

TCFD Auto Preparer Forum

Planning to scale the e-mobility
transition: climate-related financial
disclosure and the automobile sector



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In collaboration with:

**BMW
GROUP**

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1 Executive summary



1 Executive summary

Automobiles revolutionized the concept of mobility in the early twentieth century, spurring economic progress, technological development and the emergence of new industries and manufacturing methods. Today, the automobile sector (auto sector) is going through another revolution as the rise of electric and low carbon vehicles, digitalization and Mobility-as-a-Service (MaaS) business models drive deep transformation throughout the sector.

Climate change is simultaneously a challenge and an opportunity for the auto sector. The environmental impact of fossil fuels used in internal combustion engines (ICEs) is a growing concern to governments and the sector faces transition risks as stringent emissions regulations are introduced. As the global average temperature rises, physical risks such as increased severity and frequency of extreme weather events threaten to disrupt supply chains, halt operations and damage assets.

At the same time, the low carbon transition presents opportunities to the sector. Auto Original Equipment Manufacturers (OEMs) are expanding their offering to include Electric Vehicles (EVs), advancing battery technology through significant R&D spending, and partnering with other companies and sectors to deploy EV charging infrastructure. Auto leasing companies are expanding the size of EV fleets to reduce tailpipe emissions across their portfolios. In light of these strategic changes, a growing number of auto sector companies have

committed to achieving net-zero emissions targets by mid-century and are pledging significant investments to reduce their Scope 1, 2 and 3 greenhouse gas (GHG) emissions. Auto sector companies must demonstrate through their disclosures how they are approaching transition planning and embracing the opportunities of a low carbon mobility future while navigating the challenges associated with scaling the transition.

The TCFD Auto Preparer Forum ("the Forum") is a collaboration between BMW, Daimler, General Motors, LeasePlan, Mahindra, Volkswagen and the World Business Council for Sustainable Development (WBCSD). Its aim is to advance climate-related financial disclosure according to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The Forum does this by providing commentary on members' individual experiences, supported by examples of effective disclosure practices.

Four years on from the release of the TCFD's recommendations, corporate reporting on climate change is evolving in line with the TCFD's anticipated five year "implementation path". The recommendations now have the support of over 2,000 organizations globally and demand from investors for companies to report in line with the TCFD recommendations has grown dramatically. Financial firms that support the TCFD are responsible for assets worth more than USD \$175 trillion.

The 2020 TCFD Status Report showed that while disclosure of climate-related financial information has increased since 2017, further progress is needed. The number of companies disclosing the financial impact of climate change on their businesses and strategies remains low. In particular, the percentage of companies disclosing the resilience of their strategies, taking into consideration different climate scenarios, was significantly lower than any other recommended disclosure. To support implementation of specific areas of the recommendations, the TCFD issued guidance on two topics alongside the 2020 status report: [Guidance on Scenario Analysis for Non-Financial Companies](#) and [Guidance on Risk Management Integration and Disclosure](#). In this report, the Forum explores elements of these new guidance documents.

This report provides examples of Forum members' current climate-related disclosure practice and includes proposals about how disclosures might evolve and be enhanced over time. Forum members' commentary is supported by external perspectives from investors and other stakeholders who use climate-related financial disclosures to assess and quantify risk and decide how to allocate financial capital.

MAIN FINDINGS AND THEMES FROM THE REPORT

Strategy: risks, opportunities and strategic transformations

Forum members are responding to climate related transition risks by developing EV technologies that can enable the low carbon transition, managing legacy assets while aiming to ensure a just transition across the value chain for employees, supply chain, consumers and communities and embracing other mobility trends.

Disclosures on climate-related opportunities often include case studies about new innovations and products, efforts to understand the potential impacts of transition planning on employees, and policies and due diligence related to high-risk raw material sourcing. Disclosures are beginning to include financial plans, such as R&D expenditure and potential financial performance, identifying development of sales, expenditure, market size and growth.

Strategy: approach to scenario analysis and disclosing strategic resilience

Scenario analysis is one of the least understood and implemented of the TCFD's recommendations. Like other companies, TCFD Auto Preparer Forum members recognize that more work is needed to establish comprehensive in-house scenario analysis. However, Forum members are starting to use scenario analysis to assess business resilience and support decision-making.

In Chapter 4, Forum members explore the practicalities of implementing the TCFD's latest guidance on scenario analysis for non-financial firms¹, focusing on the following elements: *formulating a focal question; identifying,*

rating and ranking driving forces, developing scenario narratives through determining scenario themes, logic and storyline; and approaching quantification of scenarios and communicating strategic resilience. Forum members found their collective review of the new guidance useful in general terms for exploring how climate scenario analysis could be conducted and disclosed in line with the TCFD recommendations. However, applying the guidance to individual member companies would entail a more specific approach to ensure outcomes of analysis capture all the relevant trends affecting the company.

Risk management

Forum members are developing approaches to climate-related risk management, assessing and understanding uncertainty and disruption across enterprise, and emerging risks – particularly those related to the EV transition. Risk management supports and connects with a range of business functions, from marketing and product portfolio development to operational processes. An agreed climate-risk taxonomy, with definitions and processes as well as more training, is needed to support the application of risk management to climate risks given challenges associated with longer term time horizons and the complex relationships between climate and other risks. Chapter 5 provides examples of risks along the EV adoption S-curve, illustrative assessment and prioritization factors, and examples of risk responses.

Metrics and targets

Chapter 6 includes a table of illustrative operational and financial metrics that are useful for automotive sector companies to disclose. These metrics relate to activities ranging from financial investments in low carbon technology to sales by vehicle category and responsible sourcing. Some of these metrics are in line with the types of information expected to be required for conformance with the EU Taxonomy.

Conclusion

Like many other industries, auto companies lead, catalyze and respond to a wide range of plans and actions to support a green and just transition. Their innovations promise to shape the future of mobility. A successful, orderly and just green transition depends on changes within Forum members' control and influence and also on the collaborations they build and the context in which they operate. A shared understanding of the auto sector's contribution to the green and just transition, collaboration to achieve it, and an enabling environment to support it are the pillars on which members will transform their businesses and the future of mobility for all. Corporate disclosures according to the TCFD recommendations must reflect the breadth and depth of plans and actions that respond to the risks from climate change and maximize associated opportunities.

② Introduction and context



2 Introduction and context

2.1 INTRODUCTION

BACKGROUND TO THE AUTO TCFD PREPARER FORUM

The TCFD Auto Preparer Forum is made up of representatives from BMW, Daimler, General Motors, LeasePlan, Mahindra Group and Volkswagen. Established in October 2020, its work is coordinated by WBCSD. Membership of the Forum is deliberately restricted to a small number of companies because of the limited time the Forum had to complete its work. Forum member companies represent OEMs and a vehicle management company and are drawn from three distinct regions – Europe, North America and Asia. Members have a global footprint encompassing much of the value chain, including finance. The senior management of member companies have made public statements in support of the TCFD's work and have welcomed the initiative to enhance transparency regarding climate-related financial risk.

FORUM MEMBERS

Martina Hilmer - BMW
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Andreas Kusche - Daimler

Sharon Basel - General Motors
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Archana Kaur - LeasePlan
Matt Gower - LeasePlan

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ABOUT THIS REPORT

In this report, the Forum provides a commentary on key areas of the TCFD's recommendations based on members' individual experience of implementing them. The commentary is supported by examples of effective practice that are consistent with the recommendations. The report also includes proposals for how disclosures might be enhanced over time. Given its publication date, examples are taken from a mix of Forum members' 2019 and 2020 Annual Reports, Sustainability Reports and other public communications such as investor presentations.

The Forum received valuable input from a limited group of self-selected users of climate-related financial disclosures across a range of investor and data user types and institutions. The purpose of this engagement was to seek views on how companies can maximize the usefulness of disclosures for financial market participants. The results of the engagement are summarized and presented anecdotally as "user perspectives". Readers should recognize the limited nature of this external engagement and anecdotal input.

PURPOSE AND AUDIENCES

The objectives of this report are to:

- Reflect the current state of climate-related financial disclosure by highlighting how Forum member companies are implementing the TCFD recommendations and giving practical examples of effective disclosure to support implementation.

- Provide insight into particular disclosures that demonstrate the role of Forum members individually and collectively in managing climate-related risks. These include transition risks, work to enable the low carbon transition and efforts to mitigate and adapt to physical climate-related risks.
- Provide recommendations on how climate-related financial disclosure can continue to develop in the future.

The audiences for this report include:

- Auto sector companies seeking to enhance their climate-related financial disclosures.
- The TCFD, in order to provide input into further deliberations on how the recommendations should evolve over time and how current guidance can be most usefully implemented.
- Investors and users of climate-related financial disclosures seeking to understand the current state of disclosure practice and its scope for development over time.
- Regulators considering making climate disclosures mandatory or providing enhanced guidance.
- Organizations the TCFD has identified as making valuable contributions towards adoption of the recommendations, including stock exchanges, investment consultants, credit rating agencies, organizations that develop climate-related scenarios etc. so that they can consider what further work is required to support and enhance climate-related financial disclosure.

- Companies from all industries looking to implement the TCFD's recommendations and guidance.

The structure of the report reflects Forum members' agreed work plan. This was influenced by known challenges associated with climate-related financial disclosure, including the challenge of assessing strategic resilience using scenario analysis, which prompted the Forum to explore aspects of the TCFD's 2020 Guidance on Scenario Analysis for Non-Financial Companies.

2.2 CONTEXT

The automotive sector has a pivotal role to play in the global low carbon transition. The development of lower or zero emissions vehicles to support the transition presents great challenges. Companies that are able to realize and implement the opportunities offered by new technologies, infrastructure and customer solutions will create substantial value for their businesses and wider society in the context of renewed public interest in climate change and the scientific and regulatory imperative to make substantial emissions reductions in the next decade. This introduction summarizes the key climate change-related drivers, influences, opportunities and challenges for the automotive sector.

POST COVID-19 GROWTH TRAJECTORY

The automotive sector is expected to grow over the next decade, despite a recent decline in light vehicle sales. 64 million motor vehicles were produced worldwide in 2020 with China, Japan and Germany the largest producers of cars and commercial vehicles.² While global light vehicle sales decreased by 14% to 77.7 million units in 2020³ due to disruption caused by the pandemic, total EV sales jumped 43% to reach

3.24 million units.⁴ The global automotive sector's revenue is projected to grow to USD \$8,931 billion by 2030, from USD \$5,315 billion in 2017.⁵ While the sector's revenue is derived from numerous players including wholesalers, automotive suppliers and parts manufacturers, distributors, dealers and importers,⁶ new vehicle sales are anticipated to account for around 38% of this value, driven by sales in emerging markets as per capita incomes rise.⁷ Macro societal trends affecting the auto sector's long term growth trajectory include: population growth resulting in greater demand for cars, especially as per capita wealth grows in emerging markets; urbanization driving service-based mobility business models as the proportion of the global population living in cities increases;⁸ climate change and resource scarcity pushing consumer preferences towards low carbon products, particularly in developed nations; and digitalization causing systems to become increasingly interconnected, particularly through use of emerging technology.⁹

DRIVERS OF CHANGE

Regulation & emissions standards

The automotive sector is a significant contributor to global GHG emissions. GHG emissions from the transport sector comprised 14% of global emissions in 2019.¹⁰ The car industry makes up 47% of the total transport sector GHG emissions, contributing 9% of the total annual global figure.¹¹ The transport sector emits GHG emissions across all three scopes and auto sector companies are endeavoring to mitigate emissions throughout the value chain. For OEMs, Scope 3 (use-phase) emissions contribute to over 70% of lifetime CO₂e emissions for ICE vehicles¹²; for hybrid and battery EVs the CO₂e emissions share falls more heavily on the supply phase, although the use phase can still be high if EVs operate in

jurisdictions with carbon intensive electricity grids.¹³ The Paris Agreement's objective to limit global warming to well below 2°C relative to pre-industrial levels is driving increasingly stringent vehicle emissions standards. Emissions regulations differ across world regions: the target for the EU, USA and China converges to around 100 g CO₂/km in the time frame 2020-2025. The EU has the most ambitious industry average target of 95 g CO₂/km in 2020/2021, to be reduced by 15 % in 2025 and by 37.5 % in 2030.¹⁴ Announcements to phase out ICE vehicles and increase the number of EVs have been made by 17 countries to date, with proposed legislation coming into effect between 2030 - 2050. These countries include China, India, Norway and the UK, as well as 12 US states which are adhering to California's Zero-Emission Vehicle (ZEV) Program.¹⁵ In December 2019, France was the first country to put the intention into law, with a 2040 timeframe.¹⁶

The momentum behind tightening emissions standards and phasing out ICE vehicles is being driven by the growing number of country-, region- and city-level net-zero carbon emissions targets by mid-century.¹⁷ So far, six countries have net-zero emissions targets set in law, over 20 have proposed legislation and over 100 countries have targets under discussion.¹⁸ Aligning to the direction of policy towards lower carbon economies, a growing number of auto sector companies have committed to achieve net-zero emissions by mid-century and have set ambitious decarbonization targets to meet the challenge.¹⁹

Innovation and the electric mobility opportunity

Automakers are pledging significant investments in technology and digitalization to meet decarbonization targets and seize on opportunities associated with the low carbon transition.²⁰ This includes sourcing and developing new materials and parts to improve the fuel efficiency of ICE vehicles and reduce average fleet CO₂ emissions. The average spend per vehicle on lowering CO₂ emissions grew from USD \$274 in 2012 to USD \$1,809 in 2020. It is expected to reach USD \$2,596 by 2025.²¹ The challenges facing automakers in achieving emissions reduction targets include: increased vehicle weight, driven in part by the upward trend in SUV ownership; decreasing diesel share – which are more fuel efficient; the shift to the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) to enable more realistic measurements of fuel consumption and emissions from cars; and increasing compliance costs.²²

To reach decarbonization targets, many automakers are shifting their focus towards lower carbon vehicles, driving transformation of the auto sector. The level of investment and innovation is reflected in the variety of power systems available on the market today, which include: Hybrid Electric Vehicles (HEVs); Plug-in Hybrids (PHEVs); Battery Electric Vehicles (BEVs); and fuel-cell vehicles. EV benefits include zero tailpipe emissions, better efficiency than ICE vehicles and large potential for GHG reductions when coupled with a low carbon electricity sector.²³ Investment and competition amongst OEMs has spurred on development of the EV drivetrain and improvements in battery technology.

Green financing

Green financing is increasingly being used to fund low carbon transition-related projects. Green bond issuance rose to USD \$305.4bn in 2020, a 13% increase on 2019.²⁴ On the buy-side, assets managed by sustainable investment funds exceeded USD \$1 trillion in 2020 for the first time ever, one of the few investment strategies to record net inflows during COVID-19.²⁵ This is driving the demand for sustainable debt such as green bonds, particularly by those managing sustainable funds. Additionally, climate and other environmental, social and governance (ESG) considerations are increasingly being integrated into private equity and venture capital investment processes.

Corporate green bond issuance has previously been dominated by a few sectors, including the energy and utilities sectors. Some investors consider green auto bonds to provide an increased level of diversification within “sustainable” portfolios. Auto sector companies are recognizing the opportunity and some major OEMs issued their first green bonds in 2020.²⁶ This momentum is expected to continue in 2021.²⁷ OEMs are also using green financing tools to help fund clean transportation projects – such as the development of new vehicle platforms and powertrain technology and increased production capacity for batteries and EVs.²⁸ As stakeholders scrutinize the ESG credentials of green bond issuers in response to concerns over greenwashing,²⁹ from 2021 the EU’s green taxonomy metrics for the auto industry will be used by EU investors to classify what counts as a green project, and what does not.

EV GROWTH AND OPPORTUNITY

Global sales of EVs topped 2 million in 2020³⁰ with the global stock of EVs reaching 7.2 million electric cars. Electric cars, which accounted for 4.2% of global car sales and about 1% of global car stock in 2019, registered a 40% year-on-year increase. By 2025, 25% of cars sold are expected to have electric engines, up from 5% today.³¹ In the EU, the proportion of BEV and PHEVs in total deliveries increased rapidly from 1.7% in 2019 to 9.7% in 2020. Other markets are expected to follow a similar trajectory.³² Global sales of electric trucks hit a record high in 2019 at over 6,000 units and the number of models continues to expand.³³

CHALLENGES IN SCALING THE TRANSITION

Despite the strong growth in EV sales, there are challenges in scaling the transition. They include:

- **Achieving price parity between EV and ICE vehicles**, although the gap is narrowing with the tipping point close in some European countries.³⁴
- **Improving efficiency in heavier models** where emissions are harder to abate, for example by introducing hydrogen technology in heavy-duty trucks as a cost competitive option for heavier loads and longer distances.³⁵
- **Reducing GHG emissions from manufacturing processes.** While the use phase emissions of vehicles are being reduced towards zero, the manufacture of EVs is still energy intensive. OEMs are focused on increasing process efficiency and procuring renewable energy for manufacturing sites to reduce Scope 1 and 2 emissions.

- **Retiring ICE vehicles**, which are expected to remain a significant proportion of total car sales over the coming decade while 95% of cars will rely on fossil fuels for at least some of their power until 2025.³⁶ As national bans come into force, strategies for the disposal of ICE vehicles will be needed to prevent use-phase emissions being shifted to jurisdictions with less stringent regulations.
- **Increasing renewables in the energy mix** as the extent to which EV adoption reduces use-phase GHG emissions depends on a broader societal shift towards renewable energy.
- **Rapid deployment of charging infrastructure** to keep up with the anticipated future scale of EVs. To address this, OEMs have begun partnering with other companies in the EV value chain to deploy EV charging infrastructure, including electric utilities³⁷ and industrial manufacturing companies.³⁸
- **Securing access to essential raw materials and highly sought-after components.**³⁹ Mining rare earth minerals such as cobalt and lithium used in EV batteries has given rise to risks including supply shortages, labor violations, worker security issues, financing of armed groups and environmental hazards.⁴⁰
- **Securing the supply chain.** For example, serious shortages of semiconductors, an essential component of EVs, halted the manufacturing operations of several OEMs in 2020.⁴¹ OEMs are addressing supply chain risks through a variety of measures including supply chain traceability, reducing the need for particular materials and participating in collaborative initiatives to tackle the social and environmental issues associated with mining rare earth metals.
- **Supporting demand through subsidies.** Research indicates that subsidies for BEVs are needed to stimulate demand while battery costs remain high.⁴² Markets with significant incentives, such as Norway,⁴³ show a much greater uptake in BEVs. However, some incentives are being removed or reduced, slowing the growth trend. For example, in China EV purchase subsidies were cut by around half in 2019 as part of a gradual phase out of direct incentives. And in the US, the federal tax credit program ran out for key EV OEMs.
- **Consumer confidence.** Consumer sentiment has a strong influence on EV adoption and research suggests some consumers remain apprehensive about buying an EV. Barriers to adoption include limited public access to charging infrastructure, concerns over battery life and range, and the current relative cost of EVs compared to ICE vehicles, despite expectations of EV price decreases in the future.⁴⁴ Research shows that consumer sentiment is becoming more favorable towards EV adoption but greater public education on the characteristics of EV technology and initiatives to reduce the upfront costs would help bolster this trend.⁴⁵

CHANGES IN THE MOBILITY ECOSYSTEM

Mobility as a Service

Mobility-as-a-Service (MaaS) and the rise of connected and autonomous vehicles (CAVs) are changing trends in car ownership, particularly in urban areas. MaaS is projected to reduce the cost of private vehicle ownership by up to 40% by 2030.^{46,47} Fleets of cars connected to the internet of things have also given rise to ride hailing services, car-sharing and peer-to-peer companies.

These trends in the evolution of the mobility ecosystem have the potential to ease congestion, pollution and CO₂ emissions by bringing electrified fleets to urban areas⁴⁸. They offer new opportunities for revenue from advertising and data monetization and promise to grow the global value of the mobility system to more than USD \$1 trillion by 2030.⁴⁹ OEMs are adapting to these changes by manufacturing ever more sophisticated hardware (i.e. vehicles) and providing a platform for a variety of value-adding customer services.⁵⁰

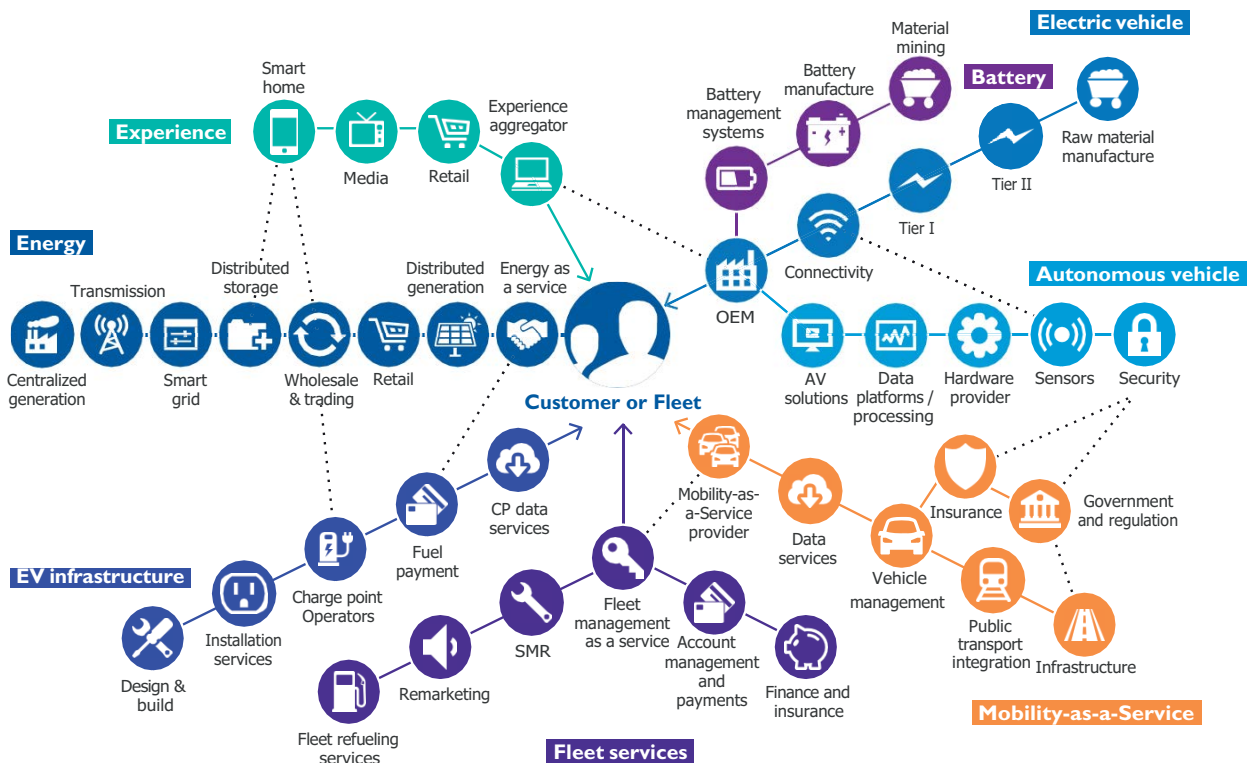
In Europe, trends in car ownership are shifting from personal to corporate, with the growth of fleet management companies and corporate-funded mobility fleets.⁵¹ Car financing and insurance schemes are adapting to provide offerings such as the bundling of insurance and servicing into a flexible vehicle subscription.^{52,53}

PARTNERSHIPS FOR AN E-MOBILITY FUTURE

Education, transparency and collaboration between actors will be key for full sectoral transformation.⁵⁴ Numerous stakeholders play a role in the automotive sector's low carbon transition, including:

- Automotive sector and OEMs that develop and roll out new technologies, communicate transparent, comparable emissions data, and market low carbon solutions;
- Consumers who demand affordable low carbon solutions;
- Energy sector players who invest in the transition to a cleaner grid mix;
- Financial services companies that provide preferential financing for investment in low carbon solutions;
- Governments that enact emissions regulations and compliance schemes and provide subsidies for low carbon projects;
- Infrastructure companies that provide a network of charging points;
- Telecommunications, media and technology companies that enable autonomous vehicles and MaaS solutions; and
- Media and the press in promoting the advantages of new technologies to the public.

Figure 1: Mobility 2030: Transforming the mobility landscape (KPMG)



③ Strategy: risks, opportunities and strategic transformations



3 Strategy: risks, opportunities and strategic transformations

SUMMARY:

- Forum members are responding to climate-related transition risks by developing EV technologies that can help enable the low carbon transition, managing legacy assets while ensuring a just transition and embracing other mobility trends.
- Disclosures related to climate-related opportunities often include case studies about new innovations and products, efforts to understand the potential impacts of transition planning on employees, and policies and due diligence related to high-risk raw material sourcing.
- Disclosures are beginning to include financial plans, such as R&D expenditure and potential financial performance, identifying development of sales, expenditure, market size and growth.

There are three parts to the TCFD's recommendation on disclosures about strategy as follows:

1. Describe the climate-related risks and opportunities the organization has identified over the short, medium and long term.
2. Describe the impact of the climate-related risk and opportunities on the organization's businesses, strategy and financial planning.
3. Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios including a 2°C or lower scenario.

Chapter 3 of this report explores how Forum member companies respond to parts 1 and 2. Chapter 4 considers the third part of the recommendation.

3.1 DESCRIBE CLIMATE-RELATED RISKS AND OPPORTUNITIES

In response to the first part of the TCFD's strategy recommendation, Forum member companies routinely disclose details of the climate-related risks and opportunities that have current or anticipated effects on their businesses. Table 1 illustrates some of the common and differentiated transition and physical climate-related risks and opportunities affecting OEMs and vehicle leasing companies. These risks and opportunities potentially impact companies' direct operations, financial performance, supply chains and customer base. The extent of the potential impact depends on the individual and collective actions companies take to manage their risks and opportunities. The more prepared and forward-looking a company is, the better placed it will be to maximize opportunities presented by the low carbon transition, while mitigating and managing climate-related risk.



