KPMG

The Future of Shipping

Market overview, trends & developments in the Greek market

KPMG in Greece / Shipping & Ports
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Objectives

Introduction & Demand Analysis

Define seaborne trade, understand the role and standing of Greek shipowners in the global market and project financial growth based on pricing of freight rate indices.

Supply Analysis

Identify significant key players per type of trade, their market share and compare their figures.

Trends & challenges in the industry

Identify trends, challenges and development opportunities as well as factors that drive innovations.

Focus topics: Green shipping imperative and the role of AI in the maritime industry

Present the industry's goals towards decarbonization and green shipping overall, as well as the utilization, challenges, and considerations regarding AI.

01
Introduction

Seaborne trade

Below is presented the global seaborn trade overview and its correlation with the global economy.

Demand for maritime transport services is a **derived** demand. Global production (GDP) and international trade conditions modify the industry's profile

Strong correlation between global GDP and demand for maritime transport services. Economic development causes increased demand for logistic services and shipping is the leading industry by serving approximately **50%-60%** of the global trade in value and **90%** in capacity terms.

of world commodities' trade (in terms of capacity) is

seaborne

Source: UNCTAD, IMF

Global Shipping outlook

The global shipping industry is expected to continue its ascending course, despite issues on accessibility, manpower and the current ecopolitical turbulence.

Ship owners and operators have suffered from shortages of vessel space and containers, while carriers had to consolidate port calls. On the other hand, ports have reported that they have been managing several logjams. Therefore, main key players across the shipping industry are aiming for greater resilience while shipping economies will need to futureproof their ports and their maritime supply chains.

Fleet

- The world fleet is dominated by small & medium sized ships up to 25,000GT (83%), while small ships alone represent 38% by number, although around only 1% by tonnage.
- None of the very large ships reached their 25th anniversary, reflecting the tendency to renew and grow large size fleet year by year

Supply – Demand

- More container ships will facilitate the ships availability problem and is expected to lower freight rates.
- The increased number of vessels in operation will restore the supply-demand balance in the coming years

Accessibility

- The problem of vessels' availability amplified by port delays and change in consumer priorities will ease in the years to come
- Infrastructure bottlenecks may occur from time to time causing problems throughout the supply chain – spanning from port and ship capacity to the ability of logistics networks to deliver goods to their final destination

Ecopolitical Turbulence

- The ongoing conflicts in Ukraine and the Middle East have significantly impacted the shipping industry.
- Key trade routes, particularly in the Black and Red Seas, are experiencing disruption due to increased military activity, maritime restrictions, attacks on US and European ships, and port closures.
- As a result, longer and more expensive routes are becoming necessary.

Human Resources

- The latest Seafarer Workforce Report from BIMCO and the International Chamber of Shipping (ICS) expect a significant shortage in maritime officers by 2026
- Women seafarers make up only 2 percent of the crewing workforce and are mostly found in the cruise industry, while they make up 34 percent of the workforce in ship-owning corporations.

The Global Shipping market is expected to further boom

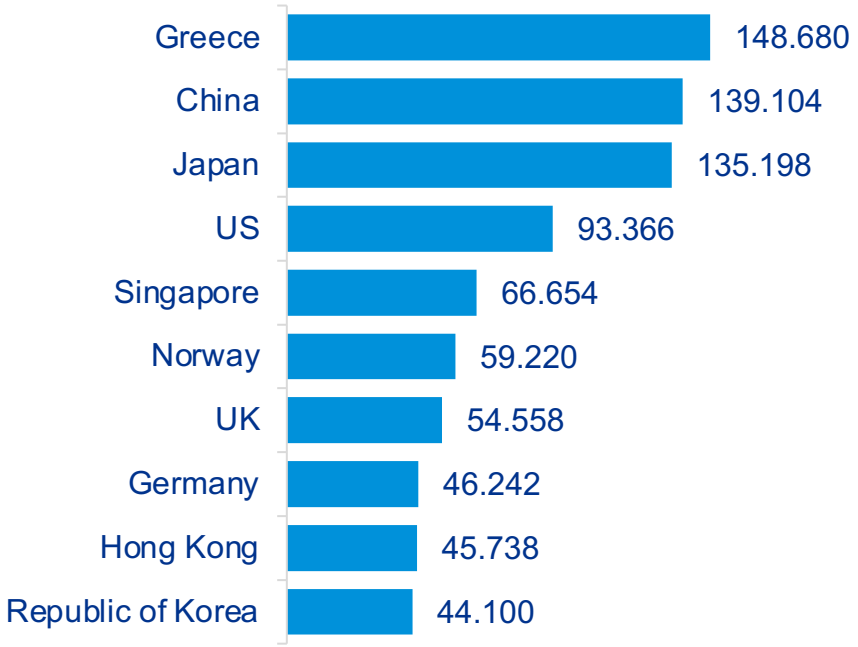
"After an era full of disruptions and turbulence the shipping market is currently following an upward trend"

Global Shipping overview in numbers

Below are presented some high level metrics for the global shipping industry.

The top 10 countries by fleet commercial value account for 66% of the global fleet.

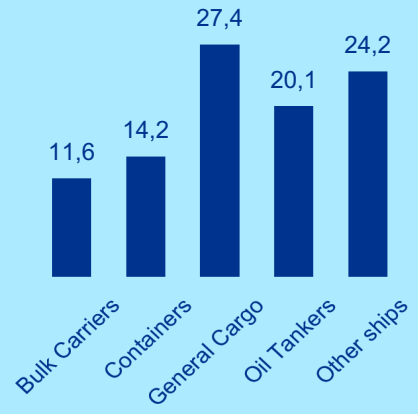
Ownership for world fleet by commercial value, main vessel types (million USD) 2023



3.2%

Of increase in dead-weight tonnage recorded in the world fleet in 2023.

The average age of the global fleet is 22.2 years in 2023. Below is the average age per vessel type.



1,608m GT

Global fleet

219.6m GT

Orderbook

1,214m GT

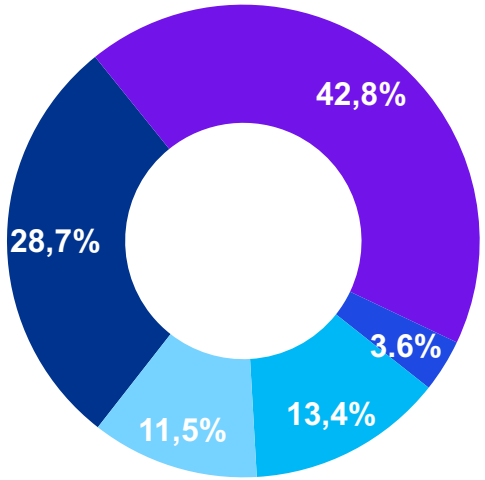
Top 10 flag states

Source: UNCTAD, Clarksons

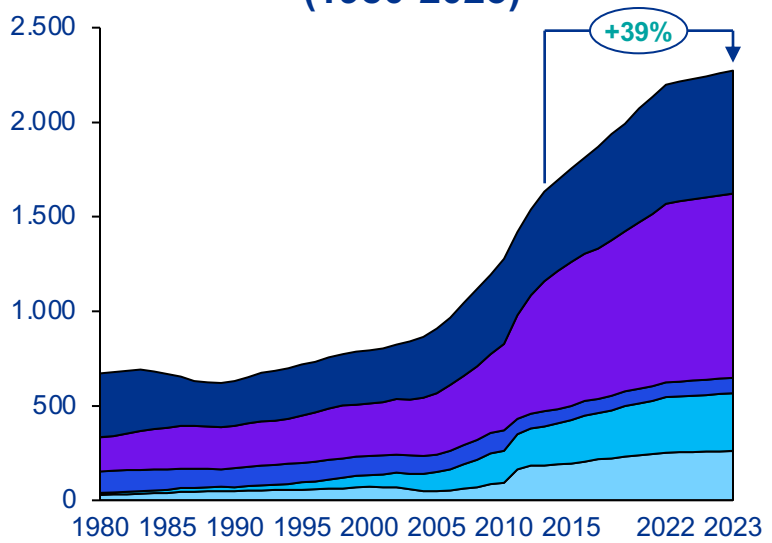
Categorization and age of global fleet

Global fleet (in terms of capacity) increased by almost 40% during the last decade. Oil tankers and bulk carriers represent almost 7 out 10 vessels globally, whereas the global fleet's age varies between different types of vessels. ***Greek-owned fleet's age in DWT terms is 10.9 years, lower than the global average of 12 years.***

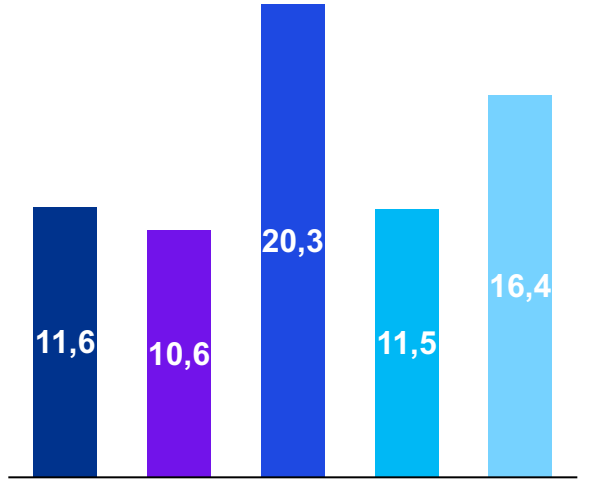
Global fleet's categorization – Dwt (2023)



Evolution of global fleet (1980-2023)



Global fleet's average age in capacity terms (2023)



Oil tankers | Bulk carriers | General cargo | Container ships | Other types of ships

Source: UNCTAD

Greece's position in the global market (1/2)

The country ranks 1st globally in ownership of merchandise vessels, presenting a 17.8% increase in owned capacity the last five years.

