



# Automotive Benchmark Insights Report

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**World  
Benchmarking  
Alliance**

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## Introduction

Our world needs a major decarbonisation and energy transformation to prevent the climate crisis we're facing and meet the Paris Agreement goal of limiting global warming to 1.5°C. Without urgent climate action, we will experience more extreme weather events, rising sea levels and immense negative impacts on ecosystems. These impact each and every one of us for decades to come, but more so the most vulnerable populations and regions.

196 countries signed up to the Paris Agreement in 2015, in the same year 193 countries committed to the UN Sustainable Development Goals (SDGs). The Intergovernmental Panel on Climate Change 2018 Special Report on limiting warming to 1.5°C showed that global CO<sub>2</sub> emissions need to fall by about 45% from 2010 levels by 2030 and reach net zero by around 2050.

The private sector plays a critical role in driving decarbonisation and must take action now to meet the Paris Agreement goal. The WBA Climate and Energy Benchmark is the most comprehensive accountability mechanism that measures corporate progress against the Paris Agreement and whether companies are contributing to a just transition. Private sector engagement alongside action by governments, financial sector collaboration and civil society is essential for meeting the SDGs and the Paris goal.

As part of the overall WBA's Climate and Energy Benchmarks, the Automotive Benchmark measures and ranks the world's 30 most influential automotive manufacturing companies on their low-carbon transition. The Automotive Benchmark 2021 is the first comprehensive assessment of companies in the automotive manufacturing sector using the International Energy Agency's (IEA) Net Zero Emissions by 2050 Scenario which was released in May 2021. In partnership with CDP and ADEME (the French agency for ecological transition), the benchmark assesses 30 keystone automotive companies' targets and performance against their 1.5°C pathways, to see if they are on track to meet the Paris Agreement goal using the ACT (Assessing low-Carbon Transition) Automotive manufacturing methodology. This is the third iteration of assessments: we assessed the globally influential automotive manufacturing companies on their alignment to a low-carbon world in 2019, 2020 and now again in 2021.<sup>1</sup>

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<sup>1</sup> In 2019 we assessed 25 keystone automotive manufacturing companies against a pathway built on the IEA ETP 2DS (2°C) Scenario; in 2020 we assessed 30 keystone automotive manufacturing companies against an IEA B2DS (Beyond 2°C) scenario pathway, and in 2021, 30 automotive manufacturing companies against the IEA Net Zero Scenario (1.5°C) pathway.

We undertook full ACT assessments – of performance, narrative, and trend – in 2019 and 2021. The 2020 updates were performance assessments only.

## Key findings

This report presents four key findings from the benchmark results, including comparison against previous findings, as well as a deeper dive into findings across each performance module assessed. The Automotive Benchmark 2021 shows evidence of improvements in the low-carbon performance of some of the companies. Nonetheless, it is clear that companies are not yet transitioning sufficiently to align with a 1.5°C world. They should look to good practice of their peers in stronger leadership, more investment in a low-carbon future and greater transparency to scale the low-carbon ambition and performance gap that exists in the sector.

### Key finding 1: Decarbonisation in the automotive sector wide of the 1.5°C mark

**Globally influential automotive manufacturers are falling behind on decarbonisation. In the third year of this benchmark, company performance in meeting the 1.5°C goal has dropped. Low-carbon vehicle sales made up just 7% of the sales share of the 30 assessed companies in 2020. Good progress was made by Tesla, Guangzhou Automobile and Daimler. But overall, low-carbon vehicles sales are far outweighed by the huge volumes of internal combustion engine sales by the largest vehicle manufacturers. Automotive companies must rapidly reduce their sales of internal combustion engine vehicles and transition to low-carbon vehicles or other decarbonised personal transport options.**

Progress on low-carbon transition by the companies assessed has not kept up with the rate of improvement needed to achieve the 1.5°C Paris Agreement temperature goal. Of the 28 companies assessed in both 2020 and 2021, just seven improved their overall performance assessment. The mean average performance score dropped from 8.0 out of 20 to 6.4 out of 20 and the maximum score dropped from 13.2 out of 20 (Volkswagen) to 12.7 out of 20 (Tesla).

The companies that show improved performance are:

- Three Chinese-headquartered companies: Guangzhou Automobile, which accounts for 0.6% of the 2020 passenger vehicle sales of the 30 companies, FAW (which accounts for 4.1%) and Great Wall (1.2%)
- US-headquartered Tesla (0.6%) and General Motors (8.7%)
- German-headquartered Daimler (2.6%)
- Japanese-headquartered Toyota (11.1%).

Companies with high sales volumes that did not keep up with the rate of change needed are Volkswagen, who dropped from 13.2 out of 20 to 10.7 out of 20 and SAIC who dropped from 9.9 out of 20 to 8.3 out of 20. Volkswagen accounted for 11% of global sales in 2020 and SAIC for 7%. All keystone companies in this high-emitting sector need to keep pace to achieve the decarbonisation transformation needed.

### To avoid excess locked-in absolute emissions, companies must act faster

To be aligned with a 1.5°C world, companies need to have aligned targets, investment strategies and low-carbon transition plans – and crucially, they must deliver on these. While the companies' performance on management of the low-carbon transition and on supplier engagement improved slightly, these improvements were not enough to make up for worsening performance in other assessment modules.

Just five companies improved their scores on the sold product performance part of the assessment. This module contributes 35% of the overall performance assessment score because the sector has the greatest emissions impact when its sold vehicles are in-use. These companies are SAIC (with 7% of 2020 sales volume), Daimler (2.6%), Great Wall (1.2%), Renault (3.1%) and General Motors (8.7%).

Based on the current sales mix and current in-use emissions intensities, total in-use emissions from vehicles sold by the 30 companies assessed this year are projected to be 24% higher, over the next five years, than the emissions available under the companies' 1.5°C scenario budgets. The chart below shows which companies are projected to contribute the most to these excess emissions.