Table 1: Climate-related risks and opportunities impacting the auto sector

Category	Risk/opportunity	Potential financial impact ⁵⁵		
		Category	Impact (positive or negative +/-)	Commentary
Policy and legal	Increased pricing of GHG emissions (e.g. EU Emissions Trading System (ETS), California cap-and-trade) or costs to comply with other relevant regulation (e.g. emissions efficiency regulations etc.)	Capital investment, Revenues	-/+	GHG mitigation reduces risk
	Requirements to provide detailed environmental information at product level (e.g. scope 3 emissions) in different jurisdictions	Operating costs, Revenues	-/+	Conformance with requirements could increase costs but resulting information could lead to demand in products that satisfy environmental credentials
	Supportive EV policy incentives	Revenues	+	For example, subsidies could support sales and revenue as well as provide planning security
	Increasing driving range of EVs	Revenues	+	Increased sales due to confidence in products
Operating costs		+	Economies of scale	
Technological advances	Advanced battery technology	Capital investment	-	R&D spend on technology advancement
		Revenues	+	If a company develops and produces its own battery systems, this may improve confidence in products
	Substitution of existing products and services with lower emissions options	Capital investment	-	Investment in new lower emissions technology, plus costs of disposal or transformation of legacy assets
	Technological advances enabling resource efficiency	Operating costs	+	Reduced energy usage/output
Market changes	Changing customer behavior	Revenues	+/-	Consumer demand for 'greener' vehicles
	Increased development and uptake of MaaS	Revenues	-/+	Decreased personal car ownership. Impact could be positive with increasing offering of MaaS products
	Stigmatization of the sector as a polluting industry	Revenues	-	Decreased ownership of ICE or other emissions vehicles. However subject to change as EV penetration increases
Physical				
Acute	Increased severity of extreme weather events such as cyclones and floods	Revenue, Operating costs	-	Disruption to production
Chronic	Impacts of physical climate risks such as changes to monsoon weather patterns	Revenues	-	Economic impacts reduce market size

Forum member examples of climate-related risk and opportunity disclosure

Figure 2: General Motors climate-related risk and opportunities and associated strategic developments; identified through scenario workshoping (General Motors 2019 Sustainability Report)

Risks/Opportunity	Recent Strategy Developments
Adoption of new business models	Continued investment in Cruise, the self-driving company in which we are majority owners; and the development with Honda of Cruise Origin, which exemplifies our vision for the future of mobility: shared, autonomous, electric and connected.
Response to new energy vehicle regulations in China	Through our SAIC-GM joint venture, we will invest \$4.3 billion to introduce at least nine hybrid or electric models in China over the next five years.
Focusing on new technologies by shifting capital resources and talent toward vehicle electrification programs	We are allocating more than \$20 billion in capital and engineering resources to EV and AV programs between 2020 and 2025.
Prioritizing renewable power sources	We have accelerated our goal to source electricity from 100 percent global renewable energy sources from 2050 to 2040 with interim goals of achieving 60 percent globally by 2025 and 100 percent of U.S. sites by 2030.

Figure 3: BMW BEV opportunities (BMW Group Investor Presentation 2021)

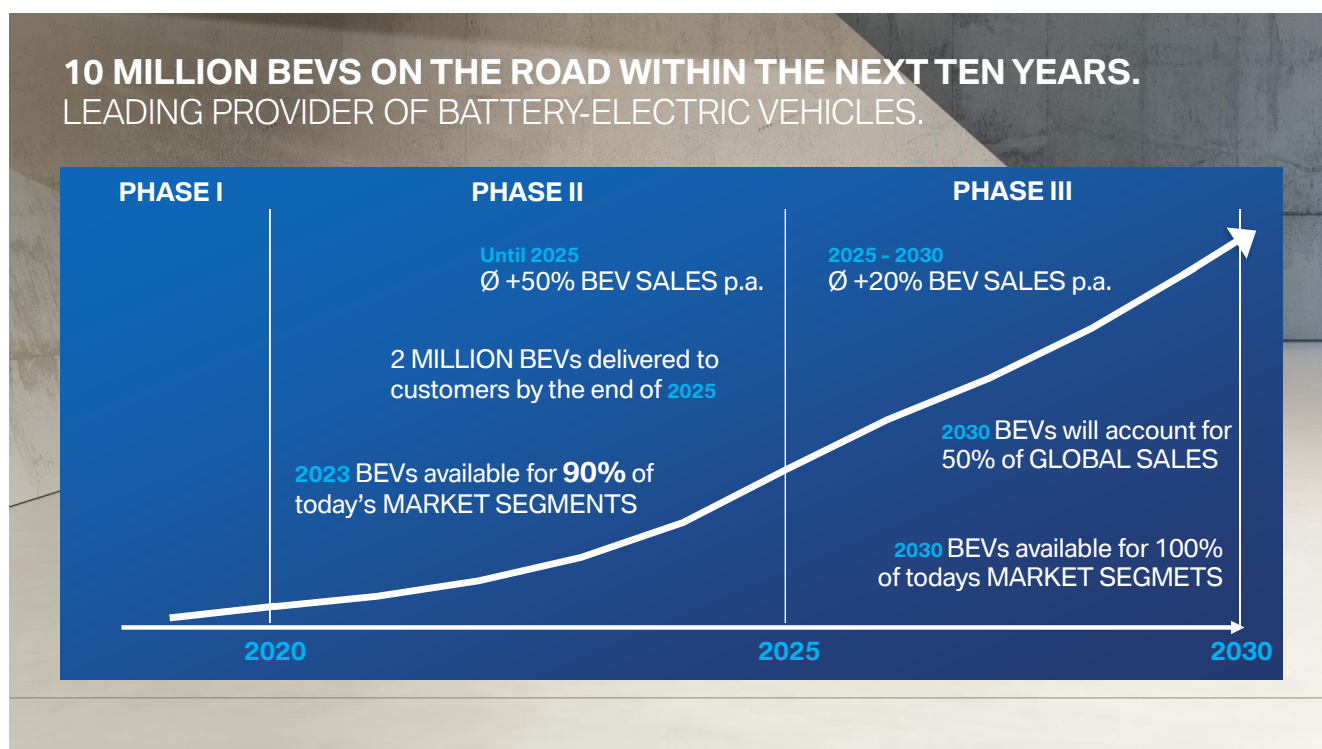


Figure 4: Mahindra EV opportunities (Mahindra & Mahindra Integrated Annual Report 19-20)

With the Government's thrust on rapid adoption of EVs, your Company being the Pioneer in EVs in India, continues to focus and invest in development of new products and advanced technologies specific to electric vehicles. Today, your Company offers a wide range of EVs, which includes the eVerito car, Supro EV cargo/passenger vans and two models of e3W - the e-Alfa and the Treo.



At the 2020 Auto Expo, your Company showcased a range of next generation mobility solutions from vehicles to EV platforms to connected mobility solutions. The next generation products included:

ATOM - Designed to appeal to the emerging new India and transform the face of last mile connectivity



eXUV300 - An aspirational electric SUV, which is the perfect mobility solution for the environment conscious customer and the ideal vehicle for those who desire thrilling performance



eKUV100 - India's most affordable compact electric SUV, ideally suited for daily city commutes. It offers peak power output of 40kW, torque of 120 Nm and a range of 147 kms.



Further, your Company, through its subsidiary Mahindra Electric Mobility Limited ("MEML"), has invested in development of next generation EV platform **MESMA 350**. The Mahindra Electric Scalable and Modular Architecture 350 is a 350 volt powertrain that supports motor sizes ranging from 60 kW to 280 kW, dual motor concepts and battery sizes up to 80 kWh.



In parallel, your Company is closely working with the Government, both at the Centre and at the State level and other participants of the mobility ecosystem to establish and grow the EV ecosystem in India.

Figure 5: LeasePlan business model risk associated with fleet transition to electric vehicles (LeasePlan Annual Report 2020)

The transition of our fleet to electric vehicles could impact aspects of our business model, which is predominantly based on the procurement, management and disposal of ICE vehicles. In some cases, the profitability of parts of our value chain could be affected, both adversely and to our benefit. We consider these impacts on our business model based on the data we receive from country entities where adoption rates are highest, namely, Norway and the Netherlands. For example, revenues from our Repair, Maintenance and Tyres (RMT) business may be impacted by a higher portion of electric and hybrid vehicles – which generally have lower RMT services costs compared to ICE vehicles – and the extent to which we qualify for supplier rebates and bonuses. The provision of EVs also entails new customer requirements for home and office charging, for which we will need to develop additional services.

We are continually assessing the impact of EVs on our business model to determine how to develop our service offering, protect our profitability and create new revenue streams. Where necessary, we redesign our

propositions based on our experiences in leading EV countries. In those markets, we are advancing our understanding of how certain impacts may materialise or change over time, what best practices we can adopt to manage them, and the implications they may have on our pricing, propositions and positioning.

Our business model may also be adversely affected by physical impacts of climate change, including extreme weather conditions, although we do not currently monitor these risks. For example, an increased likelihood of flooding, wildfires, storms or hail in our markets could make it more difficult for LeasePlan to offer affordable insurance protection and may impact our pricing of these products. Such events could also affect our RMT services if more vehicles in our fleet are damaged or require more frequent servicing as a result of changing weather patterns. Finally, extreme weather conditions could impact our business continuity at certain locations, if our employees are unable to reach their places of work or if office locations and Delivery Stores were forced to shut. It should be noted however, that as result of the

Covid-19 pandemic and lockdown measures implemented in 2020, we successfully facilitated home working for our 8,500 employees in 32 countries, and accelerated the roll out of new digital tools and platforms that our people need to stay connected to our customers and with each other.

Beyond these risks, we view the global shift to low and zero emission drivetrains as a strong opportunity to grow our market presence and strengthen our position. We are a first mover in our industry, offering end-to-end solutions that include the vehicle, implementation advice, services and charging. Our approach is supported by the fact that we are the only agile and independent Car-as-a-Service company of scale, enabling us to invest in and develop innovative service offerings without conflicting priorities. In 2020 we targeted customers in 16 countries with full package EV solutions that include charging options, as well as the processes and IT platforms necessary to facilitate EV fleet management.

Figure 6: Daimler risks and opportunities related to the legal and political framework (Daimler Annual Report 2020)

<p>Many countries and regions have already implemented stricter regulations to reduce vehicles' emissions and fuel consumption or are currently preparing such laws. They relate, for example, to the environmental impact of vehicles, including limits on noise emissions, as well as pollutants from the emissions caused by production facilities. Non-compliance with regulations applicable in the various regions might result in significant penalties and reputational harm, and might even mean that vehicles could not or could no longer be registered in the relevant markets. This also includes risks from ongoing activities relating to legislation on Real Driving Emissions (RDE). In addition, the risk exists that vehicles already in the markets will have to be reworked. The cost of compliance with these regulations is significant, especially for conventional engines.</p>	<p>Mercedes-Benz Cars & Vans faces the described risks with respect to regulations on mandatory targets for the average fleet fuel consumption and CO₂ emissions of new vehicles. Especially in the markets of China, Europe and the United States, Daimler gives these targets due consideration in its product planning. The increasingly ambitious targets require significant proportions of actual unit sales of plug-in hybrids and cars with other types of electric drive. The ambitious statutory requirements will be difficult to fulfill in some countries. The market success of alternative drive systems is greatly influenced not only by customer acceptance but also by regional market conditions such as the battery-charging infrastructure and state support.</p>	<p>also create potential risks for Daimler Trucks & Buses, because it will be difficult to fulfill the strict statutory requirements in some countries. Above all, this applies to the markets of Japan, the United States, China and Europe. The ambitious targets, especially in Europe, cannot be achieved solely with conventional technology. Daimler Trucks & Buses will therefore have to apply the latest technologies in order to fulfill these requirements. Achieving the 2025 target will require significant proportions of battery-electric trucks or other electrified drive systems in the actual market, which may only be achievable at higher costs.</p>
	<p>The described regulations for the reduction of vehicles' emissions and fuel consumption</p>	

Figure 7: Volkswagen overview of electrification opportunity (Volkswagen Annual Report 2020)

<p>Our focus on sustainable action will strengthen the Group's resilience. By 2050 at the latest, our Group will achieve net carbon neutrality worldwide – from supply chains to our plants and divisions up to the use of the vehicles by our customers. We have made substantial progress during the pandemic. This means one thing in particular – bringing out more electric vehicles. Overall, the Group tripled its sales of all-electric vehicles to 231,600 units.</p>	<p>growth. Production of the ID.3 and ID.4 began in Zwickau. Since November 2020, the ID.4 is also being manufactured at two newly constructed factories in China. When production of the ID.4 begins in the United States in 2022, the electric SUV will live up to its claim of being the electric 'world car'.</p>	<p>five years, plus another €11 billion in the hybridization of our model portfolio. Five years ago we gave the green light for e-mobility in the Group through the decision to develop the Modular Electric Drive Toolkit (MEB). Now this is a core business.</p>
<p>The premiere of Volkswagen's ID. family played an important part in this sales</p>	<p>With 56,000 units delivered, the Volkswagen ID.3 was the Group's most successful electric vehicle in 2020, followed by the Audi e-tron and the Porsche Taycan. We intend to invest around €35 billion in e-mobility over the next</p>	

3.2 THE IMPACT OF CLIMATE-RELATED RISKS AND OPPORTUNITIES

In response to the second part of the TCFD's strategy recommendation, Forum members describe the potential impacts of the risks and opportunities they identify on the organization's strategy and financial planning. The strategic choices, activities and plans they pursue in response to these impacts are complex

and depend on multiple factors and actions by governments, consumers and others. Generally, members' strategic choices fall into three main categories, all designed to support the low carbon transition and capitalize on associated opportunities. Each category is considered in more detail below:

3.2.1 Developing technologies that can help enable the low carbon transition, including investment in the EV drivetrain and battery technology.

3.2.2 Managing legacy assets while ensuring a just transition, including restructuring, developing plans for ICE vehicle production assets and disposals, and re-skilling employees.

3.2.3 Embracing other mobility trends, including MaaS, autonomous vehicles, leasing arrangements and digitalized urban mobility models.

3.2.1 DEVELOPING TECHNOLOGIES THAT CAN HELP ENABLE THE LOW CARBON TRANSITION

Forum members are developing new practices and technologies that aim to contribute to the low carbon transition, maximize business opportunities, meet growing consumer demand and respond to regulatory pressure for lower- or no-emissions

vehicles. The speed at which companies can proceed and the impact of their strategies depends on multiple factors including the following, each of which is examined further:

- **Investment**, many automakers are investing in the development of the EV drivetrain to capitalize on the opportunities presented by EVs and, ultimately, emissions-free mobility.
- **Regional variations**, including the regulatory context in which companies operate and how that contributes to readiness for their products and consumer sentiment.
- **Supply chain management**, including sourcing materials for battery components such as lithium, nickel and cobalt.

Investment and financing

Forum member example disclosures about investment and financing associated with new technology and climate-related opportunities

Figure 8 : Volkswagen green financing funding modular electric drive matrix (MEB) and battery electric vehicles (BEV) models ([Volkswagen website](#))

<p>Volkswagen successfully places first green bonds with a volume of € 2 billion</p> <ul style="list-style-type: none"> • Two bonds with terms of 8 and 12 years and annual interest of 0.875% and 1.250% • Green bonds based on the Green Finance Framework for sustainability-oriented financial instruments presented in March • Funds to be used for the modular electric drive matrix (MEB) and the new BEV models ID.31 and ID.42 • Group CFO Frank Witter: "With the issuance of our first Green Bonds, we are giving investors the opportunity to make sustainable investments in the future of e-mobility." <p>The Volkswagen Group successfully placed its first green bonds with a volume of € 2 billion in the market. The benchmark bonds, which are denominated in euros, have terms of 8 and 12 years and coupons of 0.875% and 1.250% respectively. Investors showed considerable interest, including both international and</p>	<p>specialized green bond investors. This is the first issuance based on the Green Finance Framework (GFF) for sustainability-oriented financial instruments presented in March. The proceeds of the bonds will be used in a targeted way to fund the modular electric drive matrix (MEB) and the new BEV models ID.3 and ID.4. Annual reporting on the use of the proceeds and the environmental effects achieved will create transparency for investors.</p> <p>Frank Witter, Member of the Group Board of Management responsible for Finance and IT, said: "With the issuance of our first Green Bonds, we are giving investors the opportunity to make sustainable investments in the future of e-mobility. It is a strategic milestone in our financing strategy, which we combine with our corporate target of CO₂ neutrality in 2050. The Volkswagen Group is thus successfully active in the key growth segment of green bonds. Within the framework of our comprehensive electric offensive, this will increasingly be the case in the future."</p>	<p>The funds generated by the first green bonds will be used in a targeted way for the refinancing of projects connected with the modular electric drive matrix (MEB) and the new BEV models ID.3 and ID.4. The projects will include investments and expenditures for conceptual design, infrastructure, development and production of the modular electric drive matrix (MEB) itself, for the electric vehicles mentioned above based on this matrix and the production facilities required as well as tools and systems from suppliers and key components (e.g. batteries).</p> <p>For Volkswagen's GFF, Sustainalytics, a renowned independent rating institute, has given a second-party opinion confirming compliance with the Green Bond Principles of the International Capital Market Association (ICMA) and the Green Loan Principles of the Loan Market Association (LMA). The green bonds which have now been issued have been certified by the Climate Bonds Initiative (CBI).</p>
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Figure 9: Mahindra EV investment ([Mahindra website](#))

M&M today leads India's EV push with the goal of putting half a million electric vehicles on Indian roads by 2025. Around INR 1,700 crore has already been invested in the business in India, and another INR 500 crore has been set aside for a new research and development (R&D) centre.

Figure 10: Daimler board approval of electrification investment (Daimler Annual Report 2020)

<p>In its meeting on December 3, 2020, the Supervisory Board of Daimler AG confirmed its support of the company's strategic alignment, the associated business plans for the period 2021 to 2025, and the resulting measures for attaining the profitability target.</p>	<p>As one component of this, the Board also approved the investment plan for the further transformation of the Company toward electrification and digitalization. From 2021 to 2025, we expect to invest more than €70 billion in research and development as well as</p>	<p>in property, plant and equipment. According to our plans, most of the investments will be made in Mercedes-Benz Cars & Vans.</p>
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Figure 11: General Motors EV investment (General Motors Barclays 2020 Global Automotive Conference presentation)

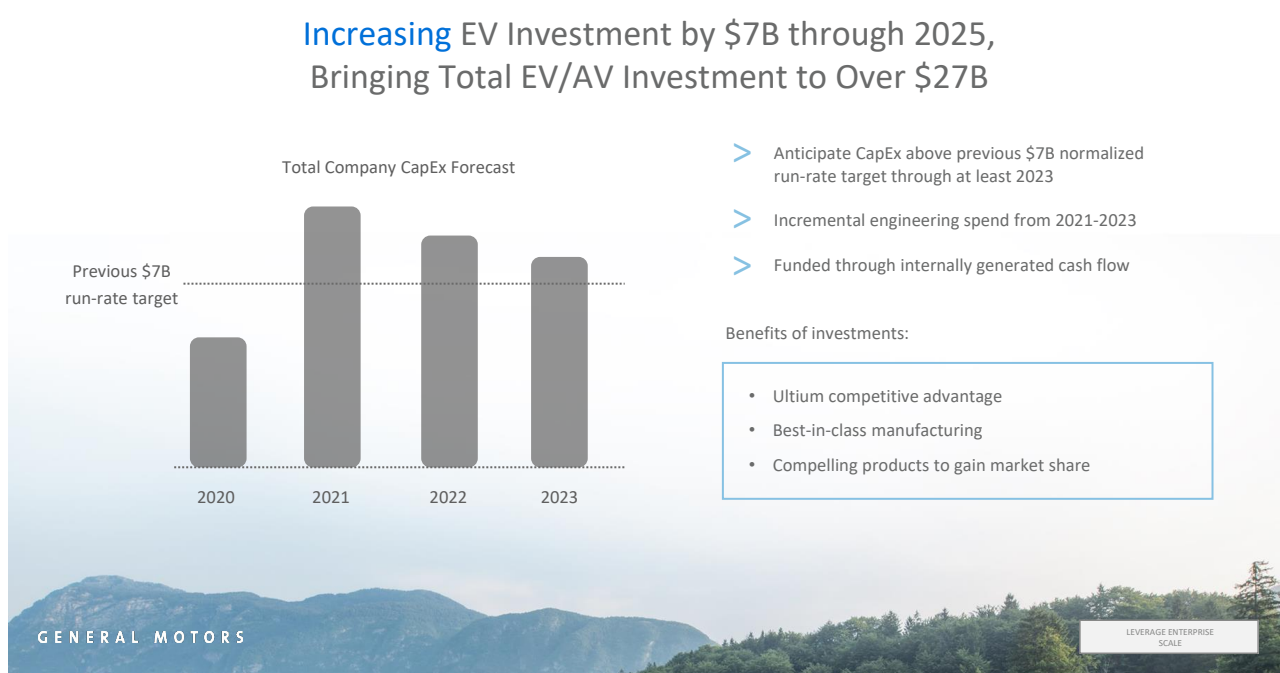


Figure 12: LeasePlan Green Bond ([LeasePlan website](#))

<p>LeasePlan Corporation N.V. successfully issued its first ever Green Bond, a EUR 500 million 5-year fixed rate note. The bond attracted EUR 3.5 billion of demand with the participation of around 260 investors. 64% of the book was allocated to Responsible Investment-orientated investors.</p>	<p>An industry first, the proceeds from the Green Bond will only be used to finance or refinance the purchase of Battery Electric Vehicles (BEVs), speeding up the transition to electric driving and helping to tackle climate change.</p> <p>The level of demand was a clear indication of the support from Europe's institutional</p>	<p>investor base for LeasePlan's sustainability strategy to achieve net zero emissions from its total fleet by 2030.</p>
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Figure 13: BMW supply contract with Northvolt ([BMW website](#))

The BMW Group is driving the expansion of electromobility and has signed a long-term supply contract worth 2 billion euros for battery cells with the Swedish company Northvolt. The battery cells will be produced in Europe at the Northvolt gigafactory currently under construction in Skellefteå in northern Sweden (series plant Northvolt Ett) from 2024.

USER PERSPECTIVE – FINANCIAL PLANNING THROUGH THE LOW CARBON TRANSITION

Users of climate-related financial information (i.e. lenders and investors) welcome disclosures that explain the assumptions used and financial planning required to support business resilience through the transition, as well as how capital expenditure (CapEx), investment and profitability are likely to be affected. Disclosures about the following matters are useful:

- R&D funding – including how transition goals are supported by investment and R&D expenditures.
- CapEx – including both transition and non-transition capex spend.
- Cash flows – including where they originate (e.g. from legacy assets) and whether they are adequate to cover costs associated with transition.
- Profitability – in particular information that helps investors understand the tipping point at which EVs and associated products are likely to become as or more profitable than internal combustion businesses. In the meantime, investors seek clarity on the extent to which EV profitability may need to be sacrificed short-term for long-term goals.
- Return on low carbon investments and the extent to which they protect or improve profitability.

Users also want to understand how the financial indicators outlined are contributing to the achievement of targets. For example, the expected investment and costs of a net-zero target.

Regional variations

Market opportunities for low carbon vehicles vary significantly by geography, driven by the regulatory landscape, availability of charging infrastructure and consumer attitudes.

Regulatory conditions and incentives have a strong influence on the choice of target markets for OEMs and the readiness of consumers to buy their products. For example, the Netherlands was Europe's sales leader for plug-in hybrids in 2015 due to government tax cuts for company-car drivers. Following a significant scale back of tax cuts, 2016 sales were halved to below 20,000.

Europe is considered relatively mature in terms of its policies to enable and encourage electrification compared to other markets. This includes the US, where federal policy has been less sympathetic to climate change mitigation in recent years, and India, where investment has typically been slower. Action towards climate change in the US is expected to increase as the Biden-Harris administration shifts its focus towards clean-energy. President Biden has vowed to replace the US government's fleet with US-built electric models.⁵⁶

Business action to develop new products, satisfy fuel efficiency emissions regulations and support consumer confidence is strongly influenced by the regulatory environment. For example, in the US EV tax credits have been perceived by some as favoring wealthy EV buyers rather than incentivizing the expansion of a low emissions industry for all.⁵⁷

FORUM MEMBER PERSPECTIVES – REGIONAL VARIATIONS – MAHINDRA AND THE INDIA CONTEXT

The India EV market is anticipated to register a compound annual growth rate (CAGR) of about 20% during the period 2020 - 2025 and could be worth nearly USD \$206bn in the coming decade, according to an independent studying released by the CEEW Centre for Energy Finance (CEEW-CEF). EV prices have dropped considerably and Mahindra & Mahindra expect the cost of battery/cells to drop further by 10-12% in the next three to five years. Government incentives have further helped encourage fleet operators to switch to EVs in India.

Mahindra & Mahindra is no longer just an EV manufacturer - we are a total EV technology solutions provider and working towards developing products for mass adoption and SUVs. We have started to see the success of our Treo range of electric three-wheelers across India in tier-1 and tier-2 cities. With the ease of driving offered by the new Mahindra Treo, M&M has supported a new customer base of women drivers, enabling them to increase household incomes, further giving a boost to the segment.

Forum member example disclosures covering different regions

Figure 14: Volkswagen business development in China (Volkswagen Annual Report 2020)

China remained the largest single market for Volkswagen in 2020. In the Chinese market, the Group offers more than 160 imported and locally produced models from the Volkswagen Passenger Cars, JETTA, Audi, ŠKODA, Porsche, Bentley, Lamborghini, Bugatti, Volkswagen Commercial Vehicles, MAN, and Scania brands as well as motorcycles by the Ducati brand. At 3.8 (4.2) million units (including imports), we delivered fewer vehicles to customers in 2020 than in the previous year in a Chinese market distinctly weakened by the pandemic. However, the Volkswagen Group remained the clear number one with Chinese customers with a market share of 19.3%. New models achieved a good market performance, including the new Volkswagen Passenger Cars flagship Touareg e-hybrid, the Viloran, the JETTA SUV VS7, the Porsche Taycan and the Audi Q2 and Q3 models. The new Tayron and Tharu models quickly took the lead in the A-SUV market. As part of the SUV campaign, we launched ten new models in 2020. They contributed to increased deliveries in the SUV segment and helped us to maintain our number one position. The new energy vehicle (NEV) segment was the

fastest growing segment in China in 2020. The seven new NEV models increased the Group's portfolio to 22 electrified models in China. The premium brands Audi, Porsche and Bentley again delivered strong sales figures, and the young entry-level brand JETTA also attracted a large number of customers in its first full year of sales.

