

# Annual Report 2020

The automotive industry in facts and figures

# 2020





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# Foreword



Ladies and gentlemen, dear readers,

The coronavirus pandemic poses challenges to all areas of life that we have not experienced since the Federal Republic of Germany came into existence. The economic consequences for the people in our country are also often far-reaching and for many without precedent. As the key industry in Germany, it is the primary goal of the automotive sector to remain the driving force in the transformation to the mobility of the future.

Europe can and must be the continent that combines an effective climate protection policy with an efficient economic and industrial policy. The automotive industry wants to be a key driver of innovation and jobs and is committed to the goal of climate neutrality by the year 2050. The way out of the crisis towards the "mobility of the future," combined with the complexity of digitalization, will challenge us all to the greatest possible extent. There are still challenging times ahead for the German automotive industry and for many of our companies.

The road to tomorrow's mobility consists of several paths. It is a matter of using digitalization to shape networked and automated driving. But we also need a circular economy in which materials are designed for reuse right from the development stage, and in which we use raw materials in a resource-conserving manner. And last but not least, the aim is to reduce CO<sub>2</sub> emissions in the transport sector with an intelligent and demand-oriented mix of drive technologies in line with Paris climate protection goals. Concepts for the mobility of the future are needed that are geared to the reality of people's lives and their individual needs – in the city as well as in the countryside.

Tomorrow's mobility will also grow out of innovations that are not only associ-

ated with the car: artificial intelligence opens the door to automated driving – safer and more efficiently than ever before. Digital platforms allow us to combine the most diverse mobility solutions – tailored to every situation. New communication technologies allow the exchange of data between people, vehicles and infrastructures. In addition, the expansion of renewable energies is an important basis for our industry to play its part in making transport climate-neutral by 2050. The development of these technologies is a joint task of science, companies from all sectors and policy-makers, who must set the framework for achieving this. For example, the comprehensive expansion and restructuring of our infrastructure is an absolute prerequisite to ensure Germany not only remains globally competitive, but is also a leader.

The German automotive industry is today already heavily involved in all the technology fields of tomorrow. Over 130,000 people work in the research and development departments of manufacturers and suppliers. More than every third euro invested in research and development by the German economy comes from the automotive industry. By spending EUR 50 billion on new drive systems alone and a further EUR 25 billion on digitalization by 2024, our industry is investing heavily in transformation.

But if the driving force of the EU economy does not soon restart vigorously, liquidity will become scarce in more and more companies – especially in our medium-sized member companies from the supplier and commercial vehicle sector. As a result, the funds for important future investments will be lacking. The effects of the coronavirus and a significant cyclical downturn have dealt a severe blow to the

commercial vehicle markets in particular. In view of this very difficult situation, we expect the German government to support a European fleet renewal program for heavy-duty commercial vehicles or to tackle this project at national level.

The German government's economic stimulus package to deal with the economic consequences of the coronavirus crisis rightly contains a clear technology and infrastructure policy component. Nevertheless, in addition to the commitment announced by policy-makers, we also need a monitoring of results to ensure that the nationwide 5G networks planned for 2025 are actually built; that the potential of hydrogen as a climate-friendly energy carrier is tested in all sectors; and that the ramp-up of electromobility is not slowed down by a lack of charging infrastructure.

The German automotive industry supports the Paris climate protection goals and the EU goal of becoming the first climate-neutral continent by 2050. The EU Commission's European Green Deal basically opens up the possibility of not only driving climate protection policy forward more ambitiously, but also more effectively. However, the "2030 Climate Target Plan" presented in September 2020 still raises questions. The EU Commission wants to reduce EU-wide CO<sub>2</sub> emissions by at least 55 percent by 2030 – the previous plan was to cut emissions by 40 percent. In this context, the CO<sub>2</sub> fleet limits for passenger cars, which were only adopted two years ago, are to be tightened from minus 37.5 percent to minus 50 percent by 2030.

This means that the new car fleet will then be allowed to have an average fuel consumption of just over two liters. This extremely ambitious target will probably only be achievable if the proportion of electric vehicles rises to at least 60 percent of new cars within ten years. This will require a committed, rapid and comprehensive expansion of the charging infrastructure –

throughout Europe! This also requires political action. Wrongly implemented, the course of the EU Commission, especially against the background of the coronavirus crisis, can further aggravate the already discernible economic and social burdens and endanger jobs as well as the competitiveness of companies and thus Europe.

By 2030, the focus will be on a rapid ramp-up of electromobility. Particularly in view of the major goal of climate-neutral transport, however, we will need all drive options – including e-fuels and hydrogen, for example. We need these in order to address the existing fleet. The great challenge of combating climate change can only be met if we are open to all technologies. In our view, a tightening of climate targets means that hydrogen and regenerative fuels will have to be used much more in the future than they have been up to now. After all, they affect the entire vehicle fleet, not just new registrations. In addition, the modern and highly efficient combustion engine, preferably also as a hybrid, will be needed for many years to come. With e-fuels, it can make a contribution to climate-neutral mobility.

As this VDA Annual Report shows, we draw our strength from the diversity of our industry. From companies that drive innovation and already have the solution for the day after tomorrow in mind. From companies in the passenger car and commercial vehicle industry, manufacturers of buses, trailers and bodies, and the supply industry, some of which can look back on more than 100 years of experience and success. And from emerging companies such as development service providers and start-ups, which are asking with a fresh perspective whether things could be done in a completely different way. In many areas, we are very successful in turning ideas into usable products and bringing them to market nationwide. In some areas, especially in the digital sector, we can do even better. Here, we

need to forge further alliances in order to develop forward-looking solutions.

Shaping future-proof mobility that is climate-friendly, environmentally and economically sustainable, socially minded and customized is a historic task. But the German automotive industry has everything it takes to achieve this! An industrial core that is unique in this form worldwide, with a mixture of large companies and many powerful, successful medium-sized companies throughout the country. Excellent research facilities, creative founders, developers and engineers who are also leaders in the field – that is of key importance right now: Transforming innovations into practical applications.

As you read the VDA Annual Report, I hope you will discover exciting insights into the many different topics and challenges that the VDA and its members face together.

I look forward to engaging in dialog with you!

Hildegard Müller, President  
Verband der Automobilindustrie e. V.





