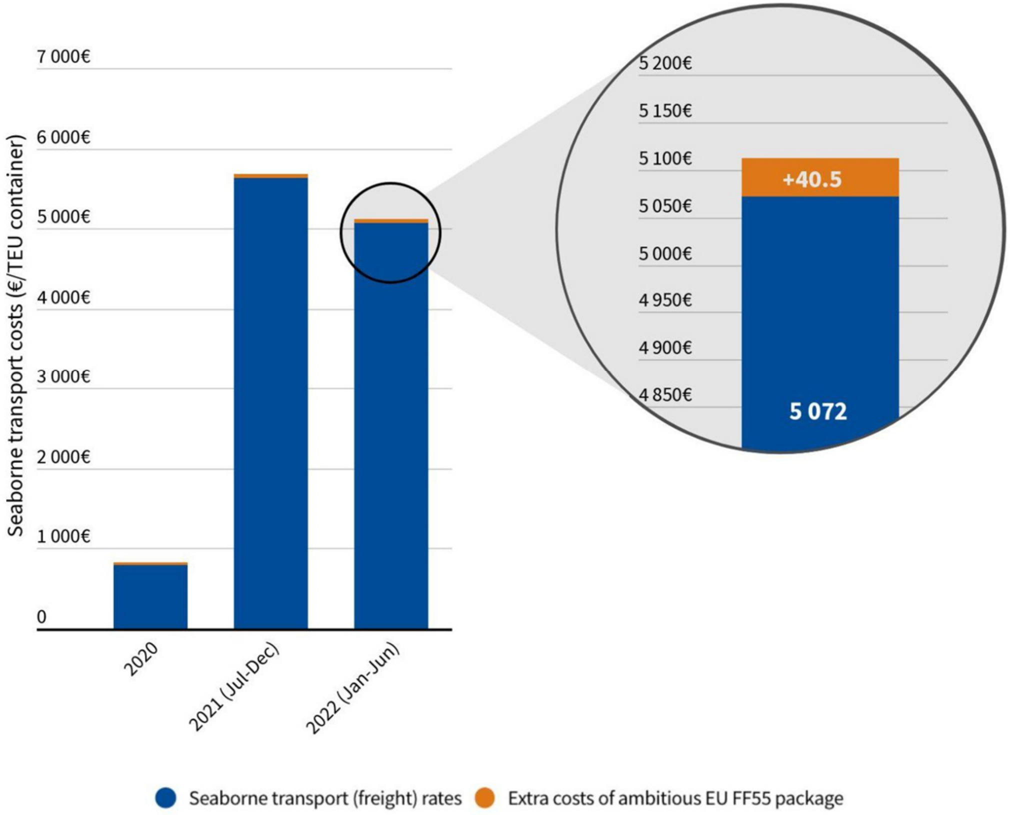
Source: Transport and Environment

Costs of green shipping of a container (China to Europe)



Source: Transport & Environment 2022. **Note**: Ambitious EU FF55 package includes a €80/tonne WtW CO2e ETS charge, 14% overall fuel GHGIE reduction target, 6% RFNBO subquota using e-methanol as a pathway. The geographical scope is limited to the 50% of the emissions/fuel consumption on the last leg (i.e Sri-Lank to Belgium) of an example China-Belgium container ship voyage using Vessel Taurus (IMO: 9728942) as an example.