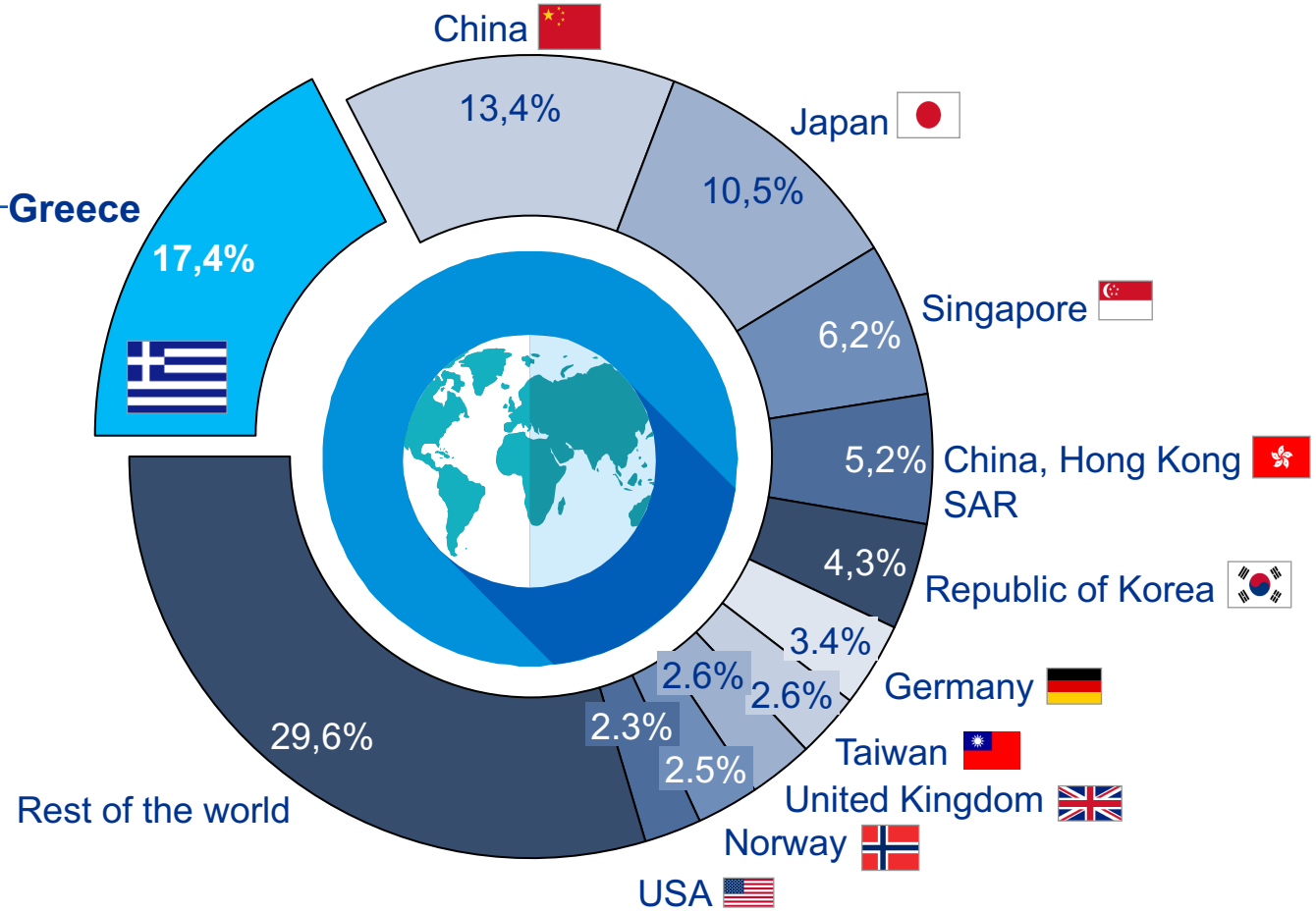
Country's average vessel's size is almost double compared to global average of 39k tons, a fact which indicates that Greek ship-owners mostly operate in high-volume markets.

In terms of flagship, Greece rank 9th with 2.6% of global fleet (in capacity terms) to be registered in the Greek register.

4,936
vessels

+17.8%
5Y change (Dwt)

79,625t
Average vessel's size

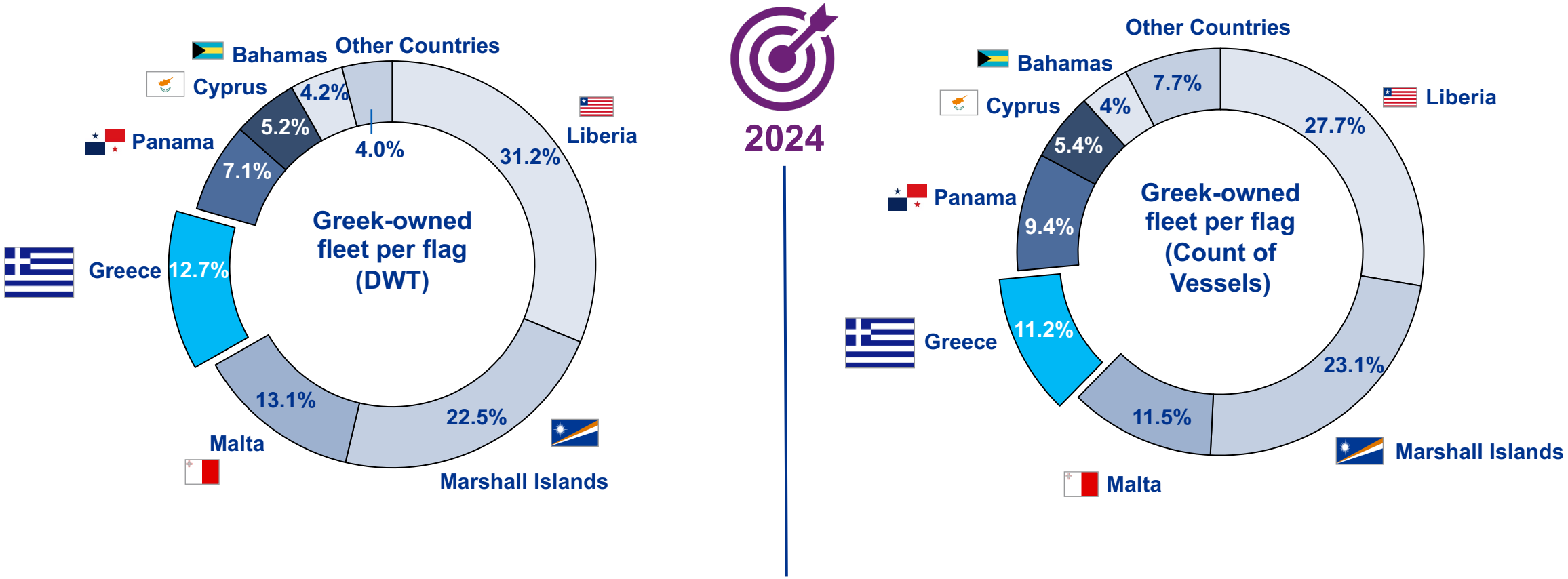


Source: 1) UNCTAD –Review of Maritime Transport 2023, 2)infomaritime.eu

**Note: Figures refer to vessels of 1000 GT and above*

Greece's position in the global market (2/2)

Below is presented the distribution of Greek-owned vessels per flag in terms of DWT and ship count.



Greek-flag vessels represent 1.1% of the global fleet count, while they rise to 2.35% in capacity terms.

Source: Clarksons.net, as of 31/3/2024

**Note: Figures refer to vessels of 1000 GT and above*

02

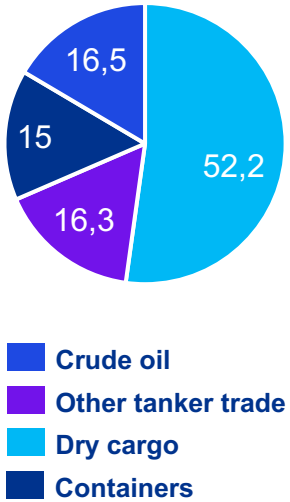
Demand Analysis

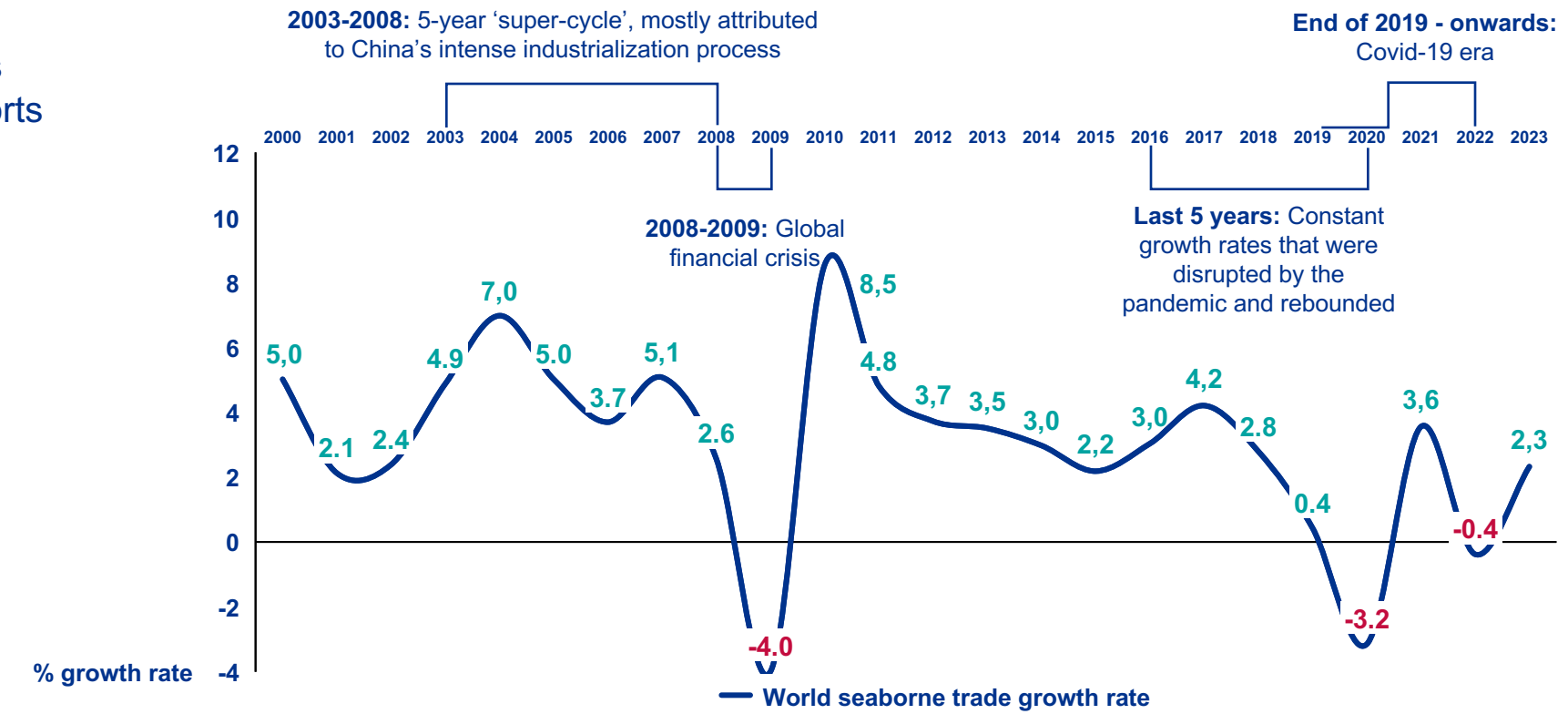
Sector's size and historical growth

Shipping represents up to 90% of global trade in terms of capacity. Sector's historical growth is strongly related to the global economy as major political, economic and social events/ periods affected directly the demand for shipping services.

12,321
Million metric tons loaded globally in ports
(Jan-Dec 2023)

type of cargo (%)

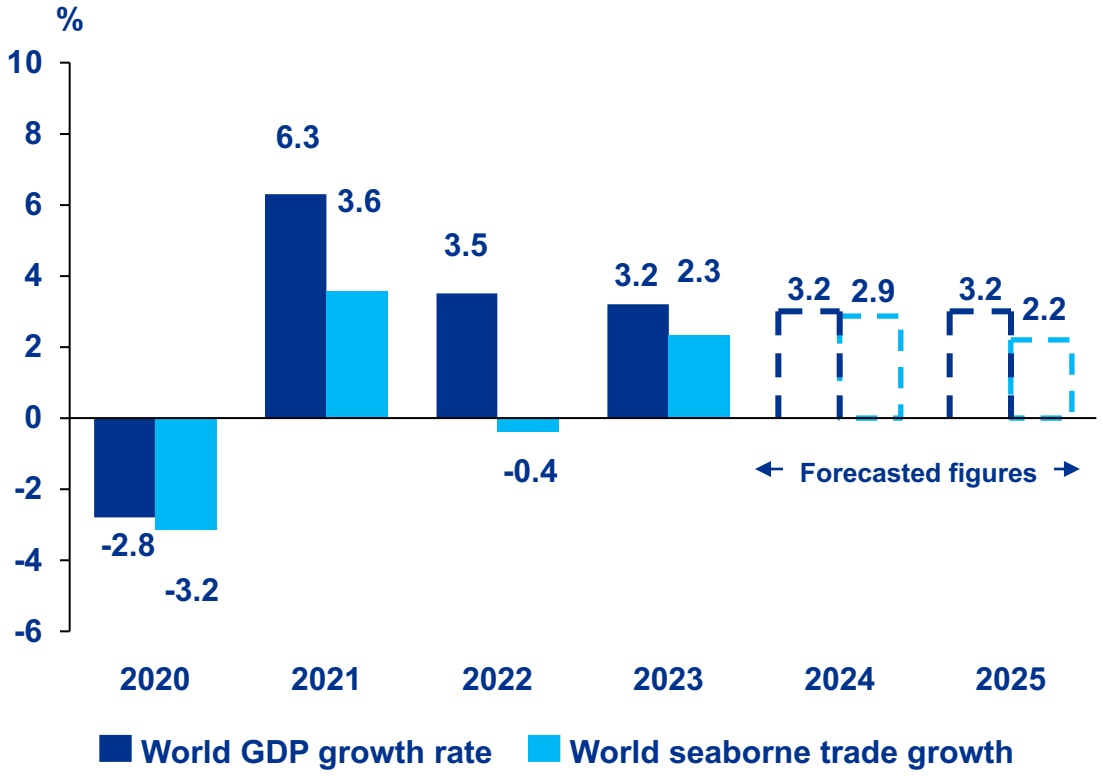




Source: UNCTAD

Financial growth projections

The global economy is set to continue its expansion at approximately 3% per year. Seaborne trade is forecasted to follow this trend mainly due to the industry's ability to rapidly adapt both to predicted or unforeseen challenges which formulate the industry's environment.

