LLOYD'S

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Greener transport

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Lloyd's Futureset

01. Introduction

Decarbonisation of the transportation sector is critical to achieving a successful global transition to a low carbon economy, and the insurance industry, Lloyd's and the SMI Insurance Task Force all have an important role to play in supporting the aviation, maritime and electric vehicle industries in particular with their ambitions.

Aviation is one of the fastest-growing sources of global GHG emissions, with direct emissions from aviation accounting for 2.4% of global emissions in 2018. Short term, the aviation industry's primary focus is on restoring and maintaining viability due to the significant challenges resulting from COVID-19.

Long term, international collaboration will be key to achieving decarbonisation of the aviation sector, which has already seen significant development over recent years driven by the desire to create faster, lighter and more fuel-efficient aircraft.

The key challenge which insurers will face is the need to find the balance between providing cover that is reflective of the risk profile of new technology/fuel sources and the availability of historic data, at a premium that is not prohibitively expensive for the aviation industry.

There is significant international dependence on shipping to facilitate world trade, with the maritime industry moving approximately 80% of world trade by volume. According to a study by the International Maritime Organisation, carbon emissions from shipping could increase between 50% and 250% by 2050.

Though operational improvements play an important role in supporting the reduction of maritime emissions, it is widely recognised that in the longer term, the use of low carbon fuels is the biggest opportunity for the maritime industry to transition towards net zero.

Marine insurance is one of the oldest classes of business on which Lloyd's of London established itself. Lloyd's and the global insurance industry are well-placed to support the creation of insurance products and risk management solutions to support the industry's transition.

The transportation sector contributes 24% of global carbon emissions (as at 2019) and within that road transportation (including cars, trucks, buses and two- and three-wheelers) is the biggest contributor.

The transition to more carbon efficient propulsion systems is being supported by rapidly accelerating customer demand in growth areas like electric vehicles.

New insurance requirements are emerging as a result of this change in business model and insurers will need to refine their product offerings to remain relevant in a changing industry.

Greener transport focuses on the aviation, marine and electric vehicle industries, outlining the global pathway towards a lower carbon footprint and the challenges on that journey that require solutions and support.

02. Greener aviation

Introduction

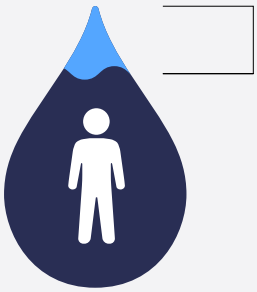
Aviation is one of the fastest-growing sources of global GHG emissions, with direct emissions from aviation accounting for 2.4% of global emissions in 2018 and pre-COVID-19 forecasts from the International Civil Aviation Organisation suggesting that emissions could triple by 2050[1].

International collaboration will be key to achieving decarbonisation of the aviation sector, and Destination 2050, a European aviation sustainability initiative, is one of a number of global/regional groups to set the ambition for all flights to be net zero by 2050 through a combination of improvements in aircraft and engine technology, operational improvements, use of sustainable aviation fuels and carbon removal projects[2].

The European Green Deal sets out the need to reduce transport emissions by 90% by 2050 (compared to 1990 levels)3, and the aviation sector, as the second largest source of transport emissions after road transport, will have a vital role to play.

Global carbon markets are recognised as an important decarbonisation enabler. For example, the International Civil Aviation Organisation's Carbon Offsetting and Reduction Scheme (CORSIA) is a market-based mechanism for pilot phase from 2021 representing 75% of carbon offsetting which was agreed by the UN, with 78 countries participating in a voluntary international flights[4].

Fuel reduction per passenger thanks to new generation materials and aircraft design



24%
between 2005 and 2017

[1]The International Council on Clean Transportation - CO2 emissions from commercial aviation, 2018 | International Council on Clean Transportation (theicct.org)

[2]GOV.UK - Prepare for lift-off: Jet Zero Council to deliver carbon-free flight - GOV.UK (www.gov.uk)

[3]European Commission Mobility and Transport - Sustainable transport

[4]Carbon Brief - Corsia: The UN's plan to 'offset' growth in aviation emissions (carbonbrief.org)

The aviation industry has already seen significant evolution over recent years driven by the desire to create faster, lighter and more fuel-efficient aircraft, which ultimately delivers commercial benefits through lower costs.

For example, the use of next-generation materials such as carbon fibre, combined with changes in aircraft design to make aircraft more aerodynamic, have delivered significant emissions savings with the amount of fuel burned per passenger reducing by 24% between 2005 and 2017. However, this has been accompanied by rapid growth in passengers of 60% across the same period, with the net result that direct emissions from aviation in 2017 accounted for 3.8% of total global CO2 emissions[5].

Key challenges

Challenges from COVID-19

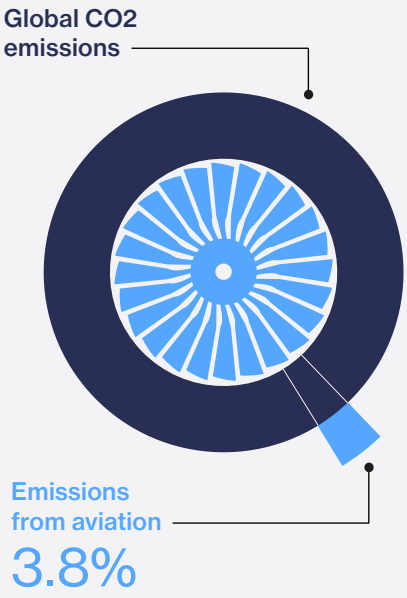
The primary focus of the aviation industry in the short term is on restoring and maintaining viability due to the significant challenges resulting from COVID-19. According to recent analysis, passenger levels are not projected to return to pre-pandemic levels until 2024, and several European airlines have ceased operations as a result of the challenges[6].

Baselines for carbon offsetting set by the CORSIA scheme were adjusted in light of COVID-19, increasing the baseline by around 30% and signalling the importance of supporting recovery ahead of pursuing net-zero targets in the immediate term[7]. As such, the industry at present has limited capital available to commit to new technologies and innovation to support longer term decarbonisation objectives.

Baselines for carbon offsetting set by the CORSIA scheme were adjusted in light of COVID-19, increasing the baseline by around 30% and signalling the importance of supporting recovery ahead of pursuing net-zero targets in the immediate term.

The challenges posed by COVID-19 for the aviation sector follows a long sequence of disasters for airlines, including the Boeing catastrophes and subsequent grounding of the Boeing 737 Max fleet[8]. This series of events has resulted in a challenging environment for the insurance industry, with some providers withdrawing from the market. Nevertheless, the aviation sector is still incentivised to accelerate the low carbon transition, with consumer pressure and broader societal expectations pushing operators towards low carbon means of transportation. As the sector emerges from the pandemic and looks towards opportunities for a green recovery, we expect to see a collective industry pivot towards the advancement of new technology to support decarbonisation.

