SUSTAINABILITY IN FOCUS

Industry Series

Electric Vehicles

MIOTECH RESEARCH

Are EVs Green and ESG?

MioTech Research, 19 Oct 2022

Table of Contents

Forward

Electric vehicles (EV) are rising in popularity in recent years, replacing traditional internal combustion engine (ICE) vehicles that rely on fossil fuels. A growing number of both developed and developing countries are being swept up by the green transport revolution.

First there are the EV behemoths Tesla and BYD. The iconic EV company Tesla, founded almost twenty years ago in 2003, had reached a market value of $190 billion in June 2020, surpassing Toyota as the world's highest market value car manufacturer. **To date, Tesla's market capitalization has exceeded $900 bn, outshining the combined market capitalization of 11 global car giants.** In the A-share market, **BYD also reached the trillion RMB market cap mark in June this year, becoming the world's 3rd largest auto company in terms of market cap (after Tesla and Toyota).**

Given the astounding growth and market adoption, the overall ESG development of the rising industry is also worth exploring in the market.

In this report, MioTech Research delved into two global electric vehicle leaders, **Tesla (TSLA.O) and BYD (002594.SZ, 1211.HK)**, as well as the emerging contenders which have released ESG reports, i.e. **XPeng (NYSE: XPEV, SEHK: 9868), NIO (NYSE NIO, SEHK:9866, SGX:NIO), and Li Auto (NASDAQ: LI, SEHK: 2015)**, for their current practice and performance in the area of sustainability and ESG.

We benchmarked the pure EV players with traditional automakers in transition, including Guangzhou Automobile Group (601238.SH, 2238.HK) and the German Volkswagen Group (VWAPY). **These six companies represent the "old, middle-aged and young" generations in the auto industry, and span three stock markets: China A shares, Hong Kong and the US.**

Key Takeaways

1. **EVs do well on ESG ratings but lag on their ESG reporting.** According to MioTech AMI, BYD, XPeng and GAC all had ESG scores of above 62 (out of 100), with ESG ratings of BB, placing themselves in the top 25% of the automotive industry. However, Other than Tesla as a pioneer that reported its first sustainability report in 2018, the Chinese players that launched back in 2015-ish era did not report their ESG performance until years 2020 and 2021.

2. **OEM production could lead to lower carbon emission intensity.** XPeng has the lowest emission intensity per vehicle sold, at 0.39 tCO2e, much lower than Tesla and Li Auto's 0.63 and 0.61. We speculate XPeng's OEM production leads to such lower carbon emission intensity.

3. **Fuel car manufacturers have higher indirect Scope 3 emission vs. EV makers.** VW Group's Scope 3 emissions accounted for 98% of the total emissions in 2021, while Tesla's Scope 3 emissions accounted for only 77%. The current life-cycle carbon emissions of PHEVs and BEVs in China are typically 60-80 percent of those of traditional ICE vehicles. As the integration of renewable energy in China's electricity grid increases and the grid emission factor gradually decreases, the advantages of EV companies in Scope 3 emissions control will be further reflected.

4. **EVs rely on Lithium-ion batteries, which have significant environmental impacts and energy consumption.** However, only Tesla and VW Group have established their own battery recycling production lines from our scope. The Li-ion battery recycling market is projected to grow from USD 1.5 billion in 2019 to USD 18.1 billion by 2030.

5. While EVs hold emission benefits, most **EV companies lag behind traditional automakers in terms of emission target setting**, recycling initiatives, and waste management. BYD's Changsha factory suffers from excessive emissions, posing material risks to the company.

6. Like traditional auto manufacturers, **EV companies have to manage a large and mostly male workforce, and worse at it**. In the past year, 178 negative events relating to EV's companies poor labor management were monitored by MioTech AMI. Females account for less than 20% of executive-level management.

COMPETITIVE LANDSCAPE OF EVs

Table: Profiles of the six car companies

Company Name	Tesla	BYD	NIO	Li Auto	XPeng	GAC	VW Group
Year Founded	2003	1995	2014	2015	2015	1997	1937
Headquarter	Austin, USA	Shenzhen, China	Shanghai, China	Beijing, China	Guangzhou, China	Guangzhou, China	Wolfsburg, Germany
Employee Count (thousands)	99.2	288.2	15.2	11.9	14.0	97.0	672.8
Vehicle Production (thousands)	930	597	91	90	98	2,138	8,300
Revenue (USD bn)	53.8	31.3	5.2	3.9	3.0	11.0	250.2
Net Profit (USD bn)	5.5	0.4	(1.5)	(0.0)	(0.7)	1.1	14.8
Net Profit Margin	10.3%	1.4%	(29.3%)	(1.2%)	(23.2%)	9.7%	5.9%
Market Cap (USD bn)	690.0	97.6	20.4	19.9	7.4	12.6	76.0
MioTech ESG Score and Rating	N/A	62.60/100, BB	65.19/100, BB	65.99/100, BB	65.93/100, BB	66.00/100, BB	N/A
MioTech ESG Industry Rank	N/A	20/78	17/78	14/78	15/78	13/78	N/A

Source: Public disclosures, Refinitiv Eikon, MioTech Research (market capitalization value as of Oct 18, 2022)

Note: Vehicle production, operating income, net profit and net profit margin are 2021 figures. The exchange rate of USD and EUR to RMB is taken as 6.9:1.

2003-founded Tesla and 1995-founded BYD are the current leaders of the pack in the global EV industry. In 2012, Tesla began delivery of the first mass-produced model- the Model S sedan, and subsequently launched a series of passenger car models, achieving global sales of 930,000 units in 2021. BYD, a company that expanded its business lines from the production of lithium-ion and NiMH batteries to launching electric passenger cars and electric buses in 2008 and achieved a rapid breakthrough in electric vehicle sales in the last two years.

As newcomers in the car-making industry, Li Auto and Xiaopeng (Xpeng) were both founded in 2015, with extended-range electric vehicles (EREV) and battery electric vehicles (BEV) as their main products. Both companies have grown substantially since. By 2021, the revenues, productions, and total number of employees were close to each other, however Li Auto enjoyed a higher profit margin, and its market cap equates to almost double the size of XPENG.

