Fossil fuel carrying ship and the risk of stranded assets in the transition to a low-carbon economy

Key Findings and Implications for Financiers and Industry Actors

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UCL THE BARTLETT ENERGY INSTITUTE

Part of the Series:
Transport and Logistics for the Low-Carbon Society of 2050

About the series

Transport and Logistics for the Low-Carbon Society of 2050

The climate crisis requires and drives a rapid transformation of our society: reducing emissions to net zero and adapting to the impacts of a new climate reality are the major tasks of our times, across all countries and sectors of the economy. By 2050, we must – and can – build a more equitable and prosperous low-carbon society.

Transport and logistics will play a key role in the transition. It will have to contribute to emission reductions through its own low-carbon development. But transport and logistics can also act as a facilitator of the transition, supporting green and sustainable development, and serving the new needs of people, industry, and society towards achieving the climate targets. Therefore, new investments and skills, and new regulations will be needed.

The Kühne Climate Center's work on 'Transport and Logistics for the Low-Carbon Society of 2050' strives to lay out the structural changes in the economy to which transport and logistics will need to adapt, the capacities the sector has to develop, and the opportunities it can seize to enable sustainable development at the global and local scale.

Selected findings from our studies are continuously being published in a dedicated series.

The transition towards a low-carbon society requires a steep decline in the consumption of fossil fuels; it will also lead to a decline in trade and transport of these commodities.

Today, over a third of the global shipping fleet carries fossil fuels as a cargo. Even if no further ships are ordered as of 2024, a large part of the fleet is at risk of being stranded along a trajectory to 1.5°C in 2050.

Shipowners and financiers can reduce their risk by foregoing further investments in shipping segments with uncertain future transport demand. And they can consider re-channelling funds to assets and activities that are compatible with and needed in a low-carbon society.

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Why this study

Achieving the climate goals as stated in the Paris Agreement requires a rapid decarbonization of the world economy. Fossil fuels used in the energy sector, in transportation, and in various industries will have to be replaced with renewable electricity and other low or zero-carbon forms of energy. In its updated net-zero scenario 2050, the International Energy Agency IEA estimates that demand for coal falls by 90% to 500 million tones, for oil by 75% to 24 million barrels per day, and for natural gas by 78% to 900 billion cubic meters (IEA, 2023a).

Today, over a third of the global shipping capacity is used to transport coal, oil, and liquefied gas. As ships are capital-intensive assets with lifetimes of 20 to 50 years, investment decisions need to consider long-term market evolutions. The decline in trade of fossil fuels would lead to a reduced demand for transporting these commodities and result in a "demand-side risk" for those ships, as framed by Smith et al. (2015). While the debate on the fleet's exposure to risks from a change in fuel and engine technology has already started, the demand-side risks from a decline in fossil fuels as a cargo has so far largely been overlooked.

The massive and rapid transition to the low-carbon society required for a stable climate holds many new opportunities and will require new investments. Rechanneling funds to activities and assets that are compatible with the needs of a low-carbon society early on protects assets and allows for an efficient use of funds that can accelerate the transition.

The Kühne Climate Center and the University College London Bartlett Energy Institute undertook this first-of-its-kind analysis to quantify the demand-side risk for fossil fuel carrying ships on a trajectory that would limit global warming to 1.5°C in 2050.

The results are intended to raise shipping actors' and financiers' awareness for the need to assess and eventually redirect their investments.

What it contains

In this study, we analyze four segments of fossil fuel carrying ships for their demand-sike risk in the transition towards meeting the 1.5°C climate target: bulk carriers for coal, oil tankers, liquefied natural gas (LNG) tankers and liquefied petroleum gas (LPG) tankers.

Using information from the Clarksons World Fleet Register, we estimate the available capacity for transport of fossil fuels by ship, the "supply", up to 2050. We estimate the "demand" for transport of fossil fuels by ship using two scenarios that align with a 1.5°C trajectory and which were modelled in the *Fourth IMO GHG Study 2020* (Faber et al. 2020); we refitted these to the observed demand up to 2023.

We assess two financial risk indicators: book loss in the form of unemployed ships, or "idle capital" and lost profits, i.e. profits which could have been expected in a business-as-usual scenario, and which fail to materialize along a 1.5°C trajectory. The results do not account for the fleets' limited ability to carry other cargos nor for an eventual decrease in supply, e.g., early scrapping as a response to a decline in transport demand; hence, our results indicate a maximum risk.

We model two scenarios: a "no further ordering" scenario, in which the world stops ordering fossil fuel carrying ships as of 2024; a business-as-usual "newbuild until 2030" scenario, in which fossil fuel carrying ships will be added to the fleet until 2030 at the average growth rate of the previous decade.

We take a high-level look at the risk exposure of four groups of actors that are economically involved in fossil fuel shipping: owners, operators, shipbuilders, and flag states.

We also provide an assessment of fossil fuel carrying ships' potential to repurpose to carry other cargos as well as a first reflection on potential implications from a greater demand for ship recycling against the backdrop of the Hong Kong Convention.

