

THEMATIC RESEARCH

INVESTING IN THE FUTURE OF TRANSPORTATION

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The Future of Transportation

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Wielding significant impact on financial performance and long-term growth potential, ESG (Environmental, Social, and Governance) issues are increasingly essential factors for investors evaluating opportunities in future transportation. With the advent of emerging technologies¹ such as electrified and automated network of cars, ships, aircrafts and other vehicles and support from governments and corporates, transportation sector promises accelerating advancements that can improve safety, reliability and efficiency of the world we live in.

Key insights

- We expect the autonomous shipping market to grow, driven by advances in software solutions and proof-of-concept projects.
- The electric vertical take-off and landing (eVTOL) aircraft segment is highly competitive and product safety issues are under regulatory scrutiny.
- Product defects pose risks to EV customers, firms and investors. EV manufacturers diverge in their approaches to Product Governance.

Boats, planes and automobiles

Automating the shipping industry



Industry research firm Fortune Business Insights projects that the global autonomous shipping market will grow from USD 6.5 bn in 2021 to USD 12 bn by 2028, at a 9% CAGR, driven by advances in software solutions and proof-of-concept projects.² **Product governance risks in this market include failures of automation systems and sensors and cybersecurity threats.** Kongsberg ASA and ABB Ltd are helping shippers automate systems that have conventionally required human interventions. Their approaches to Product Governance conform with emergent regulations in key markets.

Air taxis



According to research by Deloitte Insights, the US passenger electric vertical take-off and landing (eVTOL) market could reach USD 3.4 bn by 2025.³ With this expected growth, **safety issues are under heightened regulatory scrutiny.** Areas of concern include the use of lithium-based batteries as a main source of powering flight, software problems and the risks of flying aircraft to people and buildings. With formal commitments to maintain product safety, Leonardo SpA and Airbus SE are well positioned on Product Governance, which may help them navigate safety risks in developing eVTOL aircraft.

Electric vehicles



The global electric vehicle market is projected to grow from USD 287 bn in 2021 to USD 1,318 bn in 2028.⁴ **Product defects pose risks to EV customers, manufacturers and investors.** Lucid Group Inc. and NIO Inc. differ in their approach to Product Governance, but both have a strong foothold in the EV market. While NIO has carved a niche for itself through its battery-swapping power stations that promise to save time and reduce some range anxiety, Lucid has necessary EPA and safety certifications and holds a relatively clean record without significant controversies thus far.

Autonomous shipping technology

Publicly traded companies in different industries developing autonomous shipping technology

Company	Domicile	Subindustry	Description
Kongsberg Gruppen ASA	Norway	Conglomerates	A key stakeholder in the world's first official autonomous vehicles test bed, Kongsberg Gruppen, manufactures self-driving ships targeted at cost savings through continual optimization of energy use, thereby increasing productivity and vehicle safety.
Korea Shipbuilding & Offshore Engineering Co., Ltd. (KSOE)	South Korea	Heavy Machinery and Trucks	In April 2022, KSOE completed a virtual test run of an autonomous passenger ship. The simulation reflects real-life conditions under which the digital ship completed a trip, which included departure, high speeds, and berthing.
ABB Ltd	Switzerland	Electrical Equipment	ABB Ltd, a technology leader in electrification, is a pioneer in autonomous shipping. In 2021, the company successfully performed South Asia's first remote joystick control of a tugboat in Singapore. Through digital technology, the firm intends to provide a safe, productive and efficient experience.
Samsung Heavy Industries Co., Ltd	South Korea	Heavy Machinery and Trucks	Samsung's autonomous ship (SAS) is a navigation system that aims to reduce human error by use of technology. The system promises to enhance operational benefits by increasing fault detection and reducing collision risks, thereby improving safety performance.
Daewoo Shipbuilding & Marine Engineering (DSME)	South Korea	Heavy Machinery and Trucks	In December 2022, DSME completed trials for its autonomous navigation system using a testing ship which can collect navigational data that is similar to large vessels. The two-day test demonstrated that this navigation technology can be applied in the future to larger ships.