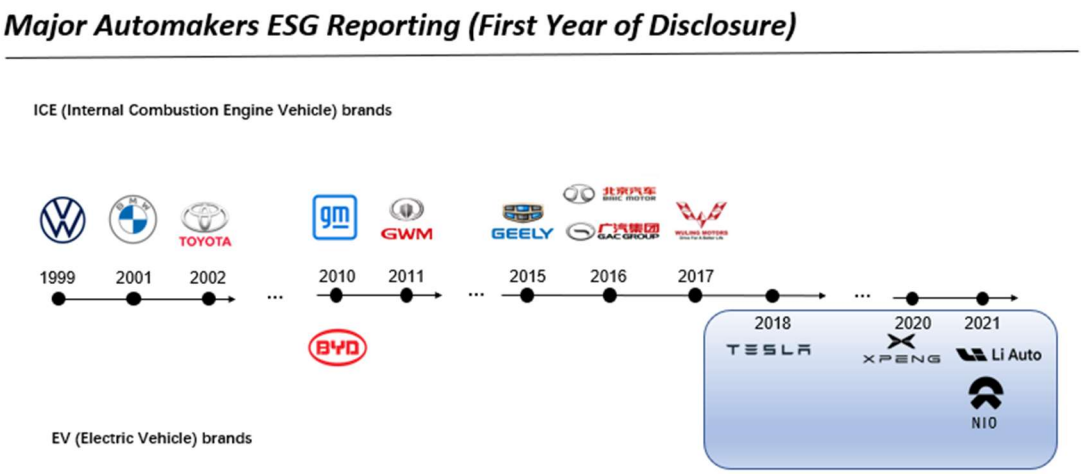
The growing popularity of the EV also pushes traditional car companies to accelerate their electrification transformation. The Volkswagen (VW) Group officially launched the pure electric vehicles ID-series in September 2020, and its Audi and Porsche brands also released various plug-in hybrid and pure electric models. The VW Group has set the target for the sales of electric vehicles to overtake those of traditional ICE vehicles by 2030.

In China, Guangzhou Automobile Group (GAC Group) is one of the earlier adopters among state-owned auto groups, launching a separate EV sub-brand Aion, and has become a leading seller in China's domestic EV market.

MioTech provides ESG scores and ratings for A-share, HK and U.S ADR listed companies based on its proprietary AI-enabled AMI platform. GAC did consistently well, achieves ESG score of 66 (out of 100) and ESG rating of BB. With the recent publishing of their first ESG reports, Li Auto and NIO both made significant improvements over the sustainability disclosures, thereby boosting their ESG ratings from DDD/C to BB. All the Chinese EV companies, including BYD, NIO, Li Auto and XPeng, had ESG scores of above 62, placing themselves in the top 25% of the automotive industry.

The new EV players' relative brief history compared with their ICE fuel carmakers also mean their ESG disclosures weaker in comparison. Other than Tesla as a pioneer that reported its first sustainability report in 2018, the Chinese players that launched back in 2015-ish era did not report their ESG performance until years 2020 and 2021, with XPeng reporting for 2020 and Li Auto making its first ESG reporting for 2021 on April 19, 2022 and NIO reporting its first ESG report very recently on Sep 30 of 2022.
The market has given very different valuations for EV and ICE companies. The EV companies with high growth in expected EPS for FY22-24 have PE(x) of 31~44 in 2024. XPENG reports worse-than-expected loss and gross margin this year. Fearing the grim outlook, its stock slumps 73.5% YTD. Excluding the obvious lagger XPENG, the stocks of EV companies show higher volatility, however on average outperform the stocks of the ICE companies this year.

Chart: Major Automakers ESG Reporting (First Year of Disclosure)



Source: MioTech Research

On the other hand, concern grows as traditional ICE loses ground in both the global and China's market. As a result, GAC and VW Group are much lower valued than its EV peers, having PE(x) of 6~9 in 2024.

Carmakers, regardless of EV or traditional ICE vehicle production, are typical manufacturing companies. Therefore, the industry usually is a high energy consumer and pollutant emitter in its production process while its operation often involves a large number of production employees and a complex supply chain of parts and material.

In addition, as a durable good, the potential for reducing automobile's carbon footprint is also substantial. Taking into account these unique industry characteristics, we selected specific ESG topics with substantial materiality for the automotive industry and discussed the companies' performances in 2021.

Table: Valuation table of the EV and ICE companies (as of Oct 18, 2022)

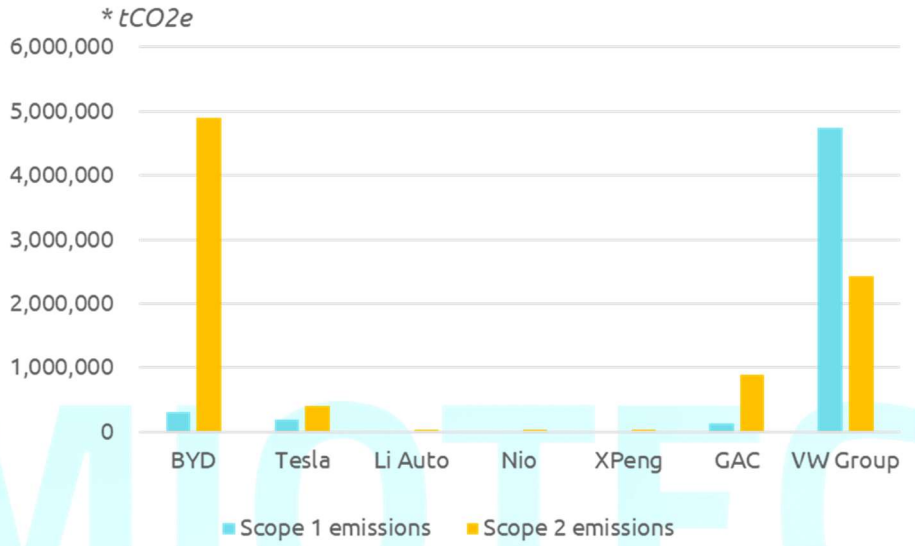
	Code	Stock Price	Mkt Cap	P/E(x)			EPS Growth（%）			Dividend Yield (%)			ROE (%)			Abs Perf (%)		
			USD m	22E	23E	24E	22E	23E	24E	22E	23E	24E	22E	23E	24E	1W	1M	YTD
	EV																	
BYD	002594.SZ	273.67	97,643	74.1	43.7	32.1	114.3	69.7	36.0	0.1	0.2	0.3	10.4	15.5	18.4	4.3	1.2	2.1
Nio	NIO	12.21	20,396	n.a.	n.a.	44.2	n.a.	n.a.	n.a.	0.0	0.0	0.0	(27.5)	(11.6)	11.1	(5.2)	(41.6)	(61.5)
Li Auto	LI.O	18.92	19,890	n.a.	86.6	33.1	n.a.	n.a.	162.0	0.0	0.0	0.0	(2.0)	3.6	9.8	(7.2)	(25.0)	(41.1)
Xiaopeng	XPEV.K	8.60	7,412	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.0	0.0	0.0	(21.1)	(16.0)	(2.8)	(9.9)	(45.0)	(82.9)
Tesla	TSLA.O	220.19	689,959	53.9	37.3	30.8	89.2	44.6	21.1	0.0	0.0	0.0	33.1	35.4	32.8	1.4	(28.8)	(37.5)
	ICE																	
GWM	601633.SH	27.52	26,512	28.4	22.2	17.1	2.8	28.4	29.4	1.6	2.0	2.5	13.5	15.5	17.5	2.2	(8.2)	(43.3)
GAC	601238.SH	12.62	15,126	12.2	10.8	9.3	29.2	13.7	15.5	2.2	2.6	2.7	10.9	11.4	12.1	2.7	(3.3)	(16.9)
VW Group	VOWG.DE	170.80	76,038	5.2	5.3	5.0	(11.4)	(1.7)	4.4	4.8	5.4	6.0	11.6	10.8	10.8	6.5	(15.8)	(33.9)