Aviation emissions in 2017



[5]Europa - Reducing emissions from aviation | Climate Action (europa.eu)

[6]International Air Transport Association - IATA - Recovery Delayed as International Travel Remains Locked Down

[7]IISD - Policy Brief: CORSIA Baseline Adjustment in Response to COVID-19: A Blessing or a Curse? | SDG Knowledge Hub | IISD

[8]Financial Times - Grounding a global fleet: Boeing faces its greatest challenge | Financial Times (ft.com)

Pathways to decarbonisation

The use of sustainable airline fuels (SAF), including biofuel and synthetic fuels, to replace fossil-fuel based jet fuel, could achieve up to a 32% reduction in emissions from the UK aviation industry by 2050 according to estimates from UK Sustainable Aviation[9]. Biofuels rely on residues (e.g. used oils and waste) or biomass (e.g. plant products) for production, the latter requiring significant land use. Conversely, synthetic fuels have the potential to be zero-carbon if renewable energy is used in the production process.

Globally SAF is nearing a tipping point, with several projects on the verge of commercial-scale production, and fourteen airports now supplying sustainable aviation fuels, albeit in low volumes[10].

However, a key constraint on the development and commercialisation of SAF on a meaningful scale is the need for an integrated transition. The key challenge which remains is the need to ensure new supporting infrastructure such as re-fuelling capabilities is globally available, and fuel types are globally certified to facilitate re-fuelling at different locations. It will also be vital that there is collaboration between airlines, airports, aerospace manufacturers and infrastructure providers to enable a co-ordinated transition. Given that aviation emissions are largely recognised as belonging to the airline rather than airports, in the absence of partnerships there is limited incentive for airports to invest in the necessary infrastructure to support this change.

From Waste to Wingtip - The Production Journey for Sustainable Aviation Fuel (SAF)

Using SAF can reduce lifecycle carbon emissions by up to 80% compared to the traditional jet fuel it replaces.

1. Feedstock is collected - such as household waste or waste oils.
2. Feedstock is converted to sustainable aviation fuel.
3. Traditional jet fuel is blended with sustainable aviation fuel to make it suitable for use in aircraft.
4. Fuel is delivered to airport and into wing.

[9]Sustainable Aviation - SustainableAviation_FuelReport_20200231.pdf
[10]Sustainable Aviation - SustainableAviation_FuelReport_20200231.pdf

Fleet optimisation can also play a significant role in delivering carbon reductions for the aviation industry, through a combination of operational optimisation, aircraft design and new engine efficiency improvements. In the medium term, hybrid-electric aircraft, which take advantage of batteries or hydrogen fuel cells, could replace conventional turbine powered planes, especially on smaller aircraft and shorter flights[11]. However, as with all new technologies, there remain technical obstacles to navigate, for example storage complexity and how best to balance the use of low energy density batteries with the additional weight that this introduces. This means that in the short-term jet-fuel will continue to be required for long-distanced commercial operations.

National governments have several policy actions at their disposal which could drive a shift in passenger demand and consequently reduce carbon emissions. This could consist of a combination of carbon pricing, frequent flyer levies, fuel duties and VAT, which all have the potential to alter incentives and reduce the number of annual airline passengers. International market-based mechanisms such as CORSIA's carbon off-setting scheme and the EU Emissions Trading System are also a key part of the comprehensive approach required to reduce emissions in the aviation industry beyond what can be delivered by technological and operational measures alone[12].

Implications of new technologies and fuels on the aviation risk landscape

Recognising that these factors are key to enable the low-carbon transition of the aviation industry, the biggest constraint on decarbonisation is the capital investment required to facilitate the industry's transformation. The need for significant changes to jet engine, aircraft and supporting infrastructure design to allow the use of alternative fuels or hybrid technologies, presents substantial upfront capital costs. Furthermore, such new technology, including hybrid-electric aircraft and sustainable aviation fuels, is also likely to introduce increased complexity and potential safety implications which could hinder private investment into these technologies.

Any modifications to the way in which an aircraft operates, and the infrastructure needed to service such new technology, will in turn have an impact on the risk landscape. There will therefore be a key dependency on the insurance industry to be able to understand and respond to increased demand for new or adapted insurance coverage and linked risk management solutions, to encourage investment and facilitate this transition.

The key challenge which insurers will face is the need to find the balance between providing cover that is reflective of the risk profile of new technology and availability of historic data, at a premium that is not prohibitively expensive for the aviation industry. Loss data for new technologies is usually very limited, however it is important to recognise that the aviation industry has experienced significant changes over recent years with fleet renewal and introductions of new-age aircraft, and insurers have been able to overcome the challenges of a lack of historic data. For example, the insurance industry is currently providing insurance to a selection of prototypical developments, including commercial spacecraft, hydrogen-powered aircraft and autonomous air ships.

The key challenge which insurers will face is the need to find the balance between providing cover that is reflective of the risk profile of new technology and availability of historic data, at a premium that is not prohibitively expensive for the aviation industry.

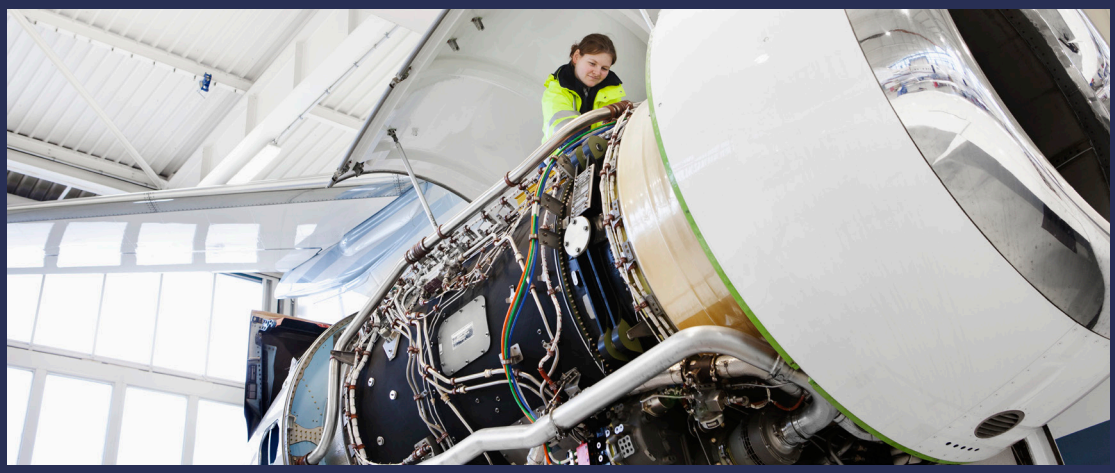
[11]IATA - technology20roadmap20to20205020no20foreword.pdf (iata.org)

[12]Europa - Market-Based Measures | European Aviation Environmental Report (europa.eu)

There has also been a strong correlation in the aviation industry between aircraft innovation and improvements in safety. The industry's excellent health and safety focus, combined with the fact that aviation is a heavily regulated sector, has alleviated some concerns around potential risks.

Early signals from the insurance market show appetite to support the aviation industry through its transition and to provide the specialist insurance coverage required. A strong partnership already exists between the aviation industry, regulators and insurers, and this partnership will be pivotal if rapid innovation and an acceleration of the decarbonisation pathway is to be successful.