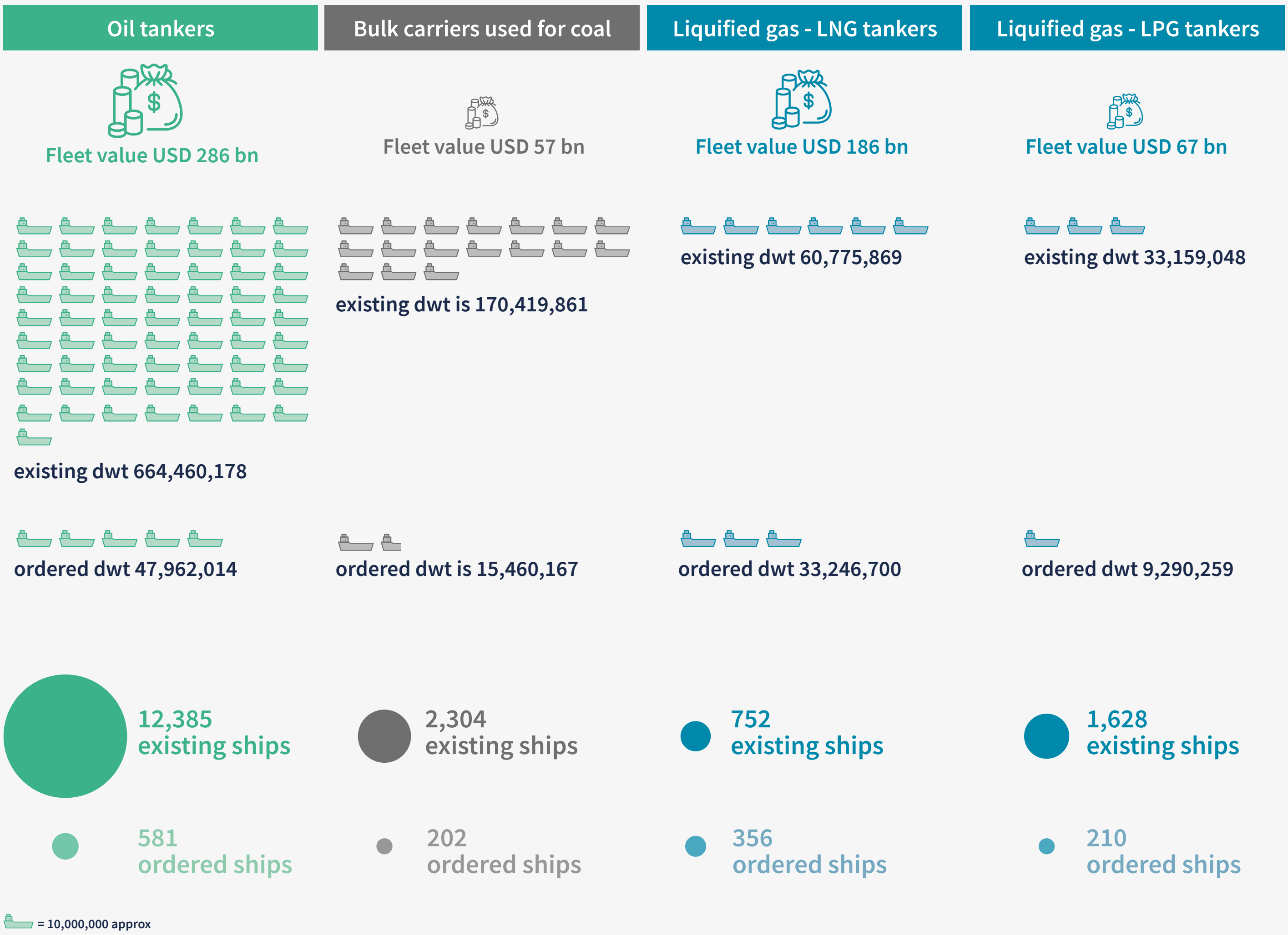
Over one third of the global shipping fleet transports fossil fuels

Today, over one third[1] of the global shipping capacity is used to transport fossil fuels. The existing and ordered fleet comprises close to 13,000 oil tankers, close to 2,000 LPG tankers, and over 1,000 LNG tankers. About 2,500 of the total fleet of close to 14,000 bulk carriers transports coal.[2]

As of 2023, we estimate the total value of the existing and ordered fleet to around USD 596 billion. Oil tankers account for USD 286 billion, LNG tankers for USD 186 billion, and LPG tankers for USD 67 billion. The share of the bulk carrier fleet that transport coals accounts for approximately USD 57 billion. As LNG tankers are much more expensive than other ships, the comparably small fleet has a high total value.

In a business-as-usual scenario, the fleet would expect to generate profits of USD 763 billion until 2050, with oil tankers contributing USD 234 billion, liquefied gas tankers combined USD 446 billion, and bulk carriers used for coal USD 83 billion.

Fleet of fossil fuel carrying ships



Figures for bulk carriers correspond to 17% of the fleet's actual figures. This is only an approximation and based on the fact that 17% is the share of the coal trade in all bulk trade in terms of tonne-miles.

