SEAS AT RISK

ONE PLANET SHIPPING

NAVIGATING THE WAVES OF CLIMATE CHANGE AND OVERCONSUMPTION

CONTENTS

This report was commissioned and published by Seas At Risk VZW.

Authors: Dr. Lucy Gilliam, Nicky Saunter and Andrew Simms, New Weather Institute, Seas At Risk.

Please reference as follows: Seas At Risk et al, (2024). One Planet Shipping – Navigating the waves of climate change and overconsumption. Brussels, Belgium

“These superstorms are a taste of the storms of my grandchildren. We are headed wittingly into the new reality – we knew it was coming.”

James Hansen, climate scientist.[01]

EXECUTIVE SUMMARY

The world is changing fast and shipping not only needs to change with it, but has an important role to play in helping the transition to a sustainable future happen. Climate change means that countries and communities around the world are facing new challenges about the future, as temperatures and sea levels rise in many places, rainfall patterns change bringing drought and deluge in unexpected locations, agriculture tries to keep up with the changing conditions, and people struggle to adapt.

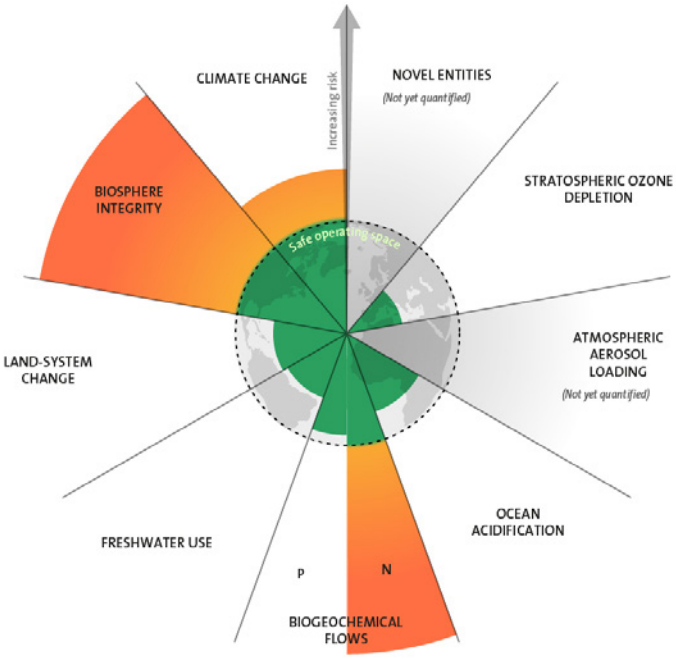
Our global economy has developed in a way that has failed historically either to work within planetary boundaries[02] or account for its environmental impact, but this is starting to change with attempts to reduce carbon emissions, reduce waste and increase the circularity of economies. The shipping industry reflects the world of trade, production and consumption that we have built, with both commodities and manufactured products shipped across continents with little thought for the environmental impact. Once this is factored in, as is increasingly likely in the future, much of today's trade could be altered, and this means the maritime industry will be altered too.

All industries will look different once the impact of climate change begins to take effect and the strategies of governments and business turn towards adaptation. Since shipping carries up to 90% of global trade, it too needs to be planning for a different future that operates within planetary boundaries. The volume of trade being carried long distances might reduce, particularly as fossil fuel use diminishes and renewable energy can be generated closer to the point of use; there will likely be less need to ship energy around. Increased recycling and reuse of resources, especially those that generate high levels of carbon emissions, will see manufacturing move closer to markets, with more business operating nationally or regionally rather than globally. Supply chains will need to become more resilient to future climate change shocks. We saw during the global pandemic and as a result of war how fragile our global system can be, particularly at certain geographic pinch points like the Suez and Panama canals. The maritime industry will need to contribute to the creation of more resilient trade webs in the future.

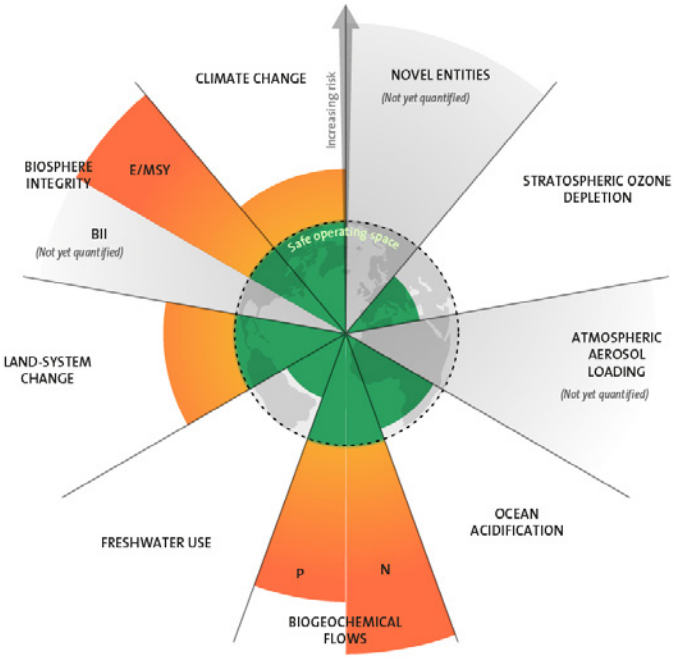
Shipping also needs to be ready to respond to these shifts in demand with cleaner, more efficient ships with the capability to use multiple propulsion options like wind and electricity, running regional and shorter routes. Where possible, vessels need to be designed to make best use of wind propulsion first and use renewable energy for their own power wherever possible, taking advantage of battery technology to convert to electricity, and remaining open minded about new wind/sail solutions. This is already happening with ferries and some pilot operators, but it needs to scale up fast. Some alternative fuels are short-term fixes at best as they still rely too heavily on fossil fuels either for their production or for their distribution.

The planetary boundaries concept presents a set of nine planetary boundaries within which humanity can continue to develop and thrive for generations to come. This system of nine processes that regulate the stability and resilience of the Earth system were described by former Stockholm Resilience Centre director Johan Rockström and a group of 28 internationally renowned scientists in 2009.

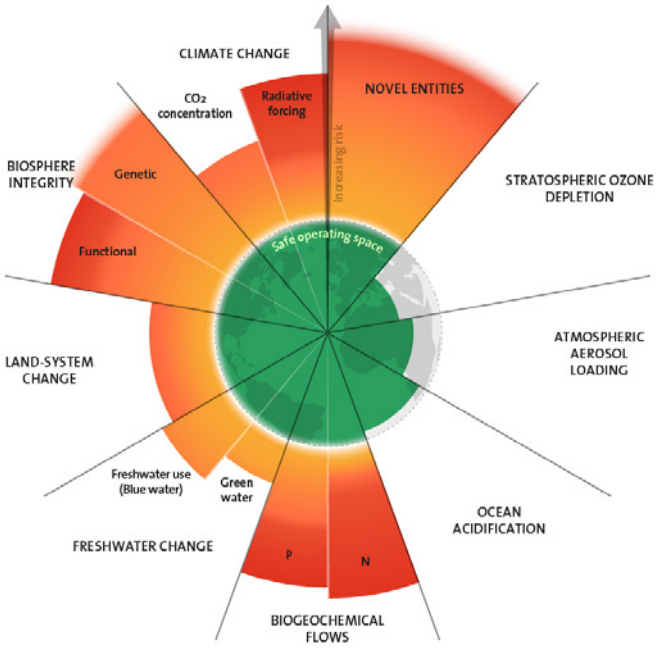
PLANETARY BOUNDARIES OVER TIME



2009
7 boundaries assessed, 3 crossed



2015
7 boundaries assessed, 4 crossed



2023
9 boundaries assessed, 6 crossed

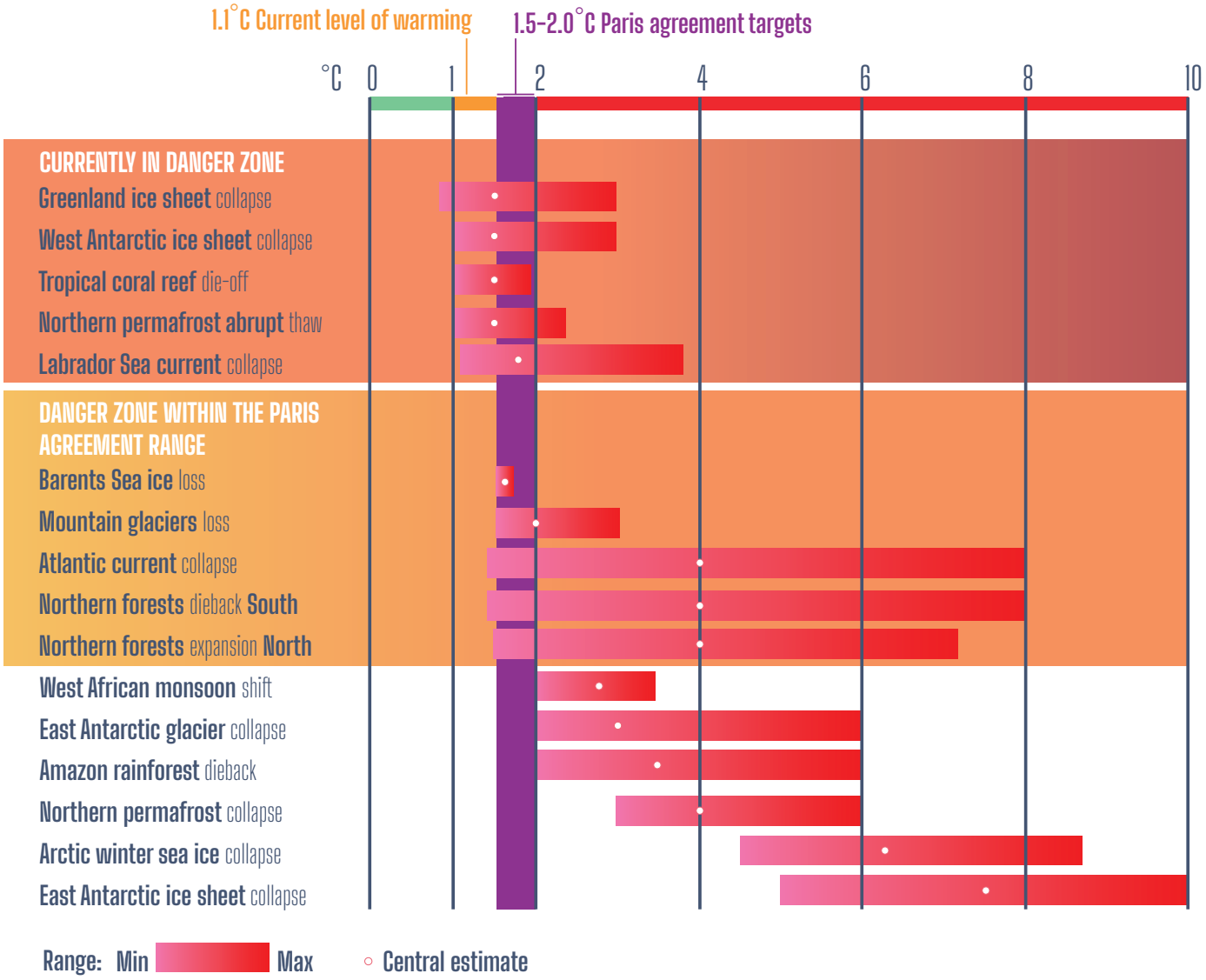
Source: www.stockholmresilience.org/research/planetary-boundaries.html

Shipping is already a global industry, with a truly international mindset. This could bode well for a future of putting the planet first rather than individual national priorities. The International Maritime Organization (IMO) could be a leader for change, providing the regulation, systems and training needed to put in place a just and sustainable shipping industry that operates for all stakeholders, including workers and local communities. There is a real opportunity for ports to be hubs for just transitions, joining communities together in a shared future. Developing a One Planet Shipping goal would help the shipping industry to operate sustainably, without damaging future prospects for people or our planet. By working alongside the existing UN One Planet Living initiative, the IMO could bring the industry together with policymakers and business in order to work out sustainable ways forward together.

The story of endless growth has been in place for a long time, and shifting organisations that have been geared towards this for centuries will require a shift in mindset too. We will need new stories that help us to change, language that prioritises people and the planet over profit alone. This report is an attempt to start this process, pulling together the great work done by so many others to illustrate the urgency required and to point to possible solutions.

THE RISK OF CLIMATE TIPPING POINTS IS RISING RAPIDLY AS THE WORLD HEATS UP

Estimated range of global heating needed to pass tipping point temperature.



Source: https://www.science.org/doi/10.1126/science.abn7950#sec-2

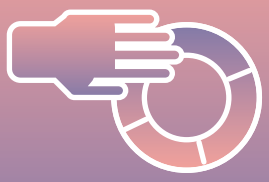
REPORT OBJECTIVE

This report is to encourage a new set of stories about shipping that will help all stakeholders to discuss more easily what a future sustainable maritime industry might look like. We will propose a set of narratives that can be used to shape thinking about the future in a positive way.

HOW TO USE THIS REPORT

This report is to encourage new conversations, campaigns and policies using a positive language for a One Planet Shipping future. In the first section, we introduce the idea of One Planet Shipping and show how history has led us to the place we now inhabit. We look at the state of shipping today and existing initiatives that are already underway. The next section will help to frame the narrative by looking at the macro trends and the unhelpful old stories that have kept us stuck on unsustainable paths. Here we introduce the new narratives of **Wind First, Safe Load, All Aboard** and **Homeward Bound**. Our One Planet Shipping vision encapsulates ideas for the future of a sustainable industry in visual form.

Wind First
– wind propulsion is free, truly renewable and viable, and should be tried first



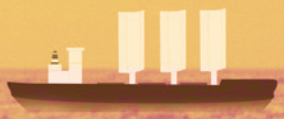
All Aboard
– all stakeholders must be considered if this industry transition is to be just

Safe Load
– moving less cargo long distances will reduce the burden on the environment and people

Homeward Bound
– ports are vital to resilient trade webs and could be hubs for One Planet Shipping

“The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.”

Marcel Proust, writer.



INTRODUCTION

We need a new "One Planet Shipping" narrative fit for the future of shipping. Old assumptions that underpinned our beliefs about shipping are no longer valid and we need new ones in order to change both our attitudes and those of the industry. Our ships should not be carrying more goods than our planet is capable of producing sustainably and no more waste than it can safely absorb. We have already overshot 6 of the 9 planetary boundaries that allow relatively stable life conditions on Earth, and currently shipping is contributing to that by adding pollutants, moving us further outside safe limits for the climate and biosphere.

The maritime industry reflects our ever-growing demand for goods and, while it has not been the cause of our overconsumption, shipping has enabled extractive industries to benefit wealthy countries at the cost of environmental damage to less wealthy nations, often in the Global South. International trade has brought huge growth and rises in standards of living and public health to many populations; however it has also failed to eliminate poverty and has even increased inequality in many parts of the world.[03]

ONE PLANET LIVING

"The European Green Deal aims to transform the EU into a climate-neutral, circular economy, and a fair and prosperous society, by 2050. The 8th environmental action programme reiterates the EU's long-term 2050 vision of living well within planetary boundaries. These ambitions are to be achieved through 'sustainability transitions' that require radical changes to our core systems of production and consumption — energy, mobility, food, and the built environment — as well as to our established ways of living and working."