Roadmap for action



As the aviation sector accelerates its efforts to drive sustainability through advancements in technology and alternative sources of fuel, opportunities will emerge for the insurance industry to support its decarbonisation pathway. Insurers should understand the risk implications of technological advancements, including resulting changes in infrastructure such as fuel transportation and storage, to ensure that cover is made available for emerging and alternative aviation risks at the moment it is needed.

To support and drive innovation across the aviation and maritime sectors, the SMI Insurance Task Force will:

Work closely with the SMI Aviation and Shipping task forces to open up discussion with customers embarking on research and development in this area to identify requisite insurance coverage for emerging risks and new technologies.

In addition, to support and accelerate the growth of greener maritime, Lloyd's will:

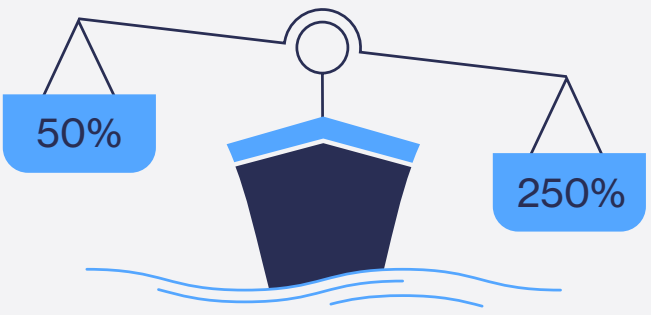
Provide a platform for dialogue between customers and insurers operating in this space to understand the specific challenges customers are facing and develop insurance coverage for emerging risks, in particular those associated with retrofitting of the global fleet to drive operational efficiency.

03. Greener maritime

Introduction

There is significant international dependence on shipping to facilitate world trade and, according to a study by the International Maritime Organisation, carbon emissions from shipping could increase between 50% and 250% by 2050[13]. The maritime industry moves approximately 80% of world trade by volume, therefore, as the world moves towards a low-carbon economy there will be an increasing need for the shipping industry to transition, not only due to direct emissions but also to help other industries decarbonise their supply chains[14].

Predicted increase in global maritime emissions by 2050



[13]European Commission - Reducing emissions from the shipping sector | Climate Action (europa.eu)
[14]UNCTAD - Review of Maritime Transport 2018 | UNCTAD

Per tonne of goods moved, the shipping industry is the most efficient way to move products[15]. This has been driven in large part by containerisation, allowing more goods to be transported with fewer journeys and reducing the time required to load and unload vessels. In addition, a larger volume of local distribution centres has also driven efficiency, with the COVID-19 pandemic accelerating the localisation of supply chains.

However, whilst efficiency has improved, the vast majority of ships are powered by combustion engines which are a significant emitter of GHG emissions and contribute to air pollution in congested port locations. Moreover, regulation of maritime emissions is uniquely challenging because of the international cooperation required in setting limits, and the difficulty of global enforcement.

Global targets for decarbonisation

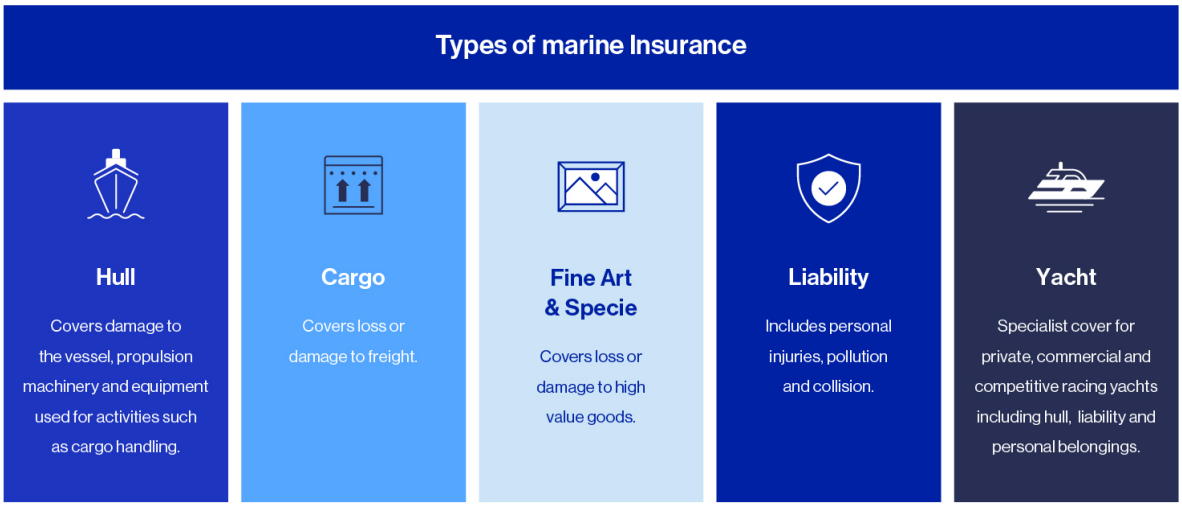
The International Maritime Organisation (IMO) has set clear global targets for reducing the shipping industry's GHG emissions by at least 50% by 2050 (compared to 2008 levels)[16]. To meet these targets close collaboration and deliberate collective action will be required between the maritime industry, the energy sector, the financial sector and government, to set up the infrastructure that will be needed to support this transition.

The global insurance industry is well-placed to play its part, and can draw on the critical role it played in helping clients to meet the introduction of the IMO's sulphur emissions regulations in 2020 as a successful example of coordinated action across the marine sector.

Key challenges

Maritime insurance landscape

Marine insurance is one of the oldest classes of business and is the foundation block on which Lloyd's of London is established. Typical insurance policies provide cover for physical loss or damage, split across hull (covering damage to the vessel, propulsion machinery and equipment used for activities such as cargo handling), cargo (loss or damage to freight), fine art and specie (high-value goods), liability (including personal injuries, pollution and collision) and yacht insurance.



[15]Modes of Transportation: What method is best for cargo and freight? (forto.com)

[16]Shell - https://www.shell.com/promos/energy-and-innovation/decarbonising-shipping-all-hands-on-deck/_jcr_content.stream/1594141914406/b4878c899602611f78d36655ebff06307e49d0f8/decarbonising-shipping-report.pdf

Global marine insurance premiums are c.£21bn per year, £4bn of which is cover obtained through the Lloyd's market[17]. The two main drivers of the marine market are cargo and hull, and it is these two areas that will likely be most impacted by the coming changes to how ships are powered and fuelled.

