

# Efficient Energy and Regulation for the Maritime Future

## e4ships Achievements and Strategic Outlook

Dr. Ralf Sören Marquardt | VSM | SMM 2022 | 08.09.2022

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# Next Port of Call: the Sustainable Ship

GREENHOUSE GASES  
(CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, HFCs, PFCs, SF<sub>6</sub>)

ACIDIFYING SUBSTANCES  
(NO<sub>x</sub>, SO<sub>x</sub>, NH<sub>3</sub>, )

PARTICULATES  
(PM<sub>10</sub>)

OZONE PRECURSORS  
(NO<sub>x</sub>, VOCs)

NOISE

CHEMICALS

HARMFUL SUBSTANCE  
IN PACKAGED FORM

MICROORGANISMS  
(ALGAE, BACTERIA...)

BALLAST  
WATER

BILGE  
WATER

BLACK/GRAY  
WATER

OIL SPILLS  
(PAHs)

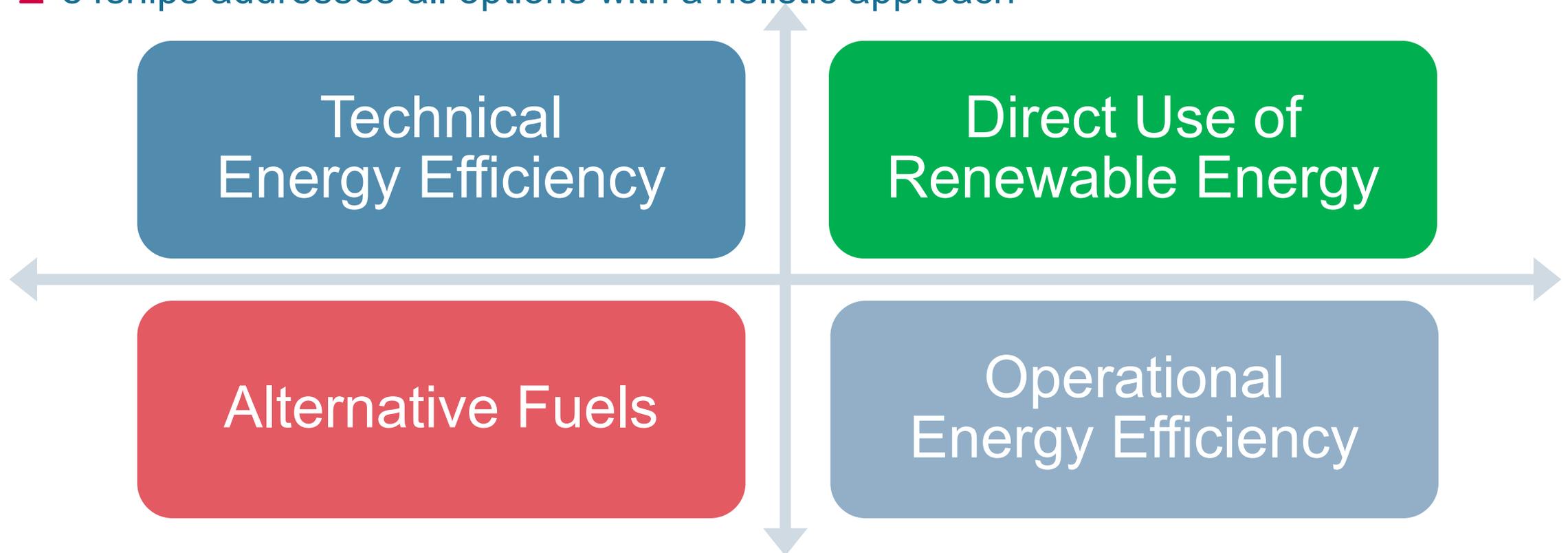
- ≡ Climate protection and adaptation
- ≡ Pollution prevention and control
- ≡ Circular Economy and biodiversity

Provide excellent opportunity for European high-tech shipbuilders to re-enter lost market segments

# Options for Emission Reduction und Climate Neutrality



- ≡ Several options for GHG emission reductions are available
- ≡ to be combined in order to fulfill sustainability goals and mitigate the energy crisis
- ≡ e4ships addresses all options with a holistic approach



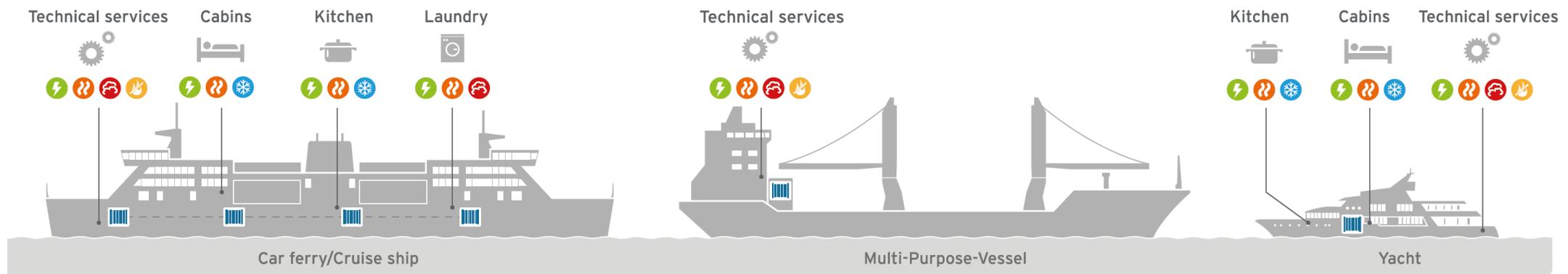
# e4ships: Combining Energy Efficiency with Fuel Flexibility