European Environment Agency, 2024

The term "One Planet Living"[04] was coined by UK architect and sustainable designer Pooran Desai in 2002, through his organisation Bioregional and its innovative London BedZed sustainable community development.[05] His aim was to design places where people can lead happy, healthy lives within the resources of our one planet, and their One Planet Living Principles have since informed sustainability strategies for communities, companies and cities in over 30 countries. Bioregional used its experience to influence the UN, teaming up with the Colombian government to introduce what became the United Nations' Sustainable Development Goals (SDGs).[06] These goals have gone on to influence international financial accounting, planning and a host of other global and national initiatives, including the UN's One Planet network.[07] This is a global community of many thousand organisations working to implement a 10-Year Framework of Programmes on sustainable consumption and production. It aims to inspire a global movement that facilitates collaboration, cooperation and coordination in order to increase organisations' combined knowledge, effectiveness and impact.

A One Planet Shipping movement would contribute to this, with the aim of moving goods and people around the world in a way that still allows the world's resources to be replenished. Setting this goal could help the shipping industry focus on finding solutions that are consistent with living safely within planetary boundaries. The future of shipping will need to be grounded in the more equitable consumption-based principles of sufficiency (as described in Hot or Cool's 1.5 degree lifestyles report[08]), resilient trade webs, and a just transition for people whose lives depend directly on shipping. This kind of paradigm shift is possible. It will need better understanding and implementation of the principles of the circular economy that generates efficiency without growth, but it could be facilitated by the maritime sector operating differently and by reconfiguring supply chains to support life within the limits of our single planet Earth.

Mounting political pressure has prompted the IMO to take regulatory action in an attempt to reduce greenhouse gas (GHG) emissions in line with the Paris Agreement, although current goals still lag behind this. The most recent 2023 Revised Strategy[09] sets a common ambition to reach net-zero GHG emissions from international shipping around 2050, and gives indicative emission reduction targets for 2030 (20% emissions reduction, striving for 30% compared to 2008) and 2040 (70% emissions reduction, striving for 80% compared to 2008), taking the full lifecycle into account – from production to the combustion of fuels. The strategy also refers to ensuring a just and equitable transition. The challenge now is for member states to agree measures that will deliver the strategy. Current negotiations revolve around a global tax or levy, a global fuel standard, revision of the Carbon Intensity Indicator (a mandatory rating system to encourage operational emissions reductions through year-on-year improvements) and on lifecycle analysis of different fuel options. There is still much to do.

In the rush to catch up and reach what are now challenging short-term targets, the danger is that the industry, incentivised by policies in many States, looks to potentially pricey, risky and environmentally damaging replacement fuels in order to keep business as usual going at all costs. Instead, it could be looking at options already available and working, with a sensible hierarchy for replacing fossil fuels and harnessing free and renewable wind energy first, followed by electricity (using fast-developing and responsibly sourced batteries) from renewable sources, and only then moving to alternative fuels to bridge the gap on a temporary basis. Major gains could be made by shortening supply chains to avoid unnecessary shipping miles and building local value chains to support regional economies.

Source: https://www.theoceanbird.com/media/

"Under capital's growth imperative, there is no horizon – no future point at which economists and politicians say we will have enough money or enough stuff."

Jason Hickel, Less Is More:
How Degrowth Will Save The World.

THE GREAT TRADE EXPLOSION

ONE PLANET SHIPPING

--- -. . / .--. .-.. . - -. . - / ... .--. .--. .. -. --.

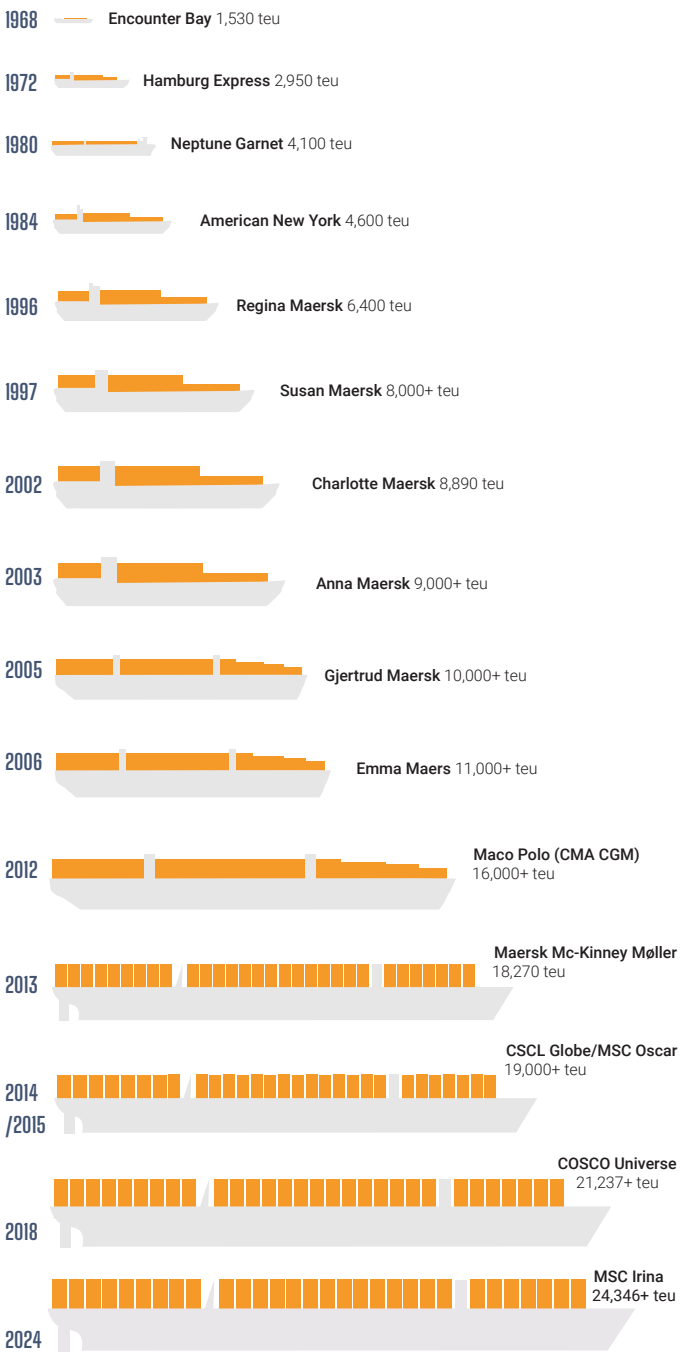
"The period of globalisation seen for most of the past 50 years required big ships on deepsea trades. This era is coming to a close..I think we're probably moving back to an era where we're going to see a lot more focus on the shortsea trades and the integration of maritime regions with shortsea shipping." Martin Stopford, world leading maritime economist [10]

International trade and the maritime industry are inextricably linked through history, involving highly damaging activities in the past that shaped the world we have today, such as slavery and colonialism. Much of early European exploration was far closer to piracy, whether state-sanctioned or freelance, involving pillage, slavery, theft and exploitation. When convenient, governments would get behind this and claim their own rights, creating vast global empires for comparatively small countries with powerful navies or marine trading companies, like Britain, the Netherlands, Spain and Portugal. However, since the 1950s there has been an enormous growth in trade, consumption and the ensuing damage to our global environment.

Between 1950 and the mid-1990s, total world output grew by a factor of five, but exports went up by over 14 times. This means that a lot of the same items were shipped to and from multiple times, largely because of the globalisation of production and distribution inside multinational businesses. World trade in parts and components increased from about 18.9% to 22.3% of total exports between 1992/93 and 2005/06.[11] Containerisation enabled this growth to speed and scale up, revolutionising port infrastructure and enabling goods to be shifted more quickly between ships, trucks and trains at less cost than traditional unloading/loading of cargo in single crates or barrels. Container ships themselves have grown massively in size: a ship in 1968 carried 1,530 TEUs (twenty foot equivalent container units) while more recent vessels regularly top 20,000 TEUs. The largest ships sailing today are capable of carrying 24,000 containers[12]– equivalent to a freight train 44 miles long.[13] The insurance industry highlights some serious risks in this trend toward ever bigger vessels, including mis-declared cargoes, fire, navigation and container losses at sea.[14]

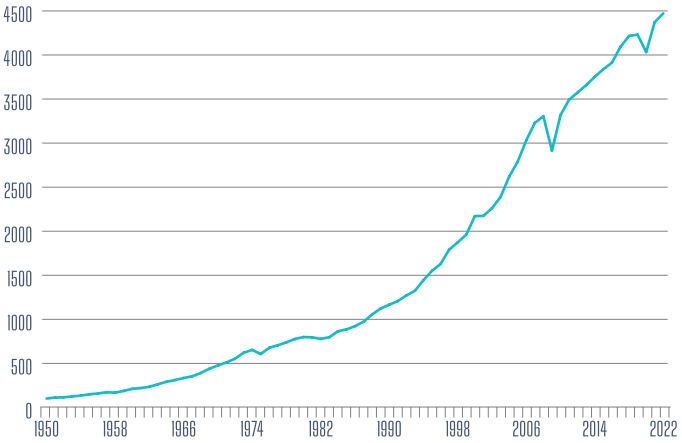
56 YEARS OF CONTAINER SHIP GROWTH

Container-carrying capacity has increased by approximately 1,491% since 1968



Approximate ship capacity data: Container-transportation.com
Adapted from the following sources: https://www.isesassociation.com/50-years-of-container-ship-growth
https://www.youtube.com/watch?v=G5qi6QaQDDA

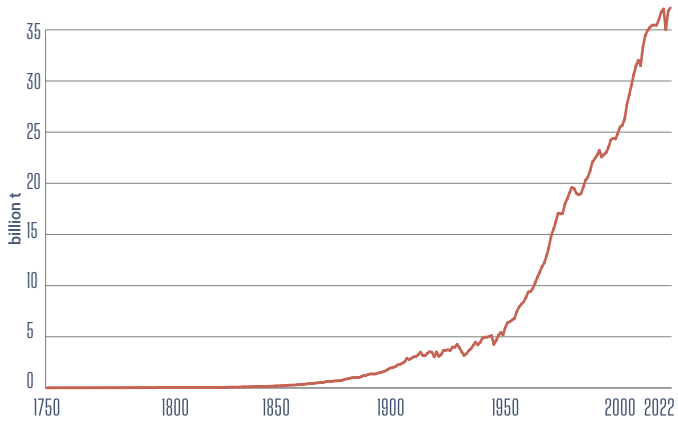
EVOLUTION OF WORLD TRADE, 1950 - 2022
VOLUME INDEX, 1950 = 100



Source: WTO

ANNUAL CO_2 EMISSIONS

Carbon dioxide (C02) emissions from fossil fuels and industry*. Land-use change is not included.



Data source: Global Carbon Budget (2023)
OurWoldInData.org/co2-and-greenhouse-gas-emissions | CC BY

* Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel and other industrial processes. Fossil emissions do not include land use change, deforestation, soils or vegetation.

Global emissions rose sharply over the same period, from construction, domestic and commercial energy use, transportation, consumer goods production and agriculture. Greenhouse gas emissions from international freight were initially not included in emissions reduction targets, but NGOs and others have argued that maritime emissions should be included in The Paris Agreement goals.[15] Shipping emissions are being included in some country and regional (EU) plans, but these efforts are patchy globally.

The early 2000s saw a rise in the offshoring of production processes (moving production overseas to lower-cost countries) and integration of western companies with low-cost foreign suppliers that caused supply chains to get longer. Manufacturers were taking advantage of a perfect storm of factors: improvements in communication technologies, investments in trade infrastructure in countries with lower wages that facilitated interaction, and broader declines in trading costs. This was dependent on a low regard for the environment, which was rarely included in any costing process and before any serious industry-wide engagement with Environmental, Social, and Governance (ESG). This trend for "off-shoring" in supply networks remained steady until 2015, when it started to slow down, and in some cases even reverse.[16] Prices had begun to creep up in many developing countries, while improved and cheaper automation and robotisation made production more viable for many manufacturers closer to home. Broader trading costs also started to rise.

The practice of using flags of convenience in the shipping industry has not helped the development of the industry, because ship owners tend to favour registering their ships in places with lower regulation, reduced taxation, fewer environmental standards, and low levels of labour rights for maritime workers.[17] This, coupled with the geographic reality of travelling over vast oceans, has meant that the global industry has largely operated out of sight and out of mind of the communities they impact, governments, other industries and potential pressure groups.

> ***"We need to redefine our notion of growth and recovery, which requires that we recognise, in this disrupted world, that the growth of the future will not be of the same nature as the growth of the past, and that bigger ships and bigger fleets will not be the markers of success in the future."***
>
> Rachel Hoyland, Maritime Shipping Lawyer[18]

THE PLASTIC ECONOMY

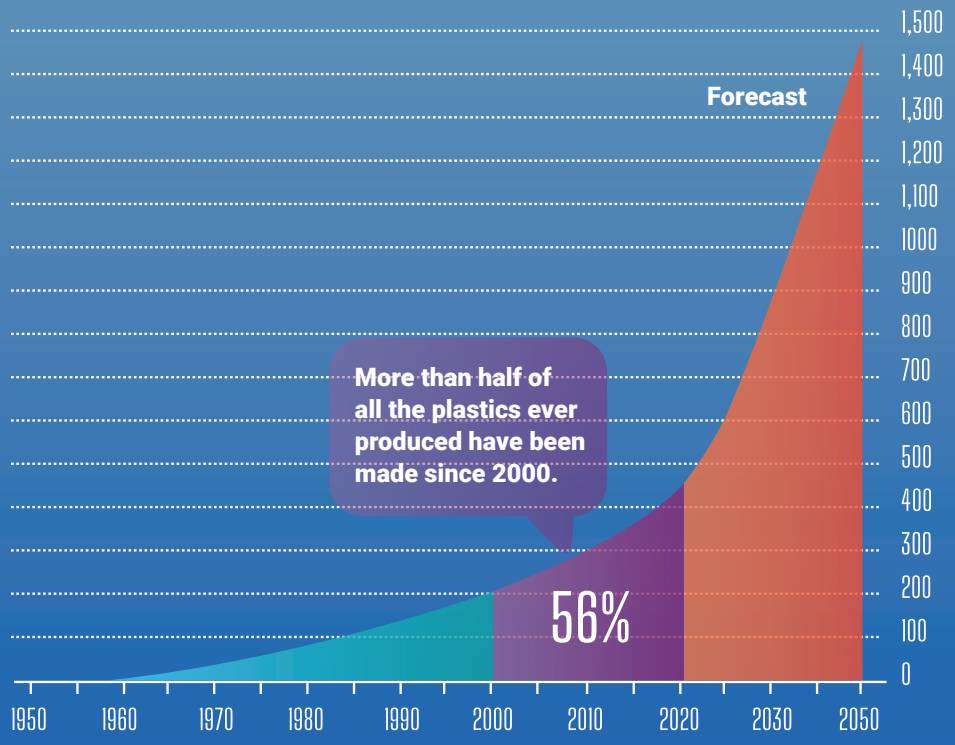
The huge subsidies given to fossil fuels historically have enabled the global use of materials to explode.[19] The International Monetary Fund (IMF) calculated that roughly 6.5% of the global GDP was spent in 2015 to subsidise fossil fuels[20]. In the plastic global economy, the raw materials to make plastics are transported by ship to the production facility, from where intermediary manufactured plastic materials such as pellets or fibres are shipped on again to be made into components and products. These items are transported yet again to end markets' distributors, retailers and consumers, where most are used for a short period before becoming waste. This plastic waste is often exported to countries with less stringent standards for processing or landfill, leaving a lot of plastic lost to the environment along the way and generating a huge emissions toll though multiple journeys. Macroplastics like water bottles and microplastics from materials like polyester breaking down over time pose a serious and long-lasting threat to marine biodiversity, human health, shoreline communities and the marine economy. It is estimated that as many as 184,290 tonnes of the tiny plastic pellets used to manufacture products are lost in Europe every year and much of this ends up in the sea.[21]

Overall, 80% of marine plastic debris comes from land, and 20% is produced by ocean-based sources such as fishing, shipping and aquaculture.[22] The biggest causes of plastic pollution by the maritime industry are:

- Container loss at sea due to poor stacking, storms and overloading
- Plastic abrasives used to clean ships hulls (anti-fouling) being released directly into the ocean[23]
- Mishandling of plastic cargo or accidental spills
- Onboard plastic items falling overboard or being dumped as waste, including rope fragments and single-use plastics
- Greywater pollution from washing out tanks and discharging wastewater, legally and illegally[24]

PRODUCTION OF PLASTIC

Global annual plastic production in million tonnes.