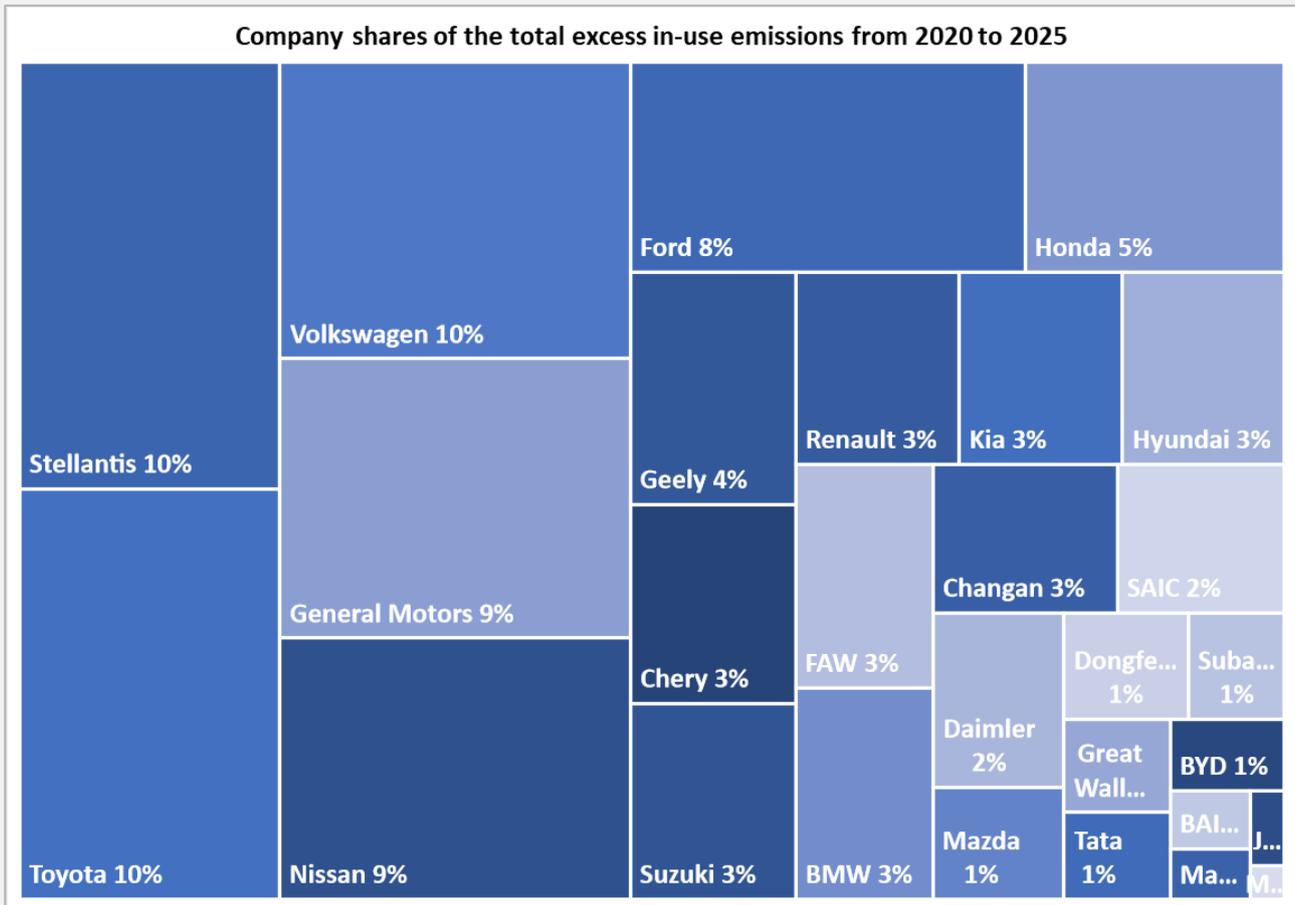


Figure 1: Company shares of the total excess in-use emissions from 2020 to 2025

### Companies are not pushing forward on decarbonisation research and development

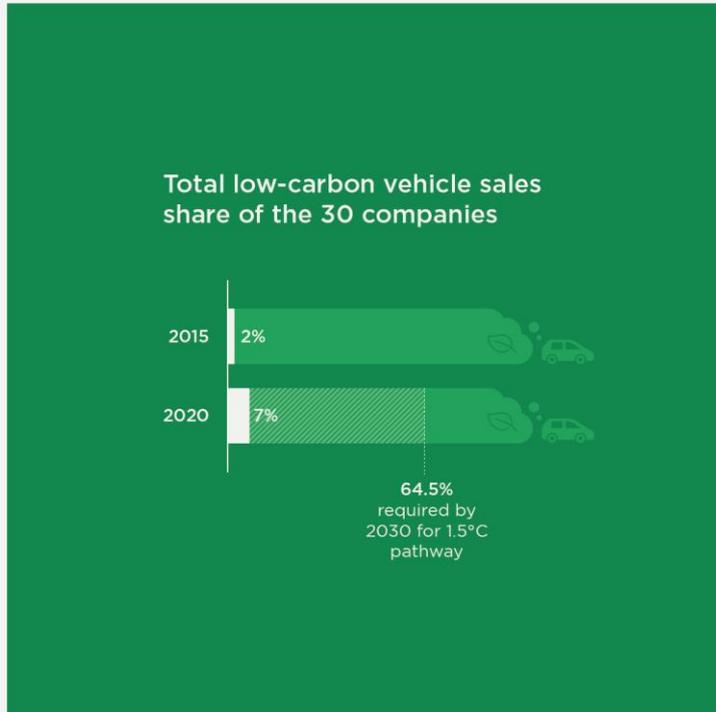
Performance has also significantly worsened on the levels of and disclosure of companies' research and development (R&D) spending on decarbonisation technologies – particularly the newer non-mature technologies such as solid state battery cells. If companies are to drive down their emissions quickly enough for a 1.5°C pathway, they need to be committing at least 23% of their annual overall capital expenditure to low-carbon R&D. Such spending is needed to bring down costs and increase uptake of low carbon technologies, so this performance area is a significant part of the assessment.

Incremental improvements to the fuel economy of internal combustion engine vehicles will not be enough for a 1.5°C pathway. Only one company, Nissan, improved its performance in this year's assessments compared to last year. Seventeen companies worsened their performance, bringing the number of companies with a zero score for this performance area to 23.

### High sales volume companies are not steering sales away from internal combustion engines fast enough

Overall, the most significant indicator of companies' low-carbon transition progress is the development of the percentage share of low-carbon vehicles (LCVs) in their sales mixes.

It is essential for companies to increase the proportion of LCVs - battery electric, fuel cell electric and plug-in hybrid vehicles - in their sales mixes. Seventeen companies increased their LCV share enough to improve their performance on this indicator compared to last year's assessments but the mean average score across all 30 companies still only improved by less than a percentage point. Only three companies either maintained or grew their LCV sales shares to match their 1.5°C pathways. These are Tesla and Chinese-headquartered Guangzhou Automobile (each with total sales contributing just 0.6% of the 2020 total sales volume for the companies assessed) and Daimler (contributing 2.6% of total 2020 sales).



Companies with the highest sales volumes need to move much faster to increase low-carbon vehicle sales. The chart below illustrates how the good progress made by some companies is made almost insignificant by the huge volumes of internal combustion engine vehicles still being sold by the vehicle manufacturers with the highest sales volumes.

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Figure 2: Total low-carbon vehicle sales share of the 30 companies

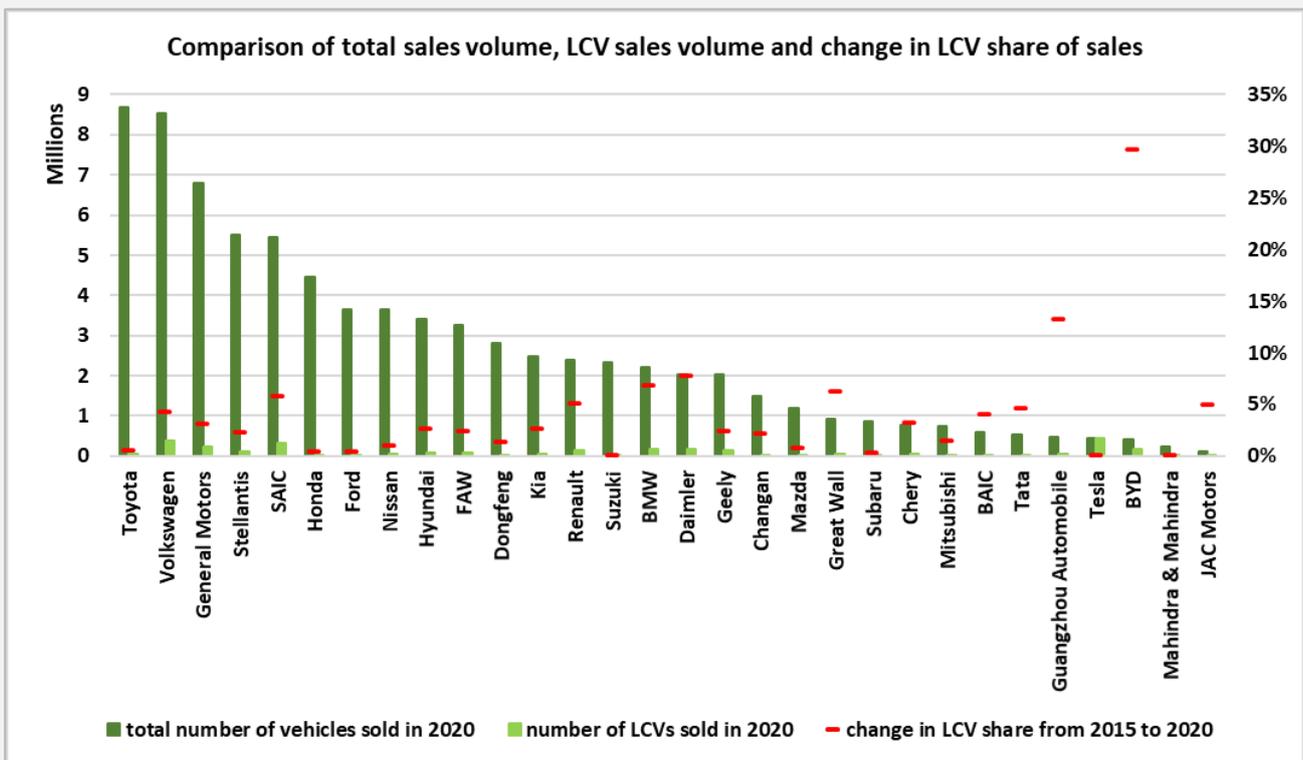
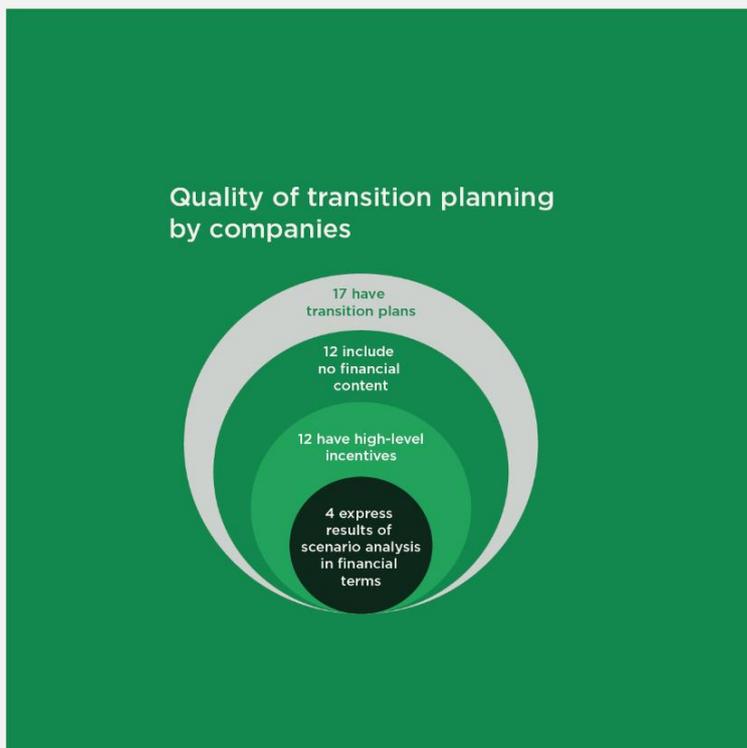


Figure 3: Comparison of total sales volume, LCV sales volume and change in LCV share of sales

## Key finding 2: Companies show they're ready to transition, but need to step up ambition

The 2021 Benchmark evidences improvements in planning and readiness to transition to a low-carbon business. Automotive manufacturers are increasingly setting targets to reduce emissions and increase sales of low-carbon vehicles. However, not enough companies are underpinning their transition plans with financial commitments and most emissions targets are not ambitious enough for a 1.5°C pathway. None of the assessed companies have set a target for its vehicle in-use emissions that covers all the company's business areas and is ambitious enough to align with a 1.5°C pathway.