In spite of the Covid-19 pandemic, Volkswagen continued to put all its energies into the strategic direction of e-mobility in China in 2020: the two MEB plants in Foshan and Anting celebrated the start of production on schedule, adding a production capacity of 600,000 units per year to the Group. The ID.4 X model from SAIC VOLKSWAGEN and the ID.4 CROZZ model from FAW-Volkswagen are the first vehicles whose production started in 2020. Three further models in the ID. family are to follow in 2021. By 2023, Volkswagen Passenger Cars will offer eight models in the ID. family on the Chinese market, which plays a decisive role in the Group's global e-mobility strategy. In 2020, Volkswagen increased its stake in Volkswagen (Anhui), formerly JAC Volkswagen, from 50 to 75%. The investment

also included the acquisition of 50% of the shares in JAG, the parent company of Volkswagen's joint venture partner JAC. The Volkswagen (Anhui) plant for all-electric vehicles has a maximum production capacity of 350 thousand units per year and should be finished by the end of 2022. Series production of MEB-based models should start there in 2023. Volkswagen has found another partner to secure future requirements for battery capacity for its Chinese e-models: with a 26% stake, Volkswagen (China) Investment Co. Ltd. wants to become the largest shareholder in Gotion High-Tech Co., Ltd. and thus the first international automotive manufacturer to directly invest in a Chinese battery supplier. The Audi brand is working with joint venture partner FAW to jointly establish a company for the production of all-electric vehicles based on the Premium Platform Electric (PPE) from 2024, the next major step for local production of e-vehicles. The Group also strengthened the production of electric drive components in China in 2020 in order to be prepared for rapidly growing demand for e-mobility.

Figure 15: BMW Group's production network: systematic approach towards electro mobility (BMW Group Report 2020)

The BMW Group continues to accelerate towards electric mobility and is bolstering its international production network for the increased manufacturing of electrified vehicles. By the end of 2022, every production plant in Germany should have the capacity to produce at least one fully electric vehicle model. The BMW Group's production system is capable of manufacturing both conventional internal combustion and electrically powered vehicles on a single line, enabling it to respond flexibly to changing customer requirements for various drivetrain systems. In 2020, the Group simultaneously manufactured electrified models at 13 locations in its global production network. By the middle of the current decade it will be deploying a new cluster architecture geared to fully electric drivetrains. Initially, the technology will be launched at the future Debrecen plant in Hungary and then

transferred to the global production network in a step-by-step process.

Electrification is also becoming increasingly important in terms of drivetrain production. In the year under report, the BMW Group announced the construction of a pilot plant for the near-series production of battery cell prototypes. The aim is to further optimise the production of battery cells in terms of quality, performance and costs. The Battery Cell Competence Centre in Munich already covers the entire value chain in terms of battery cell technology – from research and development to the structure and design of the battery cell as well as its manufacturability.

The Group's Dingolfing plant has assumed a leading role as a competence centre for e-drive systems in the production of electric

drivetrain components. It produces battery modules, high-voltage batteries and fifth-generation electric motors for the BMW Group's electrified vehicles. E-motors are also manufactured at the Landshut plant. Production facilities for battery components and high-voltage batteries are also being established at the Group's Leipzig and Regensburg sites. Currently, high-voltage batteries are manufactured at three BMW Group plants, i. e. Dingolfing (Germany), Spartanburg (USA) and Shenyang (China). In Thailand, the BMW Group collaborates closely with a partner that manufactures high-voltage batteries for electrified vehicles that are produced locally. By 2024, the production of internal combustion engines in Europe will be concentrated at BMW Group locations in Steyr (Austria) and Hams Hall (UK).

Figure 16: Daimler CO₂ emissions of the new-car fleet in Europe (Daimler Annual Report 2020)

In 2020, the average CO₂ emissions of our new car fleet in Europe (European Union, United Kingdom, Norway and Iceland) probably decreased to 104 g/km with application of the applicable legal regulations for the respective year (NEDC, including vans registered as passenger cars). We therefore achieved the CO₂ targets in the European Union in 2020. Transition from the current NEDC to the new WLTP test procedure is foreseen for the year 2021. This will involve the adjustment of fuel-consumption targets and rising certification figures. On the basis of WLTP, we expect our fleet average in Europe (European Union, Norway and Iceland) to decrease again significantly in 2021 compared with the comparable figures for the previous year calculated according to WLTP (probably between 130 to 140 g/km, based on preliminary figures for fuel consumption in 2020 taking into account the statutory regulations of 2021). This development will be driven in particular by the rising proportion of battery-electric vehicle models and plug-in hybrids in our new-car fleet.



Figure 17: LeasePlan EV Readiness Index 2021 in selected countries (LeasePlan EV Readiness Index 2021)

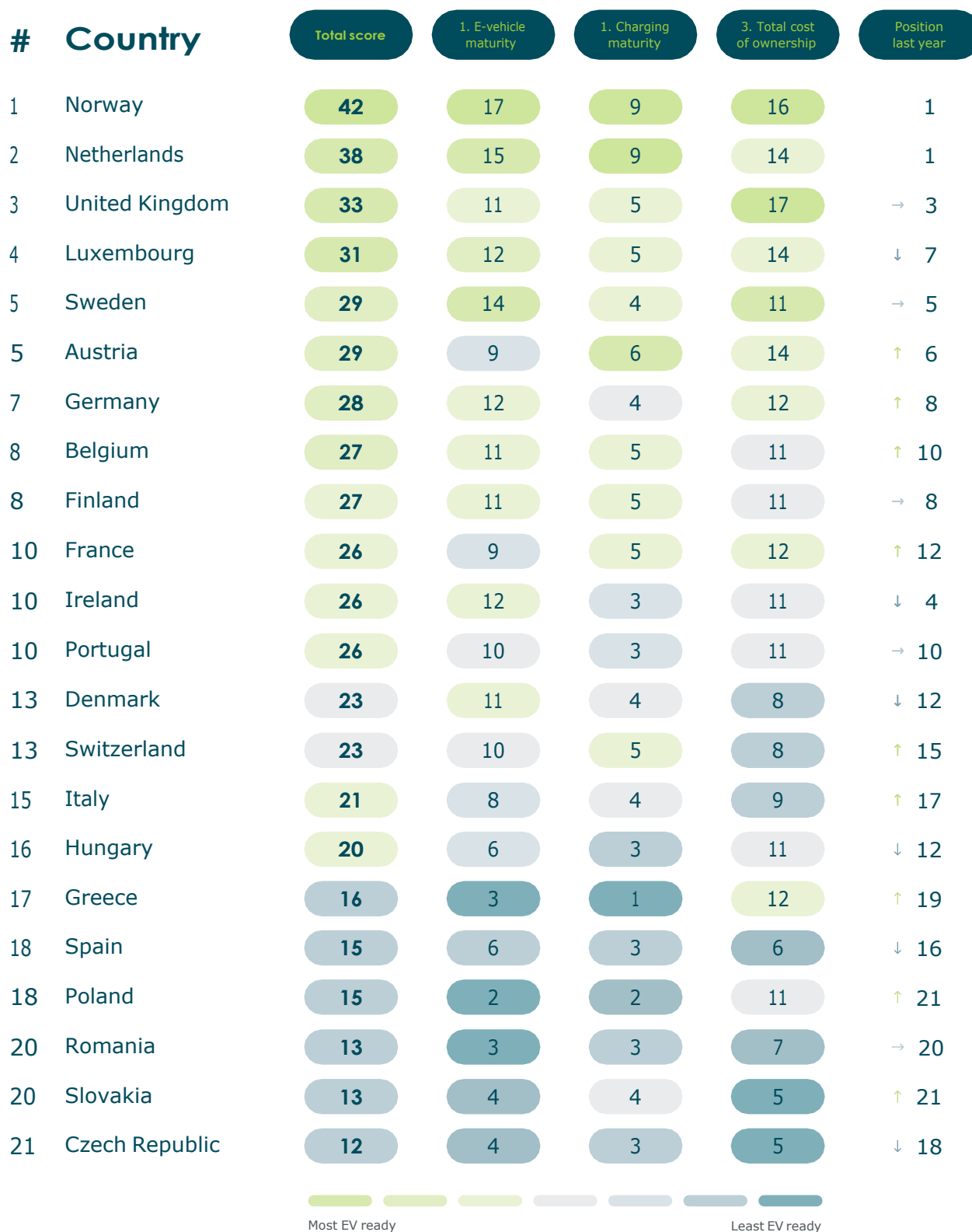


Figure 18: Mahindra Indian automotive context (Mahindra & Mahindra Integrated Annual Report 19-20)

The auto industry is an engine of economic growth. The industry contributes to 7.1% of India's GDP, 15% of GST revenues and supports 37 million direct and indirect jobs.

A highly localised supply chain has enabled the industry to be a shining example of Make In India, which is recognised world over. To meet Government's mission, of a 5 trillion USD economy by 2025, the automotive industry which constitute almost 50% of the manufacturing GDP, will have to grow by 14% CAGR till 2025.

FY2020 was a difficult year for the industry and so will be FY2021 - due to the lockdowns and uncertainties arising from the COVID-19 pandemic. The Government will need to work closely with industry to put the industry back onto growth path.

Growing concerns over air quality, road safety, sustainability and urban congestion, among consumers and society at large, are driving the regulations and policies for motor vehicles and urban development. These will impact choice of fuel, ownership patterns and will have a significant impact on the future of the automotive industry.

Over the years, the industry has made significant investment in, indigenisation of technologies in the conventional vehicles space. Step jump from BS4 to BS6 emission norms in just three years, is a shining example of the industry's capability. It is unprecedented anywhere in the world to switch to such stringent emission regime on one single day, for all categories of vehicles.

With an objective of improving air quality and reducing the fuel import bill, the Government is actively pursuing the plan for electrification of the vehicle feet and has announced the FAME II (Faster Adoption and Manufacturing of Hybrid & Electric Vehicles) policy. The industry is gearing up for meeting this challenge on the technology and product fronts and is developing capability in next generation technologies for EVs and Hybrids.

Increasing need for advanced technologies in the vehicles, competitive intensity and ever spiralling customer expectations, call for increased R&D, closer working with suppliers, shorter product life cycles and rigorous monitoring of costs.

Figure 19: General Motors fuel and emissions standards (General Motors Annual Report 2019)

Automotive Fuel Economy and Greenhouse Gas Emissions In the U.S., the National Highway Traffic Safety Administration (NHTSA) promulgates and enforces Corporate Average Fuel Economy (CAFE) standards for three separate fleets: domestically produced cars, imported cars and light-duty trucks. Manufacturers are subject to substantial civil penalties if they fail to meet the applicable CAFE standard in any model year, after considering all available credits for the preceding five model years, expected credits for the three succeeding model years and credits obtained from other manufacturers. The amount of these civil penalties is the subject of litigation currently pending in the U.S. Court of Appeals for the Second Circuit. In addition to federal CAFE standards, the EPA promulgates and enforces GHG emission standards, which are effectively fuel economy standards because the majority of vehicle GHG emissions are carbon dioxide emissions that are emitted in direct proportion to the amount of fuel consumed by a vehicle. The EPA and NHTSA also regulate the fuel efficiency and GHG emissions of medium- and heavy-duty vehicles, imposing more stringent standards over time.

In addition, CARB has asserted the right to promulgate and enforce its own state GHG standards for motor vehicles, and other states have asserted the right to adopt CARB's standards. CARB regulations previously stated that compliance with the EPA light-duty program is deemed compliance with CARB standards. However, on December 12, 2018, CARB amended this regulation to state that, in the event the EPA alters federal GHG stringency, compliance with the EPA's GHG emissions standards will no longer be deemed compliance with CARB's separate requirements. Likewise, NHTSA and the EPA have recently issued a rule asserting that California is preempted from regulating GHG emissions, which is currently being challenged through litigation. As a result, depending on the outcome of the federal CAFE and GHG

rulemaking and related litigation and the finality of CARB's regulatory amendment, in the future GM might be required to meet California GHG standards that are different than the EPA standards.

CARB has also imposed the requirement that increasing percentages of Zero Emission Vehicles (ZEVs) must be sold in California. The Clean Air Act permits states to adopt California emission standards, and 11 have adopted the ZEV requirements. The EPA has recently revoked the waiver it had granted to California that permitted its ZEV program. Depending on the finality of that revocation, there is a possibility that additional U.S. jurisdictions could adopt California ZEV requirements in the future.

In Canada, light- and heavy-duty GHG regulations are currently patterned after the EPA GHG emissions standards. However, the Canadian government will be conducting a mid-term review of its 2022 to 2025 model year light-duty GHG standards and there is an increased risk that future Canadian light-duty GHG regulations may not be aligned with the EPA regulations. In addition, the Canadian province of Quebec has adopted ZEV requirements for the 2018 to 2025 model years largely based on California program requirements. The province of British Columbia also passed legislation in May 2019 to enable similar ZEV regulations in the near term, and governments in Canada could adopt additional ZEV requirements in the future.

China has two fuel economy requirements for passenger vehicles: an individual vehicle pass-fail type approval requirement and a fleet average fuel consumption requirement. With a focus on the fleet average program, the current China Phase 4 fleet average fuel consumption requirement, which went into effect in 2016, is based on curb weight with full compliance required by 2020. China Phase 4 has continued subsidies for plug-in hybrid, battery electric and fuel cell vehicles, which are referred to as New Energy Vehicles (NEVs).

China Phase 5 has been developed with a planned start in 2021 and full compliance is required by 2025. In addition, China has established an NEV Mandate that will require passenger car manufacturers to produce a certain volume of NEVs to generate credits in 2019 and beyond to offset internal combustion engine vehicle production volume. The number of credits per car is based on the level of electric range and energy efficiency, with the goal of increasing NEV volume penetrations. Uncommitted NEV credits may be used to assist compliance with the fleet average fuel consumption requirement. China has set forth NEV credit targets for 2019 and 2020 and is setting forth new NEV credit targets aiming at further increasing volumes of NEVs between 2021 and 2025.

In Brazil, the Secretary of Industry and Development promulgates and enforces CAFE standards and has recently enforced a new CAFE program for the period October 2020 to September 2026 and October 2026 to September 2032 for light-duty and mid-size trucks and sport utility vehicles (SUVs), including diesel vehicles, imposing more stringent standards for each period.

Regulators in other jurisdictions have already adopted or are developing fuel economy or carbon dioxide regulations. If regulators in these jurisdictions seek to impose and enforce standards that are misaligned with market conditions, we may be forced to take various actions to increase market support programs for certain vehicles and curtail production of others in order to achieve compliance. We regularly evaluate our current and future product plans and strategies for compliance with fuel economy and GHG regulations.

Supply chain management – sourcing materials for car batteries

As demand for EVs increases, so does the demand for batteries and their components such as lithium, nickel and cobalt. Reserves of these raw materials are highly concentrated in a few countries where there are significant environmental and social consequences associated with extracting them. Child labor and human rights abuses are risks associated with cobalt mines, for example, and water stress is increasingly linked to lithium mining in certain regions – resulting in groundwater depletion and pollution.

Forum members have taken various measures to try to mitigate these issues. These include increasing supply chain traceability and transparency, such as through direct procurement, engaging with and upskilling suppliers, conducting supplier audits, investing in the improvement of local conditions and, where possible, reducing the need for particular materials. Recycling can help reduce demand for new materials by recovering valuable scrap metals from end-of-life products. Forum members also disclose participation in collaborative initiatives to tackle social and environmental issues associated with the sourcing of key minerals such as the Responsible Minerals Initiative (RMI), Responsible Cobalt Initiative (RCI) and the

Global Battery Alliance of the World Economic Forum. Reduction of cobalt within the Lithium-ion battery is being targeted by some companies.



Forum member example disclosures about battery development and sourcing materials for batteries

Figure 20: Volkswagen battery materials due diligence (Volkswagen Sustainability Report 2020)

Our current focus of action is battery materials, particularly cobalt. In close collaboration with our battery cell suppliers, we are pursuing the objective of creating supply chain transparency from mining the raw materials to manufacturing the finished product. This is the only way in which we can ultimately effectively prevent negative impacts. We have been passing the requirement for full transparency on to our direct battery suppliers in our contracts since 2020. An additional component of our strategy in this context is also cooperating directly with the mine operators, because the human rights risks are highest at the start of the supply chain and they can consequently be countered the most effectively here. Therefore, the plan is to also audit the sustainability performance of the mines in our supply chains. No standard for this is currently available. Volkswagen has therefore joined the CERA project (CERA = CErtification of RAw Materials). The project is dedicated to developing such a standard and has been testing this standard on selected raw materials in cooperation with a mining company since 2020.

Figure 21: General Motors technologies under development to improve charging, recycling, range, cost and battery life ([General Motors website](#))

New technologies under development to improve charging, cycling, range, cost and battery life include:



Our Ultium battery cells feature a state-of-the-art Nickel Cobalt Manganese Aluminum (NCMA) chemistry, which was designed to reduce the cobalt content in our batteries by more than 70 percent.

We have enabled the reuse or recycling of 100 percent of returned batteries, and we will keep doing so.

We apply a comprehensive battery and high-voltage safety strategy and development process to every EV we make, supported by a dedicated high-voltage battery safety team.

GM will be the first automaker to use an almost completely wireless battery management system. The system will be a primary driver of GM's ability to ultimately power many different types of EVs from a common set of battery components.

Figure 22: Daimler solid-state battery bus ([Daimler website](#))

<p>New: solid-state batteries – a pioneering achievement in automotive construction</p> <p>The new eCitaro G is the first city bus in its category anywhere in the world to be equipped with solid-state batteries. These lithium-polymer batteries are also part of the lithium-ion group of batteries. Because they contain electrolyte in its solid form as a polymer instead of the usual liquid, they are known as solid-state batteries. The battery anode is made of graphite with pure lithium, and the cathode of lithium iron phosphate.</p> <p>Solid-state batteries are characterised by their extremely high energy density, which is around 25 percent greater than in the coming generation of traditional lithium-ion batteries with liquid electrolyte. Each battery assembly in the eCitaro and eCitaro G has an energy content of 63 kWh. With seven assemblies on board this amounts to an impressive total of 441 kWh. This gives the eCitaro G a range of up to 220 kilometres in favourable conditions</p>	<p>with average demands on speed, topography and load along with straightforward climatic conditions. In the winter with the heating in operation, the eCitaro G covers an impressive 170 kilometres.</p> <p>The characteristics of solid-state batteries differ significantly from NMC batteries: overall they have a greater volume and they cannot be swapped for NMC batteries.</p> <p>As solid-state batteries operate at a temperature of around 80 degrees Celsius, there is no need for a complex cooling system as is the case with NMC batteries. Solid-state batteries reach their operating temperature solely through energy metabolism during use. During extended breaks, heating elements maintain the batteries at an ideal temperature. This occurs automatically in the eCitaro G with no need for the driver to take action.</p> <p>In contrast to NMC batteries, the suitability of solid-state batteries for rapid charging is</p>	<p>very limited as they have a maximum charging output of around 80 kW. Their suitability for intermediate charging is therefore severely restricted, and they are only supplied by Mercedes-Benz in combination with charging via connector. The solid-state batteries have an impressively long service life of up to ten years.</p> <p>Furthermore, this battery technology does not require the use of cobalt.</p> <p>Due to their very contrasting characteristics, city buses with solid-state batteries cover a different range of applications from those powered by NMC batteries. Mercedes-Benz wants transport operators to have the choice: for this reason, the eCitaro will in future be offered with a choice of NMC or solid-state batteries.</p>
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Figure 23: LeasePlan supply chain risk (LeasePlan Annual Report 2020)

<p>Electric vehicle batteries require certain materials, especially cobalt and lithium, that have been associated with poor mining practices and human rights abuses. A failure to ensure satisfactory labour conditions and protect human rights in this supply chain could materially affect our own demand and our</p>	<p>customers' demand for electric vehicles and therefore inhibit our ability to offer sustainable electric solutions.</p> <p>Through our participation in the Global Battery Alliance, convened by the World Economic Forum (we are a founding member of its</p>	<p>Battery Passport Initiative), and in cooperation with key supply chain participants, we are in discussion on how best to ensure human rights abuses do not occur going forward, and that sustainable mining practices and traceability are embedded in battery manufacture.</p>
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Figure 24: BMW sustainably sourcing lithium (BMW Group Report 2020)

<p>Electric mobility can only be sustainable if the raw materials it requires are also obtained as sustainably as possible. Take lithium for example:</p> <p>The BMW Group currently sources lithium for its fifth generation of high-voltage batteries exclusively from Australia, where the material is extracted by means of a so-called hard rock mining process.</p> <p>Furthermore, the Group has commissioned a study on sustainable lithium mining under</p>	<p>the auspices of two renowned American universities in order to scientifically investigate water consumption in the extraction of lithium. The purpose of the study, which will be jointly conducted by the University of Alaska Anchorage and the University of Massachusetts-Amherst, is to investigate the impact of lithium mining on local water supplies in Latin America.</p> <p>Lithium is the lightest metal on earth and is mainly used to produce batteries, ceramics,</p>	<p>glass and aluminium. It is therefore also an essential material for producing lithium-ion batteries and plays a key role in vehicle electrification. Two-thirds of the world's lithium reserves are located in Latin America. To date, however, the impact of lithium mining in the region has not been sufficiently scientifically studied. The gap will now be closed by the study commissioned by the BMW Group. BASF SE is also partially financing the study.</p>
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Figure 25: Mahindra Sustainable Green Supply Chain Management & Procurement Policy ([Mahindra website](#))

Mahindra & Mahindra Limited is committed to follow responsible business practices by contributing to environmental protection and enhancing people performance by green procurement & services while ensuring business growth for its supply chain.

Objective:
To enhance sustainability performance and minimize Environmental, Social & Financial risks within M&M's supply chain, procurement & services.

Policy:
Green Supply Chain:
M&M shall engage with the supply chain partners including suppliers, logistics & service providers to:

- Strengthen compliance of all relevant statutory provisions and conform to M&M's Code of Conduct
- Identify & address business and ESG (Environmental, Social & Governance) risks
- Develop management systems related to Sustainability, Quality, Environment, Safety and Energy

- Monitor, evaluate sustainability performance and identify improvement opportunities
- Reduce environmental footprint by means of material, energy & water conservation
- Encourage logistics optimization and waste reduction using 3 R (Reduce, Recycle & Reuse)
- Move towards zero wood usage for parts packaging
- Promote a safe and healthy workplace for the employees
- Enhance bio-diversity within the facilities
- Ensure eco-friendly product manufacturing in accordance with the RoHS (Restriction of Hazardous Substances) directive
- Promote supplier parks & suppliers within plant vicinity
- Promote sustainability awareness and assessments at supply chain through IT enabled processes
- Enhance sustainability within their own supply chain
- Encourage suppliers to develop and publish their own sustainability report
- Facilitate reward and recognition

Procurement:

- Comply with all relevant statutory provisions pertaining to procurement
- Establish sustainable performance indicators for equipment, products & services
- Open Door framework for all the existing and potential suppliers by maintaining highest level of ethical standards & transparency in dealing.
- Minimize the environmental, social and costs impact associated with the life cycle of goods & services
- Procurement of recycled/ part-recycled products to optimize resource consumption
- Procure energy efficient equipment by defining specifications in tender & contracts
- Co-create innovation to maximize value for both supplier and end user

3.2.2 ENSURING A JUST TRANSITION AND MANAGING LEGACY ASSETS

The Paris Agreement and Sustainable Development Goals (SDGs) stress that to achieve a just transition the benefits and opportunities of the green economy transition must be balanced with support for those who stand to lose

from it economically. In the context of the auto sector, this means that the future and livelihoods of companies' workers and their communities must be secure and impacts across the whole value chain should be considered, including responsible sourcing, customer safety, and affordability. Auto companies seek to achieve

this balance by developing the adaptive capacity of their strategies, organizational structures, operations and work forces while advancing the low carbon transition.

FORUM MEMBER PERSPECTIVE: GENERAL MOTORS AND THE JUST TRANSITION

GM's heritage of people-focussed behaviours and purpose will link its past to its future, providing the tools to enable and manage a just transition. GM considers the impact of the transition on people throughout the value chain, including employees, suppliers, customers and the wider community.

Throughout the transition, GM aims to retain talent at all levels of the organisation and ensure staff feel included in the technology transfer. For example, significant investments in additive manufacturing capabilities to make car components stronger, lighter and safer have created opportunities to re-skill employees throughout the organisation in new manufacturing techniques. GM recognizes that, if not managed properly, the social aspects of the transition could impact communities which may not be resilient to changes, and so considers re-skilling employees for the transition to be a long-term investment.

From the customer perspective, GM sees a just transition providing accessibility to EVs for all. GM has commitments to bring EVs to market at every price point and in every brand.