1 36%; calculated using the deadweight of the existing and ordered fleet of liquefied gas tankers and oil tankers, plus a further 17% of the deadweight of the existing and ordered fleet of bulk carriers from Clarksons WFR (Clarksons Research, 2022). 17% is the share of the coal trade in bulk trade (in ton-miles) from Clarksons Shipping Intelligence Network (SIN) (Clarksons Research, 2023) .

2 It is unknown which bulk carriers of the overall fleet of bulk carriers are used to transport coal, and ships may switch back and forth between coal and other commodities, like iron ore. The figures for number of ships, fleet value, and expected profits represent 17% of those of the entire bulk carriers' fleet and can only be an approximation.

In a 1.5°C trajectory to 2050, oil and gas tankers will be in significant oversupply

If transport demand for fossil fuel carrying ships aligns with a trajectory to 1.5°C in 2050, oil tankers and liquefied gas tankers are in significant oversupply. This is the case in both scenarios, the "no further ordering" scenario and even more so in the "newbuild until 2030" scenario. Supply and demand start to converge again in the early to mid 2040s for oil, and in the mid to late 2040s for gas—but only if no ships are added to the fleet from 2030 on by the latest.

The fleet of oil tankers is relatively old, with an average age of 10 to 30 years[3] and a remaining lifespan of around 10 years. Also, the orderbook is, with 7% of the existing fleet's capacity, relatively light. Even though fleet age and forthcoming retirements together with a light orderbook help that supply starts to fall soon naturally, the gap between demand and supply remains significant until 2040.

The fleet of LNG and LPG tankers is relatively young, with a rough average age of 7 years for LNG tankers and 15 years for LPG tankers; with this, it has an on average long remaining lifespan of around 20 to 30 years respectively. Also, the order book is heavy, comprising 55% and 28% of the existing fleet's capacity. The young age of the fleet and the additional capacity that will come to the market in the next years lead to a significant oversupply until the mid-2040s.

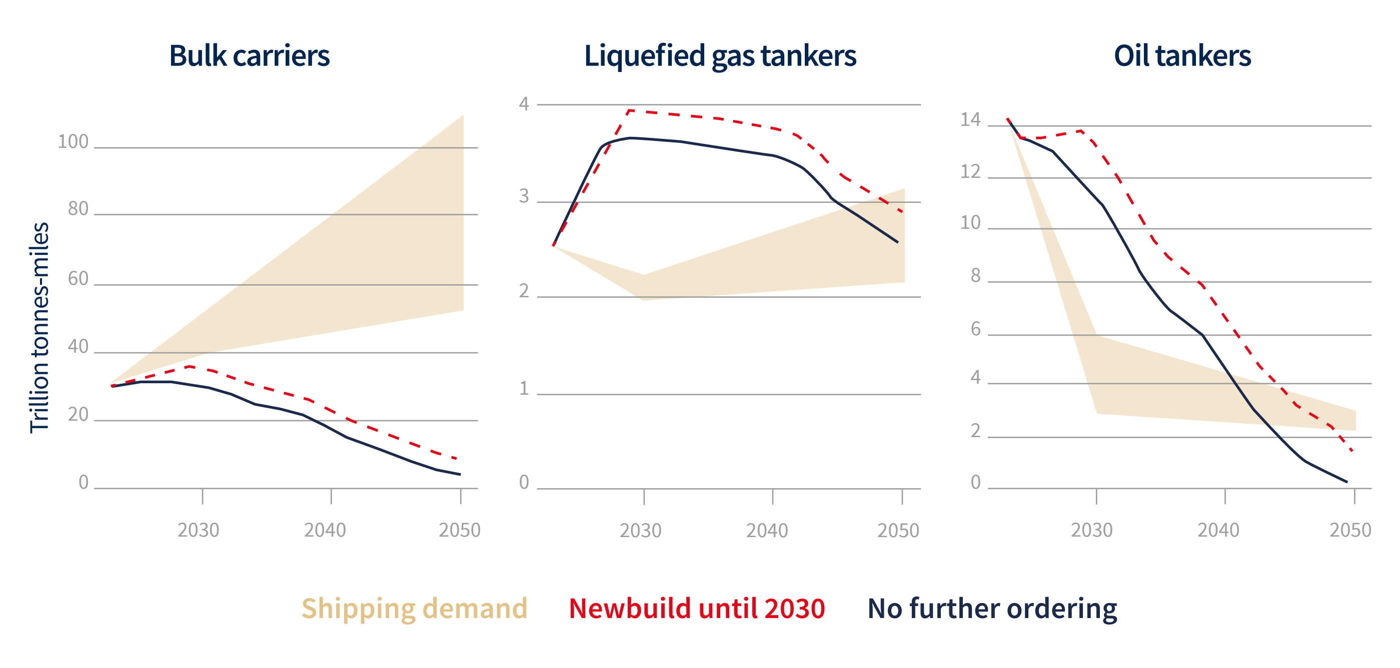
In contrast, transport demand for dry bulk cargo like iron ore, steel products, grains, forestry products, and minerals is expected to increase. With this, the expected decline in demand for coal transport will be more than compensated. If no further capacity is added to the fleet, transport supply for dry bulk cargo could soon be insufficient.

