



The Future of Shipping

Trends & Developments in the Greek Market

kpmg.com/gr

Table of Contents

1. Introduction

Seaborne trade	5
Categorization and age of global fleet	6
Greece's position in the global market	7
Impact of COVID-19 pandemic	9

2. Demand analysis

Sector's size and historical growth	11
Financial growth projections	12
Pricing - Freight rate indices	13

3. Supply analysis

Key players in Greece	16
Key players per market	18
Comparative analysis of key players	18

4. Trends, challenges & role of technology

Trends and developments	20
Recognized challenges	21
Path to digital transformation	22

5. Focused research: The pathway to green shipping

MO's GHG Reduction Strategy	24
Pathway to Green Shipping – The Seven Recognized Milestones	25

Glossary	33
-----------------	----

Our team of local experts	34
----------------------------------	----

Objectives

01

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.

03

Trends, challenges & role of technology

Identify trends, challenges and development opportunities as well as factors that drive innovations and more precisely the digital transformation of the sector.

02

Supply Analysis

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

04

Focused research – The road to green shipping

Present the seven milestones towards green shipping, which will serve shipping companies in their quest to align with IMO's GHG Reduction Strategy.

1. Introduction



1. Introduction

Seaborne trade

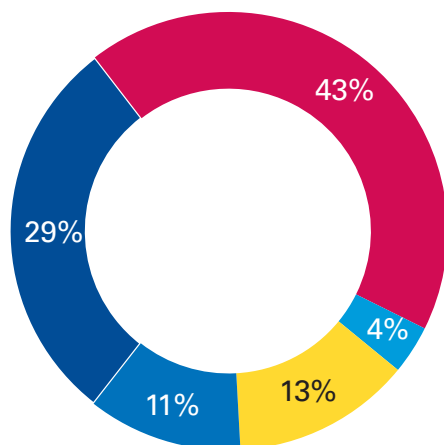


1. Introduction

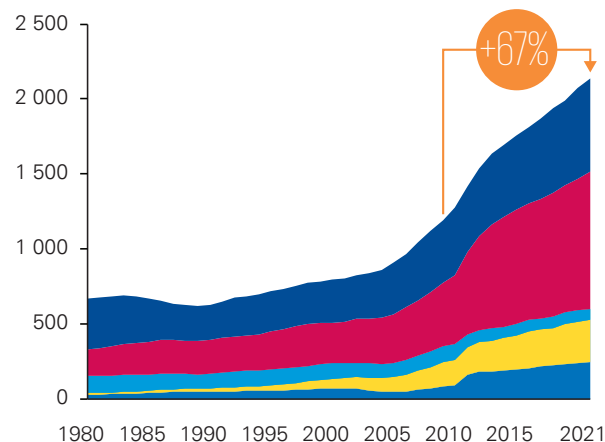
Categorization and age of global fleet

Global fleet (in terms of capacity) increased by 67% during the last decade. Oil tankers and bulk carriers represent almost 7 out of 10 vessels globally, whereas the global fleet's age varies between different types of vessels. Greek-owned fleet's age is 9.54 years, lower than the global average of 9.87 years.

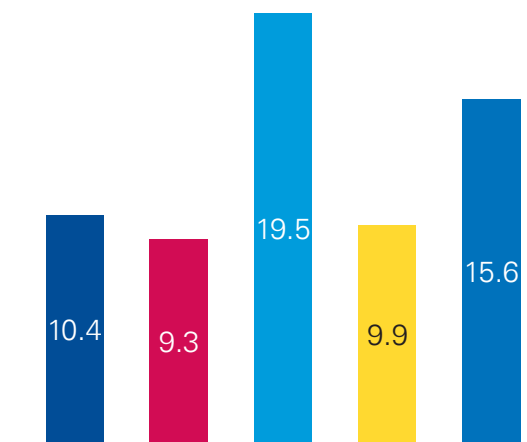
Global fleet's categorization – Dwt (2021)



Evolution of global fleet (1980-2021)



Global fleet's average age in capacity terms (2020)



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

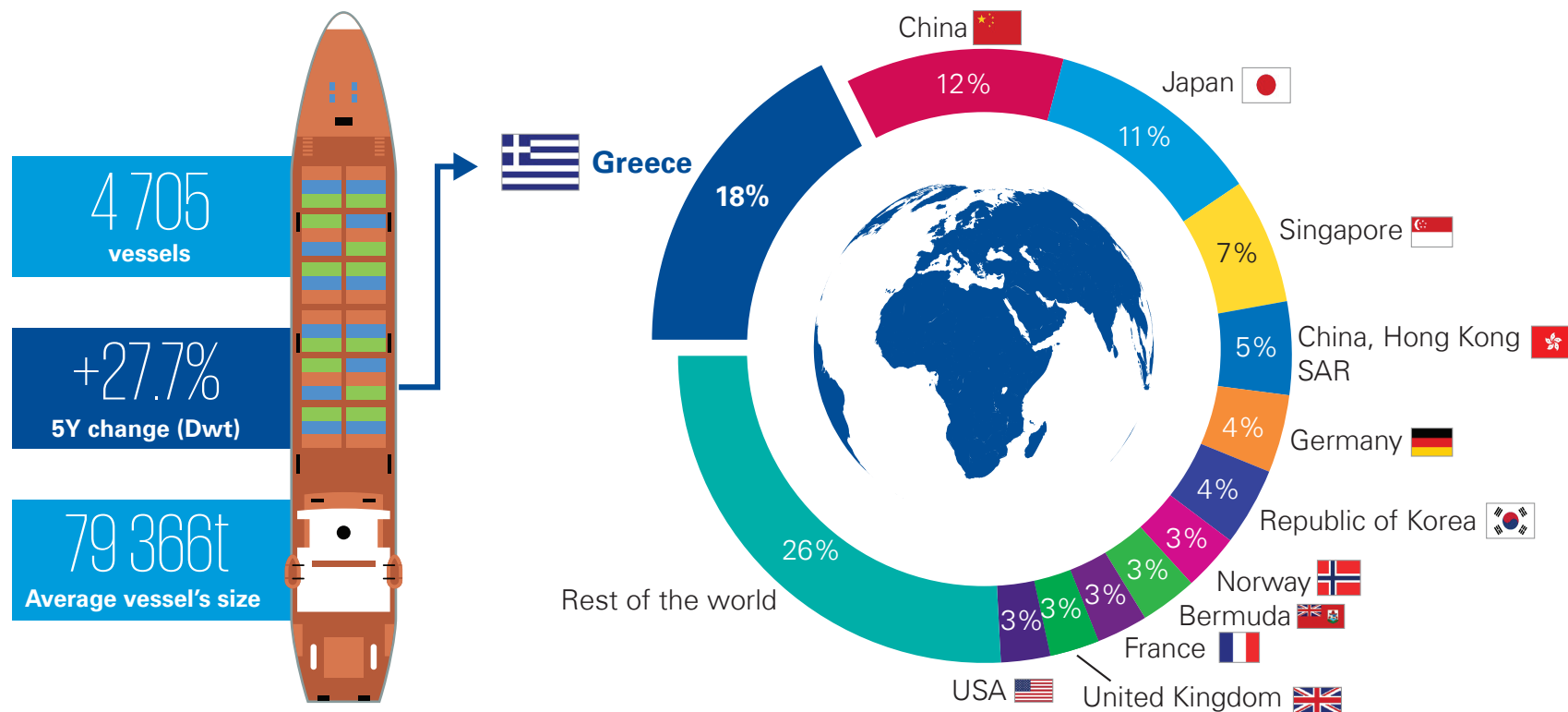
1. Introduction

Greece's position in the global market

The country ranks 1st globally in ownership of merchandise vessels, presenting a 28% 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 10th with 3% of global fleet (in capacity terms) to be registered in the Greek register.