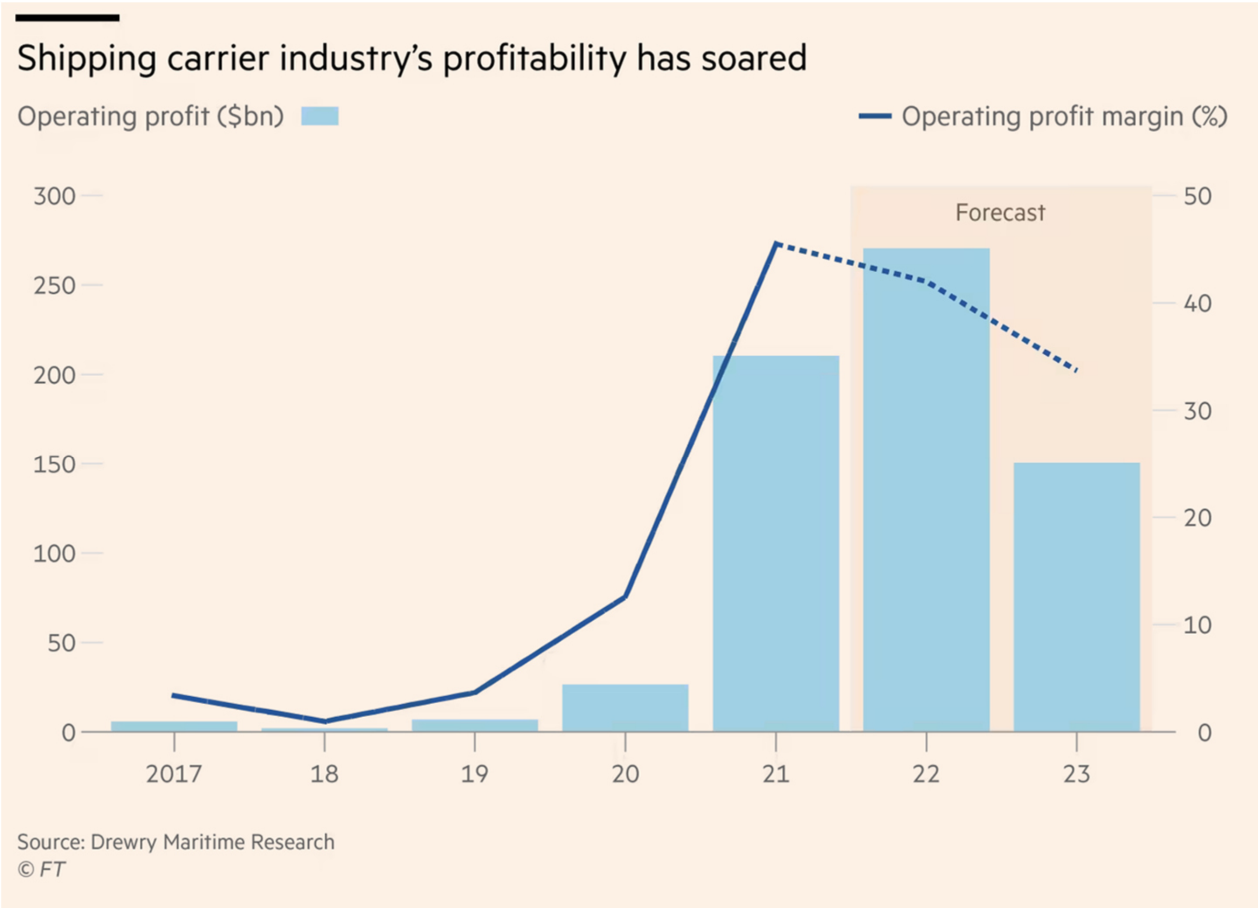
The impact of green shipping on seaborne transport costs is negligible

Ambitious EU green shipping measures would add just cents to most consumer goods

Added costs from China to Europe

Source: Transport and Environment

Who should be bearing the cost of decarbonisation?