Modelling of transport demand

For our modelling, we use the estimated future demand for transport of fossil fuels from the Fourth IMO GHG Study 2020. As the latter is based on scenarios computed in 2018, we refitted our modelling to a 2024-perspective. We therefore keep the initially expected total transport demand from 2018 to 2050 constant and adjust the period 2018 to 2023 to reflect the actual observed demand—which was higher than initially projected in 2018. We set the demand for 2050 so it is equal to the demand modelled in the Fourth IMO GHG Study 2020, and then distribute the remaining budget of transport demand over 2024 to 2050.

For more details, see the white paper 'Fossil fuel carrying ships and the risk of stranded assets' (Fricaudet et al., 2024b).

Supply and demand of shipping capacity for fossil fuels on a 1.5°C trajectory to 2050



3 The average age and lifespan vary considerably across different sub-segments and size bins. A full breakdown of the fleet's age structure is available in the white paper 'Fossil fuel carrying ships and the risk of stranded assets.' (Fricaudet et al. 2024b).

Key Findings in Detail

Bulk carriers face a relatively low risk from a decline in demand for coal transport.
Bulk carriers that transport coal today have a low demand-side risk as demand for other dry bulk transport is expected to increase. These ships can relatively readily switch to other cargos, for example, iron ore. Switching to food grade or more hazardous cargos, like certain minerals, may require investments for cleaning and retrofits such as coating, temperature control or cargo securing equipment. Also, very large bulk carriers may find limitations if their alternative cargo is traded in smaller batch sizes and if they cannot operate on all routes and enter relevant ports due to their size.

Oil and gas tankers face a significant risk; ships with a combined value of up to USD 108 billion, equal to 30% of the fleet, may be unemployed around 2030.
The oversupply in transport capacity for oil and gas is expected to peak around 2030. At that time, ships with a combined value between USD 90 to 108 billion may be unemployed even if no further ships are ordered. This corresponds to 25 to 30% of the oil and gas tanker's fleet value. If newbuilding continues to 2030, the amount of idle capital could increase to USD 121 to 147 billion, 27 to 33% of the fleet's value.

This does not necessarily mean that these ships will terminate their activity definitively, as the decline in demand may spread over the total fleet and lead to reduced activity for all the ships rather than to no activity for some of them. It means, however, that this amount of capital invested in ships will be idle, not generating any returns on investment while bearing the cost of capital, maintenance, and other fees. Some shipowners may be better off scrapping their ships earlier than planned rather than keeping them at a loss for a long time.

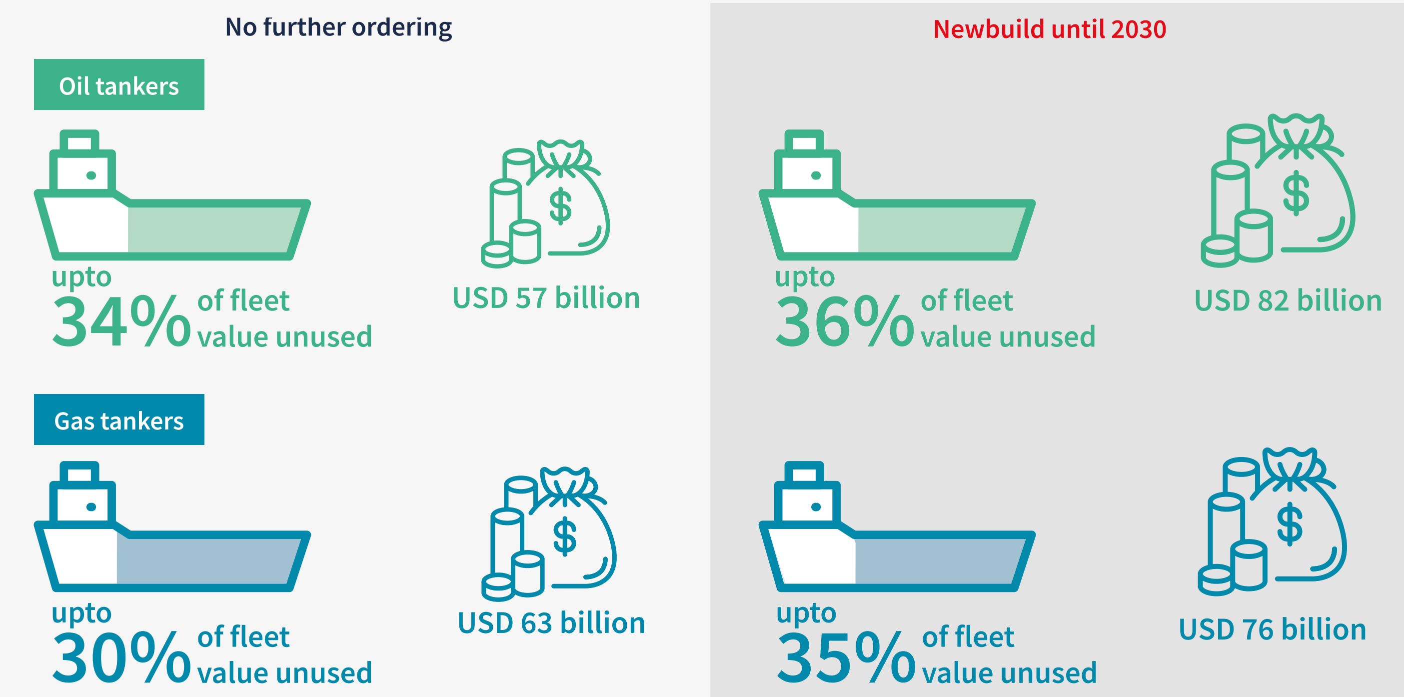
In contrast, transport demand for dry bulk cargo like iron ore, steel products, grains, forestry products, and minerals is expected to increase. With this, the expected decline in demand for coal transport will be more than compensated. If no further capacity is added to the fleet, transport supply for dry bulk cargo could soon be insufficient.

