Decarbonization Footpath

We need to be realistic

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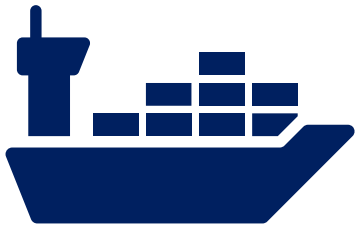
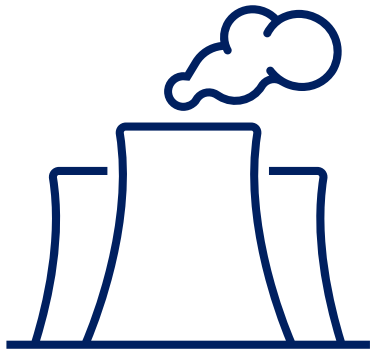
IMO Targets



Shipping industry

About 940 million tonnes of CO2 annually



2.24% of the world's total CO2

IMO remains committed to reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century.

This is the vision in the initial strategy on reduction of GHG emissions from ships, adopted in April 2018 revised end of 2023.

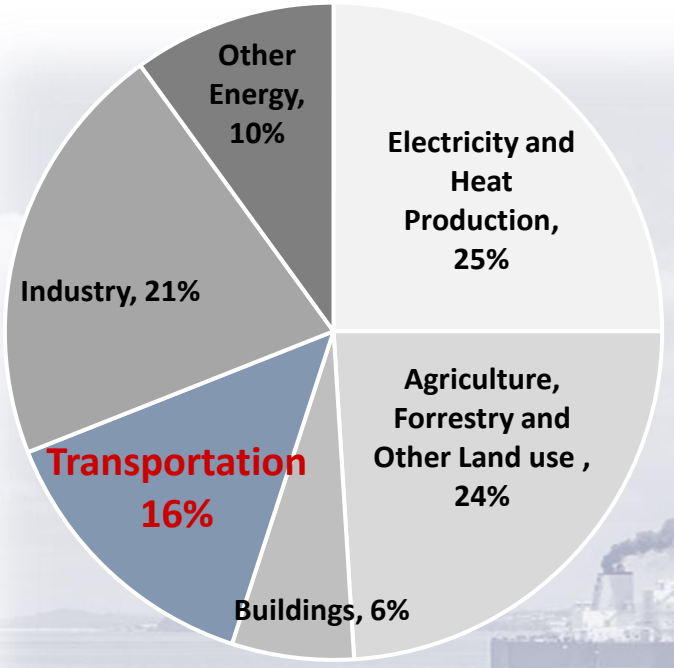
2008
STARTING POINT

2030
Mid-term measures to reduce carbon intensity of the fleet by at least 40%

2050
Long-term measures to reduce carbon intensity of the fleet by at least 70%

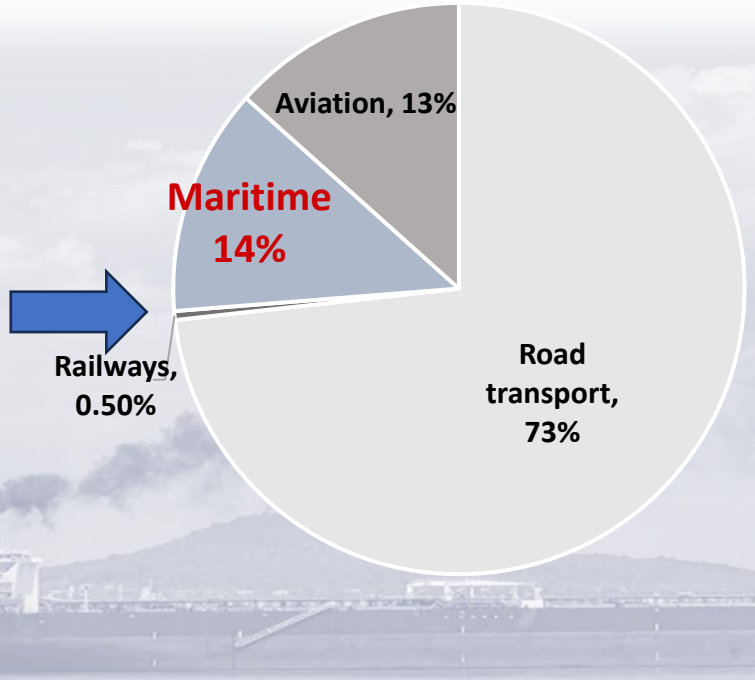
GHG – Transportation - Maritime

GHG Emissions by Economic Sector

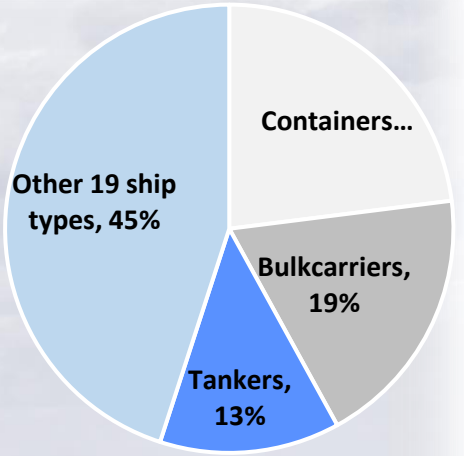


(Million metric Tons Co2 Equivalent)