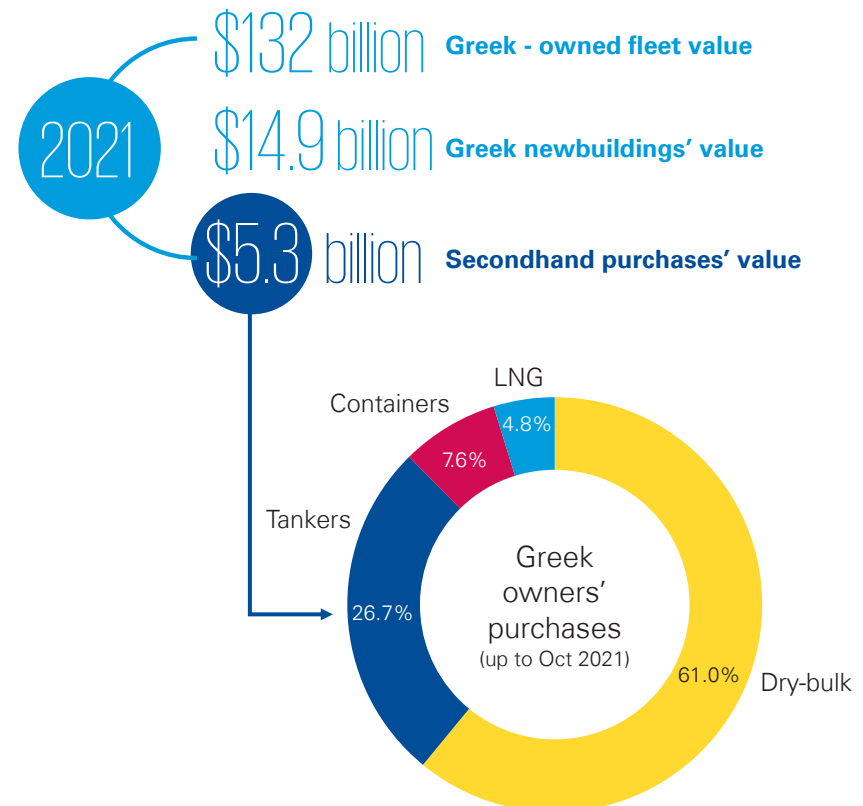
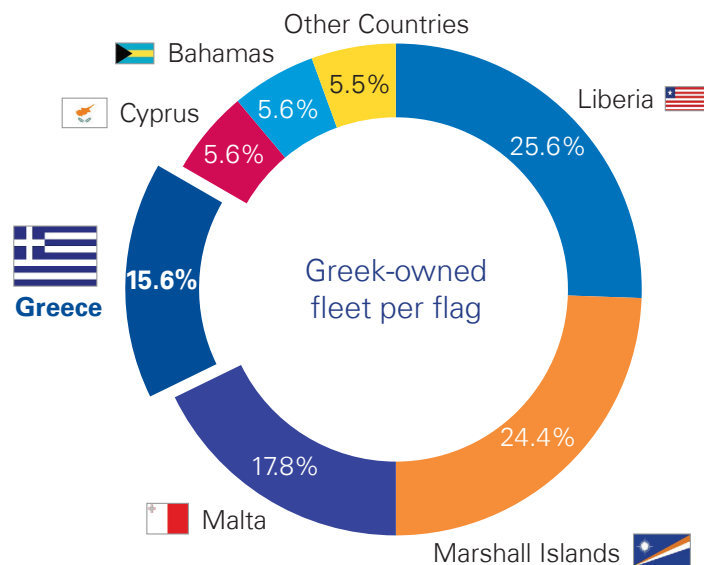
Source: 1) UNCTAD, 2) infomaritime.eu

1. Introduction

Greece's position in the global market

Greek-flag vessels represent 1% of the global fleet count, while they rise to 2.02% of the global gross tonnage count and dead weight tonnage.

Recent data show that Greek Shipowners are heavily investing in growing their fleets in 2021.



1. Introduction

Impact of COVID-19 pandemic

-3.4%

Global seaborne trade growth (2020)

Biggest recession rate after 2009 crisis

EU seaborne trade growth (2020)

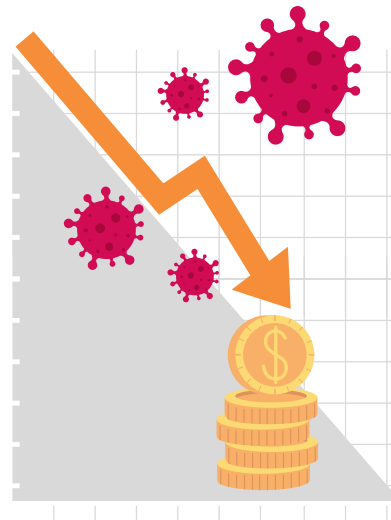
Significantly outreached global seaborne trade recession figures

-9.3%

-30%

New vessel orders

Attributed both to COVID-19 and "green" technology uncertainties



Average Intra-sector freight rates growth (2020)

High volatility throughout the year among with notable discrepancies between sectors

-2%

300k

Seafarers stranded at sea

Beyond their contracts' end

Global fleet growth (2021)

Average ship size increased by 1.73% during the same period

+3%

2. Demand Analysis



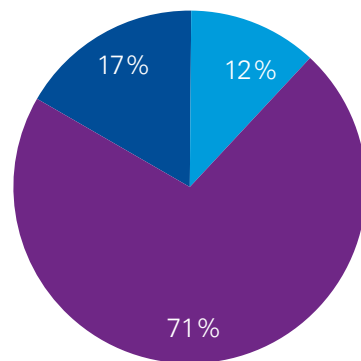
2. Demand Analysis

Sector's size and historical growth

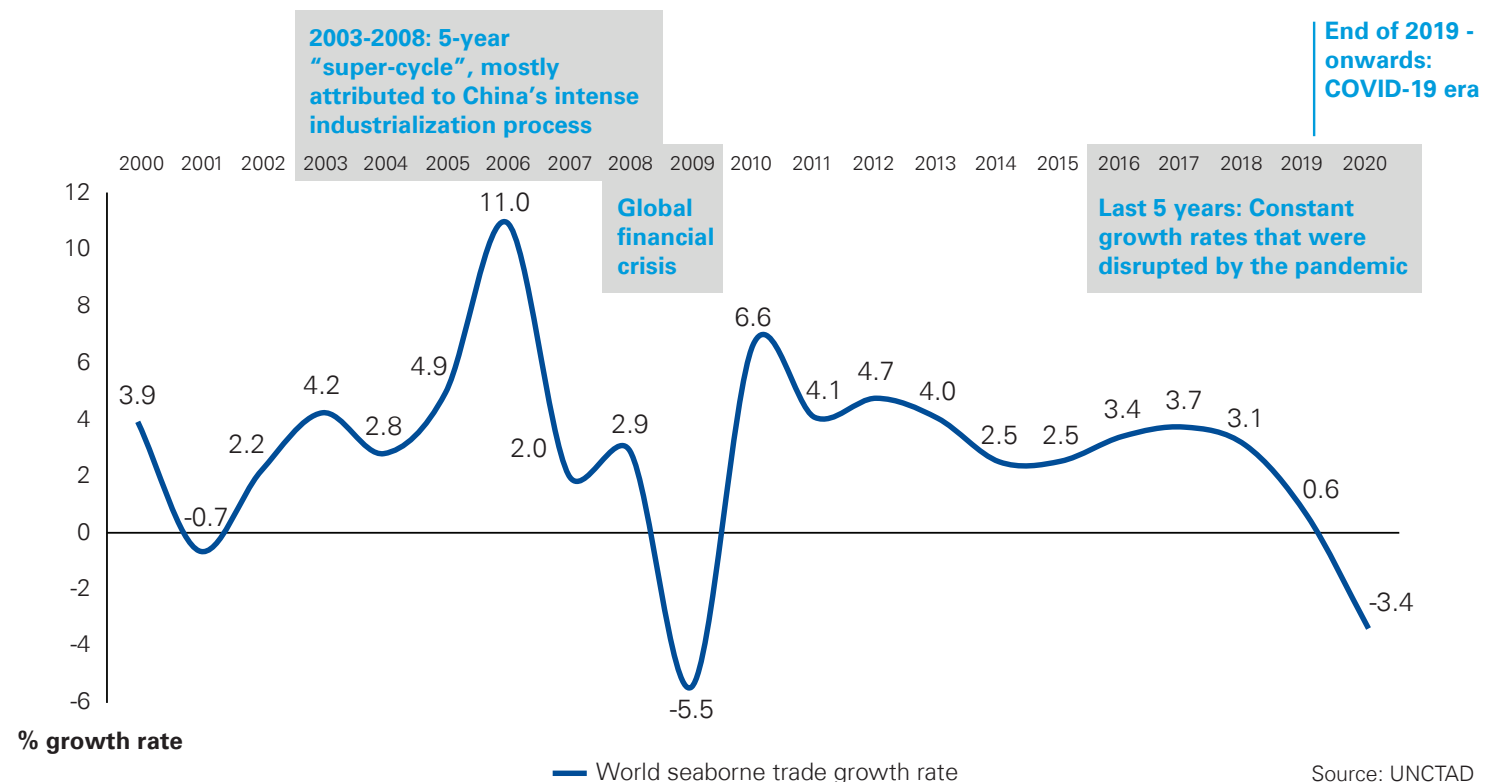
Shipping represents up to 90% of global trade in terms of capacity. Sector's historical growth is strongly related to the global economy as major political, economic and social events/ periods affected directly the demand for shipping services.

