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Allianz Global
Corporate & Specialty

Safety and Shipping Review 2022

An annual review of trends and developments
in shipping losses and safety

About AGCS

Allianz Global Corporate & Specialty (AGCS) is a leading global corporate insurance carrier and a key business unit of Allianz Group. We provide risk consultancy, Property-Casualty insurance solutions and alternative risk transfer for a wide spectrum of commercial, corporate and specialty risks across nine dedicated lines of business and six regional hubs.

Our customers are as diverse as business can be, ranging from Fortune Global 500 companies to small businesses. Among them are not only the world's largest consumer brands, financial institutions, tech companies and the global aviation and shipping industry, but also satellite operators or Hollywood film productions. They all look to AGCS for smart solutions and global programs to their largest and most complex risks in a dynamic, multinational business environment and trust us to deliver an outstanding claims experience.

Worldwide, AGCS operates with its own teams in more than 30 countries and through the Allianz Group network and partners in over 200 countries and territories, employing around 4,250 people. As one of the largest Property-Casualty units of Allianz Group, we are backed by strong and stable financial ratings. In 2021, AGCS generated a total of €9.5 billion gross premium globally.

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Executive summary

Allianz Global Corporate & Specialty's (AGCS) **Safety and Shipping Review** identifies loss trends and highlights a number of risk challenges for the maritime sector.

Loss developments > **10**

The international shipping industry is responsible for the carriage of around 90% of world trade so vessel safety is critical. During the early 1990s, the global fleet was losing 200+ vessels a year. This has dropped to around 50 to 75 a year over the past four years — a statistic made more impressive by the fact that there are an estimated 130,000 ships in the global fleet today (over 100 gross tonnage [GT]) compared with some 80,000 30 years ago.

The sector continued its long-term positive safety trend in 2021 with 54 reported total losses* compared with 65 a year earlier. Annual shipping losses have declined by 57% over the past decade since 2012 (127), while 2021 represents a significant improvement on the rolling 10-year loss average (89), reflecting the increased focus on safety measures over time, such as regulation, improved ship design and technology and risk management advances.

South China, Indochina, Indonesia and the Philippines is the main global loss hotspot, accounting for one-in-five losses (12), although activity declined year-on-year. The Arabian Gulf (9) saw a significant increase in loss activity to rank second ahead of the East Mediterranean and Black Sea region in third (7). South East Asian waters are also the major loss location of the past decade (225 out of 892), driven by factors such as high levels of local and international trade, congested ports, older fleets and extreme weather.

Cargo vessels accounted for half of all vessels lost in 2021 (27). Foundered (sunk) was the main cause of total losses across all vessel types during 2021, accounting for around 60% (32). Fire/explosion ranked second (15%, 8), with machinery damage/failure third (11%, 6). Extreme weather was reported as being a factor in at least 13 losses during 2021, while

Safety and Shipping

892 total losses in 10 years

54 total losses in 2021.
57% decline over a decade

27 cargo ships lost in 2021 –
50% of all vessels lost

3,000 shipping incidents in 2021 – up year-on-year. Machinery damage is the top cause

* As of March 1, 2022

Review 2022 in numbers

December and **May** - the most frequent months for total losses in 2021 (7 each)

13 Minimum number of total losses where **extreme weather** was reported as being a factor

28

average age of a total loss vessel over the past decade

6 incidents involving the most accident-prone vessels in **2021** – a **Greek Island ferry**, a **Scottish island ferry** and an **Alaskan ferry**

668 incidents in **2021** in the **British Isles**, **North Sea**, **English Channel** and **Bay of Biscay** region

1 in 5 total losses in **2021** occurred in **South China**, **Indochina**, **Indonesia** and the **Philippines** – the global hotspot

December and May were the most frequent months for losses with seven each respectively. Collectively, foundered (52%), wrecked/stranded (grounded) (18%) and fire/explosion (13%) are the top three causes of total losses over the past decade, accounting for more than 80% of 892 reported losses.

While the number of total losses declined over the past year, the number of reported shipping casualties or incidents increased. The British Isles saw the highest number of reported incidents (668 out of 3,000). Machinery damage/failure accounted for over one-in-three incidents globally (1,311). Fire/explosion (178) is the third top cause (after collision [222]), with the number of fires increasing by almost 10% annually.

The East Mediterranean and Black Sea region is the location of the most shipping incidents over the past decade (4,763), accounting for 18%. Globally, most incidents have been caused by machinery damage or failure (9,968), followed by collision (3,134), contact (2,029), piracy (1,995) and fire/explosion (1,747).

Ukraine impact: safety and insurance > **18**

Russia's invasion of Ukraine has caused widespread disruption to global shipping, exacerbating ongoing supply chain disruption, port congestion and crew crises caused by the Covid-19 pandemic.

The industry has been affected on multiple fronts, with the loss of life and vessels in the Black Sea, disruption to trade with Russia and Ukraine, and the growing burden of sanctions. It also faces challenges to day-to-day operations, with knock on effects for crew, the cost and availability of bunker fuel, and the potential for growing cyber risk.

To date, the biggest impact has been on vessels operating in the Black Sea and/or trading with Russia. At the start of the conflict, approximately 2,000 seafarers were stranded aboard vessels in Ukranian ports. Trapped crews faced the constant threat of attacks, with little access to food or medical supplies and a number have been killed.

The invasion has further ramifications for a global maritime workforce already facing shortages. Russian seafarers account for just over 10% of the world's 1.89 million, while around 4% come from Ukraine. Seafarers from these countries may struggle to return home or rejoin ships at the end of the current contracts.

A prolonged conflict is likely to have deeper economic and political consequences, potentially reshaping global trade in energy and other commodities. An expanded ban on Russian oil could push up the cost and availability of bunker fuel and potentially push ship owners to use alternative fuels. If such fuels are substandard this may bring machinery breakdown claims in future. Meanwhile, security agencies have warned of a heightened cyber risk with vessels in the Black Sea and surrounding areas facing the threat of GPS jamming, Automatic Identification System (AIS) spoofing, communications jamming and electronic interference.

Marine insurance losses are currently limited. The insurance industry is likely to see a number of claims under specialist war policies from vessels damaged or lost to sea mines, rocket attacks and bombings in the conflict zone in the Black Sea and Sea of Azov. Insurers may also receive claims under marine war policies from vessels and cargo blocked or trapped in Ukrainian ports and coastal waters. More uncertain is the potential for non-war claims in hull and cargo insurance from vessels caught up in the conflict, which may ultimately involve complex legal questions and policy interpretation.

Shipping trapped or blocked in the Black Sea is a particular challenge. Even if safe passage is afforded, vessels may not feel confident in using maritime safe corridors or running the risk of sea mines. However, the longer vessels are trapped, maintenance and crew welfare will be harder to sustain. Some crews have reportedly abandoned their ships in Ukraine due to security worries. Cargo in storage or in transit may be damaged or abandoned due to the conflict or if a vessel is trapped in port. Trapped vessels or ships affected by sanctions may suffer machinery breakdown or damage by fire, collision or grounding.

2,000

seafarers were stranded aboard vessels in Ukrainian ports at the start of the invasion

The problems with bigger ships > **26**

A number of recurring themes have emerged in major incidents in recent years, many of which are a consequence of the increased size of vessels. Values at risk have increased, while the environmental bar has been raised. However, regulation, safety management systems and salvage capabilities do not always appear to have kept pace.

In the past year, fires on board the roll-on roll-off (ro-ro) car carrier **Felicity Ace** and container ship **X-Press Pearl** both resulted in total losses. The large container ship **Ever Forward** ran aground in Chesapeake Bay in the US and was stuck for a month before it was freed, almost a year to the day after its sister vessel the **Ever Given** blocked the Suez Canal for six days in March 2021.

Cargo fires are a priority concern. Fires on board large vessels can spread quickly and be particularly difficult to control, often resulting in the crew abandoning ship. There have been over 70 reported fires on container ships alone in the past five years. These fires often start in containers and can be the result of mis-/non-declaration of hazardous cargo, such as chemicals and batteries. It is estimated about 5% of containers shipped consist of undeclared dangerous goods. These might be improperly packed and stowed on-board, which can result in ignition and or/ complicate detection and firefighting. The more containers on board, the higher the probability that at least one could ignite and cause a fire, and the harder it is to contain and extinguish it.

Reducing the risk of fire on board large container ships requires a combination of regulatory and industry action, and despite encouraging signs, including aiming to enhance fire detection and fighting capabilities on new container ships, these changes are some years away. In the short term, there needs to be an urgent industry review of fire detection and fighting protections and equipment.

Fires have also become a consistent loss driver for car carriers, in addition to stability issues. Among other causes, they can start in cargo holds, caused by malfunctions or short circuits in vehicles. Any breach or water ingress can affect the stability of the vessel, while the open decks can allow fires to spread quickly. Commercial pressures bring another risk factor. Vessels have relatively short turnaround times in port, which can result in them sailing before the crew may have properly verified complex pre-departure loading and ballast calculations, or secured vehicle cargos to reduce the risk of fire or shift. Car carrier losses can be very expensive, given the cargo value, and the cost of wreck removal and pollution mitigation.

The growing popularity of electric vehicles (EVs) brings another challenge as their rapid growth means many more millions of these will need to be transported by sea in future. EVs represent a significant difference in risk profile for shippers when compared with traditional vehicles and may require changes in vessel design, fire detection and fighting capabilities and cargo loading procedures. EV lithium-ion batteries could potentially ignite if damaged, are susceptible to cargo shift in rough seas if not adequately secured and can also combust with an increase in temperature from a nearby fire or even during on board charging. Fires require a large volume of water to extinguish and cool the surrounding area, which can, in turn, endanger the stability of the ship. Crews will need to be specially trained and equipped with appropriate detectors and fire extinguishing equipment.

Irrespective of the cause of an incident, when large vessels are in trouble, emergency response and finding a port of refuge can be challenging. The experience of the container ship **X-Press Pearl**, which eventually sank after it was refused refuge by two ports following a fire, is a case in point. Too often, what should be a manageable incident on a large vessel ends in a total loss. This incident was the latest in a growing list of container ships that have had difficulty finding a port of refuge following fires or problems with cargo. Port states and other stakeholders must find ways to accommodate vessels in distress. Changes to procedures and safety management systems might help avoid these incidents being repeated.

Salvage, re-floating or wreck removal of large vessels is a complex task, requiring specialist equipment, tugs, cranes and barges. The salvage of car carrier **Golden Ray**, which capsized outside the US port of Brunswick in 2019, took almost two years and cost in excess of $800mn. Environmental, social and governance (ESG) concerns are driving up costs and claims as ship owners and their insurers are expected to go the extra mile to protect the environment and local economies. Previously, a wreck might have been left in-situ if it posed no danger to navigation. Now, authorities want to see wrecks removed and the marine environment restored, irrespective of cost. Over the past five years AGCS has seen more and more claims over $100mn, with the bulk of the cost due to wreck removal and pollution mitigation.

Large container ships are of particular concern, as salvage techniques have yet to be tested on a 20,000+ teu vessel in a major incident. In the Suez Canal, the **Ever Given** highlighted the potential challenges in re-floating a large container ship. The safe discharge of thousands of containers, even in favorable conditions, would take time and is likely to stretch the capabilities and scope of equipment of the salvage industry.

Higher salvage costs, along with the burden of larger losses more generally, are a cost increasingly borne by cargo interests. General average (GA) , the legal process by which cargo owners proportionately share losses and the cost of saving a maritime venture, has subsequently become a much more frequent event with the increase in the number of large container ships involved in fires, groundings and container losses in recent years compared with five years ago. It was declared with the **Ever Given** and when its sister ship, the **Ever Forward**, was grounded in Chesapeake Bay in the US. It was also declared following separate incidents of engine fires on the **NYK Delphinus** and **Northern Jupiter** in 2021. Incidents involving larger vessels are more likely to involve a complex response, such as difficulties finding a suitable port of refuge. They will also typically involve a higher cost of salvage and wreck removal, requiring specialist tugs, cranes and equipment. These factors drive up cost, and lead to a higher contribution to GA.

Vessel size may also be contributing to a string of container stack collapses and growing numbers of containers damaged or lost at sea. In March 2022, the container ship **Dyros** lost around 90 containers and saw another 100 damaged in rough weather in the North Pacific Ocean, the latest incident in a worrying and expensive trend for insurers. Such incidents can result from causes, such as poor packaging/stowing of containers and in many cases can be linked to commercial pressures. However, larger vessels behave differently at sea to smaller ones. Container stacks are exposed to huge forces, especially when a vessel experiences parametric and synchronous roll in rough seas.

70

reported fires on container ships alone in the past five years

Post-pandemic world brings heightened risks for shipping > **48**

While the Covid-19 pandemic resulted in few direct claims for the marine insurance sector, the subsequent impact on crew welfare and the boom in shipping and port congestion, exacerbated by the Ukraine invasion, raises potential safety concerns. Demand for crew is currently high with the shipping boom, yet following the Covid-19 pandemic many skilled and experienced seafarers are leaving the industry, having endured long periods of time stuck on vessels. For those that remain, morale is low. Commercial pressures and workloads are running high, which can lead to mistakes and shortcuts, while the ever-growing burden of compliance is making the job less attractive. A future talent shortage is a risk, with a serious shortfall of officers predicted within five years. Crew welfare and retention rate is a risk factor considered in underwriting. Particularly with more modern vessels and technology, the ability to attract and retain experienced crew is critical.

The economic rebound from Covid-19 lockdowns has created a boom time for shipping, with record increases in charter and freight rates. While this is a positive for many in the industry's finances, higher freight rates and a shortage of container ship capacity is tempting some operators to use bulk and product carriers to transport containers. The use of non-container vessels to carry containers raises questions around stability, firefighting capabilities and securing cargo. Bulk carriers and tankers are not designed to carry containers and crews may not be experienced enough to handle containers or respond to an incident at sea. Carrying containers could also change the maneuvering characteristics of a vessel and affect how it behaves in bad weather.

With demand for shipping high, owners are also extending the working life of vessels. Even before the pandemic, the average age of vessels in the global merchant fleet was rising – 14.7 years for vessels greater than 2,000 gross tonnage (GT) in 2021 compared with around 13 years a decade ago, according to the IUMI Stats Report 2021. Although there are many well-managed and maintained fleets composed of older vessels, analysis has shown older container and cargo vessels (aged between 15 and 25 years old) are more likely to result in claims, as they suffer from corrosion, while systems and machinery are more prone to failure and breakdown.