Source: Plastic Atlas, Asia Edition | © Plastic Soup Foundation

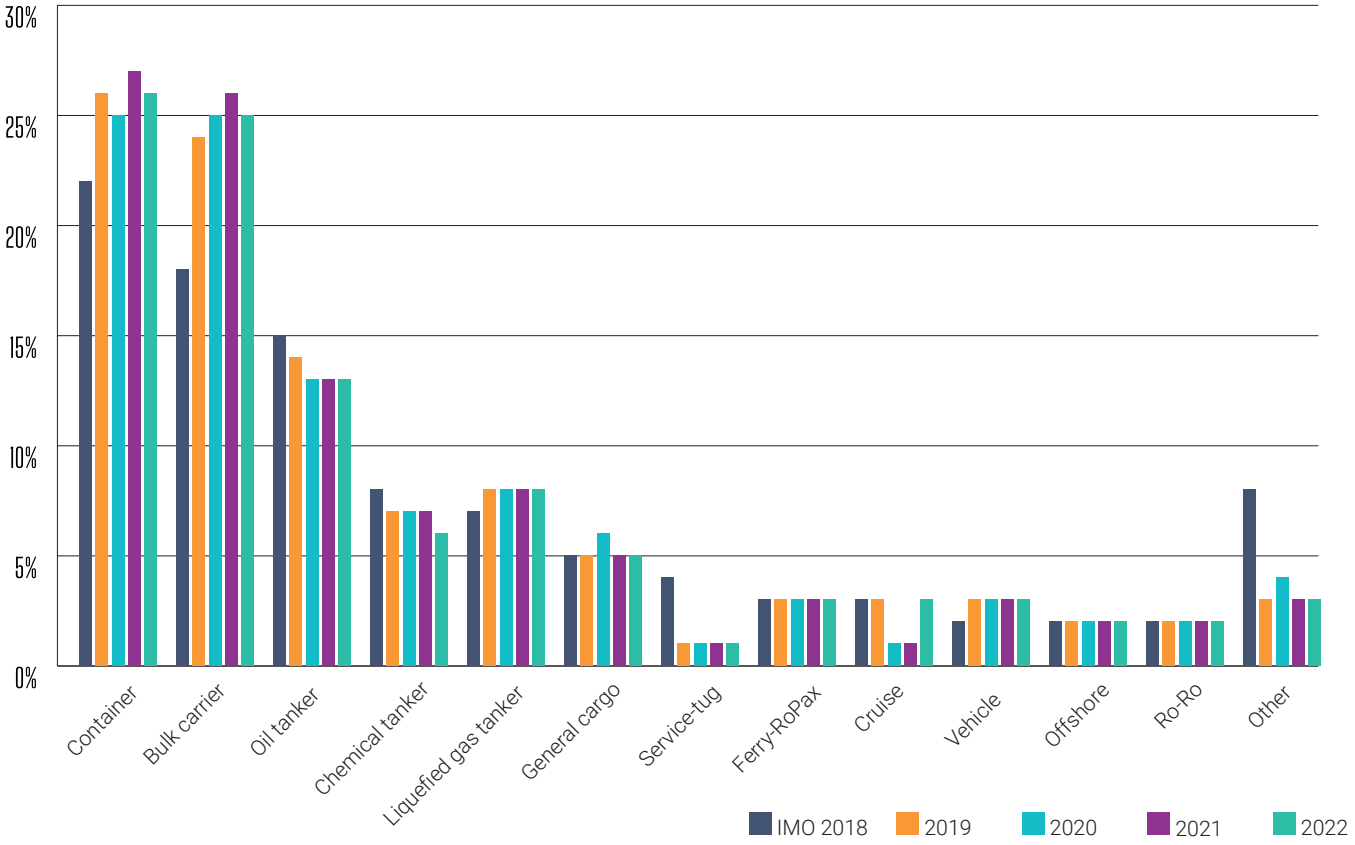
SHIPPING POLLUTION

The International Maritime Organization (IMO) promotes shipping as the least environmentally damaging form of transport, especially when compared to flying and road transport. But the maritime industry still contributes 3% of global emissions, including over one billion tons of carbon dioxide equivalent (CO_2-eq) every year. Moreover, shipping's record of decarbonising is unimpressive to date and if it fails to improve, the maritime industry's proportion of global greenhouse gas emissions could escalate to as high as 17% by 2050.[25] Other industry harms to the environment include air pollution, oil spills, hazardous substance spills, plastic and underwater noise pollution and collision with wildlife.[26] A recent research paper identified a whole range of environmental impacts of shipping, in three main categories: discharges to water, physical impacts, and air emissions.[27]

Ships commonly use inexpensive, low-quality fuel called heavy fuel oil (HFO), which emits high levels of sulphur oxides (SOx), nitrogen oxides (NOx), and fine particulates (PM2.5), which also contribute to atmospheric and oceanic acidification. The adverse health effects of shipping emissions amount to around 250,000 deaths and over six million asthma cases annually, and have prompted measures such as the 2020 introduction of a global sulphur limit on fuel content. Sadly, the exhaust scrubbers[28] used to meet these regulations can also lead to marine pollution, as the wastewater from the process goes back into the sea along with additional pollutants such as heavy metals.[29] The pollution has simply been transferred from the air into the ocean. Shipping's impact on marine wildlife is also significant, through pollution in the water, underwater noise pollution, and via direct animal strikes, particularly in busy shipping areas.[30] There is also an issue of wildlife being transferred to ecosystems where they inadvertently cause damage after hitching a ride on a boat's hull.[31]

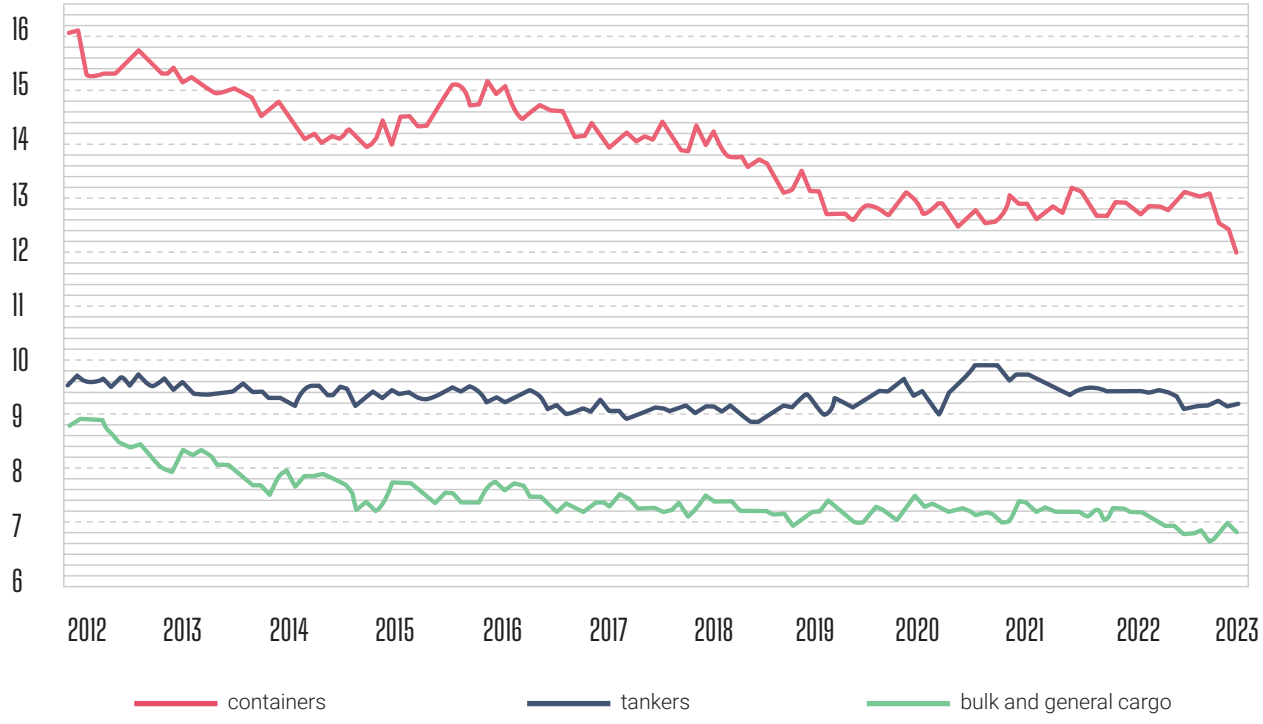
CLASSIFICATION OF THE ENVIRONMENTAL IMPACTS OF SHIPPING ON THE AQUATIC ENVIRONMENT INTO THREE MAIN CATEGORIES OF DISCHARGES TO WATER, PHYSICAL IMPACT AND AIR EMISSIONS

SHARES OF ANNUAL CO_2 EMISSION FROM GLOBAL SHIPPING (%) BY SHIP TYPE



Note: OECD estimates are available from 2019, estimates for 2018 from the latest IMO greenhouse gas (GHG) study (Fourth IMO GHG Study 2020) are shown for comparison
Source: https://one.oecd.org/document/SDD/DOC(2023)4/en/pdf

WORLD FLEET, THREE MAIN VESSEL TYPES, MONTHLY CARBON DIOXIDE EMISSIONS PER TON-MILE, JANUARY 2012–MARCH 2023 (GRAM/TON*NAUTICAL MILE)



Source: https://unctad.org/system/files/official-document/rmt2023_en.pdf

KEY INITIATIVES THAT WILL NUDGE THE SECTOR TOWARDS ONE PLANET SHIPPING

EU POLICIES DIRECTLY IMPACTING SHIPPING

- The EU's Emissions Trading System,[32] an emissions allowances system (as of January 2024) covers CO2 emissions from large ships (5,000+ tonnage) entering EU ports, including 50% of emissions from voyages from or to the EU and 100% between EU ports.[33]
- The Fuel EU Maritime Regulation[34] promotes decarbonisation by supporting sustainable non-crop-based fuels and limiting onboard energy carbon intensity, which links the GHG emissions to the amount of cargo carried over the distance travelled.
- The Alternative Fuels Infrastructure Regulation[35] mandates port infrastructure for new shipping fuels as part of the Fit For 55 package.
- The EU Maritime Safety package[36] modernises maritime safety rules and prevents ship pollution.
- The Carbon Border Adjustment Mechanism (CBAM)[37] imposes a carbon price on imported carbon-intensive goods, encouraging cleaner production globally.
- The Marine Strategy Framework Directive[38] requires Member States to develop strategies for marine protection and sustainable use of the oceans.
- The 2022 EU Noise Directive,[39] part of the Zero Pollution Action Plan, sets global-first limits on underwater noise levels.

GLOBAL POLICIES AND INITIATIVES DIRECTLY IMPACTING SHIPPING

1. Policy initiatives

- The International Convention for the Prevention of Pollution from Ships (MARPOL)[40] addresses marine pollution from ships.
- The IMO's Carbon Intensity Indicator (CII)[41], effective from January 2023 under MARPOL Annex VI, measures and mandates improvements in carbon intensity for large vessels.
- The IMO's revised GHG strategy targets net-zero emissions by 2050, with interim goals of 20-30% reductions by 2030 and 70-80% by 2040, compared to 2008 levels.[42]
- The IMO's 2020 fuel standards cut allowable marine fuel sulphur content to 0.5%.[43]
- Proposed MARPOL amendments would ban Heavy Fuel Oil (HFO) in Arctic waters after 2024.[44]

2. Industry initiatives

- The Getting to Zero Coalition's Call to Action[45], signed by over 260 maritime organisations, urges governments to create policies for decarbonising shipping.
- The Just Transition in Maritime Taskforce,[46] led by the UN Global Compact, the International Transport Federation, and the International Chamber of Shipping, aims for a people-centred transition to zero-carbon shipping.
- The CoZev's Zero Emission Maritime Buyers Alliance (ZEMBA),[47] which includes companies like Amazon and Nike, seeks to accelerate zero-emission shipping solutions.
- The Poseidon Principles for Marine Insurance[48] promote environmental stewardship and alignment with IMO policies and the Paris Agreement.

3. Government Pledges

- 14 countries have committed to the Declaration on Zero Emission Shipping[49], aiming for full decarbonization by 2050 with interim targets for 2030 and 2040.
- The Clydebank Declaration for Green Shipping Corridors,[50] signed by 22 countries, aims to establish at least six zero-emission shipping routes by 2025, focusing on fuel-centric initiatives with potential for integrating wind and electrification while protecting biodiversity.
- The Dhaka-Glasgow Declaration of the Climate Vulnerable Forum,[51] supported by 55 nations, calls for a mandatory GHG levy on international shipping to support a 1.5°C pathway and fund urgent climate actions in vulnerable developing countries.

A SELECTION OF POLICIES AND INITIATIVES IMPACTING SHIPPING INDIRECTLY

Policies and initiatives that facilitate a shift to a circular economy and enhanced sustainability (including waste reduction) are being introduced within the EU. If implemented at scale, these will reduce the consumption of single-use products, increase local recycling of materials and encourage the growth of local manufacturing where possible. Reduced waste, or more local processing and reuse of materials, will mean less long-distance shipping of waste (including from the huge fast fashion industry) for recycling or disposal elsewhere. A recent report by Berlin-based think tank Hot or Cool sets out a vision for how this might happen, including a discussion of sufficiency – buying only what we need and not what we desire.[52] If even some of this happens, it will have an indirect effect on shipping as the amount of goods being shipped around is likely to fall, the routes needed to supply markets will probably shift and the kind of goods needing to be shipped will also be different. Shipping needs to be able to respond to changes such as these:

- In the European Union, the Circular Economy Action Plan (CEAP) and legislations such as the Ecodesign Directive and the Right to Repair are meant to facilitate a transition from a linear and wasteful economic model, to a circular and regenerative one.
- There has been a recent request by the European Parliament to the European Commission to include ports and shipping in its circular economy strategy, within the context of the EU ports strategy.
- The newly adopted Plastic Pellets Regulation on pellet loss prevention includes shipping in its remit.
- The Waste and Packaging Waste Regulation could impact plastic and waste supply chains.
- The UN Plastics Treaty to End Plastic Pollution, aimed at tackling plastic pollution from production and design to waste management and recycling, could bring about global changes in our approach to plastic use, transport, recycling and disposal.