GHG Emissions of Transportation



CO2 Emissions per Vessel type



Sources: www.theicct.org
IPCC (www.epa.gov)

16% of 14% is 2.24% (GHG emissions of Maritime Transportation)

Marine Fuels of Tomorrow?

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LNG

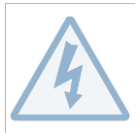
Hydrogen

Ammonia

Methanol

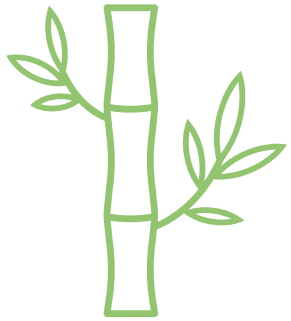
Biodiesel

Nuclear



Electric

Alternative Green Fuels



For any new fuel, the requirements to use that fuel are:

1) New dual fueled ship, capable not just ready (*majority Newbuilds not retrofits*)
2) New fuel Production (*these may need energy source(s) also to be produced*)
3) New fuel Storing/Transportation (*infrastructures & logistics*)
4) New fuel Bunkering *(Well-to-Wake from origin at the well or source to its use in the vessel's wake)*

All the above stated need:

1) Capital to fund it
2) Infrastructures (*talking of Trillions of USD*)
3) Carbon footprint to create/enable all the above *(No one can calculate this even as a rough estimate)*

If aforementioned new/alternative fuels are more than one, then we will be facing all of the above concerns in multiples!!

Can anyone ever accurately or even roughly estimate the required amount of capital needed and what will be the carbon footprint of these???

Methanol Fueled - Example

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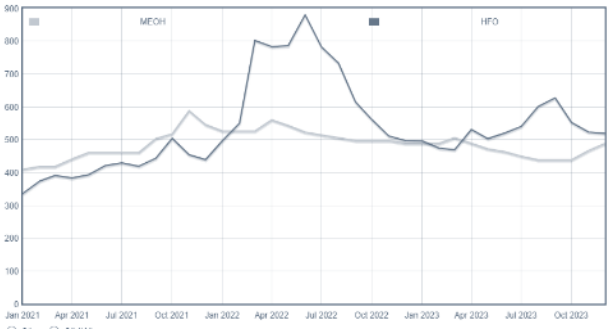
Methanol seems like a nice alternative to FO and easy to switch over. Produces less Co2 (7%) and lower Sox (99%) and Nox (60%) than fuel oil burning.



Japan KMX NB – 42mil USD (Tier III/EEDI 3) - If Methanol fueled +8mil = 50mil USD

- Due to lower energy density, we need double the Methanol quantity to produce same colorific output compared to HFO (some say 2.5 times).
- Methanol fuel price per ton, is roughly same as HFO. Thus, a methanol fueled vessel will have more than double bunker costs than one burning the established and known fuel oil.
- In the very near future, we will need to move from **grey methanol** to a ***sustainable from of methanol***: i.e. to biomethanol or carbon-recycled or e-methanol, which today, cost of producing is estimated abt **2x** the cost of existing grey/brown/fossil methanol (note: here no one knows exactly the costs as e-methanol & all e-fuels for example, depend on the cost of power/electricity which is not a known fixed cost even if this energy comes from renewable sources).
- On the above assumptions will any Charterer be here to pay the required premium in the ***daily charter*** to enable an owner to repay the **$8mil extra CAPEX investment, totaling $50mil** for a GREEN vessel that will directly compete with a $42mil HFO/IFO burning vessel?

Green “investment” or investment

Many and big question marks ??????

Can anyone answer all the below questions?

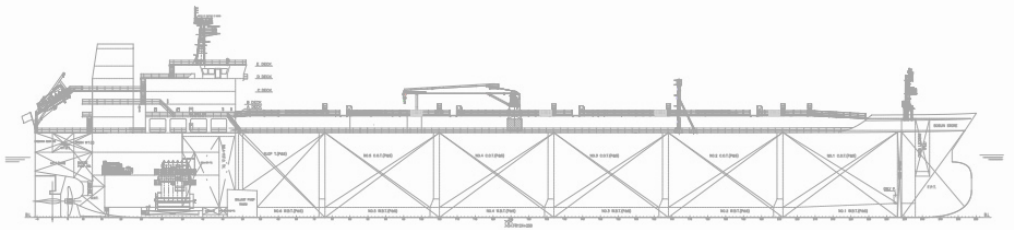
- **If a green investment is much more expensive to invest in and above all to run, will this more expensive business attract a premium or obtain a discount in its daily freight rate?**
- **Will any charterer dare to charter a green burning vessel that has daily fuel costs instead of $10,000/day, say $20k or even $30k+/day?? Who in the end, will pay for these steep extra daily expenses?**
- **Is all the green hype and green benefits, enough to offset the higher CAPEX and OPEX?**
- **The Eu-ETS and other carbon emissions penalties that you avoid paying using alternative green fuels, are enough to offset the steep expenses we just mentioned?**