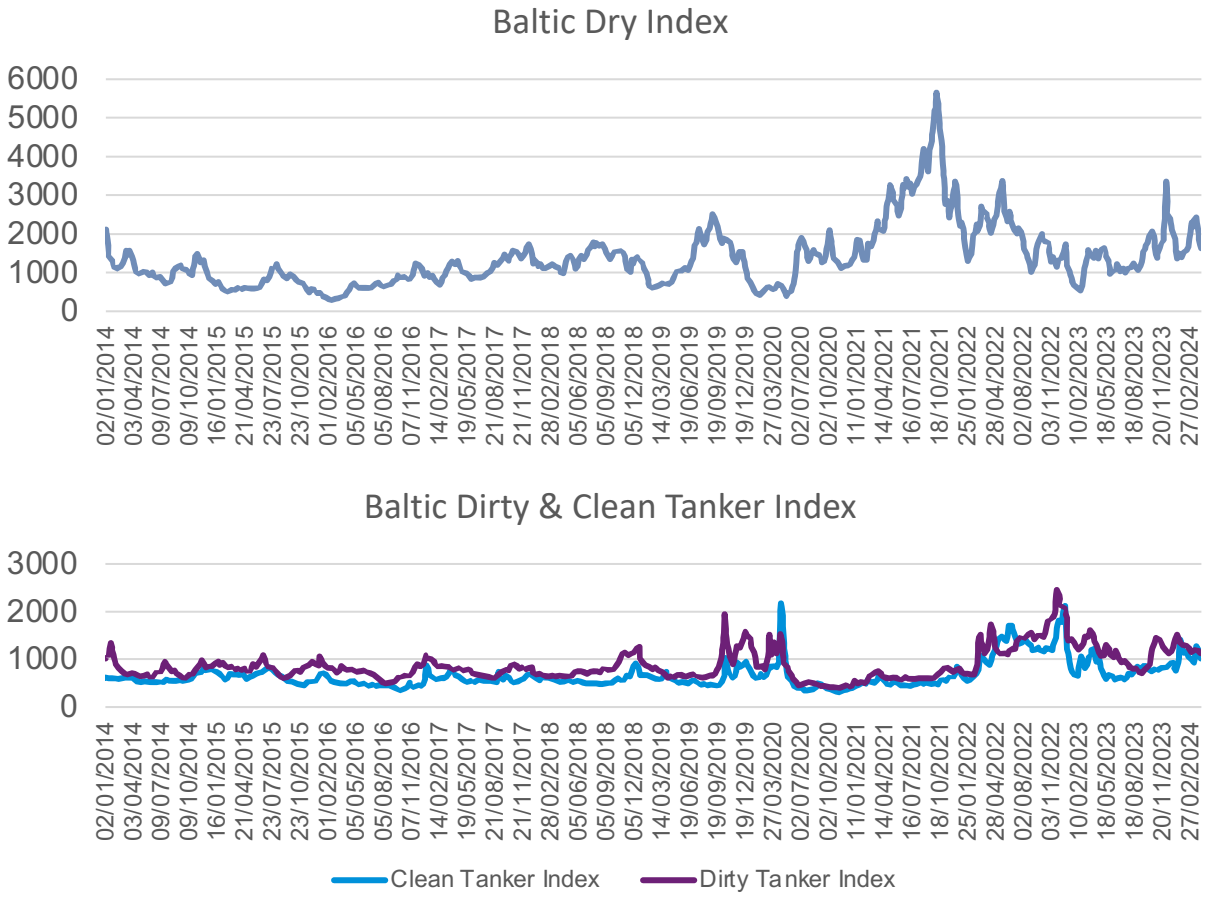


- Trade restrictions, climate change and geopolitical unrest could affect the projections and consequently the demand for seaborne transport of goods.
- Decarbonization, which is the main challenge of our age, requires the implementation of new energy solutions and technologies which could significantly alternate the current operating model of commercial vessels.
- Shipping industry seems to be resisting to the above mentioned challenges and continues to grow at a relatively stable rate which follows global growth figures.

Source: UNCTAD, IMF

Pricing - Freight rate indices (Dry bulk – Oil tankers)

Freight indices returned to pre-pandemic levels and attempt to balance between the countervailing forces of demand and supply. Their sharp fluctuations are attributed to numerous external factors which formulate the current scenery.

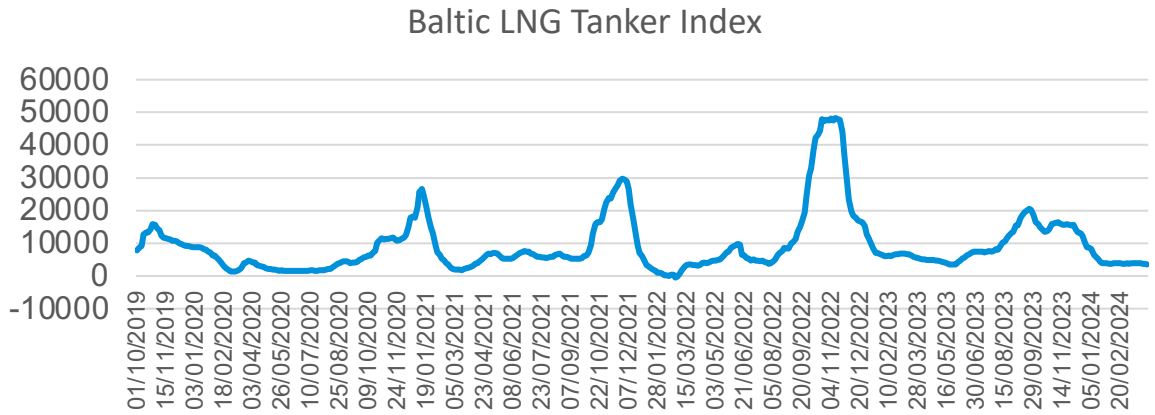


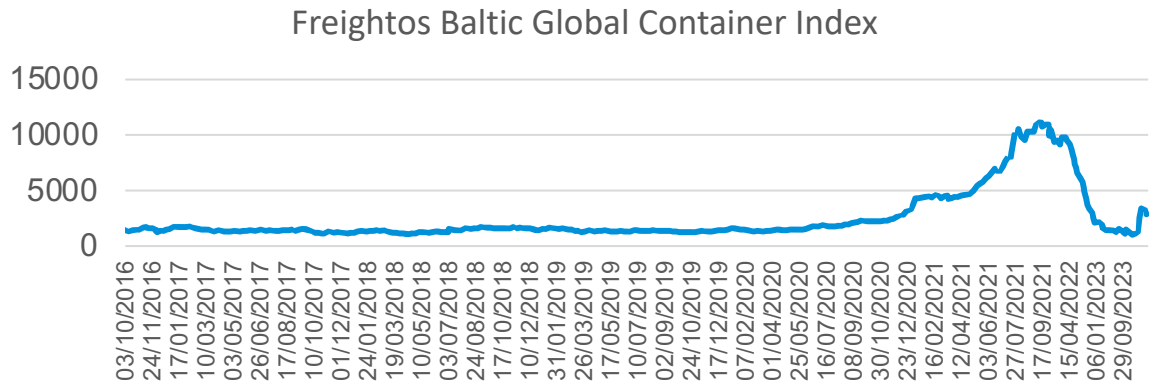
- Increasing dry bulk vessels' supply combined with a steep slow on demand side resulted in low rates across 2023;
- The recent increasing demand along with the longer routes due to voyage restrictions (i.e. Red Sea, Panama) strengthened the market during Q1 2024.

- Recent voyage restrictions (i.e. Red Sea disruption) and geopolitical factors (Russia – Ukraine conflict) maintain and support the high demand for tankers;
- Global tanker fleet increased only by 1.9% during 2023 in capacity terms.

Pricing - Freight rate indices (LPGs/ LNGs – Containers)

Freight indices returned to pre-pandemic levels and attempt to balance between the countervailing forces of demand and supply. Their sharp fluctuations are attributed to numerous external factors which formulate the current scenery.





- Current orderbook reaches approximately the 51% of the existing LNG fleet;
- The parallel projected increase in demand for LNG is estimated that will balance/ stabilize the market.

- Global consuming pattern during the pandemic pushed container freight rates to record figures which were followed by a sharp fall during 2022 and 2023;
- The recent (Mar-Apr 24) increase in container freight rates is mostly attributed to reduced number of available vessels due to voyage restrictions.

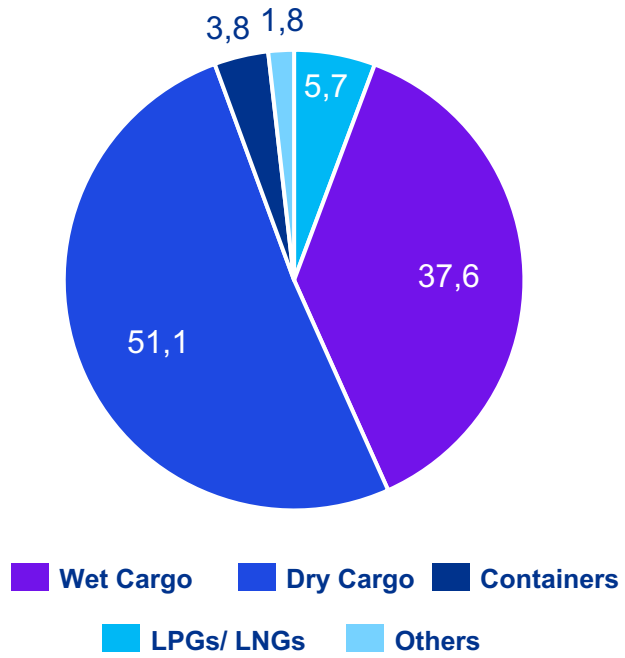
03
Supply Analysis

Overview of Greek Shipping

Below is presented a breakdown of the Greek fleet based on cargo type, as well as the Greek ownership shares compared to the global and European fleets.