11 076

Million metric tons
loaded globally
in ports (2019)



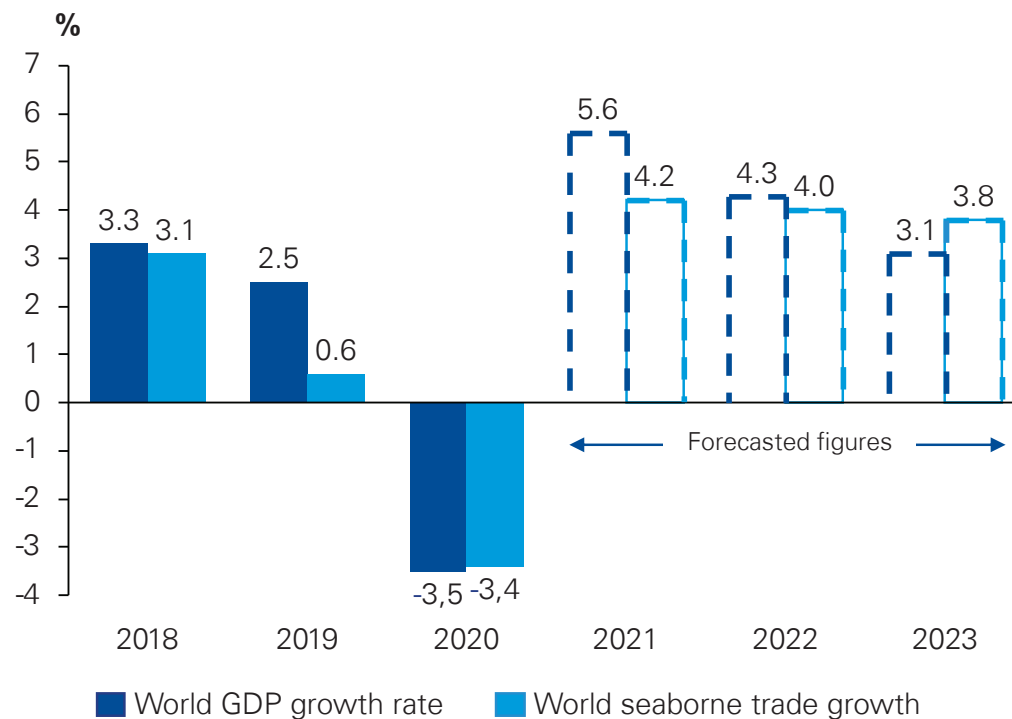
- Crude oil
- Other tanker trade
- Dry cargo



2. Demand Analysis

Financial growth projections

The global economy is set to expand 5.6 percent in 2021 - its strongest post-recession pace in 80 years. This recovery is uneven among developed and developing economies and largely reflects sharp rebounds in major ones.



Source: World Bank

- Projection are subject to significant levels of uncertainty since global demand could probably be directed to services and travel instead of products;
- This possible transition could reduce the demand for shipping services;
- Unforeseen global trade restrictions and commercial tension between global leading producers could also modify the picture of an industry which will steadily grow the next few years;
- The establishment of the African Continental Free Trade Area (AfCFTA -2021) will benefit shipping since the AfCFTA covers 55 countries with a combined GDP of USD 3.4 trillion (around 3% of global GDP) and 1.3 billion people.

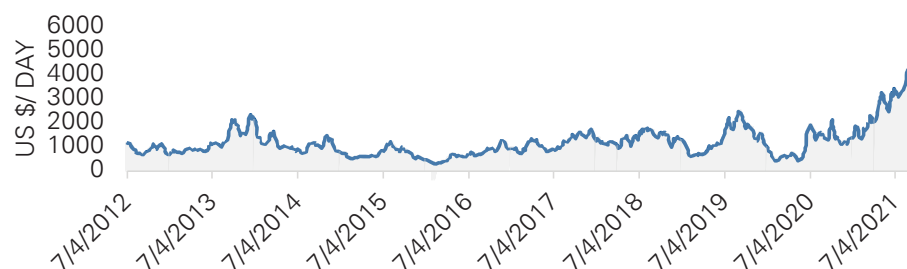


2. Demand Analysis

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

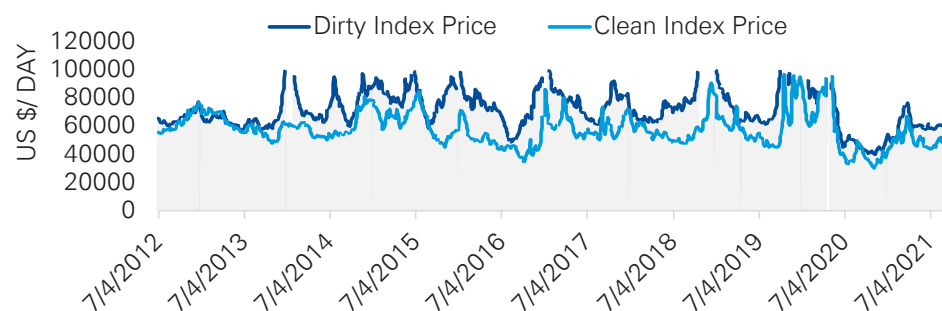
The increased demand of manufactured products during the COVID-19 era, boosted mainly container freight rates. BDI also hit 13-year high approximately 1 year after the first severe global virus outbreak.

Baltic Dry Index



- BDI reached recently its 13-year peak, following a significant reduction just after COVID-19 pandemic's outbreak
- Global shipping constraints, port congestion in China due to COVID-19 and an overall rebound in commodities demand formulated last year's growth

Baltic Dirty & Clean Tanker Indices



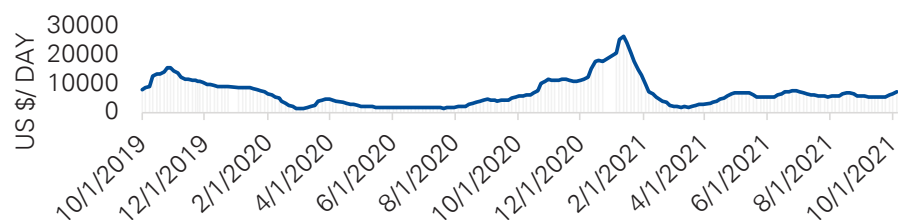
- Tanker freight rates were reduced by almost 50% just a few months after the first lockdowns
- Multiple worldwide lockdowns affected oil demand
- India (the 2nd largest oil importer) faced severely the pandemic crisis

2. Demand Analysis

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

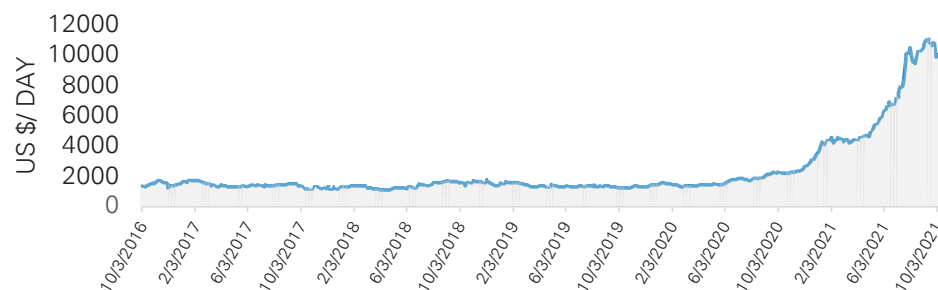
The increased demand of manufactured products during the COVID-19 era, boosted mainly container freight rates. BDI also hit 10-year high approximately 1 year after the first severe global virus outbreak.

Baltic LNG Tanker Index



- LNG's demand presented an approximate 2% increase during 2020 despite the negative reaction of the energy market