Valuation of the fleet

We estimate the value of the fleet for each year up to 2050 based on the newbuild value of ships per segment and size bin and depreciated it linearly to its scrappage value based on expected lifetime. To estimate the value of unemployed ships each year, we allocate the annual failing transport demand to ships which collectively have the capacity that equals to the failing demand. The combined value of these ships per given year represents the idle capital.

For more details, see the academic article 'Fossil fuel carriers and the risk of stranded assets' (Fricaudet et al. 2024a).

Value of the unemployed fleets peaks around 2030



Note: The values for oil tankers and gas tankers are maximum values of the unemployed fleet at the peak in a year around 2030 in two different trajectories to 1.5°C in 2050. They cannot be added, as the value at risk would be lower for one segment if the other is at its maximum value at risk. Thus, they represent separately each segment's highest risk.

Oil and gas tankers together may lose profits of around USD 214 billion up to 2050, about 32% of their expected profits. The fleet of gas tankers alone may lose USD 131 billion of expected profits.

Total lost profits of oil and gas tankers together can range between USD 162 and 265 billion, with an average of USD 214 billion. For the fleet of oil tankers, total lost profits can range between USD 59 and 107 billion. The much smaller fleet of gas tankers will be relatively more affected and incur lost profits between USD 104 and 158 billion, with an average of USD 131 billion. If newbuilding continues, total lost profits for both fleets could increase to an average of USD 286 billion, 37% of their expected profits.

Oil tankers may register a peak loss of annual profits of up to USD 11 billion around 2030, about 74% of their expected profits.

In a business-as-usual scenario, the fleet of oil tankers would expect to generate profits of USD 15 billion in a year around 2030. The decline in demand for oil transport results in potentially lost profits of USD 7 to 11 billion in just one year around 2030, 48 to 74% of the expected profits. Lost annual profits could increase to USD 10 to 13 billion if newbuilding of oil tankers continues until 2030.

Gas tankers may register a peak loss of annual profits of up to USD 8 billion around 2030, about 46% of their expected profits.

Particularly the relatively young fleet of LNG tankers has been growing considerably over the last years. The oversupply of LNG and LPG tankers together could result in lost profits of USD 7 to 8 billion in just one year around 2030, this equals to 40 to 46% of their expected annual profits. Lost annual profits could increase to USD 9 to 10 billion if newbuilding continues until 2030.

Estimates of lost profits

We estimate the expected profits per shipping segment as a share of revenue, based on observed shipping prices minus cost of fuel, operating expenses, and insurance. We then calculate lost profits by multiplying the expected profits per transport unit by the failing transport demand per year. Total lost profits are the sum of all annually lost profits.

For more details, see the academic article 'Fossil fuel carriers and the risk of stranded assets' (Fricaudet et al. 2024a).

Lost profits at their annual peak around 2030 and total lost profits up to 2050

LNG tankers face the greatest risk, also because they have the highest challenges to repurpose to other cargos.

LNG tankers are highly specialized ships with costly equipment and cooling system for as low as -162°C. When transport demand for LNG falls, they may carry liquefied bio-methane (LBM) which has similar requirements. It is highly unlikely though that transport demand for LBM will occupy the fleet's capacity; also, smaller batch sizes would further limit cost-efficient operations. Retrofitting LNG tankers to other cargos would require major changes to their tanks and equipment on deck, and eventually render the installed costly equipment obsolete. Converted LNG tankers would thus have significant economic disadvantages and low competitiveness compared to ships that were initially built for their purpose. Overall, LNG tankers have low chances to repurpose to other cargos in an economically viable way.

Oil tankers and LPG tankers will face medium challenges to repurpose to other cargos.

Some oil tankers may be able to repurpose to biofuels, methanol, and chemicals when transport demand for oil falls. The quantities of these alternative cargos are however still uncertain, and it is highly unlikely that they will fully compensate for the decline in oil transport. Additional costs for retrofits like coatings and other equipment – in cases where technically feasible – should be expected to reduce a ship's return on investment and its competitiveness on the market. For certain chemicals and hazardous cargos, maximum specified tank volumes and required distances between tanks, hull, and bottom can limit repurposing, as the changes to the ship's structure would be too profound. Especially very large oil tankers may be limited due to the typically smaller batch sizes of these alternative cargos and ships' limited ability to choose routes and access to ports given their size.