Greek fleet breakdown by type *(based on DWT)*

type of cargo (%)



Greek Shipping stands as a major player in the worldwide goods and products transportation, representing (in DWT):

- **21.5%** of Dry cargo
- **16.9%** of LNG/LPG
- **22.8%** of Wet Cargo
- **7.3%** of Containers

Greek shipping highlights based on GT:

- Greece controls around **40%** of the European fleet
- Greek fleet is **larger** than **all the EU countries combined**
- Greek fleet is **equal** to the **next 5 European countries** combined (Norway, Germany, Italy, UK, Denmark)

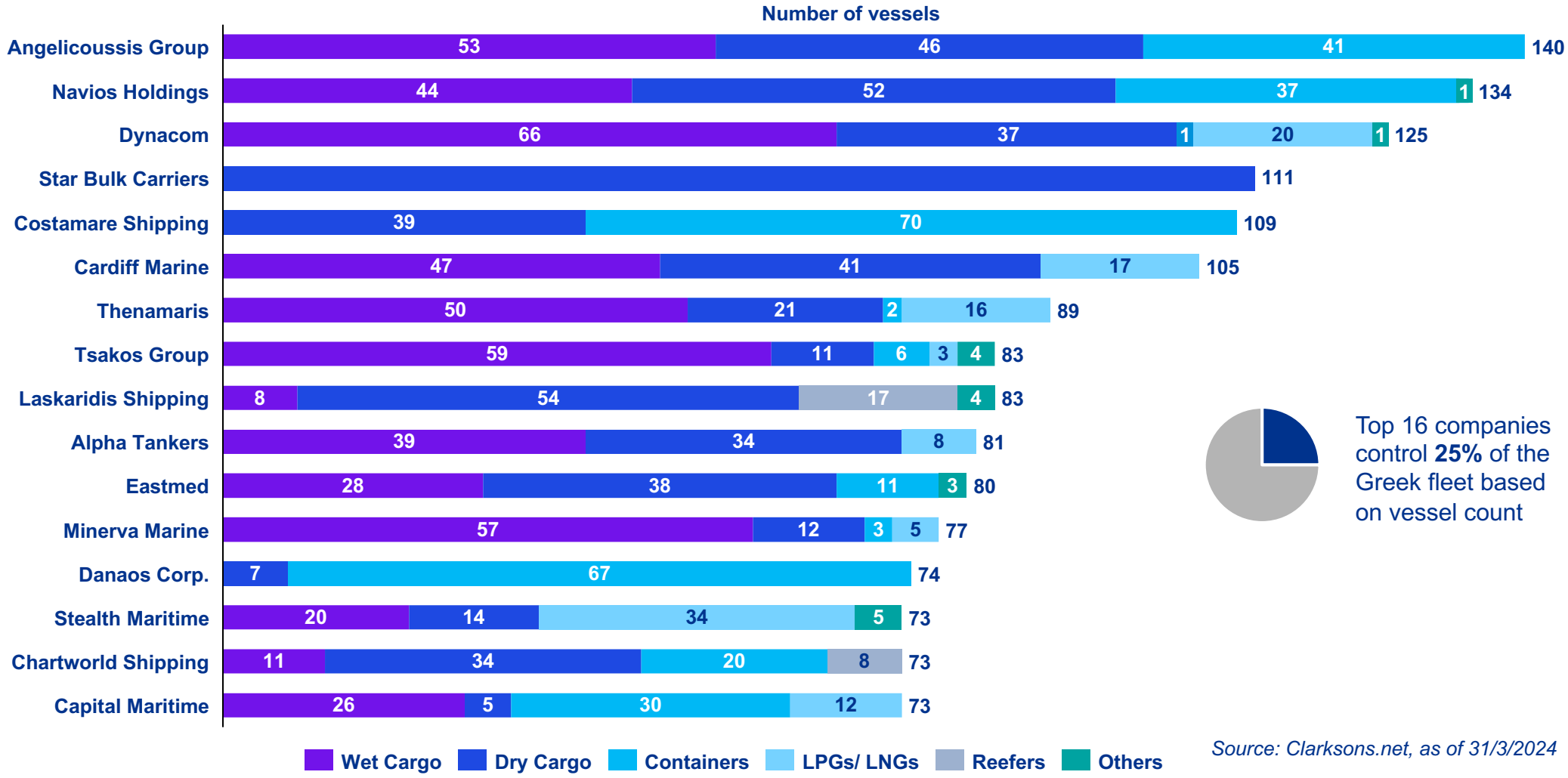
Greek fleet's **average age stands consistently lower than the global average**, making it reliable and competitive, as well as more resilient in the upcoming challenges for the industry (i.e. carbon footprint).

While **Greece stands above China and Japan in DWT controlled, it emitted less carbon dioxide than both countries** (UNCTAD – *2022 data*).

Sources:1) UNCTAD –Review of Maritime Transport 2023,
2) Clarksons.net, as of 31/3/2024

Key players in Greece (fleet size)

Below are presented the top 16 Greek shipowners based on ship count, along with a breakdown of their vessel types.

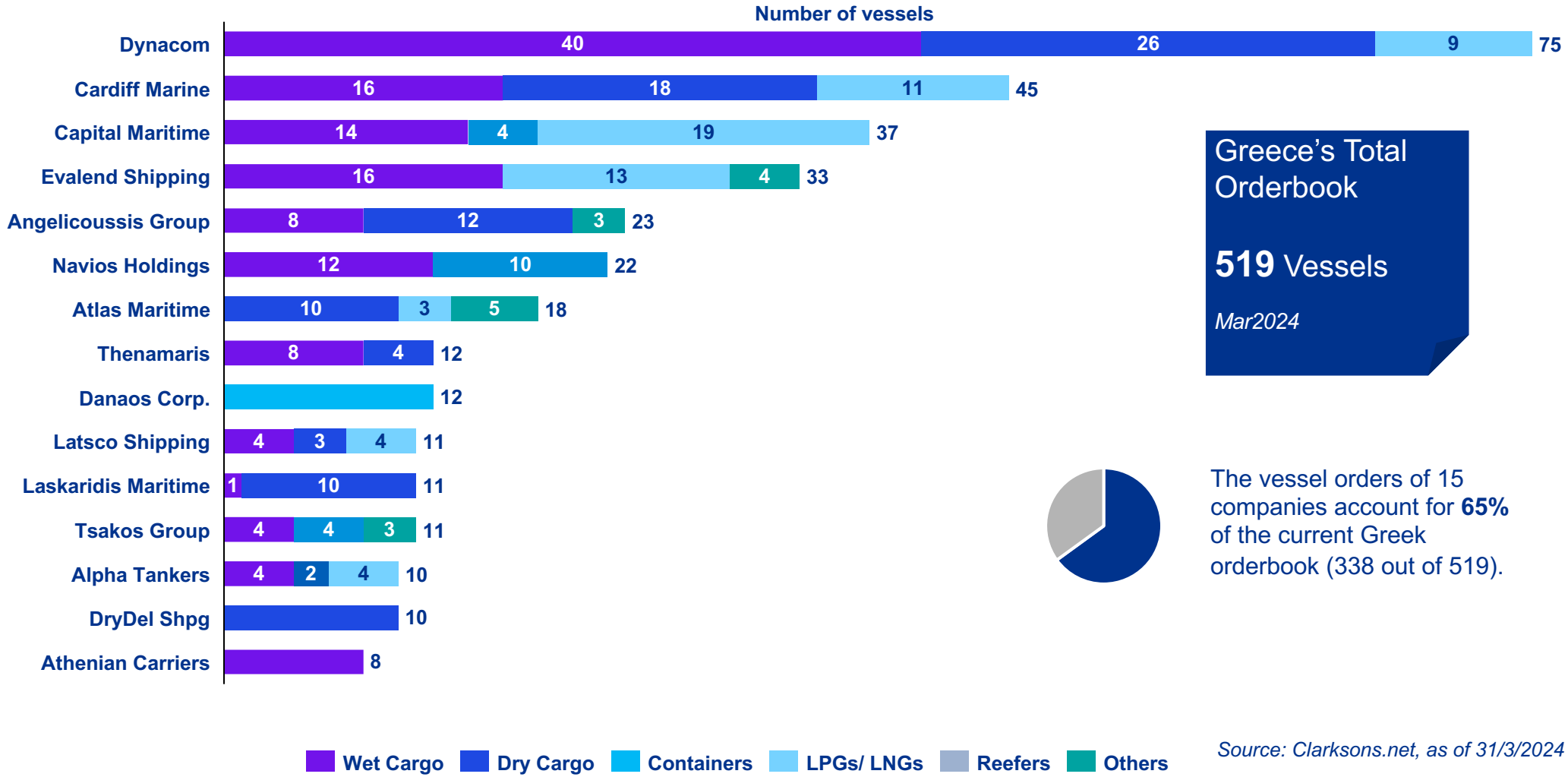


Top 16 companies control **25%** of the Greek fleet based on vessel count

Source: Clarksons.net, as of 31/3/2024

Key players in Greece (orderbook size)

Below are presented the top 15 Greek shipowners based on orderbook size, along with a breakdown of the vessel types ordered.



Greece's Total Orderbook

519 Vessels

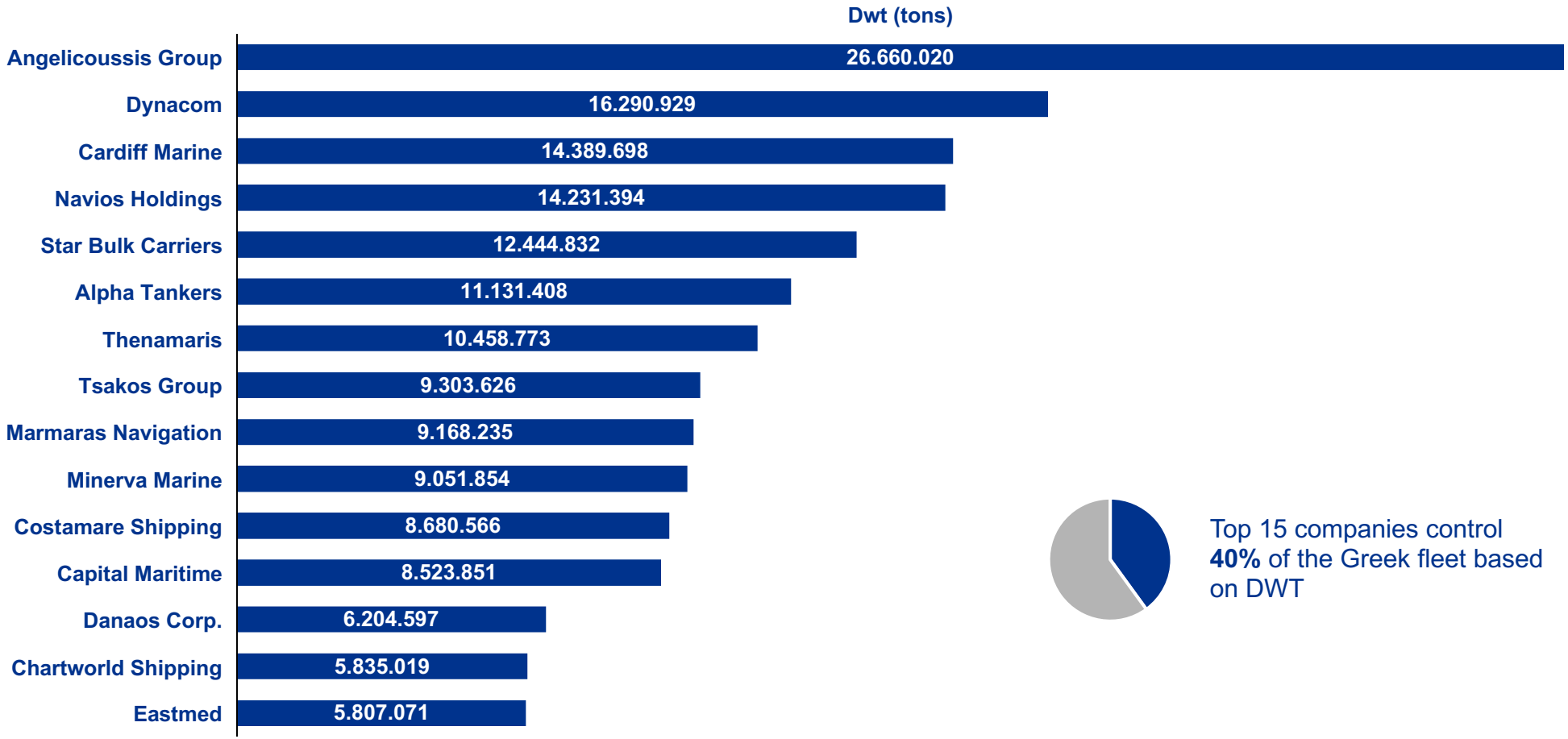
Mar2024

The vessel orders of 15 companies account for **65%** of the current Greek orderbook (338 out of 519).

