

**Deloitte.**



**Automotive**

Pathways to decarbonization

# Drivers for transformation

## The need to act on climate change

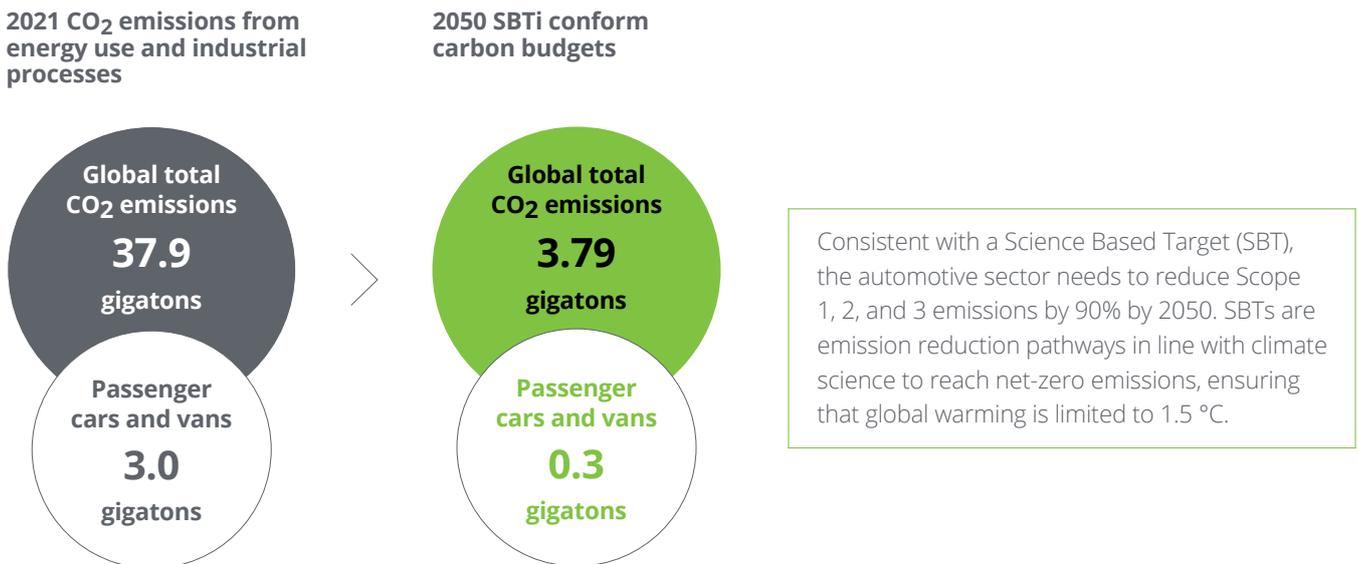
The automotive sector is a cornerstone of mobility systems worldwide, as well as a key pillar of the global economy. However, it is also a major contributor to climate change. In 2021 alone, passenger cars and vans caused 3 gigatons of CO<sub>2</sub>, almost one tenth of global CO<sub>2</sub> emissions<sup>1,2</sup>. This only includes tailpipe, thereby excluding additional emission sources along the value chain, such as parts and vehicle production.

To avoid the most catastrophic impacts of global warming by limiting average temperature increase to 1.5 °C, all sectors would be required to substantially reduce emissions to achieve net-zero, starting from now (see Figure 1). In contrast to other sectors, a key hurdle for car manufacturers is that compliance with the Science Based Targets initiative (SBTi) requires not only reductions of Scope 1 and 2, but also Scope 3 emissions.

Over the past few decades, substantial improvements in the fuel efficiency of vehicles have been made by car makers. However, the growing prevalence of larger and heavier cars, mainly SUVs, and engine sizes counteracted these efficiency gains—and no amount of efficiency improvements will lead to net-zero emissions. Together with increased vehicle ownership, these factors led to a steady increase of the sector’s CO<sub>2</sub> emissions by an average of 1% per year between 2010 and 2021<sup>3</sup>.

To effectively curb tailpipe emissions, governments around the globe therefore have implemented policies promoting and enabling the shift to electric vehicles (EVs).

Figure 1:  
Total CO<sub>2</sub> emissions and contribution from the passenger car sector



Deloitte analysis based on International Energy Association (IEA) Cars and Vans September 2022 tracking report

## A strong regulatory push for EVs

2022 was the first year that the overarching political framework for achieving the National Determined Contributions (NDCs) of the Paris Agreement was tightened worldwide. However, climate ambitions still vary widely across countries.