Source: PitchBook, Morningstar, Sustainalytics

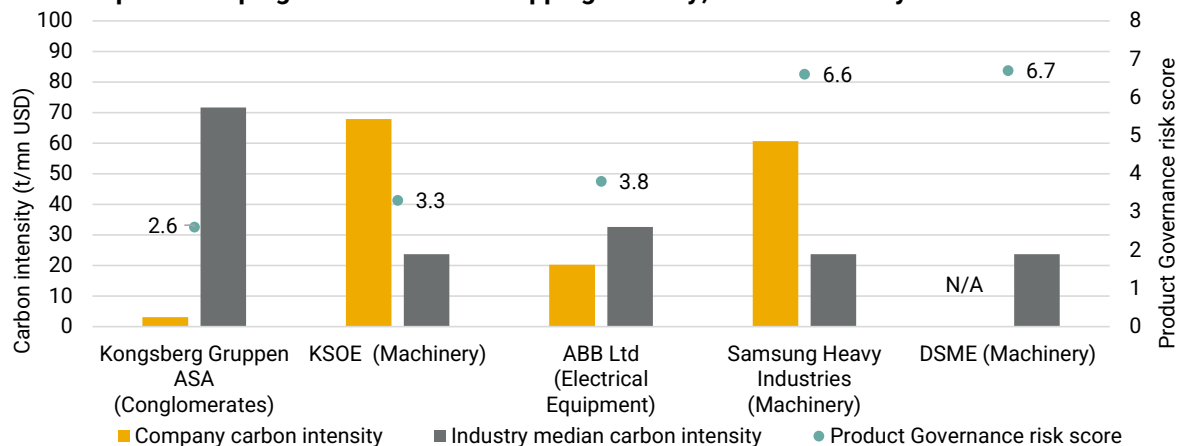
Climate-focused investments

To assess the overall preparedness of these companies to manage risks related to autonomous shipping technologies, we compare their risk scores on Product Governance. We also consider their carbon intensity relative to industry peers because this data point may be of interest to investors with a climate-focused autonomous shipping investment thesis. As shown in the chart below, the sampled South Korean industrial firms are outliers; the carbon intensity of KSOE and Samsung is more than twice their industry's median, while DSME's disclosures are insufficient for determining its carbon intensity. These shipbuilders are a part of an industry that also covers Industrial Machinery and Agricultural Machinery.

Kongsberg leading the pack

Although Conglomerates is a carbon-intensive industry, Kongsberg's carbon intensity is exceptionally low (3 t/mn USD). This firm is also low risk (2.6) on Product Governance; it has relevant Quality Management System (QMS) certifications, which point to initiatives to ensure that products and services do not pose health and safety hazards to customers. Our research indicates that 90% or more of the firm's sites have received external QMS certifications. ABB is similarly well positioned on these issues compared its peers.

Industrials companies helping to automate the shipping industry; carbon intensity and Product Governance