Covid-19 measures in China, a surge in consumer demand and the Ukraine invasion have all been factors in ongoing unprecedented port congestion. Overall, port congestion globally is running above the levels seen last year, with specific container fleet congestion trending towards previous highs, Clarksons Research noted in March 2022. Port congestion puts crews, port handlers and facilities under additional pressure. Loading and unloading vessels is a particularly risky operation, where small mistakes can have big consequences. Busy container ports have little space, while the experienced labor required to handle the containers properly is in short supply. Add in fast turnaround times and this may result in a significantly heightened risk environment. Port risks are already increasing with larger ships, which concentrates large volumes of trade into the fewer larger ports that have specialist infrastructure, meaning accumulations of cargo exposures at mega ports have been rising.

At the same time, the shipping industry continues to fall victim to cyber-attacks. India's busiest container port, Jawaharlal Nehru Port Trust, was hit by a ransomware attack in February 2022, following incidents at US and South African ports in recent years. According to a recent industry survey, just under half (44%) of maritime professionals reported that their organization has been the subject of a cyber-attack in the last three years. A third of organizations do not conduct regular cyber security training or have a cyber-response plan.

Climate change: transition problems > **58**

Shipping is a major contributor to climate change. The industry's greenhouse gas emissions grew by around 10% between 2012 and 2018, meaning the race to decarbonize is now underway. In 2018 the International Maritime Organization (IMO) called for a 40% cut in greenhouse gas emissions (compared to the 2008 baseline) across the global fleet by 2030, and at least a 50% cut by 2050. Last year, the IMO also adopted short-term measures aimed at cutting the carbon-intensity of all ships by at least 40% by 2030.

The decarbonization of the industry will require big investments in green technology and alternative fuels. A growing number of vessels are already switching to liquefied natural gas (LNG), while a number of other alternative fuels are under development including ammonia, hydrogen and methanol, as well as electric-powered ships. While there are plenty of innovative ideas on the drawing board, there is not yet an obvious technical solution available that will get the industry to its 2050 targets.

Decarbonization will transform the shipping industry over the coming decades, which will in turn alter the risk landscape. As we have seen with container shipping, there can be unintended consequences with innovation. The transition to alternative fuels will likely bring heightened risk of machinery breakdown claims, as new technology beds down and as crews adapt to new procedures.

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Minimum number of total losses in which extreme weather was reported as being a factor during 2021

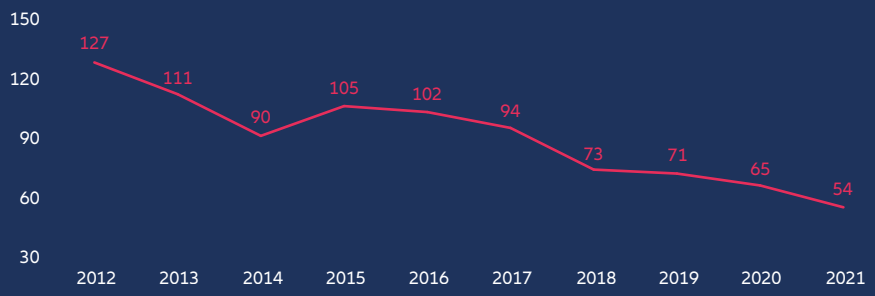
Losses in focus

The analysis over the following pages covers both total losses and casualties/incidents. See page **64** for further details

Total losses by top 10 regions 2012 - 2021 and 2021

Total losses by year - 57% decline over a decade

Safety improvements have been impressive. In the early 1990s, the global fleet was losing 200+ vessels a year. This rate has dropped to around 50 to 75 a year over the past four years.



Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

2021 review

The database shows 54 total losses over 100GT at the end of 2021 around the world, compared with 65 a year earlier. South China, Indochina, Indonesia and the Philippines remains the main loss hotspot, accounting for one-in-five losses, although activity declined year-on-year.

Total losses by top 10 regions
From January 1, 2021 to December 31, 2021

Region	Loss	Annual Change
S. China, Indochina, Indonesia and Philippines	12	↓ 5
Arabian Gulf and approaches	9	↑ 4
East Mediterranean and Black Sea	7	↓ 6
Bay of Bengal	3	↑ 2
Japan, Korea and North China	3	↓ 1
West Mediterranean	3	↑ 2
Baltic	2	↑ 2
British Isles, N.Sea, Eng. Channel and Bay of Biscay	2	↓ 4
Russian Arctic and Bering Sea	2	↓ 1
Australasia	1	↑ 1
Other	10	
Total	**54**	**↓ 11**

Total losses for 2012 - 2021

The 2021 loss year (54) represents a significant improvement on the rolling 10-year loss average (89). This is even more impressive given the fact that there are almost 130,000 ships in the global fleet (100GT+) compared with around 80,000 ships 30 years ago.

The South China region remains the top loss hotspot of the past decade, driven by factors including high levels of local and international trade, congested ports, older fleets and extreme weather. Together, the top 10 maritime regions account for around 80% of losses over the past decade.

Total losses by top 10 regions
From January 1, 2012 to December 31, 2021

Region	Loss
S. China, Indochina, Indonesia and Philippines	225
East Mediterranean and Black Sea	136
Japan, Korea and North China	87
British Isles, N.Sea, Eng. Channel and Bay of Biscay	55
Arabian Gulf and approaches	46
West African Coast	38
West Mediterranean	35
Bay of Bengal	29
S. Atlantic and East Coast South America	24
West Indies	23
Other	194
Total	**892**

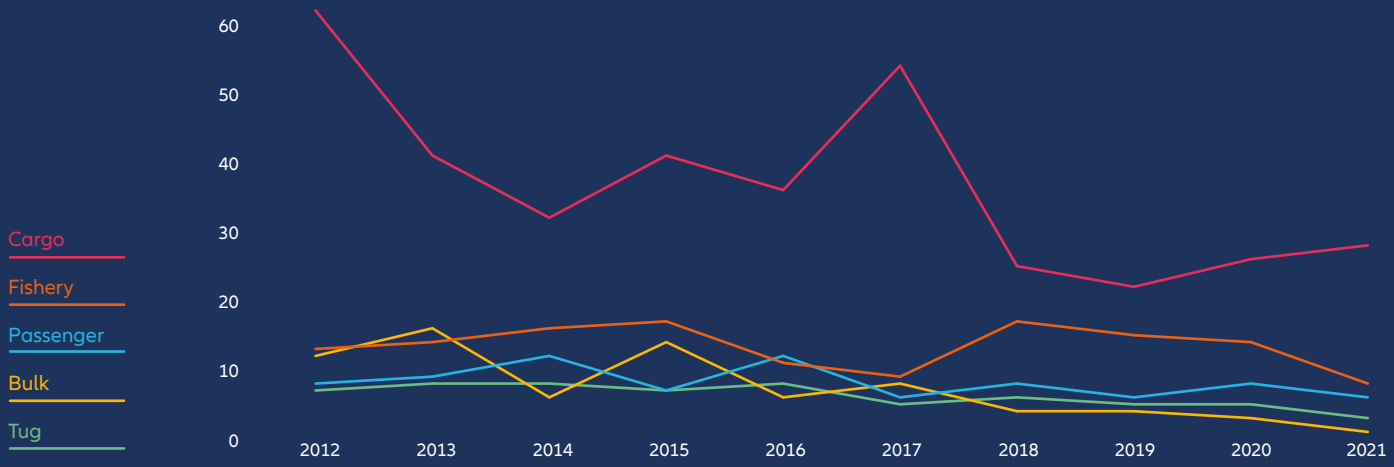
Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

Total losses by type of vessel 2012 - 2021

Cargo, fishing and passenger vessels account for over 60% of ships lost over the past decade

Top 5 vessel types lost



Total losses by type of vessel: 2012 - 2021

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Cargo	61	40	31	40	35	53	24	21	25	27	357
Fishery	12	13	15	16	10	8	16	14	13	7	124
Passenger	7	8	11	6	11	5	7	5	7	5	72
Bulk	11	15	5	13	5	7	3	3	2		64
Tug	6	7	7	6	7	4	5	4	4	2	52
Chemical/Product	8	10	2	3	7	4	3	1	2	2	42
Ro-ro	6	2	5	6	10		3	7	1	1	41
Container	7	4	4	5	5	3	2	1	1	1	33
Supply/Offshore	3	2	3	3	2	2	2	1	1	3	22
Barge		3	1		3	1	2	1		2	13
Dredger	1		1	1	1	3	2	1	2	1	13
Tanker	1		1			2	3		2	1	10
Unknown		1		2	1			3			7
LPG	1				1	1		2			5
Other	3	6	4	4	4	1	1	7	5	2	37
Total	**127**	**111**	**90**	**105**	**102**	**94**	**73**	**71**	**65**	**54**	**892**

Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

2021 review

Total losses by type of vessel

January 1, 2021 to December 31, 2021

Cargo vessels accounted for half of all vessels lost in 2021. Foundering was the most frequent cause of loss and most cargo vessels were lost in South East Asian waters.

Cargo	27
Fishery	7
Passenger	5
Supply/Offshore	3
Barge	2
Chemical/Product	2
Tug	2
Container	1
Dredger	1
Ro-ro	1
Tanker	1
Other	2

The average age of a vessel involved in a total loss over the past 10 years is 28.

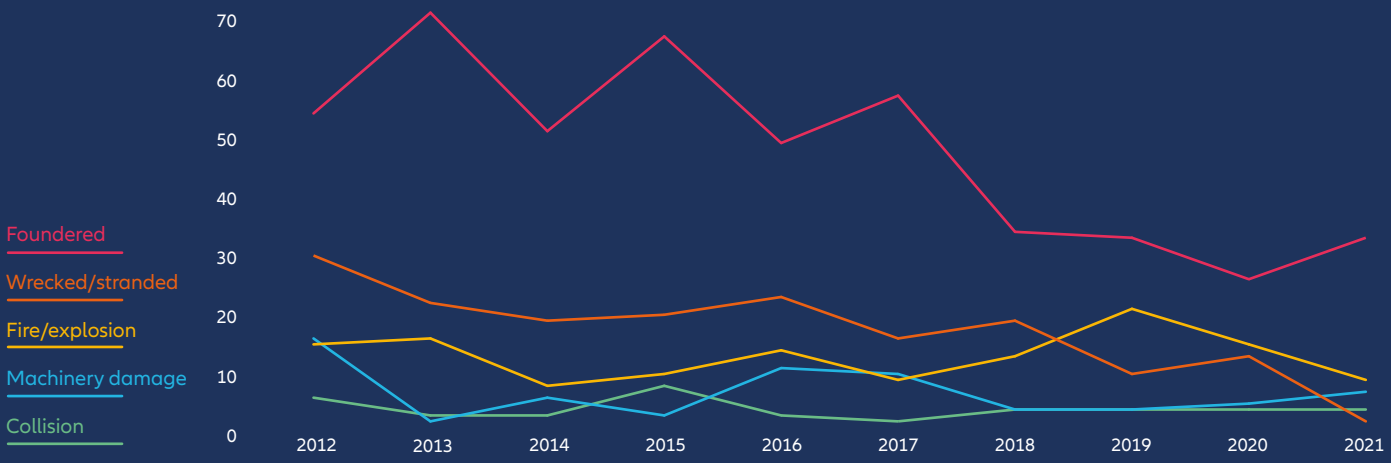
Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

Total losses by cause 2012 - 2021

Foundered (sunk) (52%), wrecked/stranded (grounded) (18%) and fire/explosion (13%) are the top three causes of total losses over the past decade, accounting for more than 80%.

Top 5 causes of loss



Total losses by cause: 2012 - 2021

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Foundered (sunk/submerged)	53	70	50	66	48	56	33	32	25	32	465
Wrecked/stranded (grounded)	29	21	18	19	22	15	18	9	12	1	164
Fire/explosion	14	15	7	9	13	8	12	20	14	8	120
Machinery damage/failure	15	1	5	2	10	9	3	3	4	6	58
Collision (involving vessels)	5	2	2	7	2	1	3	3	3	3	31
Hull damage (holed, cracks etc.)	7	1	5	2	4	5	2	1	1	1	29
Contact (e.g. harbor wall)	2		1				2	1			6
Missing/overdue					2			1			3
Miscellaneous	2	1	2		1			1	6	3	16
Total	**127**	**111**	**90**	**105**	**102**	**94**	**73**	**71**	**65**	**54**	**892**

Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

2021 review

Total losses by cause

January 1, 2021 to December 31, 2021

Foundered (sunk) was the main cause of total losses reported during 2021, accounting for around 60%. Fire/explosion ranked second (15%), with machinery damage/failure third (11%). The most frequent cause of a loss resulting from machinery breakdown was engine failure.

Foundered	32
Fire/explosion	8
Machinery damage/failure	6
Collision	3
Hull damage	1
Wrecked/stranded	1
Miscellaneous	3

Extreme weather was reported as being a factor in at least 13 losses during 2021.

December and May were the most frequent months for losses with seven during each month.

Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

Total losses in all regions 2021

This map shows the approximate locations of all 54 reported total losses during 2021.

	Region	Loss	Share
1	S. China, Indochina, Indonesia and Philippines	12	22%
2	Arabian Gulf and approaches	9	17%
3	East Mediterranean and Black Sea	7	13%
4	Bay of Bengal	3	6%
	Japan, Korea and North China	3	6%
	West Mediterranean	3	6%
5	Baltic	2	4%
	British Isles, N.Sea, Eng. Channel and Bay of Biscay	2	4%
	Russian Arctic and Bering Sea	2	4%
6	Australasia	1	2%
	Canadian Arctic and Alaska	1	2%
	Gulf of Mexico	1	2%
	Indian Ocean	1	2%
	Newfoundland	1	2%
	North Atlantic	1	2%
	North American West Coast	1	2%
	S. Atlantic and East Coast South America	1	2%
	United States Eastern Seaboard	1	2%
	West African Coast	1	2%
	West Indies	1	2%

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

Casualties/incidents

2021 review

2021: While the number of total losses has declined over the past year, the number of reported shipping casualties or incidents increased. The British Isles region saw the highest number of reported incidents (668).

Machinery damage/failure accounted for over one-in-three incidents globally (1,311). Fire/explosion (178) is the third top cause (after collision [222]), with the number of fires increasing by almost 10% year-on-year.

All casualties/incidents including total losses
From January 1, 2021 to December 31, 2021

Top 10 regions	Loss	Annual Change
British Isles, N.Sea, Eng. Channel and Bay of Biscay	668	↑ 94
East Mediterranean and Black Sea	539	↑ 113
S. China, Indochina, Indonesia and Philippines	276	↑ 13
West Mediterranean	176	↑ 71
North American West Coast	138	↑ 1
Baltic	124	↑ 10
Great Lakes	122	↓ 58
Iceland and Northern Norway	105	↓ 3
Japan, Korea and North China	104	↑ 11
Newfoundland	87	↑ 4
Other	661	
Total	**3,000**	**↑ 305**

2012 - 2021 review

2012 – 2021: The East Mediterranean and Black Sea region is the location of the most shipping incidents over the past decade (4,763), accounting for 18%.