New technologies to drive operational efficiency

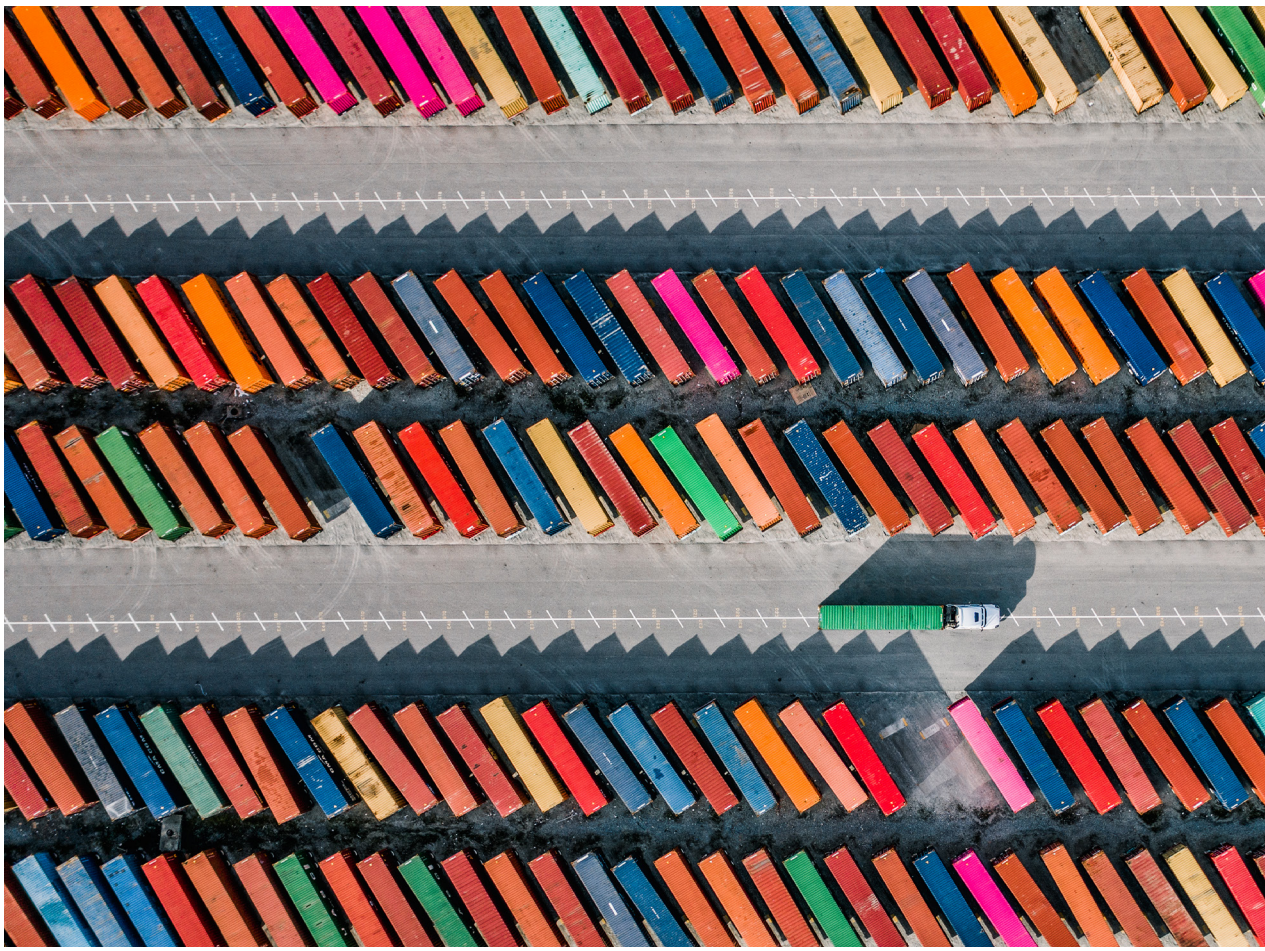
Reductions in GHG emissions can be made in the maritime sector through operational and technological improvements to drive efficiency, and offer an essential short-term bridge whilst more complex solutions such as low carbon fuels are developed in the medium term. For example, air lubrication technology is being deployed on eight of Shell's ships, which is expected to deliver a 5-8% reduction in fuel consumption[18]. In addition, operational improvements such as speed adjustments can also deliver emission reductions, and smart port technologies are being explored to enhance co-ordination between ship and port call activities to optimise voyage speeds.

The introduction of new technologies is expected to present a range of enhanced environmental, health and operational risks. It is vital that insurers stand ready to support clients in the sector with the insurance cover it needs as new technologies emerge.

The insurance market is starting to innovate in this space, for example through leveraging artificial intelligence techniques to analyse voyage planning and cargo optimisation data, to better understand the evolving risk landscape.

Insuring future marine fuels

Though operational improvements play an important role in supporting the reduction of maritime emissions, it is widely recognised that in the longer term, the use of low carbon fuels is the biggest opportunity for the maritime industry to transition towards net-zero. Some projections indicate that developing and implementing a sustainable shipping fuel would drive as much as 87% of future emissions savings in this sector[19].



[17]Lloyd's of London marine sector data (accessed 29 March 2021)

[18]Shell - Decarbonising Shipping: Setting Shell's Cours

[19]The CCC - Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)

To enable the transition to a low carbon economy, commercially viable zero-emission vessels must start entering the global fleet by 2030[20]. Currently there is no single fuel source that is universally agreed to be the 'right' maritime fuel of the future, with fuels such as biofuel, liquid natural gas, and hydrogen being explored. A 'poly-fuel' scenario may emerge across different shipping segments, for example electrification may work for short voyages including ferries and cruise ships however it may be less appropriate for deep-sea shipping.

Before alternative fuels can be used on a meaningful scale, a significant amount of infrastructure needs to be developed globally to enable transportation and storage of fuels, both onshore and offshore. According to University Maritime Advisory Services, infrastructure development costs to support alternative fuels are estimated to be between $1-1.4 trillion, presenting a significant barrier for the sector[21]. Additional challenges are posed by logistics and scale; for example, current total global capacity for bio-methanol is only 100 million tonnes annually to serve multiple purposes, of which a single shipping company such as Maersk would require approximately 10% to power its fleet for one year[22].

According to University Maritime Advisory Services, infrastructure development costs to support alternative fuels are estimated to be between $1-1.4 trillion, presenting a significant barrier for the sector.

		Global Fuel Availability	Long-Term Solution	Established Infrastructure	Safe to Handle	High Fuel Cost	Increased CAPEX	Advantages	Disadvantages
Carbon Fuels	Liquified Natural Gas (LNG)		✓	✓	✓		✓	Clean fuel and a rapidly developing infrastructure	Methane slip
	Liquified Petroleum Gas (LPG)	✓			✓			Low CO_2 emissions	-
	Methanol / Ethanol					✓	✓	Easy-to-handle, well developed terminal oil	-
Carbon Neutral	Biofuels / Biomethane				✓	✓		Increasingly used as marine fuel, can be used as drop-in-fuel	Sustainable scaling up needed
	Synthetic Methane (SNG)				✓	✓		Easily adapted to LNG infrastructure, can be used as drop-in-fuel	Large-scale production challenges, requires renewable energy source to be carbon neutral
Zero Carbon	Hydrogen		✓			✓	✓	Low energy density per volume and favourable specific density by mass	Storage challenges, particularly flammable
	Ammonia		✓			✓	✓	Solution for internal combustion engine and fuel cells	Limited bunkering, toxic effects on human health

