Accelerating Green Ports and Shipping Development in Asia
Part 1: Green Ports and Shipping Development in Asia: Status

Lu Fu
China Director
Clean Air Asia
Part 1: Green Ports and Shipping Development in Asia: Status

OPENING

Lu Fu
China Director
Clean Air Asia
Domestic Needs for Air Quality Improvement and Decarbonization

### Annual Mean Concentration Limits for PM$_{2.5}$ and Monitored PM$_{2.5}$ Concentration in 2021 of Various Countries

![Graph showing annual mean concentration limits for PM$_{2.5}$ and monitored PM$_{2.5}$ concentration in 2021 for various countries.](image)

### Decarbonization Goals of Various Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>2020 CO$_2$</th>
<th>Year</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRC</td>
<td>11,680.4</td>
<td>2060</td>
<td>Carbon neutral</td>
</tr>
<tr>
<td>US</td>
<td>4535.3</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>India</td>
<td>2411.7</td>
<td>2070</td>
<td>Net zero</td>
</tr>
<tr>
<td>Japan</td>
<td>1061.8</td>
<td>2050</td>
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</tr>
<tr>
<td>Germany</td>
<td>636.9</td>
<td>2045</td>
<td>GHG neutral</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>621.5</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>Indonesia</td>
<td>568.3</td>
<td>2060</td>
<td>Net zero</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>321.9</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>UK</td>
<td>313.7</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>Malaysia</td>
<td>262.2</td>
<td>2050</td>
<td>Carbon neutral</td>
</tr>
<tr>
<td>Thailand</td>
<td>255.5</td>
<td>2050</td>
<td>Net zero</td>
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<tr>
<td>Pakistan</td>
<td>217.0</td>
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<td>Net zero</td>
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<tr>
<td>Philippines</td>
<td>139.2</td>
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<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>108.5</td>
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<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>56.1</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>Mongolia</td>
<td>38.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myanmar</td>
<td>37.7</td>
<td>2050</td>
<td>Net zero</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>23.7</td>
<td>2060</td>
<td>Carbon neutral</td>
</tr>
<tr>
<td>Nepal</td>
<td>17.9</td>
<td>2045</td>
<td>Net zero</td>
</tr>
<tr>
<td>Cambodia</td>
<td>15.8</td>
<td>2050</td>
<td>Net zero</td>
</tr>
</tbody>
</table>

Notes: The blanks indicate the country has yet to release the goals related to Carbon Neutrality or Net Zero.
Tightening Pressure from International and Regional Regulations

IMO GHG REGULATIONS

Units: GHG emissions

- 2008 as base year
- Peak as soon as possible
- Total: 20% reduction
- Intensity: 40% reduction
- Fuel: 5% energy share
- Total: 70% reduction
- Net-zero GHG emissions by 2050

Scenario with no action

2008 2020 2030 2040 2050

EU REGULATIONS

FuelEU Maritime

Total emission: well-to-wake GHG emissions
Intensity: CO₂ emissions per transport work
Fuel: zero or near-zero GHG emission technologies, fuels and/or energy sources
Asia, the world’s leading maritime cargo handling center, accounted for 42% of exports and 64% of imports (UNCTAD, Review of Maritime Transport 2022), and possessed 50 of the top one hundred container ports. As a result, Asia is one of the most critical regions that need to take action to minimize environmental impacts from the port and shipping sectors, while supporting global shipping to achieve net-zero GHG emissions by 2050.
Part 1: Green Ports and Shipping Development in Asia: Status

Ask your questions at
www.pigeonhole.at

输入会议代码
BAQ2023

session code

Please feel free to ask questions

Day 2 Conference | 16 November
Part 1: Green Ports and Shipping Development in Asia: Status

KEYNOTE PRESENTATION

Raymund Abad
Sustainable Transport Lead
Clean Air Asia

Day 2 Conference | 16 November
AN INSIDE LOOK INTO GREEN PORTS AND SHIPPING DEVELOPMENT IN ASIA
OUR GOAL:
DECARBONIZE MARITIME TRANSPORT SECTOR

Raise awareness and create a green momentum for clean air and decarbonizing the maritime transport sector

Highlight the different priorities in terms of emissions reduction programs of various container ports in Asia

Highlight opportunities and challenges, best practices and lessons learned in the implementation of these programs in a knowledge sharing-platform
### Summary of Container Ports included in the Study

<table>
<thead>
<tr>
<th>Country</th>
<th>Container Port (Terminal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea (KR)</td>
<td>Busan Port</td>
</tr>
<tr>
<td></td>
<td>Incheon Port</td>
</tr>
<tr>
<td>Malaysia (MY)</td>
<td>Port Klang</td>
</tr>
<tr>
<td>Vietnam (VN)</td>
<td>Tan Cang Cai Mep</td>
</tr>
<tr>
<td></td>
<td>Tan Cang Hai Phong</td>
</tr>
<tr>
<td>India (IN)</td>
<td>Jawaharlal Nehru</td>
</tr>
<tr>
<td>Singapore (SG)</td>
<td>Singapore Port (PSA Singapore, Johor Port)</td>
</tr>
<tr>
<td>Japan (JP)</td>
<td>Port of Tokyo</td>
</tr>
<tr>
<td>Sri Lanka (LK)</td>
<td>Port of Colombo (Jaye Container Terminal, Colombo International Container Terminal, South Asia Gateway Terminal)</td>
</tr>
<tr>
<td>Philippines (PH)</td>
<td>Port of Manila (Manila South Harbor, Manila International Container Terminal)</td>
</tr>
<tr>
<td>Indonesia (ID)</td>
<td>Tanjung Priok, Tanjung Perak</td>
</tr>
<tr>
<td>Thailand (TH)</td>
<td>Bangkok Port, Laem Chabang Port, Regional Ports</td>
</tr>
</tbody>
</table>
Maximizing emissions reduction at container ports

<table>
<thead>
<tr>
<th>ENERGY EFFICIENCY AND MANAGEMENT</th>
<th>PORT POLICIES AND MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refers to practices and technologies that reduce energy consumption and its resulting emissions</td>
<td>Refers to planning and implementation of relevant policies and standards within ports that have or supported decarbonization policies</td>
</tr>
<tr>
<td><strong>Alternate energy sources</strong></td>
<td><strong>Pollution control and monitoring</strong></td>
</tr>
<tr>
<td>• Infrastructure and research for alternate fuel</td>
<td>• Stringent ship control and inspection</td>
</tr>
<tr>
<td>• Shore power operation and construction</td>
<td>• Emissions inventory and air quality monitoring</td>
</tr>
<tr>
<td>• Mixture of renewable energy sources/production</td>
<td><strong>Policies, standards, and community relations</strong></td>
</tr>
<tr>
<td><strong>Energy-efficient equipment and fixtures</strong></td>
<td>• More stringent ambient air quality guidelines</td>
</tr>
<tr>
<td>• Cargo handling and port terminal equipment</td>
<td>• Green port, net zero emissions, environmental policy/programs</td>
</tr>
<tr>
<td>• Tugboats</td>
<td>• Social responsibility and information disclosure</td>
</tr>
<tr>
<td>• Port fixtures</td>
<td><strong>Port operations</strong></td>
</tr>
<tr>
<td><strong>Port operations</strong></td>
<td><strong>Port operations</strong></td>
</tr>
<tr>
<td>• Optimization through digitalization and automation</td>
<td>• Optimization through digitalization and automation</td>
</tr>
<tr>
<td>• Truck operations/use</td>
<td>• Truck operations/use</td>
</tr>
<tr>
<td>• Other port distribution/collection modes</td>
<td>• Other port distribution/collection modes</td>
</tr>
</tbody>
</table>

Determined through extensive data collection of policies, plans, and existing practices
## Priorities* of each country

<table>
<thead>
<tr>
<th></th>
<th>Indonesia</th>
<th>Philippines</th>
<th>Sri Lanka</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions inventory and air quality monitoring</td>
<td>Social responsibility and information disclosure</td>
<td>Optimization</td>
<td>Green port, net zero emissions/environmental policy</td>
<td></td>
</tr>
<tr>
<td>Green port, net zero emissions/environmental policy</td>
<td>Port fixtures</td>
<td>Cargo handling/port terminal equipment</td>
<td>Cargo handling/port terminal equipment</td>
<td></td>
</tr>
<tr>
<td>Stringent ship control and inspection</td>
<td>Emissions inventory and air quality monitoring</td>
<td>Stringent ship control and inspection</td>
<td>Stringent ship control and inspection</td>
<td></td>
</tr>
<tr>
<td>Optimization</td>
<td>Green port, net zero emissions/environmental policy</td>
<td>Truck operations/use</td>
<td>More stringent air quality standards</td>
<td></td>
</tr>
<tr>
<td>Mix of renewable energy source/production</td>
<td>Other port distribution/collection modes</td>
<td>Green port, net zero emissions/environmental policy</td>
<td>Truck operations/use</td>
<td></td>
</tr>
</tbody>
</table>

* determined from Analytic Hierarchy Process (AHP) questionnaire
Developing policies that target emissions reduction from container ports is a priority in Asia.
Green Port Policies:

<table>
<thead>
<tr>
<th>Country</th>
<th>Green Port Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>Harit Sagar Guidelines</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Ministry of Transport Decree No. 8 of 2023</td>
</tr>
<tr>
<td>Japan</td>
<td>MLIT Carbon Neutral Port (CNP) Initiative</td>
</tr>
<tr>
<td></td>
<td>Port of Tokyo CNP Implementation Plan</td>
</tr>
<tr>
<td>Malaysia</td>
<td>JPA Green Port Policy</td>
</tr>
<tr>
<td>Philippines</td>
<td>Port Environmental Policy</td>
</tr>
<tr>
<td>Singapore</td>
<td>Green Port Programme</td>
</tr>
<tr>
<td></td>
<td>Maritime Singapore Decarbonization Blueprint: Working towards 2050</td>
</tr>
<tr>
<td>South Korea</td>
<td>Special Act on the Improvement of Air Quality in Ports and Other Areas</td>
</tr>
<tr>
<td>Thailand</td>
<td>PAT Green Port Plan</td>
</tr>
<tr>
<td>Vietnam</td>
<td>VINAMARINE Green Port Criteria (draft)</td>
</tr>
</tbody>
</table>

Major themes of green port policies

- Reducing fuel consumption
- Increase energy-efficiency
- Adopt clean fuels
- Utilize renewable energy
Energy Efficient Cargo Handling Equipment and Port Fixtures

Most Common Priority
Rubber Tired Gantry (RTG)

Transition to e-RTGs
All ports in the study are transitioning to energy efficient cargo handling equipment and all their green port policies include electrification of cargo handling equipment

Ports with e-RTGs:
- JNPT (IND), NCPT1 (ID), Tanjung Perak (ID), PKA (MY), PTP (MY), BPA (KR), IPA (KR), PSAC (SG), Port of Colombo (SL), LCP (TH), TCIT (VN)

Why electric RTGs?
- RTGs are more versatile than RMGs
- Diesel powered ones are energy intensive and emits more CO$_2$ emissions
- Transitioning to energy efficient RTGs reduces fuel consumption and GHG emissions

Hybrid
- Port of Tokyo (JPN), MSH & MICT (PH), Port of Colombo (SL)

Why hybrid RTGs?
- Stakeholders view that full electrification is expensive
- Hybrid RTGs are also effective in minimizing fuel consumption and GHG emissions
Energy Efficient Cargo Handling Equipment and Port Fixtures

Other Interventions

Optimization through Digitalization and Automation

Automation
- Teluk Lamong – Automated stacking cranes
- Hutchison Ports, Thailand – remote operated quay cranes, automated RTG, and Autonomous Trucks
- PTP – autonomous prime movers; RTG optimizer

Digitalization
- Digital Booking System:
  - TABS (PH), INAPORT & MarineM (ID), digitalPort@SG
  - Other Digitalization efforts: e-forms (JNPT), Digital trucking and logistics platform (ID)

Benefits
- Increases efficiency of operations
- Reduces equipment idle time
- Reduces waiting time for vessels and trucks
- Reduces total operational time
- Reduces GHG emissions
Energy Efficient Cargo Handling Equipment and Port Fixtures

Other Interventions

Energy Efficient Port Fixtures
All ports in the study are transitioning to or plans to transition to **LEDs**. Some port also consider the transition to **inverter** air-conditioning units

<table>
<thead>
<tr>
<th>Terminal/Port (Country)</th>
<th>LED</th>
<th>I-ACU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawaharlal Nehru (IN)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tanjung Priok (ID)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port of Tokyo (JP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Busan Port (KR)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Incheon Port (KR)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Port Klang (MY)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Manila South Harbor, Port of Manila (PH)</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Manila International Container Terminal, Port of Manila (PH)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PSA International (SG)</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Jurong Port (SG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jaye Container Terminal, Port of Colombo (LK)</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Bangkok Port (TH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tan Cang Cai Mep (VN)</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

Legend:
✓ = Implemented
☐ = Planned
Use of Low Sulfur Fuel for Shipping

Legend: □ = Planned

<table>
<thead>
<tr>
<th>IMO MARPOL ANNEX VI RATIFICATION</th>
<th>CN</th>
<th>IN</th>
<th>ID</th>
<th>JP</th>
<th>MY</th>
<th>PH</th>
<th>KR</th>
<th>SG</th>
<th>LK</th>
<th>TH</th>
<th>VN</th>
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<tbody>
<tr>
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<td>✔</td>
<td>¡</td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

1. **Incentives**
   - **Singapore (Green Port and Green Ship Program)** – Reduction of port dues, initial registration fee, and annual tonnage tax for vessels using LSFs. Encourages the use of low or zero carbon fuel and compliance with EEDI.
   - **Tokyo port** – waiving of port entry fees for LNG and Hydrogen powered and bunkering vessels.

2. **ECAs**
   - **South Korea** – major ports in south Korea namely, Busan Port, Ulsan Port, Incheon Port, Yeosu Gwangyang, and Gyeonggi Pyeongtaek
   - **China** – waters of Pearl River Delta, Yangtze River Delta and Bohai Rim Delta

3. **Alternate Fuel**
   - **Singapore**
     - Bunkering of IMO 2020 compliant fuel
     - Castor Initiative
   - **Sri Lanka** – Facilities and storage of LSFs
   - **Japan** – provides subsidies for LNG Bunkering

4. **MOU (Port State Control)**
   - **Tokyo MoU**
   - **Indian Ocean MoU**
Renewable Energy Sources

Typical sources of renewable energy at ports include Solar Energy and Wind Energy.

<table>
<thead>
<tr>
<th>Terminal/Port (Country)</th>
<th>Solar</th>
<th>Other renewable energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawaharlal Nehru (ID)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Tanjung Priok (IN)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Klang (MY)</td>
<td>✔️</td>
<td>Tidal (Pilot), Wind (2023)</td>
</tr>
<tr>
<td>Port of Singapore (SG)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Busan Port (KR)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Incheon Port (KR)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Ulsan Port (KR)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Port of Colombo (LK)</td>
<td></td>
<td>Wind and wave (n.d.) outside the port area</td>
</tr>
<tr>
<td>Bangkok Port (TH)</td>
<td></td>
<td>2015-2019</td>
</tr>
<tr>
<td>Port of Tokyo (JP)</td>
<td></td>
<td>2030</td>
</tr>
<tr>
<td>Manila South Harbor, Port of Manila (PH)</td>
<td>✔️</td>
<td>Increasing RE mix through utility providers</td>
</tr>
</tbody>
</table>

Legend:
- ✔️ = Implemented
- □ = Planned

Solar PVs

1. **Rooftop Solar**
2. **Floating Solar PVs**

- Typically installed on top of buildings and are used to power the building’s facilities
- Energy generated may also be sold to private energy providers (e.g., IPA)

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**Rooftop Solar PVs**

- Typically installed on top of buildings and are used to power the building’s facilities
- Energy generated may also be sold to private energy providers (e.g., IPA)

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# Renewable Energy Sources

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</thead>
<tbody>
<tr>
<td>Jawaharlal Nehru (ID)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>Tanjung Priok (IN)</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>Port Klang (MY)</td>
<td>☑</td>
<td></td>
</tr>
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<td>☑</td>
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<td>Incheon Port (KR)</td>
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</tr>
<tr>
<td>Ulsan Port (KR)</td>
<td>☑</td>
<td></td>
</tr>
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<td>Port of Colombo (LK)</td>
<td>☑</td>
<td>Wind and wave (n.d.) outside the port area</td>
</tr>
<tr>
<td>Bangkok Port (TH)</td>
<td>☐</td>
<td>2015-2019</td>
</tr>
<tr>
<td>Port of Tokyo (JP)</td>
<td>☐</td>
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</tr>
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<td>Manila South Harbor, Port of Manila (PH)</td>
<td>☑</td>
<td>Increasing RE mix through utility providers</td>
</tr>
</tbody>
</table>

**Wind Turbines**

1. **Onshore Wind**
2. **Offshore Wind**

**Challenges in Implementing**

- Lack of available space inside the ports
- High initial investment cost

**Legend:**

- ☑ = Implemented
- ☐ = Planned
## Shore Power

<table>
<thead>
<tr>
<th>Terminal/Port (Country)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawaharlal Nehru (ID)</td>
<td>☑  Supplied for tugboats</td>
</tr>
<tr>
<td>New Priok One Container Terminal (IN)</td>
<td>☑</td>
</tr>
<tr>
<td>Tanjung Perak (IN)</td>
<td>☑</td>
</tr>
<tr>
<td>Teluk Lamong (IN)</td>
<td>☑</td>
</tr>
<tr>
<td>Port Klang (MY)</td>
<td>☑</td>
</tr>
<tr>
<td>Port of Singapore (SG)</td>
<td>☑  Study Feasibility for charging infrastructure for full electric harbor crafts</td>
</tr>
<tr>
<td>Busan Port (KR)</td>
<td>☑  ☑  Mix of both low-voltage (220-440 V) and high-voltage (6600 V) units</td>
</tr>
<tr>
<td>Incheon Port (KR)</td>
<td>☑  ☑</td>
</tr>
<tr>
<td>Port of Colombo (LK)</td>
<td>☑  n.d. Planned for new terminals</td>
</tr>
<tr>
<td>Laem Chabang Port (TH)</td>
<td>☑  n.d. Indicated to be phased in development plan</td>
</tr>
<tr>
<td>Port of Tokyo (JP)</td>
<td>☑  2030 Committed to introduce shore power to achieve carbon neutrality</td>
</tr>
<tr>
<td>Port of CDO (PH)</td>
<td>☑</td>
</tr>
</tbody>
</table>

### Challenges in Implementation

| Incompatibility | Underutilization | Lack of Infrastructure |

### Direction of Asian Ports

**For those with existing facilities:**
- South Korea – Drafting additional policies to increase utilization of OPS
- Indonesia – DGST SE DJPL 22/2022 encourages more vessels to use OPS in various ports in Indonesia

**For those without existing facilities:**
- Several green port policies [e.g., Harit Sagar, (IND), CNP initiative (JPN), JPA Green port policy (MY), PAT green port program (TH), and VINAMARINE’s green port criteria (VN)] include the provision and utilization of OPS
Other Sources of Emissions: Trucks

Truck operations emit a significant amount of pollution during operations due to the type of fuel used.