≡ e4ships R&D projects and full scale demonstrators utilize different...  
...Primary fuels



≡ reaching maturity for commercial application at sea and on inland waterways:



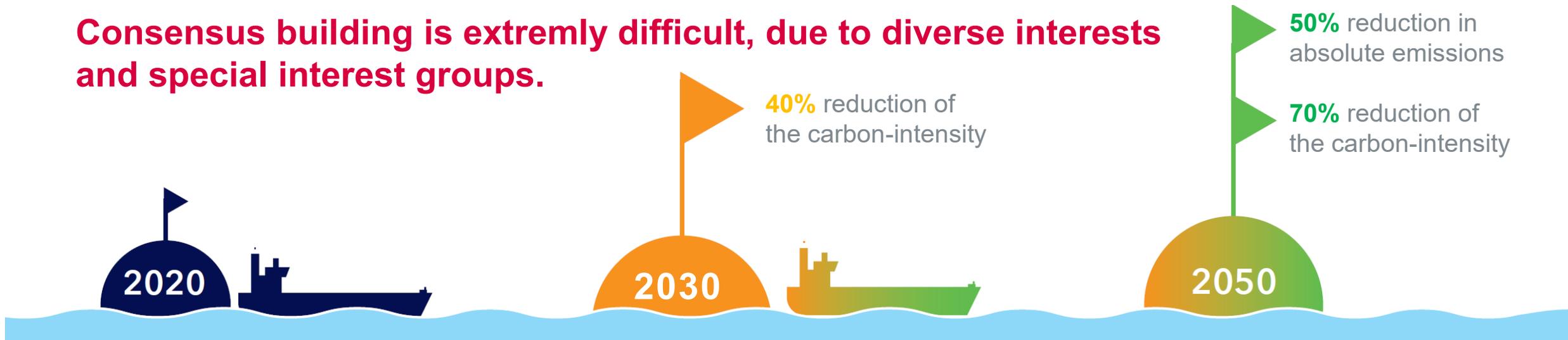
# IMO Initial GHG Strategy is not the benchmark



- ≡ International Maritime Organization defines mandatory goals for specific CO<sub>2</sub> emissions per transport work
- ≡ and strives for halving absolute emissions until 2050 and to phase them out by 2100.
- ≡ Initial Strategy is under review in order to increase ambitions and to complement it by Market-Based Measures (MBM).



**Consensus building is extremely difficult, due to diverse interests and special interest groups.**



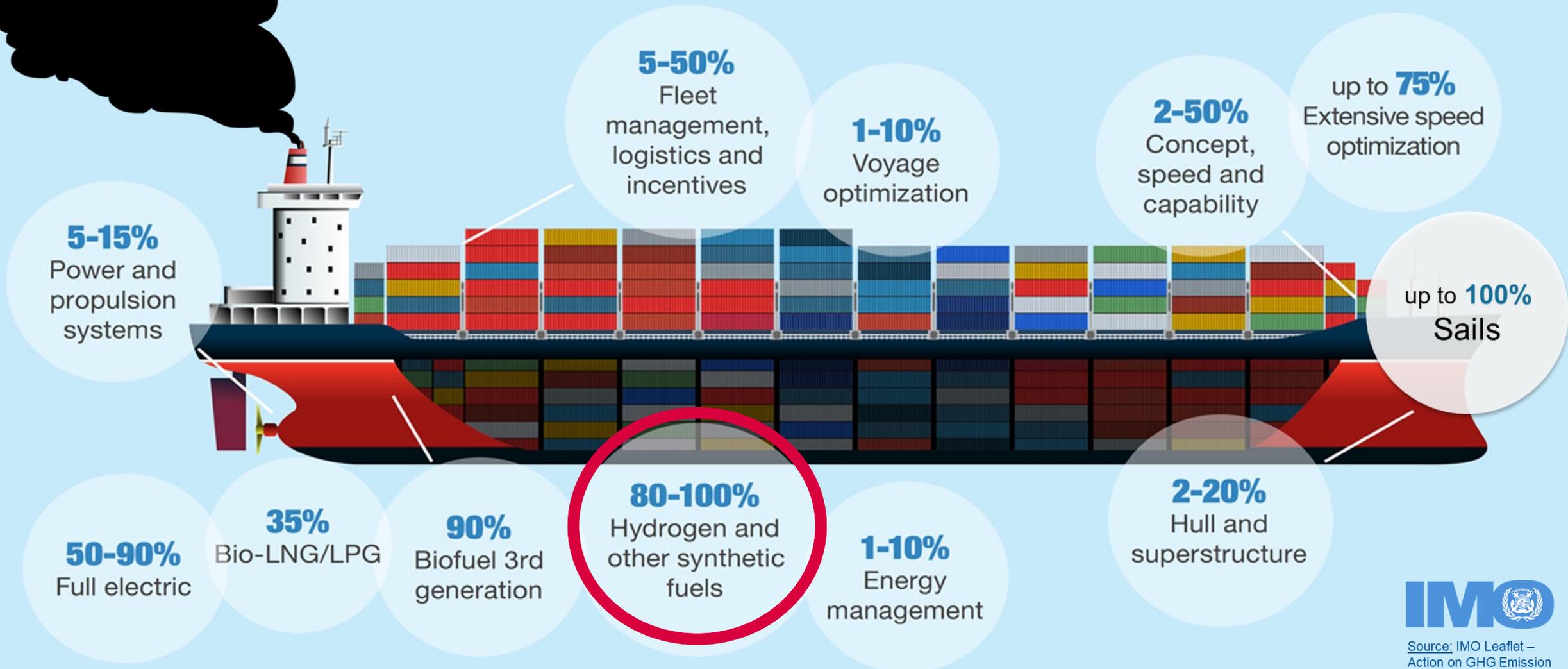
# IMO Interim GHG Strategy – Acting Forces



≡ 175 Member States, 150+ IGO and NGO, 6 languages, lowest common denominator...