Source: Clarksons.net, as of 31/3/2024

Key players in Greece (fleet capacity)

Below are presented the top 15 Greek shipowners based on DWT.

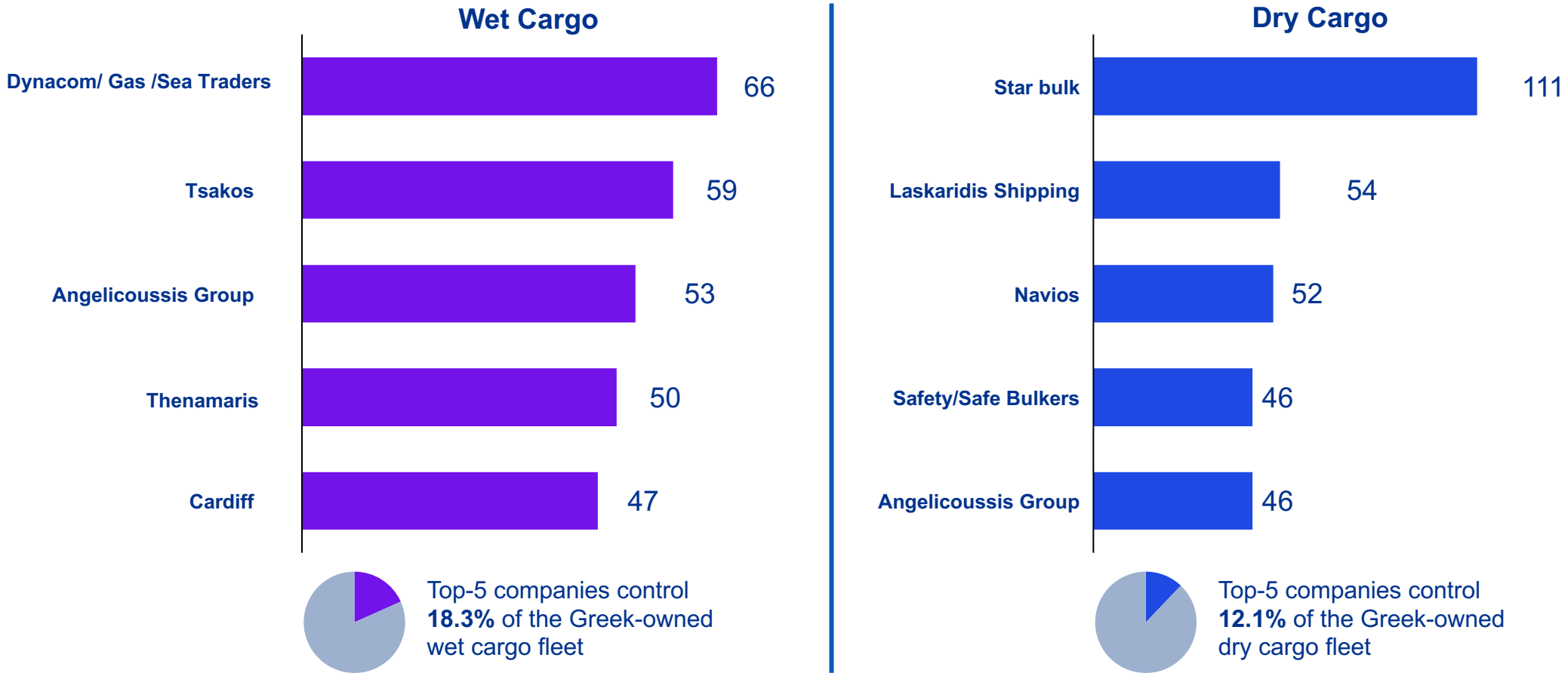


Top 15 companies control **40%** of the Greek fleet based on DWT

Source: Clarksons.net, as of 31/3/2024

Key players per type (Wet – Dry Cargo)

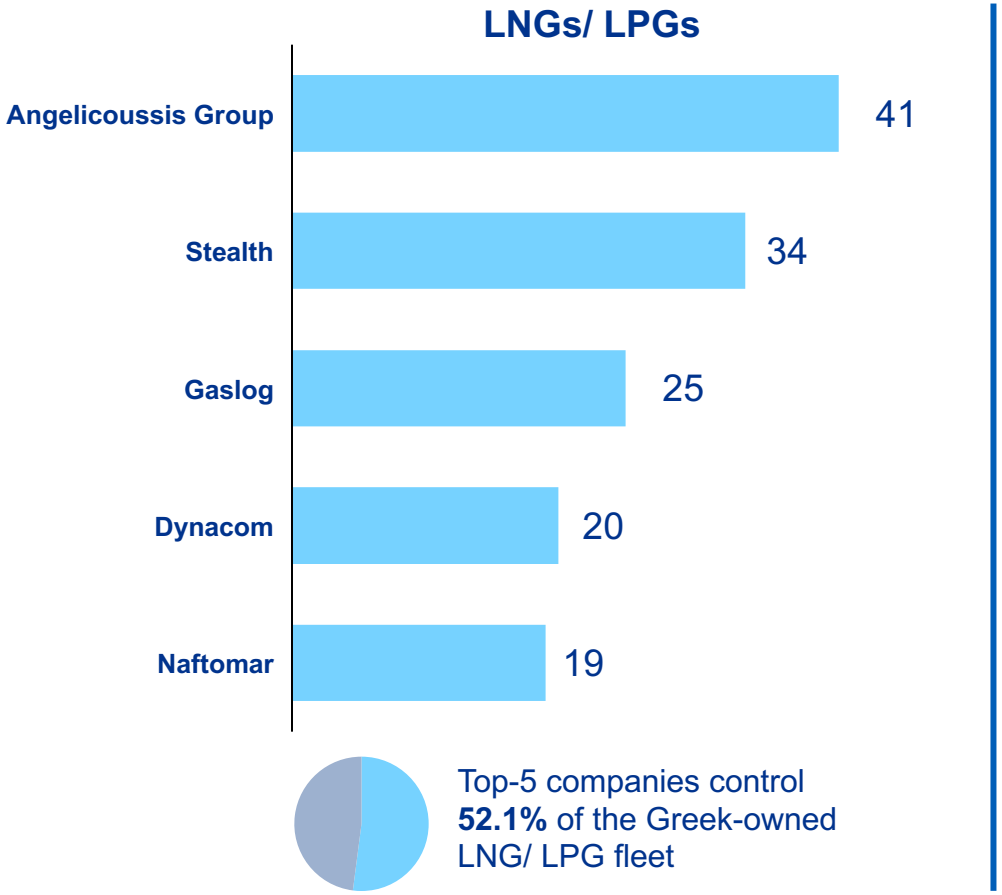
Below are presented the top 5 Greek shipowners for wet cargo and for dry cargo ships, based on vessel count.

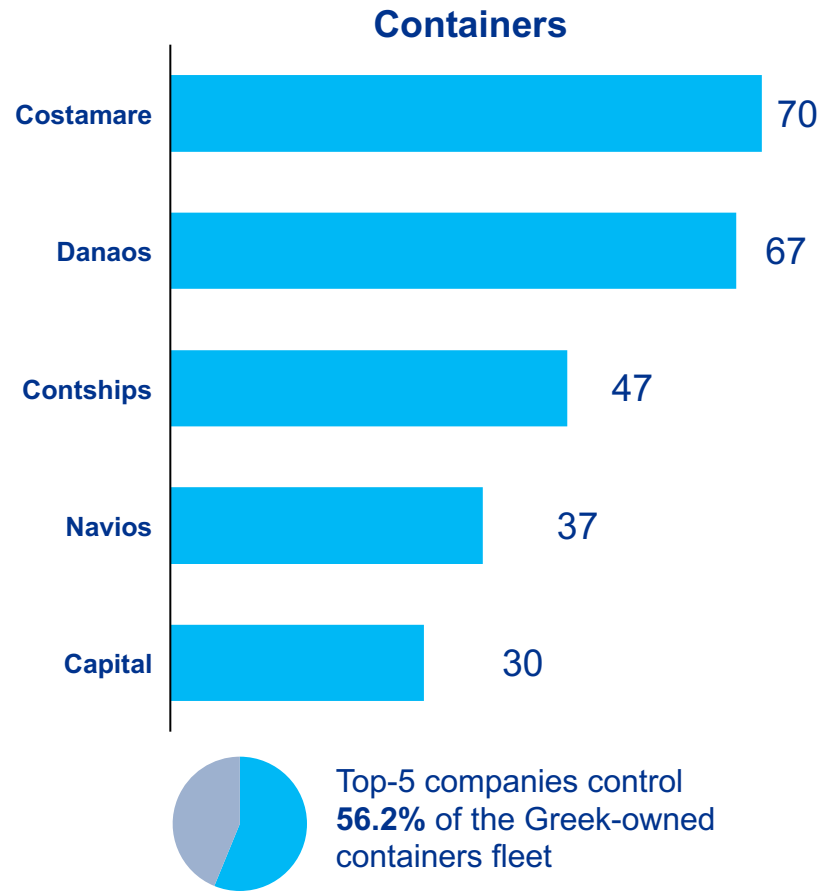


Source: Clarksons.net, as of 31/3/2024

Key players per type (LNGs/ LPGs – Containers)

Below are presented the top 5 Greek shipowners for LNG/LPG and for Container ships, based on vessel count.





Source: Clarksons.net, as of 31/3/2024

04
Trends & Challenges

Key trends

Key trends — Summary

The below mentioned are the emerging trends that highlight the transformative potential of the shipping and port industry

Decarbonization and the energy transition

Supply chain optimization

E-commerce growth and new consumption patterns

Digitalization

Port and Shipping display dynamic nature

Building resilience

Key trends (1/3)

The below mentioned are the emerging trends that highlight the transformative potential of the shipping and port industry

Decarbonization and the energy transition

About 6% of post-COVID-19 stimulus targeted GHG emission reduction, but the Russia-Ukraine conflict's impact on fuel prices may sideline decarbonization efforts. **The maritime industry, responsible for 2.8% of global GHG emissions, could see increases if coal use rises or biofuel use declines**. EU's Russian oil imports dropped significantly in 2022, with the U.S., Norway, and Kazakhstan becoming top crude suppliers. **Over 40% of marine cargo is fossil fuels, and the shift towards cleaner energy will reshape shipping demands, vessel designs, fuel usage, and port operations to cut GHG emissions**.

Digitalization

Trade and maritime transport are evolving with technology adoption, such as digital shopping and automation, which could modify global production and trade patterns. **Maritime trade, initially slow to digitalize, is now embracing IoT, blockchain, big data, and AI to improve efficiency and resilience**. Ports are using smart technologies to upgrade operations and management, with the smart ports market expected to grow from $1.9 billion to $5.7 billion at a 24.3% CAGR from 2022 to 2027.

Key trends (2/3)

The below mentioned are the emerging trends that highlight the transformative potential of the shipping and port industry

Supply chain optimization

The 2020 pandemic fueled anti-globalization and exposed the just-in-time model's vulnerabilities, previously tested by natural disasters and trade tensions. The global geopolitical climate in 2023 highlighted the dangers of over-reliance on few suppliers, as seen with Taiwan's dominance in semiconductor manufacturing affecting multiple industries. **These events have reignited debates on globalization and lean supply chains, prompting businesses to consider reshoring and diversifying supply chains for greater resilience and security**.