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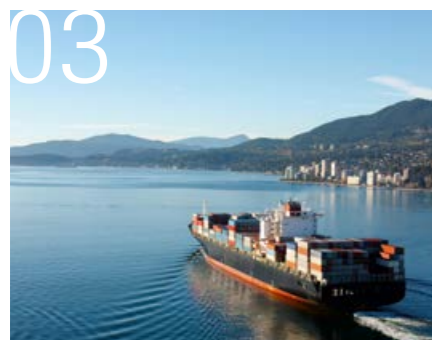
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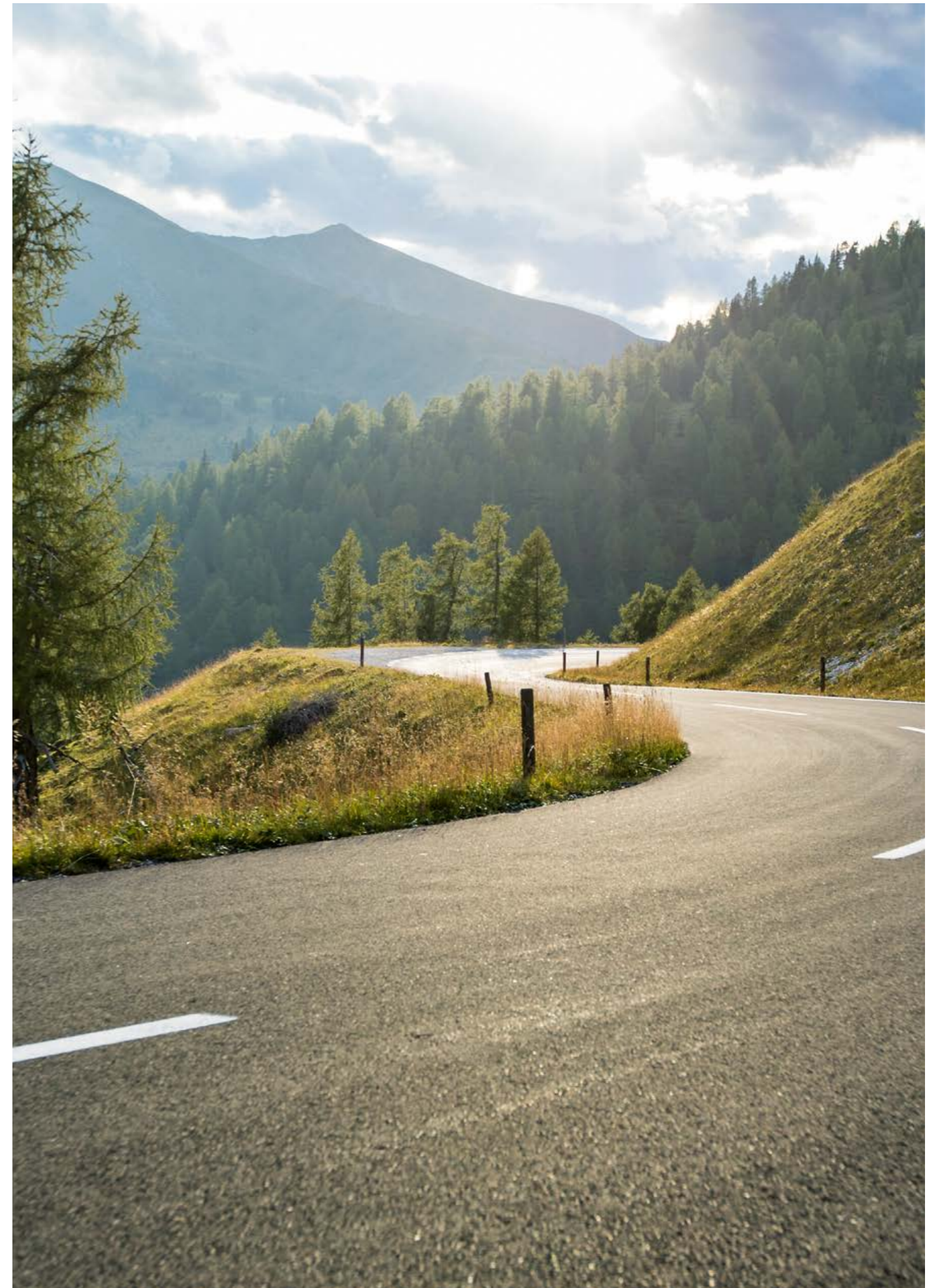
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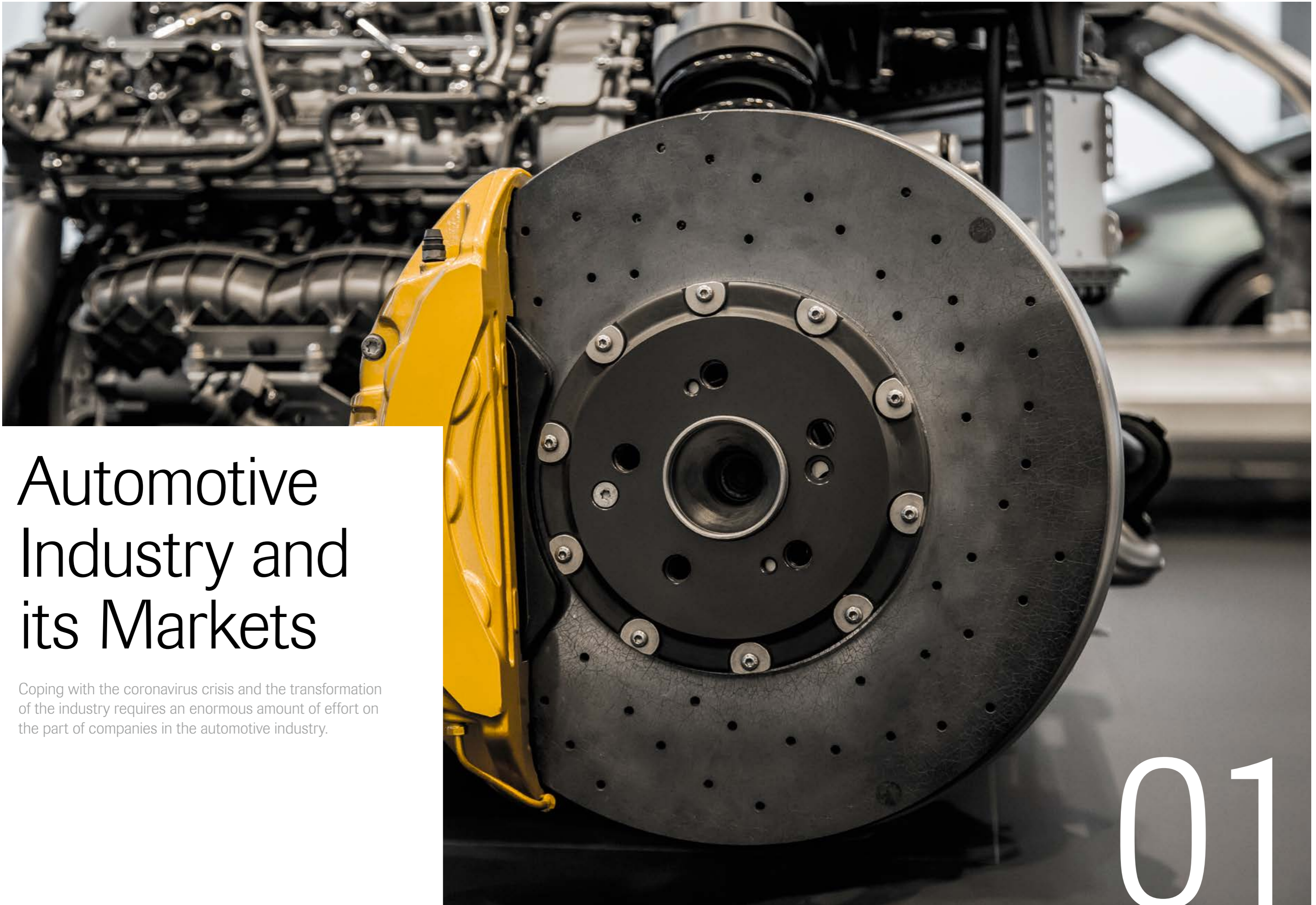
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# Automotive Industry and its Markets

Coping with the coronavirus crisis and the transformation of the industry requires an enormous amount of effort on the part of companies in the automotive industry.