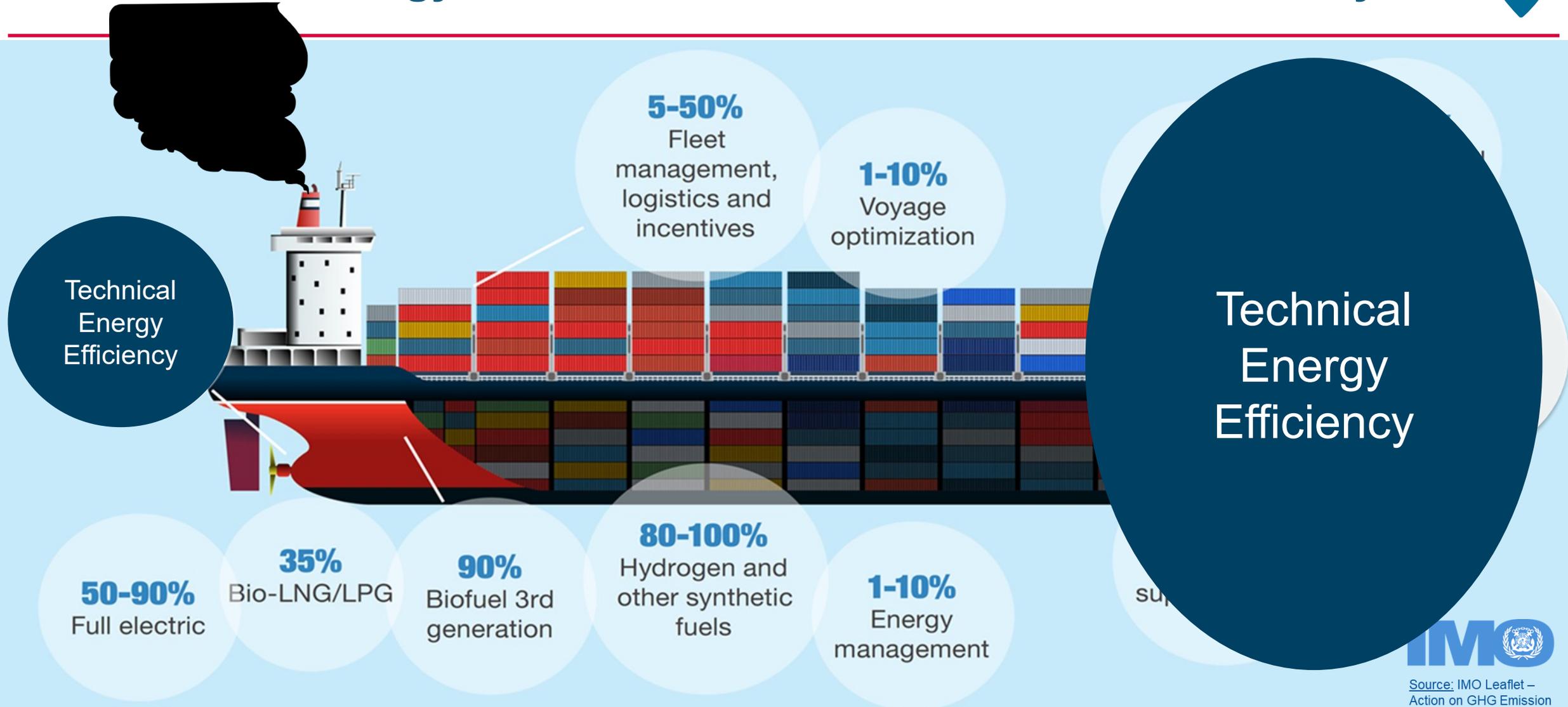


# Technology: Emission Reduction and Climate Neutrality



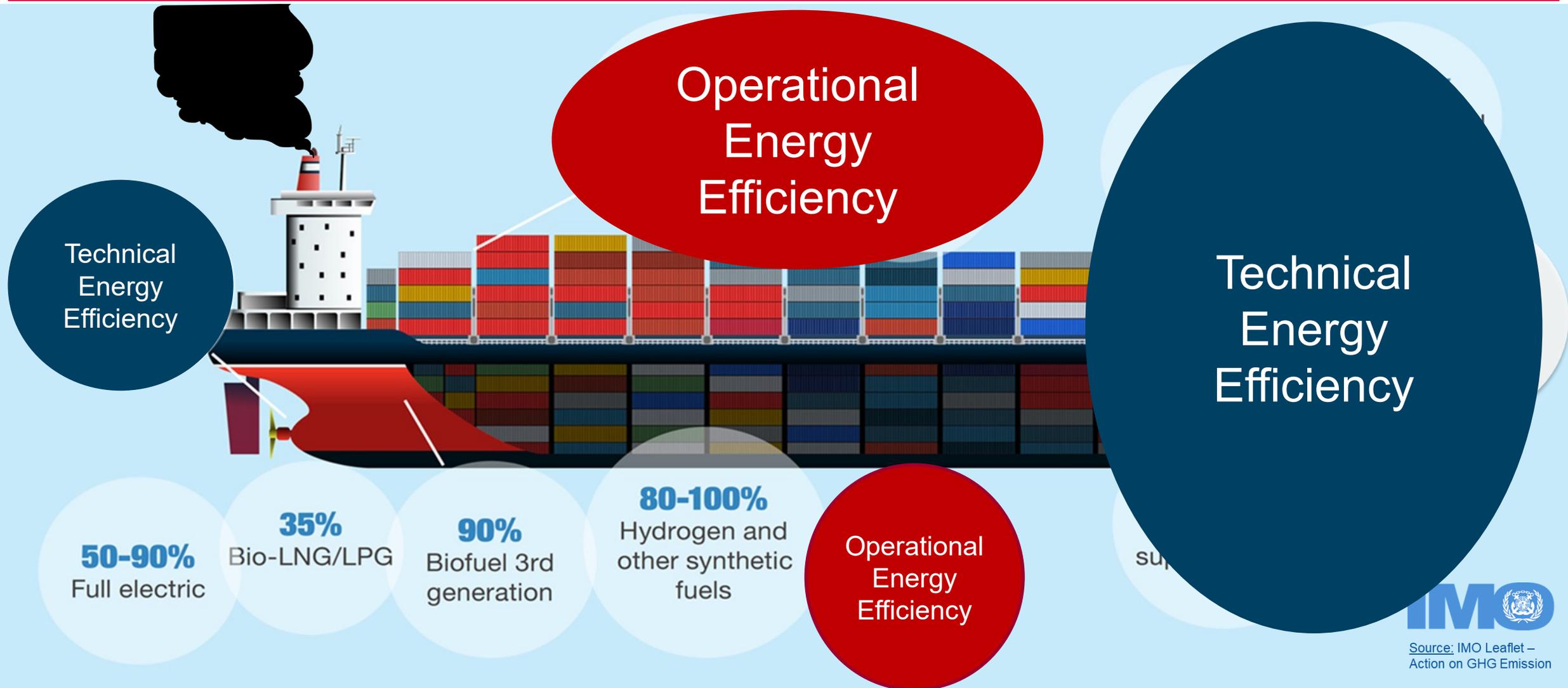
Source: IMO Leaflet – Action on GHG Emission