Freightos Baltic Global Container Index



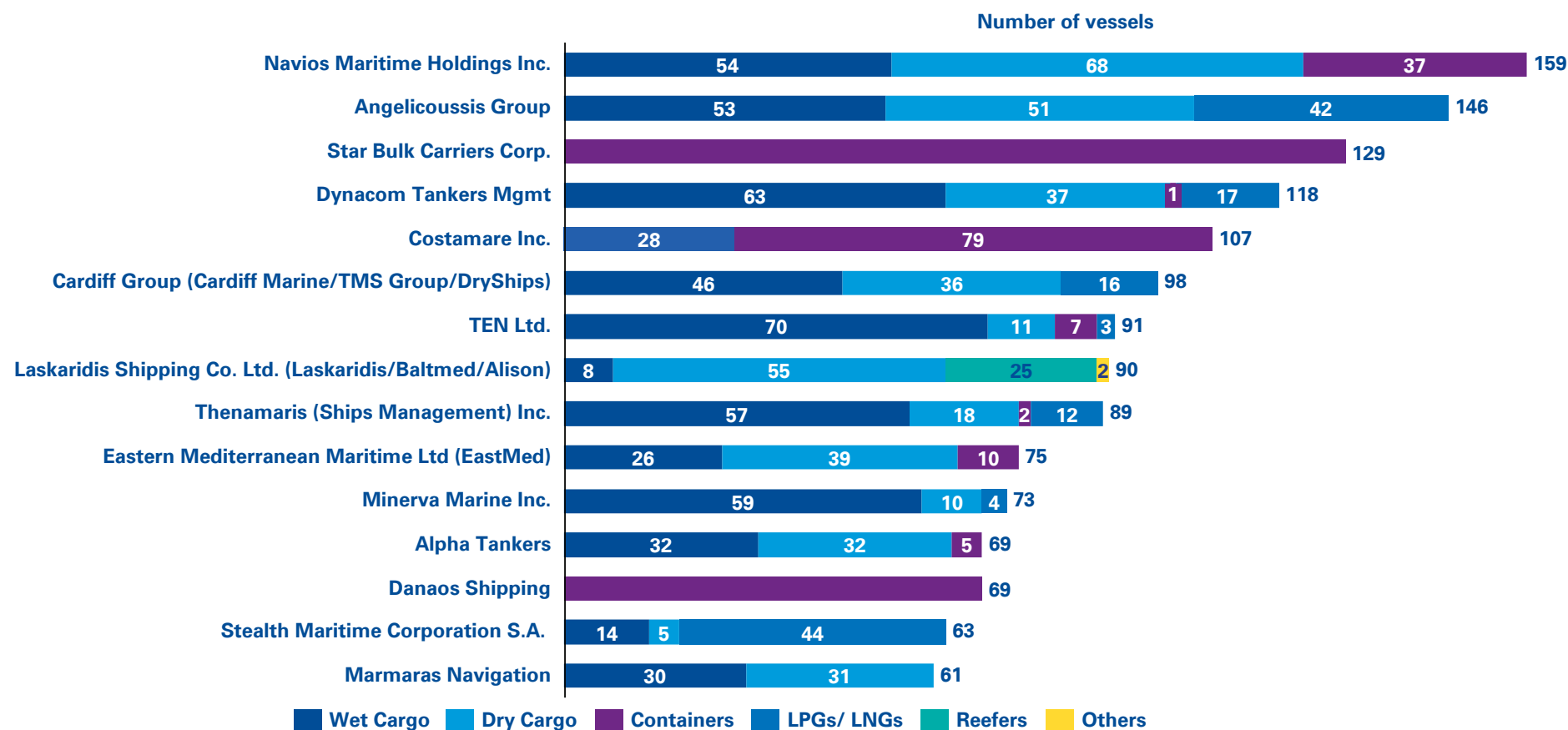
- Global consuming pattern during the pandemic pushed container freight rates to record figures
- Incremental demand for stay-home goods and PPE (personal protective equipment) and a severe shortage of containers are the main factors for this freight rate increase

3. Supply Analysis



3. Supply Analysis

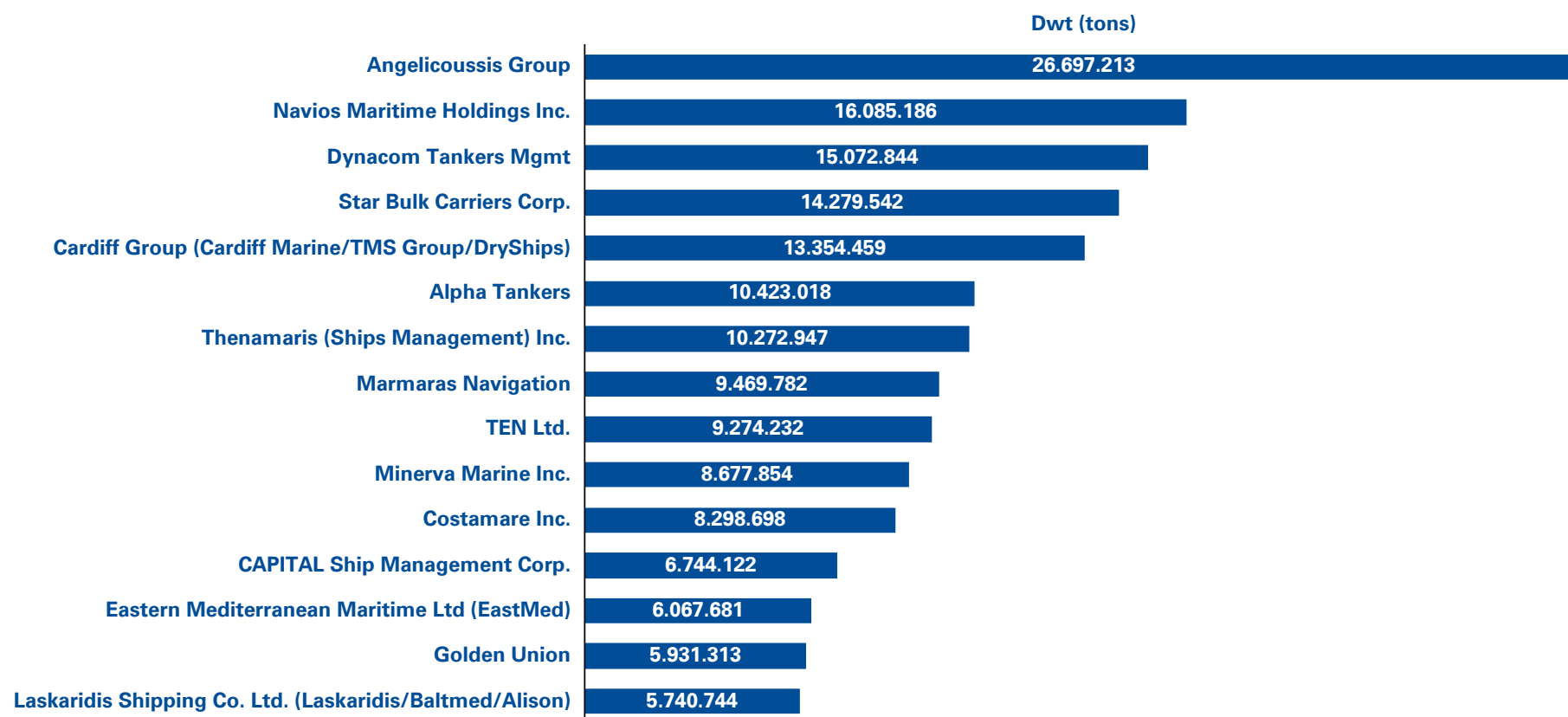
Key players in Greece (fleet size)



Source: clarksons.net, as of 31/1/2022 – orderbook not included

3. Supply Analysis

Key players in Greece (fleet capacity)

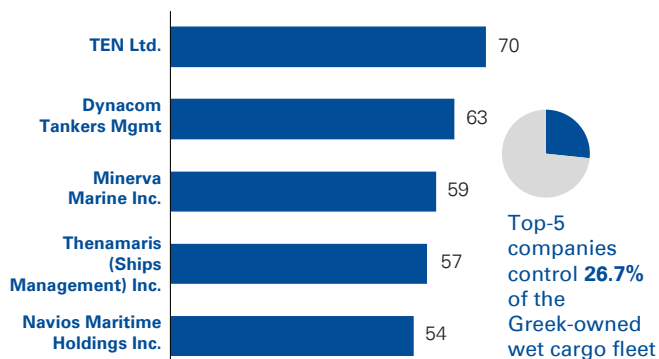


Source: clarksons.net, as of 31/1/2022 –
orderbook not included

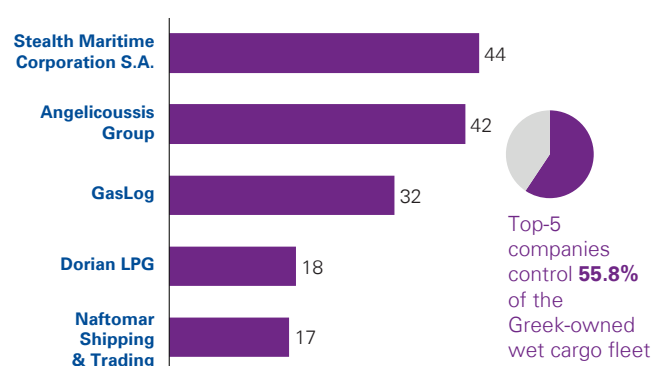
3. Supply Analysis

Key players per market

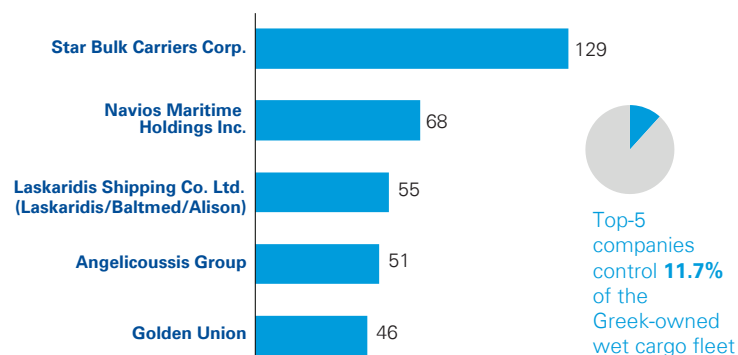
Wet Cargo



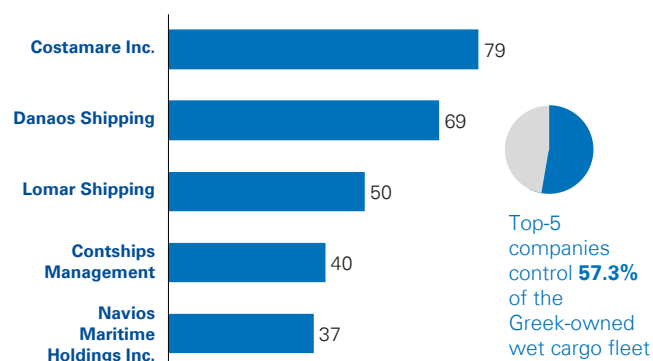
LNGs/ LPGs



Dry Cargo



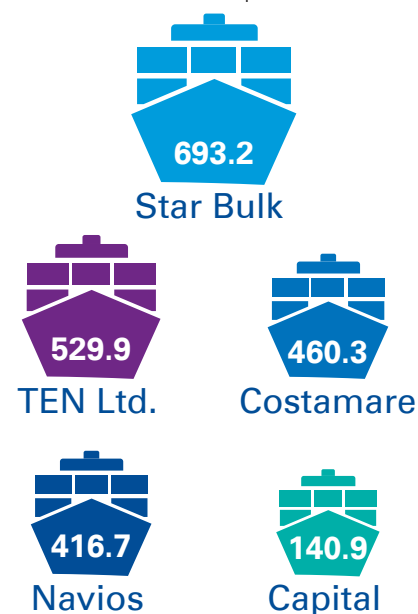
Containers



Comparative analysis of key players

Voyage revenues, US\$ million (FY 2020)

Below figures include listed companies, whereas most of key players in the Greek market remain private.