01



# Current State of the Automotive Business: First Half of 2020

The coronavirus pandemic has plunged the global economy into its deepest crisis since the Great Depression of the 1930s. This recession, which was triggered almost simultaneously worldwide, lacks any direct historical comparison. COVID-19 exposed the entire value chain to an unprecedented stress test. After production in China was initially restricted and deliveries from China, which are usually transported by ship, failed to materialize, the virus spread to Europe. The ensuing restrictions on travel and the associated traffic jams at Europe's internal borders, combined with the closure of trade, meant that production came to a standstill in many European countries.

The measures necessary to contain the pandemic have caused a massive slump in overall economic development worldwide.

The health policy measures necessary to contain the pandemic caused massive slumps in overall economic development worldwide in the first and second quarters of 2020. In the eurozone, for example, the largest drop in GDP since the beginning of the time series was recorded (-12.1 percent). In the United States, the crisis also had a massive impact on economic activities (-32.9 percent, annualized growth rate, therefore not directly comparable). Assuming that there are no further widespread lockdowns in these regions, the crisis is likely to bottom out in the first half of 2021, although the further course of the pandemic is not foreseeable.

The impact of the pandemic on the international automobile markets to date is serious. In the first half of 2020, sales worldwide suffered a massive slump. The parallel decline in most markets caused by the coronavirus is historically unprecedented. In the major sales regions of China, the USA and Europe (EU27 & EFTA & the UK), a total of 7.5 million fewer passenger cars were sold than in the same period last year. This represents a 28 percent drop in sales. In Japan, demand fell by a fifth. In Russia and Brazil, sales also plunged massively. Although the Chinese market is now on the road to recovery following a similarly massive slump somewhat earlier, it too recorded a drop of 23 percent after the first six months.

In some European countries, car sales came to an almost complete standstill in April and May. Closed dealerships and registration offices across almost all countries caused new passenger car registrations in Europe to fall by 67 percent. In Italy, Spain and the United Kingdom, sales have since fallen by 97 percent or more. In the first half of 2020, new passenger car registrations in Germany fell by almost 35 percent to 1.21 million passenger cars. This is the lowest first-half figure in Germany since reunification 30 years ago. At the beginning of the second half of the year, there were signs of recovery in parts of Europe, although these were also favored by statistical distortions in a year-on-year comparison.

New passenger car registrations in Germany fell by almost 35 percent in the first half of 2020.

Production also came to a standstill in many places. Only ten thousand passenger cars were produced in Germany in April (also -97 percent). The dramatic slump in demand, the temporary disruption of supply chains and production stops lasting for weeks

meant that passenger car production in Germany in the first half of the year fell to its lowest level in 45 years. From January to June, almost 1.5 million vehicles were produced at the German sites, 40 percent fewer than in the same period last year. Car exports developed similarly. In the first six months of the year, they slumped by 40 percent to 1.1 million units. Production resumed at the beginning of the second half of the year. However, no catch-up effects have yet become apparent. On the contrary, it can be assumed that the recovery of the markets will take some time.

Only eleven thousand cars were produced in Germany in April 2020.

The commercial vehicle markets were affected even more severely by this development. In the heavy-duty commercial vehicle sector, the coronavirus crisis followed on from an existing significant cyclical downturn that had started in 2019. After the first half of the year, the market in Europe was down 44 percent and the United States down 29 percent, although there were signs of recovery in China towards the middle of the year.

The coronavirus crisis reached the automotive industry at a time when the markets were already in a downturn. As long as there is no medical solution to the pandemic, further economic setbacks cannot be ruled out. The situation for the global automotive industry therefore remains extremely tense – especially given the fact that the initial situation was already very challenging. In 2019, the global market had already declined significantly – and in absolute terms more significantly than in the year of the global financial crisis.



# The 2019 Automotive Year: Key Figures and Data

The global economy experienced a downshift in 2019. Most notably, production in the manufacturing sector declined in the more advanced economies. However, the weak industrial economy was countered by a robust service and consumer economy. Overall, global gross domestic product expanded more moderately than the long-term average. The economic slowdown prompted many central banks to adopt a more expansive monetary policy. Trade conflicts and an ongoing discussion about Brexit dominated the debates in 2019.

## How did the automotive economy develop?

In 2019, the global passenger car market declined for the second year in a row. It fell by a significant 5 percent or 3.9 million units to 79.5 million passenger cars. In terms of the absolute decline, it is the largest ever recorded to date. In 2008 the relative change was greater, but the absolute change was not. The decline on the world market in 2019 was primarily driven by the development in China. The Chinese market shrank by 9 percent. Here alone, 2.2 million fewer units were sold than in the previous year. The weak economic development and the trade conflict with the United States played a part in this. However, the impetus for growth was lacking almost everywhere. The US market for

light vehicles slightly declined from a high level by 0.3 million light vehicles. The European market increased minimally. While the Russian market stagnated at a modest level, there was a significant decline in India. Here, worsening financing conditions played a significant role. By contrast, light vehicle sales in Brazil increased. The recovery process of recent years continued here.

## A look at commercial vehicles

The market for heavy-duty commercial vehicles (over 6 metric tons) also declined in 2019. The global market shrank by 2 percent. While the Chinese market declined slightly, more heavy-duty commercial vehicles were sold in the United States, Brazil and Europe. However, in the second half of the year, the markets in Europe and the United States began a strong cyclical slowdown. Turkey and India experienced significant declines.

## Car production in Germany

In addition, the focus was on passenger car production in Germany. Following the sharp decline in 2018, it fell again last year at the same rate of change. While in 2018 production was restricted due to the changeover to the WLTP test cycle at



that time, the cause is more complex this time. Firstly, the declining world market plays a role. Secondly, plants in Germany are being converted for the production of electric vehicles, resulting in lower production. Thirdly, the model mix produced in Germany contains a fairly small proportion of the world's popular SUVs. German manufacturers primarily produce these outside the Federal Republic.

## Employment in Germany

After eight years of rising employment, the automotive industry in Germany has maintained the number of employees in its core workforce in 2019, thus making an important contribution to the excellent job market and prosperity in Germany. An annual average of 833,000 people were employed in the plants of the manufacturers of motor vehicles and motor vehicle parts ( $\pm 0$  percent). These companies still recorded increases in the first half of the year. Employment rose by 1 percent on average in the first six months of 2019. However, this trend reversed from July onwards. Employment fell slightly in the second half of the year (-1 percent). In December 2019, the employment level was 823,000, about 11,000 fewer than in the same month last year.