Globally, most incidents have been caused by machinery damage or failure (9,968), followed by collision (3,134), contact (2,029), piracy (1,995) and fire/explosion (1,747).

All casualties/incidents including total losses
January 1, 2012 to December 31, 2021

Top 10 regions	Loss
East Mediterranean and Black Sea	4,763
British Isles, N.Sea, Eng. Channel and Bay of Biscay	4,612
S. China, Indochina, Indonesia and Philippines	2,574
Baltic	1,483
Great Lakes	1,463
Japan, Korea and North China	1,324
Iceland and Northern Norway	1,106
West Mediterranean	1,073
North American West Coast	1,057
West African Coast	923
Other	6,329
Total	**26,707**

Vessels over 100GT only

Note: All figures are based on reported total losses for the year-end 2021 as of March 1, 2022. 2021's total losses may increase in future as, based on previous years' experience, developments in losses sometimes lead to a number of total losses being confirmed after year-end, particularly in the case of constructive total losses or because of late reporting, such as during the Covid-19 pandemic.

Vessels over 100GT only

Source: Lloyd's List Intelligence Casualty Statistics
Data Analysis & Graphic: Allianz Global Corporate & Specialty

1. Ukraine impact

Ukraine invasion adds to pandemic challenges

The war has caused widespread disruption to global shipping, and is likely to exacerbate ongoing supply chain disruption, port congestion and crew crises caused by the Covid-19 pandemic.

An oil refinery hit by a missile attack in Ukraine

The shipping industry has been affected on multiple fronts, with the loss of life and vessels in the Black Sea, disruption to trade with Russia and Ukraine, and the growing burden of sanctions. The industry also faces challenges to day-to-day operations, with knock-on effects for crew, the cost and availability of bunker fuel, and the growing threat posed by cyber risk.

"Despite the tragic situation in Ukraine, and the threat to seafarers caught up in the conflict, the direct impact on shipping from the war in Ukraine has so far been largely contained to the Black Sea," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**. "However, the war is creating an additional burden on the maritime industry, which is already dealing with ongoing supply chain disruption, port congestion and a crew crisis caused by the pandemic."

The International Monetary Fund *(IMF)*[1] warned that the war in Ukraine will exacerbate already high shipping costs this year, and could keep them – and their inflationary effects – higher for longer. The cost of shipping a container on the world's transoceanic trade routes increased seven-fold in the 18 months following March 2020, while the cost of shipping bulk commodities spiked even more.

"Trade with Russia and Ukraine will suffer, adding to already strained global supply chains. Longer term, sanctions and a reduction in trade with Russia, could result in the redrawing of some supply chains and trade routes, but this all takes time and comes at a cost," says Khanna.

The biggest impact of the war so far has been on vessels operating in the Black Sea and/or trading with Russia. Ukraine's major ports, including that of Odessa, were closed due to the conflict and a Russian naval blockade of Ukraine. The country ships over *70% of its exports, including 99%* of its corn exports[2]. Hundreds of vessels were trapped in ports or at anchor while thousands of Russian and Ukrainian crews faced an uncertain future, unable to leave vessels or return home.

Russian vessels were also banned from entering UK and EU ports, and have been detained due to suspected sanctions breaches: in February 2022, French warships detained Russian roll-on/roll-off cargo ship **Baltic Leader** en route to St Petersburg while more than a dozen Russian-owned superyachts have been seized.

The Russian fleet has also been denied access to vital maritime services. A number of ports have withdrawn bunkering services for Russian-owned or flagged vessels, while engine manufacturers, maintenance companies, classification societies and insurers have said they will no longer serve Russian vessels.

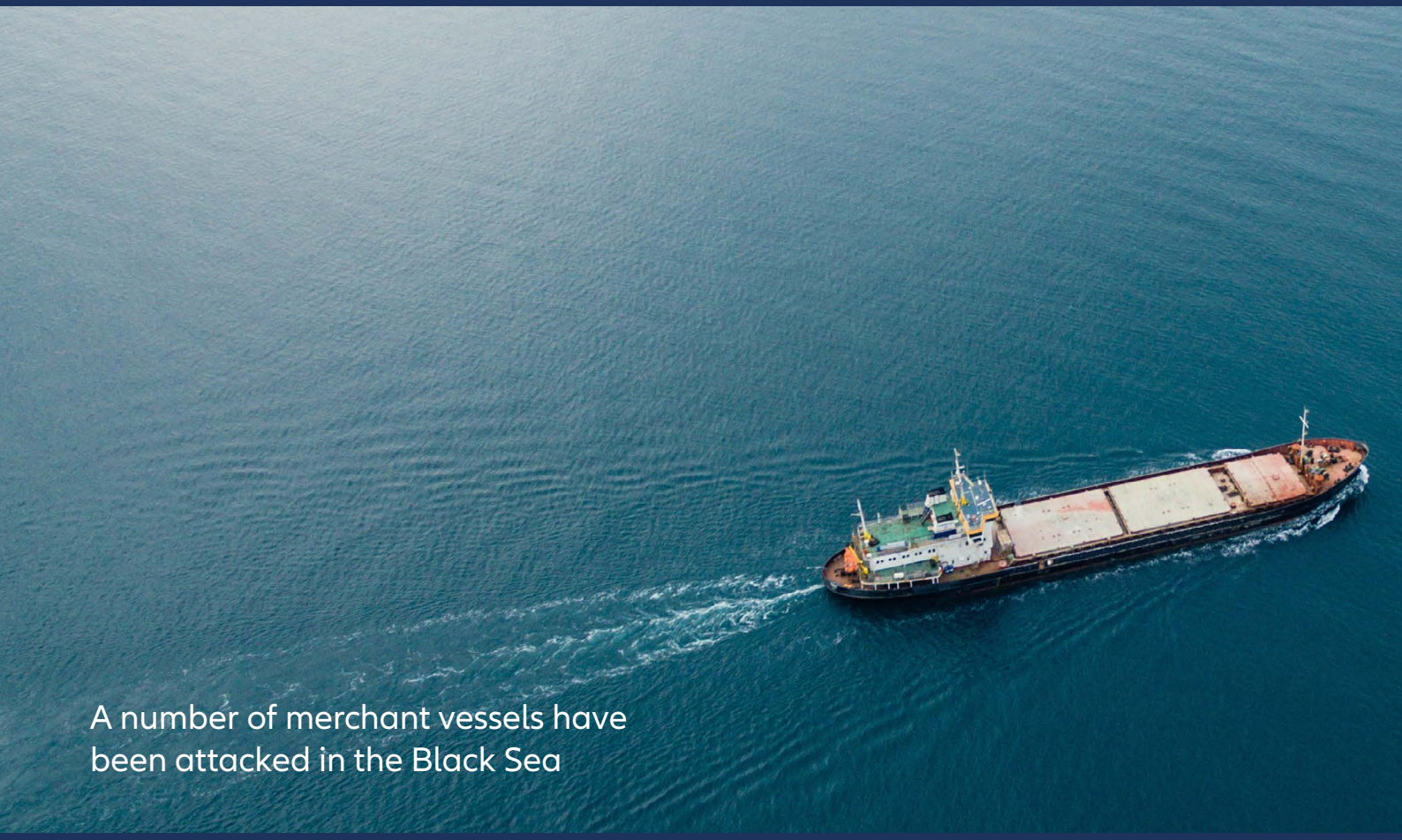
The conflict is also having a knock-on effect for shipping outside the conflict zone. US and EU sanctions, in particular, pose a significant compliance challenge for shipping companies and insurers. Many western companies have voluntarily opted to cease trade with Russia, creating a complex and uncertain legal situation for contracts, including insurance.

A prolonged conflict is also likely to have deeper economic and political consequences, potentially reshaping global trade in energy and other commodities. An expanded ban on Russian oil could push up the cost and availability of bunker fuel and potentially push shipowners to use alternative fuels.

"We have already seen requests from ship owners who are considering using non-compliant bunker fuel that has a lower explosive temperature," says **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. "Longer term, we may see a shortage of bunker fuel with more and more vessels having to turn to non-compliant or substandard fuels, which could result in machinery breakdown claims in the future."

A large part of the shipping sector will in some way be touched by the conflict, says Khanna. "In addition to the physical threats to shipping in and around the Black Sea from mines and rocket attacks, which is affecting trade, the availability and cost of bunker fuel, and the safety and welfare of crew, many container companies have already pulled out of Russia while the tanker sector faces huge restrictions and disruption, as do bulk and general cargo operators shipping Russian coal, wood and grain."

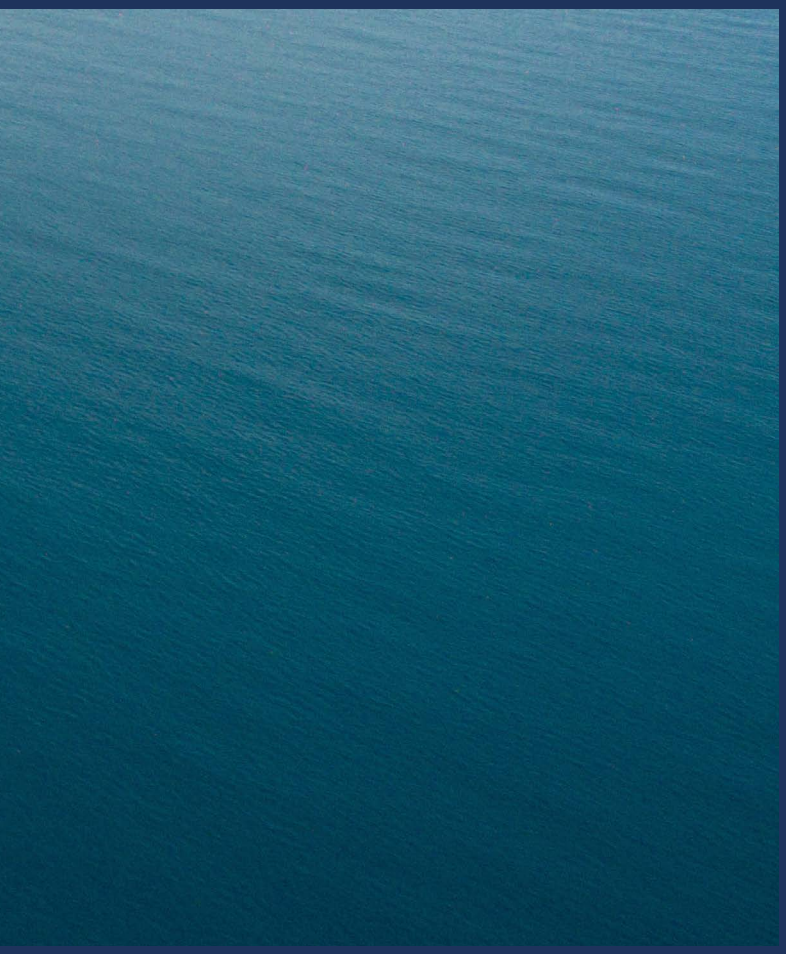
Coinciding with Covid-19 outbreaks in China, the war in Ukraine is compounding ongoing supply/demand pressures for shipping, which have resulted in port congestion, higher freight fees and longer transit times. According to *Clarksons Research*[3] container and car carrier congestion at ports is trending towards previous highs, while the impacts of the war are likely to create further inefficiencies across the maritime transport system.



A number of merchant vessels have been attacked in the Black Sea

Vessels and crew trapped in a war zone

As of April 2022, numerous merchant vessels were trapped in Ukrainian ports along the Black Sea and the Sea of Azov, while vessels in the wider region were at risk from sea mines, rocket attacks and the threat of detention.



At the start of the conflict approximately 2,000 seafarers were stranded aboard 94 vessels in Ukranian ports, according to the *International Maritime Organization (IMO)*.[4]

As of April 20, 2022, 84 merchant ships remained with nearly 500 seafarers on board. An estimated 1,500 seafarers have so far been repatriated with manning levels reduced, local ship keepers employed to replace crew, while some ships are in cold lay-up with no crew on board. For those that remain, the *(IMO)*[5] called for the urgent establishment of a blue safe maritime corridor to allow the evacuation of seafarers and ships from the high-risk and affected areas in the Black Sea and the Sea of Azov. However, it is uncertain whether it will be safe for vessels to leave.

NATO[6] issued a warning in April 2022 that the ongoing risk of collateral damage or direct hits on merchant shipping in the Black Sea was high, while harassment and diversion of shipping in the area cannot be ruled out. It also said drifting mines in the Northwest, West, and Southwest areas of the Black Sea posed a threat to shipping.

At least eight merchant vessels were attacked in Ukrainian ports and the Black Sea during the first month of the conflict. Three cargo ships — Japanese-owned **Namura Queen, Lord Nelson** and **Helt** — were attacked in the Black Sea, according to *Panama's Maritime Authority*[7]. The **Helt** sank off the coast of Odessa having likely struck a mine, killing two crew.

The sinking came shortly after a *Bangladeshi cargo ship*[8] was attacked in the Ukrainian port of Olivia, killing one of its crew members. The Moldovan-flagged chemical tanker, the **Millennial Spirit**, and the Turkish-owned bulk carrier **Yasa Jupiter** were also attacked, while the Malta-owned Dominica-flagged cargo ship **Azburg** sunk in April after it was hit in the Ukrainian port of Mariupol.

There is a risk the conflict could spill over. Stray sea mines have already been detected in Turkish and Romanian waters, whilst Ukrainian and Russian assets could conceivably be targeted outside the war zone.

In April 2022, the London market's Joint War Committee extended its high-risk advisory to include all of Russia's waters. Vessels entering high-risk areas must notify their insurers and pay an additional premium for war coverage. Following the invasion on February 24, insurers designated Ukrainian and Russian waters around the Black Sea and Sea of Azov as high-risk areas, as well as waters close to Romania and Georgia.

Potential marine claims and coverage issues

Marine insurance losses from the war in Ukraine are currently limited, although the conflict is likely to create uncertainty and legal questions for affected hull and cargo policies.

> Certain claims have to be denied under sanctions and war clauses

The insurance industry is likely to see a number of claims under war policies from vessels damaged or lost to sea mines, rocket attacks and bombings in the conflict zone in the Black Sea and Sea of Azov. Insurers may also face claims under marine war policies from vessels and cargo blocked or trapped in Ukrainian ports and coastal waters by the Russian blockade.

More uncertain is the potential for non-war claims in hull and cargo insurance from vessels caught up in the conflict, explains **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. "We can predict the various scenarios under war cover, but it is much harder to predict how non-war losses could develop for vessels trapped in Ukrainian ports and the Black Sea. There are potential issues around safe navigation, crew, maintenance and salvage for these ships if they are unable to leave."