Europe has taken the global lead in the efforts to reduce greenhouse gas emissions (see Figure 2). The main initiative affecting the automotive industry is strict tailpipe emission targets for new vehicles. The European Union has legislated that original equipment manufacturers (OEMs) are required to reduce average emissions by 55% by 2030 and by 100% by 2035 (compared to 2020). This effectively restricts original equipment manufacturers (OEMs) to selling battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) from 2035 onwards. In Norway, one of the leading EV markets, BEVs already represented 80% of new car sales in 2022 and the country has set the target to achieve 100% by 2025 at the latest<sup>4</sup>.

In the US, so far only ten states plan to phase out vehicles with internal combustion engines (ICEVs) by 2050 (at the latest)<sup>5</sup>. China has for several years promoted the market uptake of EVs. Similar to the US, however, there is no clarity on the extent of new sales of ICEVs that may be phased out in the future. Nevertheless, China has the strongest growing EV market<sup>6</sup>.

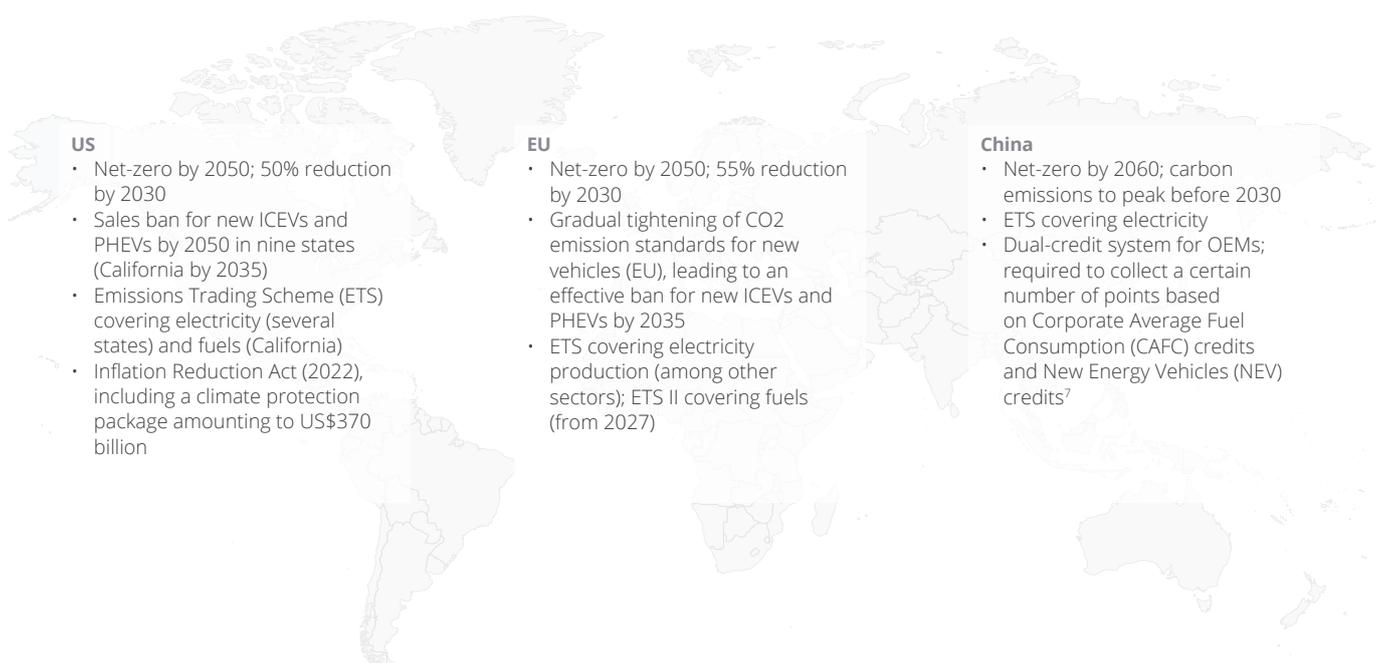
## Redirection of capital flows

International climate treaties, strict national sector targets, and shifting market dynamics have started to threaten the profitability of business models based on conventional car production. In turn, it seems increasingly difficult for OEMs and suppliers to gain access to capital at competitive costs if they cannot demonstrate their ability to decarbonize their products and operations.

## Changing customers' attitudes on sustainable mobility

While customers today are still hesitant to fully embrace sustainable mobility options, this may change in the future with increasing awareness for climate issues. A no-regret option for automotive players is therefore to move fast towards the net-zero goal as well as to extend their product portfolio by offering shared mobility solutions. Otherwise, there is a risk that customers may shift their preferences towards other modes of transport, particularly if the automotive industry cannot demonstrate its ability to transform fast.