[20]Global Maritime Forum - Getting to Zero Coalition (globalmaritimeforum.org)

[21]Bloomberg Quint - What's the Green Fuel of the Future for Shipping? (bloombergquint.com)

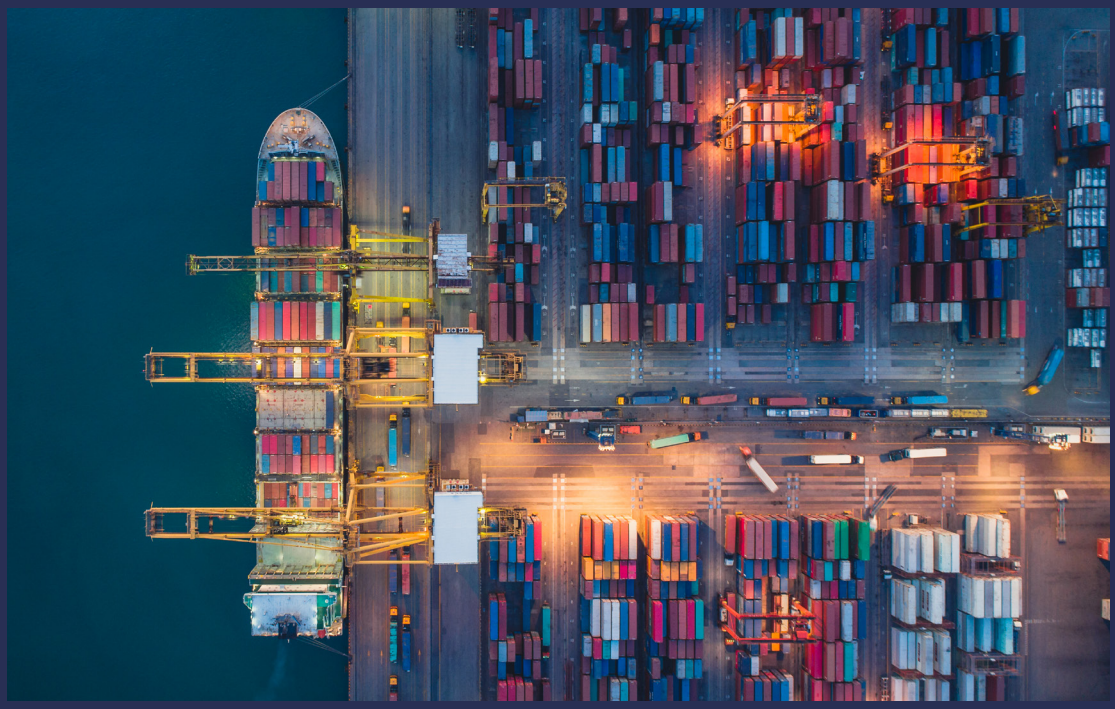
[22]Indicative calculation based on Maersk Sustainability Report 2020

The insurance industry must remain close to developments in alternative fuels as the future fuel pathway for the sector becomes clearer. Each of the possible alternative fuels for the sector introduce important risk considerations, including for example:

- The use of hydrogen (and ammonia as a vehicle for storing and transporting hydrogen) poses enhanced safety risks due to flammability and corrosive properties.
- Biofuels have been found to cause potential damage to ship engines which could impact operational performance[23].
- The potential release of GHGs such as methane from the combustion of liquified natural gases would need to be appropriately managed.
- The use of low carbon nuclear power propulsion using liquid fuelled micro-reactors is a potential medium-term solution, and naturally gives rise to unique safety and operational risks.

Whilst the future fuel scenario is still uncertain, what is evident is that insurance products and risk management solutions will need to be developed to support the industry's transition and anticipate both interim and longer-term needs. This includes supporting the development of new fuelling infrastructure, helping ports manage their emissions both onshore and offshore, and supporting with revisions to cover for the retrofitting of a global fleet to reflect engine modifications and changing fuel storage requirements.

Roadmap for action



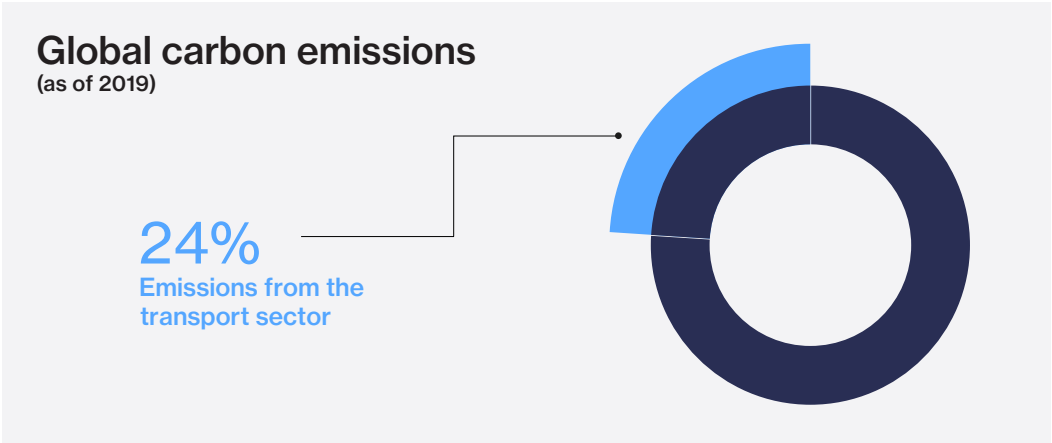
As the marine sector accelerates its efforts to drive sustainability through advancements in technology and alternative sources of fuel, opportunities will emerge for the insurance industry to support its decarbonisation pathway. Insurers should understand the risk implications of technological advancements, including resulting changes in infrastructure such as fuel transportation and storage, to ensure that cover is made available for emerging and alternative marine risks at the moment it is needed.

[23]European Parliamentary Research Service - Decarbonising maritime transport: The EU perspective (europa.eu)

04. Electric vehicles

The shift towards electrification and alternative propulsion systems

The transportation sector contributes 24% of global carbon emissions (as at 2019)[24] and within that road transportation (including cars, trucks, buses and two-and three-wheelers) is the biggest contributor. It is unsurprising therefore that the electrification of the automotive industry and the development of the supporting infrastructure required features prominently in the decarbonisation pathways of many countries.