Marine insurance policies typically exclude the seizure of ships or physical damage caused by war or hostile actions, such as damage from sea mines or attacks on vessels. However, most prudent ship owners will purchase additional *war insurance*, which will cover such losses for an additional premium, and for a limited period of time, typically seven days. Insurers are also not able to pay claims that are covered by sanctions.

Cover for non-war related damage or machinery breakdown may still be available where insurers are not able to cancel hull and cargo policies for affected ships.

The Ukrainian port of Mariupol, prior to the Russian invasion

Shipping trapped or blocked in the Black Sea is a particular challenge. Even if safe passage is afforded out of the conflict zone, vessels may not feel confident in using maritime safe corridors or running the risk of sea mines. However, the longer vessels are trapped, maintenance and crew welfare will be harder to sustain. Some crews have reportedly abandoned their ships in Ukraine due to security worries.

Given the legal and reputational risks, many companies (including insurers) have pulled back from trade with Russia. However, insurers will be required to honor valid contracts until renewal, but certain claims have to be denied under sanctions and war clauses, says Heinrich.

Cargo in storage or in transit may be damaged or abandoned due to the conflict or if a vessel is trapped in port. Trapped vessels or ships affected by sanctions may suffer machinery breakdown or damage by fire, collision or grounding.

Claims that arise under hull and cargo policies that are not directly related to the war could be difficult to resolve, involving complex legal questions and policy interpretation, explains Heinrich. For example, sanctions may prohibit a portion, but not all of an insurance claim. Claims involving trapped vessels could fall under hull insurance or war insurance, depending on the circumstance.

Renewals could also prove complicated for vessels affected by the conflict. For example, vessels trapped in the Black Sea may need to continue to pay an additional premium to war insurers to maintain cover, which could become uneconomical if the conflict is prolonged. Trapped vessels may also need to renew their hull insurance to maintain cover.

“We have identified vessels that are affected by the conflict and are keeping an eye on the status of these ships,” says Heinrich.

Conflict may exacerbate crew shortage

The Ukraine invasion also has ramifications for the global maritime workforce, which is already facing shortages as it comes out of the pandemic.

Around 2,000 seafarers were thought to be stuck on vessels in Ukrainian ports following the outbreak of the Ukraine invasion. Trapped crews face the constant threat of attack, with little access to food or medical supplies. Tragically, a number of crew have already been killed in attacks.

A significant proportion of the world's 1.89 million seafarers originate from Russia and Ukraine: according to the International Chamber of Shipping *(ICS)*[9], Russian seafarers account for just over 10% of the shipping industry's total workforce, while a further 4% are from Ukraine.

With many direct flights to Russia suspended, and with fewer vessels calling at Russian and Ukrainian ports, seafarers from these countries may struggle to return home at the end of the current contracts.

"Seafarers in the Black Sea are in a perilous situation, stuck on board vessels or in ports with dwindling supplies and under fire. This is yet another blow for the industry and global supply chains. Crew levels have not yet returned to normal levels, and now many Russian and Ukrainian seafarers may be unable to return home or rejoin ships," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**.

Regular crew changes are required across the world to ensure the flow of seafarers is maintained. Last year, the ICS and shipping trade association *BIMCO*[10] warned there could be a "serious shortage" of officers within five years if action is not taken to increase training and recruitment levels. The report predicted that there will be a need for an additional 89,510 officers by 2026, yet there was a shortfall of 26,240 certified officers in 2021.

Countries have banned imports of Russian oil and gas to varying degrees

Evolving sanctions regime increases compliance burden

The range of sanctions against Russian interests presents a sizable compliance challenge.

Western countries have introduced a raft of sanctions against Russian companies, banks and individuals, since the invasion of Ukraine. To varying degrees, the US, EU and Australia have banned imports of Russian oil, gas and coal while the EU also placed sanctions on Russian iron, steel, coal, cement, timber and luxury goods. In Asia, Japan stopped exports of luxury cars and other items to Russia while Singapore implemented export controls on technology and military exports to Russia.

The reputational risk and threat of further sanctions has led many companies and shipping groups to review their appetite for trade with Russia. However, supply chains in a number of industries, including automotive, electronics and agriculture, are reliant on raw materials and components from Ukraine and Russia, while some sanction regimes exempt certain products. Many companies have entered into contracts with Russian companies that they are unable to cancel.

Violating sanctions can result in severe enforcement action, yet compliance is complex and evolving. It can be difficult to establish the ultimate owner of a vessel, cargo, or counterparty. Sanctions also apply to various parts of the transport supply chain, including banking and insurance, as well as maritime support services, which makes compliance even more complex. The UK and EU, for example, banned insurers and reinsurers from underwriting the Russian aviation and space industry.

"The sanctions regime poses a high compliance risk for shipping companies and insurers," says **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. This is a dynamic and complex situation, and we have to take each contract on a case-by-case basis. While some Russian entities are sanctioned, there are exemptions and there may be multiple sanctioned parties within the supply chain. There are also challenges around how to manage exposures and services claims in Russia."

2. Loss drivers: larger vessels

The problems with bigger ships...

Large vessels continue to drive ever-higher exposures, with fires, container and carrier losses, hazardous cargo, costlier salvage operations and issues with port of refuge leading to oversized losses and general average becoming more frequent.

While the number of serious shipping accidents worldwide has declined over the long-term, incidents involving large vessels – namely container ships and roll-on roll-off (ro-ro) car carriers – are resulting in disproportionately high losses.

In the past year alone, fires on board the car carrier **Felicity Ace** and container ship **X-Press Pearl** both resulted in total losses. Just a few weeks after the sinking of the **Felicity Ace** in March 2022, ro-ro car carrier **Al Salmy 6** capsized and sank in the Persian Gulf in rough seas. Meanwhile, the large container ship **Ever Forward** ran aground in Chesapeake Bay on the US Eastern Seaboard, and was stuck for over a month, almost a year to the day after its sister vessel the **Ever Given** ran aground and blocked the Suez Canal for six days in March 2021.

"A number of recurring themes have emerged in major incidents in recent years, many of which are a consequence of the increased size of vessels," says **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. "As vessels have grown larger, values at risk have increased, while the environmental bar has been raised. However, regulation, safety management systems and salvage capabilities appear to have not always kept pace."

Cargo fires, in particular, are of growing concern. Mis-declared and dangerous goods are a recurrent issue for container shipping, while lithium batteries are an emerging risk for both container ships and car carriers, which are transporting growing numbers of electric vehicles, given existing counter-measure systems may not respond effectively in the event of a blaze. Cargo fires on board such large vessels can spread quickly and be particularly difficult to control, often resulting in the crew abandoning ship.

50 years of container ship growth

Container-carrying capacity has increased by around 1,500% since 1968 and has almost doubled over the past decade. Ever larger vessels are on order.

When in trouble, emergency response and finding a **port of refuge** can be challenging. Large vessels require specialist salvage equipment and port infrastructure, which all adds time and cost to a response. The experience of the container ship **X-Press Pearl**, which eventually sank after it was refused refuge by two ports following a fire, is a case in point. Too often, what should be a manageable incident on a large vessel ends in a total loss.

Of particular concern is **salvage**. Re-floating or wreck removal for large vessels is a complex task, requiring specialist equipment, tugs, cranes and barges. The salvage operation for the car carrier **Golden Ray**, which capsized just outside the US port of Brunswick in 2019, took almost two years and cost in excess of $800mn. Environmental, social and governance (ESG) concerns are also helping drive up costs of salvage and wreck removal as ship owners and their insurers are expected to go the extra mile to protect the environment and local economies.

Higher salvage costs, along with the burden of larger losses more generally, are a cost increasingly borne by cargo interests. **General average**, the legal process by which cargo owners proportionately share losses and the cost of saving a maritime venture, has become a much more frequent event with the growth in container shipping and increased size of vessels.

Values at risk continue to rise with the size of vessels and inflation, while the costs of responding to incidents and clean-up are now typically many multiples of the ship's value, explains **Captain Khanna, Global Head of Marine Risk Consulting at AGCS**. "Larger vessels mean larger losses. An incident involving a workaday container ship or car carrier – like the **Golden Ray** – can now cost as much as $1bn, once salvage and environmental considerations are factored in. A major incident involving two mega container/passenger vessels in an environmentally-sensitive region could cost in excess of $4bn."

> A number of recurring themes have emerged in major incidents in recent years, many of which are a consequence of the increased size of vessels

The Golden Ray salvage operation was the largest of its kind in the US

Photo: Shutterstock

Cargo fires
a burning issue for ship

Fires on large vessels remain a key cause of major losses, requiring urgent action to improve vessel safety.

The Felicity Ace car carrier capsized and sank in March 2022 after catching fire south of the Azores

Photo: Portuguese Navy

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A fire on board car carrier ***Felicity Ace***[11], beginning in February 2022, led to the vessel sinking in the Atlantic Ocean, along with its cargo of 4,000 vehicles. The incident occurred less than one year after a fire led to the sinking of the large container ship ***X-Press Pearl*** [12] in May 2021 off Sri Lanka.

"Fires on board large vessels remain the top issue for the shipping industry. We continue to see major incidents involving fires on large container ships, and now the emphasis is also shifting to car carriers and ro-ro vessels," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**.

Catastrophic fires on large vessels typically begin with combustible cargo, which then spreads rapidly and outpaces the firefighting capabilities of the crew. The size and design of large vessels makes fire detection and fighting more challenging than traditional shipping, and once crew are forced to abandon ship, emergency response and salvage operations become more complex and expensive, and the risk of a major or total loss increases.

"The size and design of large container ships and ro-ro car carrier vessels makes fighting fires extremely challenging. Fires need to be contained quickly, yet it may take several hours to get to the base of a fire on a container ship with as many as 20,000 containers on board, stacked ten high," says **Randy Lund, Senior Marine Risk Consultant at AGCS**.

"Fires that result in the capsizing and sinking of a vessel leave a learning void in terms of determining the root cause of the incident, which can help avert similar occurrences in the future," explains **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. "Once a vessel has capsized or sunk, the forensic fire investigations cannot be conducted and valuable information is lost forever."

4,000

Approximate number of vehicles on board the Felicity Ace

No let-up in container ship fire frequency

Fires on board large container ships are a top concern for marine insurers as a growing number of incidents continue to generate large losses.

Safety & Shipping Review analysis shows there have been over 70 reported fires on board container ships alone in the past five years, including incidents such as the ***Yantian Express***[13] (2019), and the ***Maersk Honam***[14] (2018), which made headlines around the world. More recently, a fire broke out on board the large container ship ***Zim Kingston***[15] in October 2021 after a container of dangerous goods was damaged in a storm.

There have also been many near misses. In 2021, a container of flammable products caused a large fire and explosion at ***Dubai's Jebel Ali***[16] port. Protection and indemnity insurer Gard estimates that there was at least one fire involving containerized cargo every two weeks in ***2020***[17].

Fires can take hold quickly and spread rapidly, yet container ship crews are relatively small in number, while detecting, locating and accessing a fire within a stack of containers is time-consuming. Fire-fighting equipment currently required under the **International Convention for the Safety of Life at Sea (SOLAS)** means crew face considerable risks when tackling a container fire, and are often unable to do so successfully.

"The ***X-Press Pearl***[18] sinking (off the coast of Sri Lanka in May 2021) demonstrates how a relatively small fire can escalate and result in a total loss," says **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. "Despite efforts by the crew to extinguish the fire and previous attempts to discharge the cargo at several ports, fire services were unable to save the vessel."

Reducing the risk of fire on board large container ships will require a combination of regulatory action and industry initiatives, and there are encouraging signs that these are underway. Following proposals by insurers (***IUMI***[19]), ship owners' associations and the flag states of Germany and Bahamas, the International Maritime Organization's (IMO's) Maritime Safety Committee agreed last year to amend the **SOLAS** convention with the aim of enhancing fire detection and fighting capabilities on new container ships. Although the review was held up by Covid-19, the amendments are expected to enter into force on January 1, 2028.

However, with the regulatory changes some years away, the emphasis will be on the shipping industry to tackle the issue in the short term, says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**: "We now have ships that are almost too large for the crew to fight fires effectively. There needs to be an urgent review of fire detection and fighting protections and equipment on board large container ships. We hope the IMO will soon come up with revised safety regulations with enhanced fire protection measures for large container ships."

Cargo mis-declaration at heart of problem

Addressing a root cause for fires on board container ships is key to solving the problem.

A number of blazes at sea in recent years have been traced back to combustible or mis-declared cargos in containers, including batteries, charcoal and chemicals such as calcium hypochlorite, an ingredient in cleaning products.

In March 2022, the *US Coast Guard*[20] (USCG) issued a safety alert about the risk posed by lithium batteries following two separate container fires caused by mis-declared cargo. The first saw a shipping container waiting to be loaded onto a container ship bound for China catch fire. According to the USCG, the bills of lading indicated that the container was carrying 'synthetic resins' when, in fact, it held used lithium-ion batteries.

In a similar incident in August 2021, a container full of discarded lithium batteries caught fire while being transported by road to the Port of Virginia, where it was due to be loaded onto a container ship. The cargo was mis-declared as 'computer parts'. These incidents would have been potentially "catastrophic" had the containers caught fire after being loaded aboard the container ships, the USCG said.

> "Some shipping companies are now imposing fines for customers not complying with requirements for declaration, but not all

It is estimated that around 10% of all containers loaded on board ships contain declared dangerous cargo. However, around *5% of containers shipped*[21] consists of undeclared dangerous goods — either due to administrative error or being deliberately mis-declared. For example, this would equate to 1,000 teu or more of undeclared dangerous cargo on board a 24,000 teu ultra-large container vessel.

According to **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS,** regulators and the shipping industry must take urgent action if the problem of container ship fires is to be solved: "The key is to tackle mis-declaration. Some shipping companies are now imposing fines for customers not complying with requirements for declaration, but not all. This is an issue that the IMO could help solve."

In 2019, the International Union of Marine Insurance (IUMI) and other stakeholders co-sponsored a submission to the International Maritime Organization (IMO) Sub Committee on Carriage of Cargoes and Containers proposing a comprehensive review of the **International Maritime Dangerous Goods Code (IMDG Code)**, which defined and classified dangerous goods, as well as procedures for declaration. At present, some of those commodities are not considered dangerous and do not need to be declared as such by the shipper to the carrier.

Car carrier incidents now major cause of loss

Roll-on roll-off (ro-ro) car carriers are back in the spotlight following the total loss of the **Felicity Ace**. The incident follows the grounding of the **Golden Ray**, which resulted in one of the costliest marine insurance losses in recent times.