Figure 2:  
**Regulatory landscape in the US, EU and China**



# Decarbonization challenges

## OEMs and suppliers in the driver seat

The goal for the automotive industry seems to be clear: to be compliant with the 1.5 °C temperature goal, it is necessary to decarbonize their entire value chain, which will likely be built around EVs.

Current decarbonization discussions are mainly driven by regulation, however car makers (OEMs, supplier, dealerships, etc.) need to take the “driver’s seat” by being part of the solution. While long-term targets have yet to be set (according to their SBTi commitments)<sup>8</sup>, the industry has demonstrated their intention of driving the solution through ambitious near-term targets. For example, in some cases OEMs already partly plan to phase out ICEV production ahead of regulatory requirements.

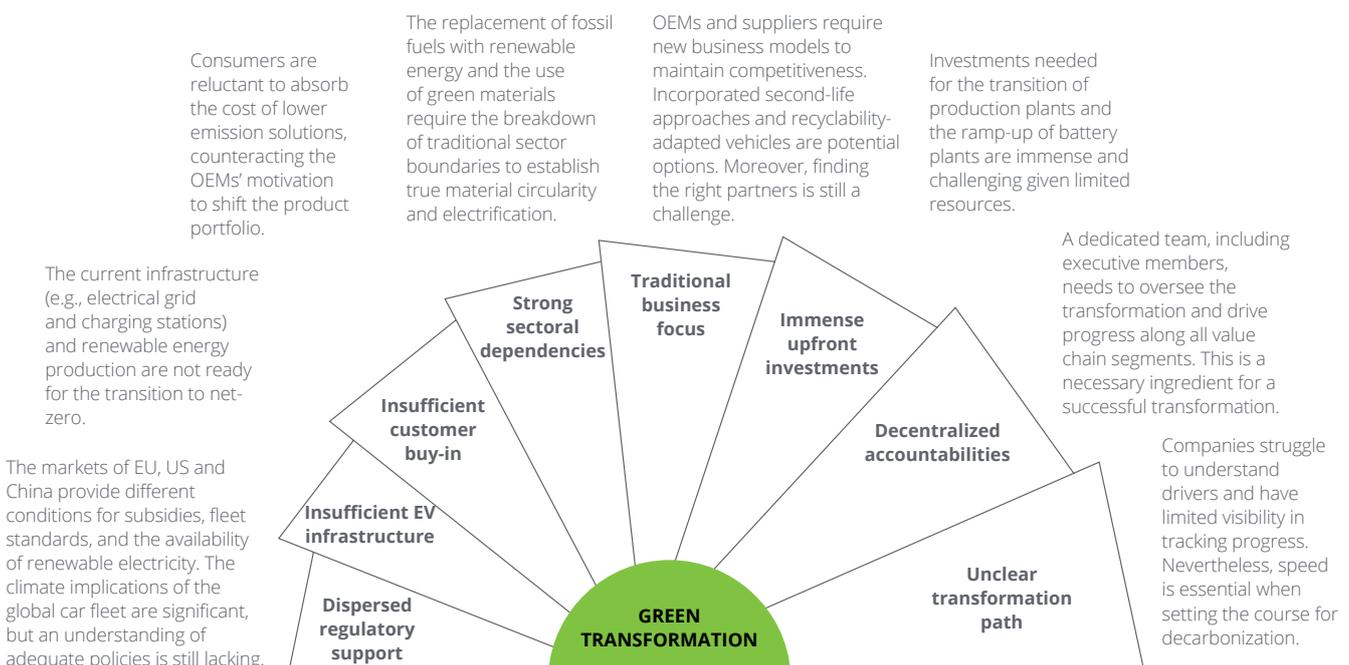
However, putting targets into practice has proven difficult as the industry faces multiple external and internal challenges (Figure 3). The transformation requires not only high investment costs for ramping up EV capacity, but also a net-zero business model that is still not competitive due to higher technology costs that cannot be passed on to consumers.

## The challenge to decarbonizing the global vehicle fleet

What is left unspoken: Even though CO<sub>2</sub> emissions from new sales of vehicles have started to decline with increasing EV shares, the global fleet of 1.2-1.6 billion cars consists predominantly of ICEVs (around 98.5%) and this will persist for some time<sup>9,10</sup>. Existing ICEVs currently in use clearly impacts the overarching target to reduce emissions according to the 1.5 °C path. In fact, today’s climate policies target new sales—except for some instruments that increase operational costs of petrol and diesel cars (such as CO<sub>2</sub> taxes on fuels).