Policies and initiatives directed at the energy transition impact shipping indirectly in terms of reducing overall shipping demand but also reshaping trade routes. For instance, cuts in fossil fuel shipments (mounting to ~36% of total shipments in 2021[53]) would affect global seaborne trade as it will encourage fewer and more regionalised trade routes. In fact, the International Energy Agency (IAE)'s own roadmap to net zero in 2050 predicted that global fossil fuel use in 2035 would be just 50% of 2020 levels.[54]

- The EU Taxonomy, a classification system meant to guide investors towards sustainable investments, albeit controversial as it currently includes nuclear and fossil gas, also affects shipping.
- With the exit of the EU from the Energy Charter Treaty countries are no longer tied to fossil fuels investments, which enables countries to accelerate the phase-out of fossil fuels, which would result in reduced shipping demand.
- Similarly, developments on the campaign for a Fossil Fuel Non Proliferation Treaty, which targets new expansion of fossil fuels and phase-out of current production could have the same effect.

Nature and human rights protection policies and campaigns might also have indirect effects on the sector because they seek stricter regulation and higher standards for environmental and human rights protection.

- The campaign pushing for Ecocide to be recognised as a crime within EU and national legislation globally could bring about stricter regulation on waste disposal, which will reduce global trade in waste, but also increase operational costs and add to legal and financial risks.
- The High Seas Treaty, aimed at creating Marine Protected Areas in marine areas beyond national jurisdiction, which could result in stricter environmental regulations, in route changes and in more strict impact assessments and reporting.
- The 2024 Corporate Sustainability and Due Diligence Directive is designed to hold companies accountable for respecting human rights and environmental standards and this applies to shipping companies, which will have to, among others, ensuretransparency and responsibility along the supply chains they serve, as well as mitigate pollution, conduct risk assessment, report publicly and disclose information on working conditions.

“The climate is nearing tipping points. Changes are beginning to appear and there is a potential for explosive changes, effects that would be irreversible, if we do not rapidly slow fossil-fuel emissions.”

James Hansen, Director of the Climate Science, Awareness and Solutions, The Earth Institute.

WINDS OF CHANGE

ONE PLANET SHIPPING

--- -. . / .--. .-.. .- -. . -/ ... .--. .--. .. -. --.

With shipping being the unseen backbone of global trade, changes disrupting world trade, such as the energy transition, ultimately affect shipping and therefore the industry always needs to take key trends into account. Some of today's trends show a positive direction of travel and offer hope for a more sustainable future.

"Megatrends such as demographics and decarbonisation are silently recalibrating the relationship between global economic growth and seaborne trade volumes."

Danmarks Skibkredit (Danish Ship finance Report, 2024)

CLIMATE ACTION BY SHIPPING

According to the European Environmental Agency's climate risk assessment,[55] Europe is the fastest-warming continent in the world.[56] A whole range of new policies and regulations aimed at accelerating countries' decarbonisation efforts (See Key Initiatives box) will have a significant impact on the maritime industry. Meanwhile, there is pressure from consumers on the corporate, financial and insurance organisations to improve their Environmental, Social, and Governance (ESG) reporting.

The inevitability of decarbonization in the shipping industry seems set, with a continuing direction of travel away from the use of fossil fuels and towards strategies that reduce emissions. However, the speed of change would be increased by including Scope 3 emissions in decision making at all levels: these emissions are not made directly by ships burning fossil fuels, but include the indirect effects up and down the supply chain, from purchasing goods, services and raw materials, to the use of a product after it has been sold. Scope 3 emissions are usually large and there are currently few restraints on them.

Much of the energy today being spent on decarbonising shipping is going into researching, producing and designing systems to supply and use alternative fuels, such as ammonia or hydrogen. However, these new fuel options cannot solve all the problems outlined above in a sustainable way – either because they are prohibitively expensive, not available at scale, their production will be in competition with other sector demands for green electricity, or the existing markets for these options are dependent on fossil fuels for their production and/or transportation.

Direct use of renewable energy is a more sustainable option. For shipping, this will mean prioritising wind propulsion and electrification with electricity from renewable sources, while infrastructure for green renewable fuels of non biological origin (RFNBOs) are scaled and the global economy adjusts to become more circular and in line with the goals of the energy and material transition.

FUEL	PROS	CONS	EFFICIENCY OF ELECTRICITY – PROPULSION
WIND	• Direct use of wind for propulsion, makes use of a renewable energy source free for all. • Significant fuel savings leading to cost savings on each voyage. • Is predictable when meteorologic modelling is used. Can be used on most routes. • Does not require any onshore infrastructure/investment. • In many cases wind technology can be re-fitted onto a new vessel when the original's lifetime ends.	• Varies with wind condition and direction. • Not suitable for some ship types as retrofit, but almost all types of vessel can be designed with wind installation integrated. • To reach full decarbonisation will need to combine with hybrid electrification and e-fuels, however some designs are incorporating energy harvesting systems that turn excess wind energy into electricity/fuel on board. • Requires investment upfront.	100% – direct use of captured renewable energy
ELECTRIFICATION	• Direct electrification from renewable electricity has the best energy performance and sustainability score compared to all other fuels. • Should be promoted whenever feasible. • Battery densities and range are improving fast. • Suitable for short coastal journeys.	• Potential constraints on raw materials for batteries, range limited by size of batteries. • On longer journeys hybrid solutions will be necessary.	70%
RENEWABLE HYDROGEN*	• Synthesised from electrolysis is cheaper and more energy efficient to produce than other renewable fuels like methanol or ammonia.	• Significant technical challenges in transporting, storing, distributing and using safely as a transportation fuel.	20%
RENEWABLE METHANOL*	• Lower production costs than other e-liquids and lower investment risks for the development of new fuel distribution infrastructures, compared with hydrogen. Highly flammable but safer to handle than ammonia.	• Challenges sourcing renewable carbon for e-methanol. • Higher energy demand compared to renewable ammonia.	10%
RENEWABLE AMMONIA*	• Lower production costs than other e-liquids and lower investment risks for new fuel distribution infrastructures, in comparison with hydrogen.	• Highly toxic. • Challenges with e-ammonia safety. • Risks of disruption of the nitrogen cycle from any reactive nitrogen (NH3, NOx) emissions as well as potential for N2O emissions which will require tight control from use and through the supply chain.	10%
BLUE AMMONIA, BLUE METHANOL, BLUE HYDROGEN**	• Cheaper than green variants produced with renewable electricity.	• Challenges with carbon capture and long-term storage of CO2, prolongs use of fossil fuels and requires expensive infrastructure investments that could be better spent elsewhere.	NA
BIOFUELS INCLUDING BIOGENIC LNG	• Cheaper than renewable liquid e-fuels.	• Availability limited. • Competing demand in the bioeconomy. • Sustainability constraints with respect to land use change. • Need to clearly define what can make them viable in which contexts and to supplement with other sustainable fuels. • Food- and feedstock-based biofuels have significantly lower sustainability performance than advanced bio-based fuels.	NA

*Renewable Fuels of Non-Biological Origin (RFNBOs) comprise fuels made by electrolysis using electricity from renewable sources to split water into hydrogen and oxygen without emitting CO_2, as long as other chemical elements that they contain (e.g. carbon, oxygen, nitrogen) are also not from biological origin. RFNBOs are chemically similar to their fossil counterparts.
**Derived from natural gas, combined with CO_2 capture technology to minimise emissions.
Source: for information in table adapted from Cazzola et al. 2023; Transport & Environment 2017, 2018; Barnard – Clean Technica 2024; Bertagni et al 2023;[57]

RESILIENT TRADE WEBS, EQUAL ROUTES AND LOCALISATION

We will need new trade narratives that help us to distinguish necessary from unnecessary trade, as we are risking our future in order to prolong today's dangerous levels and patterns of consumption. To supply lower levels of consumption that take account of all human needs within planetary limits, different networks of supply need to be created with shorter chains. This is a proven solution; making more resilient trade webs can be achieved in a relatively short time frame. Reorganising shipping routes alone has a huge potential for driving a reduction in shipping emissions by as much as 38%, by optimising international trade patterns.[58] It is only in the last few decades, in response to the obsession with low storage levels and "just-in-time" delivery of stock, that we have allowed supply chains to become so stretched out and, lacking buffers and back-ups, so vulnerable. Many of these have proven problematic, easily broken or damaged under stress.

The war in Ukraine revealed obvious vulnerabilities in the supply of oil and gas from unstable states across waterways prone to attack from pirates. And the shortages caused by the stopping and starting of production during the pandemic caused bottlenecks at global pinch points with no room for expansion in times of trouble. In March 2021, the giant container ship Ever Given got stuck across the Suez Canal, effectively blocking it for a week and holding up almost $60 billion worth of trade as ships formed a queue behind it.[59] Huge amounts of food and other perishables rotted away in the heat, bringing into the spotlight, both the fragility of our global supply chains and how enormous some of today's ships have become.

Future supply chains must be shorter, working with groups of suppliers across regions – even bioregions – in hubs more like a web rather than in a linear chain easily disrupted by a single event in one geographic location. More journeys will be coastal and may involve intermodal transport on land via train, for example, making use of smaller ports nearer to destinations and relying less on vast sea crossings and then long lorry trips. Smaller ships would enable more ports and harbours to receive goods, where previously the scale of port infrastructure or physical geography might have prevented today's mega-ships from docking. This renewed activity closer to the point of consumption would bring new employment and stimulus to many abandoned coastal communities.

Even before Covid and the most recent geopolitical developments prompted industries and governments to prioritise resilient sourcing and production – and therefore shorter routes and local production – globalisation had plateaued and was starting to favour more domestic supply chains.[60] Reshoring (bringing a business back from where it has been relocated to its original location) and nearshoring (outsourcing particular tasks or parts of production to neighbouring or nearby locations) are growing trends, accelerated by technological advancements and pandemic impacts. In September 2020, a survey found that 66.2% of companies worldwide are currently thinking about reshoring.[61] The Asian Development Bank reports that reshoring will lead to a decrease in global trade, shorten supply chains, create local and regional supply networks and reduce traditional large-volume, long-distance commodity flows for oil, coal, and Liquified Natural Gas (LNG).[62]

Shifts in global demographics and economic development will further impact demand for goods and services, subsequently altering international trade dynamics and shipping trends. By 2030, developing nations are projected to represent over half of global consumption, with countries like India, Indonesia, Thailand, Malaysia, and the Philippines accounting for 35% of this consumption.[63]

In May 2024, in an interview with TradeWinds, Fred Tsao, Chairman of the Tsao Pao Chee Inc, a traditional shipping company turned integrated supply chain management company operating in 17 countries and considered one of Asia's most influential business voices, predicts that new materials, new energy sources, new trade patterns moving north/south, not east/west, carbon credits, a greater focus on supply security, a shift towards sustainable local production and anti-consumerism will all lead to a drop in demand for shipping.

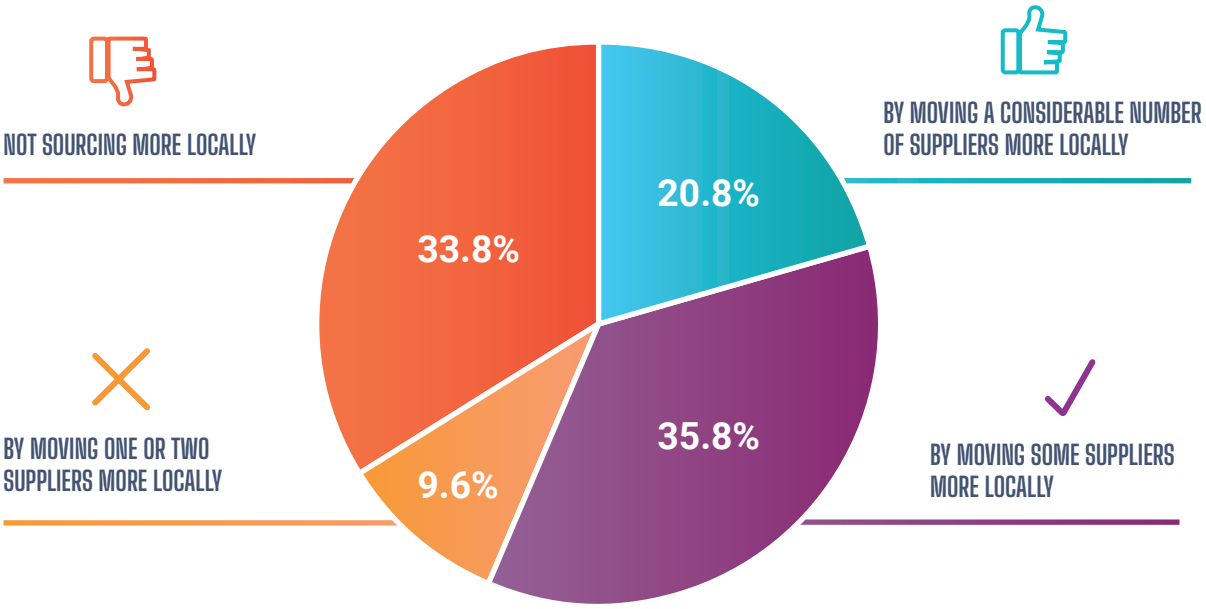
"Energy is 60% of the fleet. That is going to change. We are going to localise into alternative energy more and more".

"Solar and wind are viable and cheaper at current oil and carbon prices. It is just a matter of scaling. There are some restrictions on infrastructure for scaling. Everyone is talking about financing this infrastructure boom except shipping people".

"Big things are going on around the world that shipping people need to wake up to."