Source: Refinitiv Eikon, MioTech Research

1. ENVIRONMENT: CARBON EMISSION AND NET ZERO

It is worth noting that all six car companies disclosed their Scope 1 and Scope 2 emissions data for 2021. Tesla and Volkswagen Group further disclosed their Scope 3 data. From the disclosed data, there are significant differences in carbon emission situations among the companies.

Figure: Scope 1 and Scope 2 emissions of the seven car companies in 2021



Source: Public disclosures, MioTech Research

In their emission profiles, each company's Scope 1 and 2 emissions roughly correspond to its production scale, while Scope 2 emissions (or emissions from purchased electricity) are generally larger than Scope 1 emissions. There are two noteworthy outliers. One is that BYD's Scope 2 emissions are much higher than its Scope 1 and other manufacturers' Scope 2 emissions. The second is that VW Group's Scope one emissions are higher than those of other car companies and also substantially exceed its own Scope 2 emissions.

One possible explanation for BYD's higher Scope 2 emissions may be that BYD's auto-related revenue only accounts for about half of the listed company's revenue, and the rest of its businesses such as semiconductors, electronics, and battery production have processes with much higher electricity consumption intensity, which increases the company's Scope 2 emissions. In addition, BYD does not disclose its carbon emissions by business units.

The reason for VW Group's high Scope 1 emissions may be related to its old plant facilities and its ownership of thermal power assets, such as the coal-fired power plant built for the VW Wolfsburg plant, which was commissioned

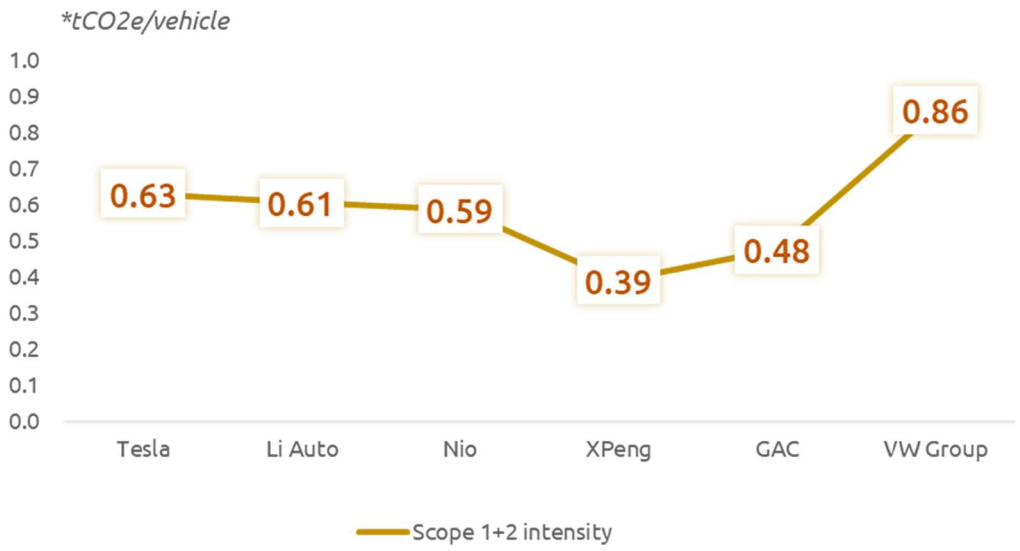
in 2000. The energy consumption data disclosed by the Volkswagen Group shows that its fossil energy consumption is disproportionately high as a percentage of total energy consumption, reflecting on the one hand the low level of electrification of the equipment and processes and on the other hand the energy efficiency of production equipment may need to be improved.

Other than BYD, which has more than one main business, the greenhouse gas (GHG) emissions of other companies are almost all from the production of electric or ICE vehicles. We attempted to compare the auto sector's emissions across the board by calculating "the GHG emission intensity value" of automotive companies from the ratio of vehicle production from each company and the total Scope 1 and 2 emissions.

