GHG Emissions Reduction Targets for International Shipping

Maritime Bureau, Ministry of Land, Infrastructure, Transport and Tourism, Japan
Adopted the Paris Agreement in 2015

- Below $\Delta 2^\circ C$ above pre-industrial
- Pursuing efforts to limit $\Delta 1.5^\circ C$

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<tr>
<th>Year</th>
<th>Activity</th>
<th>Submitted NDCs</th>
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<td>2015</td>
<td>Adoption</td>
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<td>Submission of NDC* by each party</td>
<td>EU $\Delta 40%$ by 2030 China $\Delta 65%/GDP$ by 2030</td>
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<td>2020</td>
<td>Global Stocktake*</td>
<td>Japan $\Delta 26%$ by 2030 India $\Delta 35%/GDP$ by 2030</td>
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<td>2023</td>
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<td>Canada $\Delta 30%$ by 2030 Brazil $\Delta 43%$ by 2030</td>
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<td>~2100</td>
<td>GHG Balance*</td>
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*NDC: Nationally determined contribution
*Global stocktake: review process every 5 years
*GHG balance: anthropogenic emissions = removals

- $\Delta$ denotes reduction in carbon emissions
Adopted global GHG reduction targets and measures including MBM in 2013

- Δ2% (efficiency) every year
- Maintain below 2020 level (volume)
International shipping needs GHG reduction target

IMO’s approach

- **EEDI** for new ships (2013-)
- **SEEMP** for new & existing ships (2013-)
- **Data collection system** for new & existing ships (2019-)

Yet, **no GHG reduction target** in international shipping

Could be regarded as a “loophole”

IMO should show its commitment to the world
Setting the targets for International Shipping

Targets should be ambitious, but achievable

Level of contribution to climate change
- Paris agreement
  - well below Δ2°C
  - pursuing efforts Δ1.5 °C

Maximum achievable level of GHG reduction
- Operation;
- Design & retrofitting; and
- Alternative fuels.

satisfying both requirements

Global GHG reduction targets with the highest possible ambition
GHG reduction
Short- to Mid-term Target (-2030)
Short- to mid-term goal (Japan’s proposal)

Reduction target for shipping sector should be based on efficiency

\[
\text{[GHG emission]} = \text{[transport volume]} \times \text{[efficiency]}
\]

Out of control for the maritime sector

Can be improved by the effort of the maritime sector
Short- to mid-term goal (Japan’s proposal)

Short- to mid-term goal: \(\Delta 40\% \) (efficiency) by 2030

Base year (2008)

BAU scenario
(based on IMO Study)

\(\Delta 40\% \)
(efficiency)

Target emissions level
(Japan's scenario)
Contributions by EEDI upgraded new ships: $\Delta 17\%$ (efficiency)
Continuous R&Ds necessary to meet EEDI upgrades

- Hull & propulsion improvement
- Air lubrication
- Energy recovery
- Wind power
- LNG-fueled ships
Existing ships

Retrofitting + Maintenance + Operation: △28% (efficiency)

Target emission level (Japan's scenario)

CO₂ emissions Mt

2005 2010 2015 2020 2025 2030

BAU scenario (based on IMO Study)

Design (e.g. EEDI)

Maintenance and retrofitting

Operational measures

△28%
Existing ships

Retrofitting & Maintenance

Costly and limited options

- Propulsion system upgrade
- Maintenance and monitoring

Operational measures

Potential without substantial investments

- Speed reduction
- Weather routing
Existing ships

**Speed reduction has potential, but has limit**

*Design speed*  

![Graph showing the relationship between CO₂ emissions (tonne-mile) and speed with points labeled as Design speed and Optimum speed.]

**Constraints**

- Social impact
- Fleet increase
- Safety
- Other environmental risk
In the **short- to mid-term**, 

\[ \Delta 40\% \text{ (efficiency)} \] is challenging, 

but achievable in **2030**.

- \( \Delta 40\% = \text{EEDI (design & LNG) + retrofitting + maintenance + operation} \)
GHG reduction
Long-term Target (-2060)
Long-term goal (Japan’s proposal)

Long-term goal by 2060: △90% (efficiency) (= △50% (volume))
New alternative fuels

**Not achievable by conventional approaches** (technical & operational)

Drastic **fuel shifts are necessary**
- over-80% carbon-reduced fuels
  (zero-carbon fuel available?)

Alternative fuels
(e.g. Hydrogen, biofuels)

Target emission level
(Japan's scenario)

△82%
New alternative fuels

Carbon intensity of the fuels

Fossil fuel

△82%

New fuel

New fuels involve challenges

Challenges

- R&D
- Safety & risk assessments
- Legal frameworks
- Supply chain
- Land infrastructure
- Fleet replacement

New alternative fuels

Carbon intensity of the fuels

Fossil fuel

△82%

New fuel
New alternative fuels

**Years are needed for fuel shift**

- **2018**
  - R&Ds
  - Safety & risk assessments

- **2030**
  - Developing legal frameworks
  - Developing supply chain & land infrastructure
  - Design, contract, building, delivery

- **2060**
  - Fleet replacement

**Preparatory stage** (by 2030)

**Implementation stage** (2030-2060)

**Long-term goal**
In principle, reduction target for shipping sector should be based on efficiency.

But **volume target** would be appropriate for the **long term**.

Because

- 90% efficiency reduction target is not achievable by conventional approaches by the shipping sector;
- mostly depends on readiness of alternative fuel; and
- volume target can show the level of contribution to the global GHG reduction.
In the long-term

$\Delta 50\%$ (volume) is challenging, but achievable in 2060.

- $\Delta 50\% = \text{technology} + \text{regulation} + \text{infrastructure} + \text{fleet replacement}$

Fuel shift
- 2-Degree Scenario (2DS)
- Beyond 2-Degree Scenario (B2DS)

**Shipping, 2DS/B2DS**

Δ50% (volume) by 2060 is within the range of below Δ2°C goal

- 2-Degree Scenario (2DS)
- Beyond 2-Degree Scenario (B2DS)

Global GHG reduction target with the highest possible ambition

1. Short- to mid-term target
   • Δ40% (efficiency) by 2030 (over 2008)

2. Long-term target
   • Δ50% (volume) by 2060 (over 2008)
Emission scenarios (Japan’s proposal)

**Base year (2008)**

**Short- to mid-term target year (2030)**

- Development of new technologies, regulations, and infrastructure for new alternative fuels
- Years needed for fleet replacement

**Long-term target year (2060)**

- 3,561 Mt (△90%) efficiency
- 50% emissions reduction from 2008

- **648 Mt (△40%) efficiency**
  - Based on IMO Study

**Operational measures**

- Design, maintenance, and retrofitting

**Alternative fuels**

- Scenario 16 of IMO Study (RCP2.6) (-2050)

**Carbon footprint reduction**

- Target emission level (Japan’s scenario)
  - 2008 level

**Decarbonization?**
Emission scenarios (proposals to ISWG-GHG 2)

**Japan**
- 40% (efficiency) by 2030

**ICS et al (1)**
- 2008 level (volume)

**ICS et al (2)**
- △50% (efficiency) by 2050

**Marshall et al**
- Zero emission by 2035

**Belgium et al**
- △70% (volume) and △90% (efficiency) by 2050

**Japan scenario**
- △50% (volume) by 2060
Thank you.