The ***Felicity Ace***[22] sank in March 2022 with 4,000 vehicles worth an estimated $400-$500mn on board while being towed by salvors, two weeks after a fire broke out en route from Germany to Rhode Island, US. The vessel was also carrying electric vehicles, raising concerns about the risks associated with lithium-ion batteries.

Car carrier losses: a growing list

The **Felicity Ace** joins an ever-growing list of car carrier/ro-ro incidents in recent years, including:

- The **Hoegh Osaka** ran aground in January 2015 on its way from Southampton to Bremerhaven carrying over 1,400 high-end cars.
- **The Modern Express** developed a list in the Bay of Biscay in January 2016, while carrying earthmoving equipment, trucks and logs.
- **MV Honor** suffered a fire on its upper vehicle deck in February 2017, which led to extensive damage to the vessel, as well as to its cargo of about 5,000 vehicles.
- **Grande America** suffered a fire in March 2019 and subsequently capsized and sank. The resulting oil spill stretched for 10km and the ship was carrying 2,000 cars and 365 containers, of which 45 were deemed to hold hazardous substances.
- The **Auto Banner** caught fire on its 11th deck in May 2018, allegedly originating in a used vehicle on board.
- **Sincerity Ace** caught fire in the Pacific on New Year's Eve, 2018 with more than 3,500 cars onboard. The crew had to abandon the vessel, and five tragically died.
- The **Diamond Highway** had to be abandoned by its crew in the South China Sea in June 2019, due to fire, while carrying more than 6,000 cars.
- The **Golden Ray** capsized just outside the US port of Brunswick in September 2019 with over 4,000 cars on board. Its salvage took close to two years – one of the most expensive ever.
- The **Höegh Xiamen**, caught fire in June, 2020 in Jacksonville, Florida, resulting in the total loss of the vessel and its cargo of 2,420 used vehicles. An improperly disconnected battery in a used vehicle led to the fire, according to the official investigation.
- The ro-ro car carrier **Al Salmy 6** capsized and sank in the Persian Gulf in rough seas in March 2022.

Car carriers, the largest of which can hold as many as 8,000 vehicles, are susceptible to stability issues and fires, explains **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. "Ro-ro vessels were already under scrutiny following a string of incidents, including the ***Golden Ray***[23], which reports indicate are set to cost the insurance industry more than $800mn. And now we have the **Felicity Ace**. These casualties are very complex and expensive to resolve."

Fires have become a consistent loss driver for car carriers over the past decade. In many cases, fires involving vehicle cargos have resulted in the total loss of cargo and the vessel. The ***Grande America***[24] sank in 2019 carrying 2,000 cars following a fire. Months earlier, in an incident reminiscent of the **Felicity Ace**, the car carrier ***Sincerity Ace***[25] caught fire and was abandoned whilst transiting to Hawaii from Japan, with the loss of 3,500 new vehicles.

Among other causes, car carrier fires can start in cargo holds, caused by malfunctions or electrical short circuits in new or used vehicles. A National Transportation Safety Board (NTSB) incident report into the ***Höegh Xiamen***[26] incident in June 2020, attributed the fire — which led to the total loss of 2,420 cars — to an improperly disconnected car battery in a used vehicle. NTSB recommended improvements to car carrier regulations and improved oversight of vehicle loading and training by the ship's operator.

Vessel design and commercial pressures are key risk factors for car carrier and ro-ro vessels. Vessels are under time pressure and have relatively short turnaround times at port. However, the stability of these vessels is dependent on complex pre-departure loading and ballast calculations, while vehicle cargos must be made safe and properly secured to reduce the risk of fire or cargo shift.

"The wide-open deck spaces on ro-ro vessels create additional risks for stability and fire, with very little margin for error. Any breach or water ingress will affect the stability of the vessel, while the open decks allow fires to spread quickly. However, these vessels are under huge commercial pressure with short turnaround times at port, which can result in vessels sailing before the crew has verified ballast calculations or completed lashing and securing watertight doors," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**.

"Fast turnaround times in ports put crews under immense pressure, leaving little or no time to complete critical checks and verifications," agrees **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. "Crews often work around malfunctioning instruments or make assumptions in order to keep to schedule, while there are also gaps in maintenance due to time constraints."

In the case of the **Golden Ray**, the *NTSB accident report*[27] concluded that inaccurate stability calculations had probably caused the vessel to capsize. It also found that open watertight doors had allowed flooding into the vessel. It recommended that the ship's operator revise its safety management system to establish procedures for verifying stability calculations and implement audit procedures.

"Incidents involving car carriers can be very expensive, given the value of cargo, and the cost of wreck removal and pollution mitigation. It's in the interest of both operators and insurers to address this problem," says **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS**.

Lithium batteries an emerging risk for shippers

Lithium-ion batteries are increasingly impacting shipping safety, with a number of fires. The issue raises questions for the design and firefighting capabilities of ro-ro vessels carrying electric vehicles (EVs), as well as the declaration, stowage and packaging of battery container cargos.

The fire and subsequent sinking of the ro-ro car carrier ***Felicity Ace***[28] in March 2022, with the loss of some 4,000 vehicles, has further shone the spotlight on risks associated with EVs, and lithium batteries in particular. Given the vessel sank, the exact cause of the fire may never be known. However, it is thought the presence of lithium-ion batteries on board aggravated conditions.

"Lithium-ion batteries are a known issue for the shipping industry and the wider logistics industry, where there have been a number of near-misses in ports and during transport," explains **Régis Broudin, Global Head of Marine Claims at AGCS**. "Batteries are not only a potential cause of fire, they also aggravate the problem, as battery fires are very difficult to extinguish and have the potential to reignite, days or weeks later."

An emerging bank of research in the car manufacturing and shipping industries point to an increased fire risk on car carriers and ro-ro vessels from EVs. Test carried out by *P&I Clubs*[29] have shown that ship water sprinkler systems alone are not effective at extinguishing an EV fire.

The growing popularity of EVs over traditional combustion engines will mean more vehicles with lithium-ion batteries transported by sea. Meeting global emission targets in line with the Paris Agreement could see *70 million EVs manufactured by 2025 and 230 million by 2030*[30].

"However, EVs represent a significant change in risk profile for shippers when compared with traditional combustion engine vehicles and may require changes in vessel design, fire detection and fighting capabilities and cargo loading procedures," says **Captain Rahul Khanna,**

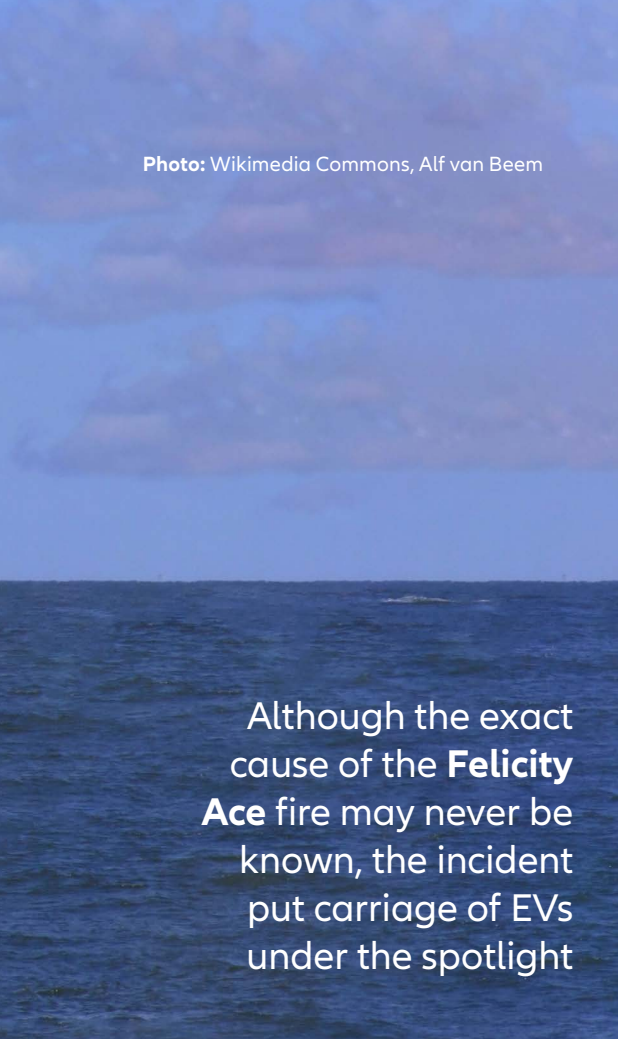


Photo: Wikimedia Commons, Alf van Beem

Although the exact cause of the **Felicity Ace** fire may never be known, the incident put carriage of EVs under the spotlight

> Batteries are not only a potential cause of fire, they also aggravate the problem

Global Head of Marine Risk Consulting at AGCS. "For example, EV batteries could potentially ignite if damaged, and therefore be susceptible to fire during a cargo shift in rough seas, if not adequately secured. Batteries can also combust with an increase in temperature from a fire in the surrounding area, or during on-board charging of an EV."

EVs will particularly challenge existing fire detection and fighting capabilities. For example, battery fires require a large volume of water to extinguish and cool the surrounding area, which would endanger the stability of the ship if run-off channels become blocked. Crews will also need to be specially trained and equipped with appropriate detectors and fire extinguishing equipment, to ensure fires are detected and extinguished quickly.

"While EVs are inherently safe, transporting them is likely to represent an enhanced risk for the maritime industry, at least in the near-term," says **Chris Turberville, Head of Marine Hull and Liabilities UK at AGCS**. "As the number of EVs increase, it would be prudent to ask the question if ro-ro car carriers are fit for purpose in terms of fire detection and fighting capabilities. These concerns should be addressed as a matter of urgency."

General average: an increasingly frequent severity event

GA was once uncommon, but with larger container vessels, cargo interests are increasingly being hit.

What is general average?

General average is the long-standing principle of maritime law that all parties share in any damage or expenditure incurred while preserving property, for example to save a vessel and its cargo during a storm. Under the terms of general average, which date back to the **York-Antwerp Rules of 1890**, cargo interests pay a contribution – based on a percentage of their own interests' value – to cover the damages or costs of others involved in a common maritime venture.

General average (GA) is a complex and specialist legal process and has become a much more frequent event with the increase in the number of large container ships involved in fires, groundings and container losses in recent years.

"Our analysis shows an increase in GA cases with the increasing size of container ships. Up until five years ago, GA for cargo was a major event. Now GA has become a frequency event, as well as an intensity event," says **Régis Broudin, Global Head of Marine Claims at AGCS**. "We now have clients that have been involved in multiple general average loss events."

GA was declared on the ***Ever Given***[31], the ultra large container ship that blocked the Suez Canal after grounding in March last year. It was also declared following separate incidents of engine fires on the container ships ***NYK Delphinus***[32] and ***Northern Jupiter***[33] in 2021. Other general average events include the ***Maersk Honam***[34] container ship which caught fire at sea in March 2018 and the ***Yantian Express***[35], which suffered a container fire in 2019. Then, in March 2022, GA was also declared on the **Ever Given's** sister vessel, the ***Ever Forward***[36], which ran aground in Chesapeake Bay on the US Eastern Seaboard, after it had been stuck for 18 days. Ship owner

18,000 containers

on board the **Ever Given** when it blocked the Suez Canal

Evergreen said the GA decision came in light of the increasing costs arising from the continued attempts to refloat the vessel.

GA tends to be more complex and costly for large container ships, due to the sheer numbers of cargo interests involved, and the higher costs of salvage associated with these vessels. Typically, general average contributions are set at around 10-20%, but for larger vessels this can be as high as 50%, says Broudin.

"Incidents involving larger vessels are more likely to involve a complex response and face difficulties finding a suitable port of refuge," says Broudin. "They will also typically involve a higher cost of salvage and wreck removal, requiring specialist tugs, cranes and salvage equipment. All these factors drive up cost, and lead to a higher contribution to general average."

General average for the **Ever Given** is likely to end up at around 25-30%, but the loss could have been much higher. The vessel was floated on a Spring Tide, just six days after it grounded. Had the vessel, with 18,000 containers on board, not been released, it would have likely required a costly and time-consuming transhipment.

Salvage and wreck removal costs drive large losses

This year marks the 10-year anniversary of the capsizing of the **Costa Concordia** cruise ship

The rising cost of salvage and wreck removal, a consequence of the increased size of vessels and growing environmental, social and governance (ESG) concerns, is fast becoming a critical issue for insurers.

A number of incidents involving large losses in recent years have ended in costly salvage and wreck removal operations, such as that of the car carrier ***Golden Ray***[37], which capsized just outside the US port of Brunswick in 2019, took almost two years and cost in excess of $800mn. The operation, the largest ever of its kind in the US, involved three million man hours and specialist equipment to cut the ship into eight pieces for removal.

The **Golden Ray** was one of the most expensive salvage operations ever, second only to the cruise ship ***Costa Concordia***[38], which cost over $1bn after it capsized off the Italian coast in 2012. The container ship **Rena**, which grounded off New Zealand in 2011, took four years to clean up at a cost of *$500mn*[39].

"The rising cost of salvage and wreck removal for large vessels is a particularly worrying trend for the insurance industry. The complexity is compounded by environmental concerns, which continue to drive up the average cost of such incidents. Wreck removal for a large vessel can now easily run into the hundreds of millions of dollars, and in some cases upwards of $500mn," says **Randy Lund, Senior Marine Risk Consultant at AGCS**.

Large container ships are of particular concern, as salvage techniques have yet to be tested on a 20,000+ teu vessel in a major incident, although there have been some close calls. In the Suez Canal, the ***Ever Given***[40] highlighted the potential challenges in refloating a large container ship. The safe discharge of thousands of containers from a stricken vessel, even in favorable conditions, would take time and is likely to stretch the capabilities and scope of equipment of the salvage industry.

"If you have an incident involving an ultra large container vessel it will most likely be a long, costly and painful salvage procedure. The question is whether the salvage industry can keep pace with the increasing size of vessels, and whether it is investing in upscaling equipment," says **Régis Broudin, Global Head of Marine Claims at AGCS**.

The ESG effect on casualties is beginning to have a serious impact on claims, says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**. "In the past, a wreck might be left in-situ if it posed no danger to navigation. Now, authorities want to see wrecks removed and the marine environment restored, irrespective of the cost. The environmental responsibilities for owners and insurers will push up the cost of these events exponentially."

"This is an area of concern for insurers and reinsurers. Over the past five years we have seen more and more claims over $100mn, with the bulk of the claim due to wreck removal and pollution mitigation," adds Broudin.

Port of refuge review needed to avoid total losses

Port states and other stakeholders must find ways to accommodate vessels in distress, after a number of fires have left container ships struggling to find refuge. In the case of the **X-Press Pearl**, the inability to discharge hazardous cargo contributed to the total loss of the vessel.

