

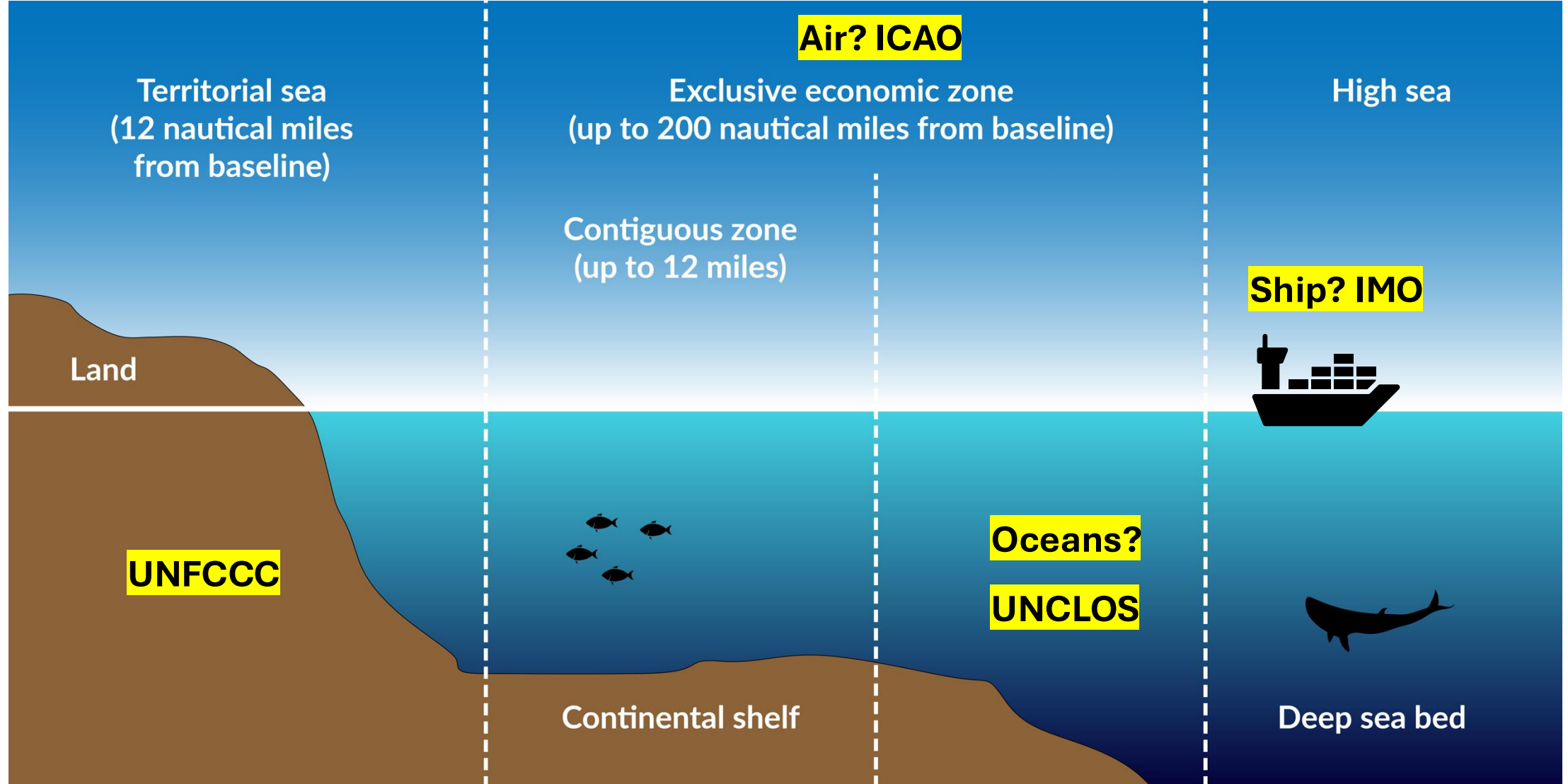
Interconnected Governance Challenges of Addressing Climate Change and Shipping