OEM PRODUCTION LEADS TO LOWER ENERGY EMISSION INTENSITY

As seen from the graph above, Tesla and Li Auto's GHG emission intensity value are at a lower number of average 0.6tCO2e per vehicle, compared to the 0.86tCO2e per vehicle of the VW Group. **The emission intensity value for Xpeng is only 0.39tCO2e, which we speculate may be due to the fact that its production is handed over to OEM Haima Auto**, and this portion of energy consumption and emissions at Haima Auto's facility is not fully accounted for in the Scope 1 and Scope 2 emission values disclosed by Xiaopeng. **GAC Group performs surprisingly well in controlling its GHG emission intensity, achieving a value of only 55% of that of VW Group.**

Figure: Greenhouse gas emission intensity values of car companies (2021)



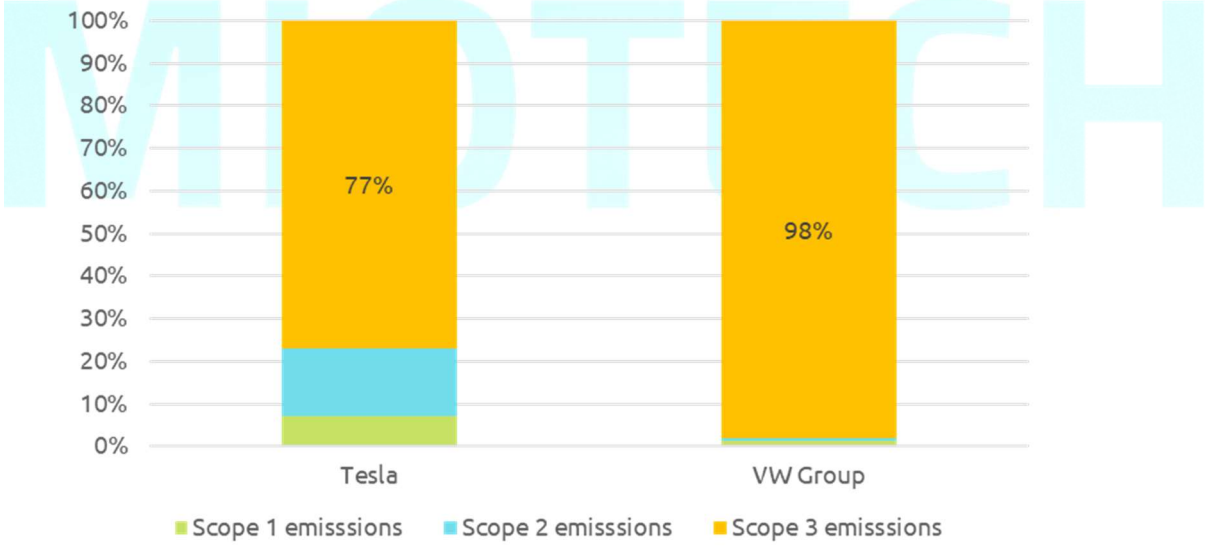
Source: Public disclosures, MioTech Research

LOWER SCOPE 3 EMISSIONS IN ELECTRIC VEHICLES

Among the seven car companies we analyzed, only Tesla and Volkswagen Group have disclosed their respective Scope 3 emissions. Unlike many other industries, **the Scope 3 emissions of EV companies bears a great significance: in terms of a vehicle's carbon footprint, its use cycle (i.e. fuel consumption) accounts for more than 70% of the total life cycle carbon emissions**. The claims of its climate-friendliness and carbon-reduction benefits of electric vehicles since their inception must be reflected in the reduction of the carbon emissions during the use phase, which means that **EV company's corresponding Scope 3 emissions should account for a lower percentage of total greenhouse gas emissions than traditional ICE car companies.**

Comparing the Scope 3 emissions between Tesla and Volkswagen Group, we do see the carbon reduction benefits of electric vehicles -- **The scope 3 emissions accounted for 98% of total emissions of the VW Group in 2021, while Tesla's Scope 3 emissions account for only 77%.**

Figure: Scope I, II and III emissions of Tesla and VW Group (2021)



Source: Public disclosures, MioTech Research

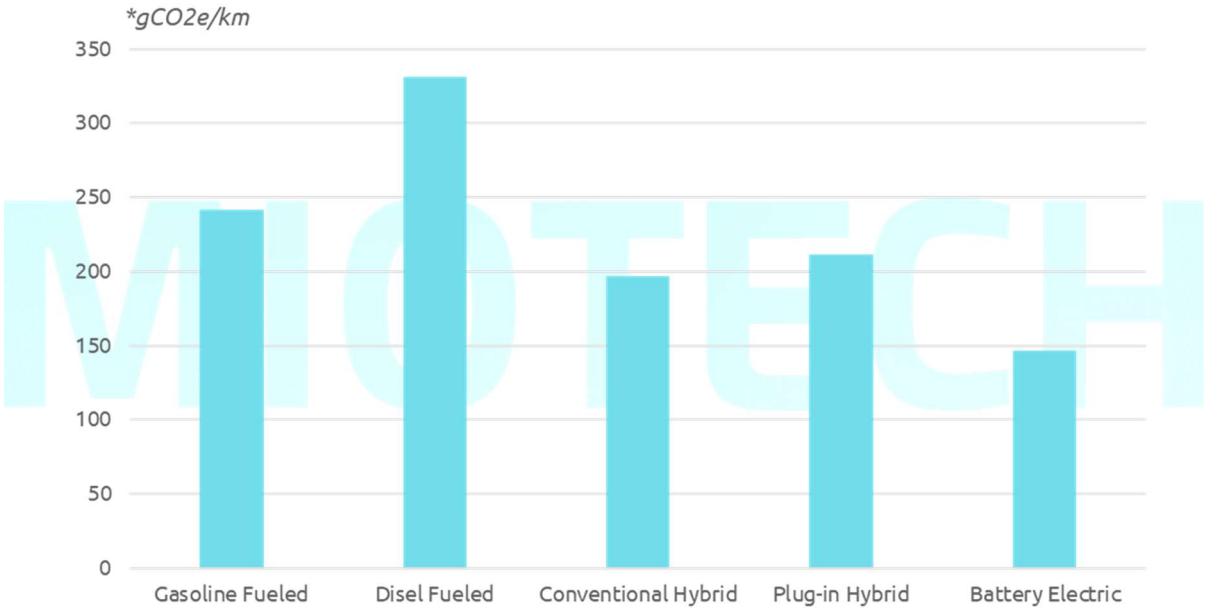
Behind the Scope 3 emissions data, there are also things to talk about. One is that according to **Tesla's 2021 impact report published this year, its 1.95 million tons of Scope 3 emissions currently includes only carbon emissions from the vehicles sold**, due to "data accuracy issues resulting from the calculation methodology and excessive assumptions for the remaining Scope 3 emissions," while according to Tesla, the reported Scope 3 data comes from the raw data uploaded by the vehicles sold and thus has a very accurate value.