Port and Shipping display dynamic nature

In the dynamic maritime transport sector, stakeholders are balancing various goals. Some carriers are expanding fleets, offering air freight, and online shopping services to control supply chains fully. Others are adapting networks, exploring new routes, and integrating rail from China to Europe. Governments are reacting with increased oversight, as seen with the U.S. Federal Maritime Commission amid high freight rates. **Shippers are securing long-term contracts for space and rates, while considering alternatives like air freight.**

Key trends (3/3)

The below mentioned are the emerging trends that highlight the transformative potential of the shipping and port industry

E-commerce growth and new consumption patterns

The pandemic spurred a shift to online shopping, with e-commerce rising to 19.7% of retail sales in 2022 and projected to hit 24% by 2026. **This growth is prompting a logistics rethink, with maritime operators investing in e-commerce and last-mile logistics**, exemplified by A.P. Moller Maersk's acquisitions. Warehouse management is adapting to these trends, facing historically low vacancy rates, prompting solutions like multi-story warehousing to address space constraints.

Building resilience

Companies are embedding risk management and readiness into their operations for risk dispersion and reducing core business disruptions. **They're focusing on "resilience by design" for long-term solutions and strategic opportunities, rather than short-term fixes**. Supply chain and logistics networks are being planned with long-term resilience in mind. For ports, resilience-building is a strategic, ongoing process, adaptable to each port's unique context. **Effective collaboration at national and international levels is crucial for addressing bottlenecks, requiring support for developing countries through financial aid, technical assistance, and capacity-building**.

Key challenges

Key challenges - Summary

The below mentioned are the challenges that possess transformative potential for the shipping and port industry

Environmental concerns

Rapid technological change

Shortage of skilled talent

Political unrests

Key challenges (1/2)

The below mentioned are the challenges that possess transformative potential for the shipping and port industry

Environmental concerns

The maritime industry, handling around 90% of global goods transport, could cause 17% of human carbon emissions by 2050. To meet sustainability goals, stricter environmental regulations are being enforced, like the **mandatory Energy Efficiency Existing Ship Index (EEXI) calculation from January 2023**. The shift away from fossil fuels will accelerate oil rig decommissioning in favor of offshore wind farms, raising collision risks that necessitate improved marine navigation aids.

Shortage of skilled talent

The maritime industry's skills shortage is exacerbated by new technology adoption and a lack of young talent due to tough working conditions and long sea periods. COVID-19's lasting effects on crew changes and the Ukraine crisis impacting tanker officers worsen the situation. **With advanced technologies emerging, significant training is needed to meet safety standards. To attract talent, the industry should promote STEM education, environmental responsibility, and support schemes for women and underrepresented groups.**

Key challenges (2/2)

The below mentioned are the challenges that possess transformative potential for the shipping and port industry

Political unrests

Geopolitical tensions, like the war in Ukraine and Middle East, disrupt shipping routes and port operations, trapping vessels and altering supply chains, which spikes commodity prices and worsens crew shortages. The shipping industry also contends with growing environmental regulations, potentially incurring extra costs as it aims to cut carbon intensity by 70% by 2050.

Rapid technological change

Embracing new technologies is key to the maritime industry's efficiency and growth. AI will enhance route planning, aiding a 9.3% CAGR in autonomous shipping by 2030. Remote monitoring with sensor-equipped data buoys will increase shipping cost-effectiveness, while digital data management provides detailed financial insights. However, rapid tech development poses challenges in adoption and troubleshooting. Additionally, increased cyber security risks threaten ships and crews.

05
Green Shipping Imperative

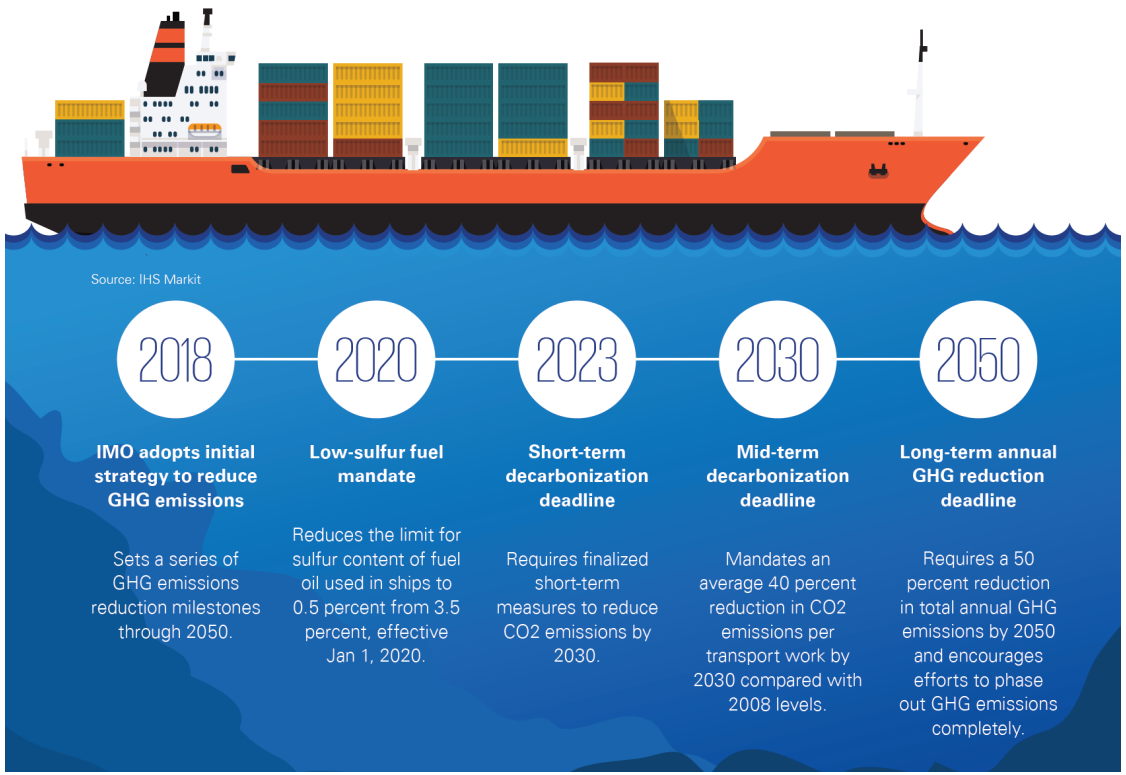
IMO's GHG Reduction Strategy

Even though the earth's climate has changed throughout history, in recent times and specifically since the industrial revolution, the global temperature has been increasing at an alarming rate,. According to studies, there has been an increase of about 0.9 degree Celsius in the planet's average surface temperature since the late 19th century. This is largely driven by the greenhouse effect occurring mostly due to man-made greenhouse gas (GHG) emissions. Economic activities causing the build-up of GHGs in the atmosphere. are the combustion of fuels for producing energy and resulting from transport, taking up around two thirds of the total GHG emmissions[1], which can be attributed to the sector's extreme dependency of fossil fuels.

As a proactive response to the catastrophic phenomena the climate change brings, many countries have committed to the reduction of their GHG emissions in the Paris Agreement. This agreement aims at keeping the rise of global warming to well below 2 degrees Celsius above pre-industrial levels and at pursuing efforts to limit the rise to 1.5 degrees.

The International Maritime Organization (IMO), a UN body formed to specialize in the creation of international treaties and other important regulations to ensure safety and sustainability in the maritime environment, has embarked on a vision to reduce the GHG emissions from international shipping by 50% and carbon intensity by 70% by 2050 (compared to the 2008 emissions) and tackle climate changes resulted by maritime transport.

In April 2018 (Figure X), the Initial IMO Strategy on Reduction of GHG Emissions from Ships[3] was adopted to enhance IMO's contribution to global efforts in reducing GHG emissions from international shipping.



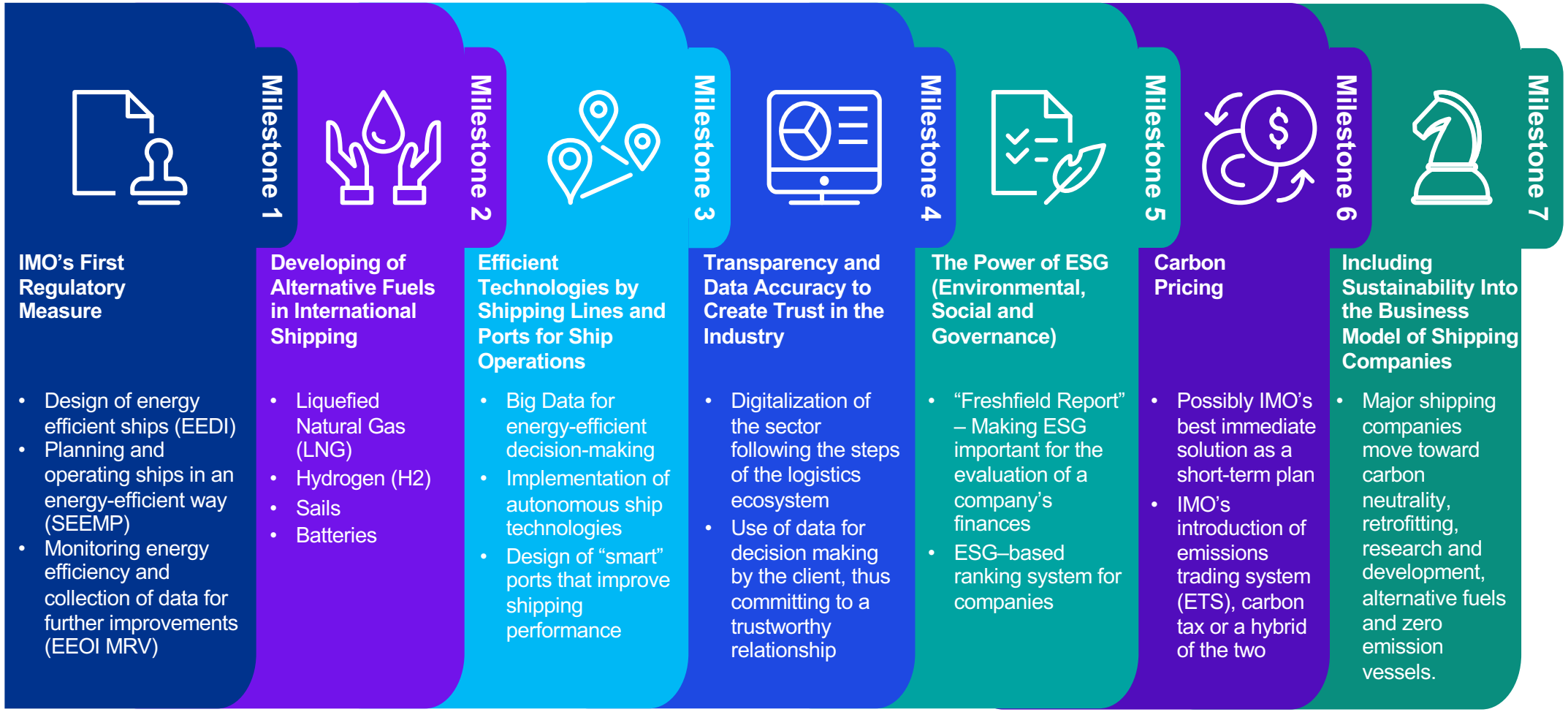
Sailing towards zero-emission container shipping

1 https://www.iea.org/reports/co2-emissions-from-fuel-combustion-overview

2 https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

3 http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx

Pathway to Green Shipping – The seven recognized milestones



EU Emissions Trading System

The European Union Emissions Trading System (EU ETS) is a cornerstone of the EU's policy to combat climate change and a key tool for reducing greenhouse gas emissions cost-effectively. It is the world's first major carbon market and remains the biggest one.