Photo: Wikimedia Commons

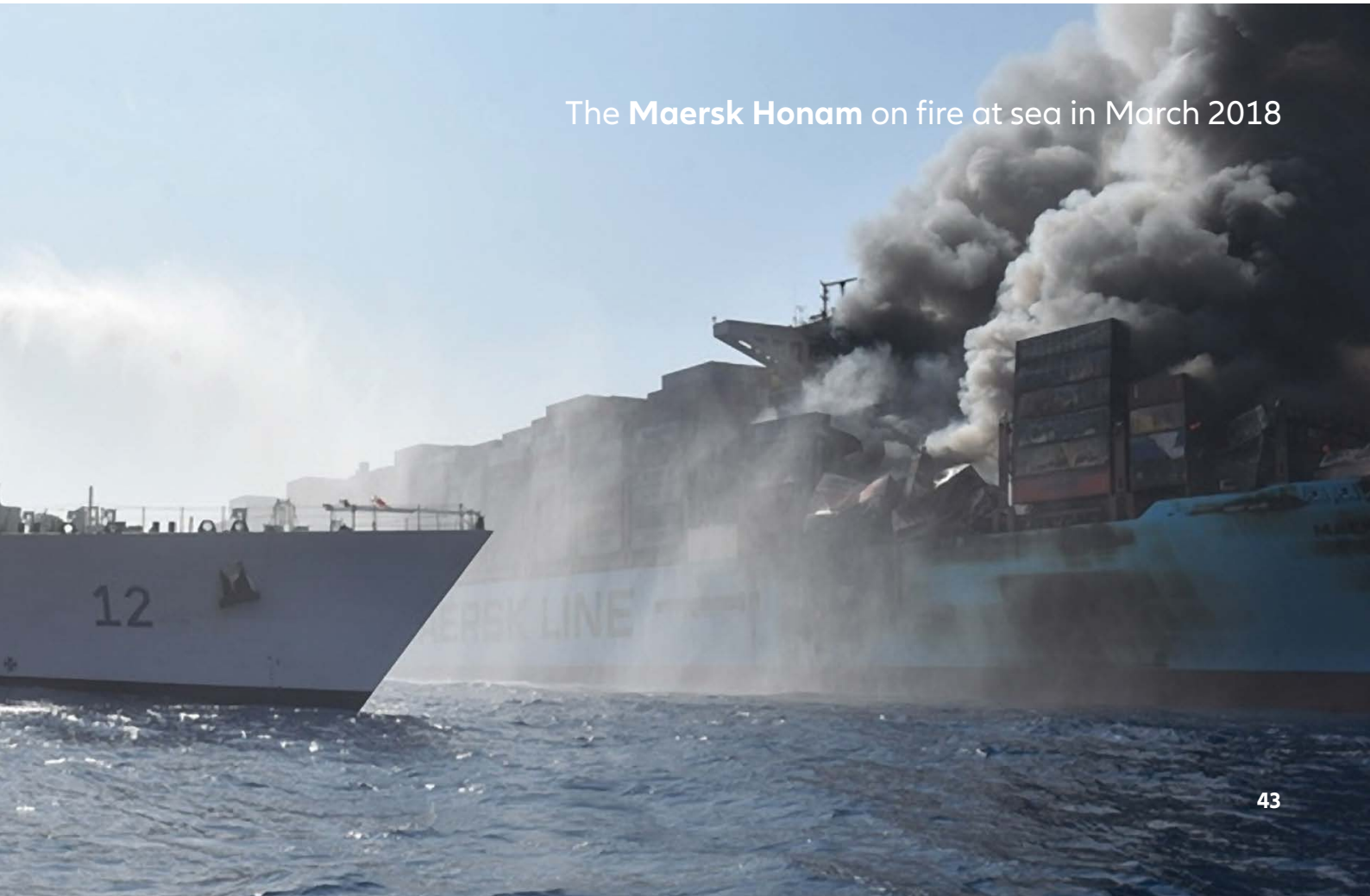
The ***X-Press Pearl***[41] sank off Sri Lanka in May 2021 following a container fire, resulting in one of the country's worst environmental disasters. Prior to the sinking, the vessel had called at Hamad Port in Qatar and Hazira Port in India, but both were unable/unwilling to discharge a leaking cargo of nitric acid, which is thought to have caused the blaze.

The vessel is the latest in a growing list of container ships that have had difficulty finding a port of refuge following fires or problems with cargo. The ***MSC Flaminia***[42], ***Maersk Honam***[43] and ***Yantian Express***[44] all had to wait several months before they were granted refuge and their cargo could be safely discharged. Such delays increase damage and salvage costs.

"The **X-Press Pearl** loss is just the latest incident in which ports have been unable to provide timely assistance to a vessel. While port states may have valid concerns, the first reaction is often to turn a ship away, even when this endangers the vessel. This is an issue we have seen time and time again, and it is now time for the International Maritime Organization (IMO) and coastal states to address the problem," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**.

These losses raise broader questions about how cargo-related incidents, and container fires in particular, should be handled in future, adds **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. "**The X-Press Pearl** incident raises questions for the obligations of port authorities with regards to vessels that are not in distress, but are under the threat of a total loss."

"We need to review how port authorities can help the ship's master, but also how the ship owner could have raised the level of the incident and involved other stakeholders – including insurers – to get a better response from the authorities. Changes to procedures and safety management systems might help avoid a repeat of this incident."



The **Maersk Honam** on fire at sea in March 2018

Collapsing containers

The size of vessels may be contributing to a string of container stack collapses, and the growing numbers of containers damaged or lost at sea.

The container ship **MSC Zoe** lost hundreds of containers at sea in bad weather in 2019

In March 2022, the container ship ***Dyros***[45] lost around 90 containers and saw another 100 damaged in rough weather in the North Pacific Ocean. The incident was just the latest in what has become a worrying and expensive trend for insurers. Recent years have seen a number of container stack collapses at sea, resulting in losses overboard and damage to cargo on deck.

In January 2022, another container ship, the ***Madrid Bridge***[46], lost some 60 containers overboard and another 80 collapsed on deck when the vessel was hit by a large swell en route to New York from Singapore. In October 2021, more than a hundred containers fell overboard from the container ship ***Zim Kingston***[47] in heavy weather off the coast of Canada. The container stack collapse caused a serious fire on board, while the resulting debris spread for over 100km. These losses followed an unusually high number of container losses in the prior year.

Around 3,500 containers were lost at sea in four separate incidents over a three-month period in late 2020 and early 2021, including 1,800 containers lost on the ***One Apus***[48] and over 1,000 from the ***Maersk Essen***[49] and ***Maersk Eindhoven***[50]. These incidents occurred in rough seas while the vessels were en route from China to ports on the US west coast. The loss of so many containers in such a short period was unprecedented, compared with an annual average of 1,382, according to the *World Shipping Council*[51].

"Container loss can result from a number of root causes, including mis-declaration, poor packaging and/or stowing of containers, and the use of sub-standard container lashing equipment and corner castings," says **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS**. The large size of modern container ships is also likely to be a contributing factor, as larger vessels behave differently at sea to smaller vessels. Container stacks are exposed to huge forces on a modern container ship, especially when a vessel experiences parametric and synchronous roll in rough seas.

Photo: flickr.com, Kees Torn

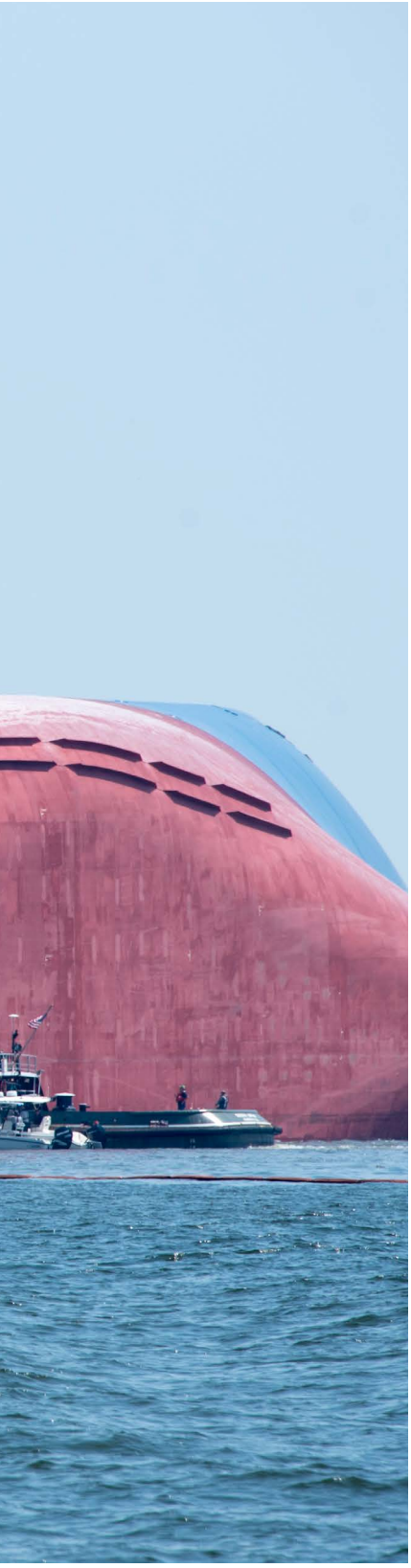
Container stack collapse and the loss of containers at sea can have serious safety and environmental consequences, particularly if dangerous cargo is involved, says **Régis Broudin, Global Head of Marine Claims at AGCS**. "There are questions around the potential for mis-declared cargo weights and lashings, but the problem may be another consequence of large vessels. The larger the vessel, the higher the containers are stacked, and this may cause issues in bad weather, which is likely to become increasingly severe given climate change."

Such losses are also likely to be linked to the commercial pressures that container ships now operate under, Broudin adds: "Vessels have to keep to a tight schedule, which increases the risk of human error. Historically, the captain was the only boss when a vessel was at sea. But that is no longer the case with modern communications, which connect the bridge to shore. Transport by container vessel now requires a specific risk management approach, much more logistics-focused rather than traditional shipping."

In a move designed to mitigate the loss of containers at sea, *the International Maritime Organization (IMO)*[52] agreed last year to introduce a compulsory reporting system.

The investigation report into the loss of the **Golden Ray** was published two years after the incident

Photo: US Coast Guard, Shutterstock



Improvements to investigation reports needed

Many accident investigation reports take too long to produce, meaning valuable lessons from shipping accidents are not being learned.

Under the **Safety of Life at Sea (SOLAS)** convention, flag states are required to submit accident reports to the International Maritime Organization (IMO). However, of the 526 serious shipping incidents that involved loss of life, major pollution or the total loss of a vessel that took place between 2017 and 2020, just 63% had an accident report submitted as of March 2021, according to data compiled by *Lloyd's List* [53] from the IMO. This was a slight improvement on the 50% rate of filing recorded two years previously, but well below the IMO's target rate of 80% by 2022.

"Maritime investigation reports by flag states often take too long, in many cases they are not published until several years after the incident, and in some cases, never at all," says **Mara Blagojevic, Senior Marine Risk Consultant at AGCS**. "Clearly this is not sustainable. Investigation reports are critical for learning from incidents and avoiding a repeat of mistakes in the future."

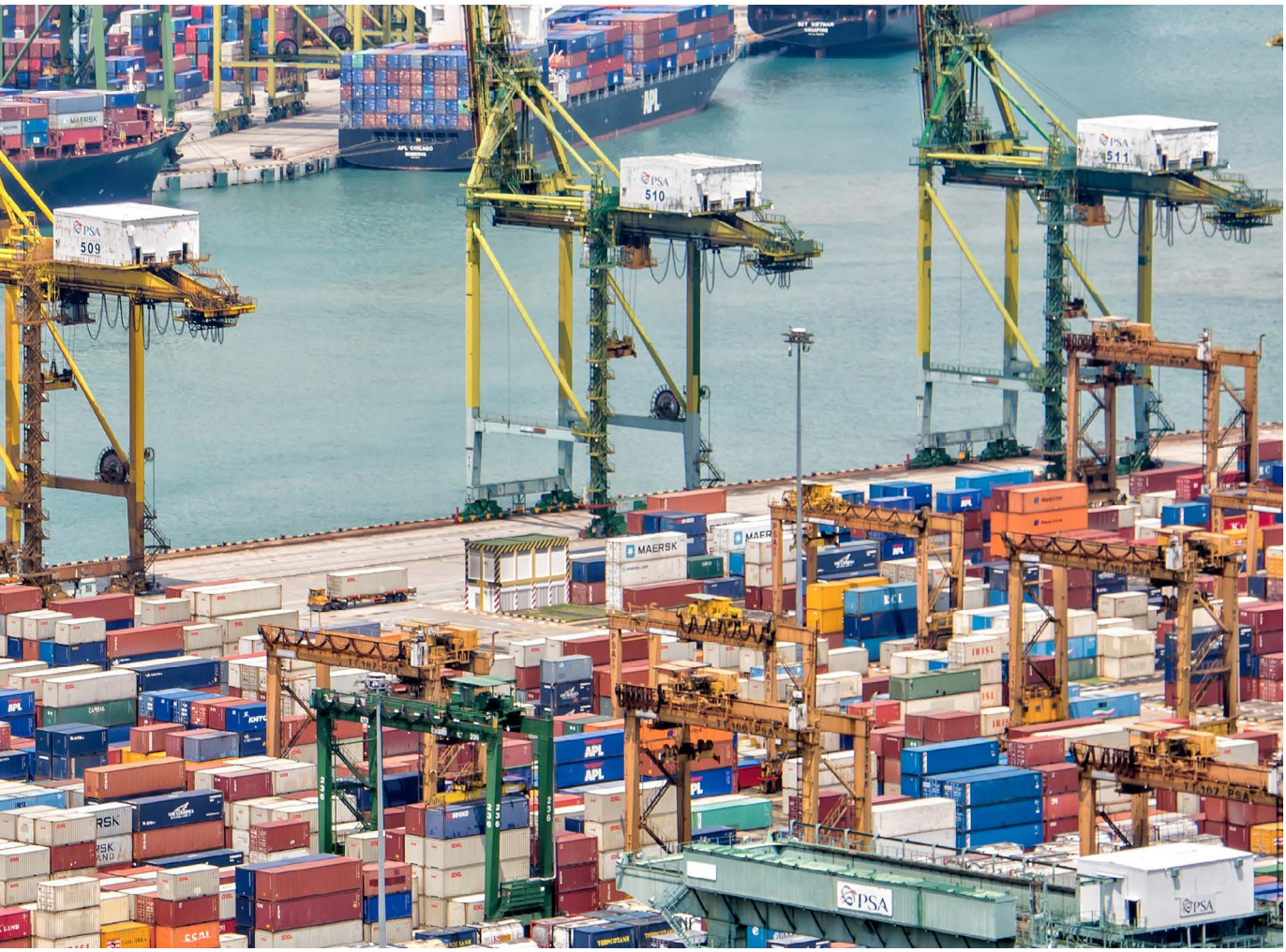
With a worrying number of complex accidents involving large vessels in recent years – several of which have led to a loss of life – there is an urgent need to learn from these accidents and improve regulation, controls and processes, says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**. "The IMO should now table stricter regulation to speed up the production of casualty investigation reports so we can learn from these incidents in a timely manner."