Efforts to address truck emissions

- BKP: Traffic management plan and e-gate system to reduce truck idle time
- PAT: Will require trucks to use fuel compliant with euro 5 standards (PCD announced euro 5 requirements)
- Sri Lanka: double trucking
- During consultations, port stakeholders recognize the impacts of truck emissions, and they were the ones to suggest interagency cooperation to address the matter.

Challenges

- Truck emissions are outside the jurisdiction of port authorities
- High quality fuel for trucks are available but are significantly more expensive
Opportunities and Way Forward

Alternative Energy Sources
- Develop/ strengthen *policies* (incentives or mandates) for the use of LSFs and green/ clean fuel
- Providing appropriate *infrastructure* for handling, storage, and distribution of clean/ green fuel
- For LNG,
  - Address risks of methane slippage

Energy Efficient Equipment and Port Fixtures
- Sustain the transition to *electric / hybrid* cargo handling equipment to reduce diesel consumption
- Explore other types of fuel (e.g., LNG, Ammonia, Methanol, Biofuels)
Opportunities and Way Forward

**Shore Power**
- **Develop/Expand** shore power facilities in the port
- **Encourage the utilization** of shore power
  - **Incentives** (e.g., reduction of port dues)
  - Installing more facilities to avoid long wait times for berthing
  - Increase capacity of shore power to cater more vessels

**Renewable Energy**
- Explore other types of renewable energy sources
- Coordinate or partner with utility companies that source energy from renewables (e.g., GEOP)
Opportunities and Way Forward

- Encourage **inter-agency coordination** to address emissions from the maritime transport sector, including port equipment, vehicles, and vessels.

- Encourage **support from the private port stakeholders**
  - Private port stakeholders oversee logistics (e.g., freight, trucks, and ports)
PITCH DECK: State of Play in Asian Countries

Raden Bonnyswara
Indonesia

Sung Ho Jung
South Korea

Renjie Wang
PRC

Giang Hoang Hong
Viet Nam

Mayuree Deeroop
Thailand

Nino Biscocho
Philippines

Cheryl Rita Kaur
Malaysia

Rituraj Misra
India (remotely)

Day 2 Conference | 16 November
PITCH DECK
State of Play in Asian Countries

Raden Bonnyswara
Indonesia
INDONESIA
Indonesia’s Existing Condition

Indonesia has 2,439 ports to support the national connectivity. More than 17 Thousand islands. The Vessel Traffic within a year (2022). It shows that Indonesia has important shipping routes which hundreds of thousands of ships passing through the Indonesian territory.

- Malacca Strait: 120,000ship/yr
- Sunda Strait: 53,000ship/yr
- Lombok Strait: 37,000ship/yr

Indonesia has 2,439 around ports to support the national connectivity.

More than 278 million Of the Populations
Indonesia adopted the IMO policy in reducing GHG emissions in the maritime transportation sector through Minister of Transportation Decree 8 of 2023 concerning Determination of Climate Change Mitigation Actions in the Transportation Sector to Achieve National Contribution Targets

NDC (Nationally Determined Contribution) → Enhanced NDC

“to handling global climate change in order to achieve the goals of the Paris Agreement to the United Nations Framework Convention on Climate Change”

- Indonesia’s commitment in the Enhanced NDC is to reduce the level of GHG emissions in 2030 unconditional by 31.89% and up to 43.2% with the condition of additional international support below the baseline emission level.
- The energy sector target from before the CM1 reduction (according to the 2016 NDC document) was 314 million tonnes of CO2, enhanced to a CM-1 reduction of 358 million tonnes of CO2 in accordance with the ENDC 2022 document.

Main Policies and Regulation that promote the Green Port and Shipping within Indonesia

- KP. 201 of 2013 Determination of RAN-GRK for the Transportation Sector
- Ministerial Decree 8 of 2023 Establishing Climate Change Mitigation Actions in the Transportation Sector

Other Policies and Regulation:
- Presidential RI Instruction No. 5 of 2020 on the National Logistic Ecosystem Management (NLE)
- Presidential RI Regulation No. 18 of 2020 on The National Medium-Term Development Plan for 2020 – 2024
- Director General of Sea Transportation (DGST) Decree No. 936 /DJPL/2020 on DGST Strategic Plan for 2020 – 2024
- Presidential RI Decree No. 98 of 2021 on Implementing Carbon Economic Value (NEK)
- Director General of Sea Transportation (DGST) Regulation No. KP-DJPL 689/2022 on Ecoport Guidelines
State of Play: The Green Port Program that Indonesia Accomplished

Green Port Concept

Management
Performance efficiency and governance of port business processes.

Technical aspect
Port area management, environment, health safety and security, energy, climate change and biodiversity.

Digitalization aspect
digitalization in business processes and transactions to improve services.

Green Port in Indonesia 2022:
• Pupuk Kaltim Specialized Terminal (Tersus)
• Kijing Port
• Petrokimia Gresik Own Interest Terminal (TUKS)
• Tanjung Emas Port
• Tanjung Priok Port
• Krakatau Bandar Samudera Terminal
• Ciwandan Port
• Makassar New Port Terminal
• Benoa Port
• Teluk Lamong Terminal
• Tenau Port
• etc

Source: ID Survey, 2022
State of Play:
Notable achievements include the development of several pilot ecoports that incorporate green initiatives like renewable energy and energy efficiency. Teluk Lamong Terminal in East Java serves as a best practice example.
State of Play: Shipping Decarbonization in Indonesia

Implementing Energy Efficiency Measurement for Ship

Indonesia has adopted mandatory measures to reduce emissions of greenhouse gases under IMO’s pollution prevention treaty (MARPOL) Annex VI Regulation, namely:

- Energy Efficiency Design Index (EEDI)
- Energy Efficiency Existing ship Index (EEXI)
- Ship Energy Efficiency Management Plan (SEEMP) Part I, II & III
- Ship Energy Efficiency Management Plan (SEEMP) IMO Data Collection System (DCS) and Carbon Intensity Indicator (CII)

Utilizing Biodiesel/Fatty Acid Methyl Ester (FAME) as Fuel for Ship

Mandatory use of Biodiesel20 (20% FAME and 80% HSD) is not only for public service obligation (PSO) use but is extended to non-PSO which includes heavy equipment, industry and shipping.
Drivers for Change: Top-Down Policies

**RPJMN 2020-2024 AND PARIS AGREEMENT**

*GHG emissions projection and reduction scenario in 2030*

- **Projected BAU emission**: 2,989
- **Target emission level in 2030**: 2,034
- **RPJMN 2020-2024**: 27.3% reduction

**Unconditional target will be achieved using:**
- National budget
- Subnational/regional budget
- Non-State Actors (NSA) resources

**NSA resources will be mobilized using:**
- Green bonds
- Labelling/recognition
- Carbon pricing
- Other environmental economic instruments

**INDONESIA** will unconditionally reduce its GHG emission 29% below business as usual level in 2030 (RPJMN: 27.3% in 2024) and is confident to reduce further with international support.

**IMO TARGET FOR REDUCING GLOBAL SHIPPING**

**THE INTERNATIONAL MARITIME ORGANIZATION (IMO) IS TARGETING A REDUCTION OF CO2 EMISSIONS BY GLOBAL SAILING OF 40% IN 2030 AND 70% IN 2040.**

**GLOBAL SHIPPING CO2 EMISSION REDUCTION TARGET**

- 2022: 40%
- 2030: 70%
- 2040:
Drivers for Change: Advantages Gained by Business Entity

Increase productivity and efficiency in business processes
- The use of digital technology in green ports can create business processes that are faster, more productive and efficient. This can also have an impact on cutting unnecessary costs.

Prevent Corruption
- Almost all transactions and data will be recorded digitally. That way, the potential for various forms of business practices can be reduced.