RESHORING / NEARSHORING APPETITE

How global supply chain professional are sourcing suppliers post-pandemic



Source: https://www.raconteur.net/supply-chain/reshoring-manufacturing-covid

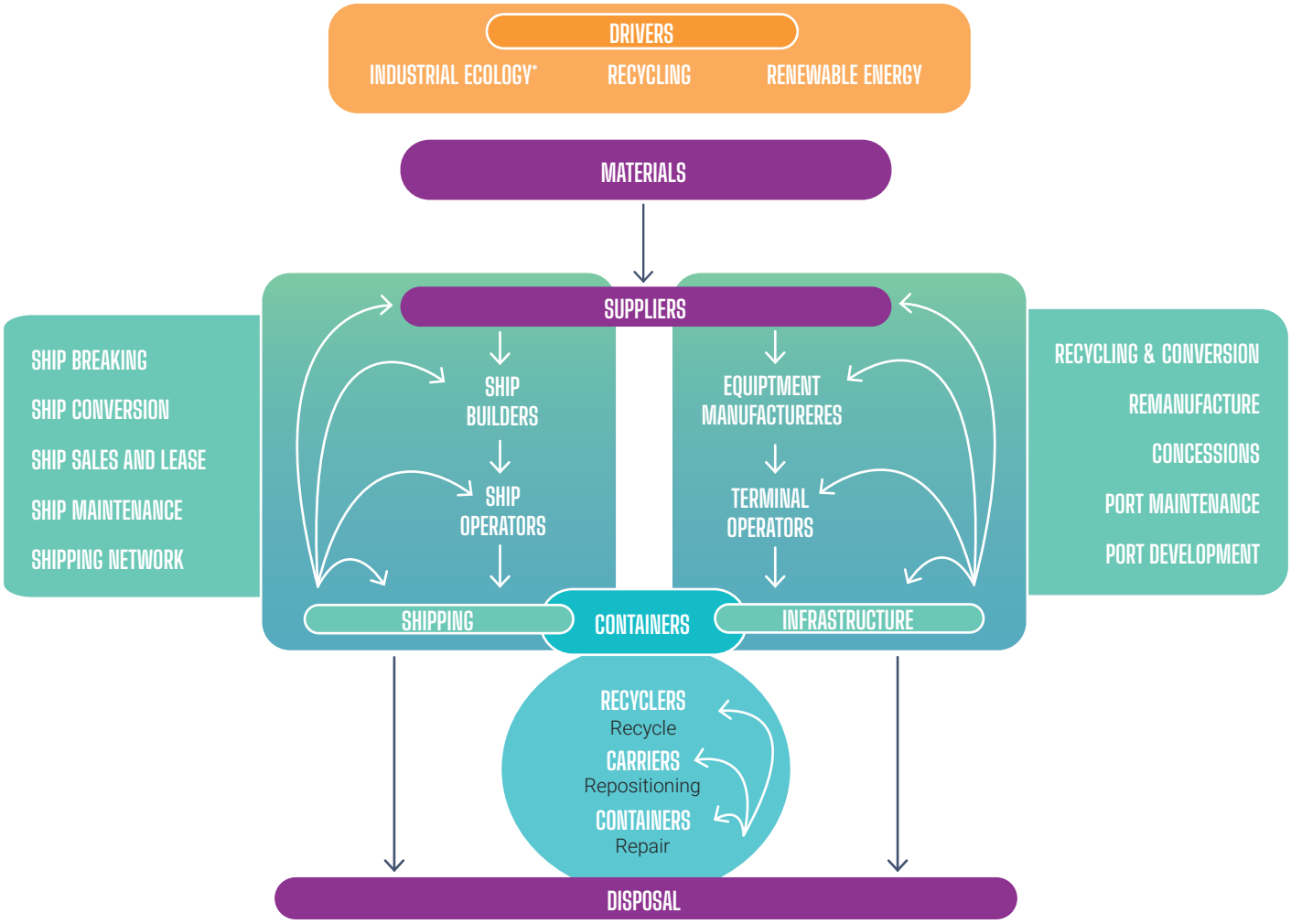
CIRCULAR ECONOMY AND MATERIAL TRANSITION

The growing understanding of the need to cut waste for environmental reasons and the shortage – and national control – of rarer raw materials are both contributing to an increased awareness of the need for a circular economy. This is a system in which products and materials are kept in circulation through a variety of processes to extend their life, from maintenance, reuse and refurbishment, to remanufacture, recycling, and composting.[64] Any sizable shift towards a circular economy would result in a significant reduction in demand for new goods and raw materials. Whilst the exact impact on shipping is still unclear, increasingly circular approaches result in a shrinking reliance on energy-intensive processes for extracting, processing and transporting virgin materials, and the shipping of waste at the end of a product's lifecycle. The maritime industry has a role to play in helping to design a future circular economy.

The European Union ships approximately 67 million tonnes of waste annually between its member states, and in 2020, also exported some 32.7 million tonnes of waste to non-EU countries – a 75% increase since 2004 – with a value of €13 billion. This exported waste primarily consists of ferrous and non-ferrous metal scrap, paper, plastic, textiles, and glass. The EU also imported around 16 million tonnes of waste, with a value of €13.5 billion.[65] The transition to a circular economy could lead to a huge reduction in waste and therefore a fall in these transport movements and the emissions they generate.

Carbon emissions associated with resource extraction and production could also be lowered, while circular economy principles will encourage innovations in ship design, operations and maintenance to optimise fuel consumption and minimise waste generation. These would be good for the industry and the environment. For example, building ships in a way that allows for disassembly and reuse at the end of their lifecycle could reduce the carbon footprint associated with shipbreaking and make the construction of new vessels less resource intensive.[66] The EU is currently developing material passports for EU-built ships as a way to ensure circular economy principles are applied. This could give the EU maritime tech industry a boost and act as a pilot for future industrial strategies. Port cities could also benefit from the move towards a more circular economy, with new opportunities from supply chain optimization, reverse logistics (returning products from end users to either the retailer or manufacturer[67]), urban mining and remanufacturing locally. These operations are likely to result in improved supply chain resilience, reduced emissions and less waste.

PROMOTING CIRCULAR ECONOMY



*Industrial ecology is the means by which humanity can deliberately and rationally approach and maintain sustainability, given continued economic, economic, cultural, and technological evolution. The concept requires that an industrial ecosystem be viewed not in isolation from its surrounding system, but in concert with them. It is a systems view in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product, and to ultimate disposal. Factors to be optimized are resources, energy and capital[68].

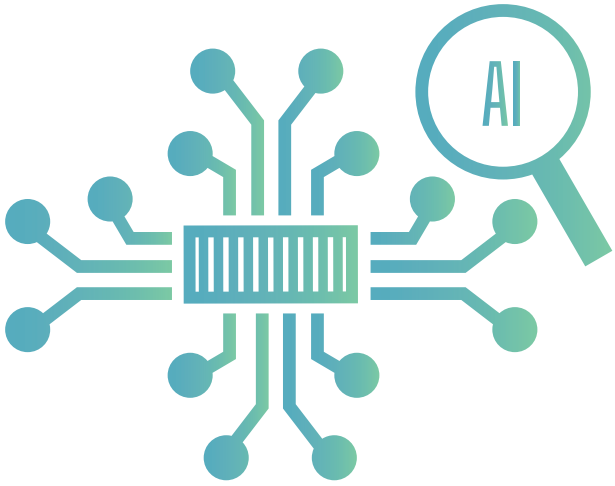
Diagram Source: Nitin Agarwala (2023) Promoting Circular Economy in the shipping industry, Journal of International Maritime Safety, Environmental Affairs, and Shipping, 7:4, DOI: 10.1080/25725084.2023.2276984

DIGITALISATION AND TECHNOLOGY

The shipping industry's approach to digital technologies is still rather conservative, despite the apparent advantages of competitiveness and operational efficiency.[69] The relatively slow uptake means there is still a lot of potential for cost-saving and environmental gains. Until very recently, digitalisation in this space focused on ship safety and navigation[70] technology, but enhanced connectivity and visibility could improve overall decision-making processes both at sea and on land, enabling the seamless track and trace of goods, better inventory control and more accurate demand forecasting.[71] This can also mean reduced energy consumption and lower emissions.[72] For example, AI-driven predictive models have the capacity to make vessel traffic management, port activities, and logistical processes more efficient by anticipating logjams and timetabling efficiently. Ships often form queues outside ports while waiting for their slot to unload or load cargo. Having fewer ships idling and helping those in motion to travel more slowly could reduce greenhouse gas emissions without affecting competitive advantage.[73] The EU funded Dynamic Navigation and Port call Optimisation in Real Time project (Dynaport) uses smart optimization and coordination tools for ports and ships that aim for "at least 10%" emission reduction at ports.[74]

Digital route optimization can cut every unnecessary mile from a journey. Making a process more efficient can also encourage people to increase throughput, so careful regulation would need to counter potentially detrimental outcomes.

Another area of technological advancement that could affect shipping is 3D-printing and its potential to move production much closer to markets. While it remains to be seen how big the actual impact will be, some analysts suggest that, if this trend prevails, "freight traffic per billion euro of consumption could drop sharply, cutting costs, congestion and CO_2 emissions."[75] 3D printing and other forms of local manufacturing have the potential to minimise transportation requirements by enabling decentralised production near the point of use, reducing exhaust emissions. Additive Manufacturing (AM) – the formal term for creating objects by adding layer upon layer of material – also typically generates less waste compared to conventional methods, as it only uses the material required.[76] Packaging materials could also be reduced.



OVERARCHING TRENDS IMPACTING SHIPPING INDIRECTLY

There are overarching global trends unfolding that may impact the shipping sector indirectly.[77] Shifts in goods and energy shipments, driven by the decarbonisation of other sectors, such as electrification of road transport and advancements in the circularity of resource use, are expected to shorten supply chains and reduce the trade of environmentally damaging goods and virgin materials. Additionally, changes in demographic and consumer behaviour, like the rapid growth of the second-hand clothing market – expanding three times faster than the overall apparel market[78] – will also impact overall shipping demand.

Global trade optimisation may also alter the concentration of trade, as currently 40% of trade relies on three or fewer economies for the supply of a given product. A further 15% relies on two or fewer economies for a given product.[79] This concentration can in some cases create fragile or risky trade relationships. The recent focus on diversification and resilience in response to global shocks aims to address these vulnerabilities. Furthermore, advancements in digitalisation and AI are anticipated to improve the sector by predicting trade patterns more accurately, enhancing port operations, reducing ship waiting times, and consequently lowering emissions.

“The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction.”

Rachel Carson, Marine Biologist.

NEW STORIES FOR ONE PLANET SHIPPING

--- -. . / .--. .-.. . - -. . - / ... .--. .--. .. -. --.

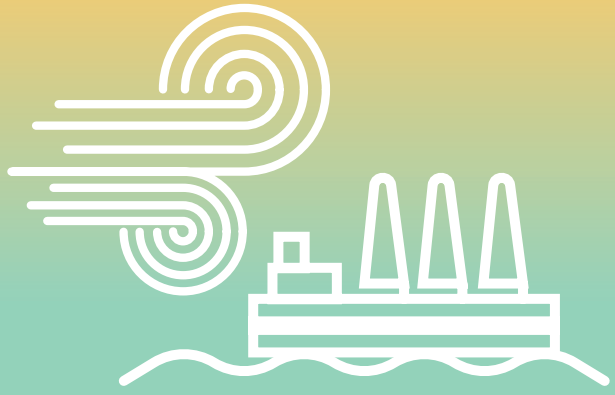
THE VISIONS WE NEED FOR A SAFE AND JUST FUTURE

The words we use to talk about a subject are important; our communications contain shared concepts, ideas and stories that help us to make sense of the world, see our place in it, and to understand each other. This new set of narratives will allow our leaders, in public life, industry and community, to talk about possible futures for One Planet Shipping together and in a positive way. These stories are already happening – we have looked at the main drivers behind them already – but making them concrete will enable us to assume a sustainable future is our shared goal and to discuss how we might reach it together.

The wind-powered vessel SV Juren AE.
Source: https://www.researchgate.net/figure/Commercial-wind-hybrid-cargo-ship-E-Ship-1-with-four-Flettner-rotors-with-top-discs-6_fig3_324681135

WIND FIRST

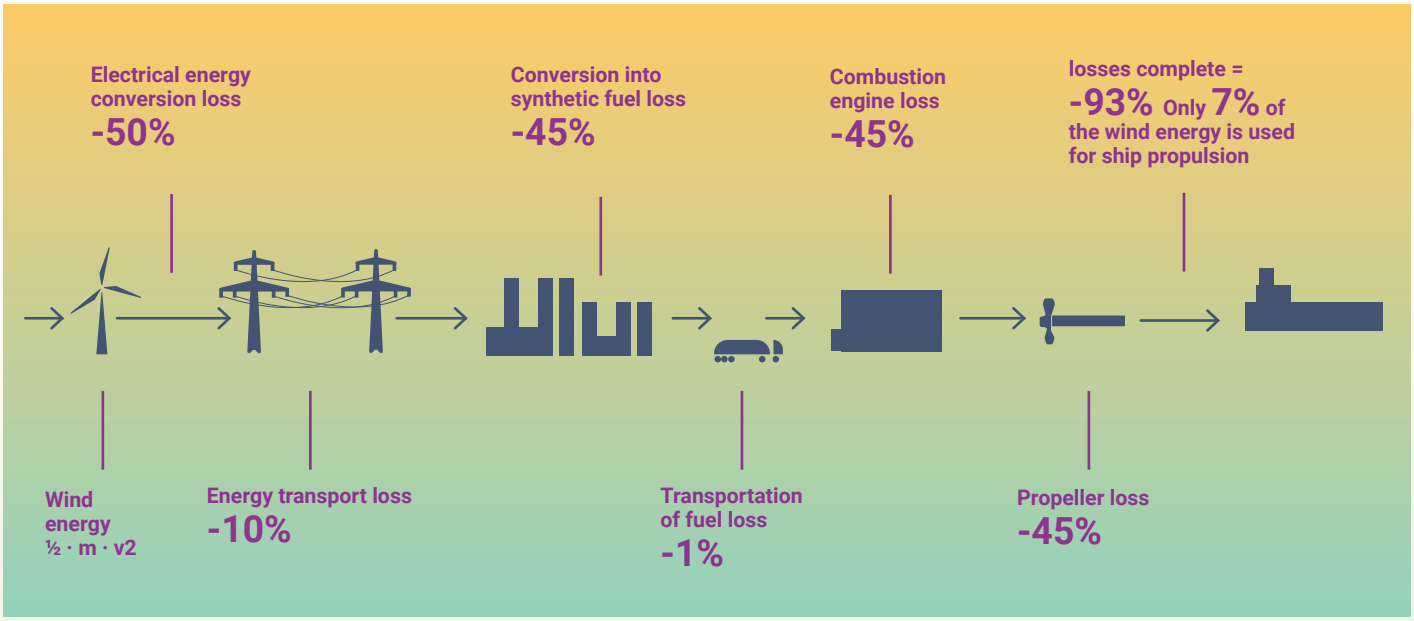
"You can't change the wind but you can adjust your sails."
Anonymous



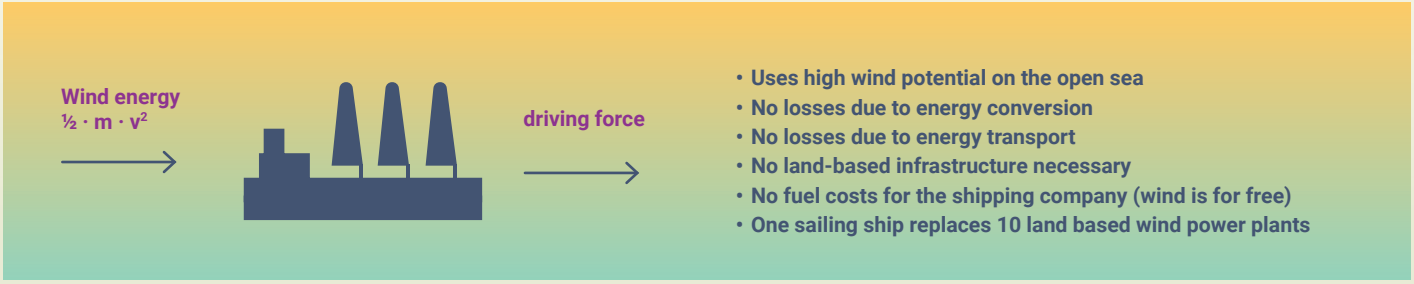
If we are to reach One Planet Shipping we need to prioritise wind power as a future source – or part-source – of energy for the future. A huge amount of time and media attention is taken up with high tech alternative fuels, most of which have pollution, price or energy downsides, but it is important to reexamine wind seriously as a viable means of propulsion, particularly in the context of mixed energy use. Research shows that combining wind propulsion with digital voyage optimisation can deliver substantial additional emission savings. Using wind as an addition to other fuel sources, especially electricity from renewable sources, is both cheaper and less polluting in many circumstances. Government policy could also play a role here: for example, by updating the Carbon Intensity Indicator (CII) to include wind power and including wind in the FuelEU maritime initiative (part of the EU's Fit for 55 package of environmental measures) and the Global GHG Fuel Standard.