Even when reports are published, more could be done to understand the root causes of incidents, according to **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. The National Transportation Safety Board (NTSB) investigation report in the US into the loss of the **Golden Ray** took two years to complete, and had just two recommendations. Although the 46-page *report* [54] (with 1,700 pages of supporting factual information) was detailed, it left many questions unanswered, and potential lessons unlearned.

3. Covid, crew and congestion

Post-pandemic world brings heightened risks for shipping

While the Covid-19 pandemic resulted in few direct claims for the marine insurance sector, the impact on the welfare of crews and the boom in shipping and port congestion, exacerbated by the Ukraine invasion, raises potential safety concerns.



High demand for shipping is affecting the risk profile of certain sub-sectors, including container shipping

Demand for crew is currently high with the shipping boom, yet following the Covid-19 pandemic many skilled and experienced crew are leaving the industry, having endured many months, and in some cases, years, stuck on vessels. For those that choose to remain, commercial pressures are running high, which can lead to mistakes and shortcuts.

High demand for shipping is also affecting the risk profile of certain sub-sectors, including container shipping. The global fleet is ageing, yet values and exposures are rising. High freight rates are also leading some operators to carry containers on bulk carriers, where crews are not trained or experienced in handling containers, while such vessels are not designed to carry them.

Crew crisis – a skill shortage in the making

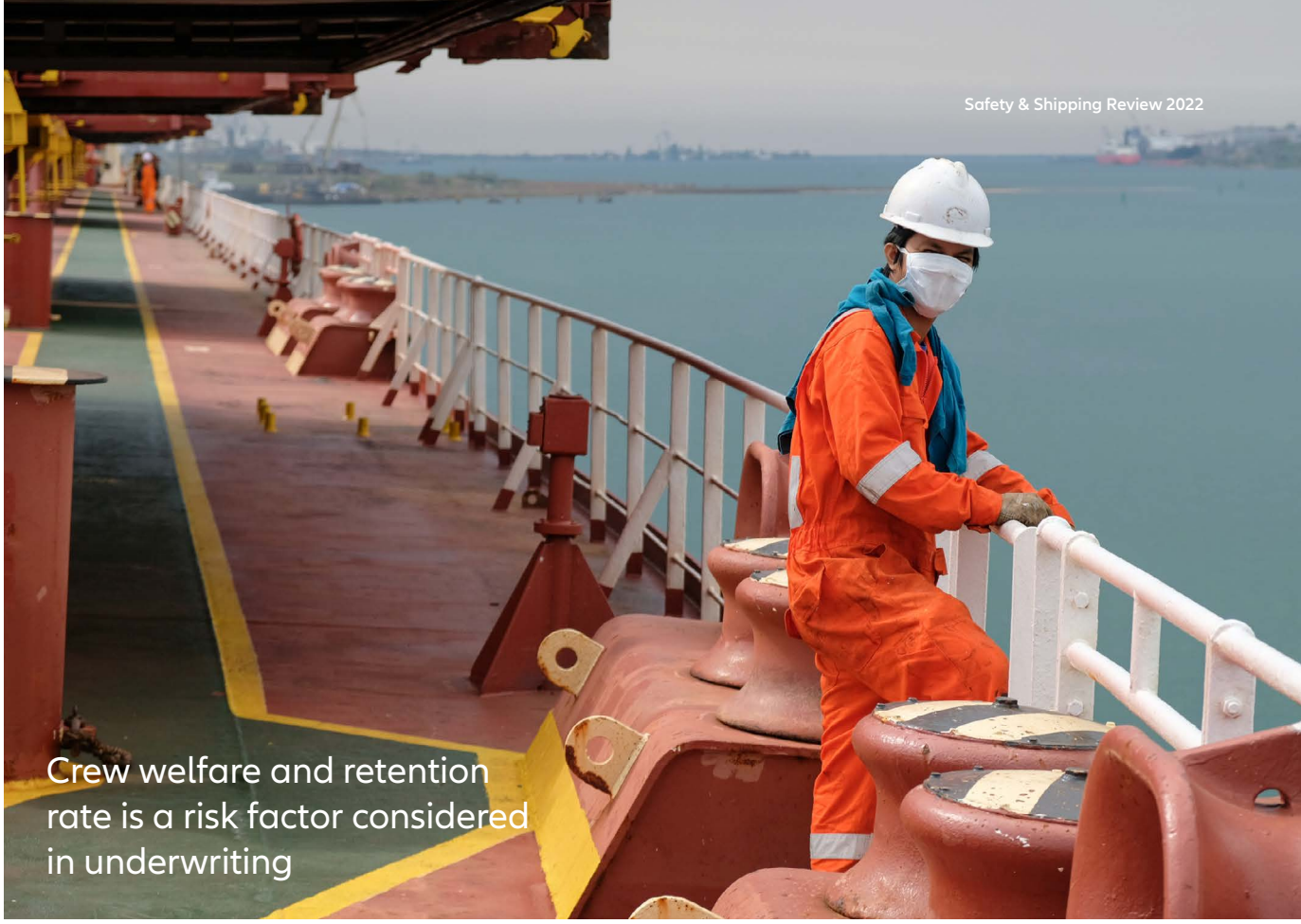
Seafarers were the unsung heroes of the pandemic, keeping the world supplied with food, energy, raw materials and manufactured goods. Yet Covid-19, and now Russia's invasion of the Ukraine, has taken its toll on the industry's workforce.

Covid-19 restrictions and travel bans meant hundreds of thousands of crew members were stranded on ships, some for years. At its peak in 2020, it was thought that up to *400,000*[55] seafarers were unable to be repatriated, falling to 200,000 in 2021. The Covid-19 crew crisis is now largely over, but the experience is likely to have long-lasting effects.

"The health and wellbeing of crew has always been a critical factor in safety," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**. "However, morale among seafarers is currently low and the pandemic has had an impact on the mental health and well-being of crew. Now crews face a rising workload, while the ever-growing burden of compliance is making the job less attractive."

In what has been termed the 'great resignation', the pandemic prompted many workers to rethink their work life balance, with some choosing to retire or switch careers. The combination of the pandemic and current working conditions risks a future skill shortage for the shipping industry, according to **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**.

"During the pandemic hundreds of thousands of seafarers were unable to leave their vessels or see their families for a prolonged period. What they have endured will have a lasting impact, and it is likely many seafarers will not return. Ship owners in some segments could feel the pinch. We do not want to see dispensations or special considerations being given by flag states," says Chopra.



Crew welfare and retention rate is a risk factor considered in underwriting

During March and April 2022, a number of vessels owned by ferry operator P&O Ferries were detained by UK authorities over *safety concerns*[56], including crew familiarization and training. The operator had previously made over 800 crew redundant and replaced them with lower paid workers. Crew welfare and retention rate is a risk factor considered in underwriting, explains **Justus Heinrich, Global Product Leader Marine Hull at AGCS**.

"Our major clients have crew retention programs and we see a lot of investment in attracting and retaining crew, as well as welfare management," says Heinrich. "From the perspective of our risk assessment, we like to see high levels of crew retention and evidence of good people risk management. Particularly with more modern vessels and technology, the ability to attract and retain experienced crew is critical."

Russia's invasion of Ukraine has further ramifications for a global maritime workforce already facing shortages. Russian seafarers account for just over 10% of the world's 1.89 million seafarers, while around 4% are *from Ukraine*[57].

With many direct flights to Russia suspended, and with fewer vessels calling at Russian and Ukrainian ports, seafarers from these countries may struggle to return home or re-join ships at the end of the current contracts. Ultimately, seafarers in the Black Sea are in a perilous situation, stuck onboard vessels or in ports with dwindling supplies and under fire, which is yet another blow for the industry and global supply chains, given crew levels have not yet returned to normal levels.

Regular crew changes are required across the world to ensure the flow of manpower is maintained. Last year, the International Chamber of Shipping and shipping trade association *BIMCO*[58] warned there could be a "serious shortage" of officers within five years if action is not taken to increase training and recruitment levels. The report predicted that there will be a need for an additional 89,510 officers by 2026, yet there was a shortfall of 26,240 certified officers in 2021.

Container shipping is in high demand

Higher values, conversions and older vessels increase exposures

The economic rebound from Covid-19 lockdowns has created a boom time for shipping, with huge increases in charter and freight rates. While higher rates are a positive for many in the industry's finances, changing the use of vessels to take advantage of this, and extending the working life of ships raises warning flags for underwriters.

High demand for container and bulk shipping has seen the value of vessels rise dramatically, while charter and freight rates have skyrocketed. Charter rates in the container and LNG markets hit an all-time high last year, and a decade high in the dry bulk market, while values remain well above historical averages, according to *VesselsValue*[59].

The value of a five-year old Panamax boxship more than tripled from $22mn in January 2020 to $82mn a year later. Charter rates for a Panamax have increased 274% over the same period. Last year also saw record values for bulkers, with a five-year old Supramax increasing in price by 46% from *$19mn to $27mn*[60].

In addition, the *International Monetary Fund (IMF)*[61] has warned that the invasion of Ukraine by Russia in February will exacerbate already high shipping costs and keep them – and their inflationary effects – higher for longer.

"Rising values and charter rates have created a mismatch for insurers," explains **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS**. "Older vessels now command higher values, while the accumulation risks have increased with larger vessels and more value on board. This results in a significant increase in the risk profile, which is not necessarily reflected in premium."

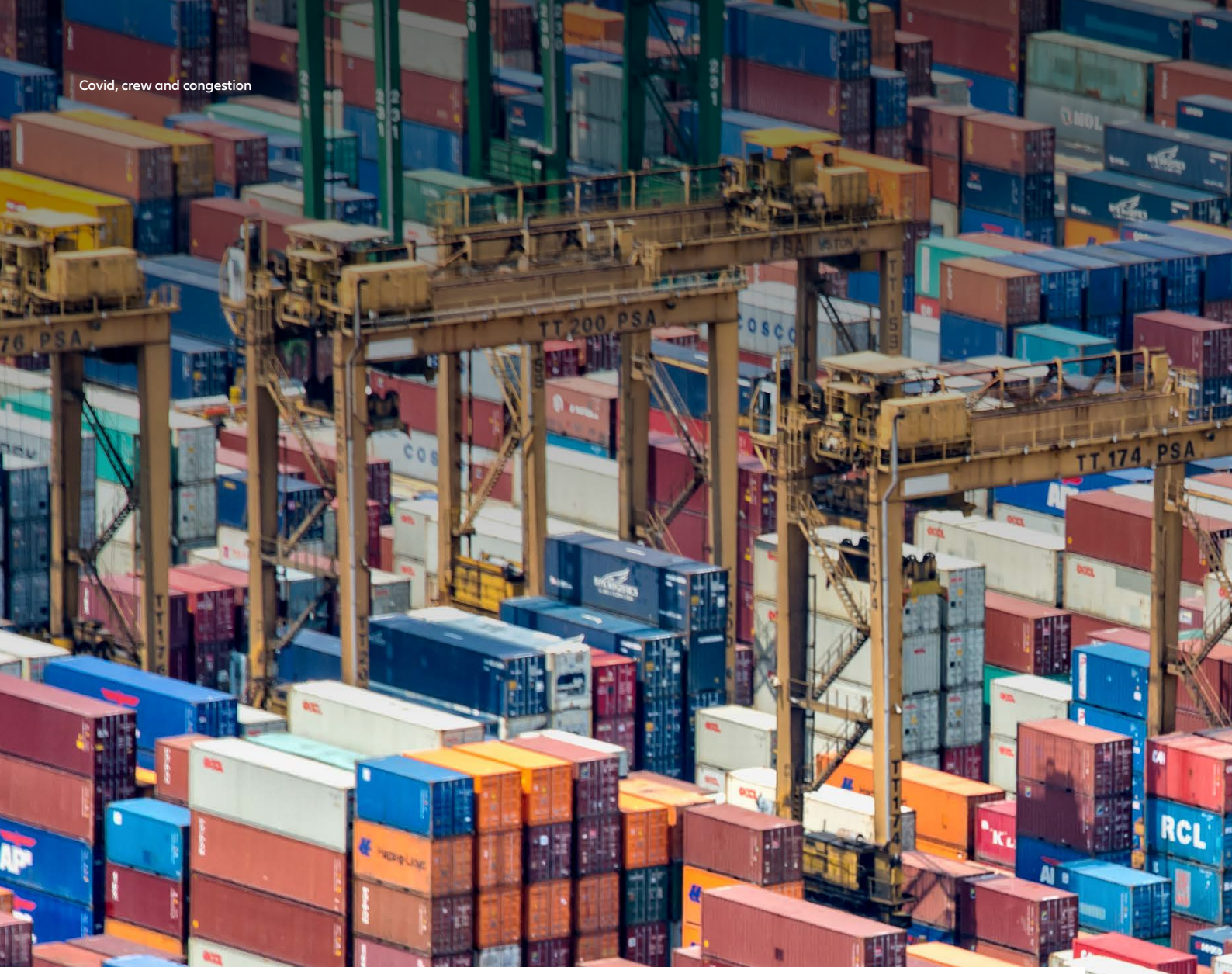
At the same time, the impact of inflation resulting in rising claims costs adds to this challenging environment.

Higher freight rates and a shortage of container ship capacity has tempted some operators to use bulk and product carriers to transport containers. It has also led some tanker operators to explore the possibility of converting vessels. Swedish tanker shipping company Concordia Maritime and ship designer Stena Teknik have announced a feasibility study into converting tankers into container *vessels*[62].

The use of non-container vessels to carry containers can raise questions around stability, firefighting and the securing of cargo, according to **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**: "Bulk carriers and tankers are not designed to carry containers. Crews may not be trained or experienced enough to handle containers or respond appropriately to an incident at sea. Carrying containers could also change the maneuvering characteristics of a vessel and affect how it behaves in bad weather and strong winds. Converting a vessel or changing its use would likely be viewed as a material change in risk profile and could be categorized by underwriters as a higher risk."