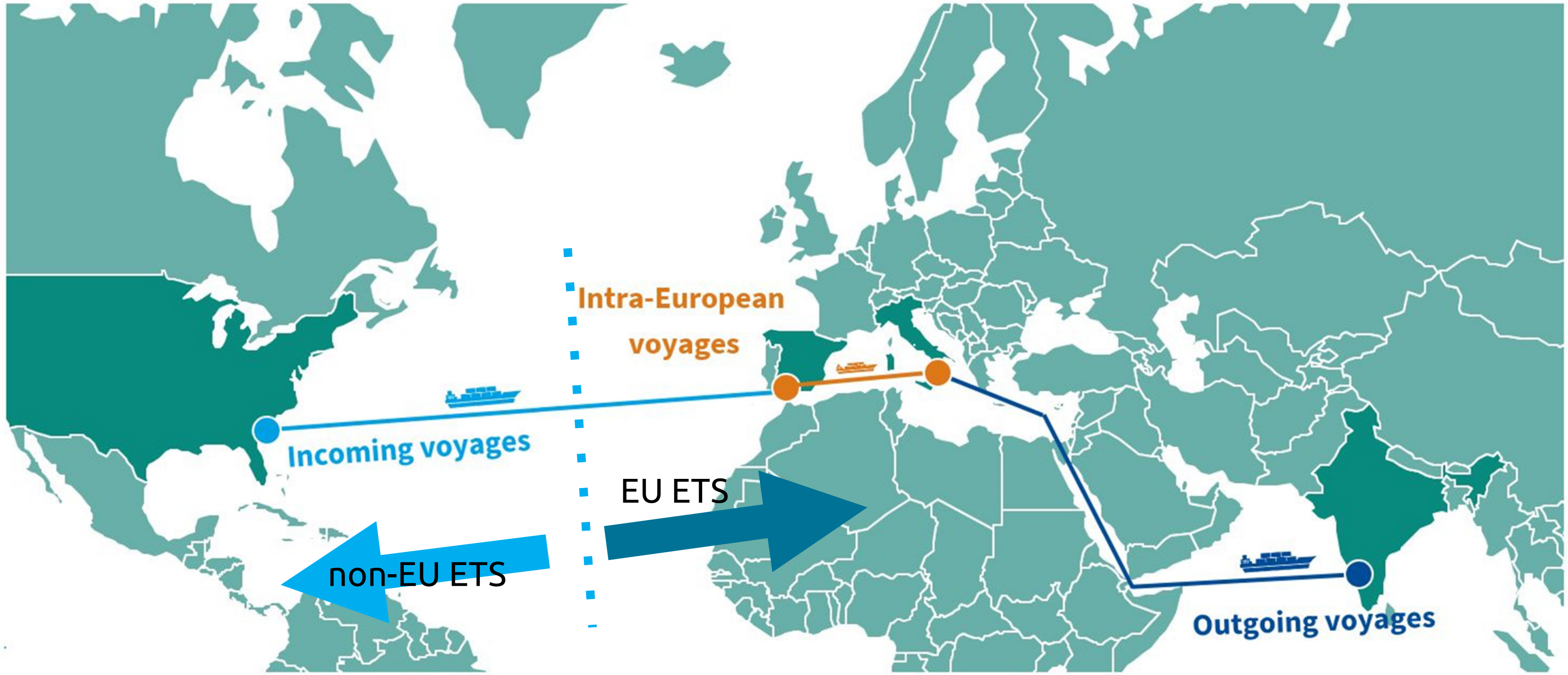


ETS

Applying "polluter pays principle" to shipping

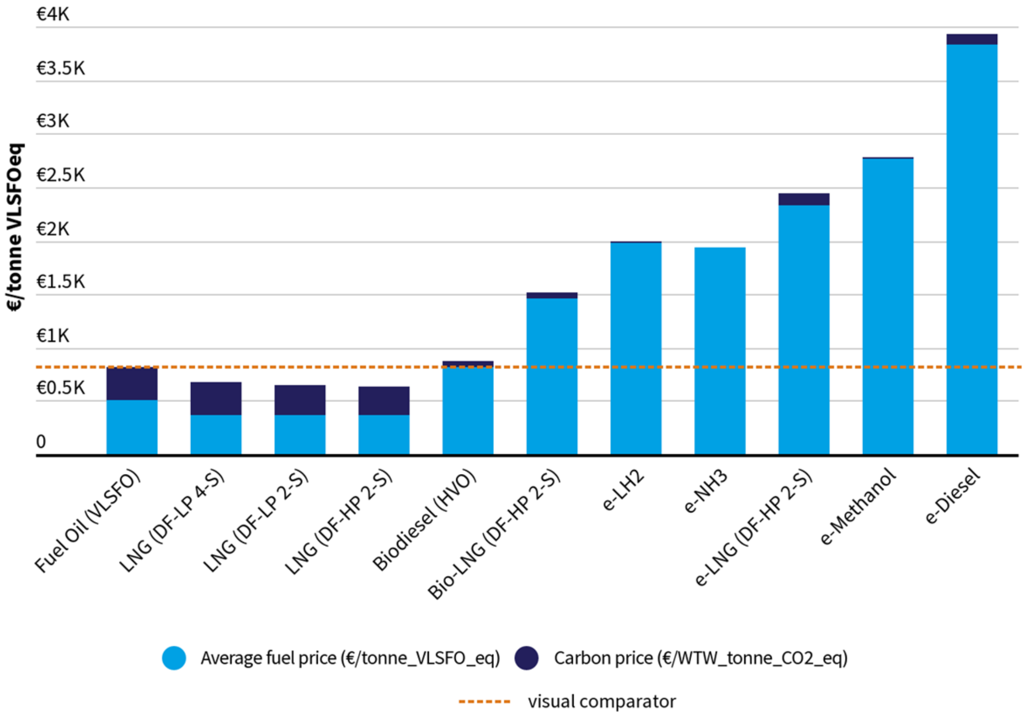
What emissions belong to the EU?
Monitoring, Reporting and Verification (MRV) Regulation