# Maritime Technology: Emission Reduction and Climate Neutrality



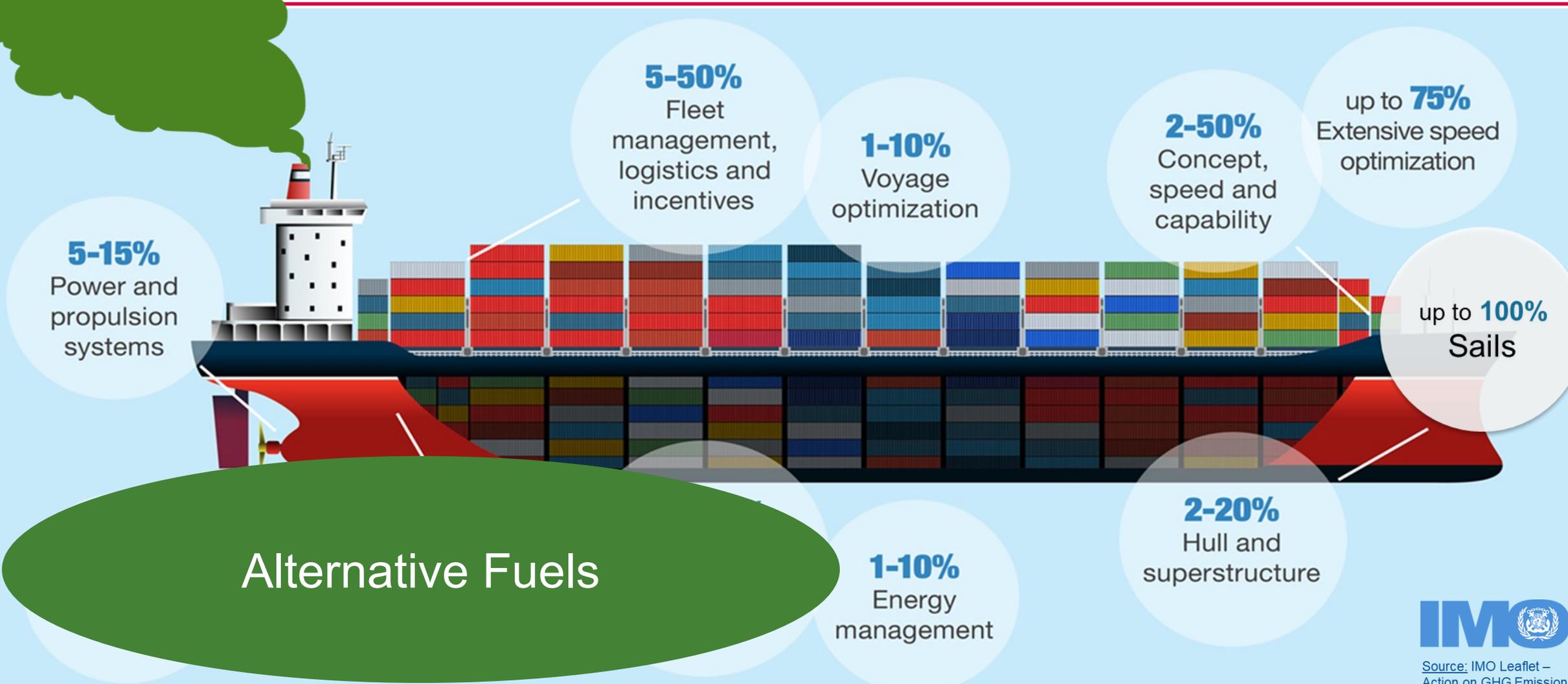
Source: IMO Leaflet – Action on GHG Emission