### Companies' plans are improving - but they are not ambitious enough

Automotive manufacturers need to establish detailed and ambitious transition plans to manage their transitions to low-carbon businesses. Transition plans should include clear emissions reduction targets, targets for low-carbon vehicle sales and low-carbon capital expenditure commitments. They should outline the planned short and medium-term actions and provide a long-term vision for the companies' future portfolios and business activities. The plans should be stress-tested using internal carbon pricing and with scenario analysis. Twenty-three of the companies assessed improved their transition planning between last year's assessments and this year's assessments. However, with the mean average score of all sample companies being just 45% for their transition plan, there is still room for improvement.

Figure 4: Quality of transition planning by companies

### Targets

Emissions created during the combustion of fuel in internal combustion engines account for the vast majority of emissions across a vehicle's lifetime. Setting public targets to reduce emissions – especially these scope 3 emissions from the use of vehicles – is crucial for companies to show their intention to truly become low-carbon and for their stakeholders including investors, consumers and regulators to track their progress. Therefore scope 3 emissions targets covering vehicle in-use emissions should be central to every automotive manufacturing company's transition planning.

Seventeen of the 30 companies were found to have as in-use emissions target either at the group level or at a major subsidiary level. However, of these, four Japanese-headquartered companies (Mazda, Mitsubishi, Subaru and Suzuki) did not provide emissions data for the starting year of their targets so these targets could not be assessed. Therefore, 13 companies' scope 3 targets were assessed, an increase on the 8 companies whose targets were able to be assessed in the 2020 Performance Update. No company assessed in the 2021 Benchmark has set a target to reduce in-use emissions that is sufficiently ambitious for its 1.5°C pathway and that covers all of its business.

Companies should also set targets to reduce emissions from their manufacturing operations. Sixteen of the 30 companies assessed have targets to reduce these scope 1 and 2 emissions at the group or subsidiary level. Just five companies have set targets for manufacturing emissions reductions that are ambitious enough for their 1.5°C pathways and cover all their light-duty vehicle brands. These are BMW, Daimler, Ford, General Motors and Volkswagen. The first three have had their targets approved by the Science-Based Targets Initiative.

### Low-carbon vehicle ambitions

Twenty of the 30 companies have published targets to increase the share of low-carbon vehicles (LCVs) in their sales mix. Only two companies have set targets to join Tesla and meet the 1.5°C pathway requirement of 64.5% LCVs in sales by 2030 – across all sales regions and for all sold brands. Both are Chinese-headquartered companies. Changan plans to end sales of conventional internal combustion engine vehicles by 2025. Great Wall aims for 80% of its sales to be LCVs by 2025. Such ambitious targets are needed to enable the low-carbon transition and should be backed up by detailed short-term plans to develop a low-carbon vehicle manufacturing base and the accompanying supply chain.

### Oversight, expertise and incentives

Twenty-six of the companies assessed have board-level oversight of climate change issues and strategies. However, only three of these have climate change experts at the board level. Eighteen companies do not report having executive-level financial incentive programs to reward emissions reductions. Instead, incentives reward other business performance criteria such as sales growth. Only two companies, Renault and Volkswagen, had the expertise at the board level and offered financial incentives that fully align to a low-carbon transition. Renault and Volkswagen, along with General Motors, scored highest for the transition plan indicator. This highlights that climate change expertise at the board level strengthens the credibility of a company's transition plan, and incentives related to emissions reductions encourage decision-makers to prioritise a low-carbon business model.

### Financial commitment to transitions

Companies need to demonstrate a financial commitment to their low-carbon transitions by sharing information about capital expenditure (CapEx) plans for emissions reductions, expected revenues from low-carbon products and services, and planned divestments and acquisitions. Eighteen companies transition plans had some financial content, with eleven making clear public low-carbon capital expenditure commitments. These include three of the five biggest companies by sales volume:

- Volkswagen plans to invest USD 83 billion in hybridisation, electric mobility and digitalisation by 2025;
- General Motors is investing USD 35 billion in electric and autonomous vehicles between 2020 and 2025;
- Stellantis is investing USD 34 billion between 2021 and 2025 on electrification and software.

The remaining 12 companies did not share sufficient financial detail in their transition planning documents to demonstrate a shift in their manufacturing bases away from internal combustion engine vehicles. These include nine of the Chinese-headquartered companies plus three Japanese companies Mazda, Subaru and Toyota. The lack of financial commitments is particularly worrying for Toyota and SAIC as they are two of the top five largest automotive manufacturers by sales volume.

There is much opportunity for Chinese companies, many of which have ambitious LCV sales targets, to improve the transparency and credibility of their low-carbon transition plans. As well as stating their planned low-carbon capital expenditure, they should also establish emissions targets. So far, none of the eleven Chinese-headquartered companies assessed have set an emissions reduction target covering all their brands.

To better prepare themselves for business in a low-carbon economy, all companies could scale up their ambition, appoint climate experts to their boards, demonstrate financial commitment to change, and ensure that key

performance indicators to track and incentivise emissions reductions are embedded into their management strategies.

### Key finding 3: Companies need to take customers and suppliers along in the low-carbon transition

**How companies engage with customers, suppliers and policy is pivotal in catalysing the transformation of the sector. Of the 30 companies assessed, 11 have not undertaken any initiatives to actively promote the sales of low-carbon vehicles over conventional vehicles. Apart from Tesla, and companies headquartered in China where lobbying is not transparent, every company assessed is a member of a trade association that lobbies against climate policy. The benchmark also evidences insufficient engagement with suppliers to drive adoption of emissions reduction targets and use of purchasing power to stimulate development of low-carbon products. On the whole, companies are failing to use their influence with key stakeholders to accelerate the low-carbon transition.**

Automotive manufacturers are keystone actors in the automotive industry. Their influence stretches beyond their financial or operational control. The companies assessed can impact the sector include:

- Customer engagement – by promoting or incentivising the purchase of low-carbon vehicles.
- Policy engagement – by directly engaging governments on regulation policy or engaging through third parties such as trade associations.
- Supplier engagement – by collaborating with suppliers to reduce emissions within the supply chain and developing cost-effective alternatives to the internal combustion engine.

As in our previous assessment, the 2021 benchmark identifies significant lack of performance in these three key engagement areas.

#### Customer engagement

As outlined in key finding 1, low-carbon vehicle sales need to rapidly increase to reach the 64.5% of the sales mix required by 2030 for the 1.5°C scenario. The automotive industry is known for its powerful brand images. Through educational programmes or financial incentives, auto manufacturers can influence customers to switch to low-carbon vehicles and accelerate the transition to a low-carbon economy. There was some progress in client engagement since the 2020 Performance Update, however, this progress is insufficient to drive the necessary sales increases required for the 1.5°C scenario. Eleven of the companies assessed have not undertaken any initiatives to actively promote the sales of low-carbon vehicles ahead of conventional vehicles. Auto manufacturers need to do more to increase sales of low-carbon vehicles. Companies would perform better in this area by expanding campaigns globally and setting clear campaign success criteria. Examples of how companies can help consumers transition to low-carbon vehicles include BMW's Points program and Volkswagen's WeCharge program. These offer discounts for electric charging through free credits or fixed monthly memberships.

#### Policy engagement

The success of government regulation requires the support of industry stakeholders. Of the 30 companies assessed this year, 17 publicly supported climate policies, with nine other companies neither supporting nor opposing climate policies. This is an improvement over last year's performance update when only 14 companies were reported to be publicly supporting climate policies. Despite this improvement in public endorsement of policies, membership in trade associations that have opposed climate policies remains an issue for the industry. Only four

of the 30 companies assessed this year were reported to directly oppose climate policy (BMW, Ford, Honda and Tata).