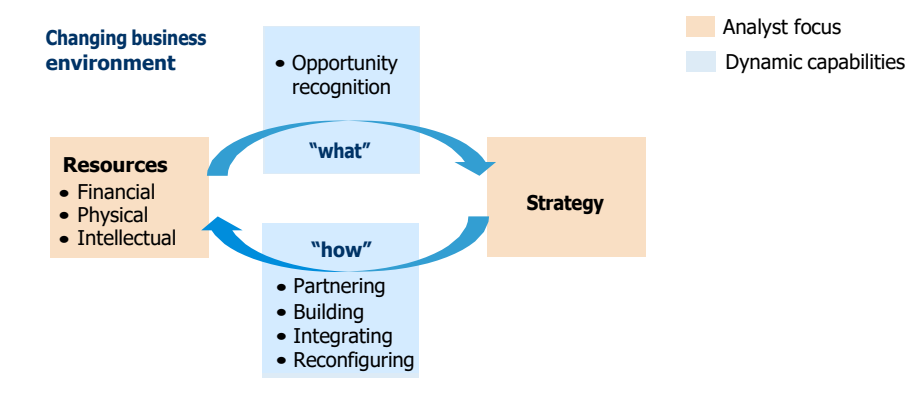
Demonstrating adaptive capacity by signposting the links between forward-looking strategy and existing resources can help investors, employees and communities understand the readiness of auto companies to transition their business from ICE vehicles to EVs. Adaptive capacity 'is the result of dynamic capabilities (partnering, integrating,

building, etc.), which allow existing resources (e.g. assets, financial pockets, intellectual property, etc.) to be put to good use, by means of a strategy. These dynamic capabilities comprise, for example, the ability to perceive external market changes, engage in alliances, reconfigure internal resources for future use, etc'.⁵⁸

Short- and medium-term plans reveal how companies are managing the eventual retirement of legacy assets. Automakers are decreasing average fleet CO₂ emissions by sourcing and developing new materials and parts to improve the fuel efficiency of their legacy product ranges of ICE vehicles. Such measures also offer opportunities for economic savings.

Figure 26: Transition risks in the automotive sector (The CO Firm (now part of PwC), Kepler Cheuvreux)

Explicit (orange) and implicit (blue) factors in an equity analyst's assessment of a company's adaptive capacity



The resources of the company, its strategies and dynamic capabilities determine whether it is future-proof

FORUM MEMBER PERSPECTIVE: VOLKSWAGEN AND THE JUST TRANSITION

The automotive industry is undergoing a radical transformation. Various global studies have predicted a significant impact on the size and skillset of auto company workforces due to e-mobility and digitalization. Volkswagen Group is preparing to facilitate a just transition in a proactive and employee-oriented way. As part of this, Volkswagen Group's independent Sustainability Council commissioned the Fraunhofer Institute for Organization and Industrial Engineering IAO to examine the implications of electric mobility and digitization on the future employment and skills requirements at Volkswagen. This was the first empirical study on the topic and involved interviewing representatives across all Volkswagen business units. It shows the reality is more complex.

The study found that employment levels at Volkswagen could decline less between now and 2030 than research studies covering the automotive industry had previously suggested. It is possible to manage the transformation of the workforce sustainably if the right measures are taken at an early stage. For example, the electric mobility transformation will heavily affect the component manufacturing sector, since the amount of work required for the electric powertrain is lower than that for conventional drive systems. Volkswagen has therefore taken strategic countermeasures by entering new areas of expertise such as battery cell development and production. In addition, the complexities of developing and implementing digitalization processes which Volkswagen are investing in are expected to lead to job growth in the medium term. As well, Volkswagen will experience a juxtaposition of upskilling and down-skilling, of reskilling, and of new skills being added in the upcoming years.

3.2.3 NEW MOBILITY TRENDS, TECHNOLOGIES AND PRACTICES

Against the background of an increasingly uncertain transition environment, auto sector companies are exploring new practices and the potential for competitive advantage and long-term resilience to be gained by embracing wider cultural and technological changes across the sector. While in some geographies personal car ownership is on the rise due to growth of middle classes and increased expendable income, others suggest a trend towards MaaS where mobility becomes the product, rather than vehicles. The rise of connected

and autonomous vehicles (CAVs) is enabling customers to use cars as an on-demand service, rather than purchasing their own. The COVID-19 crisis has reinforced the trend as customers hesitate to commit to large-scale investments and seek increasing flexibility. However, COVID-19 has also reinforced consumer needs for independence and self-determined mobility in protected spaces.⁵⁹ To adapt, many auto companies have repositioned their offerings to increase customer flexibility, for example by offering short-term leases. Fleets of cars connected to the internet of things have also given rise to ride-hailing services, car-sharing and peer-to-peer companies.

Companies are adapting their business models to explore these trends, considering corporate fleet licensing and urban mobility partnerships, for example. OEMs are adapting by manufacturing ever more sophisticated hardware (i.e. vehicles) and providing a platform for a variety of value-adding customer services. They are embracing digitization, online sales offerings and contactless test drives (borne out of necessity during COVID-19 lockdowns).

The trend towards MaaS also gives rise to new sources of revenue, such as advertising and data monetization. New offerings bundle car financing, insurance and servicing arrangements into a flexible vehicle subscription.

Forum member example disclosures about new mobility trends, technologies and practices

Figure 27: Mahindra auto recycling (Mahindra & Mahindra Sustainability Report 19-20)

CERO TO HERO | Where the End Means a New Beginning

End of useful life of a product can be a new beginning. At Mahindra, we are ensuring that the raw materials from vehicles discarded as scrap get a new life to reduce fresh consumption in making vehicles.

Mahindra has joined hands with the Government of India to set up Cero, India's first government authorised vehicle recycling company, to reduce environmental impact through the recycling of scrap vehicles.

Currently, Cero has set up two world-class facilities at Greater Noida and Chennai and has aggressive plans to be present at 25 locations across the country in the coming years. Mahindra Accelo (previously known as Mahindra Intertrade) and MSTC Ltd. (a Government of India Enterprise) have joined forces to establish Cero to achieve these goals.

ZERO POLLUTION WASTAGE TOLERANCE

towards unethical and illegal practices and zero import of metal scrap. It symbolises an effort to create a Zero Waste, Zero Pollution ecosystem. With this initiative, Mahindra is DRIVEN BY PURPOSE TOWARDS A ZERO WASTE TOMORROW. The enterprise helps clean the air, make the roads safer, and conserves natural resources which go into making steel. It is also generating more avenues of employment and steering toward the vision of 'Make in India'.

BEING FUTURE READY PROVISIONS FOR END-OF-LIFE VEHICLES CASE STUDY

TOWARDS ZERO POLLUTION NATION

Mahindra has vowed to put old polluting vehicles off the road and confine them to the scrapyards. It serves two purposes:

- 1 Boosts the demand of new, more efficient vehicles on the road which will help reduce the impact on environment
- 2 The reuse of scrap materials like steel and aluminium for manufacturing new vehicles, thereby reducing new material consumption

None of our major models have any hazardous materials like lead, cadmium, mercury, etc. Also, dismantling manuals have been developed for the first time for Mahindra vehicles. We have instituted special processes to ensure compliance to EEC directive 2005/64/EC for ELV regulation.

For European exports, in line with the EC directive on

RECYCLE RECOVERY REUSE

(RRR), here are the recyclability rates of some of our best-selling passenger vehicles:

XUV500 **93.9%**

Scorpio pickup **95.3%**

Scorpio **94.5%**

We are taking effective steps to store, treat and dispose of the end-of-life vehicles, responsibly. We are aligned with the "ELV Directive" by European Union, which is aimed at dismantling and recycling of ELVs, making them more environmentally friendly by:

- Prevention of certain heavy metals
- Achieving reuse, recycle & recovery targets
- De-pollution of fluids
- Polymeric parts marking
- Dismantling manual

The scope of the directive includes:

- M1 and N1 category of vehicles
- Regulation applies to vehicles including all their components and materials
- Regulation applies irrespective of how the vehicle has been serviced or repaired

Figure 28: General Motors Cruise Autonomous Vehicle Development (General Motors Sustainability Report 2019)

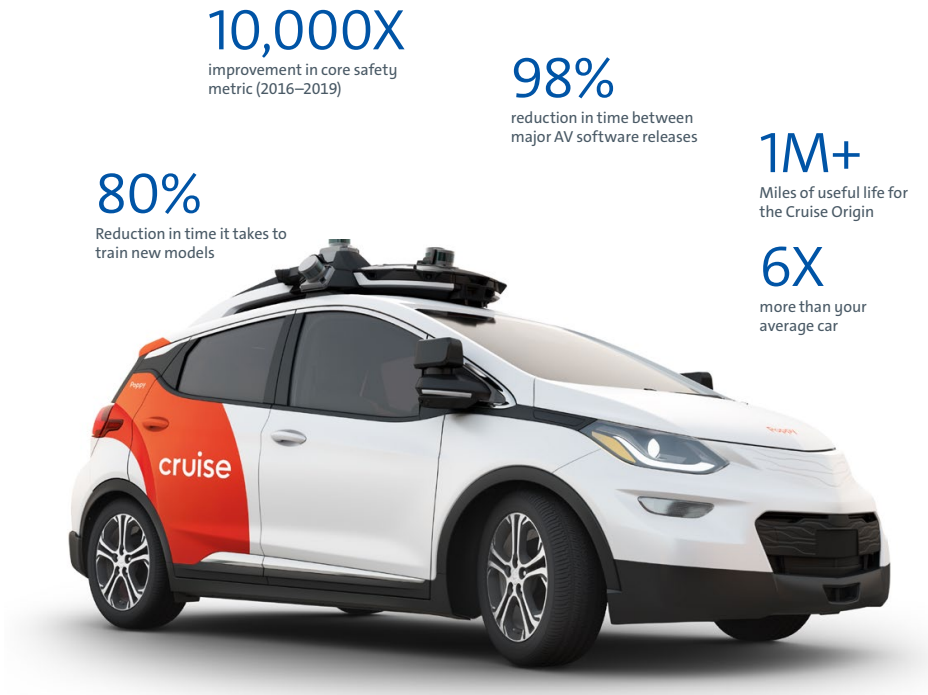


Figure 29: LeasePlan Car-as-a-Service (LeasePlan Annual Report 2020)

Our resilient and cash-generative Car-as-a-Service business provides subscription-based mobility solutions with integrated services

In our core Car-as-a-Service business, we create value by turning vehicles into a service for customers who want the benefit of cars or Light Commercial Vehicles (LCVs) without the hassle of owning them. Based on fleet size, we are the global market leader and largest player in the growing Car-as-a-Service market. We manage a total of approximately 1.9 million vehicles, of which we own around 1.3 million, across more than 30 countries.

Business model

Our resilient and cash-generative Car-as-a-Service business provides subscription-based mobility solutions with integrated services. We offer corporates, SMEs, private individuals and mobility providers a complete end-to-end service for typical contract durations of three to four years. Ownership of the vehicle, which is made possible through our diversified funding programme, is inherent to our business model as it allows us to capture the associated full value chain of services along the lifecycle of the subscription.

Within our Car-as-a-Service offering, specific services include vehicle procurement; vehicle financing; repairs, maintenance & tyre management (RMT); damage handling and insurance services; fleet management and consulting services; and fuel, accident and rental management services. We offer our services through an integrated operating model that helps us leverage our scale and implement proven best practices across countries. This generates multiple, contractually recurring revenue streams that support the overall resilience of our business.

After purchasing, funding and managing vehicles for our customers, our Car-as-a-Service business maximises the value of vehicles coming off contract by selling them or, increasingly, re-leasing them through our used car platform, CarNext.com. This means our Car-as-a-Service fleet turns over relatively quickly and, in principle, contains only the latest and cleanest vehicle models.

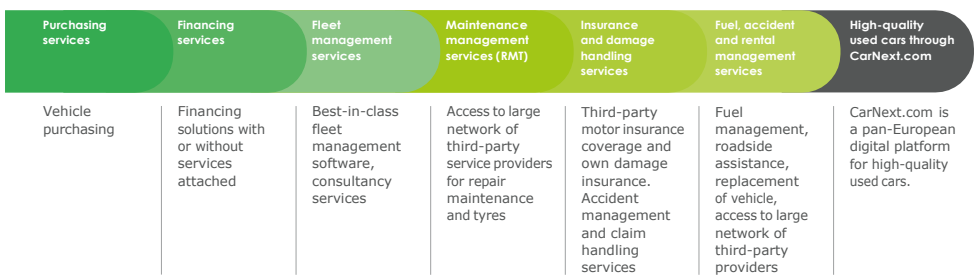


Figure 30: Daimler co-operation with NVIDIA on vehicle software ([Daimler website](#))

<p>Mercedes-Benz and NVIDIA to Build Software-Defined Computing Architecture for Automated Driving Across Future Fleet</p> <p><i>Auto and Computer Industry Leaders Intend to Join Forces and Enable Next-Generation Fleet with Software Upgradeability, AI and Autonomous Capabilities</i></p>	<p>Mercedes-Benz, one of the largest manufacturers of premium passenger cars, and NVIDIA, the global leader in accelerated computing, plan to enter into a cooperation to create a revolutionary in-vehicle computing system and AI computing infrastructure. Starting in 2024, this will be rolled out across</p>	<p>the fleet of next-generation Mercedes-Benz vehicles, enabling them with upgradable automated driving functions.</p>
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Figure 31: BMW digital mobility services (BMW Group Investor Presentation 2021)

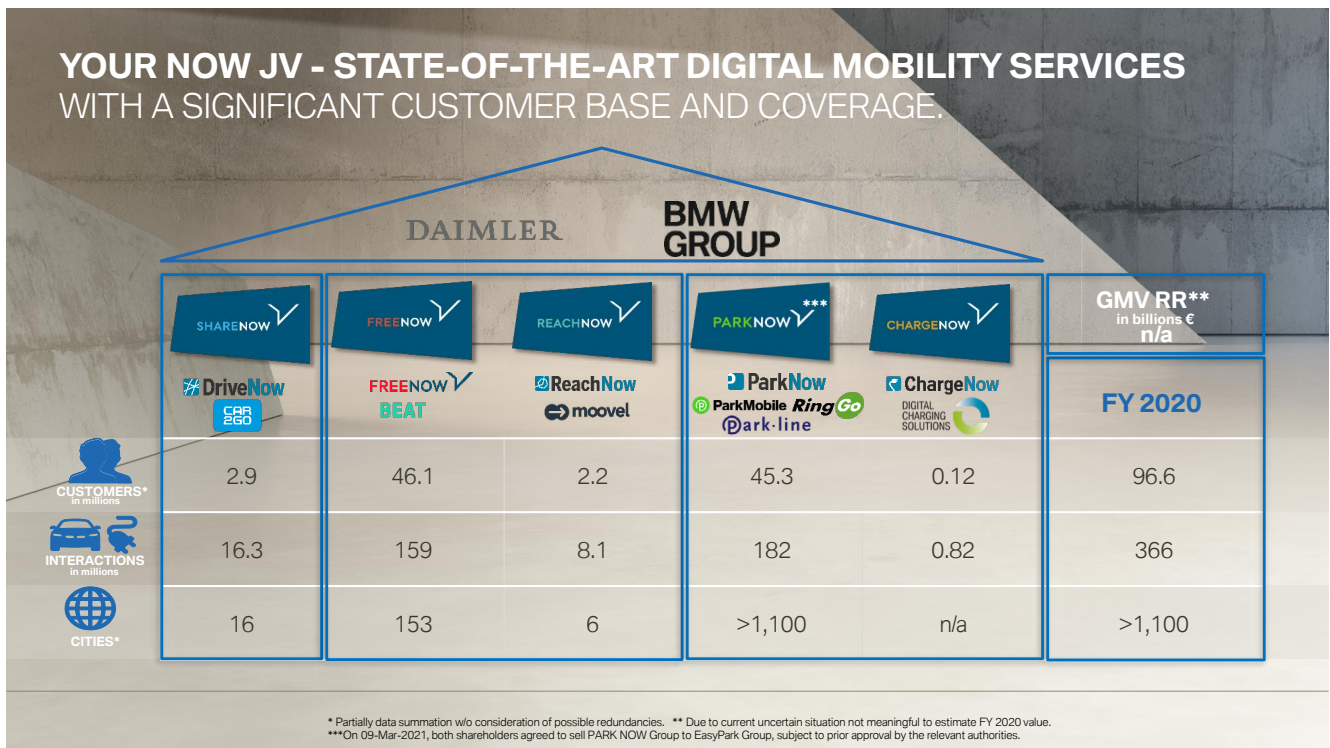


Figure 32: Volkswagen expansion of micromobility (Volkswagen Sustainability Report 2020)

<p>In addition to valuable collaboration in partnerships, the Volkswagen Group already offers cities a large number of solutions especially for the urban area – for example e-micromobility vehicles both for transporting people and for transporting goods. SEAT, for instance, unites all the Group's product-, service- and platform-based mobility solutions under one roof with its own Urban Mobility business unit. The company plays the role of a center of competence for micromobility for the Volkswagen Group and underlines this</p>	<p>with a broad range of products, including the e-roller and the SEAT MÓ e-kick scooter, use of which is also offered as a sharing service. In Prague, ŠKODA operates BeRider, an innovative and emission-free sharing service with electric rollers. ŠKODA also operates the City-Move platform in Prague, which links the various private mobility services with public transport and other services such as parking. We use the number of registered customers and kilometers travelled as sustainability KPIs for our progress in shared micromobility for</p>	<p>BeRider and SEAT MÓ. In the reporting year, 23,478 users were registered with BeRider, and they traveled a total of 798,000 kilometers with the vehicles; the SEAT MÓ app was downloaded 38,000 times. For CityMove, in addition to the number of customers, we also assess the number of business transactions. In the reporting year, 49,125 users were registered with CityMove, and they were responsible for a total of 175,947 transactions.</p>
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Chapter 3 conclusions

Based on the above commentary and examples, the following list summarizes aspects of disclosure that are useful when responding to the first two parts of the TCFD's recommendations on strategy. Briefly, corporate disclosures are useful when they:

- Explain how regional variations in policy, charging infrastructure deployment and consumer attitudes affect forward-looking planning, the distribution of current and projected sales, and strategies to support enabling conditions such as charging infrastructure collaborations.
- Describe how R&D expenditure, capital allocation and collaborations associated with the electrification of vehicles are helping to prepare for a low carbon future.
- Balance information about efforts to reduce the environmental impacts of manufacture with growth forecasts and emissions trajectories.
- Demonstrate adaptive capacity by signposting links between forward-looking strategy and existing resources so that investors, employees and communities can assess auto companies' readiness to transition from ICE vehicles to EVs.
- Explain how new innovations are being advanced, the associated assumptions and financial planning to support them, and expected income streams.

USER PERSPECTIVE: UNDERSTANDING TRANSITION PLANNING

Companies in the auto sector are exposed to risks from climate change but can also capitalise on a range of emerging opportunities. Against this background, investors seek to understand the relative strengths of climate risk transition strategies adopted by auto companies, the pathways along which progress will be chartered to achieve strategic goals and the potential challenges on route.

Disclosures are useful for investors where they provide specific information about:

Medium-term plans that complement long-term targets (typically out to 2050) by explaining the medium-term plan over a 5-10/15-year timeframe, including:

- The degree of flexibility and the type of levers that could be deployed in the event of unforeseen risks.
- Realistic and achievable plans and the extent to which they are supported by investment.
- Milestones and targets, including emissions trajectories.

The strategy around legacy businesses specifically, including plans for assets, factories and supply chains whose relevance to the business model might change as transition plans are progressed, including:

- How and by whom restructuring to meet long term ambitions will be paid for and how this could impact shorter-term returns on investment.
- How a just transition will be achieved, for example by reskilling employees and protecting their communities.

④ Strategy: approach to scenario analysis and disclosing strategic resilience



4 Strategy: approach to scenario analysis and disclosing strategic resilience

SUMMARY:

Forum members are starting to use scenario analysis to assess business resilience and support complex decision making but recognize it to be one of the most challenging aspects of the TCFD's recommendations.

In this Chapter, the Forum explores how to apply parts of the TCFD's 2020 Guidance on Climate-related Scenario Analysis for Non-financial Firms. In particular: formulating a focal question; identifying, rating and ranking driving forces, developing scenario narratives through determining scenario themes, logic and storyline; and approaching quantification of scenarios. Insights about the use of the Guidance in this chapter represent Forum members' collective views. Applying the guidance to individual companies would, by definition, necessitate a more specific and tailored approach.

4.1 STRATEGIC RESILIENCE

The final part of the TCFD's disclosure recommendation about strategy encourages companies to "describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario." The TCFD's Final Report states that "the concept of climate resilience involves organizations developing adaptive capacity to respond to climate change to better manage the associated risks and seize opportunities including the ability to respond to transition risks and physical risks."

The Forum adapted the TCFD's definition of resilience to make it applicable to the auto sector and their working definition of a dynamic state of future resilience is:

"Sustainable low or no-emissions mobility solutions for current and future generations, developed through innovation and collaboration, electrification, digitalization and the protection of resources and the environment, so that society benefits from clean, quiet, intelligent and safe mobility".

Strategic resilience refers to the way in which a company's strategy supports and prepares for the achievement of a resilient state under different climate scenarios.

Climate-related shocks and stressors to the auto sector are centered on socioeconomic and policy-related changes but also the physical impacts of a changing climate. Resilient strategies prepare for, and are responsive to, these potential shocks and stressors. Strategic resilience is developed and demonstrated at a company level by:



- Integrating climate change considerations into corporate decision-making and planning, including via the use of scenario analysis.
- Risk assessment, mitigation and adaptation approaches that consider and manage the impact of potential climate stressors and blind spots (see Chapter 5 Risk Management).
- Supporting strategic goals and financial planning with innovation and investment in new products, services and solutions that leverage opportunities associated with the low carbon transition and the changing nature of mobility (see Chapter 3 Strategy: risks and opportunities).

4.2 TESTING RESILIENCE THROUGH SCENARIO ANALYSIS

Scenario analysis is a forward-looking tool used to explore how a business might perform under different future states and to make strategic and risk management decisions accordingly. Given the uncertainty surrounding the implications of a changing climate, scenario analysis is an important tool to help companies prepare for different eventualities. A scenario describes a path of development leading to a possible future state. The TCFD's recommendations encourage companies to disclose the resilience of their strategies to a variety of climate-related scenarios.⁶⁰

In 2020, the TCFD published Guidance on Scenario Analysis for Non-Financial Companies.⁶¹ It aims to provide a practical, process-oriented way for business to begin implementing climate-related scenario analysis, extending and deepening the TCFD's 2017 Technical Supplement on The Use of Scenario Analysis in Disclosure of Climate-related Risks and Opportunities.⁶²

In this section, the Forum explores how the TCFD's latest guidance can be used to develop and enhance assessments of strategic resilience against different climate change scenarios. The Forum took a collaborative approach to exploring how the guidance might be applied, focusing on the context in which the auto industry operates rather than the specificities of individual businesses.

The Auto Forum focused on selected parts of the scenario process described in Section C of the TCFD's guidance, in particular steps two, three, four and parts of step 5 as indicated in figure 33. These are explored in this section under the following headings:

- 4.2.1 Formulate the focal question
- 4.2.2 Identify, rate and rank driving forces
- 4.2.3 Draft narrative for each scenario:
 - Determine scenario themes (using 2x2 matrix)
 - Develop scenario logic and storyline
- 4.2.4 Quantify aspects of scenarios where necessary and possible

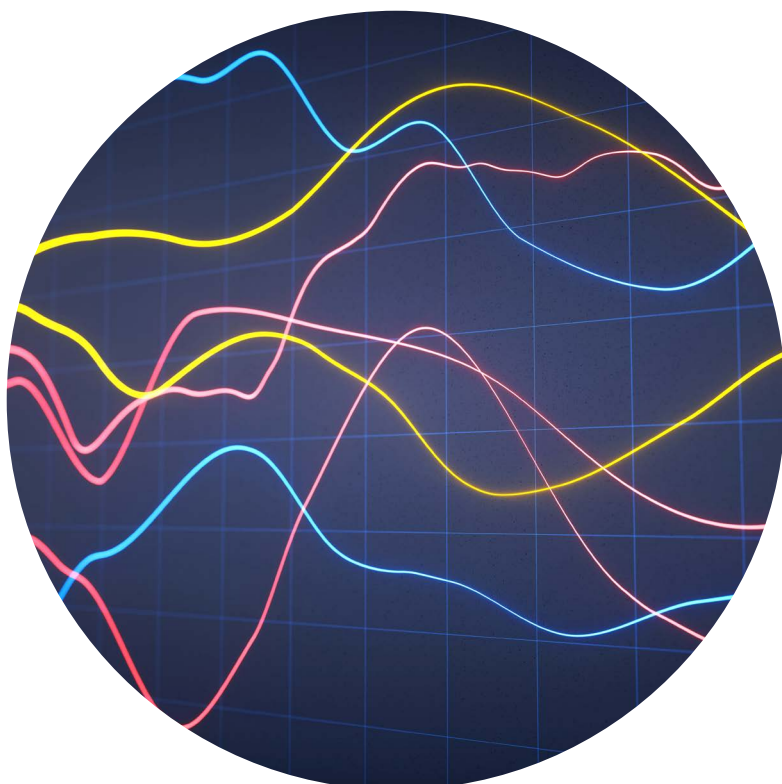


Figure 33: Auto Forum focus areas within the TCFD Guidance on Scenario Analysis for Non-Financial Companies

Detailed Overview of Scenario Process				
SECTION C	Establish Organizational Requirements for Scenario Analysis Structure, Governance, Processes, Stakeholders			
STEP 1	Assess the External Environment Past and current trends, company's current climate risks			
STEP 2	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 5px;"> Formulate Focal Question How could climate-related physical and transition risks plausibly affect our company? What should we do? When? </td> <td style="width: 40%; padding: 5px;"> Define Time Horizon(s) (short, medium, long term) </td> </tr> </table>	Formulate Focal Question How could climate-related physical and transition risks plausibly affect our company? What should we do? When?	Define Time Horizon(s) (short, medium, long term)	
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STEP 3	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; padding: 5px;"> Identify Driving Forces <i>Categories</i> S – Social T – Technological E – Economic E – Environmental P – Political/Policy/Legal </td> <td style="width: 40%; padding: 5px;"> <ul style="list-style-type: none"> External to company Relevant to focal question Directly affect company or one of its key stakeholders May bring positive or negative impacts </td> </tr> <tr> <td style="padding: 5px;"> Rate and Rank Driving Forces Identify and rank uncertainties Identify and rank impacts </td> </tr> </table>	Identify Driving Forces <i>Categories</i> S – Social T – Technological E – Economic E – Environmental P – Political/Policy/Legal	<ul style="list-style-type: none"> External to company Relevant to focal question Directly affect company or one of its key stakeholders May bring positive or negative impacts 	Rate and Rank Driving Forces Identify and rank uncertainties Identify and rank impacts
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Rate and Rank Driving Forces Identify and rank uncertainties Identify and rank impacts				
STEP 4	<p style="text-align: center;">Formulate Baseline for Scenarios Using High-Impact/Low-Uncertainty Drivers (i.e., those drivers and trends likely to occur under any/most future states)</p> <hr style="border-top: 1px dashed #ccc;"/> <p style="text-align: center;">Draft Narrative for Each Scenario</p> <ul style="list-style-type: none"> Draft initial scenarios using high-impact/high-uncertainty drivers Describe how each driving force develops and its impact over the scenario time horizon Describe how the driving forces could interact Translate to a 2x2 matrix to determine scenario themes Develop scenario narratives describing assumed cause-effect relationships among drivers, how drivers play out into the future (pathways), and anticipated outcomes 			
STEP 5	<p style="text-align: center;">Quantify Aspects of Scenarios Where Necessary and Possible</p> <ul style="list-style-type: none"> Key (social, demographic, economic) trends and drivers Company and industry key performance indicators Plausible impacts on markets, suppliers, and customers Impacts on asset value, productivity, revenue, costs, etc. 			
STEP 5	<p>Check Scenario Quality</p> <p>Plausible; Internally consistent; Logical line of reasoning; Makes sense to the intended audience; Surprising/Challenges current assumptions</p> <p>Scenarios presented for feedback and revised as needed</p> <p>Finalize Scenarios</p>			
SECTION E	<p style="text-align: center;">Draw Conclusions and Develop Strategy Options</p> <ul style="list-style-type: none"> How would the scenarios affect the company (risks and opportunities)? How do the company's current strategies, policies, and capabilities prepare the company for the scenarios? What new strategy options should be considered now and in the future? What signposts/warning signals would trigger implementation of future options? <p style="text-align: center;">Feedback on Strategy Options</p> <p style="text-align: center;">Use Selected Options to Inform Strategic Planning; Produce Strategic and Other Supporting Plans</p>			
STEP 6	<p style="text-align: center;">Identify Signpost Metrics to Monitor Future Developments</p> <ul style="list-style-type: none"> Identify thresholds for material changes in drivers Identify metrics to warn of shifts in key uncertainties <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 50%; padding: 5px;">Iterate Scenario Analysis Periodically</td> <td style="width: 50%; padding: 5px;">Evaluate Scenario Analysis Process</td> </tr> </table>	Iterate Scenario Analysis Periodically	Evaluate Scenario Analysis Process	
Iterate Scenario Analysis Periodically	Evaluate Scenario Analysis Process			

4.2.1 FORMULATE THE FOCAL QUESTION

The focal question for scenario analysis is used to anchor and concentrate the analysis on the trends and forces that most affect the company, the decisions it makes, what actions it takes and when. The Forum started with a high-level focal question about how climate-related physical and transition risks could affect a company's ability to achieve the outcome envisaged in their definition of resilience as follows:

“Given the Auto Forum’s definition of a resilient state for the industry, how do physical and transition risks plausibly affect the resilience of Auto companies’ strategies?”

