

Policies toward Carbon Neutrality in International Shipping

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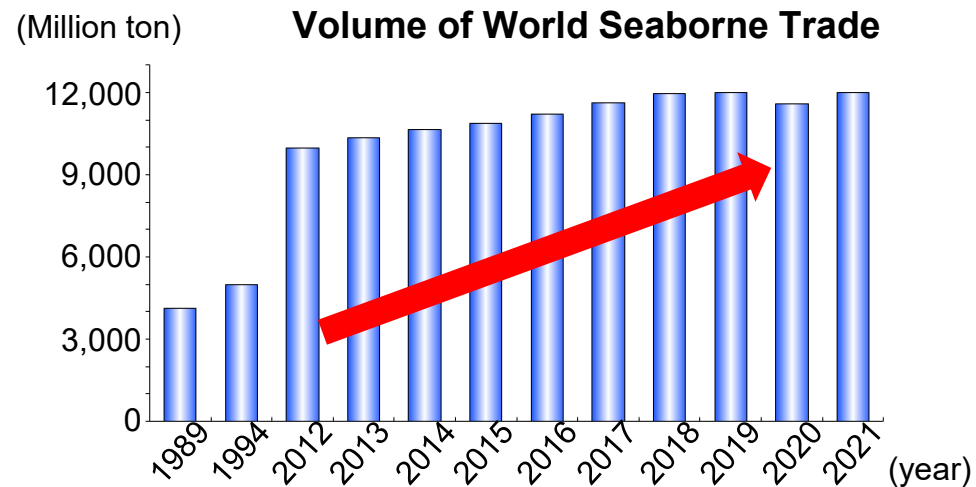
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- ✓ CO₂ emissions from international shipping account for **about 2.1% of the world's total emission** (approximately equivalent to the emissions from Germany).
- ✓ If no mitigating measures are taken, Emissions could increase to **about 7.0% by 2050** due to the volume of seaborne trade will increase as the global economy grows.
- ✓ **Reduction target and measures** of GHG emissions from international shipping is being **discussed and developed** under **IMO**.