The wind-powered cargo vessel SV Juren Ae sailing towards a sustainable future.

POWER TO FUEL CONCEPT – THE LONG WAY FROM WIND ENERGY TO DRIVING FORCE

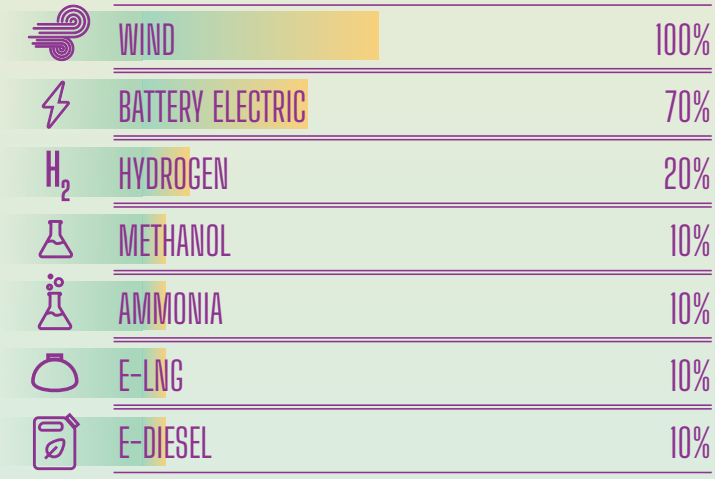


SAILING SHIP – THE SHORT WAY FROM WIND ENERGY TO DRIVING FORCE



Source: International Windship Association Network

EFFICIENCY OF ENERGY



For further information refer to p21

"The biggest advantage of direct electrification of waterborne transport is certainly the fact that it is by far the most energy-efficient option."

EU Interreg NWE H2ships Report [80]

The synthesis of hydrogen and RFNBOs from electricity is less efficient than direct electrification, and the conversion of these fuels into motive power aboard vessels (i.e. the engine or propulsion shaft efficiency) incurs losses that are much larger than in electric vehicles with batteries.

Use of electricity and battery storage is already viable for shorter, coastal and inland routes, and should be considered first before more risky, more expensive and less green fuels. Battery energy density is increasing fast and analysts predict that a range of 1200nm for maritime shipping will be possible in the coming years.[81]

FOR 1 UNIT OF ELECTRIC ENERGY PRODUCED:

- 0.95 units can be available for direct end use (after transport, storage, and distribution)

- 0.7 units can directly be used as propulsion power by a battery electric vehicle (accounting for losses on-board the vessel).

- 0.2 units of energy in the form of hydrogen from electrolysis can be used as propulsion power by a fuel cell electric vehicle (accounting for losses during the production and transportation of the fuel and on-board the vehicle).

- 0.1 units of energy from liquid synthetic fuel, also obtained from electrolysis, can be used as propulsion power by an internal combustion engine (accounting for losses during the production and transportation of the fuel and on-board the vessel) because of a first conversion from electricity to hydrogen in the case of hydrogen synthesis and a second conversion from hydrogen to a liquid fuel (hydrocarbon or ammonia) in the case of liquid fuel synthesis.

Source: https://www.europarl.europa.eu/RegData/etudes/STUD/2023/733103/IPOL_STU(2023)733103_EN.pdf

> ***"For marine shipping, that means perhaps 1,200 NM of range. And that covers all inland shipping distances and two-thirds of short sea distances. You won't push a container or bulk ship across the Atlantic or Pacific with it, but you will push a roll-on roll-off (roro) or merchant cargo vessel across pretty much every scheduled route in the world"***
>
> Michael Barnard. Decarbonisation strategist & Futurist.

Batteries still create waste, but battery recycling works well for marine batteries and there are chemistries available today that have reduced the controversial rare earths components of many batteries. Marine batteries can also have a secondary life as part of a load balancing and energy storage system on land after their service onboard.

COSCO Shipping Green Water 01, China's first electric battery-powered containership

Some studies project that over 40% of global containership traffic will be electrified by 2030,[82] reducing CO_2 emissions and mitigating the health impacts of air pollution on coastal communities. Maersk, the largest shipping company by volume, is already piloting battery hybridization on a containership operating between East Asia and West Africa[83] and battery-electric vessel pilot projects are underway in China, Japan, Sweden and Denmark.[84] Chinese shipping firm Cosco has launched the first of two fully electric container ships plying the 600m Yangtze river route, the 700 TEU ***COSCO Shipping Green Water 01,*** with 36 replacement batteries and a smart ship management system to increase the efficiency of the operations. This will adjust energy consumption based on the needs of the ship, planning the speed of the voyage according to the arrival time, water flow, battery capacity, and other factors.[85]

The ***Pyxis Ocean*** MC Shipping Kamsarmax vessel finished its recent six-week maiden voyage testing two giant, controllable rigid sails to boost its speed, reportedly saving an average of 3.3 tons of fuel per day. In optimal weather conditions, fuel consumption was reduced by over 12 tons a day and greenhouse gas emissions could come down by as much as 37%.[86] Made of the same material as wind turbine blades, its wings are folded down in port then opened out to stand at 37.5m once on the open seas. They were retrofitted to a standard ship, showing enormous potential for comparatively fast fleet alterations in an industry where new vessels come on line slowly. Potential challenges in moving through dock infrastructure will need to be addressed, but are not considered insurmountable.

Source: www.towt.eu

Other maritime designers are looking to a mix of old and new technology to make the most of sail power. Australian company Go Sail Cargo designs ships to use sail propulsion and solar-powered electric motors that can take a mix of containerised and non-containerised cargo plus passengers.[87] Their smaller size and attractive design makes them particularly suited to coast and island cargo shipping, retaining trade in places where local communities will struggle to to afford or access new fuels and may lose out on trade as a result. They could also be used for recreational travel by passengers wanting greener options.

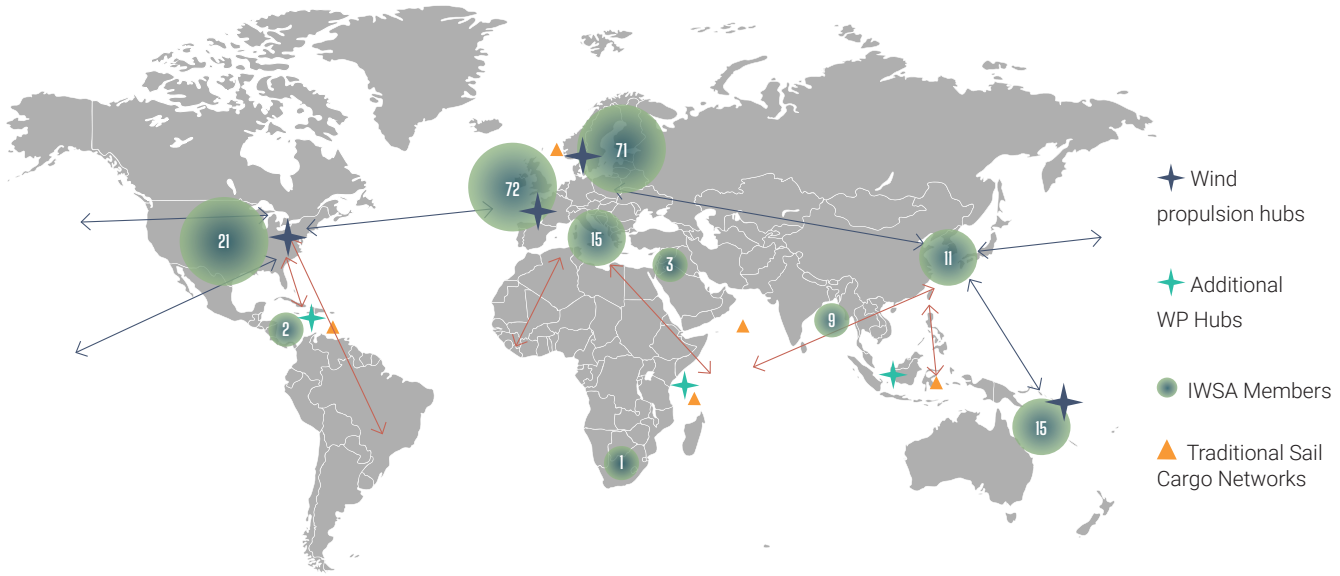
The Republic of the Marshall Islands recently received a modern sail cargo ship built in South Korea to support decarbonisation of their national fleet to be operated inter island in the Pacific.[88] French sail cargo company TOWT recently received two modern sail cargo ships to be operated between France, the Americas and the Caribbean and has another six vessels in development.[89]

"I'm rethinking the ways my chocolate gets to places (currently by aeroplane) and how global logistics should prioritise regional approaches, creating local redistribution networks and ensuring vessel capacity is not underutilised. I imagine a sailing culture rather than sailing cargo. Vessels' role in society must be optimised through a system that transports more than goods: it supports connections and exchange of culture and materials, fills socioeconomic gaps between the South and North, becomes a platform for artists to travel, and potentialises nature's mechanisms—a polyculture system that moves ideas, products, and people."

Gillian Goddard, Cocoa farmer & entrepreneur, Founder of the Cross-Atlantic Cocoa Collective, Trinidad & Tobago.[90]

SAIL CARGO CULTURE AROUND THE WORLD

International Windship Association Network (IWSA) – A unique, fast growing tech segment: significant decarbonisation & operational cost reduction potential.



MEMBERSHIP & ORGANISATION

Structure – NPO, elected board, member driven
Growth – 12 members (2014) – 150+ active (2023)
Wider Network – 1500+
Advisory – IMO, EU, National Govts

IWSA ACTIVITIES

Network – members, events, publications
Promote – communications
Incubate – projects, accelerator, hubs
Educate – seminars, research
Facilitate – standards, policy

HUB DEVELOPMENT

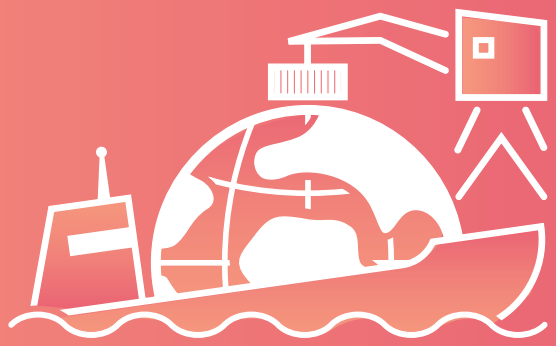
Europe – Atlantic (Nantes, Fra)
Europe – North Sea & Baltic [development]
North America (CAN/US) [development]
E. Asia (JP-KOR-CHN-SING) [early development]
South Pacific (MCST, RMI)
Africa/ S.E.Asia / Caribbean & Latin America

Source: International Windship Association Network

SAFE LOAD

"Linear change is no longer an option. The only option is exponential change. We know that the only currency that matters is speed and scale. We also need to become stewards of the entire planet."

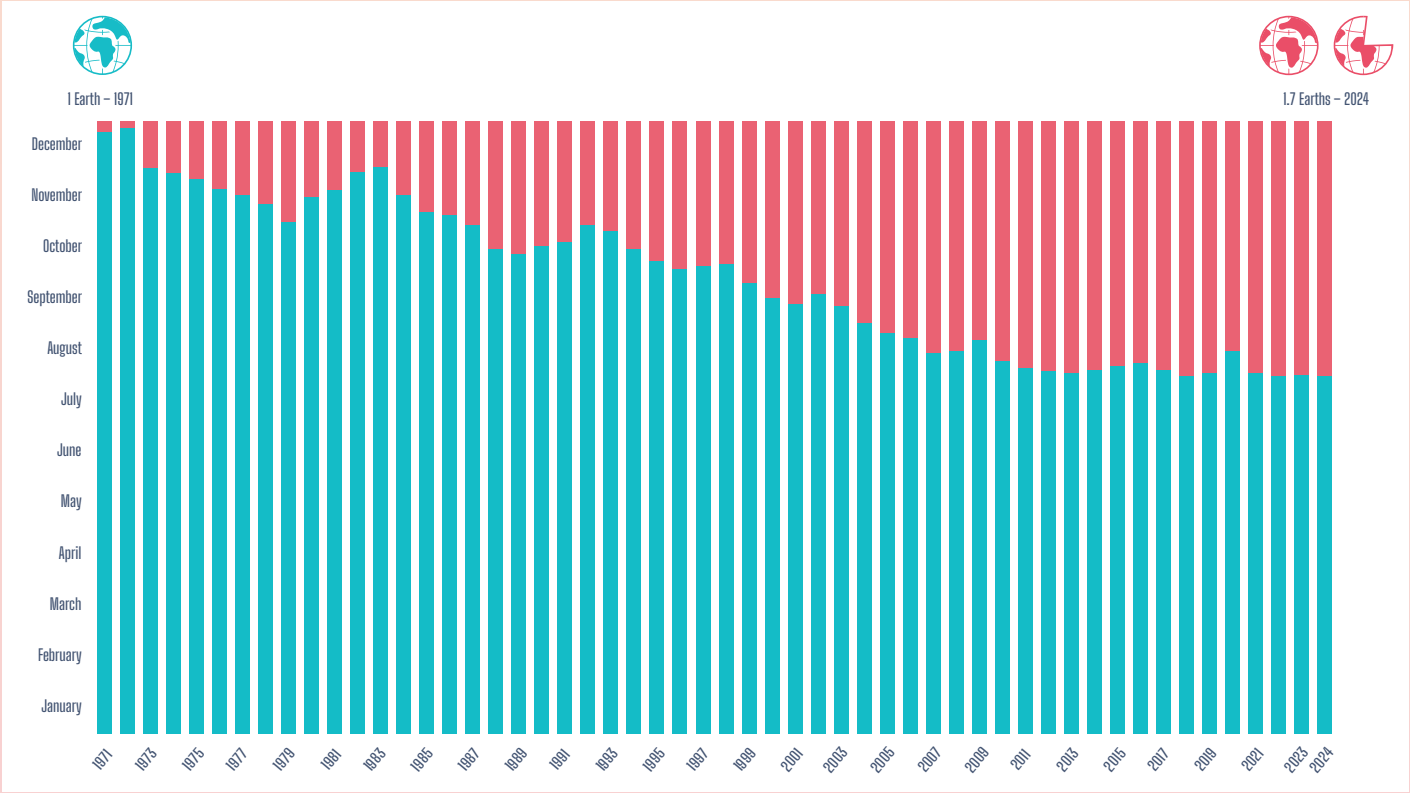
Johan Rockstrom, director of
Potsdam Institute for Climate Impact Research.



Understanding what our world can withstand is vital if we are to achieve One Planet Shipping. We need to make sure that our cargo is useful, none of it will go to waste and that the size of the load doesn't endanger the ship itself. This will mean ensuring that supply chains operate within the same "safe load" concept, designing out waste and enabling circularity to become the norm. This is essential if we are to avoid dangerous earth system tipping points which are dangerously close due to rapid climate heating and material consumption.