Although drafted in broad and general terms, the focal question could be adapted and refined to apply to the particular circumstances of individual companies - for example where scenario analysis is conducted on specific parts of the business such as operations in certain geographies or particular business units, products and/or commodities.

4.2.2 IDENTIFY, RATE AND RANK DRIVING FORCES

Having defined a focal question and broadly outlined the scope of the scenario analysis, the next step is to identify, rate and rank driving forces. The TCFD guidance defines driving forces (or “drivers”) as external factors that influence the events, trends and patterns that determine outcomes in the business environment.⁶³ For the purposes of climate-related scenario analysis, driving forces are risks and opportunities that may result in material financial impacts on the company or affect the resilience of a company's strategy.

Identifying driving forces

Driving forces were identified by Forum members based on their current disclosures and individual experience. Reputable public sources and climate scenarios that explore the potential future development of mobility under different conditions and pathways were also used to inform the selection. Box 1 summarizes a selection of public scenarios and resources used by the Forum to identify driving forces that could affect the auto industry over time.

The TCFD guidance suggests using the STEEP model, described in Figure C2 of the TCFD's guidance, replicated in Figure 34. to categorize driving forces.



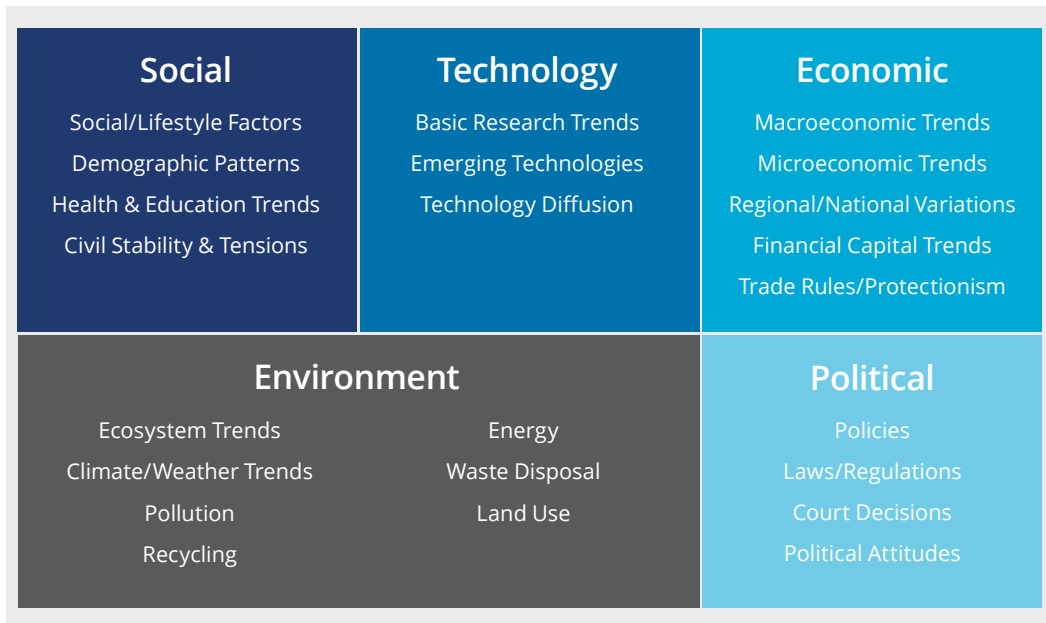
BOX 1 CLIMATE-RELATED SCENARIO SOURCES AND CHARACTERISTICS

A variety of institutions have developed climate scenarios to support policy making and provide useful context and structure for a range of institutions performing scenario analysis. Public scenarios typically explore the effects of the energy/low carbon transition or the physical/weather-related effects of climate change and are often accompanied by public and proprietary research and data points to support scenario analysis. Appendix 1 of the TCFD's Guidance lists public scenarios and models used by the climate policy and research communities and that can be used or adapted by companies for their scenario analysis.

Adapted from PRI materials the following table contains public scenarios and other sources that Forum members have found useful for conducting climate scenario analysis are:

PUBLIC SCENARIOS		
Source and scenario name	Key Characteristic	Emissions trajectory
IEA Beyond 2°C Scenario	Limits warming to 1.75°C by 2100. Starts in 2014	Emissions peak year: 2017 Year for net-zero emissions: 2060
IEA Energy Technology Perspectives 2°C scenario	ETA 2°C scenario. From 2014-2100	Emissions peak year: 2020 Year for net-zero emissions: 2060 for power
IEA Sustainable Development Scenario	Combines climate and social targets for limiting global warming to 2°C. Starts in 2016 until 2040	Emissions peak year 2020 for energy and industry net-zero not modelled
IEA New Policy Scenario	Pathway if all new policy, set out in countries' NDCs, are effectively implement. From 2016-2040	Emissions peak year: 2017 net-zero not modelled
IEA Current Policy Scenario (CPS)	Business-as-usual without new climate policies. From 2016-2040	No emissions peak no net-zero
Principles of Responsible Investment (PRI) Inevitable Policy Response (IPR) Scenario	A first step towards 1.5C exploring forceful, abrupt and disorderly policy responses by 2025	Emissions peak year 2025 net-zero by 2050
IPCC Representative Concentration Pathway (RCP) 2.6	Limits warming to the Paris Agreement's target of 2°C by 2100	Emissions peak year: 2020 Year for net-zero emissions: 2070
IPCC RCP 4.5	Immediate climate emission scenario. Global emissions peaking in 2040 and falling rapidly thereafter until 2080	Emissions peak year: 2040 No net zero
IPCC RCP 6.0	High-to-immediate climate emissions scenario, 2~3.7°C	Emissions peak year: 2080 No net-zero
IPCC RCP 8.5	High emission scenario, 4-5°C, consistent with no policy changes to reduce emissions	No emissions peak No net-zero
NGFS Orderly Scenario	Early, ambitious and action to a net-zero CO ₂ emissions economy with a 67% chance of limiting global warming to 2°C	Emissions peak year: 2020 Net-zero by 2070
NGFS Disorderly Scenario	Climate policies are not introduced until 2030. Action is late, disruptive and sudden, but sufficient to achieve a 67% chance of limiting global warming to 2°C	Emissions peak year: 2030 No net-zero
NGFS Hot house world Scenario	Only currently implemented policies are preserved. Nationally Determined Contributions are not met. Leading to 3°C+ of warming and severe physical risks	Emissions peak year: 2080 No net-zero
NGFS Alternate Scenarios	Five alternative scenarios explore different assumptions such as different temperature targets, policy responses and/or technology pathways	
OTHER SUPPORTING DATA AND PUBLIC REFERENCE POINTS		
Source name	Key characteristics	
BNEF EV Outlook	The Electric Vehicle Outlook is BloombergNEF's annual long-term forecast of how electrification, shared mobility and autonomous driving will impact road transport from now out to 2040.	
WEF Energy Transition Index	The Energy Transition Index (ETI) is a fact-based ranking intended to enable policymakers and businesses to plot the course for a successful energy transition.	
IEA Mobility Model (MoMo) and EV outlook	The IEA Mobility Model (MoMo) is a comprehensive transport modelling tool aimed at improving the analysis of all the aspects of mobility. MoMo uses the various IEA ETP scenarios, including the 2DS as a Below-2-degree pathway, and the B2DS as a Well-Below-2-degree scenario.	
ITF Transport Outlook	The ITF Transport Outlook provides an overview of recent trends and near-term prospects for the transport sector at a global level as well as long-term prospects for transport demand to 2050. The analysis covers freight (maritime, air, surface) and passenger transport (car, rail, air) as well as CO ₂ emissions.	
World Bank Regulatory Indicators for Sustainable Energy (RISE)	RISE – Regulatory Indicators for Sustainable Energy – assesses countries' policy and regulatory support for each of the three pillars of sustainable energy – access to modern energy, energy efficiency, and renewable energy.	
World Bank Climate Change Knowledge Portal	The Climate Change Knowledge Portal (CCKP) provides global data on historical and future climate, vulnerabilities and impacts. The data can be explored at a country, regional or watershed view, for deeper insights into physical climate risks and adaptation actions.	
World Bank TCdata360	TCdata360, a public data source aimed at providing policymakers, development practitioners, academics, investors, and others with free and open access to data on trade and competitiveness. TCdata360 currently features over 2400 indicators, providing snapshots of country's economic performance.	

Figure 34: STEEP Model of Driving Forces in the TCFD's Guidance on Scenario Analysis for Non-Financial Companies



Rating the driving forces by impact and uncertainty

Figure 35 shows the driving forces identified by Forum members and how they ranked them (high, medium or low) in terms of impact and uncertainty over the short (<5 years) and long (5+ years) term. Impact and uncertainty are defined as follows:⁶⁴



Impact/importance - Strength of the force's influence on future outcomes relevant to the key decision factors related to the focal question(s).

Uncertainty - The degree to which future developments and outcomes (of a force) are unpredictable within the time horizon of a scenario. One test of uncertainty is when experts within the company cannot agree on the outcome.

The list in Figure 35 is not exhaustive and the final outcome columns in Figure 35 represent the average scores assigned to individual driving forces by Forum members. The exercise was performed qualitatively and does not necessarily reflect the individual views of Forum members.

Forum members found most value from the ranking process when conducting it with a range of in-house colleagues/departments to form a representative view of the extent to which these forces could impact the business over different time horizons. There was significant variation in the impact and uncertainty ratings across Forum members' individual responses. This is consistent with the uncertainties reflected in public literature/research papers surrounding the evolution of key drivers of transformation in the auto sector, such as the orderliness of policy response and car ownership per capita. Additionally, it was noted that driving forces can have various sub-forces within them, for instance the battery technology evolution can be subsumed under speed for achieving price parity. This is explored further in section 4.2.3.

Figure 35: Results of driving forces impact/uncertainty rating exercise

STEEP CATEGORY	DRIVING FORCE	FINAL OUTCOME		
		IMPACT SHORT TERM (1-5 YEARS)	IMPACT LONG TERM (5+ YEARS)	UNCERTAINTY
Economic	Cost of carbon	High	High	Medium
Economic	Household electricity prices	Medium	Medium	Medium
Economic	Availability of key manufacturing materials/commodities/components	Medium	Medium	Medium
Economic	Cumulative GDP impact from physical risk	Low	Medium	High
Economic	Annual property/infrastructure damage from severe weather	Low	Medium	High
Economic	Level of investment and available financing for net-zero projects	Medium	High	Medium
Economic	Car ownership per capita	Medium	Medium	Medium
Political	Stringency of fleet emissions regulations	High	High	Medium
Political	Stringency of manufacturing energy efficiency regulations	Medium	Medium	Medium
Political	Favorable renewable energy policies	Medium	Medium	Medium
Political	Favorable EV policies/government incentives	High	High	Medium
Political	Orderliness of policy response	Medium	Medium	Medium
Political	Stringency of waste disposal regulations	Low	Low	Low
Political	Existence of net-zero target	High	High	Medium
Technology	Share of electricity from renewable generation	Medium	High	Medium
Technology	Proportion of population with access to electricity	Medium	Medium	Medium
Technology	Quality of transportation infrastructure including road connectivity	Medium	Medium	Medium
Technology	Readiness of electricity grid to handle large amounts of EVs	Medium	High	Medium
Technology	Speed of achieving price parity for full electric vehicles (BEVs)	High	High	High
Technology	Charging maturity: number of EV charge points per capita/ % of fast chargers	High	High	Medium
Technology	Proportion of light vehicles sold are fully electric (BEV) vs. ICE	High	High	Medium
Technology	Proportion of heavy vehicles sold are fully electric (BEV) vs. ICE	Medium	High	Medium
Social	Public sentiment towards ownership of ICE vehicles	Medium	Medium	Medium
Social	Proportion of population are mobility-as-a-service users	Medium	Medium	Medium
Social	Demand for transport (i.e. as a result of remote working)	Medium	Medium	Medium
Social	Proportion of population living in urban areas	Medium	Medium	Low
Environment	Frequency and severity of acute weather events	Low	Medium	Medium
Environment	Temperature and precipitation characteristics (chronic weather)	Low	Medium	High
Environment	Levels of water scarcity	Medium	Medium	Medium

Developing the impact-uncertainty matrix

The next step of the TCFD's guidance is to visualize the results of the rating exercise in an impact-uncertainty matrix (outlined in the

TCFD Scenario Guidance Appendix 2 paragraph 2.1.4 and Figure A2.6). This step facilitates greater insight into the results of the rating and ranking exercises, giving a deeper understanding of the relative

position of driving forces. Figures 36 and 37 present the Forum's results in the form of short- and long-term Impact-Uncertainty matrices.

Figure 36: Short-term impact-uncertainty matrix for auto sector driving forces

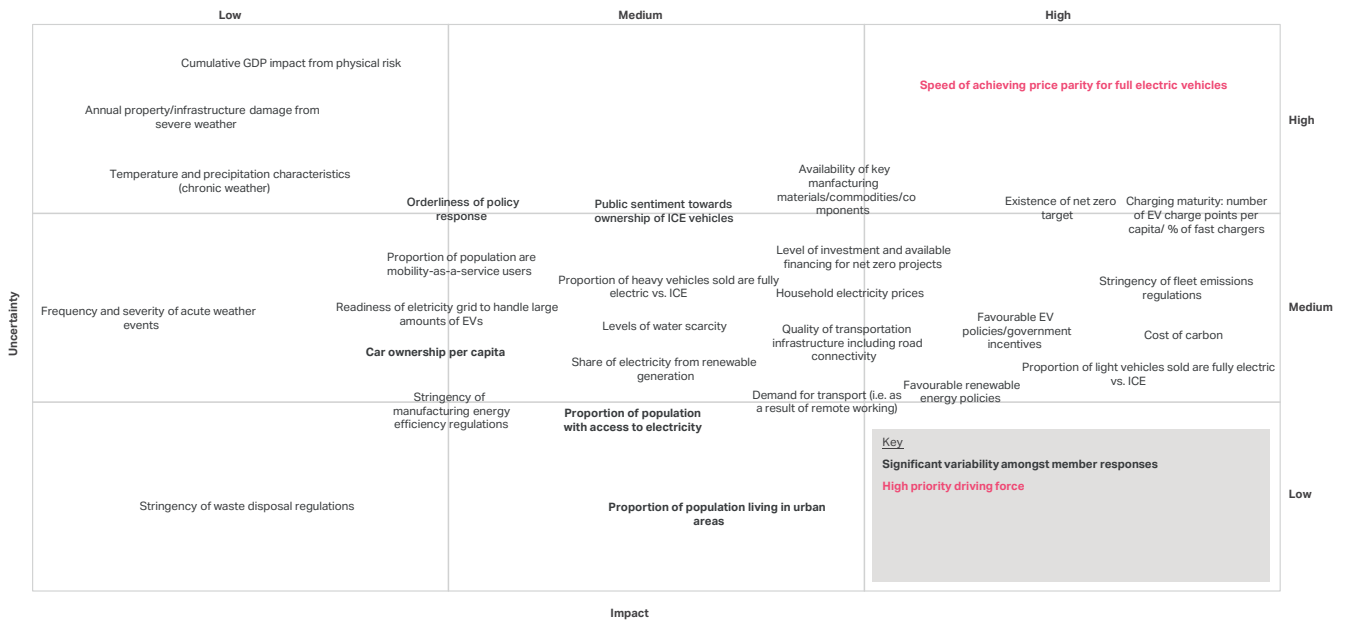
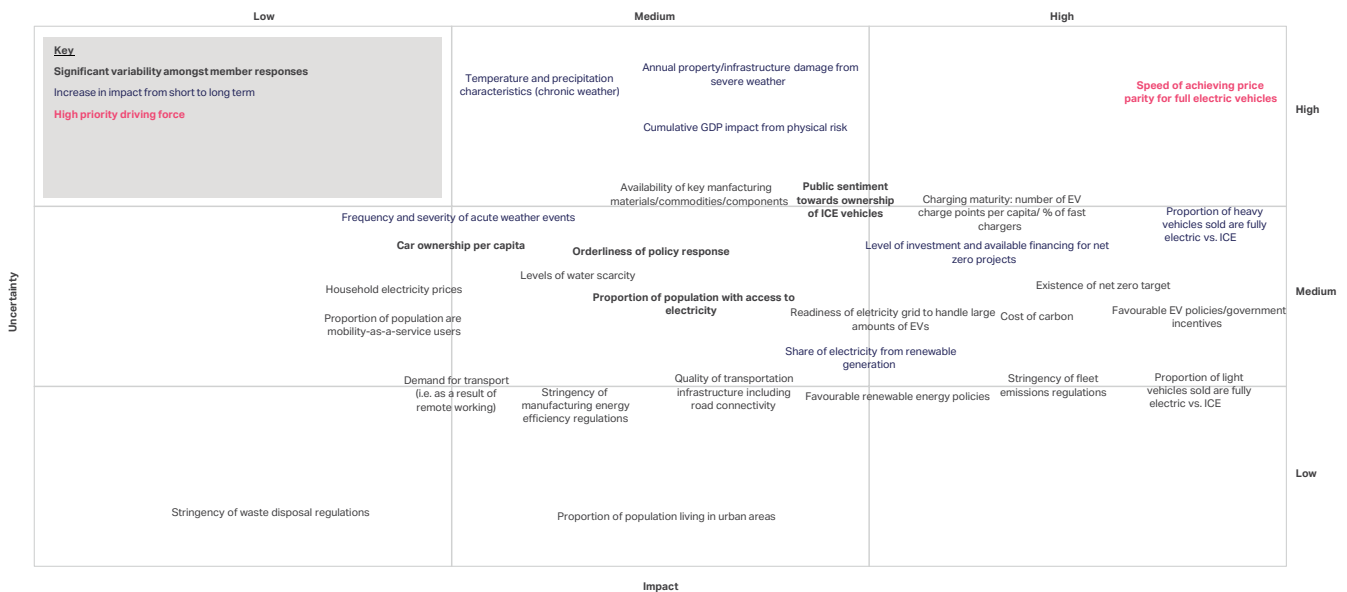


Figure 37: Long-term impact-uncertainty matrix for auto sector driving forces





High priority driving forces

As Figures 36 and 37 show, the speed of achieving price parity for EV and ICE vehicles was identified by Forum members as the driving force with the highest impact and uncertainty for auto companies over the short- and long-term. This is because one of most significant factors driving EV adoption among customers is cost. In some countries, price parity could be reached in the next five years but uncertainty stems from the dependence on incentivization in the short-term and cost per kWh for batteries. The Forum agreed that in the longer term, the speed of technological advancement and its impact on vehicle price would significantly influence the outcome of future scenarios for the auto sector.

Other drivers with high impact in the short- and long-term, though with greater uncertainty, are: public sentiment towards ownership of ICE vehicles; charging maturity and readiness of the electricity grid; stringency of fleet emissions regulations; existence of favorable EV policies; and carbon and renewable energy policies.

These are all low carbon transition-related drivers which will vary across markets and jurisdictions.

Effect of rating and ranking across time horizons

The impacts associated with most of the driving forces are expected to amplify over time. In particular, the level of investment in net-zero projects, share of electricity from renewable generation, proportion of fully electric heavy vehicles and physical risk-related drivers are all expected to have a greater impact in the longer term. The impact of economic and political drivers is expected to increase as a result of governments acting on climate commitments such as those outlined in the “inevitable policy response” set out by the PRI.⁶⁵ This anticipates a range of policy and regulatory responses being adopted to achieve Nationally Determined Contributions. Members did not expect the impact of any of the driving forces to decrease between the short- and long-term.

Physical risk-related drivers are rated the most uncertain by Forum members. Annual property/infrastructure damage from severe weather, temperature and precipitation characteristics, and cumulative GDP impact from physical risk all received high uncertainty ratings. Members recognize that physical risk drivers could affect business operations, disrupt supply chains and influence customer purchasing power, but find the outcome of physical driving forces hard to quantify or estimate at the business level because they are expected to vary significantly across geographies. This is expected to change in the future as increasingly detailed physical hazard data becomes available and analytical techniques for estimating the impact of physical hazards become more sophisticated.

4.2.3 DRAFT NARRATIVE FOR EACH SCENARIO

The next step in the TCFD's Guidance is drafting the **scenario narratives**. A scenario narrative describes a hypothetical future: it tells a story with a sequence of events detailing the developments of different economic, technical, environmental and social dimensions.⁶⁶ The narrative is made up of several elements including scenario themes, logic and storylines.

- **Scenario themes** are descriptions of hypothetical futures based on the potential state of two driving forces with high impact and high uncertainty (depicted in Figures 36 & 37).

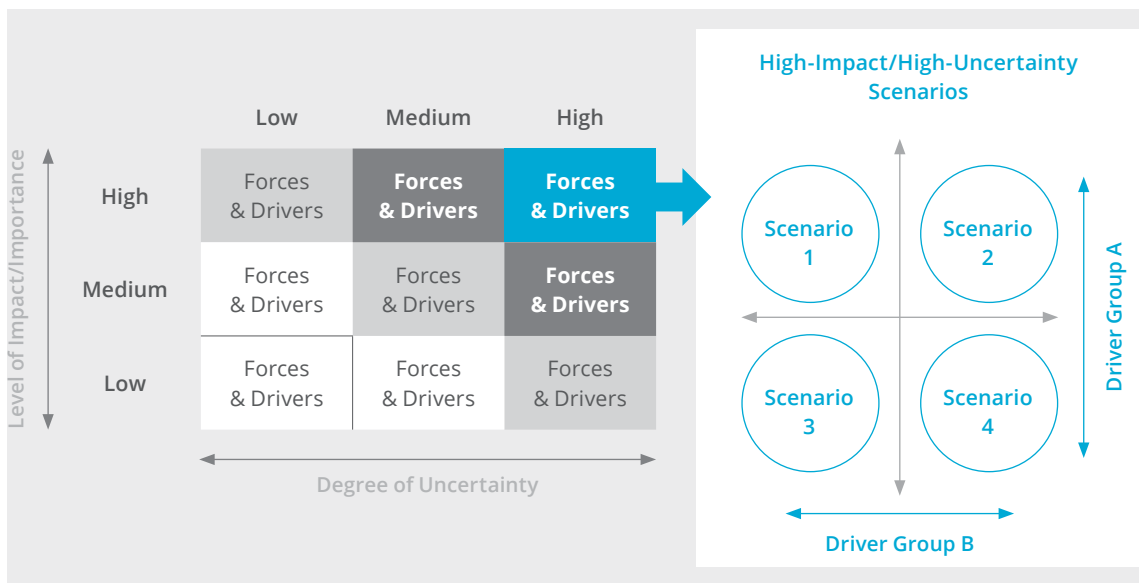
- The **scenario logic** describes the cause-effect relationship between various drivers and the resulting business/financial impact.
- The **scenario storyline** links historical and present events with the hypothetical outcome of the scenario.