Full scope of MRV emissions



50:50 - EU regulates its share and leaves rest for other systems

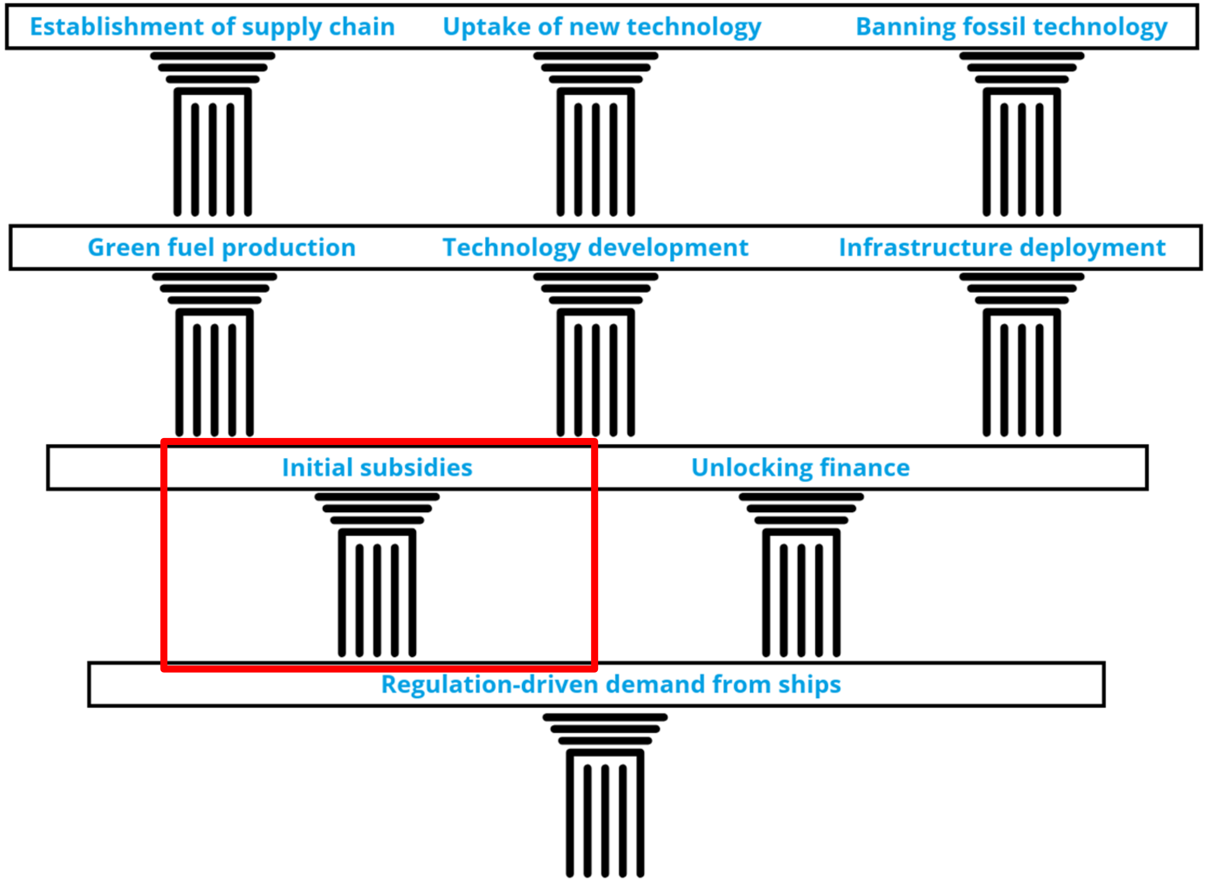
High carbon pricing & the remaining price gap between fossil & alternative marine fuels