4. Trends, challenges and role of technology



4. Trends, Challenges and role of technology

Trends and developments



Changing Role of Vessel

The emergence of digital technologies and tools will transform the role of vessels from being a central mechanism to an enabler of value creation. These tools will create smarter, more connected distributed networks and will provide performance monitoring as well as real-time visibility of the vessels. This will massively reduce the chasm in communication between the people on the vessel and those on-shore and will create more centralized know-how where data from one vessel can be used to drive improvements in other vessels as well.



Digital Transformation

Shipping is going through a digital transformation which is driving numerous other trends in the industry. There is a large number of startups creating relevant tools. Technologies such as Internet of Things (IoT), big data, artificial intelligence (AI) and sensors are being used to optimize operations, enhance efficiency, drive down costs and increase the uptime of vessels. Implementation of these innovations will require changes operating models, use of data, cyber security as well as the role of vessels to create value.



Transparency

With the advent of new technologies, the Shipping industry's landscape is changing rapidly. Companies are adopting blockchain to their supply chain to increase productivity, efficiency and transparency. To effectively manage the increasing supply chain pressure due to rising volume of global trade, companies are shifting to platforms that can ease their work. With the inclusion of blockchain into the operations, the companies believe that the information is traceable, demonstrable, transparent and is recorded in a way that all parties can trust the information. This is creating fresh opportunities for shipping carriers to improve operations and efficiency and helps them to maintain greater transparency.



Ongoing Consolidation

Increasing consolidation in the Shipping industry is driven by over capacity and weak global economic growth. Companies are looking for opportunities to increase market share and reach through M&A and alliances.

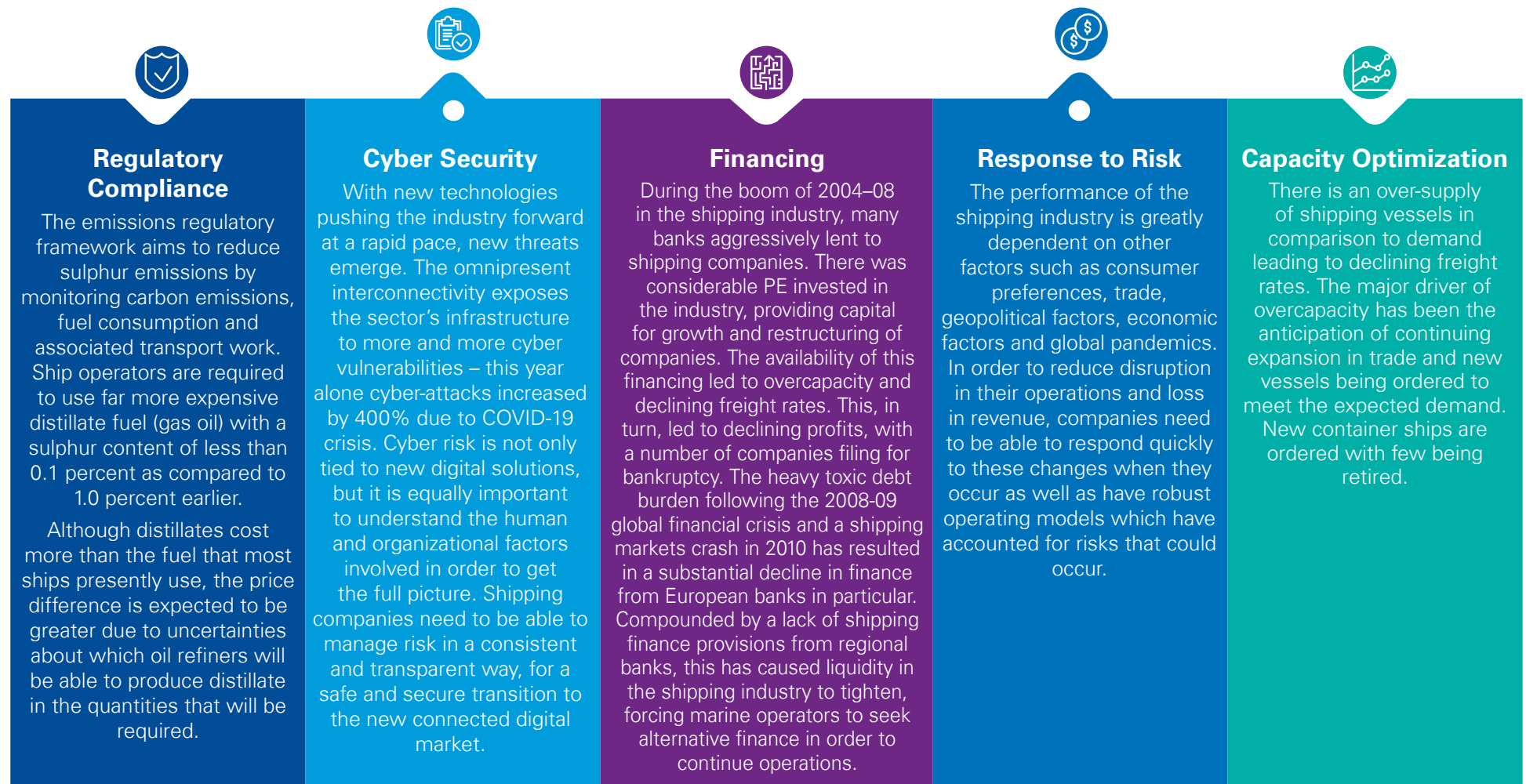


Sustainability

There is growing awareness regarding sustainability in shipping, and it could become a key parameter for the companies to compete with others. This is not limited to developed economies, as energy-efficiency measures are also being established in developing economies through assistance provided by international organizations.

4. Trends, Challenges and role of technology

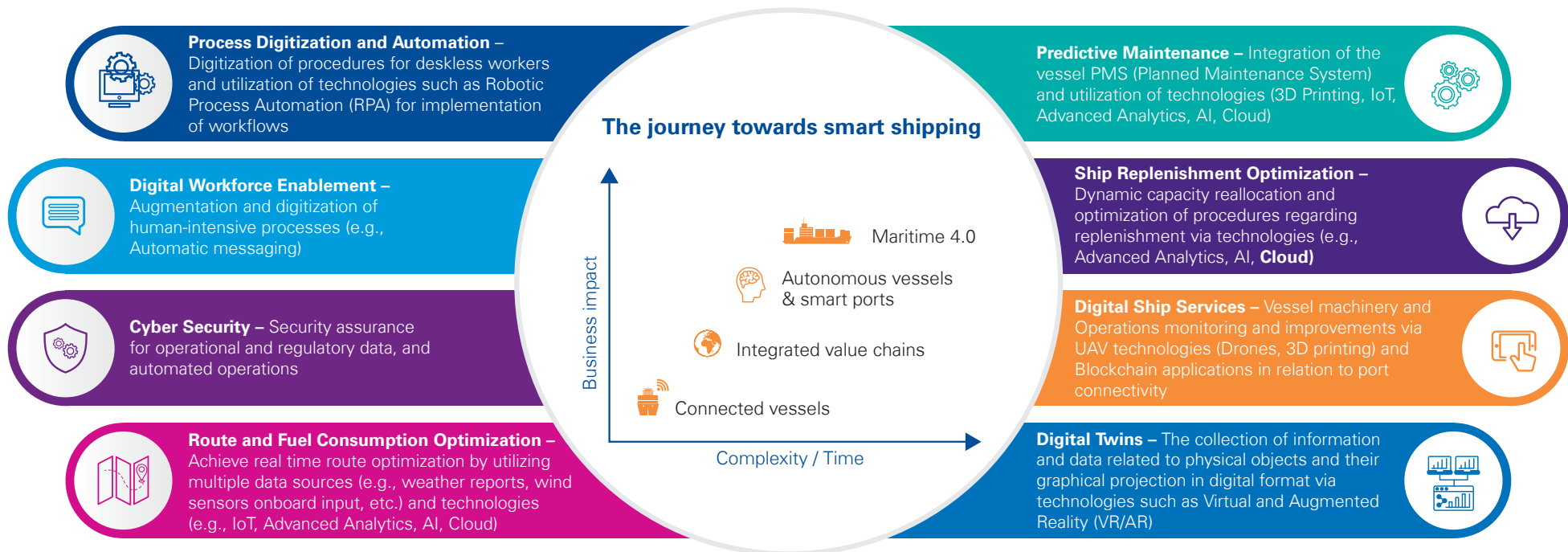
Recognized Challenges



4. Trends, Challenges and role of technology

Path to digital transformation

Digital transformation of the industry is the primary trend which will enable industry's organizations to keep up with trends and turn challenges into accomplishments. The below list of tech solutions will enhance operations and transform the ship-operators to digitally connected, cost effective and value-driven companies.