# Maritime Technology: Emission Reduction and Climate Neutrality



Source: IMO Leaflet – Action on GHG Emission

# Technology: Emission Reduction and Climate Neutrality



Source: IMO Leaflet – Action on GHG Emission

# e4ships Innovation Cluster: translating R&D into regulations



≡ Results of demonstration projects are consolidated in e4ship mirror groups and submitted to IMO

A screenshot of a Zoom meeting interface. Three participants are visible in video thumbnails. The top-left participant is labeled 'MODERATOR - Fredrik Haag'. The top-right participant is labeled 'CHAIR MEPC - JAPAN- Hid...'. The bottom-center participant is labeled 'CESA - Ralf Sören Marquardt'. Three red speech bubbles with white text are overlaid on the meeting. The top bubble, pointing to the top-right participant, says 'We need an Acceleration Plan for Alternative Fuels'. The bottom-left bubble, pointing to the bottom-center participant, says 'The draft GHG measure is just a small step for IMO...'. The bottom-right bubble, also pointing to the bottom-center participant, says '...but not yet the giant leap for mankind necessary for effective climate protection.' The Zoom interface includes a top bar with 'Live Video' and 'Presentation' options, a right sidebar with icons for 'Share Screen', 'Messaging', 'Polls', 'Documents', and 'Request List', and a bottom toolbar with 'ENGLISH' (Language Selector), 'Volume', 'Audio Meter', 'Mute', 'Turn Off', 'Settings', and 'Release Mic' buttons.