The individual manufacturer groups recorded partly different developments. The largest manufacturer group in terms of employment, the manufacturers of motor vehicles and engines, maintained their stable employment rate at 484,000 employees despite a decline in production volume. Suppliers employed a good of 310,000 people in the core staff of their plants in Germany – also a constant figure ( $\pm 0$  percent). With slightly more than 38,000 employees, the manufacturers of chassis, trailers and bodies reached the highest level since 1999. This means they exceeded the 2018 level by 4 percent or 1,500 employees.

In 2019, the German automotive industry was able to maintain the employment rate in its core workforce.

In 2019, the global passenger car market declined for the second year in a row.

The market for heavy-duty commercial vehicles shrank in 2019.



# Research and Development



The German automotive industry accounts for more than a third of the total global R&D expenditure of the automotive industry.

The German automotive industry again increased its investment in research and development (R&D) in 2018. According to the European Commission, global expenditure rose to EUR 44.6 billion (+5 percent compared with the previous year). This means that the German automotive industry accounts for more than one third of total global R&D expenditure in the automotive sector. This is by far the leading position in international comparison – ahead of Japan (EUR 32.5 billion) and the USA (EUR 18.4 billion). Three companies from Germany are also among the top 5 R&D investors in the automotive sector.

Germany as a research and development location is particularly important for the companies. For example, manufacturers and suppliers spend well over half of all R&D investments in this country. Domestic R&D expenditure grew by 6 percent to EUR 27.1 billion in 2018. Vehicle manufacturers accounted for 61 percent and suppliers for 39 percent. With 38 percent of the R&D investments of the entire German economy (excluding government and universities), the automotive industry spends almost as much on R&D as the electronics, mechanical engineering, pharmaceutical and chemical industries combined.

Just under three out of ten R&D employees (29 percent) in German industry work in the automotive industry – a total of 131,600 people are employed in the R&D departments of manufacturers and suppliers. No other sector employs nearly as many highly qualified people in the innovation sector. At the same time, the number of employees in R&D departments has risen much faster than total employment: Since 2011, almost four out of ten new jobs in the German automotive industry have been created in the research and development sector – close to 41,000 additional jobs have been created.

# International Markets

## Overview

In 2019, the global passenger car market declined for the second year in a row. It fell by 5 percent or 3.9 million units to 79.5 million passenger cars. In absolute terms, this is the largest decline ever recorded. The decline in the world market in 2019 was primarily driven by developments in China. The Chinese market fell by 10 percent. Here alone, 2.2 million fewer units were sold than in the previous year. The poor economic development and the trade conflict with the United States played a part in this. However, the impetus for growth was lacking almost everywhere. The US market for light vehicles declined slightly by 0.3 million light vehicles. The European market increased minimally. While the Russian market stagnated at a modest level, there was a significant decline in India. Worsening financing conditions played a not insignificant role here. By contrast, light vehicle sales in Brazil increased.

For the second year in a row, the global passenger car market declined in 2019.

## China

The “Year of the Pig” has not brought luck to the automotive industry in China: at 21.1 million vehicles, around 2.2 million fewer cars were sold than in the previous year (-9 percent). The downward trend thus continued. As early as 2018, sales in the Middle Kingdom fell by 4 percent – for the first time in more than two decades. There were clear signs of a slowdown in the world’s largest automobile market, especially in the first half of 2019. During this period, the number of cars sold fell by 14 percent compared to the same period last year. At 6.5 million units, it was the weakest first half of the year since 2015. Although the shrinkage became smaller in the second half of the year, twelve consecutive declines were recorded for the year as a whole. The Chinese market had to contend with external and internal risks. External risks include the trade dispute with the USA. Since the beginning of 2018, the two economies have been imposing tariffs on each other. These trade disputes caused uncertainty among Chinese consumers and dampened their buying mood. In the absence of effective social security systems, the population reacts very quickly to economic uncertainties by cutting consumption and postponing major purchases for the time being. Internal risks in 2019 included the implementation of the China 6 emission standard. The emission standard, which is not actually valid nationwide until July 2020, was already implemented in some provinces in the summer of 2019, which led to uncertainty among dealers and buyers. But even though the Chinese market as a whole was weak, things went well for German manufacturers locally. In 2019, the German Group brands were able to buck the trend and increase their sales by 2 percent to a new sales record of 5.2 million vehicles. Overall, the German brands were able to increase their share of the Chinese passenger car market in 2019 from 21.8 to 24.7 percent – a new record.

The German Group brands increased their share of the Chinese passenger car market from 21.8 to 24.7 percent in 2019.



## USA

The US light vehicle market reached a volume of almost 17 million units in 2019. Sales fell by a little over 1 percent. For the first time since 2014, less than 17 million light vehicles were sold, at 16.96 million. In absolute figures, sales fell by around a quarter of a million vehicles compared with 2018. A slight downward trend was also expected due to the enormously high market level in recent years.

In 2019, the global trend towards light trucks continued in the US light vehicle market. Light truck sales rose by just under 3 percent to more than 12.2 million units, while sales of basic cars fell by 11 percent to a good 4.7 million vehicles. This means that in 2019, 72 percent of all vehicles sold were in the light truck segment. The largest single segment within the light truck segment and the biggest winner in recent years was CUVs (cross utility vehicles/crossover), i.e., the segment that is called SUV in Germany.

Light vehicle sales fell by 4 percent to 6.9 million units in 2019. As a result, they achieved a market share of around 41 percent and again formed the largest single segment on the US market. The SUVs, equipped with larger exterior dimensions and off-road characteristics compared to CUVs, achieved a market share of 8 percent. Their sales fell by 4 percent to just under 1.4 million units.

The German manufacturers were able to increase their vehicle sales in the USA in 2019 in a declining market environment. They sold almost 1.4 million light vehicles. In the light truck segment in particular, they were able to significantly increase their sales by 11 percent to 0.8 million vehicles. In the shrinking basic car segment, sales fell by 9 percent to 0.6 million units, not quite as sharply as the industry average (-11 percent). Consequently, their market share rose to 8.1 percent in 2019 (2018: 7.8 percent).

## South America

Slightly more than 3.1 million new vehicles were sold in Mercosur last year, 4 percent less than in the previous year. The Brazilian light vehicle market is the dominant market in Mercosur. With almost 2.7 million newly registered light vehicles, the Brazilian market grew by 8 percent in 2019. Notable: The growth momentum halved in the course of the year from 11 percent in the first half to 5 percent in the second. In Argentina, the second-largest market on the South American continent, the downward trend that began in the previous year continued in 2019 in an intensified form. Sales fell by 45 percent to 372,000 light vehicles. The market level was thus 60 percent below the level reached in 2013. Sales of light vehicles slumped sharply, by 56 percent, especially in the first half of the year. However, in the second half of the year the decline was still 29 percent compared to the previous year.