5. Focused research: The pathway to green shipping



5. Focused research: The pathway to green shipping

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 emissions¹, 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.

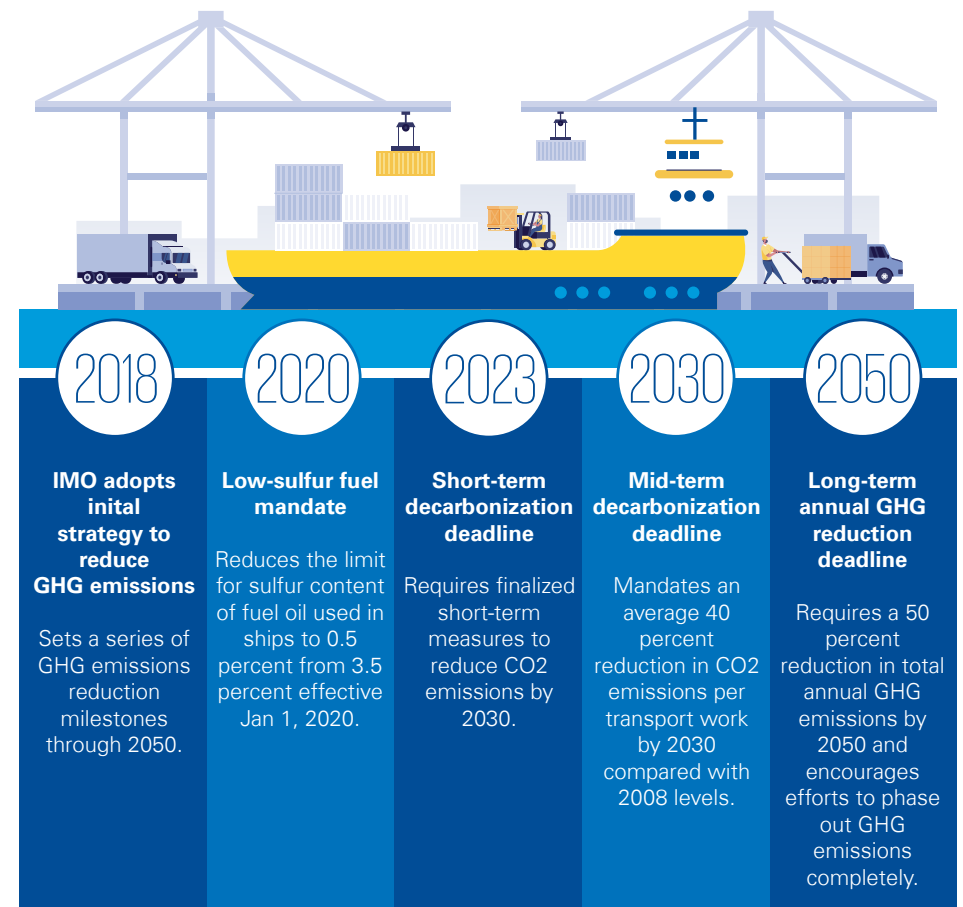
In April 2018 (Figure X), the Initial IMO Strategy on Reduction of GHG Emissions from Ships³ was adopted to enhance IMO's contribution to global efforts in reducing GHG emissions from international shipping.

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

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

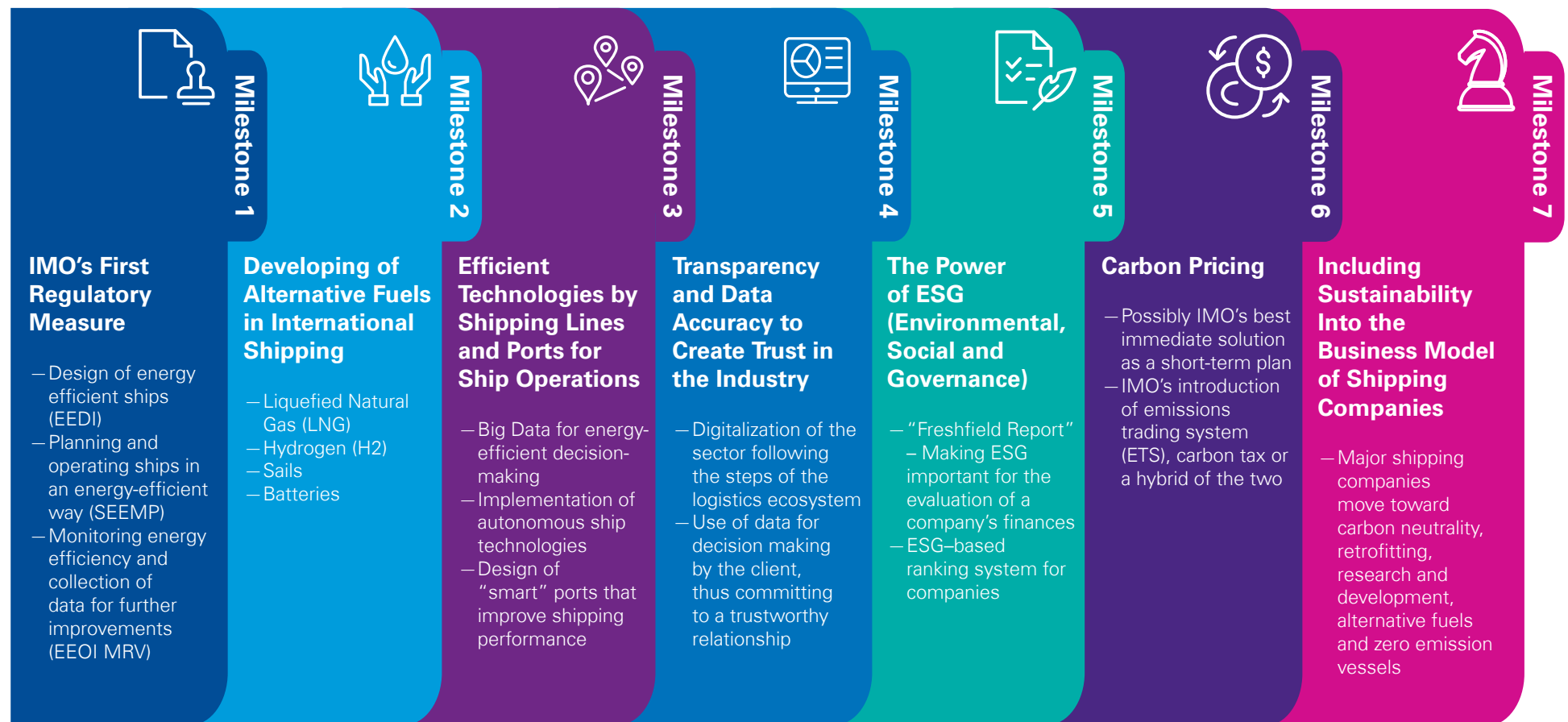
³ <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx>

Sailing towards zero-emission container shipping



5. Focused research: The pathway to green shipping

The seven recognized milestones



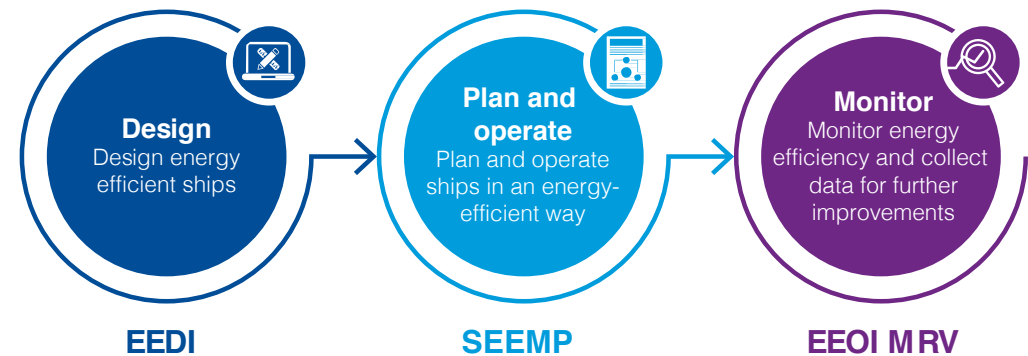
5. Focused research: The pathway to green shipping