The combined scenario theme, logic and storyline creates a plausible and comprehensive narrative based on a company's most material driving forces. This supports coherent analysis of the complex interplay between driving forces within each scenario and across alternative scenarios, as well as it making the scenario easier to explain to various stakeholders and user communities.

Determining scenario themes

The scenario theme characterizes the hypothetical future state depicted by the scenario in broad terms, based on the state of the two highest priority driving forces identified using the "Impact-Uncertainty Matrix". Each high priority driving force should be assigned two alternative hypotheses, capturing plausible but extreme future outcomes. The two hypotheses form the axes in a second 2x2 type matrix referred to in the TCFD Guidance as the "Alternative Scenarios Matrix" and illustrated in figure 38. This approach generates four scenarios with a range of diverse outcomes.

Figure 38: The TCFD's illustration of the process for determining scenario themes, using high priority driving forces from the Impact-Uncertainty Matrix to develop the Alternative Scenarios Matrix⁶⁷



The two highest priority driving forces and associated alternative hypotheses identified by Forum members were:

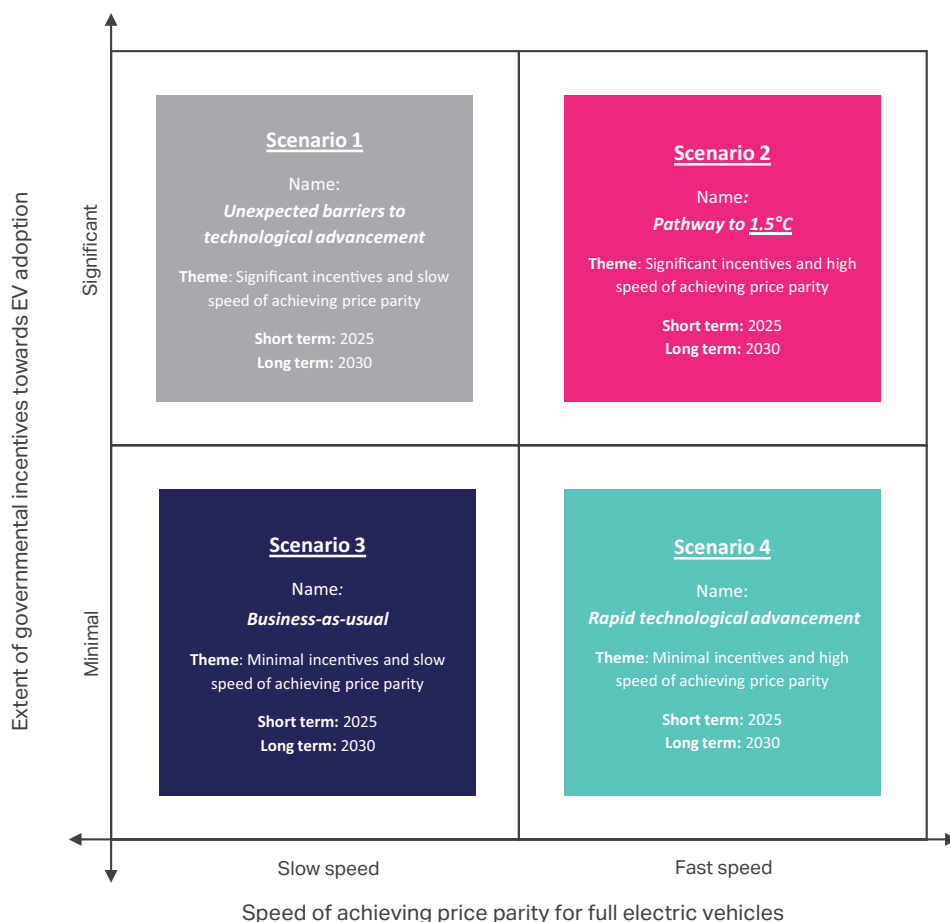
- a) Speed of achieving price parity for full EVs
 - Alternative hypothesis 1: *Slow (10+ years) speed of achieving price parity for full EVs*
 - Alternative hypothesis 2: *Fast (2 years) speed of achieving price parity for full EVs*
- b) Extent of governmental incentives towards EV adoption

- Alternative hypothesis 1: *Minimal increases in governmental incentives towards EV adoption in the short and long term*
- Alternative hypothesis 2: *Significant increase in governmental incentives towards EV adoption in the short and long term*

Driving force "a" ranked highly in both impact and uncertainty under both timeframes, making it a logical choice of a high priority driver. However, members identified several contenders for the second highest ranked driver from their list. These included, but were not limited to, charging maturity, cost

of carbon, favorable EV policies and public sentiment towards ownership of ICE vehicles. To narrow down the selection, the Forum considered whether one of more of those driving forces could be combined coherently with the price parity driving force. Members decided to cluster together multiple driving forces to create an overarching driving force named *Extent of governmental incentives towards EV adoption*. This driving force developed along the lines of TCFD Scenario Guidance Figure A2 – 8 incorporates the influence of broader climate policy such as net-zero targets, EV-specific incentives and emissions regulations on ICE vehicles.

Figure 39: Alternative Scenarios Matrix for the Auto sector showing four distinct scenario themes



Combining the two high priority driving forces and their associated hypotheses into the Alternative Scenarios Matrix created four scenario themes shown in figure 39. The scenario themes are defined by the combination of hypotheses from each driver. For the purposes of this report, each scenario is color-coded and named to bring it to life. The names are indicative of the general direction represented by each scenario and reflect the Forum's interpretation of the potential outcome from each scenario (as defined by the scenario theme). Scenario 2 *Pathway to 1.5°C* aligns best with Forum members' current strategies, centered on investments in EVs and procurement of green energy. Scenario 3 *Business as usual* is least compatible with members' vision of resilience, but it can be used to explore the implications of a scenario without some form of low carbon transition.

Scenario development is typically based on targeted temperature outcomes with associated assumptions about technology, policy, GHG emissions trajectories and so on. The warming pathway of Scenario 2 anticipates a 1.5°C average global temperature increase. The Forum recognized that the warming pathways of Scenarios 1, 3 and 4 would lead to a relatively higher increase in average global temperature than Scenario 2, but further work would be required to explore the nuances in warming pathways between the Scenarios. Forum members debated whether the scenarios they developed should cover the full range of temperature outcomes as outlined by the IPCC (1.5°C – 4°C). However, at this stage in the development of their scenario analysis thinking, the Auto Forum found it more effective to analyze resilience according to two scenarios focused on similar temperature outcomes. In particular, Scenarios 2 and 4 in Figure 39 could plausibly result in a similar level of global temperature rise

while taking very different pathways to get there. The implications of the different pathways could affect Auto companies' strategic decision making, investments and capital allocation and the pathways represented within Scenarios 2 and 4 are sufficiently diverse to provide an appropriate number and range of scenarios for analysis.⁶⁸

Forum members found the development of the Alternative Scenarios Matrix beneficial for exploring how the most material driving forces could be affected under different conditions. However, members had reservations about whether the selection of only two driving forces to develop the Alternative Scenarios Matrix would limit and impair the scope and utility of the analysis. In addition, they noted that scenario analysis would need to adapt where highly ranked driving forces were expected to resolve in the short-term. When determining scenario themes and conducting associated analyses, members plan to explore the status of multiple driving forces and multiple time frames.

Developing scenario logic and storyline

The previous step used the Alternative Hypothesis Matrix to define the overarching theme of each scenario. However, to build up the full picture of the hypothetical future states (the scenario narrative), the logic and storyline behind the driving forces need to be developed. The **scenario logic** seeks to explain cause-effect relationships among driving forces. The **scenario storyline** is the development pathway of the driving forces and links historical and present events with the hypothetical outcome of the scenario. The TCFD guidance suggests the following steps for developing the scenario logic and storyline, each of which is explored further:

- a) Assign indicators to the driving forces to define the baseline and outcome values of each driving force
- b) Explore the interconnections and influences between driving forces (logic)
- c) Define the development pathway of the scenarios (storyline)

The final scenario narrative is a written piece to bring all the elements of the scenario process together within an integrated narrative describing the causal chain of events. For the purposes of this exercise, the Forum explored scenario themes, logic and storyline but did not write the narrative piece.

The TCFD's guidance states that scenarios may be quantified using indicators and descriptive statistics. Indicators provide a unit or proxy by which to define, measure, estimate and monitor the current and future state of the driving force throughout the time period of the scenario. Indicators are dependent on the scope of the scenario, including the geography/jurisdiction, time horizons and business/product lines covered by the scenario. Table 2 shows the indicators that have been assigned to the Forum's list of driving forces.

Table 2: Auto sector illustrative example driving forces and possible indicators

STEEP	DRIVING FORCES	ILLUSTRATIVE INDICATORS
Economic	Speed of EVs reaching price parity with ICE vehicles	Difference in cost between comparable ICE vehicles and EVs Annual rate of cost decrease between EVs and ICE vehicles Expected number of years before price parity is reached
Political	Extent of government incentives towards EV adoption	Incentives for manufacturers: number or value of financial incentive policies for OEMs Incentives for consumers: number or value of purchase subsidies, ownership tax benefits, infrastructure incentives Total annual value of government spending towards incentivizing EV adoption
Economic	Cost of carbon	Price of one ton of carbon (e.g.; USD/ton CO ₂ e)
Economic	Availability and price of key manufacturing materials	Price per ton of key manufacturing materials Volatility of price of key manufacturing materials
Economic	Level of investment/ financing for green or net-zero projects	\$ amount of total green finance and % share compared to all financial flows per country (via industry or financial instrument) \$ of total green finance needed per country, estimated via country NDCs, pledges by companies and investors, academic research
Political	Existence of net-zero target	Goal year to reach net-zero and interim GHG emissions reduction targets/ carbon budgets Total quantity of emissions to be removed to reach net-zero (Mt CO ₂ e) % of total emissions expected to be offset
Technology	Charging maturity	Number of available public charge points per 1000 people Total number of public charge plugs and locations and % of fast chargers and fast charger locations Number of charge locations per EV registered
Technology	Share of electricity from renewable generation	% of gross final energy consumption from renewable sources (e.g., hydropower, tide, geothermal, wind solar, ambient heat, biofuels)
Social	Public sentiment towards ownership of ICE vehicles	Total number of EV registrations, number of EV registrations per 1000 people EV and BEV market share % of motorists with "range anxiety" from survey data
Environment	Frequency & severity of acute/chronic weather	% change in frequency and/or severity of physical hazards e.g., drought Cumulative impact on GDP from extreme weather events

The scenario **baseline** is the set of conditions that occur under all four scenarios and that is likely to have an impact on the company no matter what scenario ensues.⁶⁹ The indicator **baseline** represents the current state of the indicator, typically in the starting year of the scenario (e.g. 2020). In some cases, such as for physical indicators, the baseline will be an average value across a period (e.g. IPCC AR5 used 1986-2005).

Scenario **outcomes** describe the hypothetical context in which a company might find itself operating at a given point in the future. The **outcome** indicator reflects its state at the scenario time horizons (e.g. 2025 and 2030). The relative state of driving forces at a given time horizon is indicated by the intensity shading in Table 3.

Figure 40 illustrates the way selected indicators associated with particular drivers could change, or not, from the baseline through the short-term to the long-term under each of the four scenarios. Up and down arrows indicate whether the key indicator associated with the driving force is expected to increase or decrease under the scenario. In practice, the baseline and outcome of each driving force should be defined or quantified using reputable sources and/or expert judgement. See Box 1 for further details on public reference scenarios in the context of the auto industry.

Figure 40: Exploring the interconnections and influences between driving forces (logic)

STEEP	Driving force	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
		Significant incentives and slow speed of achieving PP		Significant incentives and high speed of achieving PP		Minimal incentives and slow speed of achieving PP		Minimal incentives and high speed of achieving PP	
		Short term	Long term	Short term	Long term	Short term	Long term	Short term	Long term
Economic	Cost of carbon	↓	↓	↑	↑	↓	↓	↓	↓
	Price of one ton of carbon (e.g. USD/ton CO2e)	↓	↓	↑	↑	↓	↓	↓	↓
Technology	Charging maturity	↑	↑	↑	↑	—	—	↑	↑
	Number of charge locations per EV registered	↑	↑	↑	↑	—	—	↑	↑
Social	Public sentiment towards ownership of ICE vehicles	↓	↓	↑	↑	↓	↓	—	—
	Total number of EV registrations, number of EV registrations per 1000 people	↓	↓	↑	↑	↓	↓	—	—
Environment	Frequency & severity of acute/chronic weather	—	—	↓	↓	↑	↑	↑	↑
	% change in frequency and/or severity of physical hazards e.g. drought	—	—	↓	↓	↑	↑	↑	↑

Driving forces influence each other and the matrix in Table 3 provides a structured way to explore the interconnections between each driving force in Scenario 2 - Pathway to 1.5°C. The driving forces are listed in the table columns and rows. The possible influence/interconnection between drivers is described where a row and a column intersect. Darker shaded boxes indicate a direct link between the two driving forces, lighter shaded boxes represent an indirect link and boxes with no shading indicate that there is no clear link between drivers.



Table 3: Matrix exploring the interconnections and influences between auto sector driving forces under Scenario 2 – Pathway to 1.5°C defining the development pathway of the scenarios (storyline)

	1. Speed of EVs reaching price parity with ICE vehicles	2. Extent of government incentives towards EV adoption	3. Cost of carbon	4. Availability and price of key manufacturing materials	5. Level of investment/ financing for net-zero projects	6. Existence of net-zero target	7. Charging maturity	8. Share of electricity from renewable generation	9. Public sentiment towards ownership of ICE vehicles
2. Extent of government incentives towards EV adoption	Significant government incentives accelerate speed of EVs achieving price parity with ICE vehicles								
3. Cost of carbon	High carbon price increases the cost of some EV manufacturing materials in the short-term, increasing OEM OpEx and reducing profitability of ICE vehicles. This may reduce available capex for EV R&D, reducing speed of EVs reaching PP	Governments implement a high carbon price to incentivize EV adoption through increasing fuels prices and running costs of ICE vehicles							
4. Availability and price of key manufacturing materials	Changes to availability and price of manufacturing materials affects the speed with which EVs reach price parity	Government incentives increase demand EVs and EV manufacturing materials, affecting availability and price	High cost of carbon increases the cost of raw materials						
5. Level of investment/ financing for net-zero projects	High levels of investment in EV manufacturing and R&D increases speed of reaching price parity with ICE vehicles	Significant government support incentivizes investment in EV projects from private capital	High cost of carbon improves the return prospects of low carbon projects relative to high carbon projects, increasing level of financing and investments	Demand for key EV manufacturing materials will rise as level of investment in net-zero projects increases, affecting price and availability					
6. Existence of net-zero target	Existence of net-zero target in key jurisdictions incentivizes focus on EV business, increasing speed by which price parity is increased	Governments which have implemented a net-zero target include incentives towards EV adoption as part of the net-zero strategy	Existence of net-zero target causes governments to set high carbon prices/increases the carbon price	Demand for key EV manufacturing materials could rise in the presence of a net-zero target, affecting price and availability	Existence of net-zero target increases investor demand for net-zero projects				
7. Charging maturity	EV price parity increases EV sales, accelerating necessary improvements in charging maturity	Supportive EV policies would increase deployment and availability of charging infrastructure	High cost of carbon incentivizes development of low carbon projects including deployment of charging infrastructure, but conversely could cause cost of project materials to rise	No clear link in Scenario 2	Greater levels of investment in charging infrastructure accelerate charging maturity	Existence of net-zero targets accelerates levels of charging maturity			
8. Share of electricity from renewable generation	No clear link in Scenario 2	Governments incentivizing EV adoption also incentivize decarbonization of the energy mix	High cost of carbon drives growth of renewables projects, increasing share of electricity from renewable generation	No clear link in Scenario 2	Investors seeking net-zero projects invest in renewables projects, increasing share of electricity from renewables	Existence of net-zero target increases share of electricity from renewables	No clear link in Scenario 2		
9. Public sentiment towards ownership of ICE vehicles	Public sentiment towards EVs improved as EVs reach price parity with ICE vehicles	Government incentives such as consumer subsidies increase attractiveness of EV ownership	High cost of carbon increases running costs of ICE vehicles, improving public sentiment towards EVs	Public sentiment towards EVs could be jeopardized if EV manufacture depletes scarce resources	No clear link in Scenario 2	Existence of net-zero target increases public awareness of climate issues, improving sentiment towards EV ownership	Greater levels of charging maturity improve public sentiment towards EV ownership	Decarbonized electricity grids optimize the low carbon benefit of EVs, improving public sentiment	
10. Frequency & severity of acute/ chronic weather	Expected changes in frequency & severity of weather events kept to a minimum as world is on a 1.5° C warming trajectory	Expected changes in frequency & severity of weather events kept to a minimum as world is on a 1.5° C warming trajectory	Expected changes in frequency & severity of weather events kept to a minimum as world is on a 1.5° C warming trajectory	Occurrence of adverse weather creates unexpected changes to price and availability of key commodities	No clear link in Scenario 2	Expected changes in frequency & severity of weather events kept to a minimum as world is on a 1.5° C warming trajectory	No clear link in Scenario 2	Increased share of electricity from renewable sources contributes to mitigating GHG emissions, minimizing changes to global climate	No clear link in Scenario 2

KEY		
No clear link between driving forces	Direct link between driving forces	Indirect link between driving forces

Each scenario anticipates a particular outcome that can be reached via different pathways, reflecting a variety of ways in which **driving forces could evolve and change over scenario time horizons**. Public reference scenarios, reputable research and

the company's own view can be used to inform the pathway for each driving force under each scenario. In addition, the interconnections between driving forces will influence the pathways of individual driving forces.

The examples in Figures 41 and 42 estimate the pathways through which two different driving forces: *Charging Maturity* and the *Speed at which EVs could reach price parity with comparable ICE vehicles* could progress under each scenario.

Figure 41: Example pathways for charging maturity in scenarios 1-4

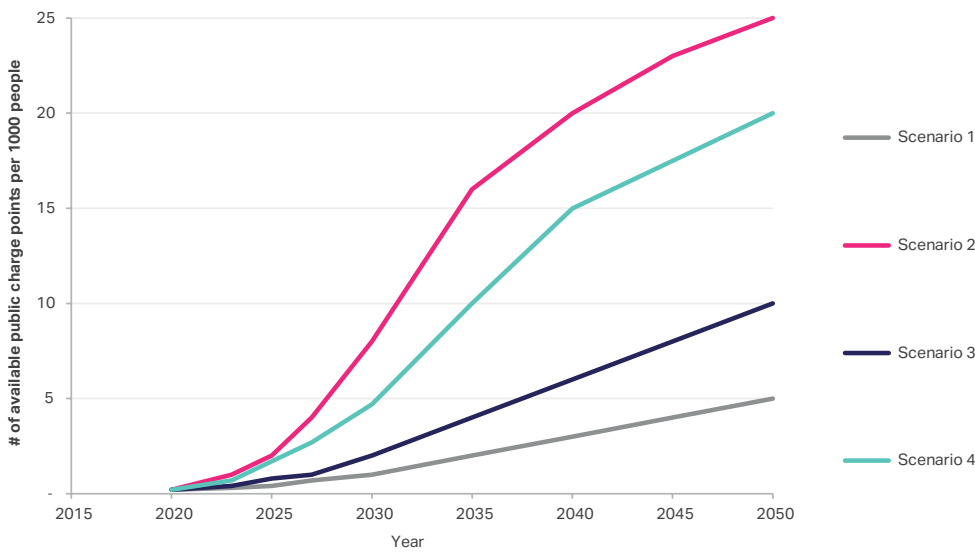
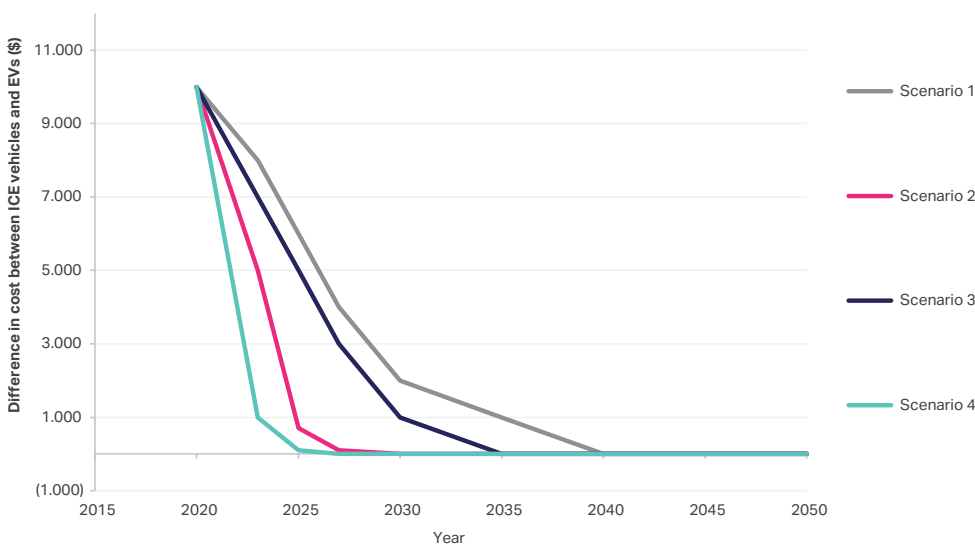


Figure 42: Example pathways for speed of EVs reaching price parity with comparable ICE vehicles in scenarios 1-4



In Figure 41, the number of available chargers increases most significantly under Scenario 2 (Pathway to 1.5°C) driven by technological enhancements coupled with supportive public policy. Scenario 4 (Rapid technological advancement) is closely behind but does not see the same growth in the number of public charge points between 2025 – 2030 due to the lack of governmental incentives towards EV adoption under this scenario. Scenarios 1 (unexpected barriers to technological advancement) and 3 (business-as-usual) see the number of charge points increase at a steady rate across the time period. However, neither scenario experiences the rapid increase in charge point numbers shown under Scenarios 2 and 4. By 2050, the number of charge points under Scenarios 1 and 3 is less than half that under Scenarios 2 and 4.

In Figure 42, price parity of EVs with comparable ICE vehicles is reached under all scenarios but at different speeds. Scenario 4, where rapid technological advancements dominate, reaches price parity earliest. It is shortly followed by Scenario 2. Scenario 1 takes the longest, reaching price parity in 2040 and reflecting unexpected barriers to technological advancement anticipated under that scenario. When comparing across Figures 41 and 42, the number of available charge points starts to increase more rapidly under Scenarios 1 and 3 after the year that price parity is reached (2040 and 2035 respectively), demonstrating the influence of price parity on the extent of charging maturity.

Readers should note that Figures 41 and 42 are hypothetical and for illustrative purposes only. They do not represent the views of individual Forum members.

4.2.4 QUANTIFICATION OF SCENARIOS

The TCFD guidance encourages quantification through a mature scenario process once sound scenario narratives have been developed. Quantification of business and financial impacts under each scenario is generally advanced through modelling, although indicators have been used in the process described above. When taking a modelling approach, quantification could proceed using the following steps:

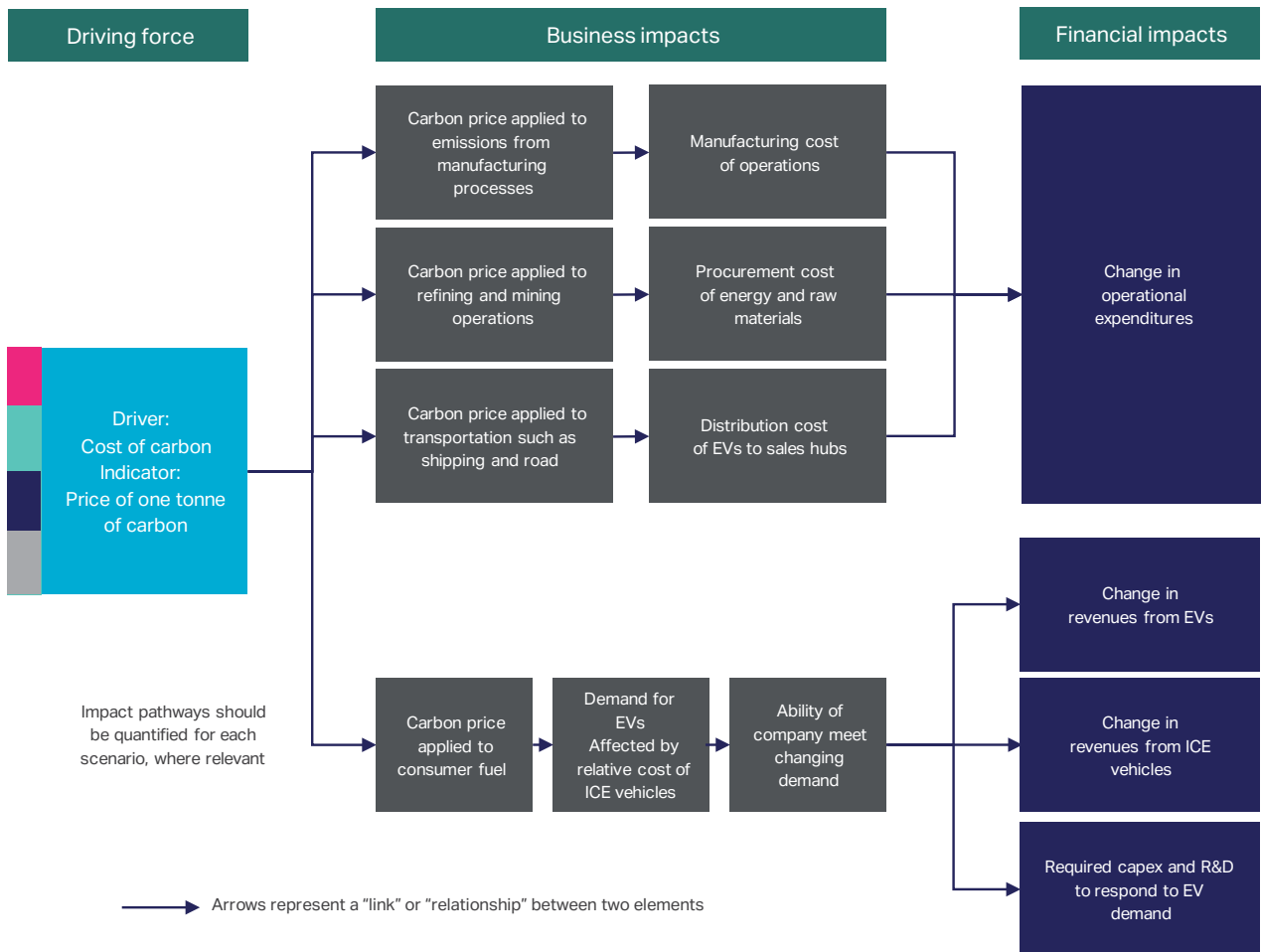
1. **Develop impact pathways linking the relevant driving forces to business and financial impacts.** Figure 43 uses an impact pathway approach to explore the business and financial impacts of the cost of carbon. A similar approach could be used to assess other material driving forces such as the impact on profitability of servicing costs and the residual value of second hand EVs.
2. **Find the right data to assess the impacts.** Data about driving forces is typically taken from public reference scenarios and other authoritative sources. Business impact estimates might be based on operational information from the company and its suppliers, such as the quantity of emissions and/or energy used or volume and cost of materials sourced. Financial impacts will relate to results in the financial statements, such as revenues or capital expenditures.