Direct company support for climate policies is undermined by continued involvement with trade associations with negative climate positions. All other companies are members of at least one trade association reported to have lobbied against strengthening climate policy. It is possible for companies to positively influence trade associations on climate change issues but a clear process to review trade associations climate change positions and a policy on what to do if their position diverges is required for this to be effective. No companies were found to have a public policy containing an option to leave a trade association with negative climate opinions. Greater transparency in this area would demonstrate stronger commitment to low-carbon transition.

### Supplier engagement

The majority of scope 3 emissions are generated during the in-use phase of a vehicle. Nonetheless, according to [McKinsey analysis](#), 18-22% of internal combustion engine vehicle lifecycle emissions come from production of materials such as aluminium and steel. To meet the necessary reductions for a 1.5°C scenario companies must engage their suppliers to reduce emissions. Five of the 30 companies assessed were found to have no engagement with suppliers. A further 15 companies do not have supplier engagement on environmental issues that goes beyond integrating climate change issues into the supplier code of conduct and procurement processes. There was a marginal increase in supplier engagement with the average score increasing from 29% in the 2020 Performance Update to 34% in this assessment.

The companies that performed well in this area engaged with the Science-Based Target Initiative. BMW set approved targets to reduce scope 3 emissions from purchased goods and services and Renault works with suppliers to set their targets through CDP's Science-Based Targets (SBTs) Campaign. In addition to emissions reductions, companies need to work with suppliers to improve efficiency in key low-carbon technologies such as battery cells and green steel. Ten companies assessed were found to collaborate with suppliers on research and development projects. Supplier engagement is an area that the sector could improve to drive down cost and increase efficiency, both of which will accelerate the transition to a low-carbon economy.

Engagement with key stakeholders has seen some improvement since the 2020 Performance Update. The sector has seen increased low-carbon vehicles promotion, more public support for climate policy and greater engagement with suppliers. However, on the whole, the companies assessed are failing to use their influence with key stakeholders to accelerate low-carbon transition. Just one company, BMW, demonstrated complete low-carbon alignment on supplier engagement and, not one demonstrated full alignment on client engagement or policy engagement.

### Key finding 4: Automotive manufacturers have much work to do for a just transition in their sector

**The global transition to a well-functioning low-carbon economy can only be successful if it is socially just – that is, if the people at the heart of the current carbon-intensive systems are identified and engaged as agents of change. A socially just transformation means rapidly phasing out fossil fuels, while creating new industries, new skills and new jobs through investment, and respecting human and labour rights at the same time. The 30 keystone automotive manufacturers assessed in the benchmark were also evaluated in WBA's 2021 pilot Just Transition Assessment. The results show that automotive manufacturers have much to do in ensuring that the low-carbon transition in their sector is socially just and gives people a central place in the planned changes. The automotive sector is in fact the worst performing sector in this regard, falling behind electric utilities and oil and gas companies.**

WBA's [assessments of 180 companies on the just transition indicators](#) provides us, for the first time, with clear insight into how companies are managing the universal challenge of eliminating carbon emissions in a way that leaves no one behind. Our assessments have revealed a systemic lack of disclosure on how companies identify, prepare for and mitigate the social impacts of their low-carbon transition strategies. Our findings uncover a current absence of a holistic approach to decarbonisation planning, where emissions reduction is considered hand in hand with respect for human and labour rights to ensure a just and equitable low-carbon transition. We did however identify some good practice examples, which are highlighted in our Just Transition Assessment report for other companies to follow.

Our results show that all the automotive manufacturing companies assessed can further improve on the just aspect of their decarbonisation journey. It is the worst performing sector of our 2021 pilot assessments. The two highest scoring automotive companies – Daimler and General Motors Corporation (GM) – received 6.5 out of 16 points on the just transition indicators. The average (mean) score for the automotive manufacturers is 2.3 out of 16, which is the same as the oil and gas companies. By comparison, the average (mean) score for electric utilities is 3.9 out of 16.

### People most at risk being left out of decision that affect their future

Guidance on just transition planning highlights that companies must engage in social dialogue and consult with relevant stakeholders (such as workers, their unions or representatives, governments, impacted communities and civil society organisations) to share knowledge and negotiate a strategic direction that ensures a 'just' low-carbon transition.

The automotive manufacturers assessed perform best on their public commitment to engage in social dialogue with appropriate parties for bipartite or tripartite negotiations (indicator element 1a). Thirteen companies meet this, which is a similar proportion to oil and gas and electric utility companies. However, only 1 automotive manufacturer actually demonstrates social dialogue and meaningful engagement with stakeholders (at a minimum including workers, unions or equivalent worker bodies, and affected stakeholders) on all aspects of a just transition. This suggests that while a significant number of companies are committed to social dialogue, they need to act on this and actually have the dialogue and engagement for a just and equitable decarbonisation transition.

Overall, automotive manufacturers scored poorly on the planning indicator, with only 6% of possible points received. Daimler and General Motors show some good practices on social dialogue and planning which are illustrated in our Just Transition Assessment report.

### Green and decent jobs and skills for the low-carbon economy

Companies are expected to minimise the impact of employment dislocation caused by the transition to a low-carbon economy by creating and providing or supporting access to green and decent jobs. This is where most evidence of companies contributing to the just transition is found, however, 28 of the 30 companies score 0 on assessing and disclosing the risks of employment dislocation. Companies should look to good practice to improve this aspect, so that workers and their communities are not left stranded.

Companies are also expected to enable job creation, retention and redeployment through appropriate skills development and training. No company scores the full 2 points available for this indicator; only five out of 30 automotive manufacturers have a public commitment to reskill and/or upskill workers displaced by the transition to a low-carbon economy, and no companies disclose a process for identifying skills gaps for workers and affected stakeholders in the context of the low-carbon transition. This process involves engaging with unions (or equivalent worker bodies) and communities. These results suggest that companies are proceeding with business as usual – creating jobs and embedding some aspects, of diversity and inclusion – but are not yet engaging with the depth and specific steps they need to take to contribute to a just transition. Volkswagen displays some good practices in this area.

### Supporting and using influence to advance a just transition

Companies are expected to contribute to social protection, pay fair taxes and to manage the impact of the low-carbon transition on social protection in their just transition planning and related activities. Indicator 5 on social protection and social impact management is second lowest scoring indicator for this industry, with only 3% of points available received. Companies need to radically improve their process for understanding impacts of the low-carbon transition on social protection and taking action to address those impacts.

Companies are expected to advocate for policies and regulations that support a just transition and to avoid undermining such policies, both individually and through trade associations and employers' organisations. Indicator 6 on advocacy is the lowest scoring indicator for this industry, with less than 1% of available points scored. No automotive manufacturer discloses a process for understanding the alignment of its lobbying activities with policies and regulation that support the just transition. No company discloses where its lobbying activities do not align with policies and regulation that support the just transition. None of the companies disclose an action plan to address any misalignment of lobbying activities with policies and regulation that support the just transition, and just one just one of the 30 companies demonstrates that it lobbies, directly and/or through trade associations and/or employers organisations, for just transition policies and regulation. They have a long way to go in contributing to the fabric of social protection, manage their impacts and advocate for or against policies and regulations.

## Module level summaries

### Module 1: Targets

Module 1, targets, assesses companies' public facing emissions reduction targets as these are the north star for navigating the low-carbon transition. They provide a framework by which companies can align their strategy, capital expenditure (CapEx) and research and development (R&D) to deliver emissions reductions. Public facing targets demonstrate the credibility of companies' climate ambitions to stakeholders including investors, consumers and regulators. This module therefore assesses:

- For indicator 1.1, the alignment of the company's manufacturing emissions reduction targets with its 1.5°C pathway - weighted 2% of the performance assessment
- For indicator 1.2, the alignment of the company's fleet emissions reduction targets with its 1.5°C pathway – weighted 9% of the performance assessment
- For indicator 1.3, the time horizon and interval spacing of all of the company's targets – weighted 2% of the performance assessment
- For indicator 1.4, the company's current progress towards emissions reduction targets– weighted 2% of the performance assessment.

This module has a high performance assessment weighting of 15%, with the highest weighting placed on indicator 1.2, alignment of fleet emissions reductions targets at 9%. This is because most of the emissions from this sector occur when the vehicles sold by the company (its fleet) are driven.

It is critically important for the decarbonisation of the sector for companies to commit themselves to public facing targets to reduce their emissions. Yet 12 of the 30 companies in the sample have no targets at all for emissions reductions. These are 10 of the 11 Chinese companies (JAC Motors, BAIC, BYD, Changan, Dongfeng, FAW, Chery, Great Wall, Guangzhou Automobile and SAIC) plus Stellantis and Tesla.

For a target to be assessable, it needs to have a start year and value, an end year and a percentage reduction expected. Some companies' targets could not be assessed because this information was not complete. Five companies have assessable targets for manufacturing emissions reductions but not for in-use emissions reductions (Hyundai, Mazda, Mitsubishi, Subaru and Suzuki).