Operational Cost Saving and Maximizing Profit
- The use of new renewable fuels will increase the efficiency of energy consumption resulting in operational cost savings.
<table>
<thead>
<tr>
<th>Policy</th>
<th>Stakeholder</th>
<th>Role/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>Shipping Companies</td>
<td>1. Ship modernization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Implementing the Ship Energy Efficiency Management Plan (SEEMP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Use of On Shore Supply at the port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Use of Anti Fouling System on the ship’s hull</td>
</tr>
<tr>
<td></td>
<td>Port Operator</td>
<td>1. Implementation of On Shore Supply facility at the port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Equipment electrification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Digitalization using 1 app for all business processes.</td>
</tr>
<tr>
<td></td>
<td>Energy Company</td>
<td>Solar electricity in transportation infrastructure</td>
</tr>
<tr>
<td></td>
<td>Shipyard and Shipping Manufacture</td>
<td>1. Implementation of Anti Fouling System on the ship’s hull</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Machinery and equipment modernization</td>
</tr>
<tr>
<td>Utilization of New Renewable Energy</td>
<td>Shipping Companies</td>
<td>Use of biodiesel fuel (B20)</td>
</tr>
<tr>
<td></td>
<td>Port Operator</td>
<td>Solar Power generation in transportation infrastructure</td>
</tr>
<tr>
<td></td>
<td>Energy Company</td>
<td>1. Development of biodiesel fuel with a content above 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Development of solar power plants for transportation infrastructure</td>
</tr>
</tbody>
</table>
Public and stakeholder engagement

Green Port Awarding 2022

- Initiated by the Coordinating Ministry for Maritime Affairs and Investment.
- The assessment was carried out by ID Survey Inc. to assess the fulfillment of the green port criteria that must be met by the ports.
- This awarding is able to encourage port operators to implement green ports to improve the port's image from an international perspective.
Challenges

Greenport Challenge

**Port Electrification**
- Electricity supply in areas outside Java island is still limited (Java have 59% of national power plan capacity).
- Low availability of components supporting electrification.

**Sustainable Development**
- Ensure the availability of green space
- Formulate evaluation of the Sustainable Development activities that have been implemented (Mangrove Planting Program, Using Non-CFC Refrigerant, etc.).

**Provide Renewable Energy**
- The cost of new renewable energy is still high compared to fossil fuels.

Shipping Decarbonization Challenge

**Fuel Efficiency**
- On average, ships operating in Indonesian waters are old and their engine systems still use old technology that is fuel inefficient.

**Ship Modernisation**
- The fiscal capacity of domestic shipping liners is low.

**Engine – Fuel Compatibility**
- It is many ship that not compatible for Biodiesel fuel ship.

**Energy Alternative Utilization**
- Low fiscal capacity and facilities for alternative fuels (fuel cells and ammonia) development.
Conclusion

In summary, the policy and regulatory foundation, pilot projects, and iterative processes of multiple stakeholders have helped Indonesia deepen its cooperation with related partners such as Clean Air Asia to promote advance decarbonization at target ports;

Pilot priorities could include testing blended finance models for green infrastructure, alternative fuels, electrification and integrating emerging solutions into port market engagement and carbon credits;

Ongoing policy improvements and increased employment and capacity will help achieve NDC targets in key maritime sectors.
SOUTH KOREA
04-Reduction Projects (Vessels Sector)

1. Achieving zero emissions from berthed vessels through AMP

- Installation of alternative maritime power systems in Busan Port
  - (Low voltage AMP) 78 AMP stations for small ships has been in operation
  - (High voltage AMP) 20 AMP Stations has been in operation (8 berth)
    - (1st pilot project) AMP installation completed for Busan New Port Piers 3 & 4 (Dec. 2019)
    - (2nd pilot project) AMP installation completed for Gamman & Sinseondea Pier (Apr. 2021)

2. Movable Connection Cable Manufacture completion (Jun. 2022)

< AMP concept image >
< Movable Connection Cable >
04-Reduction Projects (Vessels Sector)

Incentive Scheme for Low-speed Vessel Operation

- Offering 15~30% of Port Charge Exemption for the vessel operators Reducing Speed
  - (Progress) 1.65 billion won exempted for 9,796 vessels
  - *78% of Shipping Line called at Busan Port participated in 2022 (+8% compared to 2021)*

(Vessel Type) Container Vessel, Car Carrier over 3000t
(Speed Limit) 12kn (22km/h) or slower
(Area) within 20 nautical miles from harbor limit
(Detail) Shipping line should complying with the speed limit over 60% of each vessel's annual entries and departure
Building Electric Port Guide Vessel – Achieving Zero Emission

**Electric Port Guide Vessel Building Project**

- **(Project detail)** By replacing our 20 years old port guide vessel (Saenuri) with the new Electric one, we could reduce harmful emissions to Zero.
- **(Period)** Oct. 2020 ~
- **(Vessel spec)** 300 GT, full length of 40m, 2MWh battery, approximately 80 passengers
04-Reduction Projects (Cargo Handling Equipment Sector)

1. Exhaust gas reduction by switching fuel from diesel to LNG/Electric for yard tractors (Y/T)
   - 80% of Fine Dust reduction by changing the Diesel fuel engine to LNG
     - (Progress) 537 Yard Tractors are on operation as the end of 2023
     - 2023 project: 1,840 Million won (BPA 25%, Ministry of Oceans and Fisheries 25%, Private 50%)
   - Will Switched to Electricity Y/T for Carbon Neutrality

LNG YT (537 units, 2023)  
Electricity YT (4 units, 2023)
Converting Diesel Transfer Cranes (T/C) to eco-friendly Equipment

- 92% T/C(366)s in Busan Port are in operation under e-RTGC systems
  - 100% of 279 T/Cs in Busan New Port, 72% of T/Cs in Busan North Port are electrically operated.
- By the end of 2023, 6% T/C(25)s in Busan Port are in operation with DPF
- Total 98% of T/Cs are in operation as eco-friendly way, we are planning to convert all equipment to 100% eco-friendly ones by 2024
  - 103 million won to install DPF for 1 T/C (BPA and Gov.t support 45% each, Private pays 10%)
PITCH DECK
State of Play in Asian Countries

Renjie Wang
PRC
## Green ports and shipping policies in PRC

### Shipping
- Transportation mode shift
- Emission Control Area
- Shore Power
- Wharf oil vapor recovery
- Dust pollution control
- Receiving and disposing of pollutants from ships in port
- New energy application

### Port
- Port operation machinery
  - Electrification
  - Improve access condition
- Port infrastructure
  - New energy filling facilities
  - Green lighting
- Port renewable resources
  - solar energy
  - Wind energy
- Carbon emission management
  - Management platform
Green shipping achievements

- From 3 areas to expand to the coast of the country
- Put forward Hainan control area, first tighten requirements
- Two more inland river control areas
- Enhanced fuel sulfur content requirements (SOx, PM)
- Increased requirements for NOx and VOCs control
- Increase shore power usage requirements

**DECA 1**
2016—2018

- Huanbohai
- Yangtze River Delta
- Pearl River Delta
- Yangzi River main line
- Xijiang main line

**DECA 2**
2019 till now

- The shore power cover all the ports.

### Emission reduction of shore power in 2020

<table>
<thead>
<tr>
<th></th>
<th>SO2/tan</th>
<th>NOx/tan</th>
<th>PM2.5/tan</th>
<th>CO2/tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>1500</td>
<td>90</td>
<td>60000</td>
<td></td>
</tr>
</tbody>
</table>

### Regional distribution of shore power berths in 2020

- 福建省
- 广东省
- 广西
- 海南省
- 河北省
- 河南省
- 黑龙江省
- 辽宁省
- 山东省
- 天津市
- 江苏省
- 浙江省
- 安徽省
- 湖北省
- 重庆市
- 江西省
- 上海市
- 四川省
- 云南省
- 湖南省
- 贵州省
Green ports achievements

**Yangshan Phase 4 Wharf**
Five-star container terminal
largest single container terminal, Highest degree of automation

**Huanghua Port coal wharf**
The first five-star bulk terminal
Fully closed silo operation,, creating a port "oasis on the sea"

**Qingdao Port Qianwan container terminal:**
Built the energy system that integrates solar and wind

**Pacific Container Terminal, Tianjin Port:**
The world’s first traditional container terminal to build distributed wind power.
PRC aims to achieve carbon peak by 2030 and carbon neutrality by 2060

Data Source: Research on China's Long-term Low-carbon Development Strategy and Transformation Path, Tsinghua University
The trend of carbon emission reduction in international shipping is remarkable

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>emission reduction target</td>
<td>At least 50% less in 2050 than in 2008</td>
<td>Compared to 2020, the emission will reduce 6% by 2030, reduce 26% by 2040, reduce 75% by 2050.</td>
<td>80% of 1990 level by 2050 (excluding international)</td>
<td>By 2030, emissions will be reduced by no less than 90% compared to 2008</td>
<td></td>
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</tbody>
</table>
| Promotion of new energy | EEXI、CII | Share of low-carbon fuels: 18% in 2030, 37% in 2040, 50% in 2050 | The proportion of carbon neutral fuels: 14% in 2030, 60% in 2040, 60-100% in 2050 | 2025: Zero emissions from new ships.  
2035: Low-or zero-emission Marine fuel refueling options are readily available | Introduction of zero-emission ships from 2028 to 2030:  
LNG to carbon cycle methane; Promotion of hydrogen and/or ammonia fuels |
Pathway and Challenges for green ports and shipping