Examples that shed light in the dark Tunnel

NB MR2 from top S.Korean shipyard with excellent speed/consumption figures.

- **MR2** delivered in 2024 from a top S.Korean shipyard.
  She achieves laden 12knots at **14.5mt**/day Fuel + 2.5mt IFO/MDO. *In ballast this ship does 12knots at 11.5tons Fuel + 2.5mt DO.*
- For a more direct comparison an eco-S.Korean MR2 2017 built, equipped with a MAN-B&W 6S50ME-B9 M/E does 12knots at **19mt**/day + 2.5mt IFO/MDO **(25%)**.
- A non eco S.Korean MR2 2013 built, equipped with MAN-B&W 6S50MC-C M/E but otherwise considered a lean burning vessel, does 12knots at **22mt**/day + 2.5mt IFO/MDO **(35%)**.

Summarizing, a modern MR2 burning IFO, the best that today's shipbuilding can produce (in terms of ship hull design and machineries), burns:
25% less than what the well sought after eco vessels can do,
35% less than what a non eco ship burns, which despite its non eco tag is still considered as a leaner burning MR2.



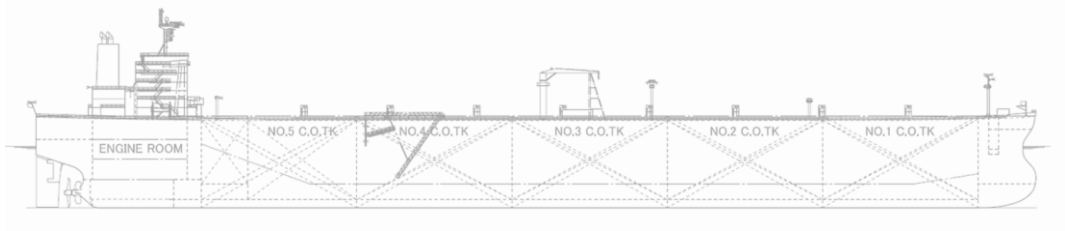
Examples that shed light in the dark Tunnel

Comparison of Speed/Consumptions of the larger Crude oil Tankers:

- **VLCC** - Newbuild VLCC, laden at 12knots burns **43mt**/day. In comparison, an Eco 5y old 2019 S.Korean built equipped with a MAN-B&W 7G80ME-C9 M/E burns **48mt**/day **(10%)** and a 15y old 2009 S.Korean built equipped with a MAN-B&W 6S90MC-C M/E burns about **67mt**/day **(35%).**

- **Suezmax** - Newbuild Suezmax, laden at 12knots burns **27.2mt**/day. In comparison, an Eco 6y old, 2018 S.Korean built equipped with a MAN B&W - 6S70ME-C M/E burns **31.6mt**/day **(17%)** and a 13y old 2011 S.Korean built equipped with a MAN-B&W 6S70MC-C M/E burns about **36mt**/day **(35%).**

Summarizing the modern Vs and Suezmaxes burn:
10-17% less than what the well sought after eco vessels can do, and
35% less than what a non eco ship burns, which despite its non eco tag is still considered as a leaner burning Crude oil Tanker.



Examples that shed light in the dark Tunnel

Analysing speed consumption figures of two different prime Japanese shipyard designs of NB Kamsarmax that share same excellent speed/consumption figures.

- **Kamsarmax** delivered in October 2023 from a top Japanese shipyard.
  Laden, she achieves 11.2knots at **12mt**/day Fuel + 2mt/day IFO/MDO. *In ballast she does 12knots at 12mt/day Fuel + 2mt/day DO.*
- For a more direct comparison an eco-Japanese KMX 2018 built, equipped with a MAN-B&W 6S60ME-C8 M/E does 11.2knots at **19mt**/day + 2mt/day IFO/MDO **(37%)**.
- For comparison purposes a non eco Japanese KMX 2010 built with MAN-B&W 6S60MC-C M/E does 11.2knots at **23.9mt**/day + 2mt/day IFO/MDO **(50%)**.

Summarizing the modern NB Kmx burns:
37% less than what the well sought after eco vessels can do, and
50% less than what a non eco ship burns, which despite its non eco tag is still considered as a leaner burning Kamsarmax.

Thank you

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