3. Establish relationships between impacts.

Relationships between impacts are denoted in Figure 43 using arrows. For quantification, these should be further defined in terms of direction and magnitude. *For example, a \$1 increase in the cost of carbon increases the procurement cost of a steel from a specific supplier by X%.* The direction and magnitude of the relationship may differ between scenarios depending on how the company decides to scope the scenario. The relationship established is likely to be contingent on several assumptions. These should be recorded as part of the analysis. *For example, it may be assumed that the steel manufacturer internalizes 50% of the increases in the cost of carbon.* Establishing relationships creates a "calculation pathway" which quantitatively links the driving force, business impacts and financial impacts.

4. **Build the model to perform calculations and quantify financial impacts.** Models run the calculations defined using the driving force and business data collected. The model outputs will be the expected financial impacts under each scenario, enabling a quantitative comparison of the possible effect of each scenario on the business.

Figure 43: Example impact pathway for Auto OEMs, exploring the effect of carbon price changes on business and financial impacts



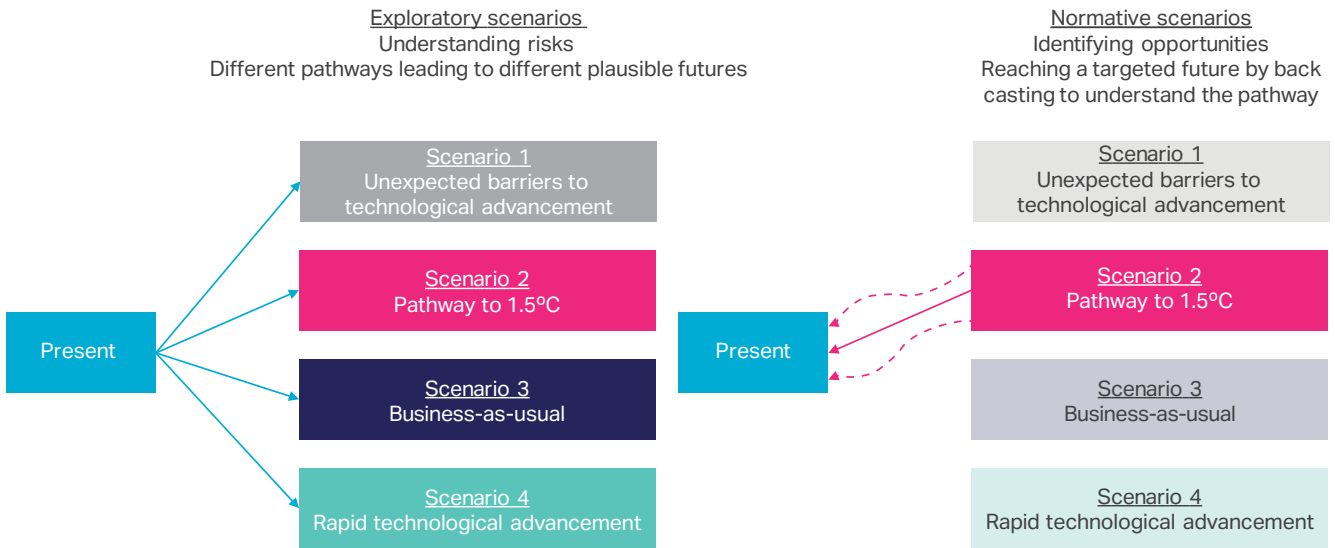
Exploratory and normative scenarios

Exploratory scenario analysis builds on the present to explore a range of plausible but different futures. Exploratory scenarios are typically used to assess potential climate-related risks and uncertainties. **Normative scenarios** start with the preferred future outcome and back-cast plausible pathways to the present. Normative scenarios are typically used for setting targets and implementation plans, for instance when defining how a net-zero emissions by 2050 goal can be achieved.

Figure 44 is based on the TCFD's Scenario Analysis Guidance⁷⁰ and compares how the scenarios developed by the Forum could be used for exploratory and normative scenarios analysis. The four plausible but diverse scenarios could be used to explore how key trends affecting the auto sector might evolve over time from the present day. Alternatively, Scenario 2 could be used in normative analysis as the preferred scenario with possible pathways back-cast to the present. The thick arrow represents the preferred pathway which could form the basis of target setting and implementation

plans. The dotted arrows represent alternative pathways which also reach the defined outcome of Scenario 2, acknowledging that pathways may not play out as expected and that flexibility should be incorporated into strategies and planning.

Figure 44: Depiction of exploratory and normative scenario approaches



Forum members have been using elements of the exploratory and normative scenarios processes in-house. Generally the normative approach has been used to set goals (such as net-zero targets), determine mitigation pathways and routes to realizing the opportunities of the low carbon transition and to make decisions that support the goals. Elements of the exploratory scenario approach have been used to identify, assess and monitor business risks, but members acknowledge that establishing a comprehensive in-house exploratory scenario process is still a work-in-progress.

Reflections

Forum members found their collective review of the new TCFD Scenario Guidance useful as a first step in exploring how climate scenarios analysis could be conducted for the auto sector and their individual companies. The guidance details a helpful process that facilitates internal discussions across a wide range of departments around the implications and relative importance of different but interconnected climate-related driving forces.

Members note that when conducting the process internally, they would consider each driving force in greater depth to capture the full complexity. In particular, the range of views that emerged from the process to rate and rank driving forces suggests that a rating scale with more intervals (i.e. not limited to high/medium/low) would capture more variation between drivers and produce a more definitive ranking. Members also note that the two-dimensional approach of the Alternative Scenarios Matrix could constrict the scope of the analysis and further work would be required to fully explore the interdependencies between all driving forces.

Members' climate scenario analyses have become more sophisticated over the past few years due to greater levels of engagement in the process by senior stakeholders and external experts. However, making disclosures on hypothetical future events and their potential effects on business resilience remains challenging for a variety of reasons. These include how to convey the ambiguities, assumptions and limitations inherent in the scenario analysis process and ways to discourage readers from interpreting scenarios as forecasts.

FORUM MEMBER PERSPECTIVE: DAIMLER AND SCENARIO ANALYSIS

Certainly, the element of scenario analysis in the context of TCFD reporting is one of the most challenging and valuable tools for considering potential climate change impacts on a specific business model. The challenges are many, ranging from the publication of sensitive projections relevant to competition and the application of adequate climate warming pathways to concrete organizational implementation and identification and involvement of relevant stakeholders. In any case, the development of a meaningful scenario analysis that is equally suitable for external and internal users is a permanent undertaking that must be continuously adapted to the company's respective situation, changing framework conditions and new findings in climate research and relevant disciplines performance, identifying development of sales, expenditure, market size and growth.

USER PERSPECTIVE: SCENARIO ANALYSIS

Users are keen to see evidence that companies are assessing their business resilience under a range of different future scenarios and taking the long-term risks associated with climate change seriously. Disclosures around scenario analysis are most useful when they include:

- Evidence that a range of possible routes to transitioning the business have been explored to take account of the variety of approaches that could be pursued and factors that are both in and outside of their control in achieving transition goals. Rather than interpreting scenarios as outcomes, users are looking to understand how each company, in their own context, is prepared for different scenarios.
- Quantitative metrics and relevant scenarios. Users expect an evolution from qualitative disclosure based on generally accepted/publicly available scenarios to more quantitative disclosures based on scenarios specific to companies.
- Emissions trajectories over the next 5 – 10 years so that users can assess company carbon intensity projections against reference points from generally accepted scenarios, such as the IEA Sustainable Development Scenario (SDS) and use the information to align their portfolios with the goals of the Paris Agreement.
- Ambitious transition plans that help users understand how the company will navigate a scenario that aims to keep post-industrial global warming to below 2°C, including the levers available to the company to manage disruption.
- Demonstration that capital allocation strategies can be flexed to accommodate changes in the environment as the low carbon transition evolves.
- The impact of the transition on people, including company employees.

4.3 RESILIENCE TESTING AND DISCLOSURE

During the course of discussions, the Forum considered how strategic resilience could be demonstrated in disclosures that respond to the TCFD's recommendations. Various methods for understanding resilience and tests for assessing resilience were considered, some of which are explained in more detail in WBCSD's [Strategic Resilience: A Primer for Business](#). In summary, the following factors can be used to develop in-house resilience thinking and guide disclosures that demonstrate strategic resilience.



RESILIENCE THINKING

Forum members discussed that it is useful to:

1. Use multiple lenses to assess and manage resilience and to complement risk assessment.⁷¹
2. Conduct sensitivity testing on particular variables associated with principal climate-related risks.
3. Introduce climate mitigation and adaptation measures and understand how they position the company to operate within planetary boundaries, in line with societal expectations and the SDGs in order to minimize threats to resilience.
4. Formulate a vision of what constitutes resilience, informed by the company's investors and others, and consider how the strategy and financial plans support it.
5. Explore a range of different possible futures and scenarios to test strategic resilience – such as the process outlined in section 4.2 – and explain the methods, scenarios, assumptions, parameters used.

RESILIENCE DISCLOSURE

Forum members discussed that it is useful to:

1. Explain how the business model and strategy are positioned for resilience (in terms of assets, products, resources, opportunities etc.) and how the business model and strategy are affected under different climate scenarios.
2. Demonstrate how the strategy is financed for resilience, including how financial impacts of climate change-related risk have been estimated and can be managed under different scenarios while remaining profitable, and how innovation is being funded.
3. Show that the strategy has governance, structural and managerial support to remain resilient and agile, including through partnerships and collaborations.
4. Explain how climate-related issues are integrated into the company's thinking, planning and processes (so there are no blind spots) and check that disclosures regarding strategic resilience are coherent within and across reporting channels.
5. Demonstrate that the company has the capacity and flexibility to transform its business model and strategy if necessary.



5 Risk management



5 Risk management

SUMMARY:

- The risk landscape for and the risk appetite of Forum members has significantly changed and the risk context will continue to evolve through the EV transition.
- Forum members are developing approaches to climate-related risk management, assessing and understanding uncertainty and disruption across enterprise and emerging risks.
- Risk management supports and connects with a range of business functions – from marketing to product portfolio development and operational processes – but there is a need to develop and support knowledge and understanding, especially given the challenges associated with assessing risk over longer-term time horizons and the complex relationships between risks.
- Illustrative risks along the EV S curve, illustrative assessment and prioritization factors and examples of risk responses are provided in this Chapter.

The TCFD recommends that companies disclose information about:

- The climate-related risks to which they are exposed;
- The process used for identifying, assessing and managing those risks; and
- Whether the process is integrated into the organization's overall risk management approach.

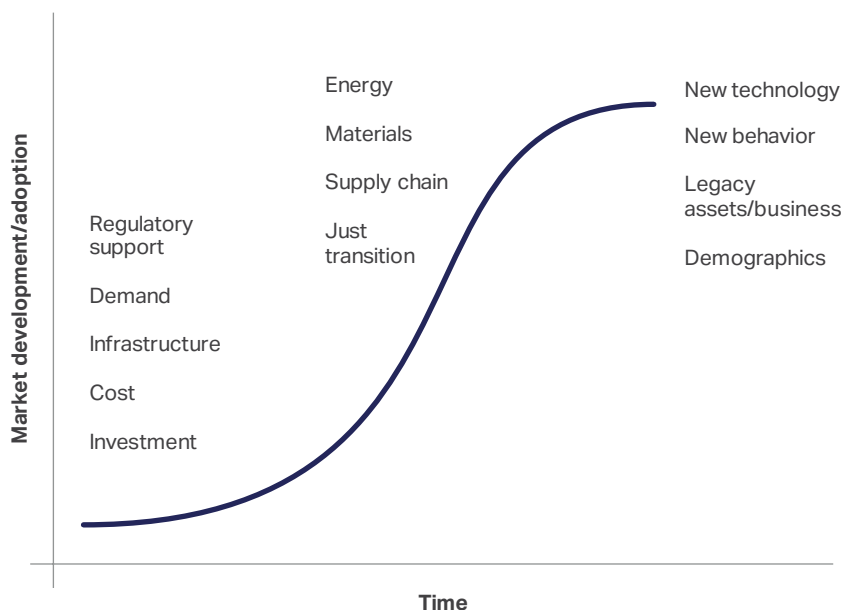
This Chapter explores the implementation of these recommendations with a particular focus on the internal processes and approaches Auto companies use and the challenges they face when integrating climate-related risk into enterprise risk management. The question of integration is addressed in the TCFD's 2020 Guidance on Risk Management Integration and Disclosure⁷² through common processes and elements. Here, we focus on the application of risk management practices to the EV transition and highlight three related considerations using company experience and illustrative examples to describe:

1. Changing risk landscape and appetite
2. Assessment and prioritization approaches
3. Risk responses

5.1 CHANGING RISK LANDSCAPE AND APPETITE

The business context for Forum member companies has changed significantly in recent years and will continue to evolve. A significant part of this change is attributable to the progression and development of the EV technology and deployment S curve. Through early, growth and mature stages, risks have and will continue to change. Auto companies have changed their risk appetites as they seek to move ahead of market signals, competition and consumer demand for EVs. This is seen as necessary to establish competitive positions and build expertise and capabilities. Such significant changes in the sector demand a sophisticated approach to risk management that involves assessing and understanding uncertainty and disruption across enterprise and emerging risks. Risk management across Forum members supports and connects with a range of business functions – from marketing to product portfolio development to operational processes. But there is a need for education and a risk taxonomy, with definitions and processes, to help relevant company stakeholders identify, describe and evaluate risks related to climate change and the low carbon transition. This is particularly true given the challenges associated with longer term time horizons and the complex relationships between risks, especially from a financial perspective. Reflecting on the changing nature of risk through the EV transition, Forum members highlighted the following illustrative risks and dependencies associated with different stages of the S curve.

Figure 45: Illustrative risks along EV S curve



5.2 ILLUSTRATIVE LIST OF ASSESSMENT AND PRIORITIZATION FACTORS – CHARGING INFRASTRUCTURE EXAMPLE

As auto OEMs and leasing companies manage product and service transitions from ICEs to BEVs, there are certain practical dependencies in relation to the enabling environment that could support or hinder change. This includes the number, location, design, function and performance of charge points. The following section provides a non-exhaustive, illustrative list of factors that could be applied when assessing these dependencies. The factors are applied to the risk that **infrastructure limits uptake and deployment of battery electric vehicles**, referred to below as “infrastructure risk.”

The TCFD’s guidance on risk management helps companies identify specific risk management processes and elements that may need to be adjusted for the integration of climate-related risk and adapt existing risk management processes and elements based on the characteristics of climate-related risk.

The following illustrative list of factors demonstrates a practical response to applying the TCFD Risk Management guidance, adapted from COSO Principles⁷³ and [Applying Enterprise Risk Management to Environmental, Social and Governance-related Risks](#).⁷⁴ They are organized into four categories:

- a) Assessment and prioritization criteria
- b) Severity measures

- c) Measurement approach
- d) Data, parameters and assumptions

a) Assessment and prioritization criteria

The following criteria may be useful for assessing and prioritizing infrastructure risks:

- Impact: the result or effect of infrastructure limitations
- Likelihood: the possibility that infrastructure will limit progress towards adoption of EVs
- Adaptability: the capacity to absorb and respond to infrastructure limitations
- Complexity: the scope and nature of the limiting infrastructure context including the degree of uncertainty and varied impacts

- **Connectivity:** the connections between infrastructure limitations and other risks, processes, conditions or situations
- **Velocity:** the speed of onset or time to impact of infrastructure limitations, i.e. how much warning can be given, time horizon of forecasts, etc.
- **Persistence:** the duration of the impact of infrastructure limitations
- **Recovery:** capacity to respond

b) Severity metrics

The following quantitative and qualitative measures may be useful for expressing the severity of the risk:

- **Revenue/expenditure:** Projected impact on income, investment
- **Capital and financing:** Projected impact on costing, budgeting
- **Sales:** Projected impact on sales across segments, brands, fleet
- **Regulatory:** Fleet emission standards/conditions fines
- **Environmental:** Fleet emissions
- **Operational:** Supply chain and production changes across segments, markets, facilities
- **Partners:** Number, type, scope, plans and agility of charging infrastructure partners
- **Public sector/government:** Investment in and delivery of charging infrastructure
- **Performance and planning:** Type, speed, location of charging infrastructure, range of vehicles
- **Customer:** Changing customer confidence, preference, concerns and complaints

- **Markets:** Number, type and nature of markets affected

c) Measurement approaches

The following tools and processes are useful for providing an evidence-based approach to measuring and understanding risk severity:

- Expert input/interviews, for example with business segment/unit leads, charging companies, transport ministries, public bodies, academics, consultancies, etc.
- Forecasting and valuation using existing market data and lookback studies to understand limitations and inform estimates of potential future impacts, changing key parameters (e.g. user behavior, policy conditions, investment and delivery) within plausible ranges

- Scenario analysis focused on potential impacts of infrastructure limitations
- Probabilistic and non-probabilistic models, drawing on actuarial statistical expertise
- Variance, limiting factor analysis and stress tests for assessing sensitivity of key markets/regions to infrastructure limitations
- SWOT analysis to understand the organization's position, prospects, preparedness and vulnerability to infrastructure limitations using quantitative or qualitative means

d) Data, parameters and assumptions

Risk assessment relies on the availability and quality of data from key primary, secondary, internal and external sources. An indicative list of potential information sources is shown in Table 4.



Table 4: Potential data sources

Internal sources	Historical and projected sales Range of vehicles Demand model Total cost of ownership Vehicle price Charge capability & behavior Market share Partnerships/agreements Fixed and variable costs Capital flexibility Distances travelled Energy efficiency Battery performance Average cost of EV repairs, tires, maintenance Cost of EV insurance Customer profile (company, household, taxi, shared vehicles)
External sources	Charging technology (type of connector, power) Level of investment Vehicle types Number of chargers Location of chargers Charge events per day Charge duration Customer sentiment Government/public authority planning User behavior Charger utilization



5.3 ILLUSTRATIVE RISK RESPONSES

According to the COSO ERM Framework, risk responses fall within the categories of accept, avoid, pursue, reduce and share.

- Accept – take no action to change the severity of the risk

- Avoid – remove the risk
- Pursue – convert to opportunity
- Reduce – take action to reduce severity
- Share – transfer a portion and/ or collaborate

Forum member companies use a range of approaches and responses responding to risk, considering business context, expectations, risk characteristics and business value. The following table provides a range of examples from all Forum member companies.

Table 5: Risk response examples

RESPONSE	RISK EXAMPLE	RESPONSE EXAMPLE	FORUM MEMBER EXAMPLE(S)
Avoid	Raw materials sourcing connected to human rights issues	Supply policies and due diligence	Daimler – Human rights in the supply chain Supplier Sustainability Standards Daimler Supplier Portal BMW – Supplier Due Diligence
Pursue	Limited market and consumer appetite for EVs	Develop and expand marketing and education	GM – No way Norway/Everybody in BMW – How to charge an electric car in 10 steps LeasePlan's Car Cost Index Daimler – Enjoy Electric
Reduce	Supply and performance of batteries	Investment in technology	Volkswagen and QuantumScape BMW and Solid Power Daimler and Farasis
	EV cost of purchase and ownership limits uptake	Leverage benefit-in-kind tax arrangements for EV scheme	LeasePlan electric car salary sacrifice
	Lack of range in pricing, across brands and models limits EV market	EV offering across different brands, vehicle segments, models and price points	VW – Investment & 70 all-electric models Mahindra - Treo
Share	Supply chain and movement of parts limits production	Supply engagement and development	Mahindra – Auto Sector Performance
	EV charging infrastructure limits demand	Collaborate/partner with peers and charging companies to develop network and support customers	IONITY GM - Building an EV Ecosystem and All-Electric Future

⑥ Metrics and targets



6 Metrics and targets

SUMMARY:

- Metrics and targets indicate how companies measure and monitor their climate-related risks and opportunities. They can be used to demonstrate progress made to implement strategic management, mitigation and adaptation responses.
- Forum members have been disclosing operational metrics about business impacts including GHG emissions, water consumption and energy usage for many years and are increasingly disclosing climate-related financial metrics as recommended by the TCFD.
- This chapter includes a table of illustrative operational and financial metrics that are potentially useful in climate-related financial disclosures for automotive sector companies to disclose. These metrics relate to activities ranging from financial investments in low carbon technology and sales by vehicle category to responsible sourcing. Some of these metrics are in line with the types of information expected to be required for the EU Taxonomy.

The TCFD encourages companies to:

1. Disclose the metrics the organization uses to assess climate-related risks and opportunities in line with its strategy and risk management process;
2. Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions and any related risk;
3. Describe the targets the organization uses to manage climate-related risks and opportunities and performance against targets.

6.1 EXAMPLES OF CURRENT METRICS DISCLOSED

Forum members commonly disclose **operational metrics** to show performance and progress against climate-related targets, including GHG emissions reductions. Commonly reported metrics include absolute Scope 1, 2 and 3 GHG emissions, sales-weighted average fleet fuel economy and renewable energy procurement. However, the metrics used for climate-related financial disclosure vary in type and emphasis between Forum members depending on their role in the auto sector value chain e.g. OEMs and car leasing. Both car leasing companies and OEMs stress the importance of Scope 3 use phase emissions for example but, for OEMs, full lifecycle emissions must also be considered that include the manufacturing stage and supply chain.

Forum members disclose metrics associated with business opportunities as well as those related to risk. Several opportunity metrics such as those relating to battery performance, renewable energy procurement/supply, EV charging infrastructure and value of green financing are considered to be particularly useful and are already disclosed by some members. Forum members note that a company's absolute GHG emissions may rise in the short- to medium-term as growth outpaces efficiency improvements and the transition to EVs and as market trends for the sector accelerate.

Forum members present **financial metrics** primarily to demonstrate investments in different business areas to enable the low carbon transition, showing that investment choices are aligned with strategies. Forum members most commonly report investments in R&D and technology. Some Forum members also disclose earnings connected to different business lines and segments, including those for low carbon products and services. In some cases, these metrics are in the financial statements or other conventional financial disclosures on capital allocation plans or R&D spending. Some of the metrics are in line with the types of information expected to be required for the EU Taxonomy including revenue, capital expenditures (CapEx) and operational expenditures (OpEx) associated with 'green' activities. Disclosures highlighting expenditure connected to operations can also give an indication of broader efforts to support the low carbon transition.

Forum members are exploring approaches to developing metrics such as:

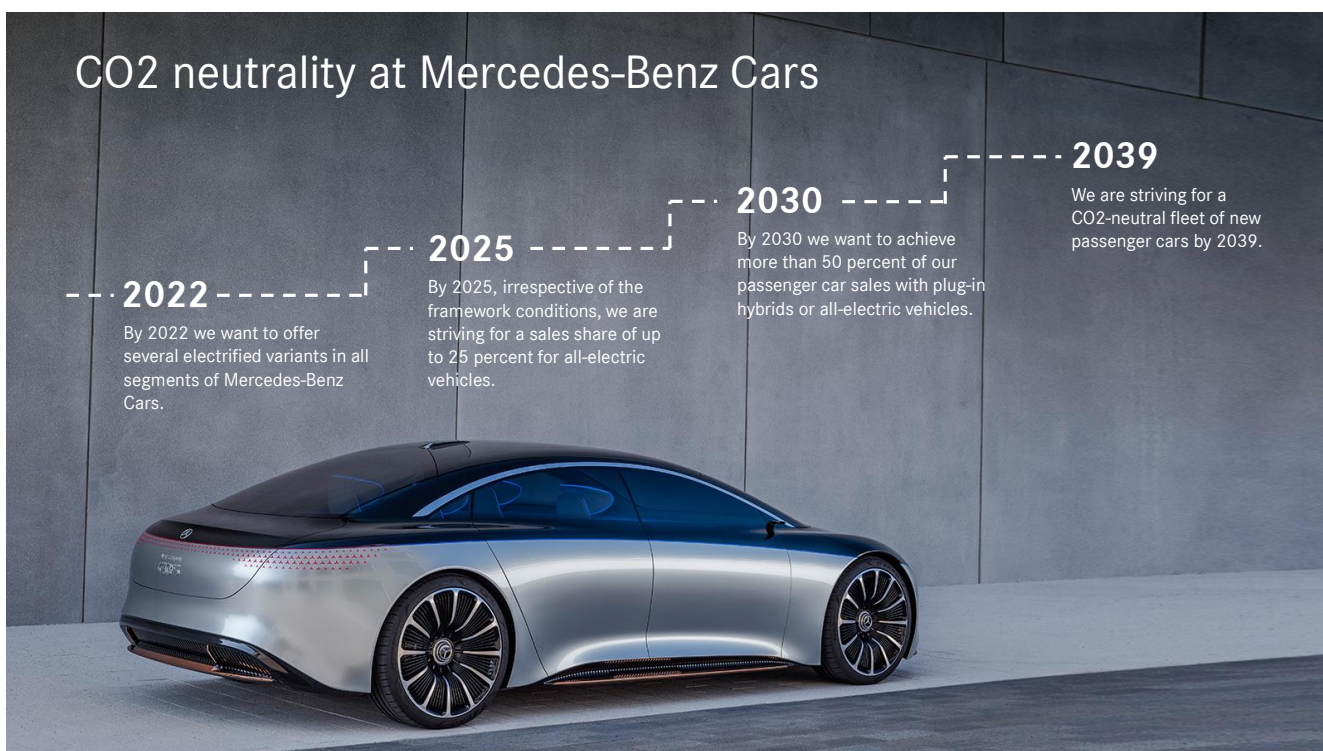
- Value-at-Risk. These values tend to be associated with specific risks or mitigation options and can be single value or range estimates.
- Estimated financial impacts of climate change based on scenario analysis. However, disclosures will be of most value once there is greater clarity on how the estimates will be interpreted by users of information.