**Stage 1**
- **Scope:**
  1. Working machinery in ports
  2. Ships enter into the ECA
- **Emission type:**
  - direct emission (fossil fuel)

**Stage 2**
- **Scope:**
  1. Working machinery in ports
  2. Vehicles in the ports
  3. Ships enter into the ECA
- **Emission type:**
  - direct emission (fossil fuel)
  - indirect emission (electricity)

**Stage 3**
- **Scope:**
  1. Working machinery in ports
  2. Collecting and dispatching system for ports
  3. All Ships
- **Emission type:**
  - direct emission (fossil fuel)
  - indirect emission (electricity)

Direct emission in port & ECA for shipping

All emission in port & new energy ships and delicacy management

Coordinated promotion for green ports and shipping
THANK YOU

WANG RENJIE
TRANSPORT PLANNING AND RESEARCH INSTITUTE, MINISTRY OF TRANSPORT OF PRC
PITCH DECK
State of Play in Asian Countries

Giang Hoang Hong
Viet Nam
VIET NAM
VIET NAM MARITIME ADMINISTRATION

GREEN PORT AND IMPLEMENTATION PLAN OF VIETNAM MARITIME INDUSTRY
1. VINAMARINE’S MAJOR FUNCTIONS AND DUTIES
2. GREEN PORT IMPLEMENTATION ROADMAP
3. VINAMARINE IMPLEMENTATION PROGRESS
VINAMARINE’s Major Functions and Duties

VINAMARINE is one of administrations under the management of Ministry of Transport of Viet Nam. Its main functions and duties are as follows:

1. To build maritime development strategies, development master plans, shipping policies and regulations, management policies and legal norms
2. To manage and execute maritime infrastructure projects
3. To propose for signing maritime agreements, memorandum of understanding
4. To propose for ratifying international maritime conventions
5. To issue permission to foreign ships to territorial waters of Viet Nam
VINAMARINE’s Major Functions and Duties

VINAMARINE is one of administrations under the management of Ministry of Transport of Viet Nam. Its main functions and duties are as follows:

6. To declare seaports opening for navigation
7. To manage maritime services
8. To carry out search and rescue operations at sea
9. To implement port state control procedures
10. To supervise maritime safety, security, and environmental protection
11. To investigate and settle maritime activities.
GREENPORT IMPLEMENTATION ROADMAP

Decision No. 876/QD-TTg dated July 22, 2022 of the Prime Minister approving the Action Program on green energy conversion and reducing carbon and methane emissions of the transportation sector:

1) Maritime green transition roadmap

Period 2022 - 2030
+ Encourage the transition of using electricity and green energy or draft the implementation plan of equivalent measures for new and existing investment ports.

From 2031: Focusing on investing in electricity and green energy equipment or issue equivalent measures for new and existing investment ports.
From 2040: Conversion of vehicles, equipment at existing ports, maritime signaling equipment to use electricity, green energy or equivalent measures.
From 2050: All facilities, port equipment, and maritime signaling devices use electricity and green energy or have equivalent measures.
2. Tasks and solutions for green transformation and carbon emission reduction

- Build and implement institutions, policies, and planning.
- Transit vehicles, and vessels to use electricity and green energy.
- Develop green transport infrastructure
- Improve energy use efficiency and reduce greenhouse gas emissions.
- Strengthen international cooperation, science and technology, human resource development and communication.
Decision No. 2027/QD-BGTVT dated October 29, 2020 of the Ministry of Transport on approving the Green Port Development Plan in Vietnam:

Period 2020 - 2025:
• Develop and promulgate basic standards on green port criteria;

• Pilot the green port model at some Vietnamese seaports and evaluate implementation results.

• Propagate, disseminate and communicate to raise awareness and capacity to apply green port criteria in Vietnam to all levels, sectors and businesses that are exploiting and operating seaports.

• Promote inspection, examination, urging, and ensure compliance with legal regulations on environmental protection, economical and efficient use of energy, and response to climate change in investment activities. investment in construction, business, and exploitation of seaports;
Tasks and implementation solutions of period from 2020 - 2025

• Propose amendments and supplements to regulations in planning management, investment, construction, and exploitation of seaports to comply with green port criteria in Vietnam.

• Propose policy mechanisms to encourage and support businesses implementing the green seaport development process.

• Research, apply, and transfer clean, low-carbon, environmentally friendly technology in seaport operations to reduce emissions, use energy economically, and effectively protect the environment as a basis for applying the green port model in Vietnam.

• Strengthen international cooperation in developing green ports in Vietnam.
2) Period from 2025 - 2030:

- Develop and promulgate national technical standards on green port criteria; Deploy voluntary application of green port criteria at Vietnamese seaports.

- Develop and promulgate policy mechanisms on reviewing, amendment, and supplementing regulations of the management of planning, investment, construction, and business, and exploitation of seaports in accordance with green port criteria in Viet Nam.
Tasks and implementation solutions of period from 2025 - 2030:

- Continue to carry out propaganda, dissemination, and training to raise awareness and capacity to apply green port criteria in Vietnam; Promote the application and transit of clean, low-carbon, environmentally friendly technology in seaport operations.

- Evaluate the results of voluntary application of green port criteria at seaports; Propose the development and promulgation of regulations on mandatory application of green port criteria for the seaport system in Vietnam.

c) Period after 2030:
Deploy mandatory application of green port criteria in planning, investment in construction and business and exploitation of seaports in Vietnam
VINAMARINE IMPLEMENTATION PROGRESS

- Vietnam Maritime Administration has been conducting propaganda and dissemination of programs and action plans of the Government, Ministry of Transport, Vietnam National Administration to seaport and shipping enterprises to know and have plans for investment and exploitation business in accordance with the roadmap and commitments of the Government;

- The Vietnam Maritime Administration has been directing planning consultants to integrate viewpoints and goals of green energy transition, greenhouse gas reduction and green seaport development into the master plans for development of Vietnam's seaport system and detailed planning of port groups;

- Vietnam Maritime Administration develops and promulges TCCS 02:2022/CHHVN base standard on green port criteria (in Decision No. 1909/QD-CHHVN dated 29/12/2022); Currently applied at seaports in Vietnam;

- Vietnam Maritime Administration is also reviewing, amending and supplementing the legal corridor on green ports and green transformation;

- Currently, the Vietnam Maritime Administration is also promoting and requesting support from countries to improve capacity, develop mechanisms, policies and technical assistance, green transformation projects.
THANK YOU VERY MUCH!
PITCH DECK
State of Play in Asian Countries

Mayuree Deeroop
Thailand
THAILAND
**BUSINESS OVERVIEW**

Port Authority of Thailand (PAT)

**Laem Chabang Port**

- **21st** by throughput in 2022 8.73 Mil (teu)
- **27th** the rankings of container port performance in the CPPI 2022
- **2505.93 acres** LCP covers an area

**Vessels and Cargoes Statistics**

at Bangkok Port and Laem Chabang Port

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Containers (Unit: TEUs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>8,729,927.75</td>
</tr>
<tr>
<td>2022</td>
<td>8,418,711</td>
</tr>
<tr>
<td>2021</td>
<td>1,277,118</td>
</tr>
<tr>
<td>2021</td>
<td>1,437,846</td>
</tr>
</tbody>
</table>

**Number of Vehicles**

(Unit: Units)

- **1,253,058** Inbound 2022
- **1,060,980** Outbound 2022

- **11.1 million TEUs** a handling capacity

**2022** | **2021**
State of Play

Thailand’s Long-term GHG Emission Development Strategy

Carbon Neutrality in 2050, and Net Zero Emission in or before 2065.

- NDC Target 30-35% by 2030
- Aims to reduce GHG by 40% with international support
- 50% share of renewable electricity generation of new power generation capacity
- Achievement of CO₂ removals of 120 MTCO₂eq
- Reduction of GHG emissions in various sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Waste, Land Use, Land Use Change, and Forestry
- CARBON NEUTRALITY
- Achievement of NET-ZERO GHG Emission while looking forward to enhanced international cooperation and support on finance, technology, and capacity-building to achieve this ambition

2035 - 69% share of electric vehicles of new vehicles in the market

Source: TGO, 2022

Thailand’s 20-Year National Strategy (2018-2037)
13th Thailand National Economic and Social Development Plan (2023-2027)
Thailand Transport Development Strategic Plan 2018-2037
PAT Environmental Policy
State of Play

GREEN PORT INITIATIVES

Decline Carbon Emissions by 10% by 2030
PAT successfully reduced carbon emissions by more than 5% in 2023 and invested more than $7 million
DRIVERS FOR CHANGE

- Top-down policies
- IMO 2023 GHG emission strategy
  - Zero GHG emission from international shipping by or around 2050

PUBLIC AND STAKEHOLDER ENGAGEMENT

PAT Strategic Plan on Stakeholder Engagement and Relationship Management

CHALLENGES

Operational barriers
- The supply of low- or non-carbon energy
- The knowledge of alternative low-carbon fuels
01-State of Play

Guiding Questions:

2. What notable achievements or progress has your country made with regards to Question No. 1.

- Participation to the Green Port Award System (GPAS) Program where five (5) PPA ports have been recipients of this award, namely, the Manila International Container Terminal (MICT) operated by International Container Terminal Services Inc. (ICTSI); Manila South Harbor operated by Asian Terminals Incorporated (ATI); the Port of Batangas; Port of Cagayan de Oro; and the Port of Surigao.