Joel Ong
**Research Assistant, NUS Centre for
International Law (Singapore)**

Joel.ong@nus.edu.sg

*IUCN WCEL 4th International Environmental Law Congress
(Parallel Session 2: Integrated Climate and Nature Protection)*

Overview

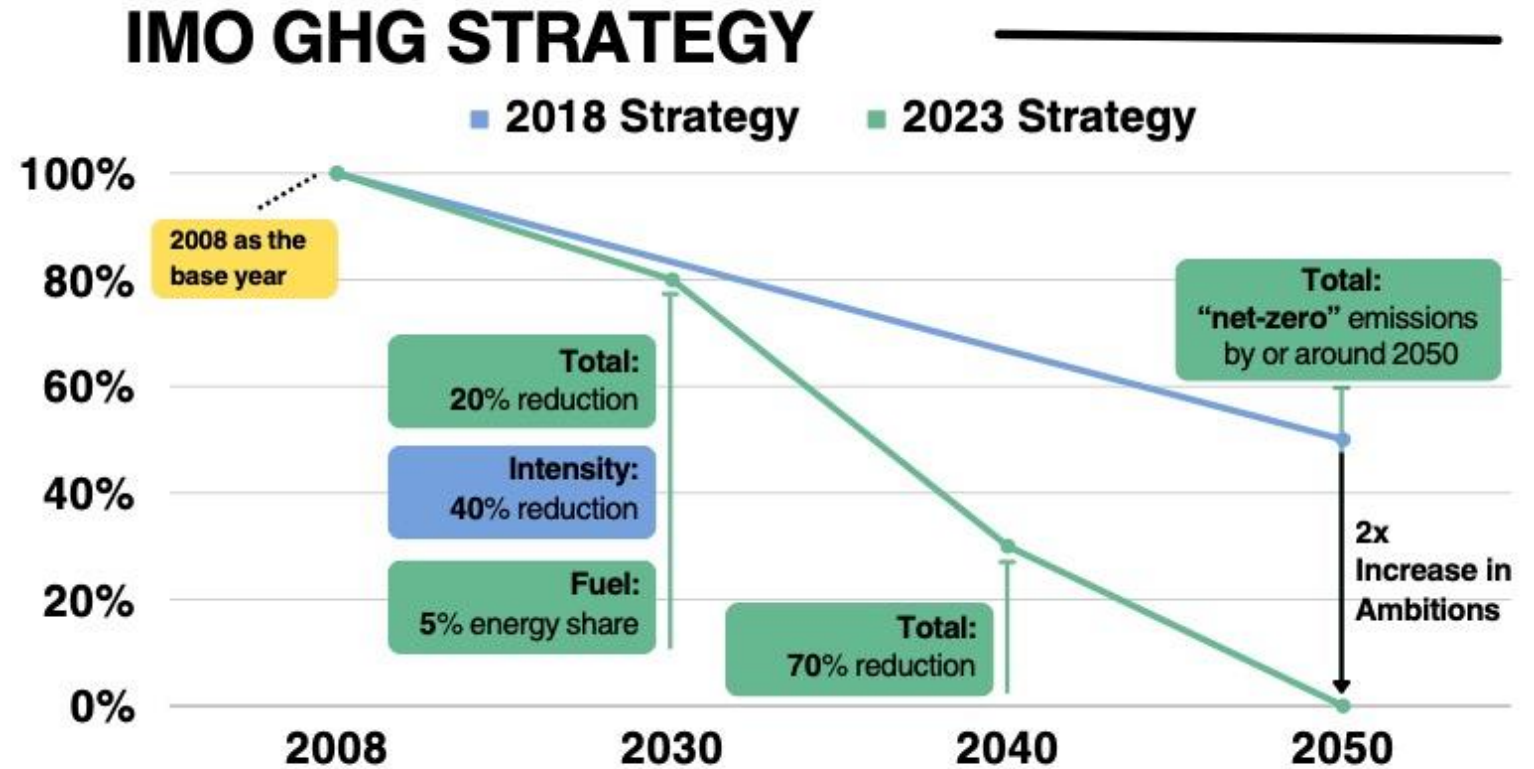


SOURCE: [HTTPS://WWW.GISREPORTSONLINE.COM/R/MARITIME-LAW/](https://www.gisreportsonline.com/r/maritime-law/)

2023 IMO GHG STRATEGY

New Targets:

- **Net-zero** by ~2050
- **20-30%** emissions cut by 2030
- **5-10%** new fuel uptake by 2030



Units: GHG Emissions contributed by international shipping

Total: "Well-to-wake GHG emissions";

Intensity: "CO2 emissions per transport work" averaged across international shipping;

Fuel: "Uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources" as a % of energy used by international shipping.