Milestone 1 IMO's first regulatory measure

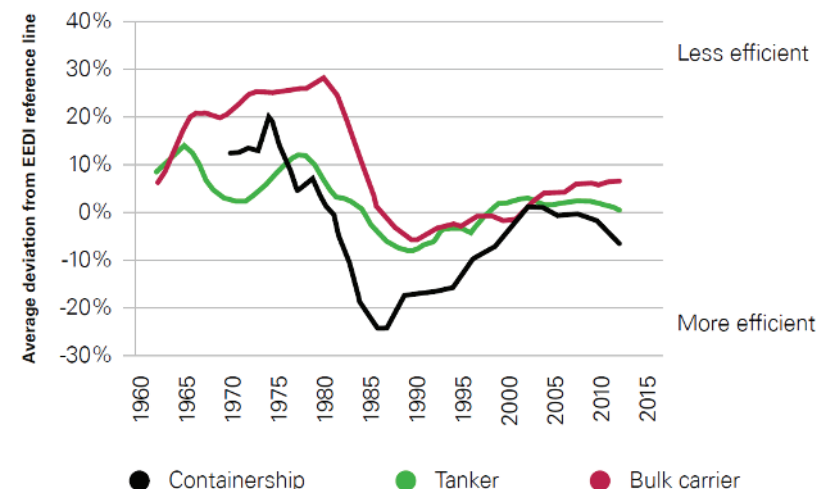
The biggest source of GHGs in maritime transportation is the burning of fuels to generate energy. If one uses less energy, it will not only save the cost of energy but also contribute to less pollutants in the environment.

IMO developed the concept of EEDI and SEEMP at MEPC 62 to improve the energy efficiency of the new and existing ships at the design and operation level:

- **EEDI** is a package of technical requirements applicable to the largest and most energy-intensive segments of the global merchant fleet. It is applied to all new ships and sets a minimum energy efficiency level for the work undertaken (e.g. CO₂ emissions per ton-mile) for different ship types and sizes
- **SEEMP** is an operational measure that establishes a mechanism to improve the energy efficiency of a ship in a cost-effective manner and provides an approach for shipping companies to manage ships and monitor ship and fleet efficiency performance over time
- **EEOI** (Energy Efficiency Operational Indicator) is a monitoring tool that enables operators to measure the ship and fleet efficiency in operation and gauge the effect of any changes in operation. Some examples include improved voyage planning, more frequent propeller cleaning, and introduction of technical measures such as waste heat recovery systems and a new propeller.



Design efficiency, all ship sizes



Source: <https://seas-at-risk.org/18-shipping/574-new-ships-10-less-fuel-efficient-than-those-built-in-1990-study.html>

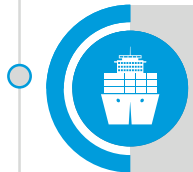
5. Focused research: The pathway to green shipping

Milestone 2 Developing of alternative fuels in international shipping

Alternative Fuel Types



LNG is a colorless mixture of gases, mostly methane cooled to condense into liquid and is sourced from natural gas. LNG has been ranked high as a fossil-fuel-based alternative by the shipping industry and the choice for newbuilding since 2000. LNG is cheaper compared to marine gas oil (MGO) and HFO. Even though the demand for LNG-powered vessels in major ports around the globe illustrates the keen interest to use LNG as a marine fuel by vessel owners and operators, it is only a good alternative for vessels in the short-run, and not in the long-run. This can be justified by the Fourth IMO GHG Study published in 2020.



The cleanest marine fuel with zero carbon emission is **green hydrogen**, which is hydrogen produced by using renewable energy. Processes include electrolysis of renewable matter and the reforming of natural gas. Therefore, only green hydrogen is currently being considered, and not any other form of hydrogen fuel. With proper advanced technologies, there are no principal limitations to production capacity that could restrict the amount of available H₂ to the shipping industry.



Sails were the primary means of ship propulsion until the advent of fossil fuel engines 100 years ago. Technologies for wind-assisted ship propulsion (WASP) include the wing sail concept, the kite sail and the flettner rotor. There are no direct fuel costs involved in operating WASP since it uses the wind energy on water for propulsion but mostly requires a small amount of secondary source of energy to operate the kites or sails initially with minimal cost. Though the availability of wind is limitless, the quality of the energy required is not constant. Hence, only selected global routes with high wind conditions are suitable for use and one needs to depend on the weather routing software for maximum benefits.



Recent technologies in **batteries** such as lithium-ion have made it possible for batteries to provide abilities to store electricity critical for the use of ship propulsion. The lower power density and greater weight limit the usage for many applications. Hence, for larger vessels, engine manufacturers are focused on the hybrid electric solutions instead of using batteries as a standalone solution. Solar energy used in conjunction with batteries is the proven solution in shipping to meet the partial electricity requirements, but the photovoltaic technology is not energy-dense enough to power a whole ship's requirement for propulsion, with the unreliability of solar energy round the clock making it ill-suited for deep sea transportation or operating in certain weather conditions.

5. Focused research: The pathway to green shipping

Milestone 3

Efficient technologies by shipping lines and ports for ship operations

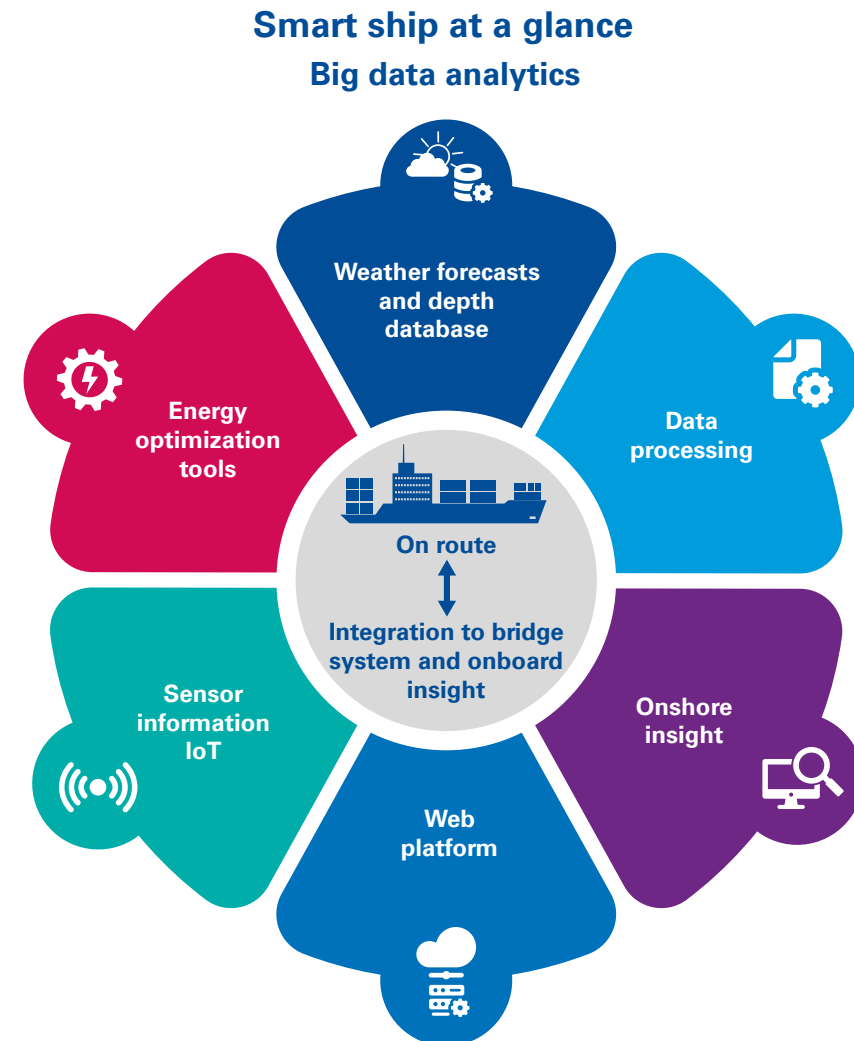
Digitalization regarding the processes in ship operation and system integration for the efficiency and safety of vessels is a promising new trend.

Data is necessary to achieve energy-efficient decision-making and reduction in GHG emissions. Implementing smart ship technology to upgrade the core systems of the current ships will increase the data volumes (weather, navigation and sensors) and processing requirements.

Autonomous shipping is a highly practical technology that helps in the navigation of vessels and improves their productivity and efficiency on the sea. It uses an on-board computer that takes decisions about the route, speed, fuel consumption, maintenance and even mooring at the harbor. Smart shipping not only covers on-board technologies but also includes the design of ports that use technologies such as artificial intelligence (AI), big data, internet of things (IoT) and blockchain to improve shipping performance.

There are a lot of research and trials that have taken place for both newly built unmanned vessels and retrofit options.