Furthermore, the inconsistency of global regulatory frameworks requires tailored business models, technological responses, and decarbonization strategies for different regional contexts. The automotive ecosystem is already complex, and, in the future, there will likely be even more actors involved. As a result, cross-sectoral collaboration and joint activities, mainly with the power sector, but also basic materials production and recycling, may increase. A successful transformation depends, therefore, also on the progress of other sectors in providing green solutions at scale. As a result of these challenges, the majority of automotive companies still find it difficult to establish a comprehensive sustainability strategy.

Figure 3:  
**Net-zero challenges of automotive players**

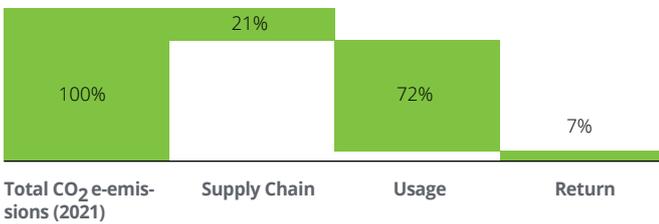


# Call for action

## Establishing a decarbonized value chain

Decarbonization should be actioned across the entire automotive value chain. A combination of a fast EV ramp-up, the use of renewable energy along the entire value chain, and the establishment of circular materiality are necessary ingredients for a 1.5°C temperature compliant pathway (Figure 4).

Figure 4: **An illustrative OEM example of today's life cycle emissions\***



\*Assuming a share of >90% ICEVs of OEMs sales

As Figure 4 shows, most emissions are caused during the usage phase that captures tailpipe emissions as well as emissions from fuel/electricity production. The supply chain phase includes vehicle production, including raw materials extraction and processing (e.g., steel, aluminum, and polymers) and component and part production (e.g., electric components and batteries). It also captures related logistics activities. During the return phase, greenhouse gas emissions are caused from scrappage and recycling activities.

## Decarbonization levers

There is a wide range of levers to be pulled for decarbonization—addressing all areas of the value chain (Figure 5). All divisions must anchor to sustainability, from administration and purchasing to development and production, and even distribution, sales, and aftersales. This focus on sustainability will be enabled by reporting structures that align climate and financial reporting to better understand the emission footprint and the potential to address decarbonization.

The transformation includes adopting circular business models and transitioning both production plants and usage to clean energy. There is a need to extend and collaborate beyond the owned value chain by seeking to involve suppliers and customers to join forces to help achieve net-zero emissions by 2050.



Figure 5: **The automotive industry's levers to reach net-zero**

 <p><b>Product portfolio alternatives</b></p> <p>Portfolio adjustments with steady shift from ICEVs to EVs</p> <p>Shift to smaller vehicle models to reduce material input and to generate efficiencies due to less fuel and electricity consumption in the usage phase.</p>	 <p><b>Green energy and electricity</b></p> <p>Production is powered by electricity from renewable sources and biogas (e.g., heating processes)</p> <p>Energy supply is secured by green energy contracts or self-generation (e.g., solar panels)</p> <p>Inbound and outbound logistics is based on low-carbon transportation modes</p>	 <p><b>Low-carbon materials and eco-design</b></p> <p>Low-carbon version of main materials and parts, including extraction, preparation, and parts processing at supplier facilities</p> <p>Less material input or the use of alternative lightweight materials to reduce vehicle weight</p>	 <p><b>Green power for transition phase</b></p> <p>Switch from fossil fuels to cleaner and/or carbon-neutral fuels (e.g., e-fuels for existing fleet)</p>	 <p><b>Secondary materials recycling</b></p> <p>Increase of secondary (recycled) materials rate in sourcing with a focus on the main materials aluminum, steel, polymer, electronics, and battery</p>	 <p><b>End of life</b></p> <p>CClosed-loop recycling of end-of-life vehicles and replacement of virgin material in material sourcing and production</p> <p>Multi-life approaches such as, second-life business models for batteries</p>	 <p><b>New business models</b></p> <p>Offsetting residual emissions by new business models</p> <p>Building or contracting for direct capture and storage for leftover emissions</p>
---	--	---	--	--	--	--

**Abatement strategies:** Various offset mechanisms including nature-based solutions

## A blueprint for changing the industry

With so many different areas of action, one critical task is to prioritize and define them as part of a holistic plan for implementation. A successful strategy must account for the evolving automotive ecosystem. This depends also on external factors and how these develop over the coming years and decades, such as consumer preferences, macroeconomic and geopolitical factors, regulations, and the pathways of closely interrelated sectors.