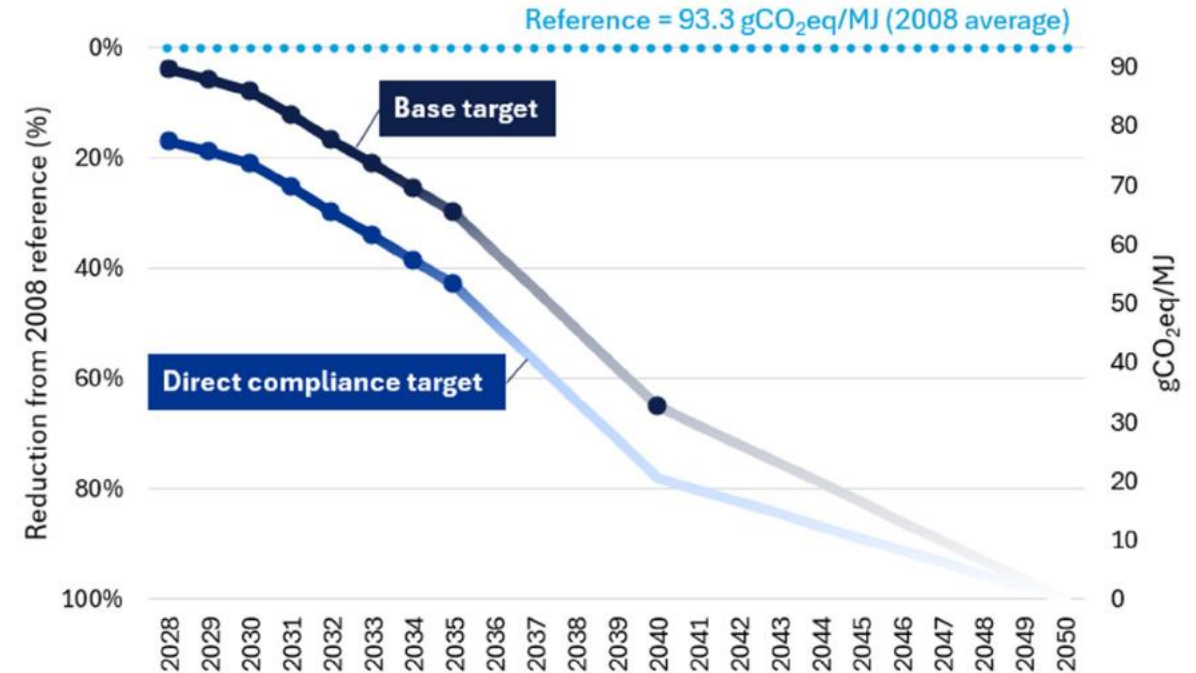
Source: Joel Ong, "Decarbonizing International Shipping at the IMO: Are Alternative Fuels The Way Forward?" (2023) 17(4) Carbon & Climate Law Review 207–234

2025 IMO CARBON PRICING MECHANISM

- Tiered Carbon Price:
 - **\$380/tCO₂e** (Tier 2)
 - **\$100/tCO₂e** (Tier 1)
- **Adoption - Historic but fragile**
 - U.S. Boycott
 - SIDS Abstention
 - Absence of many delegations during voting
 - Risk of non-enforceability

Up for
acceptance in
Oct in London

2/3 majority of 108 MARPOL
Annex VI parties [Art 16(2)(f)(ii)]



Year	2028	2029	2030	2031	2032	2033	2034	2035
Base	4%	6%	8%	12.4%	16.8%	21.2%	25.6%	30%
Direct	17%	19%	21%	25.4%	29.8%	34.2%	38.6%	43%

Source: DNV, IMO MEPC 83: GHG REQUIREMENTS APPROVED, TAKING EFFECT FROM 2028, *Technical and Regulatory News*, No. 12/2025 at 2.