- Establishment of Carbon Sink Areas (Tree Parks) in the Ports of Cagayan de Oro and Surigao, among others

- Use of clean and renewable energy sources in ports such as installation of Solar-powered lighting and LED lighting systems in office and terminal buildings.

- Upgrading/Provision of Fuel-efficient Cargo Handling Equipment and Rubber-Tired Gantries (RTGs) of terminal operators
2. What notable achievements or progress has your country made with regards to Question No. 1.

(Continued)

- **Provision of Shore-Based Power Supply (SBPS) or Cold Ironing** which is currently implemented at the Port of Cagayan de Oro

- Implementation of the following digital technologies and automation of port processes:
  - Implementation of the *Internet-based Port Operations and Receipting for Terminals System (IPORTS)*
  - Electronic Terminal Management System (ETMS)
  - e-Permit Management System
  - Terminal Appointment Booking System (TABS)
  - Transport Accreditation, Permits and Pass for Ports System (TAPPPS)
  - QR Code System
04-Challenges

Guiding Questions:

1. From your perspective, what are the primary challenges and obstacles that have hindered the transition to zero-emission ports and shipping in your nation? Are there any legal, financial, technological or operational barriers that have been particularly problematic?

- Limited funding and resources for port infrastructure and technological investments
- Comprehensive policy adjustments to drive the transition including incentivizing sustainable practices in the maritime industry
- Stringent implementation of environmental policies and guidelines
MALAYSIA
State of play

- The **2023 IMO GHG Strategy** sets out the future vision for international shipping, the levels of ambition to reduce GHG emissions and guiding principles; and includes candidate mid- and long-term further measures with possible timelines and their impacts on States.

- The strategy identifies barriers and supportive measures including capacity building, technical cooperation and research and development (R&D).

- Efforts are in line with the government’s commitment to reduce the intensity of GHG emissions to 45% of the gross domestic product (GDP) in 2030, as outlined under the Nationally Determined Contributions (NDC) Roadmap and Action Plan.

- The **12th Malaysia Plan**, spanning 2021-2025, articulates the commitment to achieve net-zero GHG emissions by 2050.

- Concurrently, the **National Energy Policy 2022-2040** & the **National Energy Transition Roadmap (NETR)** lays the foundation to steer the nation from traditional fossil fuels based economy to a high-value green economy through whole-of-nation approach, encompassing federal and state governments, industry, general public, and international community.

- Reinforces Malaysia’s commitment to net-zero emissions as early as 2050 despite contributing only 0.8% to global GHG.
Share of global maritime trade

- In 2019, Asia accounted for 41% of goods loaded and 62% of goods unloaded.
- The region has strengthened its position as a maritime hub that brings together more than 50% of global maritime trade volumes.
- Developing countries in Asia accounted for 76% of all maritime trade loaded and unloaded in developing regions.

Source: UNCTAD - Review of Maritime Transport 2020
Strategic geographical location

Shipping traffic on the 3rd June 2023
The GreenVoyage2050 Project:

- a partnership project between the Government of Norway and IMO
- launched in May 2019
- aiming to transform the shipping industry towards a lower carbon future.
Main Component

COMPONENT 1
Developing global tools to support implementation of the Initial IMO GHG Strategy

COMPONENT 2
Capacity building, policy and NAP development

COMPONENT 3
Strategic partnership development

COMPONENT 4
Technology cooperation, innovation and pilot demonstrations
### Project Countries

- **Focus Countries:** Indonesia, Malaysia, Philippines, Thailand, Vietnam
- **Participating Country:** Cambodia
- **Knowledge Support Countries:** China, Japan, R.O. Korea, Singapore

### Project Data

<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Reducing Maritime Transport Emissions in East and Southeast Asian Countries - including ships, ports and hinterland transport -</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration</strong></td>
<td>5 Years (2022 - 2027)</td>
</tr>
<tr>
<td><strong>Donor</strong></td>
<td>International Climate Initiative (IKI); German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)</td>
</tr>
<tr>
<td><strong>Implementing Partners</strong></td>
<td>IMO and PEMSEA</td>
</tr>
</tbody>
</table>
Decarbonizing Maritime Transport Sector in East Asia – Blue Solution

Decarbonizing Maritime Transport Sector in East Asia

Intl & Domestic shipping
Ports
Hinterland Transport

Operational energy efficiency
Low carbon infrastructure/carriers
Low or zero carbon fuels

Policies & regulations
Optimized logistics
Technology solutions
Investments
Access to fuel
Demonstration of chosen solutions that can support national roadmap

A wide variety of design, operational and economic solutions

- GHG Reduction from Ships in Ports
- Ports Decarbonisation
- GHG reduction from Transport into / out of Ports
PITCH DECK
State of Play in Asian Countries

Rituraj Misra
India
(remotely)
Q & A

Raden Bonnyswara
Indonesia

Sung Ho Jung
South Korea

Renjie Wang
PRC

Giang Hoang Hong
Viet Nam

Mayuree Deeroop
Thailand

Nino Biscocho
Philippines

Cheryl Rita Kaur
Malaysia

Rituraj Misra
India (remotely)

Day 2 Conference | 16 November
PART 1 – CLOSING

Accelerating Green Ports and Shipping Development in Asia
Accelerating Green Ports and Shipping Development in Asia
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

Bert Fabian
Coordinator
EANET, UN
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

RECAP PART 1

Bert Fabian
Coordinator
EANET, UN

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Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

QUESTIONNAIRE

Please scan the QR code to provide your valuable contribution

Day 2 Conference | 16 November
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

KEYNOTE PRESENTATION

Huihui Cheng
Transport Program Manager
Clean Air Asia
Fostering Collaboration: Ports and Shipping Sectors Collaborate for Sustainable Growth
Shipping decarbonization is important for port cities’ clean air, health benefits and global climate goals.

55%-72%

Proportion of NOx emissions attributed to transport vessels in the overall NOx emission from ports (example of emission inventory from ports)
Ports and Shipping Sector can Work Together Towards:

Promoting the application of onshore power and alternative fuels
## Onshore Power Application: Drivers

Shore power is gaining momentum around the world

<table>
<thead>
<tr>
<th>Location</th>
<th>Regulations/Programs</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The United States</td>
<td>California: At-berth Regulation (2007, and updated on 2020)</td>
<td>From 2014, required a certain percentage of a fleet’s vessels to plug into shore power while berth.</td>
</tr>
<tr>
<td>PR China</td>
<td>Multiple regulations</td>
<td>Vessels equipped with shore power receiving facilities (except for tankers) should use shore power when berthing for more than 2 hours (for inland ports) and 3 hours (for coastal ports)</td>
</tr>
<tr>
<td>European Union</td>
<td>FuelEU Maritime</td>
<td>From 1 January 2030, a ship at berth in a port of call under the jurisdiction of a Member State shall connect to on-shore power supply. (containerships, passenger ships)</td>
</tr>
<tr>
<td>Others</td>
<td>Developing</td>
<td>Asian countries such as South Korea, Indonesia, Thailand and Viet Nam, etc. are developing shore power in ports.</td>
</tr>
</tbody>
</table>
Case Study: Onshore Power Application in Sea Ports

Shore-side power coverage rate has increased significantly, driven by multiple policies and regulations and self-motivation of port operators.

For coastal ports, the average shore power coverage rate of five types of special-purpose berths of 21 ports reached 84%, with 7 of them achieving 100%.

Note: These mainly include the special-purpose berths for container terminals, ro-ro passenger ship terminals, cruise terminals, passenger terminals of 3,000 t and above, and dry bulk terminals of 50,000 t and above.
Case Study: Onshore Power Application in Sea Ports

However, the use rate keeps low due to limited installation rate on ship-side

Coastal ports have shown low shore power utilization

X Port in South PRC 4.5%
X Port in YRD Region 2.9%
X Port in Southeast PRC 1.3%
X Port in North PRC 0.5%

Note: this is the shore power utilization rate of ocean-going vessels

Source: Green Port Operators 2023, Clean Air Asia

Note: The definition of utilization rate in this slides refers to proportion of all ships calling at shore power berths that use shore power
Onshore Power Application: **Challenges**

Shore power application in sea ports are hindered by multiple factors:

1. Supply infrastructure on port side
2. Available Capacity that port can produce
3. Port service
4. Receiving facilities on ship side
   - Containership: 7.6%
   - Bulk: 3.7%
5. Compatibility / Technical Specification
6. Cost of installing facilities and usage
Alternative Fuels: **Drivers**

2023 IMO Strategy: uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources at least 5% (striving for 10%) of the energy used by international shipping by 2030.

*Source: DNV*
## Case Study: Alternative Fuels in Global in-Service Fleets and Orderbook

Conventional fuel dominates the fleet.