Note: T&E calculations using the following assumptions. Fuel prices (€/tonne): VLSFO - 510, LNG - 439, HVO - 870, BioLNG - 1788, e-H2 - 5780, e-NH3 - 876, e-LNG - 2792, e-methanol - 1340, e-Diesel - 3996. Assumed carbon price - **USD100/tonne CO2e** (€82/tonne CO2e). Calculations use LCV and WtW carbon factors from the draft EU FuelEU Maritime Regulation. For LNG 1% pilot fuel for DF-LP engines and 8% for DF-HP engines were assumed. Sources for the assumed 2030 fuel prices can be found here: shorturl.at/jAHY8

E-fuels still too expensive even after $100/tonne CO2 carbon pricing

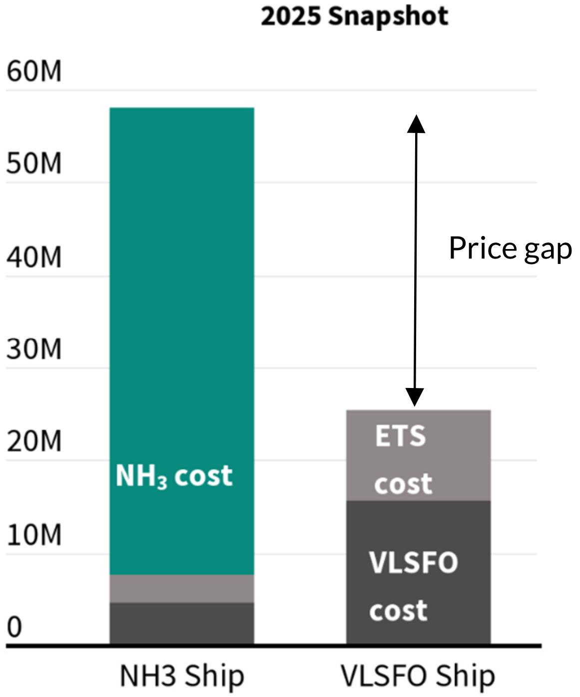
Policy-driven technological transition

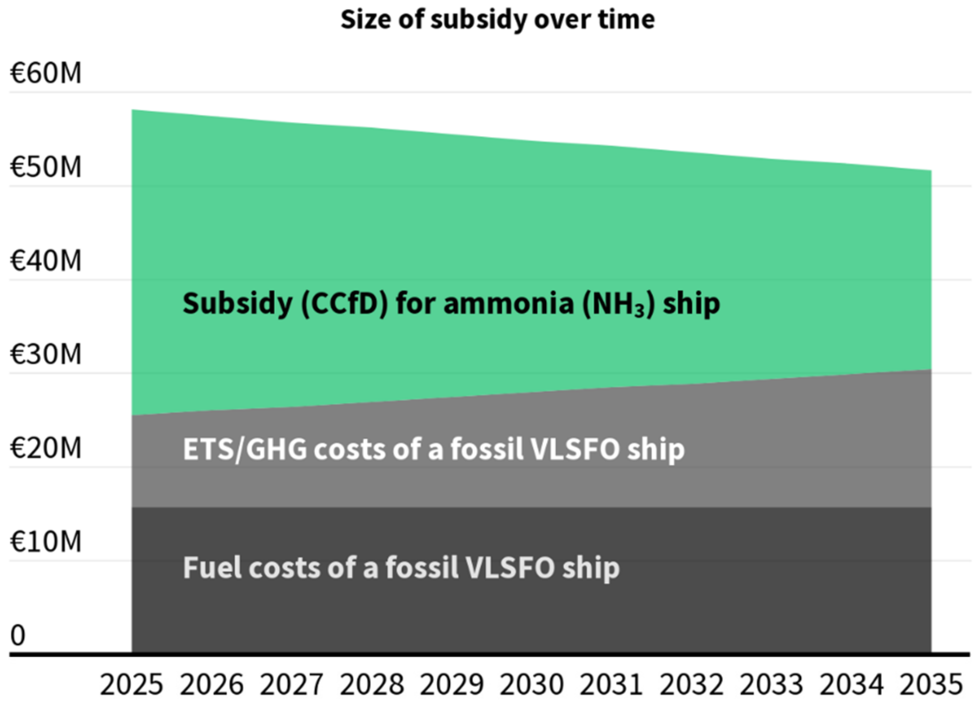


ETS can provide financing for R&D and initial deployments via CfDs

AS

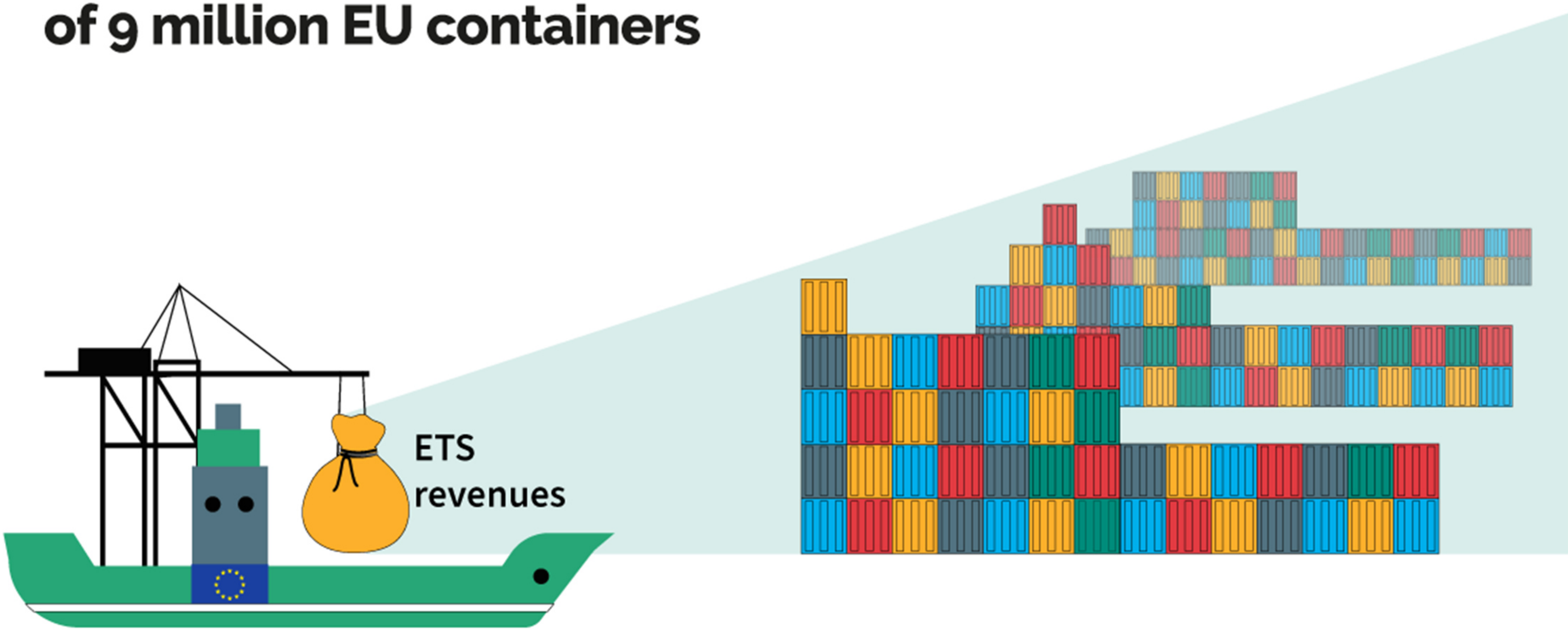
Subsidies for green fuels (CCfDs) will get cheaper as more green ships hit the water





Note: T&E calculations using fuel consumption data from the EU MRV 2020 v.67 using COSCO SHIPPING TAURUS containership as an example. Fuel cost assumptions have been taken from CE Delft 'The Availability and costs of liquefied bio- and synthetic methane' with the carbon price increasing by 5€/tonne CO2 per year from 75€/tonne CO2 in 2020, energy content - 41 MJ/kg (VLSFO) and 18.6 MJ/kg (ammonia), C-factor for VLSFO - 3.206 (gCO2/gFuel), NH3-VLSFO co-combustion ratio - 70%-30%.

Revenues from the shipping ETS can green the transport of 9 million EU containers



Note: T&E calculations using fuel consumption data from the EU MRV 2019. The following assumptions have been used: 50% extra-EU geographical scope; VLSFO price at 510€/tonne, carbon factor of 3.206 gCO2/gFuel and energy content 41MJ/kg; green ammonia at 876€/tonne and energy content 18.6 MJ/kg; carbon price 90€/tonne

Source: Transport & Environment 2022