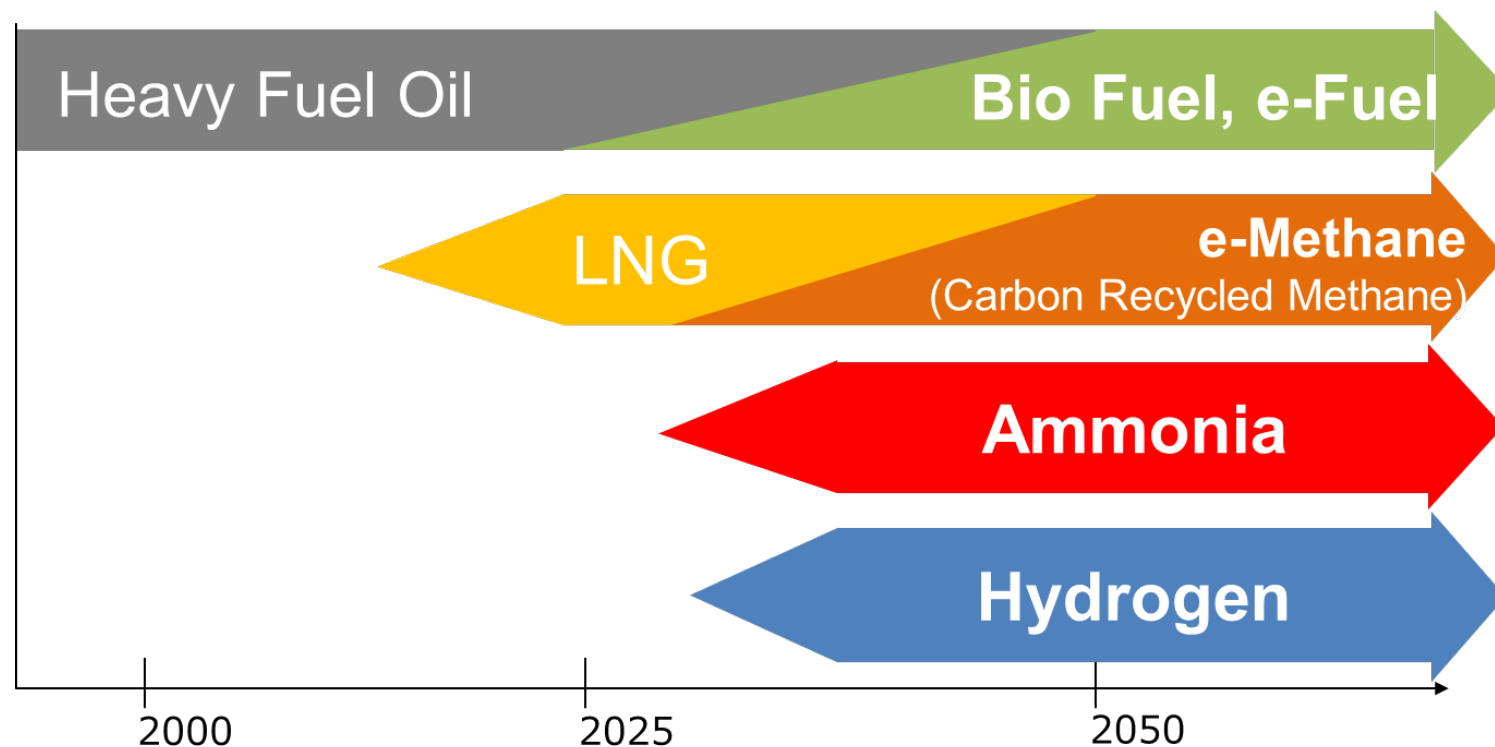


(Source) IEA「CO₂ Emissions from Fuel Combustion: Overview 2020」



(Source) 「Maritime Affairs by the Numbers 2020」MLIT Maritime Bureau

- ✓ We will experience **the great shift of ship fuel similar to** the past change from coal to heavy fuel oil.
- ✓ It is expected to shift from **HFO to LNG**, and then to zero-emission fuels such as **ammonia and hydrogen**.
- ✓ Many challenges including **technology, regulation, human resources, production facilities and fuel supply chain** should be jointly addressed by private sector and government.



On October 26, 2021, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Japan Ship owners' Association (JSA) announced that MLIT and JSA are aiming for carbon neutrality or net-zero GHG emissions in international shipping by 2050.

MLIT

- Announced Japan's goal of realizing carbon neutral (net zero GHG emissions) in international shipping by 2050.
- Jointly proposed with the U.S., U.K., and others to IMO that this should be set as a common global goal.

Japan Shipowners' Association

- JSA announced its commitment to “take on the challenge of achieving net-zero GHG emissions by 2050”.
- Shipping companies have also announced that they will aim to be carbon neutral by 2050.

- Discussions on revision of IMO GHG strategy will continue at MEPC79 (December, 2022) with the aim of reaching an international agreement at MEPC 80 (July 2023).

Green Innovation Fund: 35 billion yen (10 years)

for “**Development of next-generation ships**”

Development and demonstration of core technologies including engines, fuel tanks and fuel supply systems for zero-emission ships fueled by hydrogen, ammonia, etc.

Hydrogen and ammonia fueled engines

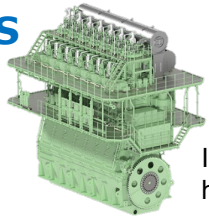


Image of hydrogen engine

Challenges

Hydrogen

- Abnormal combustion

Ammonia

- Generation of **nitrous oxide (N₂O)**

→ Advanced combustion control and fuel injection technologies



Zero Emission Ship
(Image of Hydrogen and ammonia fueled ship)

Fuel tanks and fuel supply systems



Image of hydrogen fuel tank and fuel supply system

Challenges

Hydrogen

- Volume is 4.5 times that of heavy oil
- **Metal degradation and hydrogen leakage**

Ammonia

- **Toxic and corrosive**

→ Space saving, structure and material optimization

Thank you for listening