On the other hand, the Volkswagen Group claimed that 13 out of 15 total

Scope 3 emission categories were included in its reported Scope 3 emissions. Purchased goods and services accounted for 16 percent while sold vehicle emissions accounted for 77 percent. According to the VW Group, sold vehicle emissions were calculated for fleets in 27 European countries, the United States and China, as well as taking into account the carbon emissions of fuels in transport and production.

According to data from *the China Automotive Low Carbon Action Plan Study (2021),* which is cited in the ESG reports of several EV companies, **the current life-cycle carbon emissions of hybrid and pure electric vehicles in China are typically 60-80 percent of those of traditional ICE vehicles. As the integration of renewable energy in China's electricity grid increases and the grid emission factor gradually decreases, the advantages of EV companies in Scope 3 emissions control will be further reflected**.

Figure: Life cycle carbon emission comparison of various fuel type vehicles



Source: China Auto Decarbonization Action Plan Research (2021)

New energy vehicle companies have performed poorly on the broader issue of climate change. As shown in the following table, it is regrettable that **none of the new energy vehicle companies disclosed their greenhouse gas emission management targets in detail in the ESG report**. In contrast, Guangzhou Automobile Group, a traditional car company, has formulated a short-term emission reduction target based on emission intensity and a long-term goal of carbon neutrality in 2050, while Volkswagen Group has also formulated a medium-term goal of absolute emission reduction.

Table: Performance of other greenhouse gas emissions and energy consumption management

	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
GHG Emissions Reduction Targets	No	No	No	No	No	1. Achieve product life-cycle carbon neutrality by 2050 2. Reduce GHG emissions intensity by 2% per year between 2021 and 2025	30% reduction in CO2 emissions during the production and use phases of its passenger cars and light commercial vehicles between 2018 and 2030
SBTi Validated	No	Yes	No	No	No	No	Yes
Energy-Efficiency Improvement	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Implementation of Net-Zero Technologies	Yes	Yes	Yes	No	Yes	Yes	Yes
Product Green Design	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Public disclosures, MioTech Research

The GHG management objectives of Tesla and Volkswagen Group have been verified by the Science Based Target Initiative (SBTi). At present, Chinese companies have not adopted SBTi. The energy efficiency improvement of the production process, the utilization of renewable energy and zero-carbon technology in factories and office buildings, and the green design of products (i.e. Vehicles) are often disclosed by the electric vehicle companies.

GAP IN ENVIRONMENTAL MANAGEMENT (WASTE, WATER, ETC)

In addition to carbon emissions, the potential impact of waste emissions from vehicle production plants of new energy vehicle enterprises on the environment is also worthy of attention. However, from the disclosure of environmental management indicators, the performance of new energy vehicle companies still generally lags behind that of traditional vehicle companies.

Table: Disclosure of environmental management objectives and related actions in ESG reports of major car companies

	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
Waste Reduction Targets	Not disclosed	Not disclosed	Not disclosed	Not disclosed	Not disclosed	An annual 1% reduction in hazardous/non-hazardous waste disposal intensity	By 2025, the plan is to reduce production-related environmental impacts such as energy, water, waste and volatile organic compounds per vehicle by 45%.
Waste Resource Management Targets	Not disclosed	Not disclosed	Not disclosed	Not disclosed	Not disclosed	An annual 1% reduction in water consumption intensity	
Battery Recycling	Undisclosed	Built its own battery recycling line at its Nevada Gigafactory, which recycles 50 tons of battery material per week	Undisclosed	Only objectives are stated , while no actual business is disclosed	Only objectives are stated , while no actual business is disclosed	Entrusted a subsidiary company to dismantle used EV batteries and recover the recyclable portion.	First battery recycling facility built at the Salzgitter site in 2021. It is currently in pilot operation and recycles up to 3,600 battery systems per year.
Use of Recycled Material	Not disclosed	Not disclosed	ET5's sustainable fabric made from 100% recycled PET bottles	The luggage rack bracket is made of recycled aluminum, which realizes 60% energy savings	Not disclosed	Not disclosed	The ID Models' headliners, fabrics, carpets, seats, door trim and decorative items are made from up to 100% recycled materials.

Source: Public disclosures, MioTech Research

In terms of target setting, none of the four new energy vehicle companies disclosed their waste and water resources use management targets. **In contrast, the two traditional car companies have formulated the control targets of emission intensity and consumption intensity by 2025.**

WHAT DO WE DO WITH ALL THE LITHIUM BATTERIES?

Lithium batteries impact on the environment

Lithium batteries, a key part of new energy vehicles, have significant environmental impact and energy consumption at the production end. The most effective way to mitigate these environmental impacts is to reduce the original production process by recycling. Extended Producer Responsibility (EPR) also requires producers to pay responsibility for their products to extend to the waste disposal stage after the product life cycle. Therefore, it is not uncommon for automobile manufacturers to engage in battery recycling related business in recent years.

Recycling of lithium-ion batteries mitigates potential shortcomings from the original process of lithium mining and extraction, particularly those relating with environmental and social risks, in addition to the obvious cause of securing an additional source of raw material for the mineral of high demand.

Most of the lithium is mined from brines and hard rock (spodumene). Already many papers point out that the raw brine produced during lithium mining can change the physicochemical properties of the soil, leading to soil salinization. The damage caused by the construction of roads, salt fields and various buildings aggravates the erosion of soil and water in the area, thereby damaging the local landscape environment and ecology.

The water consumption of brine lithium mining is also enormous. Toxic chemicals from lithium mining may leak from lithium evaporative ponds into the water supply. Studies have shown that lithium mining can affect fish herds as far as 240 kilometers downstream. Whether the lithium industry will also pollute the irrigation of crops is also a question for environmentalists.