**None of the assessable in-use fleet emissions reduction targets are fully aligned to the companies' 1.5 °C pathways.** The targets for two companies (Honda and Tata) are ambitious enough but do not cover a high enough proportion of the companies' vehicles sales for full scoring on this indicator. Ford, Toyota, Kia, Nissan, BMW and Daimler have in-use emissions target reaching at least halfway to the ambition required under their 1.5°C pathways.

Just five companies have fully aligned targets for indicator 1.1, manufacturing emissions reductions (2%). These are BMW, Daimler, Ford, General Motors and Volkswagen. Geely also has an aligned target but this only covers its Volvo Cars subsidiary.

Once sold, vehicles usually remain on the road for at least 13 to 19 years depending on the sales region. So, to avoid on-going locked-in emissions, companies' targets need to look out beyond the expected regionally weighted average lifetime of their sold vehicles. They also need to focus on achievement of near-term emissions reductions rather than allowing for delayed action. Indicator 1.3, time horizon of targets (2%), assesses these issues.

Just five companies have far-sighted enough targets covering all vehicles sold or produced. Suzuki and Toyota have targets for both in-use emissions and manufacturing emissions. Hyundai, Nissan and Subaru's longer-term targets are for manufacturing emissions only. Just three companies have near-term targets within five years of the 2020 reporting year (Honda, Toyota and Volkswagen). Only Toyota and Volkswagen also have a next target set at no more than five years beyond the first target.

The fourth and final indicator in the module, 1.4 achievement of previous targets (2%), assesses whether or not companies are on track to meet their targets once set. Of the 17 companies with currently running manufacturing emissions reduction targets, 12 are currently on track to achieve at least one of those targets. Four companies need to speed up their manufacturing emissions reductions to achieve their targets (Daimler, Geely, Mahindra & Mahindra and Renault). Of the 12 companies with currently running in-use emissions reduction targets, just one, Honda, is currently on track to achieve its target. Seven of the others have even increased rather than decreased the in-use emissions intensity of their sold vehicles over the last three years (Ford, Geely, Kia, Mahindra & Mahindra, Nissan, Renault and Toyota).

Companies would greatly improve their target setting by engaging with the Science-Based Targets Initiative (SBTi). Just five companies currently have 1.5°C scenario SBTi approved targets for manufacturing emissions (BMW, Ford, General Motors, Daimler and Geely for its Volvo brand). Three have B2DS (Beyond 2°C) scenario SBTi approved targets (Renault, Mahindra & Mahindra and Volkswagen). No companies have SBTi approved targets for in-use emissions – not under the under the B2DS (Beyond 2°C) scenario pathway nor under the 2DS (2°C) scenario pathway.

## Module 2: Material investment

Module 2, material investment, assesses companies' action to reduce their manufacturing emissions intensities. It has a single indicator, 2.1, and has a low performance assessment weighting (2%) as emissions during the vehicle assembly process are far less significant than emissions when the vehicles are used.

Four of the companies in the sample do not report their scope 1 and 2 manufacturing emissions (three publicly listed, JAC Motors, BYD and Changan; one fully state owned, Chery; and all headquartered in China). A further two publicly listed Chinese companies (Guangzhou Automobile and Great Wall) and one US-headquartered company (Tesla) have incomplete data across the 2015 to 2020 assessment period.

Of the remaining 23 companies assessed, three kept up with the rate of decarbonisation needed to maintain alignment with their 1.5°C pathways (BMW, Daimler, & Tata), four improved sufficiently to meet their pathways (Volkswagen, General Motors, FAW & Toyota) and a further two improved but not by enough for full alignment (Geely & BAIC).

In 2020, on average, emissions per vehicle produced were higher for companies headquartered in China than for companies headquartered elsewhere (even when the fully state-owned high emissions intensity outlier, FAW, is taken out of the mix). As Chinese companies ramp up their production volumes, it will become increasingly important for them to adopt best emissions management practices at their production facilities.

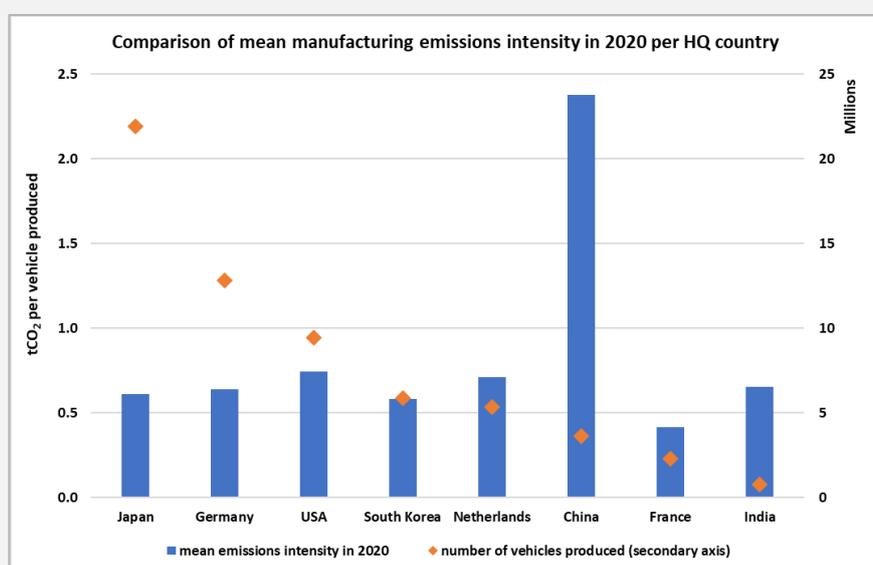


Figure 5: Comparison of mean manufacturing emissions intensity in 2020 per HQ country

### Module 3: Intangible investment

Module 3 assesses each company's research & development (R&D\*) investment in low-carbon technologies that can mitigate climate change relative to overall company capital expenditure through one indicator, 3.1. The expectation is that companies should spend an amount on low-carbon R&D equivalent to at least 23% of overall capital expenditure.

Innovation and technologies to replace high-emitting vehicles are crucial to driving decarbonisation in this sector. R&D is also an important way of reducing barriers to consumer uptake of low-carbon vehicles. A company's spending on R&D gives insight into its commitment to alternative technologies that may support new, low-carbon business models. Therefore, this module – comprising indicator 3.1 – is heavily weighted at 12% accounting for 2.4 out of the overall performance assessment score of 20.

As with the 2020 Automotive Performance Update, this assessment found that many companies do not disclose adequate information to demonstrate this low-carbon R&D investment. With only two companies scoring full marks for disclosing non-mature low-carbon R&D expenditure. This is in part because many financial and many environmental reporting standards do not require companies to report a figure for R&D. The reluctance to be transparent about R&D figures within the industry may be due to competitive advantage issues. Until there is a requirement for companies to increase transparency in this area it will be difficult to assess the true commitment of the sector to low-carbon R&D.

As the only company that has a specific disclosure in its sustainability report, Honda remains the leading practice for disclosure of R&D spending. Twenty-three companies assessed scored 0% for this module. BMW, Daimler, Ford, General Motors, Renault, Mitsubishi, and Volkswagen have all committed to investing in low-carbon technology, and overall R&D costs are reported in the financial reports. However, no breakdown of research and development expenditure was reported so these companies scored 0% for this indicator. All eleven Chinese-headquartered companies scored 0% for this module despite an increase in the sale of electric vehicles and a strong emphasis on low-carbon R&D in some of their reports. It is therefore likely that limited disclosure has resulted in poor scoring for this module rather than a lack of investment.

Of the companies that reported total mitigation R&D expenditure in 2020, the average spend was 26.7% of total capital expenditure. This is above the amount for this benchmark of 23%. From the narrative within all companies reporting, it is clear that much of this expenditure is on low-carbon vehicles such as electric or hydrogen vehicles. The lack of detail leaves the assessor unable to determine if this mitigation spending is on mature technology such as internal combustion engine efficiency.

#### *Technical notes:*

\*R&D is defined as activities connected with innovation, for example, work directed towards the innovation, introduction, and improvement of products and processes. Low-carbon R&D focuses technologies that reduce the environmental impact or provide low-carbon product alternatives. In the automotive benchmark, mature technologies were understood to be those related to fuel efficiency through improvements to internal combustion engines and vehicle design. Non-mature technologies are those related to hybrid, electric and fuel cell vehicles, as well as related charging or refuelling infrastructure.

Expenditure on non-mature, emerging technologies are award more in the scoring because more R&D investment is needed to develop and scale up immature technologies.