# Appropriate Regulations for Alternative Fuels – still a long way to go...

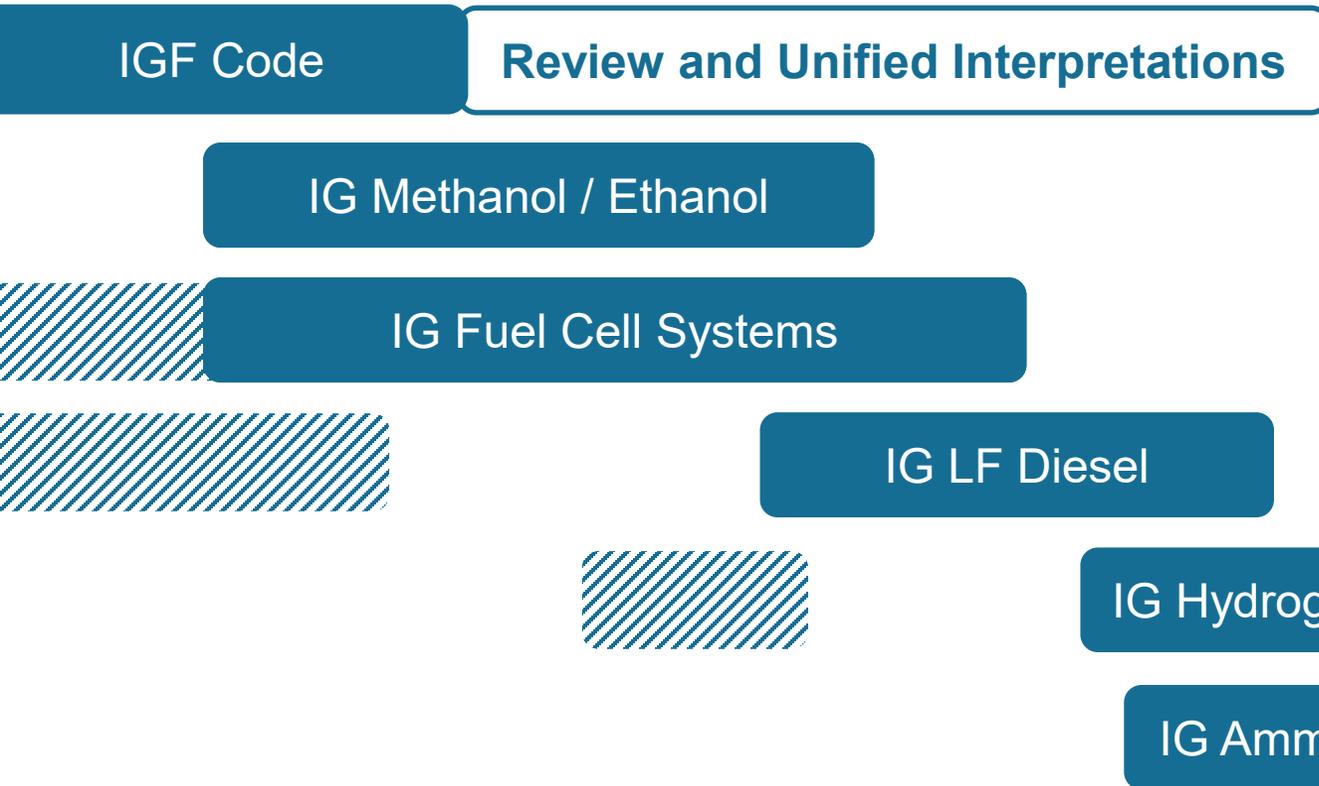


IMO Instruments	currently applied	recommendatory or underway	still missing
<p>Climate Change</p> <p><b>MARPOL</b></p> <p><b>EEDI:</b></p> <ul style="list-style-type: none"> <li>≡ new ships</li> <li>≡ CO<sub>2</sub> only</li> <li>≡ TtoP only</li> </ul>	<ul style="list-style-type: none"> <li>≡ HFO / MDO / MGO</li> <li>≡ LNG</li> <li>≡ LPG</li> <li>≡ Methanol / Ethanol</li> <li>≡ ICE (SFC)</li> </ul>	<p>Extension to existing ships and ship operation:</p> <ul style="list-style-type: none"> <li>≡ EEXI</li> <li>≡ CII</li> <li>≡ SEEMP III</li> </ul>	<ul style="list-style-type: none"> <li>≡ Life-cycle Assessment</li> <li>≡ e-Fuels</li> <li>≡ Biofuels</li> <li>≡ other GHG</li> </ul>
<p>Ship Safety</p> <p><b>SOLAS</b></p> <p><b>IGF Code</b></p>	<ul style="list-style-type: none"> <li>≡ HFO / MDO / MGO</li> <li>≡ LNG / CNG</li> <li>≡ Methanol / Ethanol</li> <li>≡ Fuel Cells</li> </ul>	<ul style="list-style-type: none"> <li>≡ LF Diesel</li> <li>≡ LPG</li> <li>≡ Hydrogen</li> </ul>	<ul style="list-style-type: none"> <li>≡ Ammonia</li> <li>≡ Carbon Capture and Storage (CCS)</li> </ul>

# e4ships Innovation Cluster: IMO Regulatory Milestones



≡ IGF Code – International Code for the Safety of Ships using Gases or other Low-flashpoint Fuels



- ≡ MSC.1/Circ.1621 – Interim Guidelines for the Safety of Ships Using Methyl/Ethyl Alcohol as Fuel
- ≡ MSC.1/Circ. 1647 – Interim Guidelines for the Safety of Ships using Fuel Cell Power Installations

≡ Acceleration Plan for Alternative Fuels

**Parallelization of regulatory development!**



# From International Maritime Organization, London, Albert Embankment...



# ...to European Commission, Bruxelles, Berlaymont

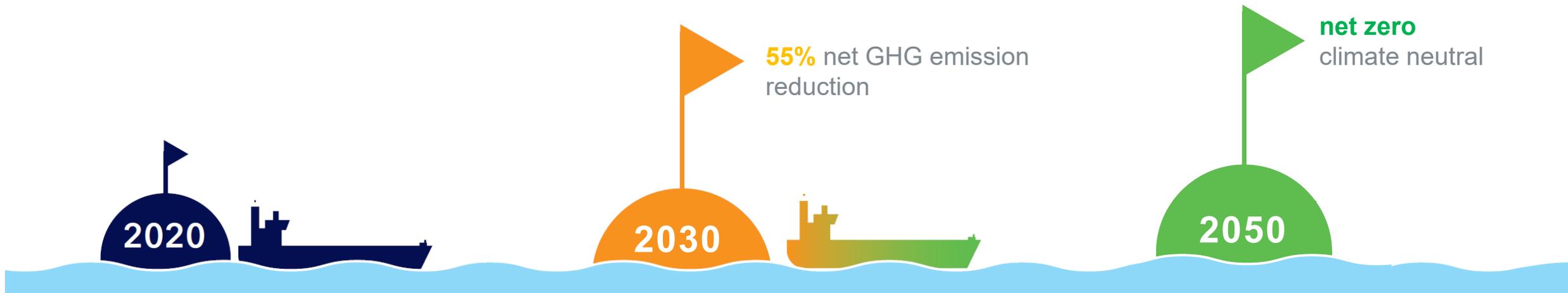


# Ambitious EU Climate Change Mitigation Goals



- ≡ EU attempts to become climate neutral until 2050 and to reduce by 55% already until 2030;
- ≡ This agenda has a different reference and is not shipping specific.

EU currently operates according to the motto „a lot helps a lot“ and produces an increasing number incompatible instruments.