## India

The Indian passenger car market suffered severe setbacks last year. With 3.0 million passenger cars sold, the market volume was 13 percent below the previous year's level. The downturn, which began in the second half of 2018, thus continued in 2019 with increased intensity. The reasons for the crisis are manifold. They include a slowdown in overall economic growth, financing bottlenecks due to a financial crisis in the shadow banking sector, and rising vehicle prices due to the introduction of the Bharat Stage VI emissions standard starting in April 2020.

## Europe

The European passenger car market (EU28 & EFTA; excluding Malta) closed the year 2019 with a positive balance. In purely statistical terms, the year was marked by the introduction of the WLTP test cycle in September 2018. In the summer of 2018, there was a wave of new registrations on the European passenger car markets – the additional car registrations subsequently disappeared as the year progressed. The year 2019

was a mirror image of 2018. In the first half of the year, sales fell by 3 percent. From July onwards, new registrations increased by an average of 7 percent, supported by a low level in the previous year. The bottom line for the European car market in 2019 is therefore an increase of 1 percent.

The British again bought fewer cars last year than in the previous year. New registrations fell by 2 percent in 2019 to 2.3 million vehicles. This was the lowest sales level since 2013, and already the third drop in a row. Uncertainty about the timing and uncertain consequences of the United Kingdom's withdrawal from the EU in particular created a headwind. It was mainly private customers who stayed away from car dealerships (-3 percent). By contrast, business customers increased their demand slightly (+1 percent).

The upturn in the French passenger car market continued in 2019. With 2.2 million new registrations, 2 percent more vehicles were sold than in the previous year. The positive result was primarily due to a strong year-end spurt, as the market was still down by almost 2 percent at the end of the first six months. The fourth quarter of 2019 then saw the turnaround with an increase of more than 12 percent. Despite a growing overall market, diesel vehicles had a difficult time last year.

After six years of recovery, the Spanish passenger car market took a breather in 2019. New registrations fell by 5 percent, but at 1.3 million units remained above the 2017 level. Positive momentum was mainly generated by commercial customers, who increased their demand by 3 percent to 433,700 units. Investments in the vehicle fleet in Spain are often made through leasing contracts or the car rental industry, which retained its almost constant demand last year at 238,300 units. Private customers, on the other hand, stayed away from car dealerships. Their new registrations fell by 12 percent to 586,300 units in 2019.

In Italy, new car registrations remained at the previous year's level. At 1.9 million vehicles, the market remained below the 2 million mark. The last time this mark

was exceeded was in 2009. Commercial customers in particular held back last year (-6 percent), while private customers kept their demand constant. Leasing companies proved to be the most dynamic (+6 percent).

In the Eastern European countries, the automobile markets developed positively in 2019 almost without exception. In the twelve countries that have been members of the European Union since 2004, new registrations rose by more than 6 percent overall last year. The 1.5 million mark was exceeded for the first time. This means that they are continuing the growth course embarked upon in 2014. As the largest single market among the Eastern European countries, Poland was able to record a growth of more than 4 percent with 555,600 new registrations.

The bottom line for the European car market in 2019 is an increase of 1 percent.

As the largest single market among the Eastern European countries, Poland was able to record a growth of more than 4 percent in 2019 with 555,600 new registrations.

With almost 2.7 million new light vehicles registered, the Brazilian market grew by 8 percent in 2019

In 2019, 72 percent of all vehicles sold in the USA were in the light truck segment.



# German Market

The German passenger car market showed a positive annual balance for 2019. With 3.6 million new registrations, the market level was 5 percent higher than in the previous year. Only in 2009, when sales were significantly boosted by the scrappage scheme, was the sales level higher at 3.8 million new vehicles. The first and second halves of the year were very different. Growth momentum in the first half of the year was only very slight (+1 percent). Sales in the first half of 2018 had been very high, driven by the introduction of the WLTP. In the second half of the year, growth momentum picked up significantly (+10 percent). The reference level was therefore low, after new registrations had fallen significantly in the second half of 2018. In addition, there was a slight anticipatory effect at the end of 2019 in connection with the new CO<sub>2</sub> regulation for 2020.

## Owner groups

A noticeable change was observed in the ratio of private and commercial registrations. While new registrations by private owners remained at the previous year's level, new registrations by commercial owners rose by 8 percent. In the fourth quarter in particular, there was a significant surge in the number of commercial owners (+20 percent). This is also due to the anticipatory effect of the CO<sub>2</sub> regulation. Among new commercial registrations in 2019, rental vehicles (+9 percent) and company cars (+11 percent) particularly stood out. A positive effect here was the change in company car taxation in 2019, which has improved the attractiveness of this form of ownership. The market share of rental car (11.4 percent) and company cars (34.6 percent) each rose to a new record level.

## Drive types

In 2019, alternative drives showed the strongest dynamics. Purely electrically powered passenger cars (BEVs), plug-in hybrids (PHEVs) and vehicles with fuel cells (FCs) showed strong growth (+61 percent or 41,000 vehicles). Their new registrations accelerated over the course of the year (Q1: +33 percent, Q2: +48 percent, Q3: +65 percent, Q4: +97 percent). However, their market share in 2019 remained low at 3.0 percent of total new registrations.

Sales of diesel passenger cars stabilized. Although their share fell slightly to 32.0 percent (previous year: 32.3 percent), new diesel registrations rose in absolute terms by almost 4 percent to around 1.2 million passenger cars. New vehicles with gasoline engines were registered as frequently as in the previous year. Their market share fell by a little over 3 percentage points.

2019 new registrations of commercial owners increased by 8 percent.





# Production and Export of German Car Manufacturers

The trade conflict with the USA leads to an even stronger tendency towards on-site production.

Germany remains by far the most important production country in Europe.

## Domestic production

As in 2018, domestic production was cut by 9 percent in 2019. At 4.7 million cars, almost 1 million fewer cars rolled off the assembly lines than in 2017. There are many reasons for this. For one, the global market fell by 5 percent in 2019. This hit Germany particularly hard, as around three quarters of the cars produced here are exported. In addition, there has been a strong trend towards efficient compact SUVs for many years. German car manufacturers have primarily recently started to produce new models in this vehicle segment in other European countries. In the global country rankings, Germany was nevertheless able to defend fourth place ahead of Mexico and behind China, the USA and Japan. In Europe, Germany remained by far the most important production country.

## Foreign production

Contrary to the trend of a 5 percent drop in world production, German automakers continued to pursue their global orientation in 2019 and increased their production outside Germany by 1 percent to 11.4 million passenger cars. In Europe, production rose by 1 percent to a record 4.0 million units. China was able to maintain its position as the most important foreign location with 5.1 million passenger cars produced (-1 percent). NAFTA production by German manufacturers reached a new high of 1.5 million passenger cars in 2019 (+8 percent).

## Exports

The main reason for the decline in domestic production in 2019 was exports, which actually fell by 13 percent to 3.5 million passenger cars. On the one hand, the weakness in exports must be seen in the context of the 5 percent decline in the world market, and on the other hand, an even stronger tendency towards local production is discernible, partly due to the trade conflict with the USA. This is also a reason for the increasing foreign production at the expense of exports.