On the other hand, the hard rock mining of spodumene requires developing a large amount of land area, replacing the local vegetation. Large-scale earthwork development is also likely to cause disasters such as soil erosion and landslides. In addition, the mining process produces a large quantity of

solid waste, mainly from the crushing and screening processes. **A ton of spodumene contains very little lithium (~1.5%), which means that processing a ton of spodumene ultimately produces around 0.99 tons of waste, which can cause severe land acidification if directly disposed of.**

Further environmental impacts also come from the lithium refining or lithium salt production process. Depending on the different processes, the refining facilities discharge various pollutants such as exhaust gas, wastewater, solid waste, etc. The calcination and leaching method will generate a large amount of acid mist and fluorine-containing gas during the spray drying process, which causes the problem of environmental pollution. Significant amount of **hazardous waste** is generated as well.

Lithium Mining from Brine

Lithium Mining from Spodumene

Lithium batteries impact on the social aspect

In addition to the environmental footprint, water use, and ecological risk, the potential labor and human rights issues affecting the mining sector need to be evaluated as well. More than half of the global lithium reserves are found in countries like Bolivia, Chile and Argentina that have comparatively weak social and environmental standards. **Cobalt is concentrated in the Democratic Republic of Congo and its extraction and refining pose unique risks in terms of human rights and conflict minerals trade**. In 2016, Amnesty International reported that major automakers were sourcing minerals from mines in the DRC that have been linked to human rights abuses.

Lithium batteries - looking beyond

The existing issues restrict many countries to develop their own lithium batteries and value chain capacities, and may also lead to **investor backlashes** if lithium extraction issues are not addressed properly. **The long development cycle (15-17 years)** also further limits the speed at which lithium production capacity can be ramped up. The market is expecting a shortage in lithium supply in the future, so having a sustainable supply to lithium will be key to sustaining EV business.

Therefore, lithium-ion battery recycling is expected to grow, which could

help fulfill the world's need for lithium and reduce its environmental and social impacts. The Lithium-ion battery recycling market is projected to grow from USD 1.5 billion in 2019 to USD 18.1 billion by 2030. Other alternatives are being studied to alleviate the environmental impact of the extraction process, for example, lithium extraction from geothermal waters where geothermal energy is naturally powering the lithium extraction from the solid rock.

Nio's battery swapping system could be another attempt addressing the battery waste problem by maximizing the effective use of Li-ion battery before being retired. All the Nio vehicles support battery charging and swapping. Through the swapping network, batteries in good working conditions serve as EV batteries, while batteries in poorer conditions could be employed in various other scenarios, such as energy storage and logistic vehicles, thereby extending the lifetime of Nio's battery assets.

WASTE MANAGEMENT -Li Auto and VW lead in recycling

Tesla and Volkswagen Group have established their own battery recycling production lines, while the list of new energy vehicle companies in China, including BYD Auto, Li Auto, XPeng, have not yet made corresponding actions. At present, domestic battery recycling mainly includes battery and battery material manufacturers entering the layout, such as Bangpu Cycle under Contemporary Amperex Technology (300750.SZ) and Ganfeng LiEnergy Technology (002460.SZ). Li Auto and Volkswagen Group are at the forefront in the use of recycled materials for car bodies, taking the lead in using recycled aluminum and recycled plastics in interior and exterior trim and parts.

In the disclosure of waste discharge, we found that Chinese manufacturers generally only disclose the amount of waste generated, while foreign manufacturers tend to disclose the amount of waste shipped out of their facilities. Disposal data can better reflect the environmental impact of an enterprise on the outside, so we suggest that more enterprises can consider disclosing such indicators when disclosing waste emissions.

Table: Water Consumption, Waste Discharge and Disposal of Major Car Enterprises (2021)

	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
Water Consumption (Million cubic meter)	35.9	2.9	0.5	0.5	0.4	8.0	39.7
Non-hazardous waste generation amount (metric ton)	471,780	270,242	10,922	17,131	11,995	292,820	Not disclosed
Non- hazardous waste disposal amount (metric ton)	Not disclosed	15,701	1,920	Not disclosed	Not disclosed	Not disclosed	28,961
Hazardous waste generation amount (metric ton)	41,447	34,934	1,142	668	1,071	20,148	Not disclosed
Hazardous waste disposal amount (metric ton)	Not disclosed	20,502	Not disclosed	Not disclosed	Not disclosed	Not disclosed	54,369

Source: Public disclosures, MioTech Research

NEGATIVE EVENTS: BYD's excessive emissions in Changsha

In addition, **according to the summary negative events monitoring of MioTech AMI platform, BYD has accumulated 138 negative events surrounding excessive emissions in the past year.** This is mainly related to an environmental storm in BYD Changsha factory in the first half of this year. Residents in the Yuhua district of Changsha, Hunan province, complained online about strong irritating gas near BYD's Changsha factory, which affected residents' health. Subsequently, the Changsha Municipal Party Committee and Municipal Government set up an investigation team to organize third-party testing institutions of government functional departments and related experts to enter BYD Changsha factory for investigation. It is reported that there is no further progress in the investigation results at present.

2. SOCIAL AND GOVERNANCE MATTERS

TROUBLES IN MANAGING LARGE WORKFORCES

We find that despite the rapid growth of new energy vehicles, their Social and Governance aspects need immediate improvement.

One social issue relates to labor and employees. **Due to the large scale of the automobile industry, automobile manufacturers generally employ a large number of manufacturing employees and managers. For example, in 2021, BYD has more than 280,000 employees and Volkswagen Group has more than 670,000 employees. The summary data of public opinion monitoring on MioTech AMI platform shows that BYD, Li Auto and Xpeng have received public attention on negative issues related to labor management.** Our AI-enabled news analysis shows that BYD suffers from a poor working environment, low factory pay rate and serious overtime ('sweatshop allegation'), while Li Auto and Xpeng were accused of revoking the signed employment contracts for fresh graduates.