The EU ETS works on the 'cap and trade' principle. A cap is set on the total amount of certain greenhouse gases that can be emitted by installations covered by the system. The cap is reduced over time so that total emissions fall. Within the cap, companies receive or buy emission allowances, which they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value.

Since January 2024, the EU's Emissions Trading System (EU ETS) has been extended to cover CO2 emissions from all large ships (of 5000 gross tonnage and above) entering EU ports, regardless of the flag they fly.

Emissions included

50% of emissions from voyages starting or ending outside of the EU (allowing the third country to decide on appropriate action for the remaining share of emissions);

100% of emissions that occur between two EU ports and when ships are within EU ports.

Emissions covered

The EU ETS covers CO2 (carbon dioxide), CH4 (methane) and N2O (nitrous oxide) emissions, but the two latter only as from 2026.

The system covers CO2 emissions from all activities that take place when a ship is at sea, during voyages between EU ports, and while at berth in EU ports. This includes emissions from:

- **Main engines and auxiliary engines used for propulsion.**
- **Cargo handling equipment.**
- **Loading and unloading of cargo.**

EU Emissions Trading System

Emissions from maritime transport are included in the overall ETS cap, which defines the maximum amount of greenhouse gases that can be emitted under the system. The cap is reduced over time to ensure that all ETS sectors contribute to the EU's climate objectives. This will incentivize energy efficiency, low-carbon solutions, and reductions of the price difference between alternative fuels and traditional maritime fuels.

To ensure a smooth transition, shipping companies only have to surrender allowances for a portion of their emissions during an initial phase-in period (the first surrendering deadline falls due in September 2025 in all Member States, in respect of emissions reported as taking place from 1 January 2024 to 31 December 2024):

:

2025 — **40%** of their emissions reported in 2024

2026 — **70%** of their emissions reported in 2025

2027 onwards — **100%** of their reported emissions

Impact on Shipping

Increased Costs

Shipping companies have to pay for their emissions allowances, leading to increased operating costs. This cost is usually passed down the supply chain, potentially leading to higher prices for consumers.

Incentivizing Decarbonization

The EU ETS incentivizes shipping companies to reduce their emissions. They can do this by investing in more fuel-efficient ships, using alternative fuels, or optimizing their routes.

Administrative Burden

Compliance with the EU ETS requires monitoring, reporting, and verification of emissions, which can be administratively burdensome for shipping companies.

Competition Issues

There are concerns that the EU ETS could put European shipping companies at a competitive disadvantage compared to those outside the EU.

Overall, the EU ETS's impact on shipping is significant. While it aims to reduce emissions and promote sustainability, it also presents challenges such as increased costs and administrative burdens.

Climate Change and Green Shipping Imperative

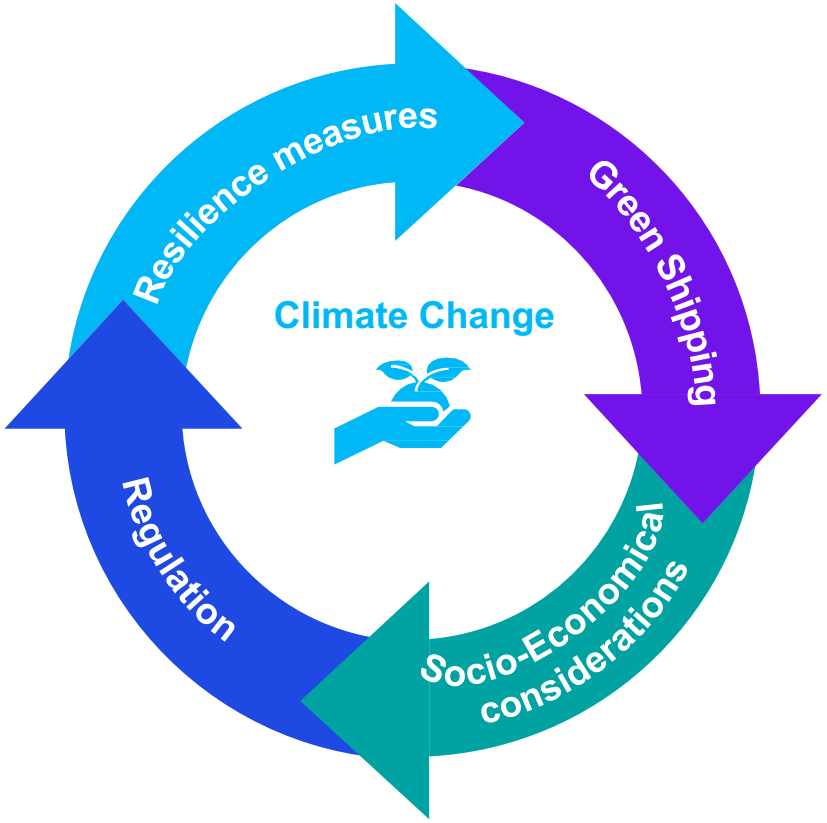
Weather extreme conditions that were almost unheard of in 2022 are anticipated to become more frequent and intense as a result of climate change. Recently, we hear more about extreme heat, summer floods, hurricanes, tornados and glacier melting.

Extreme weather conditions are influenced by global warning and carbon emissions, therefore Climate Change is natively tied to Green Shipping as any improvements in the latter's aspects (e.g. decarbonization) will lessen extreme events and risks for disruptions.

Shipping is directly affected from climate change as ports are built across open coasts or low-lying estuaries and deltas, which makes them significantly exposed to natural hazards such as rising sea levels, storm surges, waves and winds, flooding, as well as tectonic events (e.g. tsunamis). Out of these events, increasing sea levels phenomenon is alarmingly growing and pose an important threat for seaports.

Enhancing port's climate resilience appears to be of great socio-economical importance for the global economy and society. Focusing to ports' resilience is also significant for small island developing States (SIDS) and other vulnerable coastal and island nations to allow them explore the potential and benefits of sustainable development. Ports consist critical assets for SIDs and immense natural events may lead to SIDs exposure in developmental and financial risks. Strong legal and regulatory frameworks, as well as strategies, policies and plans to lessen SIDS vulnerability, are all necessary for effective adaptation.

De-escalating aspects of Climate Change



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Source: UNCTAD

The rising sea levels

Sea Level Rise (SLR) poses significant financial risks to port operations and interconnected global supply chains, resulting in direct infrastructure damages and operational disruptions. Economic losses escalate due to delays in cargo handling and transport, amplifying the impacts across the entire supply chain network.

SLR is mainly driven from global warming effect. Some alarming metrics indicate the significance of global warming effect's evolution over the years:

- Global warming of more than 1.0°C above pre-industrial levels has already been observed
- Predictions expect this to reach 1.5°C as early as in the 2030s
- The maximum acceptable threshold before climate change risks become unacceptably high is 2°C of global temperature increase and it may be reached by the 2050s, depending on the future GHG emissions
- The latest UNEP Emissions Gap Report indicates that the world is still heading for a temperature rise in excess of 3°C this century, which is far beyond the Paris Agreement goals of limiting global warming to below 2°C.

Global warming can force large mean sea level changes by the combination of ocean thermal expansion, ocean water mass increases from the melting of the continental ice sheets, caps and glaciers and isostatic adjustments.
Recent Mean SLR projections suggest a global mean of 4.0 cm per decade (WMO, 2021). By 2100, with 2°C of global warming above pre-industrial levels, global SLR will be 30 - 93 cm higher than the mean of 1986-2005 period (IPCC, 2018). Recent studies suggest that polar and mountainous glaciers will lose between about 18 and 36 % of their ice mass (relative to 2015) over the course of the 21st century, depending on the climate scenario (IPCC, 2019 SROCC).

Source: UNCTAD

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Moving towards a resilient landscape

The severe impact of changing weather conditions becomes evident by looking back to the near future at some representative cases of financial losses caused by weather-related disasters:

- 2012: Over US$ 62 billion losses in New York, New Jersey and Connecticut from hurricane Sandy, including extensive damage and a week-long shut-down of the US New York/New Jersey container port
- 2017: Total losses of US$ 320 billion during the Caribbean hurricane season, with damages and losses in many affected SIDS amounting to a significant share (or multiple) of GDP
- 2019: Total losses of US$ 3.4 billion from hurricane Dorian for the Bahamas, with a large fraction of these damages/losses associated with transport infrastructure

A recent study estimates that the total value of assets exposed to episodic coastal flooding by 2100 could increase to 12- 20 % of the global GDP, if no adaptation measures are taken. According to the World Bank, the overall net benefits of investing in resilient infrastructure in developing countries could amount to $4.2 trillion over the lifetime of new infrastructure - a $4 benefit for each dollar invested in resilience.

Crafting effective strategies for climate adaptation in ports necessitates a collective approach involving policymakers, industry players, international bodies and development partners. The urgency of the situation cannot be overstated, as delayed action may lead to severe economic and trade implications, particularly for vulnerable communities like SIDS, undermining their sustainable development goals. Therefore, adaptation strategies must address not only direct damages but also the broader socio-economic impacts on communities and global supply chains. All things considered, these factors underscore the urgent need for comprehensive climate change measures in coastal regions, focusing on infrastructure resilience and stakeholder collaboration.

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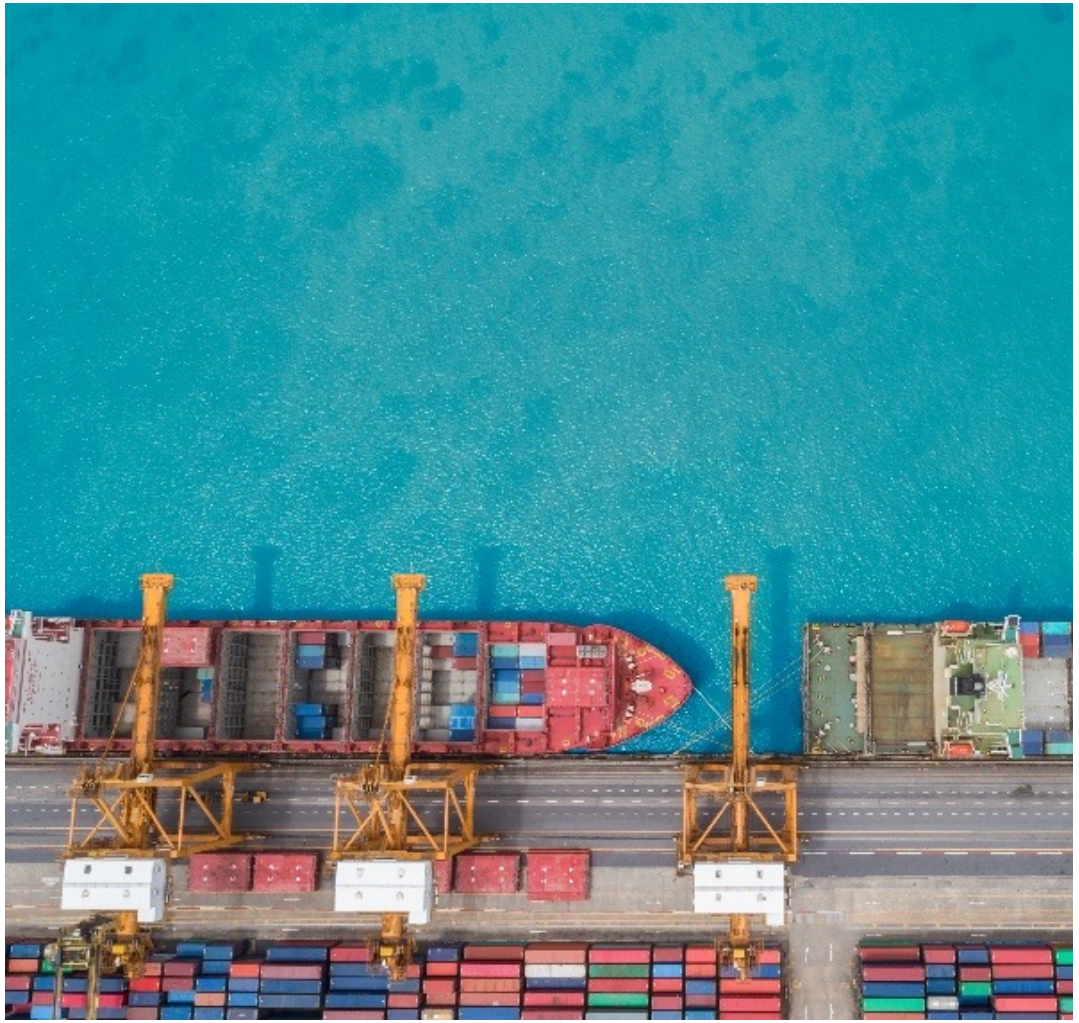