LPG tankers have, from a technical perspective, relatively good chances to repurpose to ammonia as a cargo, given similarities in storage needs. Eventual retrofits like tank coating and additional safety monitoring systems may require additional investments, and crews on board and at ports will need training. Finally, the evolution of international trade of ammonia by ship still has to be seen.
If this demand does not materialize, alternative cargo options for LPG tankers seem rather scarce.

Assessment of the challenges for repurposing fossil fuel carrying ships to other cargos

Literature and guidance documents on the challenges and options for repurposing fossil fuel carrying ship to other cargos still have to emerge. For this high-level assessment, we contacted industry actors responsible for the design and operation of these ship. Their insights were combined with information from industry codes and safety standards.

Given that repurposing to other cargos may become relevant soon, a more comprehensive assessment of technologically feasible and economically viable options as well as the provision of guidance documents in the area are urgently needed.

A more detailed overview of the findings is available in the white paper 'Fossil fuel carrying ships and the risk of stranded assets' (Fricaudet et al., 2024b).

Challenges to repurpose fossil fuel carrying ships to other selected cargos

	Toxicity and safeguarding	Structural changes to the ship	Trading, cargo size, and port restrictions	Costs and return on investment	Cargo optionality
Oil tankers to biofuels and chemicals including methanol	Low-medium	Medium	Medium-High	Medium	Medium
LPG tankers to ammonia	Medium	Low-medium	Medium	Low-medium	Medium-High
LNG tankers to ammonia	Medium	Medium-High	Medium-High	Medium-High	Medium-High
Coal carriers to other dry cargo like iron ore or minerals	Low	Low	Low	Low-medium	Low

New types of cargo may not necessarily translate into new demand for oil and gas tankers.

Besides ammonia, biofuels, and methanol that were discussed above, pure hydrogen and CO_2 may – or may not – become a significant cargo for transport by ship. Some LNG and LPG tankers with specific characteristics could, from a technical perspective, repurpose to carry CO_2. The commercial risk lies with the great uncertainty about the future demand for transporting this cargo. If seaborne trade of liquefied hydrogen emerges, it will require highly specialized ships equipped with cooling to -253°C, special materials, and safety features. The world's first hydrogen carrier was built in 2020. Beyond many uncertainties related to seaborne trade of hydrogen, it seems highly unlikely that a ship which was not designed to carry hydrogen from the beginning would be able to repurpose.

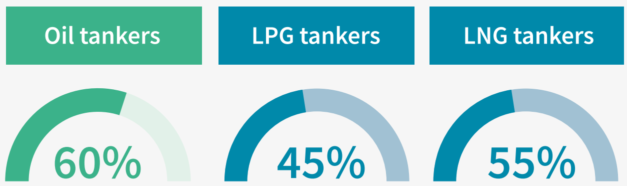
Owners and operators of LNG tankers face the greatest demand-side risk; owners and operators of oil tankers may be more vulnerable.

The different ship segments and groups of actors have different levels of exposure to the demand-side risk. While the total demand-side risks for owners and operators of LNG tankers are greater than those for owners and operators for oil tankers, many of the latter may have a higher level of vulnerability: the oil tanker fleet with its close to 13,000 ships is highly fragmented across many mainly small actors. The group of owners and the group of operators count each around 4,000 actors; the top 10 owners own together less than 17% of the fleet. 60% of all owners and operators handle a fleet that consists of at least 90% of oil tankers. Not only do these actors have little opportunity to compensate their lost profits through other shipping activities; but they also have lower chances to coordinate the large community of actors to mitigate their collective risk.

For LNG tankers, the group of owners and the group of operators each count well below 200 actors and constitute a much smaller community. The top 10 owners of LNG tankers own together 37% of the fleet, 55% of owners and operators handle a fleet that consists of at least 90% of LNG tankers.

Also, the groups of owners and operators of LPG tankers are, with somewhere between 400 and 500 actors per group, relatively small. Though here, similarly as for oil, many smaller actors are involved, and the top 10 owners of LPG tankers own together less than 17% of the fleet. This group shows a somewhat lower degree of specialization, with 45% of actors handling a fleet that consists of at least 90% of LPG tankers.