Metrics and targets that reflect strategy and long-term ambitions are useful for demonstrating and tracking progress against the company's intentions and direction. Disclosures about project pipelines and other investments give an indication of plans beyond five years and the extent to which the company is aligning with future trends and integrating innovation into its business model. Although helpful to users, disclosure of this information might be limited due to competitive concerns of the issuers. Impactful targets need to address the whole value chain and full life cycle emissions. This can make accountability challenging but is considered important. Disclosures about medium- and long-term targets are useful when

they include descriptions outlining how companies will reach targets (e.g., through investments in EVs, battery technology, efficiency improvements). However, longer-term views of the business model will depend on assumptions about how the industry, market and regulatory environment will evolve. There is currently a high degree of uncertainty and companies will need to update them as new analyses emerge. Forum members also highlight that for targets to be impactful, there is a need for them to address the whole value chain and life cycle of products as well as regional variations, and breakdowns may help to tell the story better.

Examples from Forum member metrics and targets disclosures

Figure 46: Daimler CO₂ neutrality across cars, trucks & buses, locations & administration (Daimler Fixed Income Presentation 2020)



Daimler Trucks & Buses: Making CO2-neutral transport a reality

**Second half
of 2020s**

Hydrogen-based series-
production vehicles in the
second half of the decade.

2022

Battery-electric series-
production vehicles in all core
regions by 2022.

2039

CO2-neutral driving operation (tank-
to-wheel) by 2039 for new trucks and
buses in the markets of Europe, Japan,
and North America.



Daimler Mobility und Mercedes-Benz Bank: CO2-neutral locations and administration

2020

Sustainability –
embedded in our
corporate values.

2022

Global CO₂-neutral
locations
and administration.

A modern glass building with a blue sky background. The building has a curved facade and large windows. The words "Daimler Mobility" are written in large, bold, black letters across the front of the building. A green tree is visible on the right side of the image.

Daimler Mobility

Figure 47: General Motors new EVs target (Barclays 2020 Global Automotive Conference presentation)

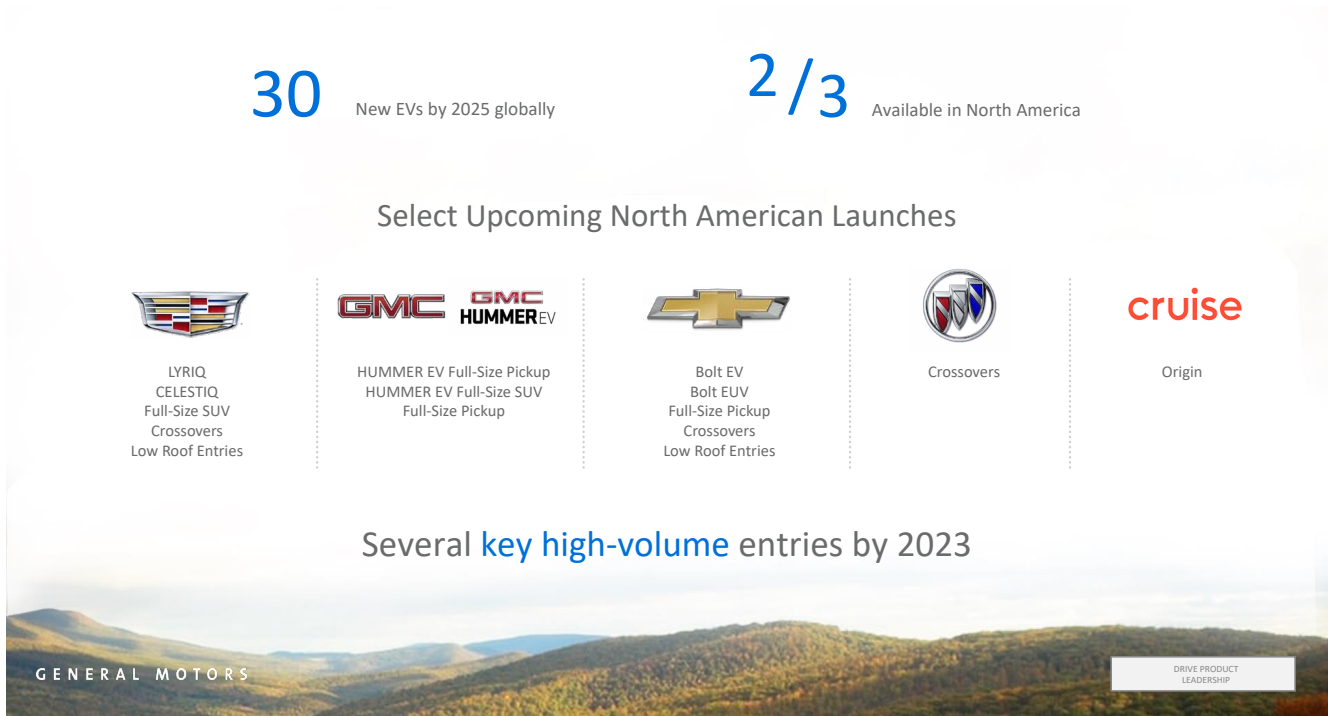


Figure 48: BMW carbon dioxide reduction across value chain (BMW Group Investor Presentation 2021)

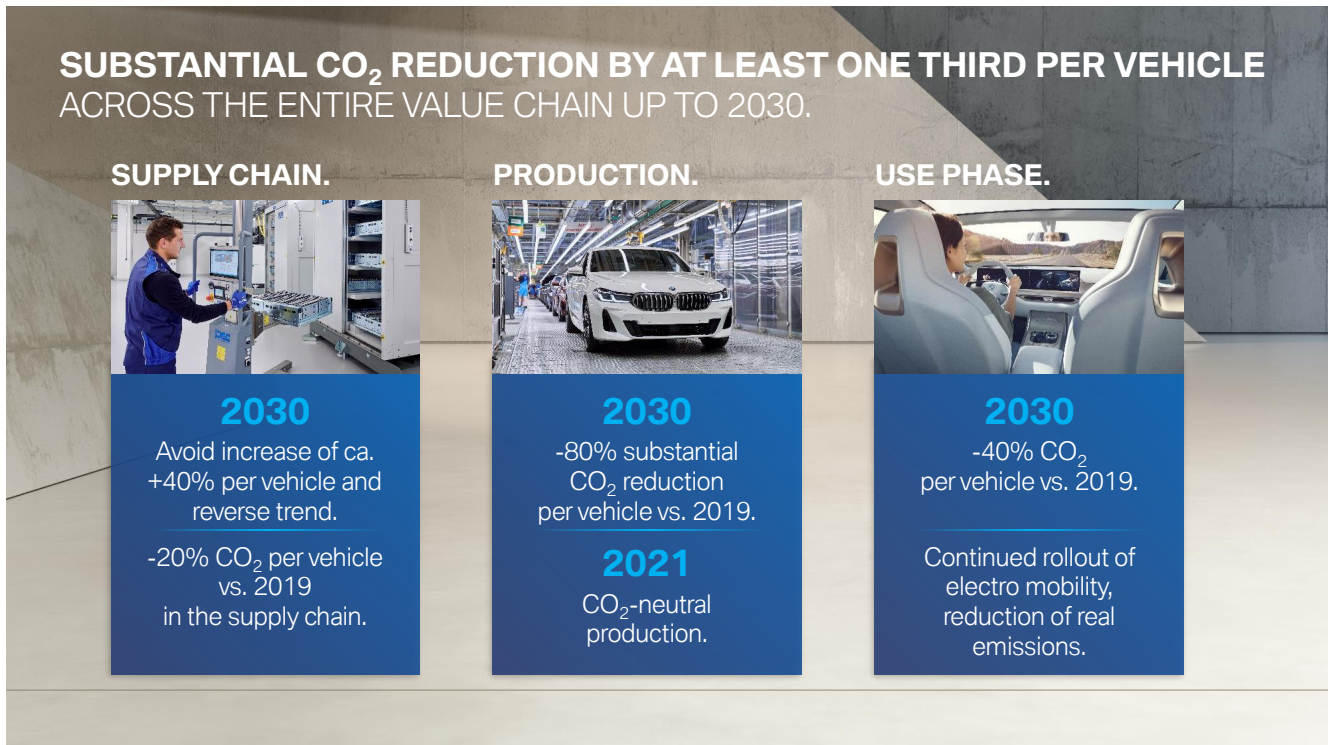
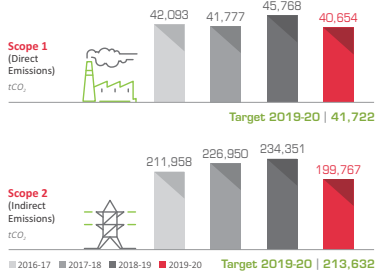


Figure 49: Mahindra breakdown of emissions by scope, source and business unit (Mahindra & Mahindra Sustainability Report 19-20)

GREENHOUSE GASES

Total Absolute GHG Emissions



In line with our SBT emission reduction roadmap, we have decided an emission intensity reduction target of 4.1% year-on-year for the next 15 years. This was used to derive the Scope 1 absolute emission reduction target for F20. For Scope 3, we reported only for 6 categories till 2018-19. From 2019-20, we have improved our reporting of Scope 3 to 11 categories, and hence the increase.

We achieved our targeted emission reduction with a clear focus on increasing the energy efficiency and the transition to renewable energy in our operations.

M&M Ltd. has reduced its total Scope 1 & 2 emissions by 14% as compared to previous year.

GHG Emissions - Division-Wise Composition

Sector	2016-17		2017-18		2018-19		2019-20	
	Scope 1	Scope 2	Scope 1	Scope 2	Scope 1	Scope 2	Scope 1	Scope 2
AD	20,024	87,465	17,943	94,897	20,466	102,596	14,840	82,247
FD+SD	15,819	70,720	17,609	75,421	17,843	72,795	16,086	61,720
SBU	77	1,611	155	1,919	154	1,826	182	2,566
SFD	1,119	25,427	1,081	27,884	1,184	28,641	946	22,000
NPD	27	2,432	29	2,250	29	2,085	41	1,424
MRV	5,026	21,844	4,959	22,177	5,794	23,159	7,382	23,928
CC	DNA	2,460	0.25	2,403	111	2,232	19	2,162
MTWD	344	843	286	1,146	189	1,017	1,159	3,721

DNA - Data Not Available

GHG Emissions - By Source

Source	2016-17	2017-18	2018-19	2019-20
Scope 1 - Direct Emissions				
Diesel/HSD	16,561	12,655	13,018	13,105
Furnace Oil	205	NA	NA	NA
LPG	3,652	5,582	7,015	7,610
Natural Gas	16,053	15,598	17,582	12,470
Petrol	713	968	1,249	1,553
Propane	4,909	6,974	6,904	5,917
Grand Total	42,093	41,777	45,768	40,654
Scope 2 - Indirect Emissions				
Electricity purchased	211,958	226,950	234,351	199,767
Scope 3 - Other Direct Emissions				
6 categories till 2018-19	464,935	349,712	218,495	58,425,531
11 categories from 2019-20				

GHG Mitigation

Sector	2019-20
AD	3,036
FD+SD	5,741
SFD	83
NPD	166
MRV	681
CC	104
Total	9,812

In the reporting year, our businesses together mitigated 9,812 tCO₂ of GHG emissions.

11 categories considered for Scope 3 this year

Sr. No.	Category No.	Category Name	Emission (tCO ₂)	% share
1	Category 1	Purchased goods and services	4,372,542	7.48%
2	Category 3	Fuel and energy related activities	111,338	0.19%
3	Category 4	Upstream transportation and distribution	56,528	0.10%
4	Category 5	Waste generated in operations	51,127	0.09%
5	Category 6	Business travel	12,762	0.02%
6	Category 7	Employee commute	2,017	0.00%
7	Category 9	Downstream transportation and distribution	91,786	0.16%
8	Category 11	Use of sold products	53,677,130	91.87%
9	Category 12	End-of-life treatment of sold products	38,938	0.07%
10	Category 13	Downstream leased assets	8,960	0.02%
11	Category 14	Franchises	2,403	0.004%
		Total	58,425,531	100%

Total Specific Emissions (Scope 1 + 2)

Sector	2016-17	2017-18	2018-19	2019-20	% Reduction in 2019-20 over previous year
AD	0.192	0.185	0.191	0.198	-4%
FD+SD	0.204	0.190	0.177	0.181	-3%
SBU	0.229	0.300	0.279	0.338	-21%
SFD	0.908	0.901	0.878	0.836	5%
NPD	4.398	4.340	3.894	2.113	46%
MRV	9.545	9.640	10.039	10.856	-8%
CC	0.168	0.164	0.160	0.149	7%
MTWD	DNA	DNA	0.055	0.023	57%

NA - Not Applicable DNA - Data Not Available

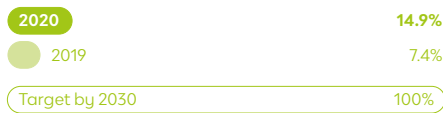


GRI 102-11, 305-1, 305-2, 305-3, 305-4, 305-5

Figure 50: LeasePlan EV and average CO₂ tailpipe g/km per vehicle funded fleet (LeasePlan Annual Report 2020)

14.9%

New EV orders¹¹



126 g/km

Average CO₂ tailpipe g/km per vehicle funded fleet¹²

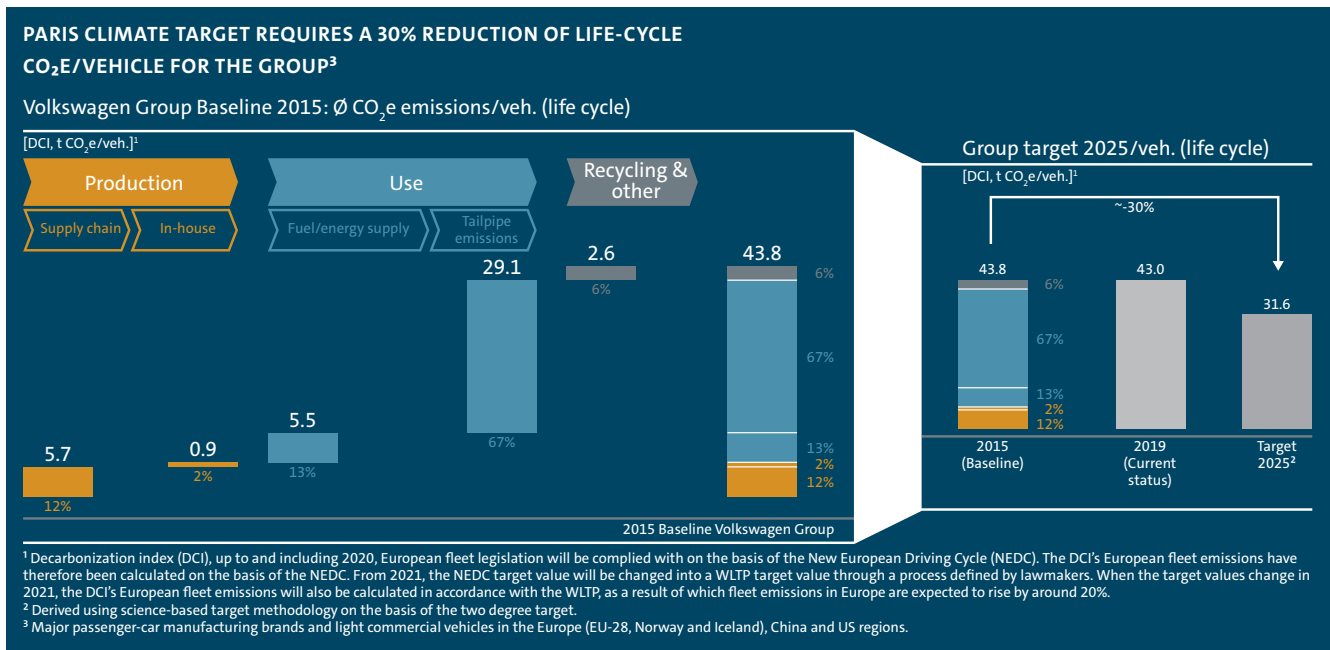


11. New orders of Battery Electric Vehicles (BEVs) plus Plug-in Hybrid Electric Vehicles (PHEV) in 2020, excluding USA. Limited assurance was provided for this indicator by our external auditors

12. It includes passenger vehicles (PVs) and light commercial vehicles (LCVs). The total for PVs was 116 g/km. The figures reported are on the basis of vehicle test (either WLTP or NEDC, dependent on the moment of matriculation). This KPI has received limited assurance from our external auditors

13. This KPI has received limited assurance from our external auditors

Figure 51: Volkswagen Group carbon dioxide equivalent target (Volkswagen Sustainability Report 2019)



6.2 CHOICE OF METRICS AND COMPARABILITY

Forum members support efforts to categorize, structure and define activity in such a way that progress towards the transition can be

measured and monitored. Activities that can be measured include investments in energy efficiency, sales of EVs and installation of charging technology and infrastructure. EU Taxonomy-aligned

spend is expected to become increasingly useful in the future, with forum members awaiting further specification within the delegated act.

THE EU TAXONOMY: A POTENTIALLY USEFUL MEANS FOR ENSURING CONSISTENT COMPARABLE DISCLOSURES

The EU Taxonomy on Sustainable Activities will require large public interest entities to disclose in non-financial statements whether, and the extent to which, its activities are environmentally sustainable. Specifically, this will describe the proportion of their revenue, capital expenditure and operating expenditure which is associated with Taxonomy-defined sustainable economic activities, covering the financial year 2021. According to the criteria from the technical annex to the TEG final report on the EU taxonomy, activities associated with zero tailpipe emission vehicles would be automatically eligible, and vehicles with tailpipe emission intensity of maximum 50 g CO₂/km (WLTP) would be eligible until 2025. At present, it is challenging to precisely scope spend and investments as 'green' or not. For example, spend on salaries may cover roles which are split between older and newer parts of the business and technology. It is hoped that further clarity will develop over time and that the framework will support consistency across disclosures.

As work progresses to develop climate-related financial metrics, companies should explain in their disclosures why particular metrics are used, the parts of the business or products etc. to which the metric applies, how results have been estimated and calculated, and the meaning of terms relevant to understanding the metric.

The Annex to the TCFD's Final Report provides industry-specific illustrative metrics for Transport sector companies. As TCFD disclosure practice evolves, Forum members recognize the need to categorize, structure and define climate-related metrics to identify decision-useful metrics that

respond to the TCFD's principles for effective disclosure. This must reflect varied climate-related risks, opportunities, strategic and management approaches. The Forum has prepared Table 6 to illustrate a range of climate-related metrics auto OEMs and leasing companies can consider using in their disclosures.

Table 6 outlines illustrative metrics collated through the Forum's discussions, including with certain investors, as well as sources such as TCFD guidance, draft EU Taxonomy guidance and the Sustainability Accounting Standards Board (SASB). At present, a number of these metrics do not

have universally agreed definitions and companies choosing to disclose them should explain how they define metrics and associated terminology according to their business reporting. As climate-related disclosures evolve over time, there will be opportunities to support greater comparability – for example by standardizing categorizations of transition enabling activities. Further work could involve connecting emission reductions and emission intensity to a full range of technologies and activities to give a complete picture of how companies are managing the transition.

Table 6: Illustrative metrics

KPI	UNIT	RELEVANCE TO DIFFERENT AUTO SECTOR PLAYERS
Sales-weighted average fleet fuel economy, by region and weight/number of people transported	MPG, L/Km, g CO ₂ e/Km,	OEMs
Rental day-weighted average rental fleet fuel economy, by region	MPG, L/Km, g CO ₂ e/Km,	Fleet management
Revenues/savings from investments in low carbon alternatives (e.g., R&D, equipment, products or services)	Local currency	OEMs
Vehicle sales (historical, current and projected) by category (e.g., gas vehicles, diesel vehicles, battery electric vehicles, plug-in hybrid electric vehicles, alternative-powered vehicles (LPG, CNG, fuel cells)	Number/value of vehicles sold	OEMs
Expenditures (OpEx) for R&D for low carbon transportation equipment or transportation services	Local currency	OEMs
Total fuel consumed and percent renewable	GJ, percentage	Fleet management
(1) Total energy consumed, (2) percentage grid electricity, (3) percentage renewable	GJ, percentage	OEMs, fleet management
Road vehicles—Geographic breakdown of GHG emissions: emissions and/or emission intensity of products for key geographies against regulatory requirements/targets	MT of CO ₂ e or CO ₂ e/km	OEMs, fleet management
Life cycle reporting of GHG emissions of Transportation products (auto) (Scope 1, 2 and relevant Scope 3 (use phase) emissions)	MT of CO ₂ e	OEMs
Investments (CapEx) in low carbon transportation equipment or transportation services	Local currency	OEMs
Battery performance - energy density, range, charging speed	Various/km	OEMs
EV charging infrastructure development - charging points, partnerships	Number	OEMs, fleet management
EU Taxonomy aligned turnover e.g. which substantially contributes to climate change mitigation or adaptation, transition to a circular economy, pollution prevention and control, sustainable and protection of water and marine resources, protection and restoration of biodiversity and ecosystems	% or local currency	OEMs
A forward-looking best estimate of EU Taxonomy aligned spend over the course of their planning horizon	% or local currency	OEMs
Metrics associated with critical materials sourcing – such as proportion of materials required considered to be at risk, based on scale of reserves, resource demand, and depletion rate	%	OEMs

USER PERSPECTIVE: TRANSPARENCY AND GRANULARITY OF DISCLOSURES

Users noted that climate-related financial disclosures could be enhanced through greater transparency and granularity around their product lines, regional variations and key emissions metrics. Users would find it helpful to see greater disclosure around:

- The breakdown of different classifications of products (e.g., plugin/hybrid/BEV) and where sales are being made. Users explained that this would provide greater clarity on risks and opportunities and the extent to which product mix and capital allocation strategies can flex to accommodate the uncertain environment.
- Real drive emissions, and how close carmakers are from baseline laboratory test emissions.
- Regional variations in the regulatory landscape and how companies are considering them, given that government decision making has the potential to abruptly change the risk landscape. For example users note the differences between:
 - Country level net-zero targets
 - Europe's Green Deal
 - US tax credits
 - State level subsidies in India



7 Conclusion



7 Conclusion

The auto industry has a history of rapid change, but the innovations unfolding in the twenty-first century herald unprecedented advances within the auto industry and to mobility systems more generally. OEMs and car leasing companies are at the center of a mobility system that is speeding towards decarbonization, electrification and new mobility services. As this report has shown, the successful transition to business models, products and services that support a low or no carbon future depends on a wide range of actions and actors. OEMs must lead change through technological innovation, catalyze change in supply chains, manage change in their workforces and customer bases, and respond to regulatory change. Auto companies must manage their legacy assets, profitability, existing plants and workforces and maintain stability as the maelstrom of change proceeds. Ultimately, auto companies will have to offer appealing alternatives to ICE cars that satisfy consumers in terms of price, safety and environmental impact along with products and services that respond to the changing mobility system.

Against this dynamic background, Forum members are innovating to offer new products and services, financing developments through green bonds and other mechanisms, preparing for a range of futures through their scenario analysis practice, collaborating with partners to develop charging infrastructure, adopting circular practices, supporting the just transition and setting their own targets to mitigate climate risks. This report provides insight into these diverse activities and how they are planned, managed and financed.

The context within which auto companies operate and the changes they are navigating have implications for the way in which companies respond to TCFD disclosure. For example, the mitigation plans and targets companies report are influenced beyond the TCFD recommendations by regulatory pressure on auto companies and consumer preferences for particular products, etc. Some of the trends they observe are designed to monitor specific aspects of the enabling environment for mobility development. The TCFD recommendations represent a flexible and useful framework for auto companies to report their climate-related risks and opportunities while focusing on the specificities of impacts on the auto industry.

Although relatively advanced in their TCFD disclosure practices, Forum members recognize that there is work to do to enhance climate-related financial information. Members are exploring approaches to develop metrics such as value at risk associated with specific risks or mitigation options. As with many other sectors, they are developing climate-related financial disclosure practices. The Forum's work on scenario analysis in Chapter 4 provides a firm foundation on which to build more bespoke analyses.

As other Preparer Forums have noted, both preparers and users of information will benefit from standardization of some aspects of TCFD disclosure, including the way in which transition-enabling activities are defined and assessed. The EU Taxonomy is likely to support standardization over time. Again, like other Preparer Forums, the Auto Forum welcomes further dialogue with users of information to foster mutual understanding of the disclosures that are most useful in analysis and decision-making.

A shared understanding of the auto sector's contribution to the green and just transition, collaboration to achieve it and an enabling environment to support it are the pillars on which companies will transform their businesses and the future of mobility for all. Corporate disclosures according to the TCFD recommendations must reflect the breadth and depth of plans and actions that respond to the risks from climate change and maximize associated opportunities.

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