A **tipping point** is where a small change makes a big difference to a system and it is often used as a point of no return, beyond which something fundamental has irreparably changed. Our levels of consumption are bringing us close to a tipping point at which the Earth's climate will move into a different phase that will be dangerous for humanity. A research study of more than 10,000 people in 29 high income and middle income countries found that overconsumption is putting our planet and society at risk.[91] By reducing our unnecessary consumption – of fossil fuels, foodstuffs, natural resources and manufactured goods – the total weight of what we ship will come down and we may be able to reverse away from any tipping point.

EARTH OVERSHOOT DAY

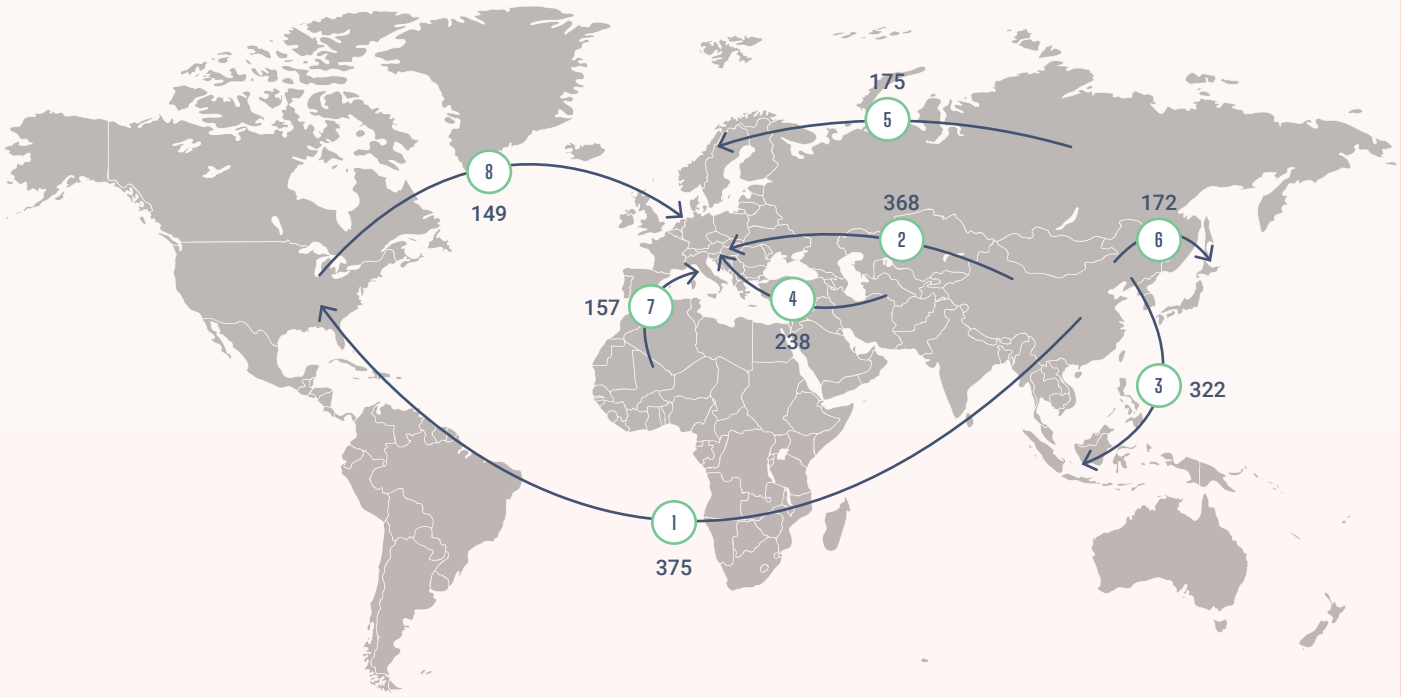


Source: https://overshoot.footprintnetwork.org/newsroom/past-earth-overshoot-days/

The scale and speed of overconsumption in richer countries is shocking: for example, the US population today is 60% larger than it was in 1970, but consumer spending rose 400% (adjusted for inflation) over the same period. The drive to buy is not logical as people continue consuming long after they have all the goods they need: driven by marketing that encourages us to compare ourselves with others, we opt for an upgrade every time. A lower-and slower-consuming society is perfectly thinkable, because we have been there before – and in living memory. Global Footprint Network calculates that as recently as 1971, we were consuming, however unequally, at the rate compatible with one planet's resources; this is, what we used could still be replenished by the natural cycles of the planet's systems. Each year, the NGO marks Earth Overshoot Day, the date on which we reach this same point – and every year it is earlier and we "overshoot" the earth's capacity to replace our consumption more quickly. In 2023, we had consumed one planet's worth by 3rd August and the rest of the year was taken up with consuming the share of generations to come.

Government policies can help create a low-consumption economy, in which there would no longer be striving for economic growth for its own sake. Past a fairly basic level of meeting needs, human well being does not rise in tandem with more consumption. The idea of "sufficiency" could be reintroduced as a fair way to allocate resources. Efforts to enforce this during the pandemic, for example, were widely successful and helped to ensure everyone had access to basic goods. Richer countries could be focused more on health and happiness; areas where they are starting to see declines despite continuing growth in GDP. Individuals in wealthier societies who are used to overconsumption, might become more self-sufficient, growing food, mending things and using spare time for creative or social activities closer to home. Brands could produce fewer but better-quality goods, while governments concentrated on regulating for a circular economy and using levers such as the tax system to reduce consumption.

CO_2 EMISSIONS FLOWS IN INTERNATIONAL TRADE



1. China to US (Peters et al, 2012)
2. China to EU (Carbon Trust, 2011)
3. China to Rest of Asia (Carbon Trust, 2011)
4. Rest of Asia to EU (Peters et al, 2012)
5. Russian Federation to EU (Peters et al, 2012)
6. China to Japan (Carbon Trust, 2011)
7. Africa to EU (Peters et al, 2012)
8. US to EU (Peters et al, 2012)

Source: CO2 emissions flows in the international trade showing the asymmetry of trade and emissions (adopted from Liu et al. 2016) – Lee, Chew Tin & Klemeš, Jiri & Hashim, Haslenda & Ho, Chin. (2016). Mobilising the potential towards low-carbon emissions society in Asia. Clean Technologies and Environmental Policy. 18. 10.1007/s10098-016-1288-7.

Low consumption areas of the world still need to raise their standards of living, but this could happen in a more sustainable way as the pressure from rich countries to extract and ship raw materials would reduce. The current balance of trade is unequal, as illustrated by the fact that 40% of what is currently moved by ship is ballast water,[92] when goods going one way are not carrying reciprocal cargo on their return journey. This kind of imbalance is detrimental to global development and embeds levels of inequality. Increased regionalisation and localisation of trade could also help, both by reducing the number of unnecessary long journeys made by cargo vessels and by increasing economic opportunities for companies and communities closer to home.

Regulators could also play a role in making our shared load safer by ensuring that due diligence along supply chains includes all emissions in a product's lifecycle, and that decisions over investment were also dependent on these same figures.

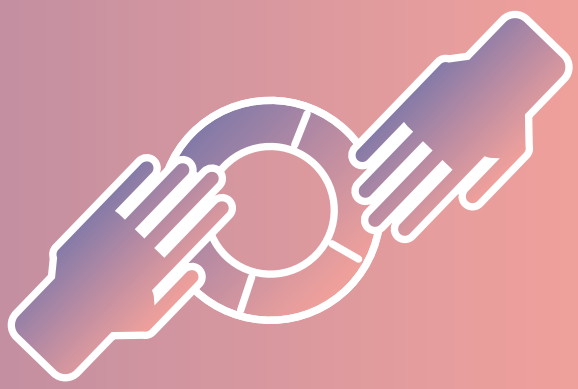
There are currently three levels of emission used in carbon calculations: Scope 1 covers direct emissions from owned or controlled sources; Scope 2 covers indirect emissions from the purchase and use of electricity, steam, heating and cooling; and Scope 3 includes all other indirect emissions that occur in the upstream and downstream activities of an organisation.[93] Scope 3 usually means supply chains and is often forgotten and dismissed as too hard to calculate, and this is where shipping sits.

Without these reductions, we will exceed the planet's own Plimsoll line (the line on all ships that defines the maximum load capacity, hence safety onboard), stretching its ability to carry us safely. Future generations might wonder why we risked our lives to transport a slightly newer model of phone or a pair of shoes we may only wear once halfway round the world when we could simply have chosen to work within safe limits.

Source: https://www.francebleu.fr

ALL ABOARD

"There are no passengers on spaceship earth. We are all crew."
Marshall McLuhan, Canadian philosopher[94]



If everyone took up a more equal amount of space and used a similar share of resources, then we could distribute our impact on the planet in a more balanced way. There would consequently be less need to ship products long distances to find cheaper producers and wealthier markets. A just transition that makes offshoring a thing of the past will increase equality, which increases human wellbeing. In order to achieve this level of equity across a global transport system, operators in less developed countries will need support to adapt their shipping to zero emissions technologies. Wealthier nations could fund this through a levy on the maritime industry to ensure that everyone is aboard.

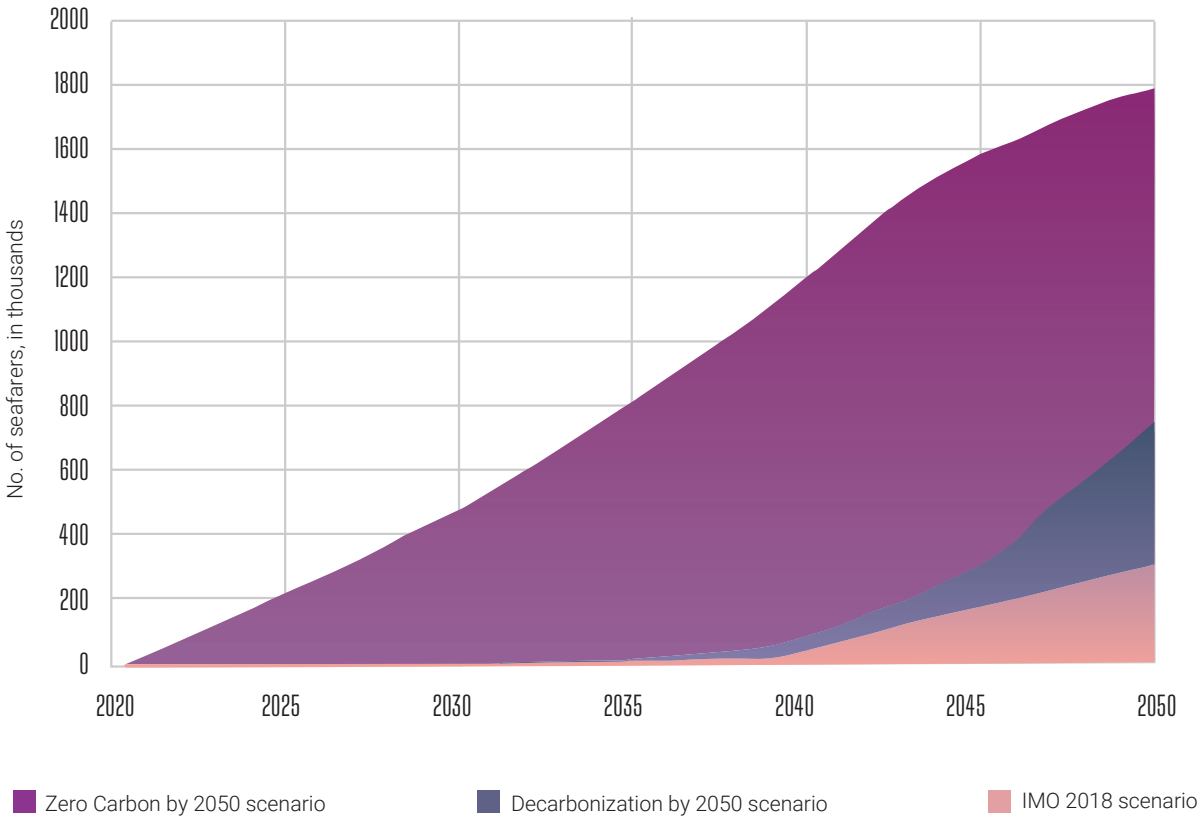
Tackling inequality will be key, because this also contributes to consumption; keeping up with what our peers have and aspiring to get closer to those at the top builds in overconsumption. In search of equity with others, we gain debt and then stress in trying to service it. The materialistic values that fuel overconsumption also make people less likely to take pro-environmental actions. As we all face the challenges of climate change together, we will need to build trust and cooperation rather than division. And reducing inequality increases trust.[95] To address the global climate crisis and effectively reduce GHG emissions, we cannot rely on technological solutions alone; many of the eight billion people on our planet will need to shift their lifestyles, with the richest 10% needing to drastically reduce their consumption to a tenth of today's levels.[96] This issue is complex and remains contentious, because at the same time, the most impoverished populations will justifiably need to increase their consumption by two to three times simply to achieve an agreed level of basic wellbeing.

Having everyone on board will mean a just transition for people working in the shipping industry, so that as the industry changes, new jobs are available with decent pay and high quality training. Plans for this have started both at the IMO and UN level, and within individual companies, but not at the scale needed, without addressing the potential use of wind power, inequality within the industry or its future shrinkage. The current training programmes to prepare maritime workers for decarbonisation is geared towards using fuels such as hydrogen, ammonia and methanol, each of which has limitations (see alternative fuels box), and is run by the IMO and the Maritime Just Transition Task Force Secretariat. Lloyd's Register will develop the training framework for seafarers and officers, as well as an instructor handbook for maritime training institutions. The World Maritime University (WMU), an IMO global research, education and training institute based in Malmö, Sweden, will provide academic expertise and a global industry peer learning group will share knowledge.[97] Once developed, the Baseline Training Framework for Seafarers in Decarbonization will be tested in Asia with support from the IMO Maritime Technology Cooperation Centre (MTCC) Asia and other partners.

However, its 2022 report points out a range of challenges: "A lack of clarity surrounding the viability and uptake of alternative fuel technologies and decarbonization trajectories, coupled with uncertainty surrounding regulatory developments and financing, is making it difficult to plan for the further training of the maritime workforce."[98] The absence of industry and governmental planning for shipping has left the industry grasping at replacement fuels as the silver bullet. Each person for themselves doesn't work on board ship; planning for a shared future is the only way to prevent disaster.

POWER TO FUEL CONCEPT – THE LONG WAY FROM WIND ENERGY TO DRIVING FORCE

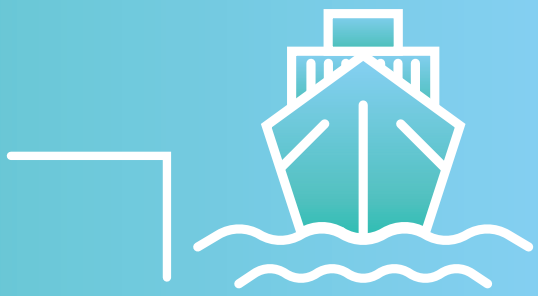
Estimated number of seafarers working on board ships equipped with alternative fuel technologies, all scenarios



Source: https://www.ics-shipping.org/wp-content/uploads/2022/11/LINK-2-document-DNV-Report-Insights-into-Seafarer-Training-and-Skills-for-Decarbonized-Shipping-Nov-2022.pdf

HOMEWARD BOUND

"Seaborne trade volumes will likely shrink towards 2050, primarily to encompass only cargo that is more feasible to transport than produce locally."
Danmarks Skibskredit (Danish Ship Finance, 2024)



The huge growth in long-haul shipping for everyday goods and commodities is a fairly recent phenomenon and could therefore be reversed to reduce our dependence on goods from the ends of long supply chains. Localisation and regionalisation with shorter supply chains could be designed in a positive way to boost local economies,[99] capture more benefits locally and encourage environmental impacts to be prioritised. Shorter supply chains could be better for all of us, including regions where trade has historically been extractive.

