



FONASBA

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Dr. Dureid Mahasneh  
REGIONAL VICE PRESIDENT  
Middle East & South Asia



# Green Maritime Transportation



## Introduction

- 90% of world trade by volume is transported by shipping.
- Shipping consumes around 140 million tons of oil a year.
- The International Maritime Organization (IMO) indicates that by 2050 maritime trade could increase between 40% and 115% in comparison to 2020 levels.

# What are the benefits of green transportation

- Fewer to no environmental pollution.
- Saves money.
- Contribute to building of a sustainable economy.
- Improved health.
- Less pollution and clearer skies.
- Healthier communities.
- Harmful chemicals are reduced.
- Slowdown Climate Change.
- Improves air quality.



# Shipping vessels

- The shipping sector has long been in the spotlight for its detrimental impact on the environment. In addition to particulate matter, ships' engines emit sulfur oxides (SOx), nitrogen oxides (NOx), and greenhouse gases (GHG), most notably carbon dioxide (CO2). It was estimated that in 2018, shipping accounted for almost 11 percent of all transport-related CO2 emissions in the world.
- Discharge of untreated ballast water, which used to be common practice, is another environmental problem of this industry. Furthermore, at the end of their life cycle, ships are often dismantled in yards located in developing countries, a practice which comes at great human and environmental costs.