Table: Number of labor-related public opinions in the last year

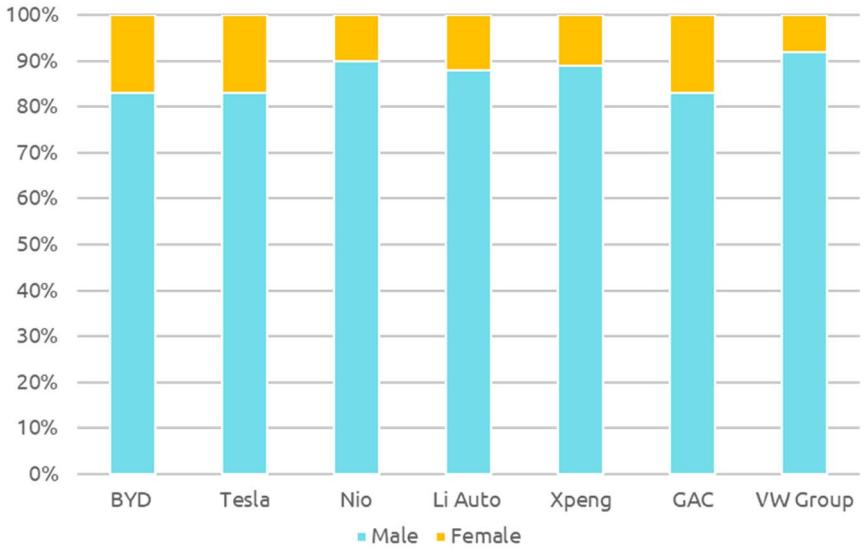
	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
Non-compliance with Labor Management	39	N/A	3	45	20	0	N/A
Poor Working Conditions	72	N/A	8	0	2	0	N/A

Source: Public disclosures, MioTech Research
(Note: 0 represents the public opinion without corresponding label in the last year, while Tesla and Volkswagen Group did not join the public opinion data statistics, so it is displayed as N/A)

MORE THAN 80% MALE WORKFORCE SHOW GENDER IMBALANCE

All seven car companies disclosed their management gender structure in the ESG report. According to another study, **female executives account for about 20% of A-share listed companies, and men account for 80%. Therefore, the gender imbalance of executives in new energy automobile enterprises is relatively high**.

Figure: Gender structure of Senior Executives of car companies (2021)



Source: Public disclosures, MioTech Research

PRODUCT QUALITY AND SAFETY AS DOMINANT SOCIAL ISSUES

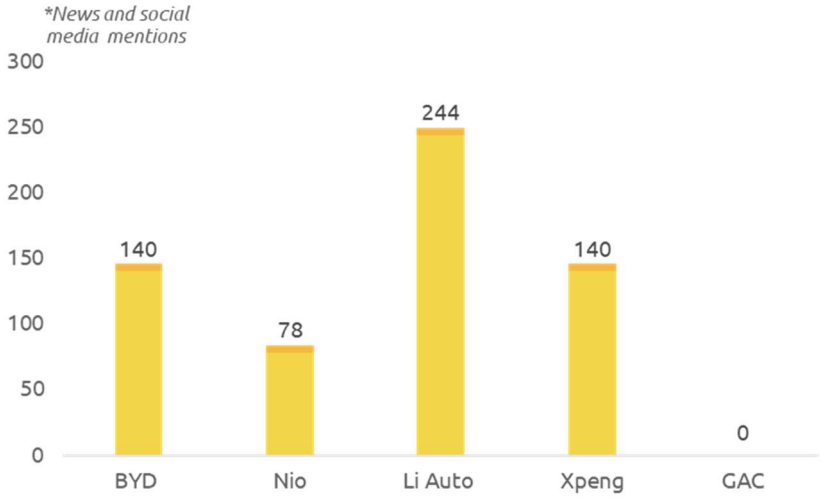
Product quality and safety are also very relevant and important aspects of automakers' "social" performance. In the traditional sense, the quality and safety of automobile products include strength safety, collision safety, environmental health and safety, etc. The listed new energy vehicles have at least reached the relevant national mandatory standards and will not be repeated here. **The two unique topics that are controversial about new energy vehicles are battery safety and reliability of assisted driving.**

The accident of vehicle fire caused by thermal runaway batteries of new energy vehicles during driving or charging has been widely reported recently. Some experts believe that the excessive pursuit of energy density performance for power batteries in the fierce market competition of new energy vehicle enterprises is one of the main reasons for frequent fires of new energy vehicles. In addition, the test verification of battery products is seriously insufficient, and the lack of a test cycle is also one of the possible reasons. At present, we have not seen the complete accident frequency statistics of car companies or models.

Since the technology of automatic assisted driving was put into practical use, it is not uncommon to report that the system leads to car accidents. It is hard to say which car company can achieve convincing safety in automatic driving. On the one hand, while striving to improve the safety of

automatic assisted driving, manufacturers should also fulfill the obligation of safety by carrying out safety training and education for users to enhance drivers' safety awareness.

Figure: The number of negative events on product safety and quality issues in the last year



Source: Public disclosures, MioTech Research
(Note: 0 represents the public opinion without corresponding labels in the recent year, while Tesla and Volkswagen Group did not join the public opinion data statistics, so they were not included in the statistics in the figure)

3. ESG GOVERNANCE - BYD and Nio AS WINNER

Table: ESG governance structures of the car companies

	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
Highest decision-making body	Board of Directors	Board of Directors	Board of Directors	Board of Directors	Board of Directors	Board of Directors	Board of Directors
Supervision and Coordination	CSR Committee	Audit Committee *	Nominating and ESG Committee	Audit Committee	ESG Taskforce	Strategy Committee	Group Steering Committee for Sustainability
Execution	ESG working groups and under BUs	Unspecified	ESG Steering Team	ESG Working Group	ESG Execution Group	Working Group and Task Force	Group Sustainability, Brand Sustainability Managers

Source: Public disclosures, MioTech Research
* limited to ESG disclosure and accounting assessment of the ESG report
** limited to GHG emissions management

Excellent ESG performance often needs to be guaranteed by a set of ESG governance structures with clear rights and responsibilities of high efficiency, clarity and effectiveness. A good ESG governance structure should include multiple levels and be fully responsible for the issues of ESG sustainability and climate change. A better approach would be to set up dedicated committees and leadership working groups to lead and implement the ESG initiatives.

BYD's Board of Directors is fully responsible for the Group's ESG strategy and reporting, and in 2021, it set up a CSR Committee to be responsible for coordinating ESG work. The actual implementation is completed by the ESG Working Group and the teams under each business group. Similarly, Nio has set up a clear three-layer ESG governance structure with a dedicated ESG committee and steering team for supervision/coordination and execution, respectively.