### Module 4: Sold product performance

Module 4, sold product performance, assesses the most significant emissions from the automotive manufacturing sector, which occur when vehicles are in use. It is critically important for the sector to transition away from internal combustion engines. This module therefore assesses:

- For indicator 4.1, the fleet emissions pathway – weighted 8% of the performance assessment
- For indicator 4.2, the fleet emissions lock-in – weighted 7% of the performance assessment

- For indicator 4.3, the low-carbon vehicle share – weighted 15% of the performance assessment
- For indicator 4.4, the rate at which companies are increasing the distance travelled by their ICE vehicles per litre of fuel consumed (conventional internal combustion engine efficiency) – weighted 5% of the performance assessment.

This is the most highly weighted module in the performance assessment at 35% of the performance assessment score.

Indicators 4.1 and 4.2, fleet emissions pathway (8%) and fleet emissions lock-in (7%), capture how companies' in-use emissions are developing (past and future). The in-use emissions are compared to company decarbonisation pathways established under the scenario applied for the assessments.

Compared to last years' performance, only five companies either maintained or improved their fleet emissions pathway performance scores (Tesla, BYD, JAC Motors, Great Wall & Mitsubishi). Two thirds of the companies fell further behind. This means that, compared to last year's assessments, there was a larger gap between the reporting year in-use emissions intensities of these companies' sold vehicles and the in-use emissions intensities needed for their decarbonisation pathways under the scenario applied for the assessment. These 22 companies are not keeping up with the rate of change needed to decarbonise the sector. Seven of them even increased the in-use emissions intensity of their sold vehicles between 2015 and 2020 by more than 5%. These are Renault, Stellantis, Ford, Daimler, Suzuki, Mazda and Nissan. It is fair to acknowledge that a change in the testing regime has resulted in higher measurement values in the last three years. However, Renault, Stellantis, Ford, Suzuki and Nissan even increased their intensities between 2018 and 2020 under the same new testing regime.

With the current sales mix and current in-use emissions intensities, in-use emissions from vehicles sold by three of the companies assessed are projected to be 50% higher, over the next five years, than the emissions available under their 1.5°C scenario budgets (Chery, BYD and JAC Motors). A further nine companies exceed their budgets by more than 25% (Nissan, Suzuki, Geely, Renault, Changan, Mahindra & Mahindra, Stellantis, Ford and Tata).

These companies' in-use emissions are effectively locked-in, i.e. unavoidable, unless there are very rapid improvements in the overall fuel economy of sold internal combustion engine (ICE) vehicles and very rapid increases in the share of low-carbon vehicles (LCVs) in the sales mixes, i.e. plug-in hybrids, battery electric or fuel cell electric vehicles.

However, the individual locked-in emissions performances of the companies assessed do not provide the whole picture. Companies selling more vehicles have a greater impact on emissions for the sector. As we can see in the chart below, just five companies account for nearly 50% of the total emissions above the collective five-year budget for the companies assessed.

High sales volume companies must do more to more rapidly decarbonise their vehicles.

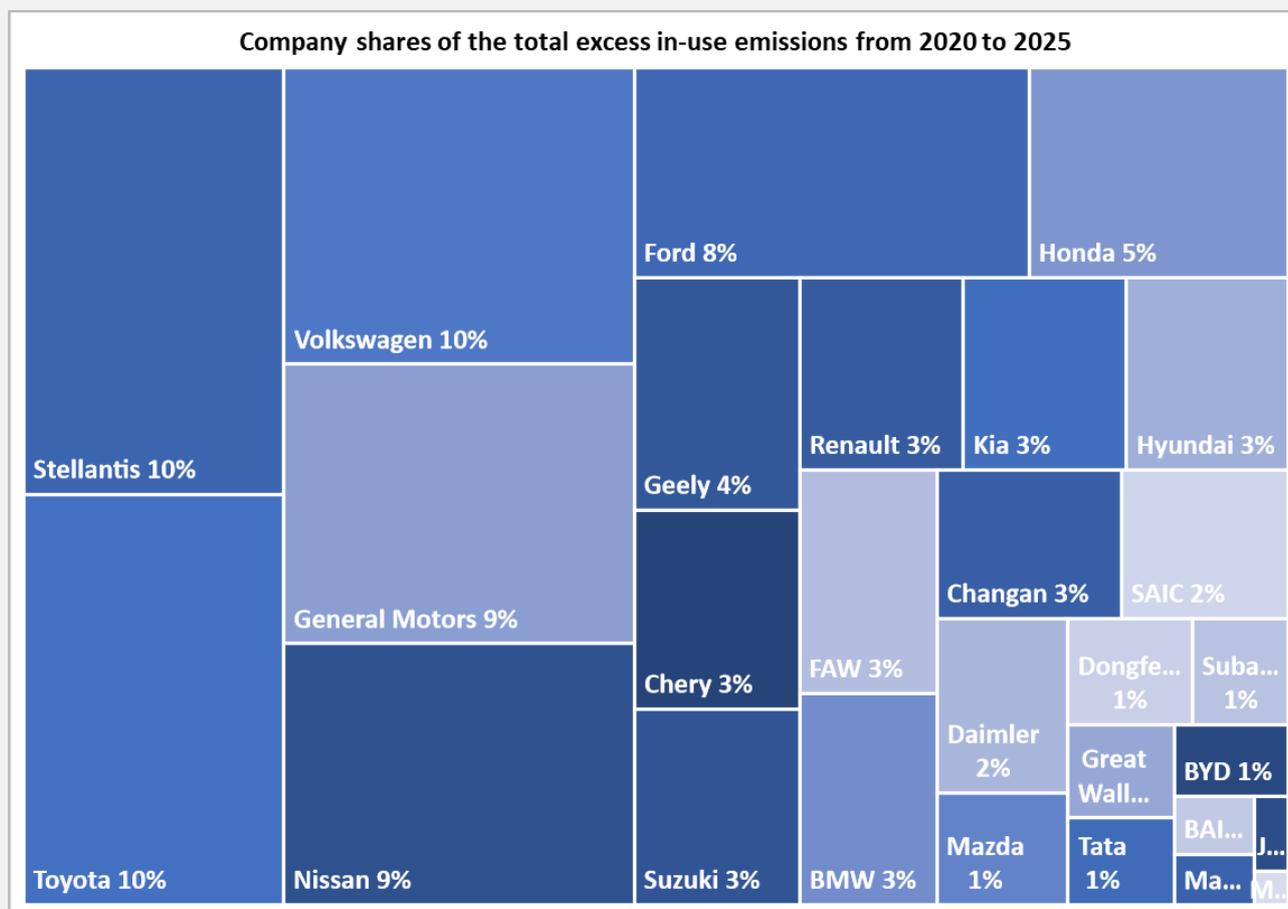


Figure 6: Company shares of the total excess in-use emissions from 2020 to 2025

Improvements in ICE vehicle fuel economy alone will not decrease companies' in-use emissions fast enough to meet their 1.5°C pathways. Companies also need to rapidly accelerate the rate at which low-carbon vehicles (LCVs) are taking sales share from ICE vehicles. Therefore, indicator 4.3, low-carbon vehicle share (15%), is the highest weighted indicator across the whole performance assessment.

Compared to last years' assessments, 15 of the companies assessed improved the alignment of their LCV shares to their company pathways this year. Two companies kept pace with the change needed for full alignment to the new 1.5°C scenario. These are Tesla who only sell LCVs and Guangzhou Automobile who increased the percentage share of LCVs in its sales mix from 7.5% in 2019 to 13.2% in 2020. Eleven companies did not keep pace with the change needed to maintain their previous level of alignment. (Stellantis and Chery do not have 2019 assessment results for comparison.) Unfortunately, seven companies, six headquartered in China and the seventh in India, reduced the percentage share of LCVs in their sales mixes in 2020 compared to 2019 (JAC Motors, BAIC, BYD, Changan, Chery, Dongfeng and Mahindra & Mahindra).

There are clear differences in the rates at which the companies assessed are shifting their sales from ICE vehicles to LCVs. The top performers are Tesla, who only sells LCVs, and BYD, who increased the share of LCVs in its sales from 12.9% to 42.6% between 2015 and 2020, followed by Guangzhou Automobile, who increased from 0% to 13.2%. However, the number of additional LCVs those changes brought to the road is tiny compared to the number of ICE vehicles sold by companies such as Toyota, Volkswagen and General Motors. All three of these companies have improved their indicator 4.3 scores compared to last year's assessments - but not by anywhere near as much as is needed. Figure 1 in key finding 3 (at page 6) clearly illustrates this point. Companies with high sales volumes must do more to increase their sales of LCVs.

Indicator 4.4, conventional ICE vehicle efficiency (5%), assesses the rate at which companies are increasing the distance travelled by their ICE vehicles per litre of fuel consumed. Only two of the companies assessed improved their performance on this indicator compared to last year's assessments. These are JAC Motors and BAIC, both Chinese companies.

For six of the ten top sales volume companies in 2020, the fuel economy of their sold ICE vehicles worsened overall between 2018 and 2020 (Toyota, Volkswagen, Stellantis, Honda, Ford and Nissan). As well as not shifting to LCV vehicles at a fast enough rate, these companies are shifting towards sales of generally heavier and less fuel efficient vehicles such as sport utility vehicles (SUVs), multi-purpose vehicles (MPVs) and pick-up trucks. With the exception of Stellantis, the proportion of more compact car versions in these companies' conventional passenger car sales decreased slightly over the last three years.