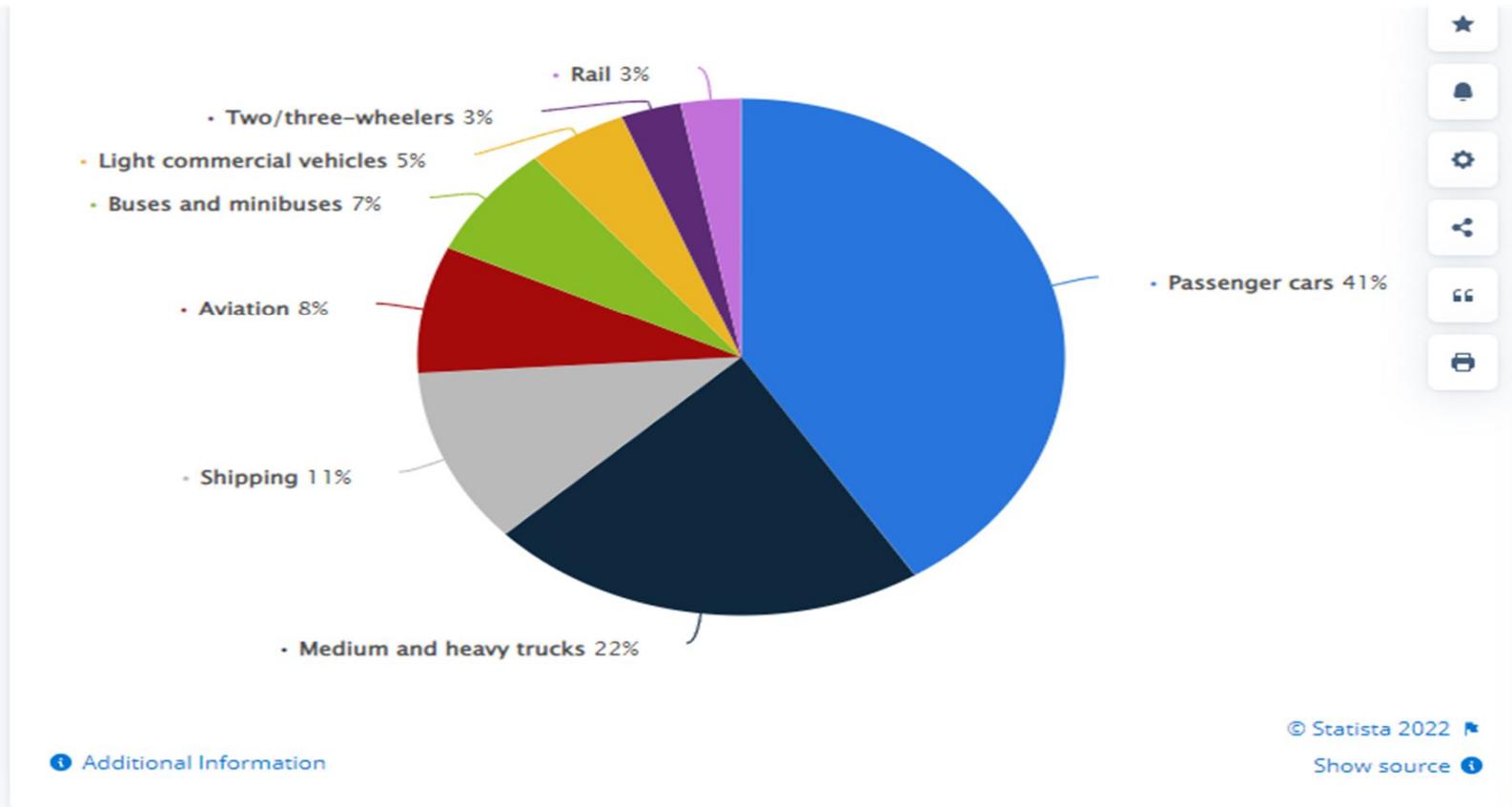


## Pollution from Shipping



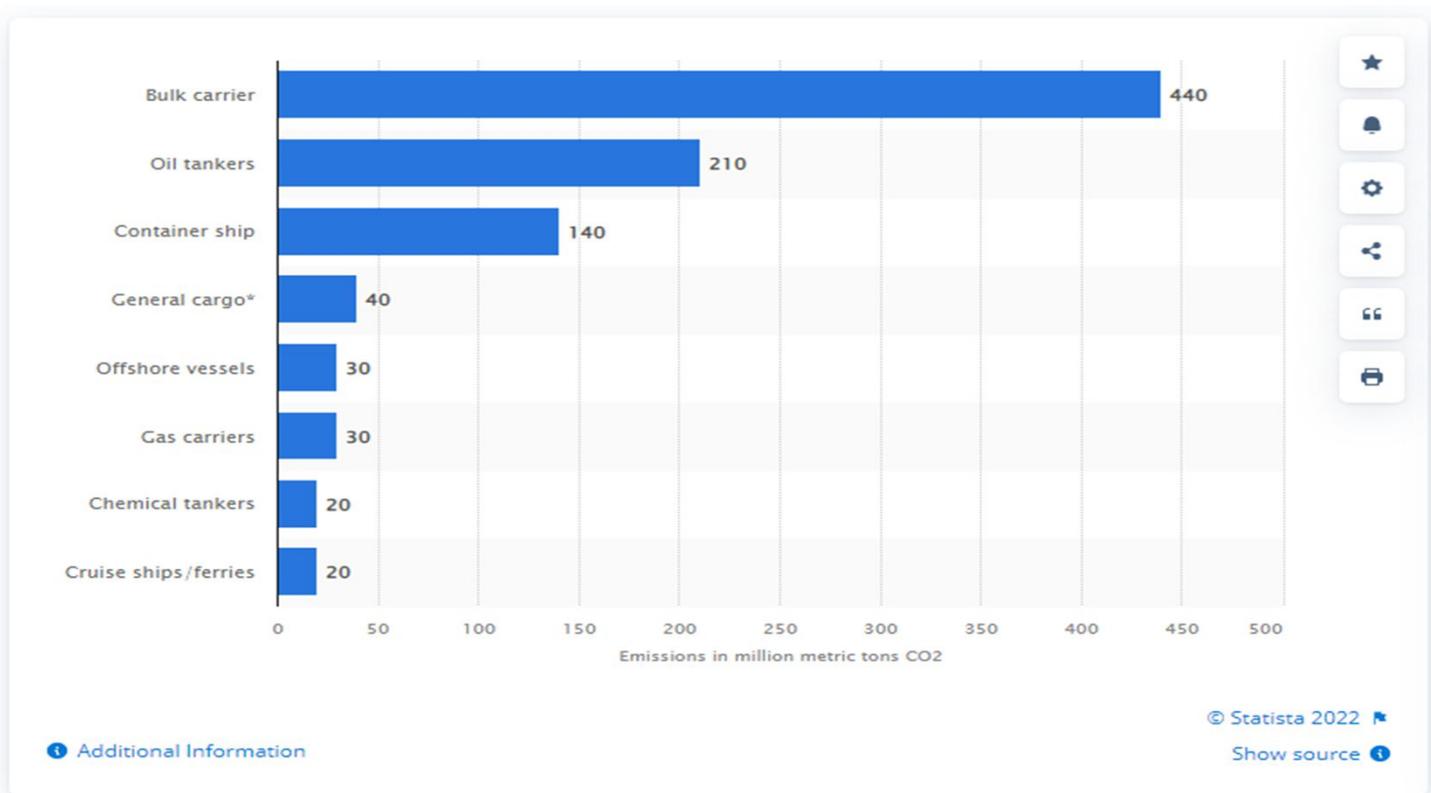
- Carbon dioxide emissions from shipping is estimated to be 4%-5% of the global total caused by human activity.
- Global shipping activity is a significant source of sulphur oxide (SO<sub>x</sub>) and nitrogen oxide (NO<sub>x</sub>) emissions.
- Shipping is a major source of airborne pollution over land, particularly around coastal area and ports.