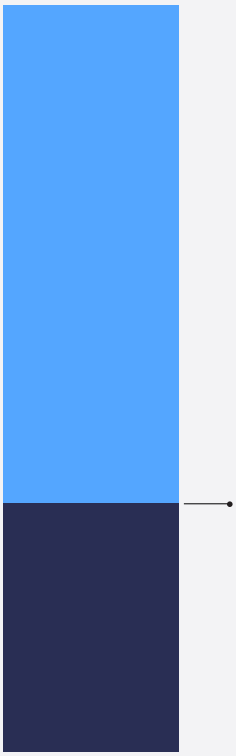


[24]International Energy Agency - Tracking Transport 2020 – Analysis - IEA

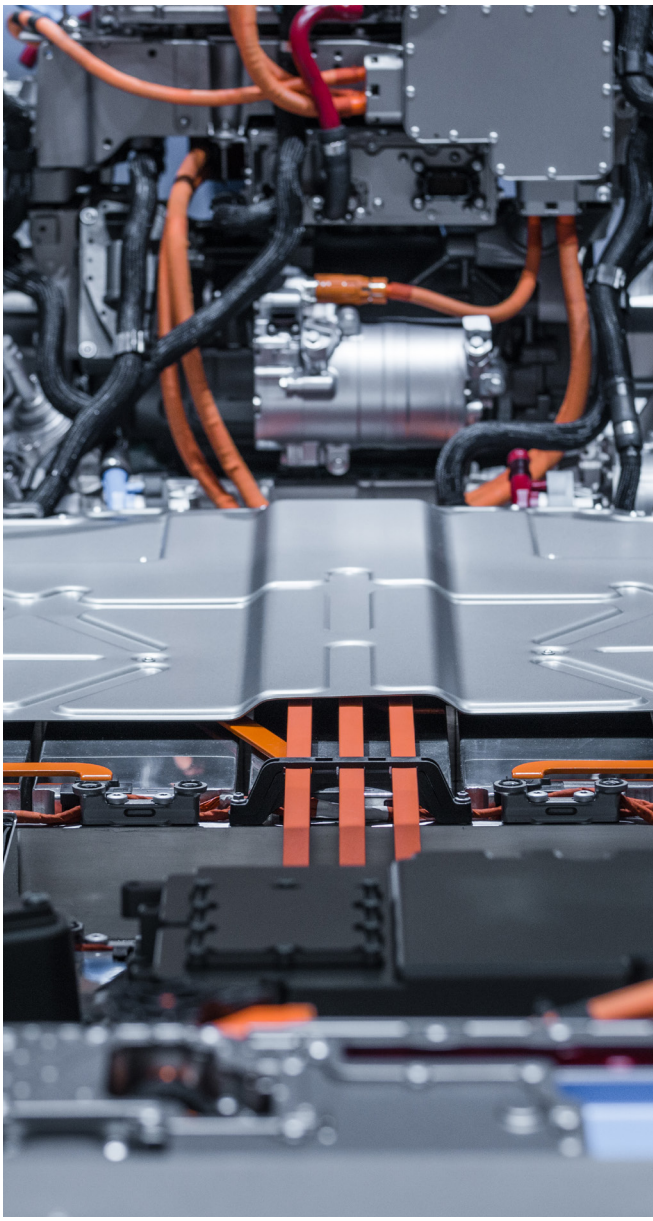
Today, China is leading the electric market, accounting for the largest share (40%) of global sales of electric vehicles (EVs). We are, however, starting to see rapid growth in other regions including Europe and the US[25]. Projections by BloombergNEF suggest that the global EV fleet could reach 116 million by 2030 from 8.5 million today[26]. In the UK, the National Grid suggests that the UK stock of electric vehicles could reach up to 10.6 million by 2030 and could increase to as high as 36 million by 2040, representing over a third of the total UK vehicle stock[27].

There are a range of low or zero carbon propulsion systems offering more carbon efficient alternatives to traditional combustion engines, including electric batteries, fuel cells and renewable biofuels. In the near and medium term, battery driven electric vehicles are expected to see significant rates of growth[28]. Hydrogen fuel cell vehicles represent an alternative solution, in particular for commercial vehicles carrying heavier loads or driving longer distances, though challenges remain including accommodating heavy onboard storage systems, fuel cell durability and reliability in extreme weather, and establishing the requisite network to produce, transport and dispense hydrogen to consumers[29].

UK vehicles in 2040



36 million
Electric vehicles



The transition to more carbon efficient propulsion systems is being supported by rapidly accelerating customer demand as well as regulatory change. As a result, participants in this sector are competing to rapidly gain market share across the value chain, including in electric vehicle (EV) production, smart charging solutions, electric charging infrastructure, and innovative vehicle to grid solutions.

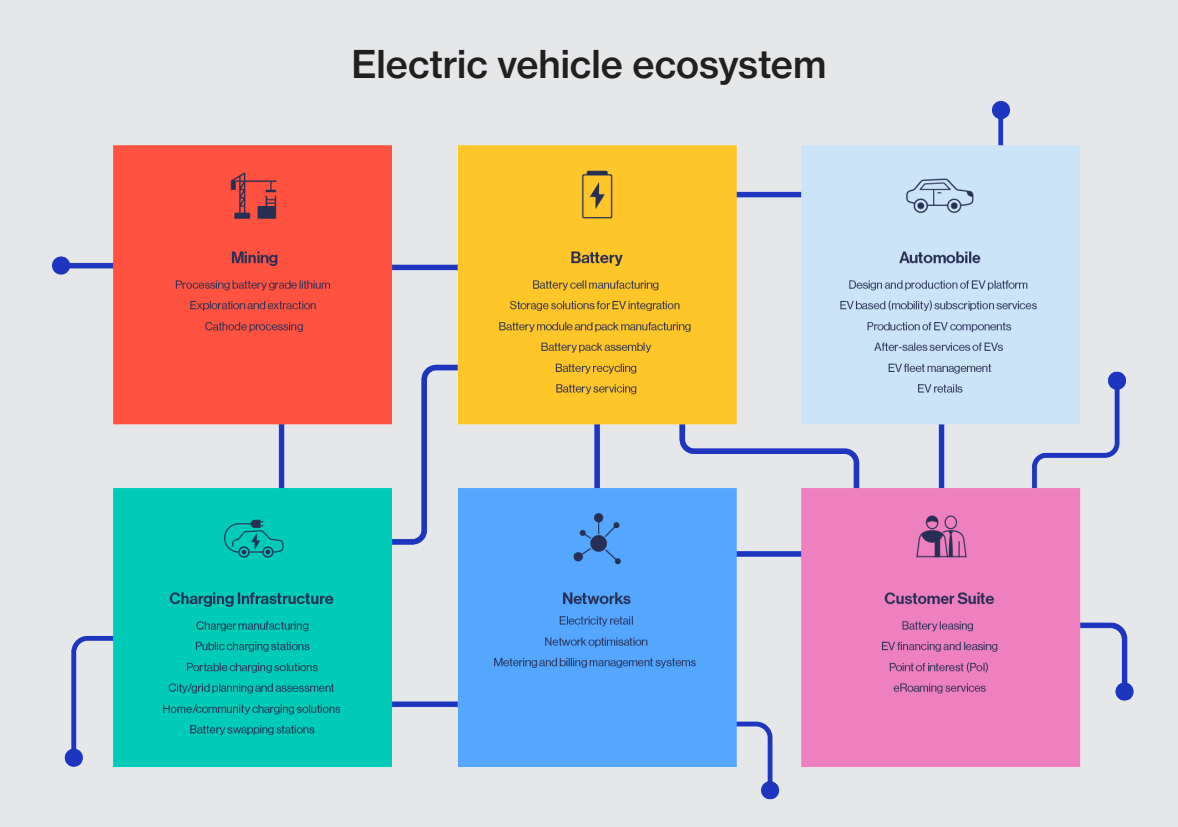
[25]Forbes - Plugging Into The Future: The Electric Vehicle Market Outlook (forbes.com)