Tesla and Li Auto designated the Audit Committee as the regulatory coordinating body. Tesla said that its responsibilities only included being responsible for matters within the scope of accounting evaluation of ESG disclosures and ESG reports.

Xpeng has set up an ESG Task Force as a regulatory coordination body, but the level of the group composed of the president and senior executives is lower than that of other companies' committees (i.e. Board members), which may cause inconvenience for it to perform its regulatory coordination function.

Tesla's ESG governance structure is very limited in scope of work and has not set up a daily work executive body, which has been criticized by the overall market.

Finally, we will take a look at the disclosure status of ESG reports of the car companies. As early as 1999, Volkswagen Group disclosed its environmental report separately BYD and GAC began to disclose separately in 2010 and 2012 respectively. Tesla, Xpeng, Nio and Li Auto were later. Most of these ESG reports follow the GRI reporting framework, and some car companies refer to SASB/ISSB, UNGC SDGs principles and TCFD framework. Tesla and Volkswagen Group sought third-party forensics for their reports, provided by PwC and E&Y respectively.

Table: Disclosure status of ESG report of car companies

	BYD	Tesla	Nio	Li Auto	XPeng	GAC	VW Group
Year of first ESG report disclosure	2010	2018	2021	2021	2020	2012	1999
Referenced disclosure framework/standard	GRI	UNGC SDGs SASB	GRI UNGC SDGs	GRI UNGC SDGs TCFD	GRI	GRI	GRI UNGC SDGs TCFD SASB
Third-party assurance	Not provided	Yes, by PwC	Not provided	Not provided	Not provided	Not provided	Yes, by E&Y

Source: Public disclosures, MioTech Research

PARTING THOUGHTS

The rapid rise of the new energy automobile industry benefits from the gradual recognition and attention of the mainstream public to environmental protection and sustainable development in this era, which is similar to the development of ESG. However, in the period of rapid development of the industry, it means that **the board of directors and management will focus on the speed of business development, and often ignore the governance of other elements.**

Is a company that focuses on providing new energy or low-carbon products equivalent to practicing ESG? We believe that the essence of ESG is to examine its long-term operating ability and risk besides financial performance by measuring the performance of environmental and social corporate governance. Therefore, **the connotation of ESG is far broader than the business classification of an enterprise.** The implementation of each enterprise will inevitably have unique challenges in multiple dimensions of E, S and G. For example, if low-carbon products cannot be produced in a low-carbon and environmentally friendly way or their products have a higher carbon footprint, the environmental performance of ESG is obviously far behind that of other enterprises that do better.

The new energy vehicle industry is not a natural leader in ESG performance. Contrary to intuition, the high carbon emission intensity caused by its industry attributes, the environmental impact of production process and supply chain, the protection of workers' rights and interests in production lines, and the quality and safety of products are all aspects that need to be formulated and implemented by these enterprises urgently.

Therefore, we believe that new energy automobile enterprises should also improve ESG performance in the following key aspects:

- **Setting climate change and environmental impact management goals**

None of the four new energy vehicle companies we studied have set emission reduction targets for climate change (including greenhouse gas emissions and energy consumption management) and environmental impact (including water, waste gas, wastewater and solid waste emissions). Formulating and implementing corresponding short-term, medium-and long-term goals is a powerful and effective tool to promote sustainable and environmental management of enterprises.

- **Paying more attention to the protection of labor rights and product quality and safety.**

The public opinion data of MioTech AMI platform found that in the past year, various new energy vehicle companies had intensive negative public opinion focusing on issues such as labor and employee management, product quality and safety. Performance deficiencies on these basic social issues need to be followed up and improved by enterprises in time.

- **Improving ESG governance architecture.**

We find that most new energy enterprises have audit committees or other part-time institutions to supervise, manage and coordinate ESG affairs part-time. Given the size of the company, these companies may encounter many sustainable risks that are not mentioned in the disclosure, such as network risks and technical risks. Where the Company does not currently have a Compensation Nomination Risk Committee to assume these responsibilities, the Company may consider setting up a dedicated ESG Committee or similar organization to lead the promotion of ESG related initiatives.

MIOTECH

Authors

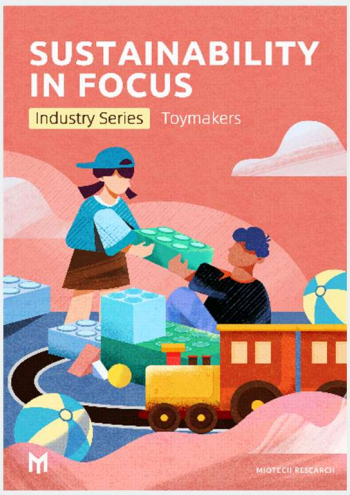
Fay Wu
Global Head of Research
fay.wu@miotech.com

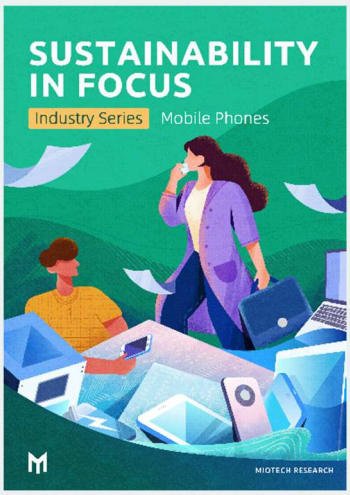
Jiaye Pan
Senior Analyst
jiaye.pan@miotech.com

Business Contact

Jack Lin
President
jack@miotech.com

Our SUSTAINABILITY IN FOCUS Portfolio





Find more

https://www.miotech.com/en-US/research

General Disclaimer

This document and all the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of Mioying Financial Technology (HK) Limited (MioTech) and is provided for informational purposes only.

Locations

Hong Kong
1706B, FWD Financial Center, 308 Des Voeux Road Central, Hong Kong
Singapore
The Work Project Bugis, 600 North Bridge Rd, Parkview Square, #10-01, Singapore 188778
Shanghai
200120, Room 1402/1405, Shanghai Center Building, No.501, Yincheng Middle Road, Pudong New District, Shanghai
Beijing
100020, Room 908, West Tower, Prosper Center, No.5, Guanghua Road, Chaoyang District, Beijing