### Proportion of Alternative Fuel Pathways in Global in-Service Fleets (as of June 2023)

<table>
<thead>
<tr>
<th>Fleet Type</th>
<th>Conventional Fuel</th>
<th>LNG</th>
<th>LNG Ready</th>
<th>Methanol</th>
<th>Methanol Ready</th>
<th>Ammonia Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>98.48%</td>
<td>0.53%</td>
<td>2.89%</td>
<td></td>
<td></td>
<td>0.09%</td>
</tr>
<tr>
<td>Containerships</td>
<td>99.32%</td>
<td>2.15%</td>
<td>6.45%</td>
<td>0.04%</td>
<td>0.05%</td>
<td></td>
</tr>
<tr>
<td>Oil Tankers</td>
<td>99.59%</td>
<td>1.44%</td>
<td>2.52%</td>
<td>0.14%</td>
<td>0.92%</td>
<td></td>
</tr>
</tbody>
</table>

### Proportion of Alternative Fuel Pathways in Global Orderbook (as of June 2023)

<table>
<thead>
<tr>
<th>Fleet Type</th>
<th>Conventional fuel</th>
<th>LNG</th>
<th>LNG Ready</th>
<th>Methanol</th>
<th>Methanol Ready</th>
<th>Ammonia Ready</th>
<th>Hydrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>82.51%</td>
<td>8.98%</td>
<td>1.61%</td>
<td>0.33%</td>
<td>0.41%</td>
<td>8.52%</td>
<td></td>
</tr>
<tr>
<td>Containerships</td>
<td>42.00%</td>
<td>30.80%</td>
<td>6.98%</td>
<td>13.86%</td>
<td>5.86%</td>
<td>12.50%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Oil Tankers</td>
<td>63.38%</td>
<td>24.65%</td>
<td>11.00%</td>
<td>0.18%</td>
<td>1.86%</td>
<td>5.22%</td>
<td></td>
</tr>
</tbody>
</table>

Data Source from Clarkson, analyzed by Clean Air Asia
Alternative Fuels: Challenges

No “one-fit-for-all” solution?

- **total cost of ownership**: Construction/retrofitting costs of alternative fuel vessels, additional supply infrastructure construction costs, alternative fuel production costs, etc.
- **non-CO₂ GHG emission control**: LNG (methane escape, GWP 100: 28) Ammonia (N₂O, GWP 100: 265)
- **Green Fuel Availability**: The supply chain of green fuels, like Bio-fuel, e-fuel, etc.
- **Security**: Safety of ships using ammonia as fuel

Global production of alternative fuels and the proportion of renewable sources:

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Global Production Capacity</th>
<th>Of which renewable sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen</td>
<td>70 million ton ✈️ V.S. 7,000 ton</td>
<td></td>
</tr>
<tr>
<td>Ammonia</td>
<td>250 million ton ✈️ V.S. 20,000 ton</td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td>100 million ton ✈️ V.S. 0.2 million ton</td>
<td></td>
</tr>
</tbody>
</table>

Data source: KPMG Green Ammonia Industry Overview and Outlook; Xing Hui, Li Xiang, "Progress in the application of Marine Alternative Fuels", World Shipping.
1. Voluntary Initiative between Port Operators and Ship Operators

Demonstration Action Plan on Promoting the Use of Shore Power by container ships and cruise ships on International Routes (2023-2025)

14 container port operators (90% of the cargo-carrying capacity entering and leaving China) and 10 container ship operators

**Targets**

- **Shore power receiving facilities**
  By 2025, 40% of container ships for each shipping companies

- **Shore power coverage rate in ports**
  By 2025, 90% of container terminals covered with high-voltage shore power for each shipping companies

![Installation Rate of Shore Power Facilities in 2022 and Their Targets](chart)

- MSC
- A.P. Moller
- CMA CGM
- China COSCO Shipping
- Evergreen Marine
- ONE
- Hapag-Lloyd
- Yang Ming Marine
- Wan Hai Lines
- ZIM Integrated Shpg

Installation rate of shore power receiving facilities in 2021 vs gap towards 40% target
2. Green Shipping Corridors

Scale up near/zero carbon alternative fuels

Cargo Owners
Ship Operators
Port Operators
Government agencies
Fuel Provider
Research Institutes
NGO

Source:
ABS, AN APPROACH TO GREEN SHIPPING CORRIDOR MODELING AND OPTIMIZATION
2. Green Shipping Corridors

Scale up near/zero carbon alternative fuels

1. Shanghai- LA
16. Rotterdam- Singapore
17. SILK Alliance
18. Australia-Asia Iron Ore
21. Los Angeles-Long Beach-Singapore

Most recent: Tokyo Port and Yokohama-Los Angeles
Most recent: Gothenburg and Shenzhen sister port agreement
Most recent: New: Guangzhou-Los Angeles

Figure source:
Global Maritime Forum, 2022, Annual Progress Report on Green Shipping Corridors
2. Green Shipping Corridors

Scale up near/zero carbon alternative fuels

Container ships calling at PRC in 2022:

The share of port calls in East and South-East Asia is 74%.
3. Incentives to Top-Runners

Identify the green port pioneers and green shipping pioneers in clean air and decarbonization efforts.

- Energy Transition
- Dust and VOCs Emission Control from Cargos
- Collection and distribution
- Cargo-handling equipment
- Port-owned or port-leased trucks

Technological Emission Reduction

Management Measures

Port 1
- Policy support
- Low carbon energy supply
- Green Development Strategy
- Scientific Capacity

Port 2
- Policy support
- Low carbon energy supply
- Green Development Strategy
- Scientific Capacity

Port 3
- Policy support
- Low carbon energy supply
- Green Development Strategy
- Scientific Capacity

Port 4
- Policy support
- Low carbon energy supply
- Green Development Strategy
- Scientific Capacity

- Decarbonization Strategy
- Fleet Renewal

Shore power receiving facilities
NOx Emission Tiers
EST applications
Alternative fuel
More Information

Download Reports (English Version Available from 2022)
Email address: china@cleanairasia.org
Part 1: Green Ports and Shipping Development in Asia: Status

Ask your questions at
www.pigeonhole.at

输入会议代码
BAQ2023

session code

Please feel free to ask questions

Day 2 Conference | 16 November
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

KEYNOTE PRESENTATION

Ninan Biju Oommen
Senior Port & Maritime Transport Specialist
The World Bank
Green energy transition in Ports & Shipping sector

Ninan Oommen Biju, Senior Port & Maritime Transport Specialist

Better Air Quality Conference, Manila
16 November 2023
World Bank programmatic approach

- **Zero-carbon bunker fuels**
  - April 2021

- **Role of LNG**
  - April 2021

- **Carbon revenues**
  - April 2022

---

**Global policy & analytics**

**In-country engagement**

---

**IMO**

World Bank is observer at the International Maritime Organization
1 Development opportunities – major opportunities for countries and ports in decarbonizing shipping

2 Regulatory framework – certainty is key to unlocking investments

3 Carbon revenues from international shipping – to enable an equitable energy transition
Realignment of the fuel market

OIL-DERIVED FUELS

BUNKER FUEL PRODUCTION FOR CONVENTIONAL SHIPPING

Country with no or insignificant oil reserves, but large renewable energy resources

HYDROGEN AND AMMONIA

BUNKER FUEL PRODUCTION FOR ZERO-CARBON SHIPPING

SYNTHETIC CARBON-BASED FUELS

BIOFUELS
The potential for zero-carbon bunker fuel production

- Blue ammonia only
- First blue, then green
- Green ammonia only
Investment needs

Decarbonization by 2070

- Produced with SMR + CSS: 85%
- Produced with a mix of SMR + CSS and electrolysis: 88%
- Produced with electrolysis: 89%

Decarbonization by 2050

- Produced with SMR + CSS: 85.5%
- Produced with a mix of SMR + CSS and electrolysis: 87.5%
- Produced with electrolysis: 89%

Investment barriers

Investment barriers include uncertainty regarding:
- future demand for and supply of clean fuels
- evolution of policy and regulatory environment.

Climate policy uncertainty is associated with significant decreases in investment.

Uncertainty is a fundamental barrier to increasing climate finance. Political leadership and policy interventions are central to addressing this uncertainty.

Sources: Marine Capital (2022) UK Domestic Shipping; Mobilising Investment in Net Zero; OECD (2022) Measuring and assessing the effects of climate policy uncertainty; IPCC (2022) AR6 WGIII Chapter 15.
Where are we now?