Source: Sustainalytics

Electric and hybrid air taxis

A selection of Aerospace and Defence companies developing air taxis

Company	Domicile	Subindustry	Description
BAE Systems	US	Aerospace and Defence	In October 2022, BAE Systems and Supernal announced an agreement to design and develop the flight control computer for Supernal's eVTOL vehicle. BAE Systems is also collaborating with other industry players, including Embraer, to explore the development of defence eVTOL aircraft.
Airbus SE	Netherlands	Aerospace and Defence	In 2021, the European aerospace company unveiled a brand new flying taxi called the CityAirbus NextGen. Heavily informed by Airbus's past eVTOL concepts, the zero-emission aircraft has two main focuses: running quietly and covering short distances quickly.
The Boeing Co.	US	Aerospace and Defence	In early 2022, Boeing invested USD 450 mn in flying taxi developer Wisk. In October 2022, Wisk launched its first sixth generation, four seater, pilotless electric aircraft in the US market. The company is awaiting approval from the US Federal Aviation Administration to launch its operation.
Leonardo SpA	Italy	Aerospace and Defence	Leonardo is collaborating with UK-based Vertical Aerospace to develop the VX4, a four passenger, one pilot eVTOL which it projects will have speeds up to 200 miles per hour, a range over 100 miles, while being nearly silent when in flight and with zero operating emissions.
Northrop Grumman Corporation	US	Aerospace and Defence	Northrop Grumman and Leonardo have partnered to pursue opportunities in the VTOL Uncrewed Aerial Systems (UAS) space. Drawing on Leonardo's expertise in rotorcraft and Northrop Grumman's capabilities in advanced aeronautics and next generation autonomous aerial systems.

Source: Sustainalytics

Investor interest: mitigating safety risks

To get a broad perspective of how these companies manage safety issues related to all of their product offerings (including conventional aircraft), we compare the approaches to managing Product Governance issues. Although this MEI gauges a wide range of quality and safety issues that go beyond the scope of air taxis, this data point may help investors assess the general approach companies in this space take to mitigating safety risks.

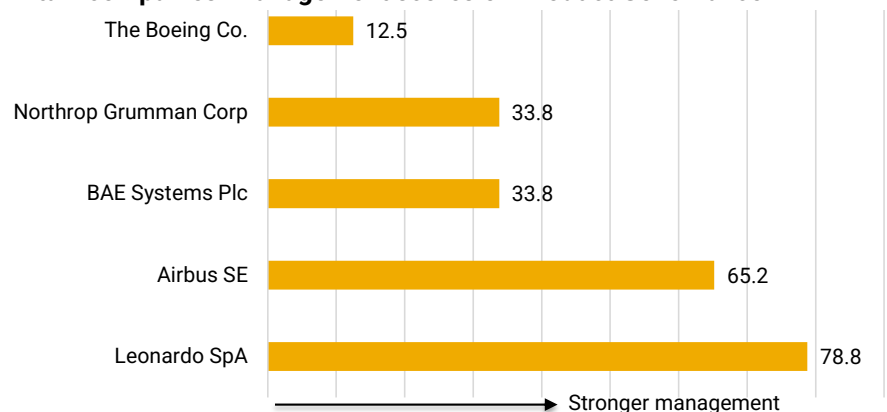
An example of weak product score

Boeing's weak Product Governance management score reflects gaps in its disclosures about product safety, such as gaps in external product safety audits, QMS certifications and regular emergency response procedures. The firm has been involved in several related controversies, including the 2019 737-MAX crash, which triggered associated losses estimated at USD 19 bn.⁵

Leonardo and Airbus leading

Other players in this space exhibit stronger management of Product Governance issues. Leonardo and Airbus disclose formal commitments to ensure product safety and they report that they conduct quality and safety risk assessments throughout their operations and employees receive regular training on product safety.

Air taxi companies' management scores on Product Governance



Source: Sustainalytics

EVs: quality, safety and reliability

Product Governance risks

The chart below compares a sample of EV makers (battery electric vehicles and plug-in hybrid electric vehicles) with respect to their Product Governance risk scores. Most of the car manufacturers in this sample have a high (6-8) or severe (>8) risk score, except for Lucid Group (4).