# Distribution of carbon dioxide emissions produced by the transportation sector worldwide in 2020, by subsector



Breakdown of CO2 emissions in the transportation sector worldwide 2020, by subsector

# CO2 emissions in worldwide shipping in 2020, by ship type (in million metric tons CO2)\*



CO2 emissions in international shipping 2020

## Incentives and Disincentives

- Enabling regulatory framework
- Levying of an emissions tax
- Setting GHG reduction targets
- Emissions trading scheme



Disincentives

## Barriers



- Advanced biofuels are limited by the global availability of sustainable feedstock.
- Sustainability, lack of cost-effective, and reliable low-pressure storage choices for the hydrogen cell remain as critical issues that need to be addressed.
- The existence of conflicting incentives between ship owners and operators, resulting in limited motivation for the deployment of clean energy solutions in this sector.
- Achieving the full potential of renewables in the shipping sector will require an integrated systems engineering approach that addresses these barriers to their deployment.

## What is Green port



A Green Port, also known as an ecological port, is a sustainable development port, which not only meets the environmental requirements, but also raises their social, economic interests. The core question of an ecological port is to find a balance point between environmental, social impacts and economic interests .

A green port invests in sustainable operations in all formats of the ports and maritime industry, such as supplying ships with the needed renewable energy Exp. Solar cells , Wind and Hydrogen .



# Renewable Energy Integration in Ports

- Electrifying operations would reduce air pollution and carbon dioxide emissions.
- Renewable energy sources, especially off-shore wind farms, can:
  1. Generate electricity
  2. Produce green hydrogen



## Solar cells

- A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon.



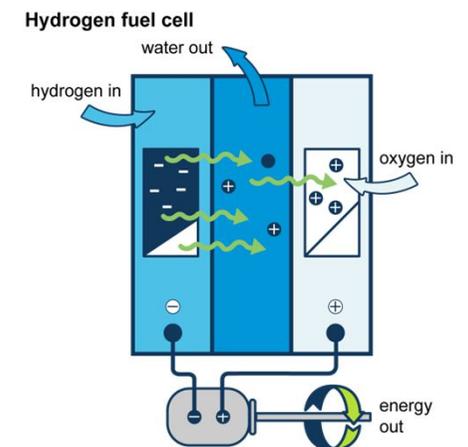
## Wind power

- Wind power or wind energy describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power.



## Hydrogen

- Hydrogen fuel cells produce electricity by combining hydrogen and oxygen atoms. The hydrogen reacts with oxygen across an electrochemical cell similar to that of a battery to produce electricity, water, and small amounts of heat. Many different types of fuel cells are available for a wide range of applications



Source: Adapted from National Energy Education Development Project (public domain)

# Shipping Fuels

Fuel	Advantages	Challenges
LNG	<ul style="list-style-type: none"> <li>• High energy density.</li> <li>• Well-established supply infrastructure.</li> <li>• Has a lower sulphur content than HFO.</li> <li>• Currently used in vessels globally.</li> </ul>	<ul style="list-style-type: none"> <li>• Has fewer emissions compared with HFO but more than low-carbon alternative fuels.</li> <li>• Uses non-renewable resources.</li> </ul>
Advanced Liquid Biofuels	<ul style="list-style-type: none"> <li>• Easy to integrate into existing engines.</li> <li>• They have an established infrastructure due to prevalent use across multiple sectors.</li> <li>• Can be used as a drop-in fuel.</li> </ul>	<ul style="list-style-type: none"> <li>• Growth of feedstock used in biofuel production may affect land usage and impact global food security.</li> <li>• Scaling is difficult considering high demand from multiple sectors.</li> </ul>
Hydrogen	<ul style="list-style-type: none"> <li>• Employment would lead to nearly zero carbon emissions.</li> <li>• A main option as an energy carrier in FCs.</li> <li>• Has multiple applications, which can increase the rate of research.</li> </ul>	<ul style="list-style-type: none"> <li>• Costly production and storage, requiring cryogenic storage.</li> <li>• Still an immature technology for the shipping sector but has high potential as an alternative fuel.</li> </ul>