Passenger car exports to Europe were unable to halt the general trend, falling by 13 percent to 2.2 million units. The main Asian export partners were China (-7 percent to 268,000 units) and South Korea (-10 percent to 121,000 units). Exports by German car manufacturers to America declined for the sixth year in succession. They fell by 12 percent to 535,000 units. The most important partner was the United States with 418,000 vehicles (-11 percent).

# Economic Situation of the German Automotive Industry as a Whole

Even though it faced headwinds, the automotive industry in Germany can look back on a successful year in 2019. In 2019, companies generated sales of EUR 435.3 billion and increased their sales by around EUR 9.1 billion or 2 percent – a new record. Domestic and foreign sales increased at the same rate. Export revenues rose by 2 percent and reached a value of EUR 282.4 billion. Sales to countries outside the eurozone exceeded the previous year's level by 3 percent and amounted to EUR 194.2 billion. Companies in the eurozone generated EUR 88.2 billion, matching the previous year's level. Sales to domestic customers increased by 2 percent and amounted to EUR 152.9 billion.

Despite lower production and export volumes, manufacturers of motor vehicles and engines were able to increase their revenues in 2019 to EUR 343.4 billion (+3 percent). Against the backdrop of strong domestic market development, they generated sales of EUR 100.2 billion in Germany (+5 percent). Export revenues also increased – by 3 percent to EUR 243.2 billion. Business outside the eurozone expanded by almost 4 percent to EUR 174.1 billion. The companies in the manufacturer group generated sales of EUR 69.1 billion in the eurozone, matching the high level of the previous year ( $\pm 0$  percent).

German manufacturers increased their revenues to EUR 343.4 billion in 2019.



# Economic Situation of the Supply Industry

Automotive suppliers did not increase their sales in 2019.

In 2019, automotive suppliers were unable to increase their sales. They generated sales of EUR 79.7 billion, the third highest figure even. This represents a 2 percent decline compared with the previous year. Business with foreign customers remained at the strong level of the previous year ( $\pm 0$  percent). Export revenues amounted to EUR 33.6 billion. In connection with a drop in domestic passenger car production, domestic sales fell 3 percent (EUR 46.1 billion) short of the 2018 figure. Among suppliers, manufacturers of electrical and electronic equipment for motor vehicles were able to slightly increase their sales from the previous year to EUR 9.8 billion (+1 percent). At EUR 69.9 billion, the manufacturers of other parts and accessories for motor vehicles generated the lion's share of the automotive supply industry's sales (-2 percent).



# Suppliers and Small and Medium-sized Enterprises

## Regional and global German suppliers: Small and medium-sized companies (SMEs) and corporations

Suppliers account for 75 percent of the added value in automobiles. The German automotive supply industry consists of almost 900 companies with a total of over 300,000 employees and a turnover of more than EUR 80 billion per year. The two largest automotive suppliers in the world are German companies, and the 100 largest automotive suppliers include 17 German companies, which account for about a quarter of total sales. Worldwide, one in three patents filed under e-mobility comes from Germany. All this shows that German companies – not only manufacturers, but above all many suppliers – have been working intensively on the technologies of the future for a long time. German automotive suppliers have invested an average of 5.7 percent of their sales in research and development in recent years.

On average, German automotive suppliers have invested 5.7 percent of their sales in R&D in recent years.

The supplier industry has been hit hard by the coronavirus crisis in 2020. Even before the lockdown measures in Germany and Europe, the global supply chains gradually broke down, because, for example, production was no longer carried out in China, but the lines were still running in Europe. Many suppliers made enormous efforts to maintain supply for as long as possible.

It is not yet clear how quickly the major markets will recover and whether the coronavirus pandemic will plunge the global economy into a prolonged recession. The forecasts for the automotive supply industry are correspondingly difficult. However, it was already clear after the first months of the crisis that small and medium-sized enterprises in particular are under enormous financial pressure. In recent years, these companies have made huge investments in the conversion of their products and production as part of the transformation process, frequently using their own resources. These investments are to be understood primarily as input, as the market for electric vehicles or automated and connected driving is still evolving and thus increase the volumes slowly. As a result, the liquidity situation was already tense for many before the crisis began and offered little flexibility to bridge the massive order slump during the crisis.

The VDA supports its members in this difficult process in central committees and councils, including in the committee for SMEs as well as the VDA Young Entrepreneur Group that is focused on SMEs. An annual highlight is the VDA Medium-sized Companies Day, which had to take place digitally in 2020 due to the coronavirus. There, entrepreneurs discuss current economic policy issues with top representatives from politics and science as well as practical questions from the everyday business life of companies, which are often located in rural areas and have been family-run for several generations. Internationally, the VDA supports suppliers of all sizes through joint booths at the world's leading trade fairs, roundtables in the largest production countries such as China and Mexico, and through a digital cooperation portal. This allows SMEs to meet with political decision makers at international level through their association and to discuss issues of international markets and trade.



## Suppliers in the transformation process

The multidimensional transformation process in which the automotive industry finds itself affects suppliers in a special way. Many smaller suppliers are highly specialized in individual components. If they specialize in power trains, companies face the challenge of having to change the entire product range within a short time when drive types undergo significant changes. In view of the currently declining market share of the diesel engine, many suppliers are required to fundamentally adapt their own business model, sometimes even to completely restructure it. Investments in alternative drives, especially in electromobility, are therefore high. At the same time, the economy weakened even before the coronavirus crisis and buying patterns changed. In combination with the slow start-up of electromobility and the changing political framework conditions, this leads to great planning uncertainty in the companies. Today, it is difficult for many companies to estimate which type of drive will prevail in what period and to what extent in the various markets of the world.

In addition, there is the digitization of products and production, which is central to competitiveness. It is changing company occupational and training programs considerably. By automating production, fewer workers are needed on the conveyor belt, but more in plant programming and control. Costly retraining is required. In view of these challenges in production, many manufacturers are again taking more production steps themselves. Nevertheless, suppliers continue to perform capital-intensive development tasks and thus make an important contribution to the mobility of the future and the future competitiveness of the German automotive industry.

## Start-ups and development service providers (EDL)

The VDA is not only an association for the traditional companies in the industry, but also for young digital start-ups and service providers that are working on the mobility of the future.

The high level of investment in research and development (R&D) in the sector also benefits development service providers. This is reflected in an expected overall EDL market of EUR 29 billion in 2030 (2019: EUR 20.5 billion). This corresponds to an average growth of the EDL market of around 3 percent per year. The close cooperation between manufacturers, Tier 1 suppliers and EDL represents a significant competitive advantage for Germany as an automotive location. The intensive division of labor has developed a highly innovative and efficient value creation chain.

A study by the VDA in cooperation with the management consulting firm Stahl Automotive Consulting (Materials on the automotive industry: "The value added by the EDL industry in the globally transformed automotive industry") concludes that the necessary realignment of the EDL will have a massive impact on the SME structure that has grown over the years. The strategic focus on absolute cost-efficiency, investments in new technologies and greater procurement volumes to EDL are making new regions more important in international location competition.

The constantly changing framework conditions lead to long-term planning uncertainty in the transformation process, especially among SMEs.

The VDA also represents digital start-ups and development service providers.