With demand for shipping high, owners are also extending the working life of vessels. Even before the pandemic, the average age of vessels in the global merchant fleet was rising – 21.75 years in 2021, or 14.7 years for vessels greater than 2,000 gross tonnage (GT). This compares with around 19 years a decade ago, and 13 years for vessels greater than 2,000 GT, according to the *IUMI Stats Report 2021*[63].

Analysis has shown older container and cargo vessels (aged between 15 and 25 years old) are more likely to result in a claim, says **Justus Heinrich, Global Product Leader Marine Hull at AGCS**. "Newer ships need less maintenance and have the latest technology, which typically translates to a lower risk. Older ships are more likely to suffer from corrosion, while systems and machinery are more prone to failure and breakdown. Of course, that is not to say we don't also see well-managed and maintained fleets composed of older vessels as well."



Port congestion and commercial pressures heighten risk

Covid-19 measures in China, a surge in consumer demand and the invasion of Ukraine have all been factors in ongoing unprecedented port congestion.

Congestion at the US ports of Los Angeles and Long Beach reached record levels in November 2021, with 116 container ships either in port or at anchor, while in March 2022, Los Angeles recorded its *third-busiest month ever*[64] as work continued to clear marine terminals of cargo and reduce the number of ships waiting at sea. At the same time, repeated outbreaks in China, resulting in the staggered lockdown of Shanghai in March/April 2022 for example, and Russia's invasion of Ukraine is compounding ongoing supply/demand pressures for shipping, which have resulted in port congestion, higher freight fees and longer transit times. Overall, port congestion globally is running above the levels seen last year, with specific container fleet congestion trending towards previous highs, *Clarksons Research*[65] noted in March 2022, while the impacts of the invasion are likely to create further inefficiencies across the maritime transport system.

Port congestion puts crews, port handlers and facilities under additional pressure, increasing risk at a critical stage of a ship's journey, according to **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS**.

"Loading and unloading vessels is a particularly risky operation, where small mistakes can have big consequences," says Leonburg. "Busy container ports have little space while the experienced labor required to handle the containers properly is in short supply. When you add in fast turnaround times and port congestion, this may result in a significantly heightened risk environment."

Port risks are already increasing with larger ships, which concentrates large volumes of trade into the fewer larger ports that have specialist infrastructure. Accumulations of cargo exposures at mega ports have been rising, while commercial pressures increase the risks of mistakes and accidents. Ports are also increasingly reliant on technology, where an outage or cyber-attack could effectively close a port.

Commercial pressures are already a contributing factor in many losses that resulted from poor decision-making," says **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**. "The pressure on vessels and crew is currently very high. The reality is that some may be tempted to ignore issues or take shortcuts, which could result in future losses."

AGCS analysis shows that 75% of shipping incidents involve human error.

Ports and shipping face heightened cyber threat

As geopolitical risks rise, so does the prospect of malicious digital disruption.

The shipping industry continues to fall victim to cyber-attacks. In February 2022, a container terminal at Jawaharlal Nehru Port Trust, India's busiest container *port*[66], was hit by a ransomware attack. It is just the latest to be affected, following ransomware incidents at US and South African ports in recent years. Earlier this year, a number of European oil terminals were also affected by a cyber-attack.

Cyber criminals have also targeted shipping and logistics companies. US-based freight forwarder Expeditors was hacked in *February, 2022*[67], while *Hellmann Worldwide Logistics*[68] suffered a ransomware attack in December last year that disrupted operations for weeks. In recent years, some of the world's largest shipping companies – Maersk, Mediterranean Shipping Company, COSCO and CMA CGM have all been targeted.

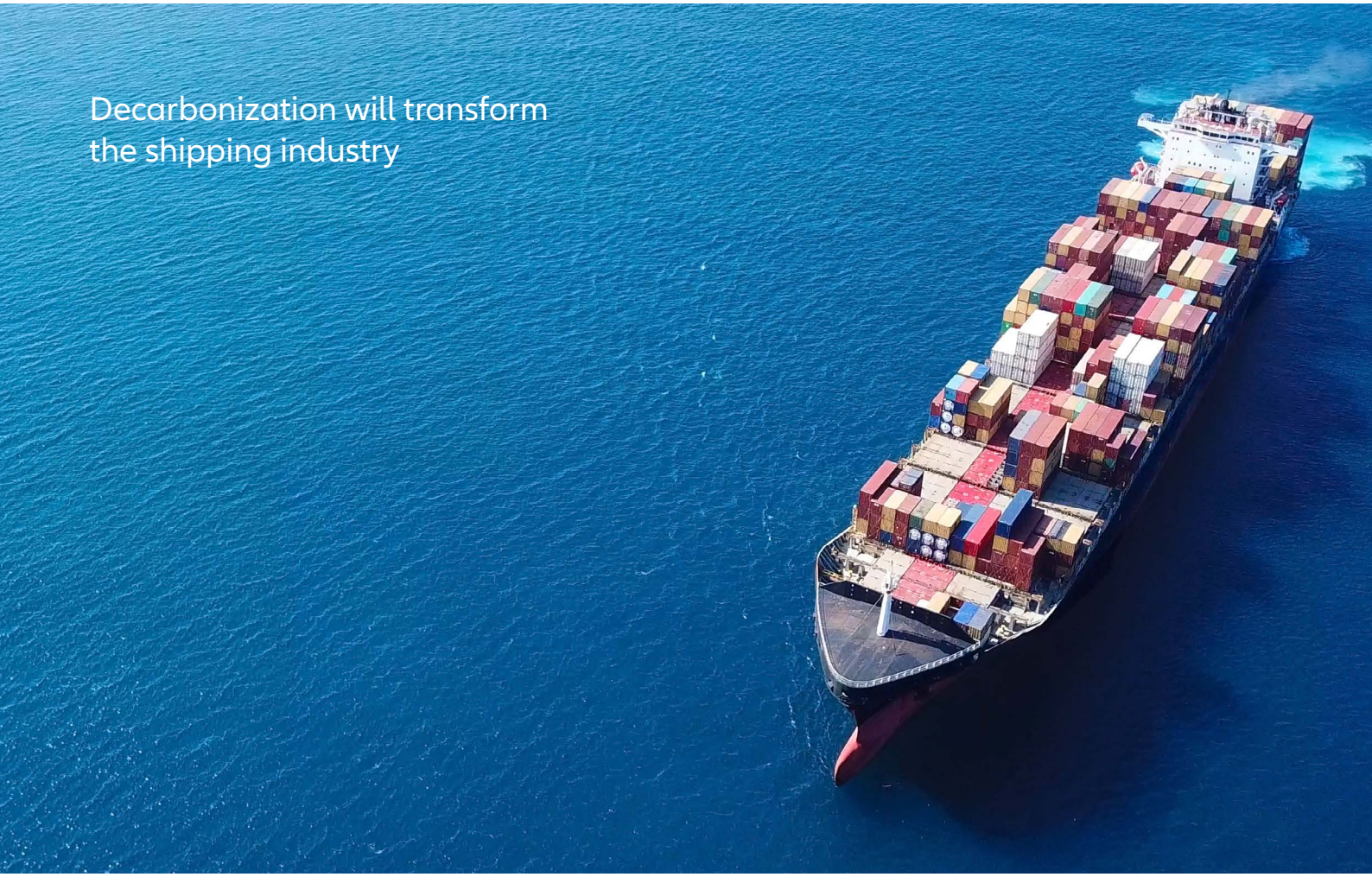
According to a recent *industry survey*[69], just under half (44%) of maritime professionals reported that their organization has been the subject of a cyber-attack in the last three years. Of these, 3% agreed to pay a ransom, which averaged at around $3mn. It also found 32% of organizations do not conduct regular cyber security training while 38% do not have a cyber response plan.

"Cyber risk is a major concern and we do see more and more incidents involving non-marine operations, such as ports," says **Régis Broudin, Global Head of Marine Claims at AGCS**. As the industry becomes more reliant on technology and automation, the potential for disruption from a cyber-attack or technical failure increases. And with the increased connectivity of ships, it is only a matter of time before it will also affect vessels."

Security agencies have warned of a heightened cyber risk due to the conflict in Ukraine. NATO warned vessels in the Black Sea faced the threat of GPS jamming, Automatic Identification System (AIS) spoofing (prior to the Ukraine invasion there had already been a number of these incidents, reported in the Middle East and China), communications jamming and electronic interference. The US Cybersecurity and Infrastructure Security Agency also warned the maritime transportation sector could be a target for foreign adversaries.

"There is concern that shipping assets and ports could become collateral damage if the conflict in Ukraine results in an increase in cyber activity," says **Captain Rahul Khanna, Global Head of Marine Risk Consulting, AGCS**.

The port of Rotterdam has previously been targeted by cyber criminals



4. Climate change

Transition problems...

The decarbonization of the industry will require big investments in green technology and alternative fuels. It is essential that the transition to low-carbon shipping does not create new risks with unintended consequences.

With 90% of global trade moved by sea, shipping is a major contributor to climate change. The International Maritime Organization *(IMO)*[70] estimated that the industry's greenhouse gas emissions grew by 10% between 2012 and 2018, while the industry's share of global anthropogenic CO2 emissions grew slightly to almost 3%, about the same volume as Germany. It also forecasts that 'business as usual' could see emissions increase by up to 50% by 2050 due to the growth in shipping trade.

The race to decarbonize shipping is now underway. In 2018 the IMO called for a 40% cut in greenhouse gas emissions (compared to the 2008 baseline) across the global fleet by 2030, and at least a 50% cut by 2050. Last year, the IMO also adopted short-term measures aimed at cutting the carbon intensity of all ships by at least 40% by 2030. However, these targets do not go far enough, and the IMO plans to revise its greenhouse gas strategy by 2023.

The EU, which is aiming for climate neutrality by 2050, says it *will set greenhouse gas reduction targets*[71] for the maritime transport sector (shipping emissions represent around *13%*[72] of the overall EU greenhouse gas emissions from the transport sector). Last year, the US also set out its plans to reduce greenhouse gas emissions by around 50% by 2030, which included the transport sector. *Nine big companies*[73] including Amazon, Ikea and Unilever have pledged to only use zero-carbon ships by 2040.

Achieving the IMO's 50% cut in emissions, let alone the more ambitious targets required to meet the Paris Agreement goal of limiting global warming to well below 2 degrees Celsius will require huge investment in alternative fuel and more efficient shipping. The scale of investment required to meet the IMO 2050 target is estimated at *$1-1.4 trillion*[74]. To fully decarbonize shipping would require a further $400mn of investment over the next 20 years.

A growing number of vessels are already switching to liquefied natural gas (LNG), while a number of other alternative fuels are under development, including ammonia, hydrogen and methanol, as well as electric-powered ships. Cargo vessels and tankers are also experimenting with wind power, using kites, sails and rotors to supplement traditional propulsion. Wallenius and Alfa Laval, for example, have proposed a car carrier that uses wings and a specially designed hull to reduce emissions by as much as *90%*[75].

While there are plenty of innovative ideas on the drawing board, there is not yet an obvious technical solution available that will get the industry to 2050, according to **Captain Rahul Khanna, Global Head of Marine Risk Consulting at AGCS**.

"LNG alone will not get the shipping industry to where it needs to be by 2050, while alternative fuels like hydrogen and biofuel are only ever likely to be partial solutions. The industry needs to come together and fund research and development for alternative fuels, propulsion and ship designs. IMO 2050 is a challenging target, but collectively I believe the industry can find solutions," says Khanna.

The shipping industry needs to make use of alternative fuels and technology to start reducing its emissions right away. "Continuing to increase emissions while waiting for better alternatives is not the path to take," says Khanna.

"Decarbonization will transform the shipping industry over the coming decades, which will in turn change the risk landscape. As the industry plots its course through the transition, it will need to ensure risks are contained within acceptable limits. As we have seen with the development of container shipping, there can be unintended consequences with innovation," says **Justus Heinrich, Global Product Leader Marine Hull at AGCS**.

Fuel-ing industry change

The introduction of low-carbon alternative fuels also brings a number of risks.

A growing number of vessels are being built or converted to run on liquefied natural gas (LNG) and biofuel, including some large container ships. Further ahead, a number of projects are underway to test a range of alternative fuels, including ammonia, hydrogen and methanol, as well as onboard carbon capture technology. Maersk, for example, is to run eight methanol-powered container ships from *2024*[76].

"When different fuels are introduced, it raises questions for insurers as alternative fuels are largely untested over the long-term," explains **Captain Nitin Chopra, Senior Marine Risk Consultant at AGCS**.

In January 2020, the International Maritime Organization (IMO) introduced a new lower limit on sulphur content in shipping fuel. "The switch to low-sulphur fuel seems to have been well managed so far, and has not led to high frequency losses," says Chopra. "However, there have been multiple claims from sister vessels for engines that have not worked well with low-sulphur fuel. We remain watchful of how these new fuels affect engines over their life span."

> "Alternative fuels are largely untested over the long-term

The development of new fuels such as hydrogen and ammonia will take time, so in the meantime ship owners are being encouraged to switch to existing lower-carbon fuels, like LNG and biofuel. The first *large bulk carriers*[77] to use LNG entered service in 2022 while LNG powered ro-ro vessels and tankers are under construction. LNG group *SEA-LNG*[78] says 90% of new car and truck carriers that will enter the market in the coming years will be dual fuel LNG. CMA CGM is to test biofuel on 32 of its container ships this *year*[79].

The transition to alternative fuels will bring heightened risk of machinery breakdown claims, as new technology beds down and as crews adapt to new procedures, explains **Captain Anastasios Leonburg, Senior Marine Risk Consultant at AGCS**: "The move to low-sulphur fuels was a big leap, but the shift to biofuel will be a big difference. The impact of biofuels on older vessels has yet to be seen."

"We now see more and more vessels powered by LNG, but this fuel requires storing at low temperatures, and crews will need to obtain new skills and knowledge. Biofuel blends have been approved for use by manufacturers, but only tested over a limited duration. We have yet to see how these new fuels will work over the long term," adds **Randy Lund, Senior Marine Risk Consultant at AGCS**.

The transition to alternative fuels will bring heightened risk of machinery breakdown claims

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Data and sources

The primary data source for total loss and casualty statistics is Lloyd's List Intelligence Casualty Statistics (data run on March 1, 2022).

Total losses are defined as actual total losses or constructive total losses recorded for vessels of 100 gross tons (GT) or over (excluding, for example, pleasure craft and smaller vessels), as at the time of the analysis.

Some losses may be unreported at this time and, as a result, losses (especially for the most recent period) can be expected to change as late loss reports are made. As a result, this report does not provide a comprehensive analysis of all maritime accidents, due to the large number of minor incidents, which do not result in a "total loss", and to some casualties which may not be reported in this database.

This year's study analyzes reported shipping losses on a January 1 to December 31 basis.

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