IMO's Maritime Safety Committee has considered including the issue of maritime autonomy in the regulatory framework for safe, secure and environmentally sound trials and operations.



5. Focused research: The pathway to green shipping



Milestone 4 Transparency and Data Accuracy to create trust in the industry

Transparency and data accuracy can help the shipping industry to proactively and efficiently manage disruption in its supply chain. Finding a balance to effective and financial-wise results is important to every business. Additionally, access to the right data makes results measurable and equips customers with the right decision, which in the end benefits businesses.

Building a trustworthy relationship not only strengthens one side of the business but also builds trust for the entire ecosystem of the business.

5. Focused research: The pathway to green shipping



Milestone 5 The power of ESG (Environmental, Social and Governance)

ESG investing, popularly known as the ‘sustainable investing’, is the three relevant factors that are used when screening the ethical and sustainability effect of an investment in a company or business.⁴ The factors of this term tackle a broader range of issues that are not included in financial analysis, however, might have a financial relevance.

ESG are the three standards used by investors to measure the behavior of businesses and determine their financial performance in the future. Environmental concerns such as labor practices, product safety, resource management, climate change, data security, etc. are covered by ESG along with anything that can potentially affect the impact a business has on the environment. ESG do not necessarily apply to some specific companies, hence, these are applicable in all businesses and companies.

The ESG rating is the best tool to help investors make smart decisions to attain a market-beating profit since companies that perform high in ESG are more likely to create a longer duration of value, recognize talent and have a better financial performance. Thus, it can be said that ESG-based ranking system helps sieve well-founded sustainable performers from the rest.⁵

Funding by banks and investors are key for the shipping industry. Therefore, it is important for companies to integrate ESG into their business model because investors use this as a yardstick in selecting which business to invest in.

The focal point in assessing ESG in the shipping industry will be on fleet emission and energy efficiency because banks lending to maritime companies are already using KYC (know your client) check in tracking the processes of their clients. In instances where there are weak or no ESG regulations, the least regulation regarding that aspect, for example, sanctions and anti-money laundering are specifically explained. Failure to do so might result in serious ramifications for the sponsoring bank.

Along with how relevant ESG is to the stakeholders, the question of how its integration in companies can pay off is essential.

⁴ <https://marketbusinessnews.com/financial-glossary/esg-definition-meaning/>

⁵ <https://www.alva-group.com/blog/what-are-esg-ratings/>

5. Focused research: The pathway to green shipping



Milestone 6 Carbon pricing

ETS (emissions trading system) and **carbon tax** both are types of carbon pricing. While they both put a price on carbon, generate revenue and are cost effective, a hybrid system would be complicated. Looking at how both operate and their implementation and differences, carbon tax comes across as a suitable option for the shipping industry. Since carbon tax uses well-established channels of tax system and does not require new infrastructure such as the cap and trade do for its trading allowance, its global implementation by IMO will be easier.

5. Focused research: The pathway to green shipping



Milestone 7

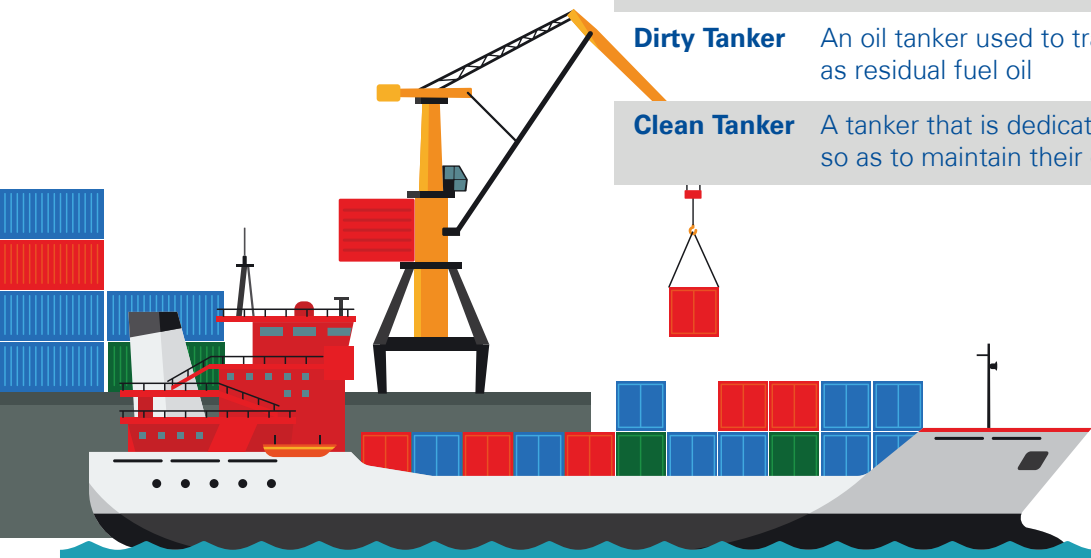
Including sustainability into the business model of shipping companies

Shipping lines around the globe are **strategizing** toward emitting less CO₂ or permanently cutting emission. Currently, some are retrofitting their vessels with alternative technologies, testing zero-emission vessels or researching on better alternatives to contribute toward the green shipping deal. Even though there are various technologies that most organizations believe will help with decarbonization, some still believe that there needs to be more research in order to get a good view on how to attain carbon zero emission.

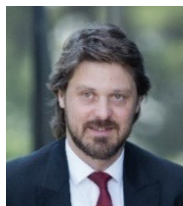
Looking at the various shipping line goals, such as those of Maersk Line, Hapag-Lloyd, CMA CGM partnered with Energy Observer and MSC to name a few, carbon neutrality, retrofitting, research and development, alternative fuels and zero emission vessels are common among them.

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.)



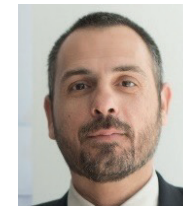
Our team of local experts



Ioannis Bravos
Partner, Audit
Shipping Sector Lead Partner
Athens, Greece
Tel.: +30 210 60 62 116
ibravos@kpmg.gr



Michael Papageorgiou
Director, Consulting
Shipping BD Sector Lead
Athens, Greece
Tel.: +30 210 60 62 372
mpapageorgiou@kpmg.gr



Theodoros Stergiou
Director, Consulting
Shipping Cyber Security Expertise
Athens, Greece
Tel.: +30 60 62 228
tstergiou@kpmg.gr



Efthymios Ntamarellos
Senior Manager, Consulting
Shipping Recruitment Expertise
Athens, Greece
Tel.: +30 210 60 62 376
entamarellos@kpmg.gr



Emmanouil Mylonas
Manager, Consulting
Shipping Risk Consulting /
IRM Expertise
Athens, Greece
Tel.: +30 211 18 15 732
emmanouelmylonas@kpmg.gr



Anastasios Bartzokis
Manager, Consulting
Shipping Operations Expertise
Athens, Greece
Tel.: +30 10 60 62 269
abartzokis@kpmg.gr



Nikolaos Astyfidis
Manager, Consulting
Shipping Cyber Security Expertise
Athens, Greece
Tel.: +30 210 60 62 206
nastyfidis@kpmg.gr



Eirini Mantzourani
Supervising Senior Advisor,
Consulting
Shipping Cyber Security Expertise
Athens, Greece
Tel.: +30 210 60 62 398
imantzouranis@kpmg.gr



George – Romanos Foukas
Senior Advisor, Consulting
Shipping Emerging
Technologies Expertise
Athens, Greece
Tel.: +30 210 60 62 100
gfoukas@kpmg.gr



Maria Eleni Chalkia
Senior Advisor, Consulting
Shipping Recruitment Expertise
Athens, Greece
Tel.: +30 210 60 62 296
mchalkia@kpmg.gr



Giota Papageorgiou
Senior Advisor, Consulting
Shipping Recruitment Expertise
Athens, Greece
Tel.: +30 210 60 62 100
ppapageorgiou@kpmg.gr



George Vatikiotis
Advisor, Consulting
Shipping Emerging
Technologies Expertise
Athens, Greece
Tel.: +30 210 60 62 139
gvatikiotis@kpmg.gr

KPMG

ATHENS

3, Stratigou Tombra Street

PC 153 42

Tel: +30 210 6062 100

Fax: +30 210 6062 111

400B Mesogeion Ave., Aghia Paraskevi

PC 153 42

Tel: +30 211 1815 600

Fax: +30 210 6062 111

THESSALONIKI

Aghias Anastasias & Laertou, Philippos

Business Center

P.O. BOX 8405, 57001, Thermi

Tel: +30 2310 55 09 96

Fax: +30 2310 54 36 70

e-mail: info@kpmg.gr

kpmg.com/gr

kpmg.com/socialmedia



© 2022 KPMG Advisors Single Member S.A., a Greek Société Anonyme and a member firm of the KPMG global organization of independent member firms affiliated with KPMG International Limited, a private English company limited by guarantee. All rights reserved.

The information contained herein is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

The KPMG name and logo are trademarks used under license by the independent member firms of the KPMG global organization.