Political leaders can still reverse this trend and maintain the attractiveness of the location. However, this requires targeted measures such as:

- Targeted R&D funding at levels that are internationally competitive and technology-neutral
- More comprehensive R&D tax support and ensuring competitiveness through targeted re-qualification and further training

The doubling of the tax base for research allowance from EUR 2 to 4 million per beneficiary annually, which was decided in the context of the economic recovery package and is limited to mid-2026, is certainly a step in the right direction. With a funding rate of 25 percent, this results in a research allowance of no more than EUR 1 million per year per beneficiary.

At present, there are international imbalances in research funding, even within the EU. It is the task of political leaders to balance these and create a competitive environment.

A strong start-up culture, with simple start-up opportunities and an attractive range of venture capital, also provides fertile ground for an innovative economy. Traditional industry and start-ups have been looking for ways of coming together for years. Often, the cultural difference inhibits both worlds from coming together. The VDA has been taking on the task of building this bridge for several years. In addition to special events such as "Digital Days" or the visit of VDA members to start-up centers, business trips to the start-up hot spots of the world take place annually. Most recently, VDA delegations in Silicon Valley and Tel Aviv had intensive exchanges with start-ups. Trip participants report successful contacts that lead to new business relationships and products. The VDA will continue to be active in this area and will seek ways for its members to find innovative partners.

## Raw materials and sustainability in the supply chain

The technology diversity of drives in the automotive industry will lead to an increasing demand for materials and raw materials in the coming years, and their use is new to the industry in some instances. Lithium, nickel, cobalt and graphite are raw materials that are used for traction batteries and therefore appear for the first time in the automotive value chain. For the construction of an electric motor, besides larger quantities of copper, rare earth materials are also needed to a greater extent. In addition to physical availability, the focus is also on building a sustainable supply chain. Here, ecological and social sustainability factors, ethical aspects, the CO<sub>2</sub> footprint, political risks as well as possible country concentrations or monopolies are identified.

The pre-competitive exchange on the availability of raw materials and aspects of sustainable procurement are an important topic in the VDA.



# Economic Situation of the Commercial Vehicle Industry

In order to support this change, the VDA and its member companies are concerned with the availability and sustainable procurement of raw materials identified as critical. Through regular analyses of the supply and demand situation of individual raw materials, potential bottlenecks in the sense of strategic raw material management are to be identified at an early stage.

The German automotive industry is committed to the fact that responsibility for people and the environment does not end at the factory gate, but must be anchored throughout the entire supply chain. German companies make an important contribution to job creation and to raising environmental and social standards worldwide.

The VDA supports its member companies in implementing sustainability effectively in their companies and in the supply chain. The VDA is currently working with manufacturers and suppliers to develop a standardized testing and exchange mechanism to evaluate the sustainability performance of companies in the automotive supply chain and mutual recognition of results. The common approach is an integral part of implementing companies' due diligence. The aim is to further develop sustainability in the industry.

The Guiding Principles on Business and Human Rights, adopted by the UN Human Rights Council in 2011, also provide, for the first time, an international framework of reference that clearly describes the duties and responsibilities of all stakeholders. With the 2013 coalition agreement, the Federal Government has committed itself to implementing the UN guiding principles in Germany. Through the National Economic and Human Rights

Action Plan (NAP), it aims to contribute to improving the global human rights situation and make globalization more socially equitable in view of the 2030 Agenda for Sustainable Development.

The protection and promotion of human rights worldwide are also of great importance to the VDA. The VDA actively participates in the work of its members and the industry dialog working groups between the Federal Ministry of Labor and Social Affairs and the automotive industry, and coordinates this with the relevant committees. The aim is to support companies in the presentation and implementation of human rights due diligence requirements in supply chains.

## Collaboration between manufacturers and suppliers

The VDA sees itself as a link between car manufacturers and suppliers and a neutral forum for the exchange on the common challenges of the industry. To this end, the VDA conducts regular roundtables and delegation meetings with individual manufacturers and their suppliers. In addition, the VDA also looks after the suppliers within the framework of the IAA and offers opportunities to talk to the exhibiting manufacturers. Finally, the VDA is also the link between its members from the supplier industry and the European umbrella organization CLEPA.

Following four consecutive record years, German trailer and body manufacturers suffered their first drop in sales in 2019, but still managed to achieve the second-highest level on record. The companies generated sales of EUR 12.2 billion – a drop of 4 percent. Business with domestic customers showed positive development. Domestic sales rose by 3 percent to EUR 6.5 billion. In contrast, foreign sales fell by 12 percent to EUR 5.7 billion. Export revenues in the eurozone fell by 9 percent to just under EUR 3.2 billion, while business with other foreign countries accounted for EUR 2.5 billion or -16 percent.

The VDA supports its member companies in implementing sustainability in their companies and in the supply chain.





# Markets for Commercial Vehicles and Buses

## Heavy-duty trucks: Global market, Europe, Germany

In a strong environment, the US truck market grew by 8 percent to 527,000 units in 2019. Most recently, the volume of half a million trucks was exceeded in 2006. However, the growth trend in the market did not continue in the fourth quarter of 2019, with truck sales falling by 4 percent.

The Chinese truck business showed a robust development in 2019. At 1.31 million vehicles sold, unit sales almost reached the previous year's level (-1 percent). Following the record year 2017 and the equally strong year 2018, more than 1.3 million heavy-duty trucks were delivered for the third year in a row.

In Western Europe, new truck registrations over 6 metric tons in 2019 rose by 3 percent. For the first time since 2008, the 300,000 mark was surpassed with just under 307,000 units. The introduction of the smart tachograph on June 15 led to advance purchases and strong market growth of 18 percent in the first half of the year. As a result, sales were, as expected, significantly weaker in the second half of the year (-13 percent). In addition to the pre-purchase effect, the beginning of a cyclical downturn was also a key factor in the market's decline. Germany has by far the highest volume among the major individual Western European markets. New registrations here continued to develop positively in 2019, rising by 3 percent to a little over 91,000 vehicles. With an increase of 2 percent, truck sales in France became the only Western European volume market to return to its pre-crisis level of over 50,000 units (54,000 units). New registrations in the United Kingdom were strong in the context of a Brexit inventory build-up. The market grew by 13 percent to almost 49,000 heavy-duty commercial vehicles. New registrations in Spain rose by 1 percent to almost 24,000 trucks. In contrast, the Italian truck market did not record any growth in 2019. Sales fell by 8 percent to 21,000 units.

## Transporter markets

In 2019, new registrations of commercial vehicles up to 6 metric tons in Western Europe increased for the sixth year in succession, reaching a volume of more than 2 million units for the first time since 2007. In 2019, 2.03 million transporters were sold – an increase of 2 percent and the second-highest volume ever achieved. The main driving force behind the improved levels in the transport market continues to be the dynamic development of online and mail order sales.

The introduction of the smart tachograph for heavy-duty trucks led to early purchases and strong market growth in the first half of 2019.

In 2019, the German market continued to benefit from strong growth of online and mail order sales.