Conversely, the transformation of the auto sector will have wide-reaching impacts at the regional and national level as specific industry branches will be heavily affected, with repercussions to the entire economy. It is therefore opportune to develop an industry blueprint for decarbonization based on scenario analysis—closely examining the future—with collective action across the entire value chain to navigate the complexities and reach 90% CO<sub>2</sub> reduction targets by 2050.

# Authors and contacts

This paper is part of a collection of insights on possible pathways to decarbonization for high-impact sectors. Each sector perspective offers a foundational starting point for leaders who would like to better understand the landscape across these critical sectors. For additional sector papers and links to in-depth reports, please visit [Pathways to decarbonization](#) on Deloitte.com.

At Deloitte, we support power and utilities players on their path to net-zero by helping them develop, finance, and implement the sustainable solutions required to achieve a multi-faceted transformation. With in-depth knowledge of the evolving regulatory environment, extensive power and sustainability expertise, and a vast client ecosystem, we provide an invaluable hub for the development of enhanced business capabilities, transformation know-how, and behavioral change management.

To learn more about how we can support your organization, contact us.



**Harald Proff**

Global Automotive Leader  
Partner, Consulting, Deloitte Germany  
[hproff@deloitte.de](mailto:hproff@deloitte.de)



**Bernhard Lorentz**

Global Consulting Sustainability & Climate Strategy Leader  
Partner, Consulting, Deloitte Germany  
[blorentz@deloitte.de](mailto:blorentz@deloitte.de)



**Cathleen Gutglück**

Senior Manager and Risk Advisory Climate Lead  
Deloitte Germany  
[cgutglueck@deloitte.de](mailto:cgutglueck@deloitte.de)



**Corina Cruceru-Weisbrod**

Manager, Supply Chain Network Operations  
Deloitte Germany  
[ccruceru@deloitte.de](mailto:ccruceru@deloitte.de)

# Endnotes

- 1 IEA, [World Energy Outlook 2022](#), October 2022.
- 2 IEA, [Cars and Vans Tracking Report](#), September 2022.
- 3 European Commission, [Proposal for a Regulation of the European Parliament and of the Council amending Regulation \(EU\) 2019/631 as regards strengthening the CO<sub>2</sub> emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition](#), 2022.
- 4 Norwegian Ministry of Transport, [Report to the Storting \(white paper\) National Transport Plan 2022–2033](#), June 2021.
- 5 Sandra Wappelhorst and Hongyang Cui, [Growing momentum: global overview of government targets for phasing out sales of new internal combustion engine vehicles](#), ICCT, November 11, 2020.
- 6 Canals, ["Global EV sales up 63% in H1 2022, with 57% of vehicles sold in Mainland China,"](#) August 11, 2022.
- 7 Ministry of Industry and Information Technology of the People's Republic of China, Passenger car enterprise average fuel consumption and new energy vehicle credit parallel management method, 2021.
- 8 Science Based Targets, ["Companies taking action – Science Based Targets,"](#) accessed March 10, 2023.
- 9 German Environment Agency, [Marktdaten: Mobilität](#), March 2022.
- 10 BloombergNEF, [Electric Vehicle Outlook Report 2022](#), June 2022.

# Deloitte.

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms, and their related entities (collectively, the “Deloitte organization”). DTTL (also referred to as “Deloitte Global”) and each of its member firms and related entities are legally separate and independent entities, which cannot obligate or bind each other in respect of third parties. DTTL and each DTTL member firm and related entity is liable only for its own acts and omissions, and not those of each other. DTTL does not provide services to clients. Please see <http://www.deloitte.com/about> to learn more.

Deloitte provides industry-leading audit and assurance, tax and legal, consulting, financial advisory, and risk advisory services to nearly 90% of the Fortune Global 500® and thousands of private companies. Our professionals deliver measurable and lasting results that help reinforce public trust in capital markets, enable clients to transform and thrive, and lead the way toward a stronger economy, a more equitable society and a sustainable world. Building on its 175-plus year history, Deloitte spans more than 150 countries and territories. Learn how Deloitte’s 415,000 people worldwide make an impact that matters at [www.deloitte.com](http://www.deloitte.com).

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms or their related entities (collectively, the “Deloitte organization”) is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

No representations, warranties or undertakings (express or implied) are given as to the accuracy or completeness of the information in this communication, and none of DTTL, its member firms, related entities, employees or agents shall be liable or responsible for any loss or damage whatsoever arising directly or indirectly in connection with any person relying on this communication. DTTL and each of its member firms, and their related entities, are legally separate and independent entities.

© 2023. For information, contact Deloitte Global.