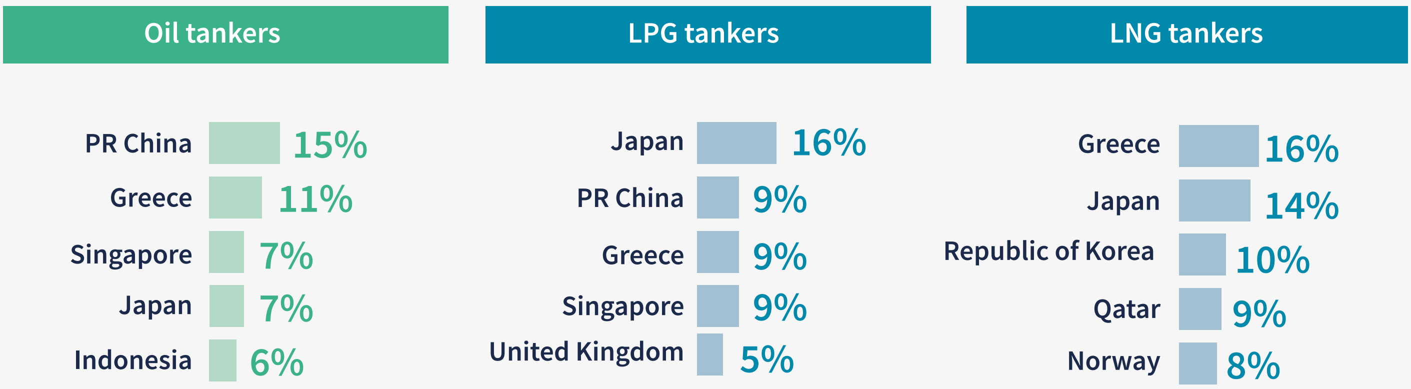
Specialization of owners and operators in one sub-segment



Note: the visual shows a combined value for owner and operators; values per group of actors in each sub-segments lie within max. +/- 5% around the combined value.

Geographically speaking, the owners' risks concentrate in a few countries. The top five owner countries per segment hold 46% of the oil tanker fleet, and 48% and 57% respectively of the LPG and LNG tanker fleet. Overall, the People's Republic of China, Japan, Greece, Singapore, and the Republic of Korea have the greatest exposure to demand-side risks across the three segments.

Top five locations of owners of the oil and gas tanker fleet



Shipbuilders and flag states have a generally low risk – with few exceptions.

Among the four groups of assessed actors, shipbuilders and flag stages generally have a relatively low risks: most shipbuilders demonstrate great diversity across different ship segments, with only a few focused on constructing fossil fuel carrying ships. Flag states, which comprise many developing countries with vulnerable economies and Small Island Developing States generate national income from flagging ships. Almost all of them are found to flag different types of ships, which limits their risk of losing income should fossil fuel carrying ships deregister early. Exceptions are Bermuda where 49% of flagged ships are LNG tankers and Gabon where 71% of flagged ships are oil and gas tankers; in the top five ranking follow Thailand with 37%, Bangladesh with 30%, Marshall Islands with 29% and Greece with 28% of flagged ships being oil and tankers.

Summary of risks per segment

	Bulk carriers	Oil tankers	LNG tankers	LPG tankers
Lost profits in USD billion *	0	59-107	104-158	
Book loss in USD billion*	0	27-57	52-63	
Challenges for repurposing	Low	Medium	High	Medium

Global sustainable shipbreaking capacity is unlikely to be sufficient.

A decline in demand for oil and gas tankers could lead to ships' early retirement. While global shipbreaking capacity is difficult to estimate – figures ranges from 15 to 70 million light displacement tonnage (LDT)[4] with little transparency on its sustainability – additional demand for shipbreaking could achieve 40 to 65 million LDT at the peak of oversupply.

It will largely depend on the enforcement of the Hong Kong Convention, which enters into force in 2025 and which determines the conditions under which the existing and additional shipbreaking capacity will be provided. An ambitious increase in shipbreaking regulation would likely lead to a fall in scrapping value: Barua et al. (2018) show that the current scrapping value, up to USD 260/LDT is based on the fact that the majority of the fleet is scrapped by beaching. On the other hand, most environmentally friendly and safe methods, e.g. dry dock, alongside or landing methods, are only able to pay shipowners USD 37/LDT. Paradoxically maybe, an increase in the safety and environmental regulation for shipbreaking might incentivize the repurposing of ships, if feasible, and reduce the number of ships going to scrap.

The Hong Kong Convention

The Hong Kong Convention aims to establish minimum standards for worker safety and pollution prevention in shipyards where ship recycling takes pace. It was adopted in 2009 by the IMO but the criteria for its entering into force were only met with Bangladesh's ratification in 2023.

4 Light displacement tonnage expresses the weight of the ship excluding cargo, fuel, water, ballast, stores, passengers, crew, but with water in boilers to steaming level.

Implications and recommendations

Risks for owners and operators will transcend to financiers and beneficial owners.
While there is little publicly available information on the financiers and beneficial owners – the person or company who ultimately owns the ship behind the registered owner – banks have historically served as the primary source of financing (Alexandridis et al., 2018). Some banks have limited their lending to the shipping industry since the stricter BASEL III capital requirements (Gong et al., 2013), but lending continues to be the primary source of financing for shipping (Del Gaudio, 2018). With falling profits, registered owners and operators would not be able to serve their debt, at least not from their fossil fuel shipping activity.

Shipping investors should assess the medium and long-term viability of their assets.
The current investments in fossil fuel carriers suggest that investors have a strong focus on immediate returns, and that they may overlook future evolutions that limit the profitability of their assets (Fricaudet et al. 2023). Shipowners and financiers can reduce their risk – and the risk for everybody invested in shipping of fossil fuels – by foregoing further investment in segments with uncertain future transport demand. Investing in additional optionality for ships to repurpose to other cargo and factoring demand-side risk or cost of future retrofits into adjusted returns are options for those who still consider investment in fossil fuel carrying ships. Other, fast growing, low-carbon economy shipping sectors may well be more attractive investments.