## Ways to Reduce the Environmental Impacts of Sea Transport:

- Greener technological measures, including more efficient engines, ship hulls, designs, propellers, cleaner fuels (low carbon content, LNG), alternative fuels (fuel cells, biofuels, etc.), devices to trap exhaust emissions (scrubbers), energy recuperation devices.
- Logistics-based measures, such as weather routing, fleet and speed optimization.
- Market-based measures or MBMs, including Emissions Trading Schemes (ETS), carbon taxes imposed on fossil fuel, etc.



## What is green port policy?

- The Green Port Policy acts as a standard document for the integration of environmental sustainability principles and initiatives to guide business decisions, development and operations towards achieving a sustainable port development and operation.

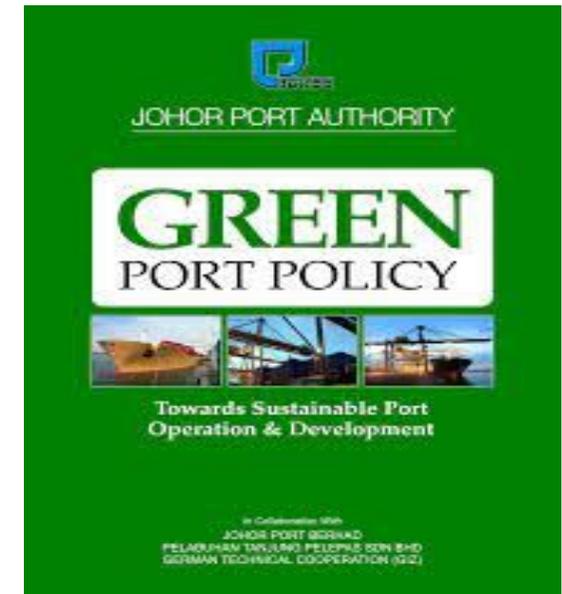
## How do Agents make a port sustainable?

- Provide alternative energy sources for docked ships.
- Maintain a good quality of Sea water and prevent air pollution .
- Prevent Port malpractices such as: throwing ship and port waste into the sea.
- Improve waste disposal facilities.
- Utilize big data to improve efficiency.
- Upgrade port equipment.
- Reduce noise and light pollution.
- Reserve marine life.



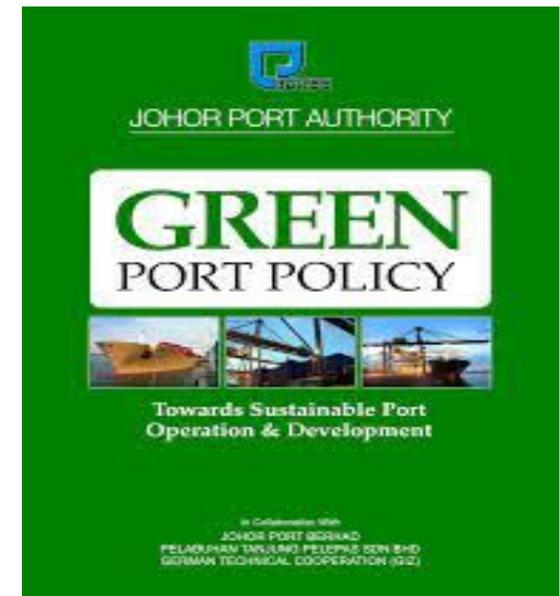
## Examples of Green Policies in Ports

- Mandating speed reduction of ships entering the port.
- Discount for ships with lower emissions.
- Discount for ships that use low sulfur fuel.
- Discount for rail operators that use low emission locomotives.



## Green Policies in Ports - Continued

- A ban on entry of high emission vehicles.
- Cold ironing – supplying electricity from shore while ship is docked.
- Replacement from diesel to electric automatic guided vehicles (AGVs).
- Port fee increase for trucks during peak hours.



## Green Ports

- **Hamad Port- Qatar** :is one of world's largest green projects.
- **Haldia Port – India** :has become the 'first green port' in India after a bio-diesel dispensing unit was inaugurated in it. Haldia Port Complex, part of Kolkata Port Trust, will start using biodiesel to run its railway engines, trucks and other vehicles. Bhavnagar port of Gujarat has become World's first CNG port.