Source: UNCTAD

Greece leads by example sailing towards blue economy and green shipping

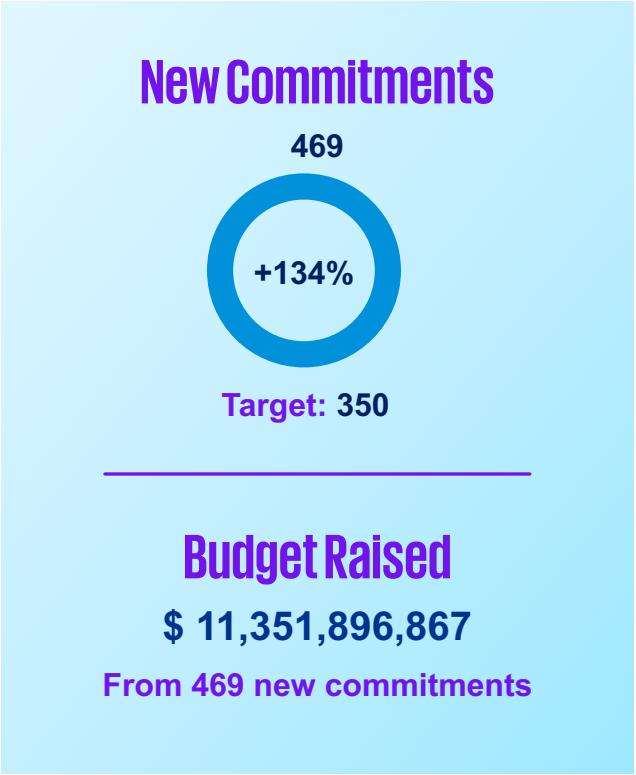
Greece hosted the 9th Our Ocean Conference in 2024. The Conference took place in Athens, at the Stavros Niarchos Foundation Cultural Center, on the 16th and 17th of April. By hosting the 9th Our Ocean Conference, Greece reaffirmed its commitment to transition to a “Blue economy” to harness the advantages of a new balance between economic development (growth), social cohesion, and sustainability as well as addressing some key challenges such as climate change and sustainable shipping activities.

Our Ocean Conference 2024 called for actions in six areas:
- Marine Protected Areas
- Sustainable Blue Economies
- Climate Change
- Maritime Security
- Sustainable Fisheries
- Marine Pollution.

During the 9th Our Ocean Conference 469 new commitments have been closed raising a budget of approximately USD 11,5 billion.

The Our Ocean Conference consists a great initiative that has already mobilized more than 2,160 commitments worth approximately USD 130 billion since 2014. Only during the 8th Our Ocean Conference more than 360 commitments worth USD 22 billion across the six issue areas of the conference have been closed.

The 9th Our Ocean Conference’s key focus areas addressed four aspects that have an enabling character over its committed areas of actions:
- Sustainable tourism in coastal areas and islands
- Reduction of marine plastic and microplastic pollution
- Green shipping
- Green transition in the Mediterranean.



It is worth noting that Green shipping & Green transition in the Mediterranean imperatives have been stressed out during the Conference, which aimed in taking concrete, measurable and impactful commitments as key outcomes engaging the public sector, private sector and civil society organizations. Greece’s vision is to turn oceans into resilient and vibrant ecosystems through shared global actions and achieve world’s ocean ambitions.

1 9th Our Ocean Conference

06
AI in Shipping

AI in the Shipping Sector: An Overview

Artificial Intelligence (AI) is revolutionizing the shipping industry, offering increased efficiency, safety, and sustainability. AI's ability to learn and adapt makes it a versatile tool, capable of transforming operations from strategic decision-making to environmental conservation.

Key applications of AI in the shipping industry include planning the shipment of containers, optimizing container positioning, voyage planning and route forecasting, optimizing fuel consumption and reducing emissions, enabling autonomous ships and port operations, predictive maintenance, dynamic pricing, demand predictions, safety and security enhancement. These applications are not just theoretical but are being actively implemented and tested in the industry. For instance, autonomous vessels powered by AI are being developed to reduce human error and increase efficiency. AI is also being used to optimize routes based on real-time data, leading to significant fuel savings and reduced emissions. Predictive maintenance, powered by AI, is helping to prevent equipment failures and reduce downtime. In cargo management and supply chain optimization, AI is being used to predict demand, optimize inventory, and streamline operations. AI is also being used to enhance safety through behavior-based safety systems and fire detection systems.

However, the integration of AI into shipping presents a complex array of benefits and challenges that need to be carefully navigated.

Use Cases of AI in Shipping

AI is being used in various ways in the shipping industry.

One of the key applications is in planning the shipment of containers. Predictive analytics enables shipping companies to optimize their vessel scheduling, using port calls data like destination, arrival time, trajectory, and trip duration to manage their trips most efficiently. Machine learning helps them deal with unpredicted scenarios caused by emergencies and enforced route changes.

AI is also revolutionizing the organization of container positioning. AI-fueled machinery can optimize the container positioning to make the best use of the available space. The machines position the containers using computer vision, making autonomous decisions after learning through unsupervised methods.

In the area of voyage planning and route forecasting, AI is being used to optimize routes based on real-time data, enabling companies to react to unexpected events and choose the most time-effective alternatives. AI is also playing a crucial role in optimizing fuel consumption and reducing emissions. AI solutions facilitate the ship's carbon print reduction, such as route forecasting involving fuel consumption factors.

Autonomous ships and port operations are another area where AI is making a significant impact. Machine learning algorithms can generate moves of the automated machinery, enabling partial autonomy of the units like ships or ports.

Predictive maintenance is another key application of AI in the shipping industry. AI allows companies to identify machinery issues before they escalate, causing downtimes and affecting the whole supply chain.

For safety, AI is being used in behavior-based safety systems to analyze CCTV footage and identify crucial safety and security events in real time. This approach enhances the understanding and assessment of the safety culture on board, facilitating the sharing of insights and best practice with the crew and fleet.

In terms of fire detection, AI-based systems analyze real-time video feeds from onboard cameras, enabling them to detect potential fire hazards even before smoke or flames become visible. These systems can learn from previous incidents, enhancing their accuracy over time and providing greater protection for the ship and its crew.

AI is also being used for dynamic pricing in the shipping industry. The dynamic pricing algorithms estimate the revenue-optimal price using the demand function, built based on historical data.

Finally, AI is being used for demand predictions. Considering the complexity of the maritime supply chains and the long duration of shipping goods, accurate predictions can save companies from financial and operational consequences.

In addition to these, AI is also being used to streamline back-office operations with Natural Language Processing (NLP), enabling autonomous shipping and other impressive innovations.

Challenges and Considerations in Implementing AI

While AI offers numerous benefits, it also poses challenges.

Cybersecurity is a major concern, requiring robust measures to prevent potential compromises. As operations become more digital, they also become more vulnerable to cyber threats. Protecting sensitive data and systems is a significant challenge that needs to be addressed.

AI's effectiveness relies heavily on accurate and comprehensive data. Ensuring AI has access to such data is crucial for its effectiveness. However, collecting and managing this data can be complex and costly.

Overreliance on AI should be avoided. While AI can assist in decision-making and operations, it should not replace human judgment and oversight. Traditional methods for tasks like collision avoidance should still be used. Training for users is essential to ensure they understand how to use AI confidently and are aware of its limitations.

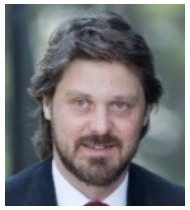
Ethical issues such as crew privacy also need to be considered. AI often relies on input from cameras and real-time footage, raising concerns about crew privacy. Robust procedures need to be in place for handling AI data to ensure privacy and compliance with relevant legislation. A holistic approach that combines AI with human oversight is necessary to unlock its full potential and mitigate the risks associated with its implementation.

We are not responsible for data and figures originated from well-known and reputable sources which are referred accordingly in our survey entities.

07

Our team

Our team of local experts



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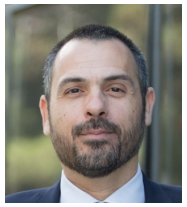

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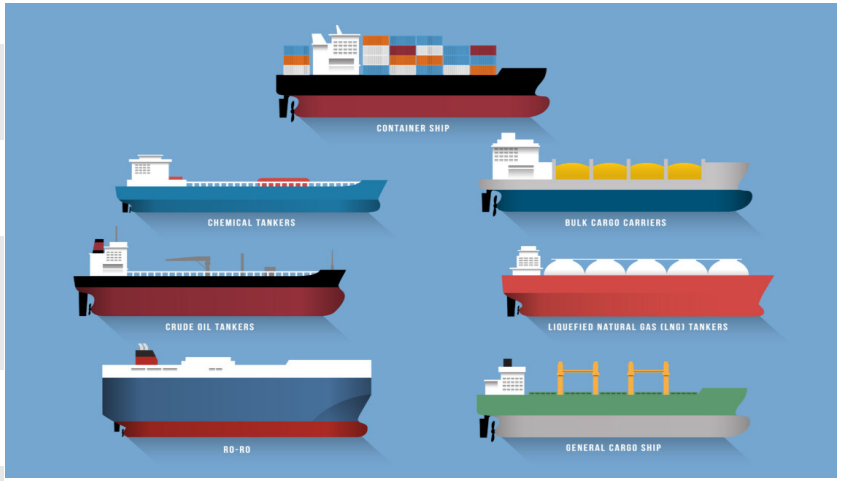
08
Glossary

Glossary

Term	Definition
Wet cargo	Wet cargo vessels are usually oil-based but may also include chemical product tankers.
Dry cargo	Dry cargo vessels include bulk, general and breakbulk and Ro-Ro carriers.
LPG/LNGs	Vessels designed to carry Liquefied Petroleum Gas (LPG) or Liquefied Natural Gas (LNG) under pressure.
Containers	Container ships are designed to carry containers predominantly on liner routes.
Reefers	Refrigerated cargo ship typically used to transport perishable cargo, which require temperature-controlled handling (i.e. fruits, dairy products, meat etc.)
Dirty Tanker	An oil tanker used to transport crude oil or other black oils such as residual fuel oil
Clean Tanker	A tanker that is dedicated to moving finished petroleum products so as to maintain their quality (i.e. gasoline, diesel etc.)
DWT	Deadweight tonne(s) is a measure of a ship's carrying capacity in metric tonnes, including cargo, bunkers, water, crew and provisions
GT	Gross tonnage is a unit of measurement of the volume of all ship's enclosed spaces measured to the outside of the hull framing. One gross tonne is equal to 100 cubic feet or 2.832 cubic metres



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