Opportunities for Transport and Logistics in the Wind Energy Sector
The Kühne Climate Center is currently undertaking its next study of the Logistics 2050 series. It assesses the logistics capacities needed to scale wind energy to meet the requirements for net-zero in 2050. Shipping activities for the wind industry will be part of it.

The study is planned to be published in the second half of 2024.

Repurposing to other cargos should happen early in a ship's lifetime.
If technologically feasible and economically viable, repurposing fossil fuel carrying ships to other cargos can be seen as one of the more sustainable ways to mitigate some of the demand-side risks. It would also potentially avoid additional emissions due to scrapping and newbuilding, as well as pressure on the market for sustainable shipbreaking. For ships that can technically be repurposed, early retrofits maximize the period over which the ship can then recoup the additional investments. Also, those who repurpose early to alternative cargos may evade an increasing commercial pressure in a more and more crowded space. Various factors that determine the ship's ability to repurpose successfully need to be thoroughly assessed. Understanding of the costs, capacity, and feasibility of repurposing needs to be improved quickly.

Early scrapping of older ships can help reducing demand-side risk for owners and operators collectively.
In our modelling, ships were maintained in the fleet even if they were idle or operated at loss. However, for some owners and operators of particularly older ships, scrapping earlier than planned may be the better option to avoid losses. A decrease in the fleet's capacity would then lead to a lower total risk for the entire sector. Such action in the common interest would require a strong coordination among actors, and an incentive for those who scrap their ships earlier. The high fragmentation of owners especially in the oil tanker segment would probably be a key obstacle to a joint response.

Support the increase of sustainable shipbreaking capacities.
The potential increase in demand for shipbreaking from fossil fuel carrying ships is certainly not the only but another reason to strengthen sustainable shipbreaking capacities. Parts of the foundation for this have been laid by the Hong Kong Convention. It remains to be seen how it will be enforced, and what ship owners' response to potentially higher cost of scrapping and thus lower residual value of ships will be.

Shipbreaking today takes place in mainly three countries: Bangladesh, Pakistan, and India account for 90% (UNCTAD, 2022). Governments and the international community can work together to strengthen sustainable shipbreaking capacities in general and, in particular, in these countries, where the activity constitutes a livelihood for many workers.

Opportunities to invest in activities and assets that are compatible with climate goals are rising.
The transition to a low-carbon society holds many opportunities—and it requires new investments. Many of the opportunities will lie within or close to the maritime industry. Transport capacity for dry bulk cargo will likely need to increase, as our modelling suggests. Production capacity for low-carbon fuels for the shipping industry, but also for other sectors is urgently needed. Ports will require new facilities to serve as hubs for trade in green energy and other low-carbon goods and technologies.

Since 2016, global investments in clean energy have outpaced investments in fossil fuels every single year. In 2023, clean energy accounted for 60% of the total USD 1,800 billion spent in the sector (IEA, 2023b).

The sails are set.

Limitations of this study

The limitations of this study lie, first and foremost, with the scenarios modelled for the demand of shipping of fossil fuels. The initial scenario used was based on 2018 estimates from the *Fourth IMO GHG Study 2020*. This is outdated as the consumption and transportation of fossil fuels between 2018 and 2024 did not align with any of the in 2018 projected 1.5°C trajectories. To address this limitation, we adjusted the scenario to a 2024-perspective.

This adjustment brings many uncertainties. One could fit an infinite number of curves for this adjustment, of which only one was selected for practical reasons. Our estimates do not include a bottom-up modelling of energy goods consumption and their impact on trade, because such modelling is not available at the date of writing. The fitted curves should therefore be considered a proxy for 1.5°C-aligned trade rather than a strict estimate. Limitations of the initial input data from the *Fourth IMO GHG Study 2020* remain. In particular, it does not include the recent evolutions in trade, the consequences of the conflicts in Ukraine and Gaza onto global trade such as the increase in sea distance, mode shift from pipeline to ship, or reduction in gas consumption due to higher prices.

Also, this initial assessment of stranded assets is based on averages taken for each type and size-class of vessel, making the findings indicative. Enhancing precision may entail refining these estimates by incorporating more granular data at the individual ship level. Distinguishing between various types of liquefied gas tankers, such as LNG and LPG tankers, could provide deeper insights, given significant differences in everything from how they are designed to their cost structures.

Last, this analysis only covered one factor of demand-side risks. Other factors linked to a low-carbon transition could exacerbate future demand uncertainties. For instance, a global shift away from fossil fuels may reduce offshore activities associated with fossil extraction, while increased regionalization of trade may decrease shipping distances and activity (Walsh et al., 2019; Walsh & Mander, 2017. Conversely, current demand estimates often overlook the potential uptake of alternative commodities like biofuels, CO_2, and hydrogen-derived fuels, which could partially offset the decline in fossil fuel transport demand.

Further research is required to explore the future trade dynamics of these commodities and assess the economic feasibility of retrofitting existing ships to accommodate these functions.

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Further Readings

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