[26]BloombergNEF - BNEF EVO Report 2020 | BloombergNEF | Bloomberg Finance LP

[27]UK Parliament - Electric vehicles: driving the transition - Business, Energy and Industrial Strategy Committee - House of Commons (parliament.uk)

[28]BloombergNEF - BNEF EVO Report 2020 | BloombergNEF | Bloomberg Finance LP

[29]Fuel Cell Vehicles: Challenges (fueleconomy.gov)



In parallel the popularity of diesel and petrol cars is declining rapidly, driven in part by new regulations and standards such as the expansion of low emission zones, as national governments look to reduce noise and air pollution in densely populated areas. To date, 17 countries have announced plans for the phase out of internal combustion engine vehicles through to 2050, including setting targets for 100% zero-emission vehicles[30]. For example, the UK Government has stated that all new vehicles will be required to have significant zero emissions capability from 2030 and be 100% zero emissions from 2035[31]. Up to £1 billion has been committed by the UK Government to support the electrification of UK vehicles and their supply chains, recognising the key reliance on supporting infrastructure to be able to facilitate this transition.

On the commercial side, manufacturers and large fleet operators are accelerating their investments in EVs as part of their long-term climate commitments, as well as to meet near-term policy requirements.

Over 20 companies with operations in the UK have now committed to fully electric fleets by 2030, including the UK's four biggest fleet operators: BT, Centrica, DPD UK and Royal Mail[32]. Heavy-duty road freight has experienced faster growth than other modes of road transportation due to increased demand for goods, therefore this segment of the market plays a vital role in the decarbonisation of the transportation sector[33].

UK Government has stated that all new vehicles will be required to have significant zero emissions capability from 2030 and be 100% zero emissions from 2035 . Up to £1 billion has been committed by the UK Government to support the electrification of UK vehicles and their supply chains.

[30]International Energy Agency - Global EV Outlook 2020 – Analysis - IEA

[31]HM Government - The Ten Point Plan for a Green Industrial Revolution (publishing.service.gov.uk

[32]The CCC - The-UKs-transition-to-electric-vehicles.pdf (theccc.org.uk)

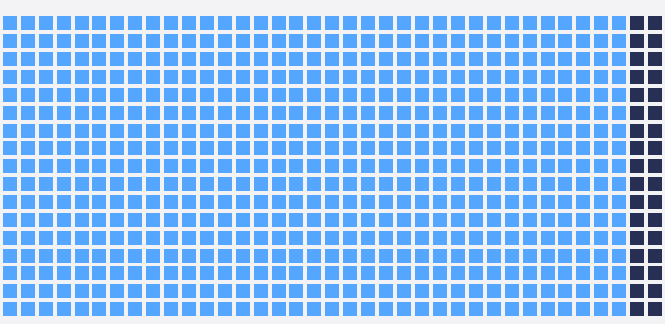
[33]IEA - Tracking Transport 2020 – Analysis - IEA

Key obstacles and role of the insurance industry

The need for an integrated charging infrastructure network

In order to accelerate growth in the use of EVs, there is a significant reliance on the infrastructure transformation to facilitate this growth, particularly charging infrastructure across a broad range of locations including motorways, streets and private charging points. This will be a key driver of consumer demand for EVs going forwards, with a particular focus on the speed at which batteries can be charged, capacity of batteries to cover long distances, and cost. As of April 2020, there were approximately 18,000 public charging points in the UK, however projections by the UK Government Climate Change Committee estimate that nearly 325,000 will be needed by 2032 in order to grow the UK's EV fleet to 23.2 million by 2032[34].

Infrastructure availability is also a significant barrier to success for commercial fleet electrification. Corporates can incur significant charging infrastructure installation costs, and the scale of infrastructure may introduce limits on their operating models and capacity planning, for example through integrating charge point availability and recharge time into their planning. These costs will be significant for any individual company to bear, and the insurance industry can support by providing policy structures that put financial protections around these risks to encourage the flow of capital into infrastructure projects.



18,000
Charging points currently in the UK

325,000
Charging points needed in the UK by 2032

[34]Climate Change Committee - The-UKs-transition-to-electric-vehicles.pdf (theccc.org.uk)

Not only is the availability of infrastructure important, but improvements in the interoperability of charging networks will be crucial to delivering a future-proof charging infrastructure. This will require collaboration between industry participants as well as governments, in order for consistent standards to be adopted.

Heightened risks of electric vehicles

Analysis of recent insurance claims by Allianz has indicated that, whilst electric vehicles are less likely to be involved in accidents due to shorter distances travelled, any damage sustained can be more expensive on average than for conventional cars. Whilst there is insufficient density of data to draw comprehensive conclusions at this stage[35], this is an area that the insurance industry will need to be cognisant of as the use of EVs continues to grow. It is critical that insurers are able to understand and respond to these changes in the risk landscape and refine the coverage they provide accordingly.

The battery supply chain

As the global EV market continues to grow, there will also be a critical dependency on battery manufacturing capacity.
The electrification of cars is a crucial driver in reducing battery manufacturing costs through economies of scale, and the cost of lithium-ion batteries has fallen by approximately 87% since 2010[36]. The UK is seeking to develop 'gigafactories' across the country in order to produce batteries at larger volumes, however there is currently limited capacity to extract and process enough raw materials such as lithium, nickel and cobalt[37] to meet the anticipated requirements. The supply of some of these materials is also highly concentrated, with the Democratic Republic of Congo currently responsible for approximately 70% of global cobalt supply and China responsible for around 80% of all commercial-grade refined cobalt. There is currently no commercial production of battery quality lithium raw materials in Europe, however research in the UK led by the Li4UK project is finding ways to produce lithium carbonate from UK-based raw materials, potentially providing a more sustainable supply chain as the EV industry gains momentum[38].