EV product problems

Defective products expose automakers to risks of litigation and warranty claims, especially in the US, where regulations mandate recalls of vehicles that do not meet safety standards.⁶ Areas of concern for Tesla include reported problems with batteries, software and self-driving features.⁷ The firm faces a probe from the US Department of Justice and an investigation by the US National Highway Traffic Safety Administration in relation to claims that Tesla’s driver assistance system Autopilot was activated during car crashes.⁸

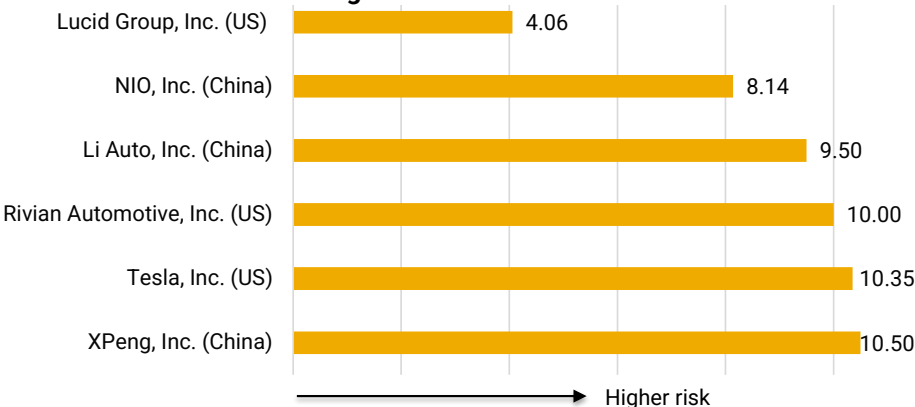
EV market in China

Similarly, Chinese EV manufacturers including Xpeng, Li Auto and NIO continue to recall EV vehicles for battery fires, brake failure and numerous other defects.⁹ According to a survey on new EVs, Chinese EVs retain less of their purchase value than ICE cars after their first year. One potential reason is that China’s initial large subsidy scheme (2010) may have led EV makers to manufacture and price cars aggressively.¹⁰ Before the government significantly reduced the subsidies in 2019, many EV makers produced cars to secure the subsidies, but those cars eventually went to the used car market, where they were sold at prices much lower than the retail price. Many carmakers have buyback programmes to compensate drivers, which has led to losses in cases where buyback prices surpassed used-car values.

Lucid: lesser quality issues

Lucid has a significantly lower Product Governance risk score than its peers, which is supported by its having obtained the necessary EPA and safety certifications and having steered clear of significant controversies. However, compared with the other firms in this sample, Lucid is a newcomer to this space, as it has only had EVs on the market since 2021.¹¹ As it gains experience, the firm could face similar quality and safety issues that have the potential to increase Product Governance risk.

Product Governance risk ratings of six EV manufacturers



Source: Sustainalytics

The road ahead

Two sides of the coin

This year's edition of our *10 for* series surveys emerging spaces for investors to consider in 2023 and beyond. In this article, we outlined some of our findings about three market segments: autonomous shipping, air taxis and EVs. In the full report, we go into more detail about these emerging technologies, as well as other spaces, including gene therapies, AI in IT operations (AIOps) and small modular reactors. SMRs are market segments developing technologies that present sustainability opportunities and risks.

Regulators encouraging growth

A key finding of this study is that regulators are increasingly scrutinizing emerging technologies. However, they are also playing a crucial role in spurring growth. For example, several countries and jurisdictions have expressed support for rules that would ban or limit the sale of new internal combustion engine cars by 2035. At the same time, regulators are seeking to stem EV product defects, particularly those that pose public safety risks. Companies developing technologies that contribute to a low carbon transition while also mitigating ESG risks could potentially be aligned with a sustainable investment goal.

Health and safety are paramount

Product Governance is an issue that we identify as relevant for all the spaces and companies assessed in this report. Emerging technologies may have the potential to improve aspects of society and the environment, but they can also present risks to human health, ecosystems and companies involved in these spaces. Investors can assess and engage with companies on this and other MEIs to gauge the preparedness of firms to take on critical sustainability challenges.

To learn more about these emerging technologies and the ESG issues facing companies and investors in these spaces, download the full report at our website [10 for 2023: Investing in Emerging Technologies \(sustainalytics.com\)](https://sustainalytics.com/10-for-2023-investing-in-emerging-technologies).

Endnotes

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