Overall, the sales mix for the 30 companies assessed is shifting towards larger, heavier sports utility type vehicles faster than it is shifting towards LCVs. Companies must push down the accelerator on shifting their sales mixes to LCVs.

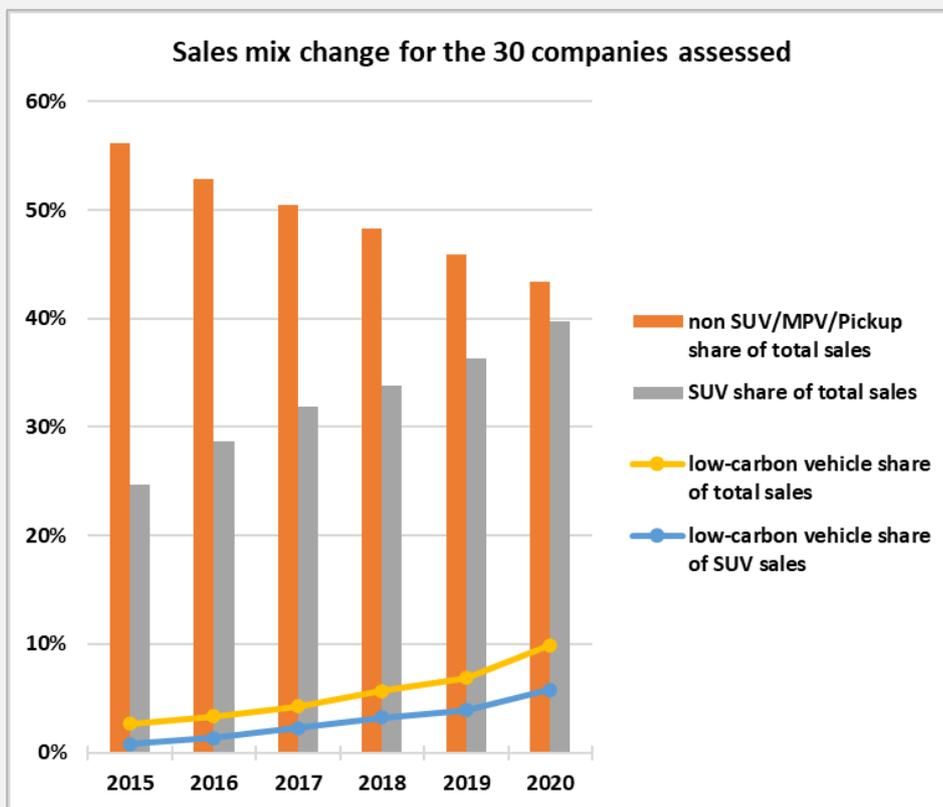


Figure 7: Sales mix change for the 30 companies assessed

## Module 5: Management

Module 5, management, assesses governance mechanisms companies are using to manage the transition to a low-carbon economy in five key areas: low-carbon transition plans; climate-related scenario analysis or stress testing; level of oversight (e.g. at board level); climate expertise; and incentives for climate change management. Together the indicators of module 5 paint a picture of the companies' management and strategic approach:

- With indicator 5.1, level of oversight (e.g. at board level) of climate change issues – weighted 1% of the performance assessment
- With indicator 5.2, climate expertise – weighted 1% of the performance assessment

- With indicator 5.3, low-carbon transition plan – weighted 4% of the performance assessment
- With indicator 5.4, incentives for climate change management – weighted 1% of the performance assessment
- With indicator 5.5, climate-related scenario analysis or stress testing – weighted 4% of the performance assessment.

Twenty-three companies improved their score in this module compared to last year's assessment, indicating an overall improvement in climate governance, as company's set out more detailed plans to transition to producing low-carbon vehicles. The top five performing companies in this module were Renault, Volkswagen, BMW, Ford and Daimler. Each of these companies has board-level oversight of climate change, a detailed transition plan and has conducted climate scenario analysis.

Overall, 26 of the 30 companies have board-level or executive oversight of climate change, indicating that the highest levels in the companies are responsible for decisions on climate change. Three of the companies that were not found to have board-level or executive oversight were Chinese companies. In general, these have limited transparency on their climate governance. The fourth company is Stellantis. This new company was formed in 2021 from the merger of Groupe PSA and Fiat Chrysler Automobiles (FCA). It has not yet published detailed information on its climate oversight.

Despite the high-level oversight of climate change reported by most companies, just three companies were found to have significant expertise in climate change and the low-carbon transition at the board-level. One of Renault's Vice-Presidents previously worked at the low-carbon transition focused think tank IDDRI. Mahindra Group's Executive Chairman is a board member of the UN Global Compact and has chaired the High-level Commission on Carbon Pricing and Competitiveness. Volkswagen likely has the strongest climate expertise, with its sustainability board including a co-director for the Potsdam Institute for Climate Impact Research, a president of the European Green faction of the European Parliament, a founding director of UN Global Compact and a former EU Commissioner for Climate Action.

Sixteen companies disclose information stating that incentives are given to employees for management of climate change issues, with 12 of these companies stating that these incentives are given at the board or executive level. However, there is limited transparency about the proportion of overall compensation that these incentives account for, with just three companies providing information on this (Daimler, Renault and Volkswagen). Without this information it is difficult to assess how materially significant climate change incentives are as part of executive remuneration.

The median score on the transition plan indicator was 46% of the points available for the indicator, compared to a median score of 29% in last year's assessment. This was despite the addition of Chery to the companies assessed, which disclosed no information on its transition planning, and the replacement of Groupe PSA and FCA with Stellantis, which has not yet fully disclosed its full transition plan. The number of companies scoring over 70% on this indicator increased from five to eight. This suggests that overall, companies' climate transition plans have become more detailed and ambitious.

Sixteen transition plans included scope 1 and 2 targets at the group or major subsidiary level, whilst a further 17 had some scope 3 use of sold products targets included in their plans (Tesla did not have a scope 3 target but its all electric vehicles have no tailpipe emissions). Most significantly, 24 out of 30 companies have made commitments to increase low-carbon vehicle sales at the group or major subsidiary level. Four of the six companies without published commitments to increase low-carbon vehicle sales were Chinese companies. Chinese companies are generally less transparent over their low-carbon transition plans (BAIC, BYD, Dongfeng and Chery). However, some Chinese companies have made highly ambitious low-carbon vehicle, or new energy vehicle as they are known in China, commitments. Changan has committed to end sales of conventional internal combustion engine vehicles altogether by 2025, whilst Great Wall is aiming for 80% of its sales to be new energy vehicles by 2025.

Eleven of the 30 companies assessed disclosed significant financial content in their transition plans. Only eight reported using an internal carbon pricing mechanism to support financial planning.

Fifteen of the thirty companies have conducted some form of climate scenario analysis. The details published on these also vary significantly, with some companies not clearly disclosing the scope of the analysis in terms of business geographies and emission scopes, or the results in value-at-risk terms. Ford, Renault and Toyota were found to have the best scenario analysis of the companies assessed.

## Module 6: Supplier engagement

Module 6, supplier engagement, assesses companies' efforts to decarbonise the supply chain by reviewing information relating to the type and coverage of the supplier engagement, along with any demonstrated collaboration with suppliers on R&D and emissions reductions. This module comprises one indicator and is weighted at 6%, accounting for 1.2 points out of the overall performance assessment score of 20.

Automotive manufacturers rely on technologically complex and integrated supply chains for their vehicle parts. Not only do supply chain emissions fall under the indirect upstream emissions companies should be accounting for in their greenhouse gas reporting, but innovation across the supply chain can also be key to achieving ambitious decarbonisation goals in both the manufacturing and use phases of the vehicles. As such, engaging with suppliers to drive progress on the low-carbon transition is a vital element of climate leadership.

Comparing average performance for this indicator in the current assessment to the 2019 Benchmark and 2020 Performance Update highlights the lack of progress in this area, with the mean average scoring remaining at 33% of the points available for the indicator. Five out of 30 companies were found to have no climate-focused engagement with suppliers.

For half of the companies assessed, supplier engagement on environmental issues does not go beyond integrating climate change issues into the supplier code of conduct and procurement processes. While some companies mention in such documents that greenhouse gas emissions reductions are a necessity, it is unclear how this is monitored or enforced.

The top-scoring companies in this area of the assessment are BMW, General Motors, Stellantis and Volkswagen. These companies provided evidence of emissions reductions through supplier engagement as well as evidence of collaboration with suppliers on low-carbon drivetrain research and development (R&D).

BMW received the highest score. An example of its good practice is its Science-Based Initiative (SBTi) approved target to reduce the scope 3 emissions from purchased goods and services and upstream transportation and distribution services by 22% per vehicle sold between 2019 and 2030.