# „Fit for 55“ Package and Taxonomy-Regulation

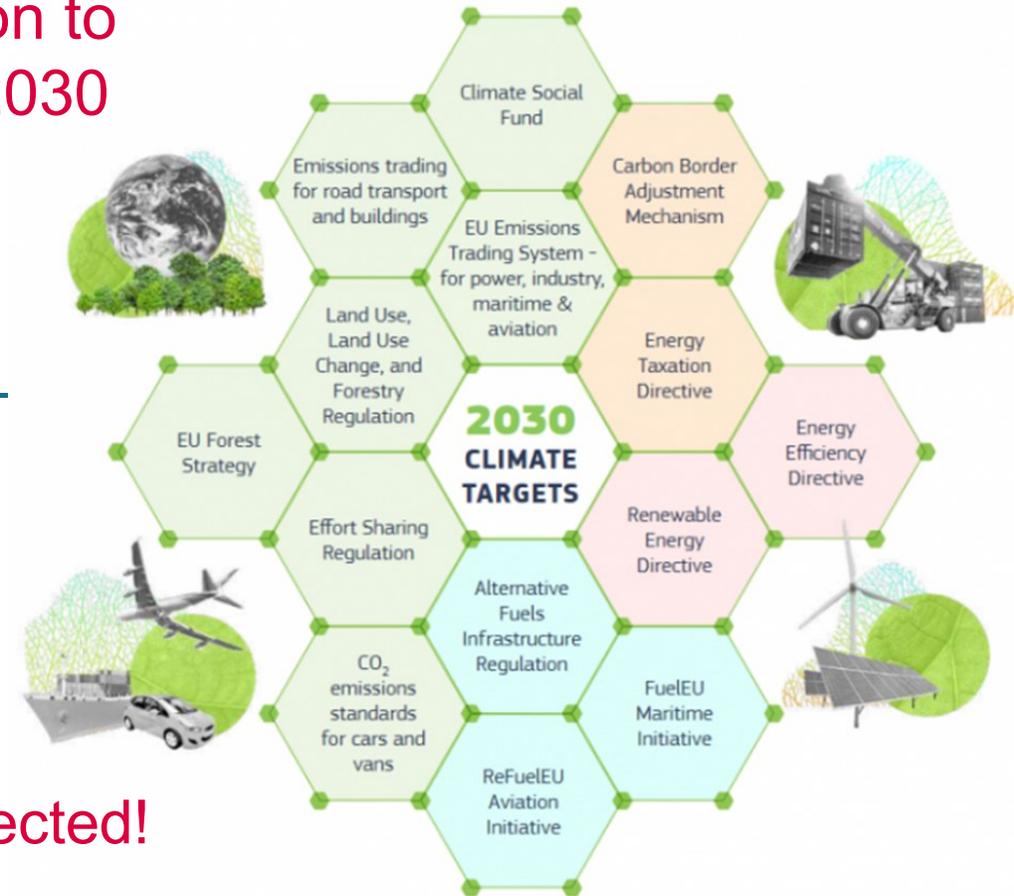


Legislative package to implement the EU ambition to reduce European GHG emissions by 55% until 2030

## Instruments with shipbuilding significance:

- ≡ Fuel quality standard – FuelEU Maritime
- ≡ Sustainability criteria and Green ship finance – Taxonomy-Regulation (EU) 2020/852 and related Delegated Regulations by COM
- ≡ Introduction of CO<sub>2</sub> pricing in shipping – Emission Trading System (ETS)

Problems: (over-)ambitious, incompatible, disconnected!

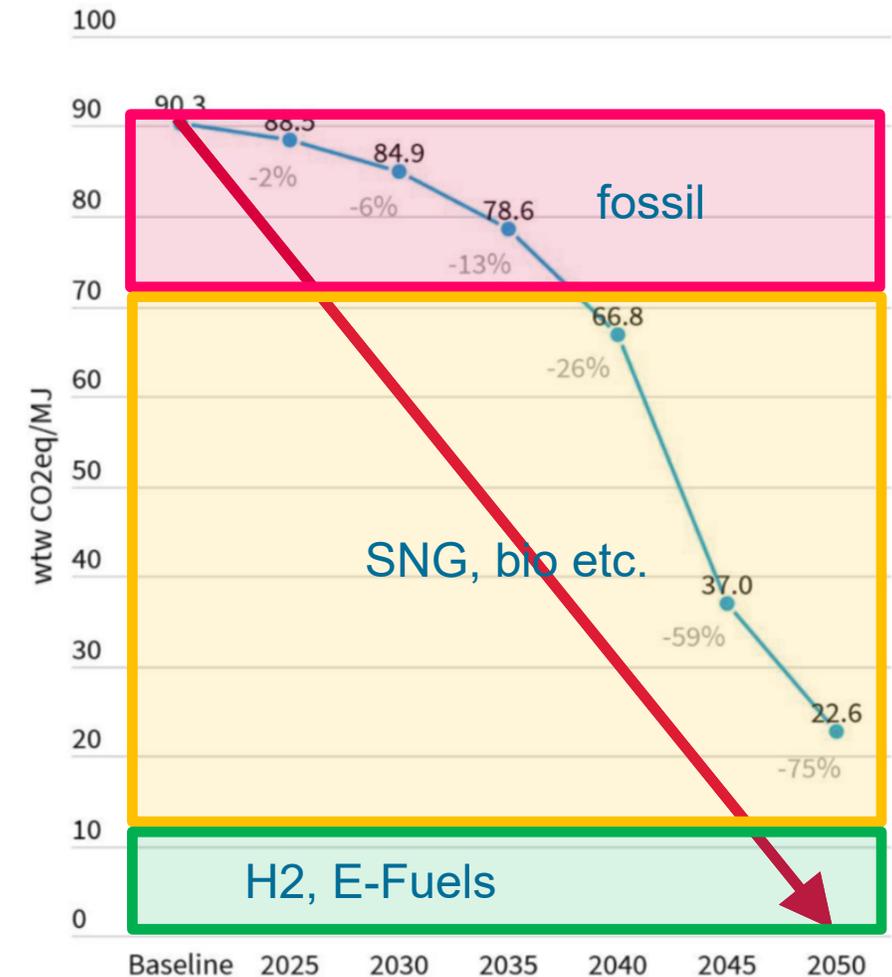




## Regulates and enforces fuel quality:

- ≡ Continuous reduction of GHG intensity [ $\text{CO}_2_{\text{eq}}/\text{MJ}$ ] phases-out fossil fuels
- ≡ Holistic well-to-propeller assessment (LCA)
- ≡ incl. „greenwashing“ of electric mobility
- ≡ Mandatory onshore power supply or use of zero-emission technology for (at least) container and passenger vessel
- ≡ Fuel quality bonus for sail-assisted ships
- ≡ Goals can be achieved by blending, pooling and more.