- **FINALIZED AND AGREED BY 2018–2023**
- **FINALIZED AND AGREED BY 2023–2030 (likely to 2025)**
- **BEYOND 2030**

**MID-TERM MEASURES**

- **CURRENTLY TABLED AT IMO**
  - Command and control measures
  - Performance standard, fuel emissions standard, etc.
  - Market-based measures
    - Cap-and-trade with free distribution of emissions allowances, or subsidies
    - Tax
    - Carbon levy or cap-and-trade with sale/banking of emissions allowances
  - Non-revenue raising
  - Revenue-raising

**Potential Revenues 2025-2050**
- Total: $11 to $3.7 trillion
- Annual: $40 to $60 billion
Potential carbon revenue use options

MARITIME TRANSPORT

Shipping’s decarbonization
- Fleet upgrades and renewal
- Zero-carbon bunker fuels & infrastructure

Maritime transport infrastructure and capacity
- Maritime transport infrastructure and services
- Capacity enhancement

BEYOND MARITIME TRANSPORT

Broader climate aims
- Climate change mitigation
- Climate change adaptation
Key implications for policymakers and industry

Development opportunities in shipping’s energy transition

Stringent policy at global level needed to drive the transition

Carbon revenues from shipping can enable an equitable transition

Main findings: (1) Significant opportunities - (2) Policies needed - (3) Revenues as enablers

THE WORLD BANK
Thank you.

Contact
Ninan Oommen Biju, nbiju@worldbank.org
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

KEYNOTE PRESENTATION

Shane Balani
Director of Research & Projects
Global Centre for Maritime Decarbonization
Feasibility and Approach to Green Shipping Strategies

Shane Balani
Director, Research & Projects
Better Air Quality Conference, 16 November 2023
Green maritime supply chains require end-to-end stakeholder involvement

Stakeholders in the fuel supply chain

Production

Low-/zero-carbon fuel suppliers

Classification societies, consultants + safety trainers

Distribution + Storage

Tankers

Storage terminals

Port terminal operators

Bunkering

vessels at anchorage

Bunker suppliers

vessels at berth

Vessel owners

Engine providers

Vessel operators

Fuel storage systems providers

Application

Chartering brokers

Freight forwarders

Buyer of logistics services

Cargo owners

Stakeholders: Port terminal operators, Bunker suppliers, Vessel owners, Vessel operators, Shipyards, Engine providers, Fuel storage systems providers, Classification societies, consultants + safety trainers, Regulatory + safety authorities, Financial institutions
GCMD’s efforts to help accelerate decarbonisation

Our mission is to help the maritime industry eliminate GHG emissions by shaping standards, deploying solutions, financing projects, and fostering collaboration across sectors.

- **Ammonia bunkering**
  - 2021: Safety study by DNV, Surbana Jurong, w/ 22 industry partners
  - 2022: Competency framework incorporated into curriculum at SMA
  - 2023: Develop emergency response procedures | submit guidelines to SDOs
  - 2024: Ammonia transfer pilot(s) in port limits

- **Assurance for drop-in green fuels**
  - 2021: Biofuels bunkering completed for 2 supply chains through Singapore
  - 2022: Biofuels bunkering completed for 1 supply chain through Netherlands; 1 pending
  - 2023: Biofuels bunkering in USA
  - 2024: Lab and engine testing of crude algae oil
  - 2025: Scoping of pilots for drop-in syn-LNG/bio-LNG/bio-methanol

- **Shipboard carbon capture**
  - 2022: Engineering study and FEED design of carbon capture system
  - 2023: CO₂ offloading study by LR, Arup, w/ 28 industry partners, 2 ports authorities
  - 2024: Hardware construction and land trials
  - 2025: Retrofit aboard Stena Impero

- **Enabling wide scale adoption of energy efficiency technology**
  - 2021: Defining and validating problem statement
  - 2022: Scoping pilot project and securing partnerships
  - 2023: Phase 1 – Set up of Technology, Data & Financing agreements
  - 2024: Phase 2 – Initiation and installation of EET

---

**Founding + strategic partners**
- BHP
- DNV
- Eastern Pacific Shipping
- Hapag-Lloyd
- MPA Singapore
- ONE
- NYK Line
- Seatrrium

**Impact partners**
- gCaptain
- the human energy company
- BCG
- Gard

**Coalition partners**
- International Chamber of Shipping
- IBIA
- SSA
- Singapore Shipping Association
- MSA
- ashurst

**Knowledge partners**
- GLOBAL MARITIME FORUM
- Maersk Mc-Kinney Møller Center for Zero Carbon Shipping
- KLPLER
- GSBN
Ammonia bunkering pilot safety study released

+ Singapore ammonia bunker demand projected to take off mid-2030’s; about 2 MTPA by 2035

+ 400 operational and locational risks identified across 4 concept designs and three locations; all considered low or mitigable

+ Guidebook incorporated into curriculum at SMA; first course offered in March 2023

+ Learnings will be submitted to standards development organisations to shape standards domestically and internationally

+ Working with OSRL to develop emergency response procedures

+ Readying for first STS transfer of ammonia in Singapore waters to gain confidence and competence
Developing a port network for ammonia bunkering readiness

+ Identified 8 key drivers for port readiness for ammonia bunkering
+ Each driver will have unique nuances for individual port operations
+ Outcomes from each pilot will address partnering port’s needs and be elevated for general applicability across ports for ammonia bunkering
+ GMCD’s Phase 1 safety study addresses 4 of the 8 drivers Study led by DNV, SJ & SMA with 22 study partners, >130 industry panel & consulted regulators
+ GMCD Phase 2 pilot will build from Phase 1 and address remaining drivers i.e., emergency response plans, navigational assessment, environmental impact, & ecosystem readiness
+ Additional pilots at other ports will close remaining gaps each building on past experience either by adopting, adapting, refining existing knowledge
+ GCMD will identify specific port(s) to demonstrate ammonia Shore-to-ship bunkering which is relevant to the port and translate lesson to for general port applicability

136
Drop-in fuels assurance framework

+ Developing a framework to trace and assure the Quality, Quantity and GHG abatement of drop-in green fuels, such as biofuels, bio methanol or green ammonia
+ Working across the fuel producers, supply chain logistics, and fuel consumers to drive change on a pilot-basis.

Route-based pilots involving port pairs:

Port A

Port B
Shipboard Carbon Capture pilot and LCO₂ offloading study

+ An end-to-end full scale demonstration of shipboard carbon capture, offloading and eventual utilisation or sequestration for pilot vessels
+ In combination with a study to understand the offloading requirements to enable large scale capture and storage systems in ports around the world.
Accelerating energy efficiency technology (EET) by closing the data-financing gap

+ EET installation costs must be reconciled through OPEX fuel savings, however fuel savings are hard to measure, and split incentives occur between who invests and who saves fuel.

+ Generating high quality data for a foundation to alternative business models can mobilise affordable capital dedicated to decarbonising shipping

---

**Technology financing**

- Hull coating
- Main engine improvements
- Reduced auxiliary power demand
- Propeller improvements
- Hydrodynamic design
- Waste heat recovery
- Optimization of water flow around hull
- Air lubrication
- Super light ships
- Solar panels
- Wind power

**Data transparency**

- EET OEMs
- Shipyard
- Charterers & operators
- Maritime lawyers
- Ship owners
- Banks & insurers
- Data comms
- Platform developers
- Sensor OEMs
- Verifiers
STAKEHOLDER DIALOGUE: How Asia countries can collaborate to accelerate decarbonization?

**Moderator**
- Bert Fabian
  - EANET, UN

Panelists:
- Ninan Biju Oommen
  - The World Bank
- Shane Balani
  - Global Centre for Maritime Decarbonization
- Chris Chatterton
  - Methanol Institute
- Ahila Karan
  - Lloyd's Register (remotely)
- Freda Fung
  - Climate Works Foundation

Day 2 Conference | 16 November
### FIGURE 19  Shipping emissions in Hong Kong in 2015

<table>
<thead>
<tr>
<th></th>
<th>Ocean going vessels</th>
<th>River vessels</th>
<th>Local vessels</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SO$_2$</strong></td>
<td>11,100 (57%)</td>
<td>210 (1%)</td>
<td>150 (1%)</td>
<td>11,460 (59%)</td>
</tr>
<tr>
<td>Total: <strong>11,460 (59%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NO$_x$</strong></td>
<td>14,650 (16%)</td>
<td>9,170 (10%)</td>
<td>10,090 (11%)</td>
<td>33,900 (37%)</td>
</tr>
<tr>
<td>Total: <strong>33,900 (37%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PM$_{10}$</strong></td>
<td>1,390 (26%)</td>
<td>140 (3%)</td>
<td>330 (6%)</td>
<td>1,860 (34%)</td>
</tr>
<tr>
<td>Total: <strong>1,860 (34%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Clean Air Plan for Hong Kong – 2013-2017 Progress Report
STAKEHOLDER DIALOGUE: How Asia countries can collaborate to accelerate decarbonization?

Moderator: Bert Fabian
EANET, UN

Panelists:
- Ninan Biju Oommen
  The World Bank
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  Global Centre for Maritime Decarbonization
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  Methanol Institute
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  Lloyd's Register (remotely)
- Freda Fung
  Climate Works Foundation

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Potential of Green Hydrogen Supply Far Exceeds Demand

Comparison between economic potential of green hydrogen supply below USD 2/kgH2 and forecasted hydrogen demand, in EJ/year, in 2050

Sources: IRENA (2022) Global hydrogen trade to meet the 1.5°C climate goal – Part III Green hydrogen cost and potential
Part 2: Green Ports and Shipping Development in Asia: Opportunities and Solutions

Q & A
PART 2 – CLOSING

Accelerating Green Ports and Shipping Development in Asia