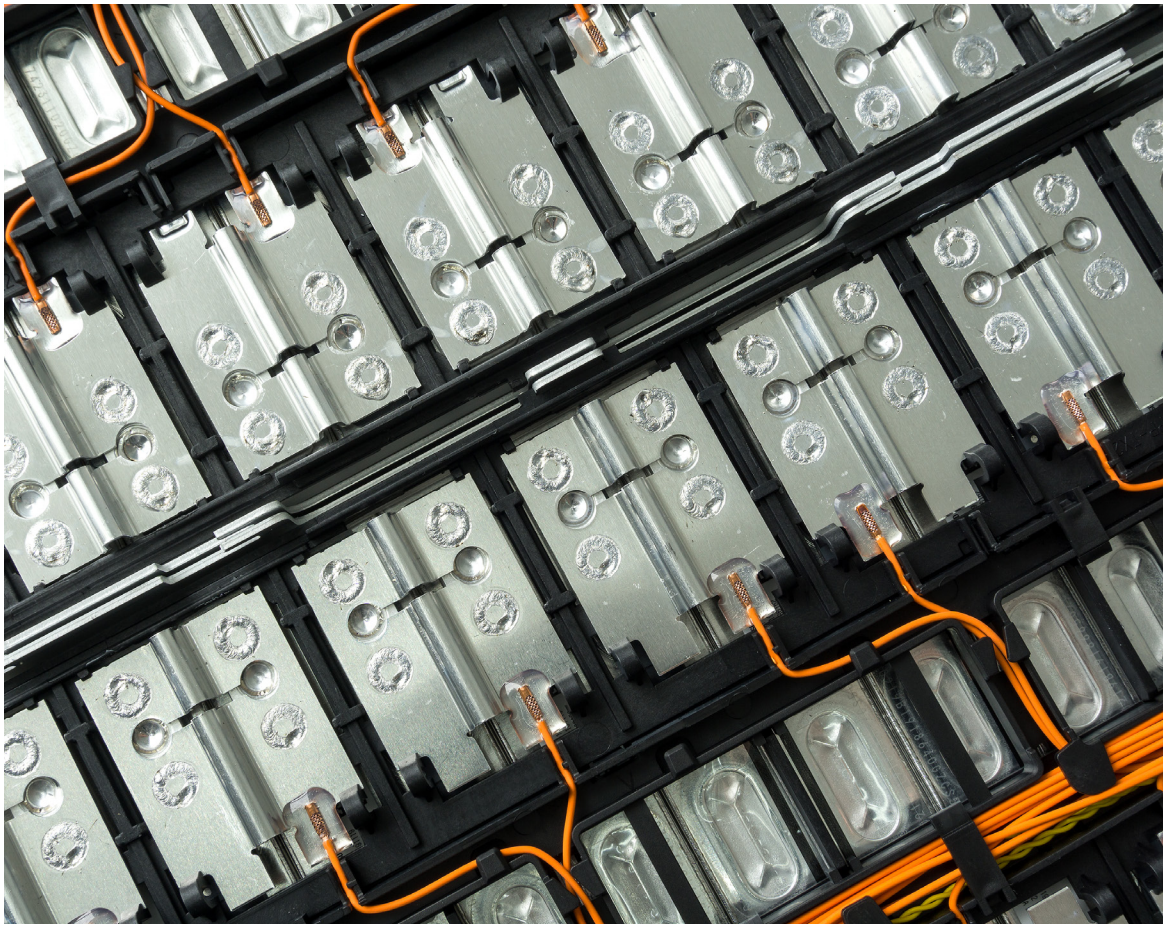
[35]Allianz - AGCS-Electric-Vehicles-Risk-Report.pdf (allianz.com)
[36]Bloomberg NEF - BNEF EVO Report 2020 | BloombergNEF | Bloomberg Finance LP
[37]NS Energy - China, cobalt and the Congo: Why Xi Jinping leads the batteries arms race (nsenergybusiness.com)
[38]Li4uk - lithium 4 UK | Securing Domestic Lithium Supply Chain for UK (li4uk.co.uk)

The demand for these materials has grown sharply over the last decade, particularly for metals used in the manufacturing of electronics such as lithium and cobalt. The extraction and ultimate disposal of these metals has a potentially harmful environmental impact; 100-120 GWh of electric vehicle batteries are estimated to retire by 2030, a volume roughly equivalent to current annual battery production[39]. In addition, the restricted supply of raw materials will mean that manufacturers are exposed to heightened risks across their supply chains, for example due to geopolitical disputes. The insurance industry, which for decades has insured physical assets globally against loss due to political instability, can help vehicle manufacturers understand where these key dependencies lie in their supply chains and support to manage these risks.

The risks of increased connectivity

The growth in EVs is closely correlated with the growth in autonomous vehicles. The resulting increased connectivity and reliance on data has the potential to make the electricity system more vulnerable to cyber-attacks; an attack on EVs and fast charging stations could cause significant disruption to local power supply, with a central pool potentially required to cover catastrophic risks such as total outages of services and systems. Insurers will need to reflect on the increased inter-connectedness of infrastructure networks, to the extent that it may increase exposure to cyber-related claims.

Research in the UK led by the Li4UK project is finding ways to produce lithium carbonate from UK-based raw materials, potentially providing a more sustainable supply chain.



[39]International Energy Agency - Global EV Outlook 2020 – Analysis - IEA

Roadmap for action

The business model of automotive companies operating in the EV sector is shifting from manufacturing towards providing full lifecycle solutions to customers. New insurance requirements are emerging as a result of this change in business model, for example an increase in demand for non-damage business interruption cover to protect against enhanced risks of connectivity, and cover for inter-connected global operations (compared to cover for local operations). Insurers will need to refine their product offerings to remain relevant in a changing industry.

To drive innovation and accelerate product development, through the SMI Insurance Task Force Lloyd's will:

Convene stakeholders including insurers, personal and commercial vehicle manufacturers and electric infrastructure providers as part of a collaborative product design workshop. The objective of this workshop is to drive innovation and design an early stage insurance product concept to address potential protection gaps which may emerge across the EV value chain.

Lloyd's will then:

Facilitate a product design sprint to develop potential products through from ideation to commercially viable products.

05. Committing to action

Lloyd's and the global insurance industry are uniquely positioned to facilitate efforts across communities, businesses and governments around the world to drive a transition to a lower carbon economy.

We have engaged with a range of insurers, Lloyd's market participants and corporates to assess the scale and complexity of decarbonisation ambitions across the transport sector (aviation, maritime, electric vehicles). The actions taken by the insurance industry today to support the scale and pace of ambition from both governments and businesses will be critical in driving positive, long-term change.

	Greener aviation & shipping	Electric vehicles
Action the global insurance industry should take	Insurers should understand the risk implications of technological advancements, including resulting changes in infrastructure such as fuel transportation and storage, to ensure that cover is made available for emerging and alternative marine and aviation risks at the moment it is needed.	The business model of automotive companies operating in the EV sector is shifting from manufacturing towards providing full lifecycle solutions to customers. Insurers will need to refine their product offerings to remain relevant in a changing industry.
Actions that will be delivered through the Sustainable Markets Initiative Insurance Taskforce	Work closely with the SMI Aviation and Shipping task forces to open up discussion with customers embarking on research and development in this area to identify requisite insurance coverage for emerging risks and new technologies.	Design an innovative EV insurance product to address protection gaps as new risks emerge and vehicle business models evolve.
Actions that Lloyd's will take	Provide a platform for dialogue between customers and insurers operating in this space to understand the specific challenges customers are facing and develop insurance coverage for emerging risks.	Facilitate a product design sprint to develop potential products from ideation to commercially viable products.

Together, by taking immediate action on climate change, Lloyd's and the insurance community can make a positive contribution. Actions such as product innovation around emerging and alternative marine and aviation risks and the refinement of products to remine relevant in the electric vehicle space will help deepen the insurance industry's understanding of the risk implications of the transport sector.

Lloyd's own commitments are wide-ranging, from working closely with the Sustainable Markets Initiative (SMI) aviation and marine task forces to embark on research and open up discussion with customers dedicated, to designing an innovative EV insurance product.

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