Companies such as Daimler, through Mercedes-Benz, have partnered with companies such as H2 Green Steel (H2GS) to produce CO<sub>2</sub>-free steel. However, this alone is not enough to make the transition required for the 1.5°C scenario. Twelve of the companies assessed participate in the CDP Supply Chain Programme. General Motors has eight suppliers that have engaged with the SBTi. However, Renault was the only company in the assessment that has signed up for the CDP 2021 Science-Based Targets (SBTs) Campaign that requests that suppliers set science-based targets. More companies actively recruiting suppliers to set SBTi approved targets would accelerate the sector's transition to a low-carbon economy.

## Module 7: Client engagement

Module 7, client engagement, assesses companies' customer engagement efforts. Including low-carbon vehicle options in product ranges is not enough, on its own, to achieve rapid low-carbon transition. Companies should make active efforts to influence their customers and direct a culture change away from high-emitting vehicles. Sales promotions should be actively in favour of low-carbon vehicles. This module assesses information on promotions of low-carbon vehicles, including geographic coverage and the ambition of any associated sales

performance indicators. It comprises one indicator and is weighted at 4%, accounting for 0.8 out of the overall performance assessment score of 20.

In the current assessment, 11 out of the 30 keystone companies have not undertaken any initiatives to actively promote the sales of low-carbon vehicles ahead of conventional ones. This is a slight improvement on last year's assessment where 16 out of 30 companies did not actively promote the sales of low-carbon vehicles. This progress can be seen by the mean average sample score rising to 34% of the points available for the indicator, up from 25% in previous assessments. Despite this scoring increase, in an industry in that invests significant sums in advertisement and brand awareness, there is significant scope for improvement by developing clearer strategies to shift consumers towards low-carbon vehicles.

Much of the focus of incentives is on mature markets for low-carbon vehicles such as Europe, North America, and China. To deliver the low-carbon vehicle sales required for the 1.5°C scenario companies will need to improve client engagement in developing low-carbon vehicle markets such as India. Sixteen of the 19 companies to score in this indicator offer customers incentives in just two regions or fewer. Only Tesla, who solely sell battery powered electric vehicles, promote the switch to low-carbon vehicles in three or more regions.

Eleven companies scored below 50% for this module (BAIC, BYD, Dongfeng, Great Wall, Hyundai, Mitsubishi, Mahindra & Mahindra Nissan, Tata, Toyota and Volkswagen). Within this group Toyota is the only company assessed to have set clear sales performance indicators. The failure to communicate sales performance indicators has impacted the overall score on this module for the rest of these companies.

Examples of good practice on client engagement include financial incentives for electric vehicle charging such as BMW's Points program or Volkswagen's WeCharge program.

## Module 8: Policy engagement

Module 8, policy engagement, assesses companies' political influence from the perspective of three indicators:

- For indicator 8.1, whether the company has a policy on what action to take when the industry or trade associations it belongs to are found to oppose climate policies - weighted 2% of the performance assessment
- For indicator 8.2, whether the company engages with any industry or trade associations that hold climate-negative positions - weighted 2% of the performance assessment
- For indicator 8.3, whether the company publicly supports or obstructs climate policies - weighted 2% of the performance assessment.

Nearly all auto manufacturers were found to have made public statements supporting government climate policies. In the USA, Ford, General Motors and Stellantis made a joint statement supporting the Biden Administration's Build Back Better Plan and announcing a shared aspiration for 40-50% of US sales by 2030 to be low-carbon vehicles. Volkswagen and Daimler have both stated public support for the European Green Deal. Some direct opposition to climate policy appears to persist however, with [the Guardian](#) reporting that BMW, Ford and Honda wrote to the UK government arguing that the UK's ban on internal combustion engine vehicle sales should be introduced in 2040, rather than the government's target year of 2030.

Automotive trade associations continue to oppose climate policies. With the exception of the Chinese-headquartered companies and Tesla, every company assessed was a member of trade associations that have opposed climate policies. Both the European Automobile Manufacturers Association (ACEA) and the Association of the German Automotive Industry (VDA) stated their opposition to the European Union's proposals to cut emissions from new automobiles by 50% by 2030 and 100% by 2035. Likewise, the Japan Automobile Manufacturers Association (JAMA) and the UK's Society of Motor Manufacturers and Traders have stated their opposition to policies which ban internal combustion engine vehicles. In February 2021, the Alliance for Automotive Innovation stated that US corporate fuel economy standards should not return to the levels (5% per

annum reduction for cars and 3.5% per annum for trucks) introduced under the Obama administration, but instead remain halfway between the standards set by the Trump administration and Obama administration.

Only two companies had detailed, publicly available policies stating how they ensure their trade association memberships are consistent with their approach to climate change (BMW and Ford). Both companies publish the principles that they follow in ensuring alignment and in 2020, Ford published its first annual review of how the trade associations it is a member of align with its climate change position. Neither companies' policy specifies the option of leaving trade associations where there is significant misalignment on climate policy. This is significant, as several major trade associations continue to publicly oppose major climate policies which may be at odds with company's stated ambitions on climate change.

Other companies state that they have processes in place to ensure alignment with trade associations on policy engagement, but do not have a public policy to review trade associations' positions on climate policy and specify actions to be taken in the event of misalignment on climate policy. The major trade association in China is the China Association of Automobile Manufacturers (CAAM), but it does not directly lobby government. In China, companies are limited in their ability to support or oppose climate policy, but several companies have referenced their role in delivering China's goals of peaking carbon emissions by 2030 and reaching carbon neutrality by 2060. BYD was the only Chinese-headquartered company assessed who signed the [COP26 Declaration on accelerating the transition to 100% zero emission cars and vans](#). Chinese-headquartered companies performed reasonably well in this module, as they have expressed support for climate policies and no evidence was found of direct opposition to climate policy or indirect opposition through trade associations.

## Module 9: Business model

The shift to a low-carbon transport system implies a rethink of the way vehicles are used in society, beyond just shifting from internal combustion engine vehicles to low-carbon vehicles. Module 9, business model assesses company actions across three new business areas offered by the low-carbon transition:

- For indicator 9.1, activities that reduce barriers to low-carbon vehicles – weighted 3% of the performance assessment
- For indicator 9.2, activities that enable more efficient use of cars than personal ownership – weighted 3% of the performance assessment
- For indicator 9.3, activities that develop mass transit vehicles or alternative personal vehicles – weighted 3% of the performance assessment.

New business activities maturity is scored based on their current profitability and size, as well as plans for their future growth and deployment.

The median score in this module was 18% of the points available for this module, with 16 companies scoring less than 20%. This was often because the new business activities were of a small scale and the companies do not disclose clear plans to develop them. Five companies scored 0% because they either were developing no new low-carbon business activities or these were too early stage to be considered (Subaru, FAW, Chery, Suzuki and Mazda). BAIC, Stellantis, Volkswagen and SAIC had the highest scores because they were developing two or more low-carbon business activities with clear plans for their expansion.

The first area companies were assessed on was activities that reduce barriers to low-carbon vehicles, such as development of electric vehicle charging infrastructure, battery manufacturing, energy storage or hydrogen infrastructure. Twenty of the 30 companies assessed in this benchmark are developing business activities in this area. Tesla and BAIC are the leading companies in this area. Tesla has three substantial activities in this area: its energy generation and storage business which provided 6.3% of Tesla's total revenue in 2020; its supercharger network which had 2,500 locations worldwide in 2020; and thirdly it is aiming for its own battery cell manufacturing to reach 3 terrawatt-hours (TWh) by 2030. BAIC has been developing a battery swapping model,

an alternative to electric vehicle charging, with 160 battery swap stations online by the end of 2019 and a goal to build 3,000 by 2022, capable of serving 500,000 electric vehicles.

The second area assessed were activities that enable more efficient use of cars than personal ownership, such as car-sharing, ride-hailing and car rental. Twenty of the 30 companies were developing business activities in this area, though they were generally less mature than activities in the previous category. The leading companies were SAIC, Volkswagen and Stellantis. SAIC has a mobility business called Xiangdao Travel, which has over 26 million registered users for its ride-hailing service as well as a car rental business which covers 154 cities in China. Stellantis has inherited Groupe PSA's Free2Move mobility business, which offers car-sharing and ride-hailing services and generated EUR 830 million (USD 948 million) of revenue in 2020.

Activities that develop mass transit vehicles, such as buses or light-rail, or alternative personal vehicles, such as electric scooters, was the third area to be assessed. Fewer companies have activities in this area, with 15 of the 30 the companies assessed developing these business activities. The top three scoring companies were BYD, BAIC and Renault. BYD is developing monorail systems in several cities in China, Brazil and North America, as well as tram systems in China and electric buses. However, limited public information was found on planned growth of these business areas. Renault sells electric scooters and Twizys, electric quadricycles, though it only sold 2,000 Twizys in 2020.

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