More ambitious pathway is be expected that soon call for the use of best e-fuels and fuel cells.



# Taxonomy Criteria for Green Finance

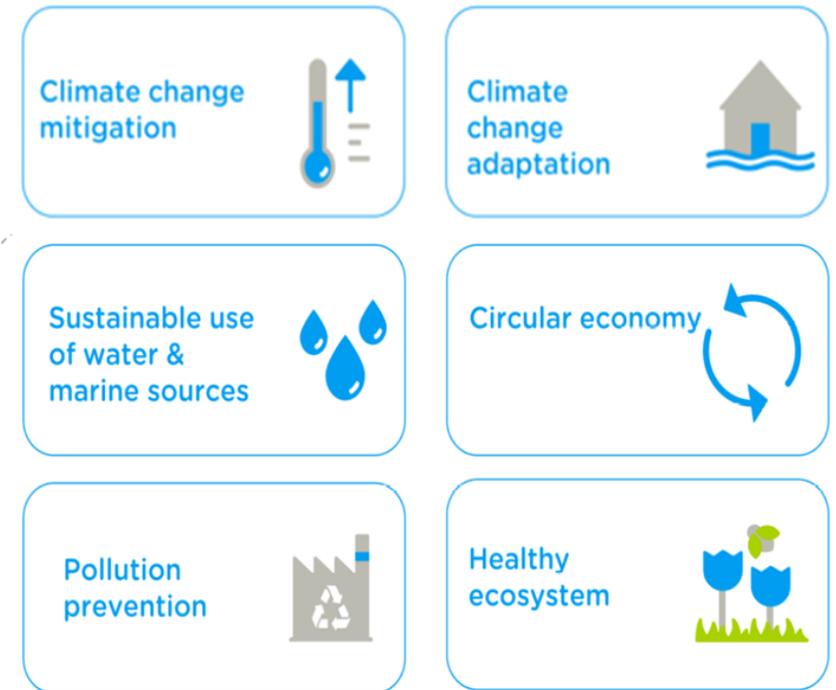


≡ Technical Screening Criteria (TSC) to define sustainable shipbuilding and shipping



Sample Criteria defining a Significant Contribution (SC) to:

- ≡ Climate Mitigation: zero direct (tailpipe) CO<sub>2</sub> emissions or climate neutral fuels (LCA) with GHG intensity -80%
- ≡ Pollution Prevention: zero tailpipe emissions SO<sub>x</sub>, NO<sub>x</sub>, PM with limited use of Exhaust Gas Cleaning Systems (EGCS)
- ≡ Proposed exclusions:
  - ≡ transport of fossil fuel (climate protection) as well as beef, soy, nuclear waste (pollution prevention)
  - ≡ Cruise ships and yachts, considered to be generally not sustainable



# From European Commission, Bruxelles, Berlaymont...



# ...to Strasbourg, Palais du Rhin



Presented by Torsten Hacker, Lloyds Register

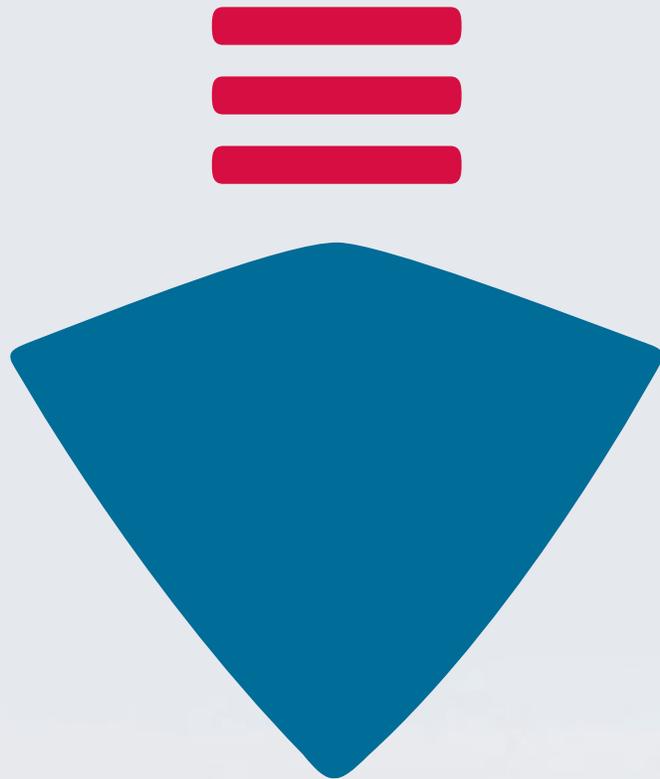


# Safe and Competitive Decarbonization for European Leadership



- ≡ Utilize mature technologies in commercial and governmental vessels
- ≡ Strengthen environmental legislation to match the state-of-the-art
- ≡ Accelerate and support development of safety regulations
- ≡ Intensify innovation aid for fuel cell technology and alternative fuels
- ≡ Implement compatible green investment aid and GHG pricing





**Continue to utilize e4ships and  
launch additional innovation projects!**

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