ALTERNATIVE FUELS – NOT A SILVER BULLET

- **Ammonia:** zero-carbon, but extremely toxic to marine life/humans
 - Nitrogen cycle effects? N_2O
- **Methanol:** Less toxic, but lifecycle emissions depend on production (coal-based can be 50% worse than oil).
 - Chemically difficult to distinguish
 - Coal-based methanol emits nearly 5 kg CO_2 per kg
 - Green methanol emits under 0.5 kg
 - Heavy Fuel Oil = 3.6 kg
- **LNG:** Low marine environ risk, but methane slip is a major climate threat
- **Biofuels:** land use change etc.

Key Takeaway?

Green fuels may cause “brown” environmental outcomes. Knowledge gaps.

1

Ammonia is **1,161** times more lethal than Heavy Fuel Oil

956 times more lethal than Diesel

734 times more lethal than LNG

121 times more lethal than Gasoline

15,400 mg/l
Methanol

ECHA, European Chemical
Agency, registration dossier
Methanol

**79
mg/l**

**Heavy Fuel
Oil (HFO).**

GKG/ A/S
Dansk Shell,
Safety Data
Sheet

**65
mg/l**

Diesel

ECHA,
European
Chemical
Agency,
registration
dossier Diesel

**49.9
mg/l**

**Methane
(LNG).**

ECHA,
European
Chemical
Agency,
registration
dossier
Methane

3

8.2 mg/l

Gasoline

Petrobras/
Statoil ASA,
Safety Date
Sheet,
ECHA
registration
dossier
Gasoline

0.068 mg/l



Ammonia

ECHA,
European
Chemical
Agency,
registration
dossier
Ammonia

Methanol is **195** times less
lethal than Heavy Fuel Oil

2

Comparison
of lethal dose
to 50% (**LC50**)
of marine life
population

Lethal Concentration 50 (LC50): the dose that is lethal to 50 percent of organisms in a given population.

In other words, other things being equal, a spill of 1200 times more HFO than Ammonia is needed to kill the same number of fish.

LEGAL AND REGULATORY GAPS

- Lifecycle accounting: production happens **on land under jurisdiction of a State** (outside of IMO's mandate)
- No IMO liability convention covers **non-oil** fuel spills (e.g., ammonia/methanol/LNG as bunker fuel).
 - Gaps in the 1992 CLC, 2001 Bunker Convention, and 1996 HNS.
- **Proposal**: Expand existing conventions or create a new liability regime + dedicated compensation fund



EQUITY AND REVENUE GOVERNANCE

- Up to **\$30-40 Billion/year** in carbon revenue
 - Who gets it?
- Risk of double taxation with EU Emissions Trading System (ETS).
- Unprecedented Evolution: **Obligations on private actors (shipping companies)**
 - IMO proposes an Independent Board of Governors (non-state governance)
 - All previous IMO instruments traditionally impose duties on flag States
- **Core issue:** enforceability
 - Can we enforce GHG contributions across non-participating flags?



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TAKEAWAYS AND NEXT STEPS

- True Decarbonization needs **interoperable legal regimes** (IMO-UNFCCC)
- Climate **ambition is not enough**: we must balance **safety, liability, and environmental protection**
- **Future work**: Integrated liability systems, lifecycle accounting laws which accommodate land-sea interactions, cross-regime coordination
 - Eg. Ship emissions while waiting in port – NDCs?



A vibrant underwater photograph of a coral reef. In the foreground, there are large, colorful coral structures in shades of purple, blue, and pink. A large school of small, orange fish swims in the middle ground. In the background, a scuba diver is visible, silhouetted against the blue water. The overall scene is rich in marine life and color.

THANK YOU!

JOEL.ONG@NUS.EDU.SG