Ports are sometimes left behind in city planning and rarely thought of as desirable destinations. Infrastructure may attract government subsidies but port profits often return to private companies, while local taxpayers may cover the costs and be left with the environmental impact. Local noise and air pollution, as well as the impact of higher levels of traffic on local roads are often swept under the carpet, or played down in the face of badly needed local jobs and growth. But ports are also vibrant and collaborative places that could become hotspots for circular, regenerative economies, promoting equality and demonstrating how a just transition to a sustainable future might happen. This would require an ambitious and more holistic EU ports strategy, and the inclusion of ports as hubs in the EU circular economy action plan.[100]

Ports could also play a vital role in climate mitigation and adaptation, driven by their global links, their deep understanding of the sea and the vulnerability of local communities. Our coastlines are home to approximately 28% of the global population, around 11% of whom live on land that is less than 10m above sea level and extremely vulnerable to flooding and rising oceans. Nearly 50% of coastal wetlands have been lost over the last 100 years, putting people in increased danger from tidal surges and storm flooding, particularly as climate change is causing wave heights to increase in many regions. Many of these communities are situated near ports that could form part of a regional and then global network collaborating to reduce emissions and increase opportunities for local communities. A truly transformative strategy for our future port cities should be able to improve social outcomes without ecological degradation.[101]

ONE PLANET VISION

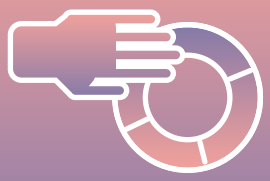
As we navigate the waves of change and an uncertain path towards our goal of stabilising – or even starting to reverse – climate change by 2050, this report offers some hope and direction.

The maritime industry knows the challenge that lies ahead and is already taking steps towards a clear, fairer future for shipping, but big issues remain. This report might serve as a compass, urging the shipping industry to rethink its course and sail towards a future where prosperity and environmental stewardship can coexist harmoniously. This will involve embracing innovation, being open to change, and learning from what works rather than being driven by exciting new technologies alone. It will mean the industry shrinking and adapting positively to its new size, ships becoming smaller and cleaner, and the workforce becoming better skilled and more diverse. We might see a lot more ships with sails in some form again, which would be no bad thing.

The seas ahead may be challenging, but with bold new stories to share of what is possible and collective determination across the industry and the communities it serves, we can chart a course to a better, fairer world. Stories of safe loads and lower consumption will help us to appreciate the importance of working within Earth's limits and ensure that we can all stay aboard with a fair chance of reaching our destination together. Making the most of the enormous natural power of wind and safeguarding the riches of our oceans will help us on our way. Looking after our home ports will enable us to reduce our global emissions and cut back on wasteful travel and transport, looking instead to improve links with our neighbours. If we manage this, then we have a chance of avoiding the storm ahead.

This will require those in positions of leadership, such as the IMO, national governments and CEOs within the industry, to step up and take brave decisions. They may be unpopular now, but many of them are inevitable and those who are farsighted enough to see beyond today's quick profits will benefit in the long term. One Planet Shipping is possible, and there are many pathways to it, but we must start now by changing our stories of what is good for shipping and what kind of future is on the horizon.

Wind First
– wind propulsion is free, truly renewable and viable, and should be tried first



All Aboard
– all stakeholders must be considered if this industry transition is to be just

Safe Load
– moving less cargo long distances will reduce the burden on the environment and people

Homeward Bound
– ports are vital to resilient trade webs and could be hubs for One Planet Shipping

“We are all one, all connected, all part of the same universe.”

Lilla Watson

REFERENCES

EXECUTIVE SUMMARY

01 https://www.theguardian.com/environment/2023/jul/19/climate-crisis-james-hansen-scientist-warning

02 https://www.stockholmresilience.org/research/planetary-boundaries.html

INTRODUCTION

03 https://insights.som.yale.edu/insights/how-has-globalization-benefited-the-poor

04 https://www.bioregional.com/one-planet-living

05 https://oneplanet.com/about/founder/

06 https://sdgs.un.org/goals

07 https://www.oneplanetnetwork.org/about/the-one-planet-network

08 https://hotorcool.org/1-5-degree-lifestyles-report/

09 https://wwwcdn.imo.org/localresources/en/MediaCentre/PressBriefings/Documents/Clean%20version%20of%20Annex%201.pdf

THE GREAT TRADE EXPLOSION

10 Martin Stopford has enjoyed a distinguished career in the shipping industry as Director of Business Development with British Shipbuilders, Global Shipping Economist with the Chase Manhattan Bank N.A., Chief Executive of Lloyds Maritime Information Services; Managing Director of Clarkson Research Services and an executive Director of Clarksons PLC. He lectures regularly at Cambridge Academy of Transport and is a Visiting Professor at Cass Business School, Dalian Maritime University and Copenhagen Business School.

11 https://www.researchgate.net/publication/237424052_Global_Production_Sharing_Trade_Patterns_and_Determinants_of_Trade_Flows_in_East_Asia

12 https://www.nytimes.com/2021/03/30/business/economy/container-ships-suez-canal.html

13 https://www.costamare.com/industry_containerisation

14 https://safety4sea.com/bigger-ships-bigger-problems/

15 https://www.transportenvironment.org/discover/shipping-and-aviation-are-subject-to-the-paris-agreement-legal-analysis-shows/

16 https://unctad.org/system/files/official-document/wp-2023d2-no3_en.pdf

17 https://seanews.co.uk/shipping-news/flags-of-convenience-advantages-disadvantages-impact-on-seafarers/

18 https://www.google.com/url?q=https://londoninternationalshippingweek.com/decarbonisation-has-the-power-to-change-shippings-future-for-the-better/&sa=D&source=docs&ust=1716456041330239&usg=AOvVaw2rGrmxYBk1uRhMNSTzQpzY

19 https://english.elpais.com/climate/2023-12-11/cars-plastics-and-even-clothes-is-a-world-without-fossil-fuels-possible.html#

20 https://www.cambridge.org/core/journals/mrs-energy-and-sustainability/article/social-and-economic-consequences-of-the-fossil-fuel-supply-chain/181CB4D021BA549E64D87B667D3FB987

21 https://seas-at-risk.org/press-releases/plastic-production-pellets-in-ecaussinnes-meps-take-a-bitter-look-at-chronic-pollution/

22 https://www.iucn.org/story/202207/plastic-pollution-crisis

23 file:///Users/Apple/Downloads/sources-fate-and-effects-of-microplastics-in-the-marine-environment-part-2-of-a-global-assessment-en.pdf

24 https://images.app.goo.gl/3KTHxB8NG3yc26Mj8

25 The State of Shipping and Ocean Report, page 5

26 Ibid.

27 https://www.sciencedirect.com/science/article/pii/S0048969719335624 page 3

28 https://www.ksb.com/en-gb/magazine/innovation-and-progress/scrubber-technology-exhaust-gas-scrubbing-on-ships

29 https://www.google.com/url?q=https://cleanarctic.org/2024/02/14/infographic-why-we-need-to-ban-scrubbers-on-ships/&sa=D&source=docs&ust=1713430614212797&usg=AOvVaw22Y33JvwwDkwTmxI0ppL-2

30 https://www.theguardian.com/environment/2023/apr/09/whales-killed-passing-ships-save-alert-detection

31 https://ocean.si.edu/conservation/invasive-species/collecting-invasive-species-boat-hull

32 https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en

33 https://icapcarbonaction.com/en/news/eu-extends-its-ets-maritime-sector

34 https://www.lr.org/en/services/statutory-compliance/fit-for-55/fueleu-regulation/

35 https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en

36 https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2023)751433

37 https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en

38 https://research-and-innovation.ec.europa.eu/research-area/environment/oceans-and-seas/eu-marine-strategy-framework-directive_en

39 https://environment.ec.europa.eu/news/zero-pollution-and-biodiversity-first-ever-eu-wide-limits-underwater-noise-2022-11-29_en

40 https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

41 https://www.imo.org/en/MediaCentre/HotTopics/Pages/EEXI-CII-FAQ.aspx

42 https://www.imo.org/en/MediaCentre/PressBriefings/pages/Revised-GHG-reduction-strategy-for-global-shipping-adopted-.aspx

43 https://www.nature.com/articles/s41560-022-01065-y#ref-CR11

44 https://www.nature.com/articles/s41560-022-01065-y#ref-CR9

45 https://globalmaritimeforum.org/article/call-to-action-for-shipping-decarbonization/

46 https://unglobalcompact.org/take-action/think-labs/just-transition/about

47 https://www.cozev.org/initiativesfeed/join-zero-emission-maritime-buyers-alliance

48 https://www.poseidonprinciples.org/insurance/

49 https://oceanconservancy.org/wp-content/uploads/2022/04/declaration-on-zero-emission-shipping-by-2050-cop26-glasgow-1-november-2021.pdf

50 https://www.gov.uk/government/publications/cop-26-clydebank-declaration-for-green-shipping-corridors/cop-26-clydebank-declaration-for-green-shipping-corridors

51 https://www.thecvf.org/our-voice/news/dhaka-glasgow-declaration-of-the-cvf/

52 https://hotorcool.org/wp-content/uploads/2021/10/Hot_or_Cool_1_5_lifestyles_EXECUTIVE_SUMMARY.pdf

53 https://www.ics-shipping.org/resource/shippings-role-in-the-global-energy-transition/

54 https://www.iea.org/reports/world-energy-outlook-2022/an-updated-roadmap-to-net-zero-emissions-by-2050

WINDS OF CHANGE

55 https://www.eea.europa.eu/publications/european-climate-risk-assessment

56 https://meta.eeb.org/2024/04/17/when-less-is-more-reducing-europes-material-footprint/

57 https://www.pnas.org/doi/full/10.1073/pnas.2311728120

58 https://www.nature.com/articles/s41558-021-01176-6

59 https://www.wired.com/story/ever-given-global-supply-chain/

60 Miroudot S. and Nordstrom H., 2020 in SAR Growth Report

61 https://www.raconteur.net/supply-chain/reshoring-manufacturing-covid

62 Ibid. p.23

63 McKinsey, 2019 in SAR Growth Report

64 https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

65 (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0709)

66 https://doi.org/10.1080/25725084.2023.2276984

67 https://www.ascm.org/lp/reverse-logistics/

68 https://www.sciencedirect.com/topics/earth-and-planetary-sciences/industrial-ecology

69 https://www.sciencedirect.com/science/article/pii/S016636152200207X

70 https://doi.org/10.1109/IEEM.2017.8290113

71 https://doi.org/10.1016/j.compind.2022.103811

72 SAR Growth Report p.35

73 Pratham Agarwala, Sanjay Chhabra & Nitin Agarwala (2021) Using digitalisation to achieve decarbonisation in the shipping industry, Journal of International Maritime Safety, Environmental Affairs, and Shipping, 5:4, 161-174, DOI: 10.1080/25725084.2021.2009420; Manlio Del Giudice, Assunta Di Vaio, Rohail Hassan & Rosa Palladino (2022) Digitalization and new technologies for sustainable business models at the ship–port interface: a bibliometric analysis, Maritime Policy & Management, 49:3, 410-446, DOI: 10.1080/03088839.2021.1903600)

74 https://dynaport.eu/

75 https://www.alanmckinnon.co.uk/uploaded/PDFs/Papers/FOCUS%20article%203DP%20-%20SilverBullet.pdf

76 https://www.dnv.com/oilgas/laboratories-test-sites/article/3D-printed-parts-could-benefit-oil-gas-offshore-and-maritime-supply-chains

77 https://seas-at-risk.org/publications/the-state-of-shipping-oceans-report/

78 https://qz.com/the-secondhand-clothing-market-is-exploding-1850313653

79 https://www.weforum.org/agenda/2023/01/concentration-in-global-trade-wef23/

80 https://vb.nweurope.eu/projects/project-search/h2ships-system-based-solutions-for-h2-fuelled-water-transport-in-north-west-europe/

81 https://cleantechnica.com/2023/05/24/what-do-battery-energy-density-improvements-really-mean-for-trucks-ships-planes/

82 https://www.ics-shipping.org/news-item/could-40-of-global-containership-traffic-be-fully-battery-powered-by-2030/

83 https://www.nature.com/articles/s41560-022-01065-y#ref-CR13

84 https://www.nature.com/articles/s41560-022-01065-y#ref-CR14

85 https://maritime-executive.com/article/china-launches-first-700-teu-electric-containership-for-yangtze-service

86 https://www.popsci.com/technology/windwing-ship-sails/

NEW STORIES FOR ONE PLANET SHIPPING

87 https://youtu.be/-uU6Qncod_E

88 https://changing-transport.org/launching-ceremony-for-the-pacific-island-supply-vessel-on-geoje-island/

89 https://www.towt.eu/en/towt-home/

90 https://www.equalroutes.ca/resources/index.html

91 Breakfrefromplastic.org/plastics-and-EU

92 https://www.dnv.com/expert-story/maritime-impact/Ships-for-the-long-haul.html#:~:text=The%20operational%20profile%20for%20the,between%2015%20and%2019.5%20knots

93 https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/what-are-scope-3-emissions-and-why-do-they-matter

94 https://marshallmcluhan.com/biography/

95 https://link.springer.com/article/10.1007/s10902-018-0021-0

96 https://www.google.com/url?q=https://hotorcool.org/wp-content/uploads/2021/10/Hot_or_Cool_1_5_lifestyles_EXECUTIVE_SUMMARY.pdf&sa=D&source=docs&ust=1717512926916742&usg=AOvVaw0i7l-7rtdGo20_ni8JZUXc

97 https://www.lrfoundation.org.uk/en/news/training-seafarers-for-a-decarbonised-future/

98 https://www.ics-shipping.org/wp-content/uploads/2022/11/LINK-2-document-DNV-Report-Insights-into-Seafarer-Training-and-Skills-for-Decarbonized-Shipping-Nov-2022.pdf

99 Tribukait, I., Le Merle, K. (2024). "A Positive Narrative for a Just Transition".Policy Study, Foundation of European Progressive Studies (FEPS) and SOLIDAR, Brussels

100 https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

101 https://www.nature.com/articles/s41467-023-37073-z

SEAS AT RISK

Seas At Risk
Rue de la Charité 22,
1210 Brussels, Belgium

Tel: +32 (0)2 329 0124
E-mail: secretariat@seas-at-risk.org
X: @SeasAtRisk

seas-at-risk.org
Seas At Risk is a member of the Clean Shipping Coalition

bwa.design

Seas At Risk gratefully acknowledges EU funding support.
The content of this report is the sole responsibility of Seas At Risk.
It should not be regarded as reflecting the position of the funder.