The volume markets recorded growth almost across the board. In France, the largest transporter market in Western Europe, new registrations rose by 4 percent to 481,000 vehicles. In Italy, sales increased by 3 percent to around 190,000 light commercial vehicles. The UK market exceeded the previous year's level by 2 percent with 376,000 new registrations. Only in Spain did sales stagnate at a volume of 216,000 vehicles.

In 2019, the German transporter market reached a new record level for the sixth year in a row. With 311,900 light commercial vehicles up to 6 metric tons, the 300,000 mark was exceeded for the first time last year (+7 percent). The market continued to be fueled by strong growth in the online and mail order business. The growing population in the cities and the increasing number of online shops offering direct delivery increased the demand for courier, express and parcel services, and thus also their need for transporters.

## Bus market in Germany and Europe

In 2019, the high level of the previous year was maintained with 5,600 new registrations of buses over 8 metric tons in total weight. The bus market has thus grown by 30 percent since 2012. A key driver here was the liberalization of the long-distance bus market in 2013. Passenger numbers, which have been rising in recent years, have settled at the previous year's level in 2019. In the coming years, city buses in particular are likely to provide additional momentum. The strict nitrogen oxide specifications make it necessary to make greater use of battery buses and plug-in hybrid buses in local public transport. For this purpose alone, EUR 300 million of public funds have been earmarked up to 2022.

# Markets for Trailers and Bodies (incl. Employment)

For the third time in a row, the German trailer market reached a sales record in 2019.

In Germany, well over 300,000 new trailers were registered in 2019. With 317,900 towed units, the German trailer market achieved record sales for the third year in a row. Compared to 2018, the demand for trailers clearly grew again with an increase of 10,900 trailers. However, new registrations of semitrailers fell for the first time since 2013 – a drop of 6 percent. With 38,300 units, the German semitrailer market maintained a high level.



# VDA's Manufacturer Group II and its Emphasis on Small and Medium-sized Enterprises

The member companies of the VDA's Manufacturer Group II include manufacturers of trailers, bodies and buses. They are primarily SMEs and frequently manufacture highly specialized products for customers, most of them from the business customer sector (B2B). The vehicles are as different as their respective fields of application. The spectrum ranges, for example, from vehicles with refrigerated or tank bodies to interchangeable bridge systems and dump trucks to standard semitrailers. Heavy-duty transport systems are also in the portfolio of VDA members.

Germany remains one of the largest commercial vehicle manufacturers in the world. SMEs in particular are a guarantee of growth and employment. At the same time, SMEs, with their regional roots and their local social and cultural commitment, are an essential pillar of society. A major difficulty for many companies in recent years has been the shortage of skilled workers. This is a challenge for SMEs in particular, especially as they are often located in rural areas. This is a reason why it is difficult to find young engineers, for example – especially as many young people prefer living in metropolitan areas. For this reason, the companies of HG II are trying to recruit skilled workers with a high level of commitment, e.g., through cooperation with universities or soft factors such as a good working environment.

Climate change and decarbonization, digitalization and globalization demand continuous change and high flexibility from the German commercial vehicle industry. In order to promote decarbonization and achieve the relevant CO<sub>2</sub> reductions, the companies rely, for example, on aerodynamics and lightweight construction, but also on partial electrification of trailers and their auxiliary units. It is also increasingly understood that the potential of digitalization can be used in production and sales, not least for offers to customers. An example of this are solutions in trailer telematics. Companies, which have often been run by families for several generations, are committed to continue meeting the expectations of the further development of their products in terms of environmental and technical requirements.

Manufacturers of trailers, bodies and buses are organized in the VDA's Manufacturer Group II, primarily comprised of small and medium-sized enterprises (SMEs).

The shortage of skilled workers is one of the major challenges for manufacturers of trailers, bodies and buses.



# The Chinese Market and its Peculiarities

The People's Republic of China has experienced an incredibly rapid development as a sales market in recent years. Before 2000, China only played a marginal role as a global sales market. In 2013, more cars were sold in the People's Republic than in the United States. For seven years now, China has been the world's largest car market. Even the latest dent has not changed that. With 21.05 million vehicles sold in 2019, China as a sales region was 24 percent larger than the US market and six times the size of the German market. A decline of about 10 percent is expected for 2020 due to the coronavirus pandemic.

One vehicle segment must be highlighted in particular: the SUV. The share of this vehicle class in China was 44 percent of total sales in 2019 and a comparable result for 2020 is emerging. German manufacturers have shown particularly strong growth in sales. The type of drive is not a key purchasing factor for Chinese customers. Most vehicles in this segment have an internal combustion engine.

In the meantime, one in four newly sold cars in China is a German group brand; German manufacturers were thus able to further increase their market share in an overall weak environment. The majority of vehicles sold are self-produced within the country. German car manufacturers and suppliers operate more than 350 production sites in China. The VDA has been locally active on-site since 2006 with a local quality management center. Since 2014, the VDA has been representing the interests of its member companies in the name of the VDA with its own business unit in Beijing.

## Electromobility in China

In order for China to continue to maintain its position as a global leader in new technologies, the state and party leadership will not leave the development, production and sales of connected, autonomous and electrified vehicles to the free market alone. Framework conditions are created to ensure the rapid distribution of these vehicles.

China has been intensively promoting electromobility for several years, and the number of e-vehicles sold has increased significantly since 2014. In 2015, more than 200,000 electric vehicles had already been registered, and in 2018 the mark of one million newly registered electric cars was exceeded for the first time. In the first half-year of 2020 the market share of electrified vehicles in China was about 4 percent. In China, they are referred to as new energy vehicles (NEV), which means pure battery, but also hybrid and fuel cell vehicles. In contrast to other countries, pure battery electric vehicles in China have been by far the largest group. This is also due to the legislation of individual regions. Beijing, for example, only promotes battery-powered vehicles. The state offers financial and also other incentives. In particular, funding from the Ministry of Finance has significantly boosted sales of electric cars. In 2019, the government reduced subsidies, and growth in this type of drive slowed immediately. The plan was to further reduce support in 2020 and then phase it out completely by the end of the year. Because of the coronavirus pandemic, this plan has been changed. The grants have been extended until 2022, but will be reduced from year to year. To nevertheless ensure that electromobility is successful in China, the manufacturers are instructed to follow production specifications. These regulate exactly how high the electrical share of the respective fleet must be. As a result, the market ramp-up of electric cars is now largely the responsibility of the manufacturers.

German car manufacturers and suppliers operate more than 350 production sites in China.

China's importance for the automotive industry is growing, even as an export country.

German OEMs have responded to this growing challenge. Hybrid vehicles are already manufactured in China, and all well-known manufacturers implement their electric plans. The share of sales of German electric vehicles has risen from 3 percent in 2018 to 7 percent in 2019. New factories are being built – but soon not only to meet demand in China itself. So far, the export of German vehicle manufacturers from China has not played a role, but with electrification this could soon change. There will be models of German corporations that are solely manufactured in China and exported from there. The importance of China for the automotive industry is thus growing once again. The People's Republic is transforming itself from a large sales market into an automotive export country.

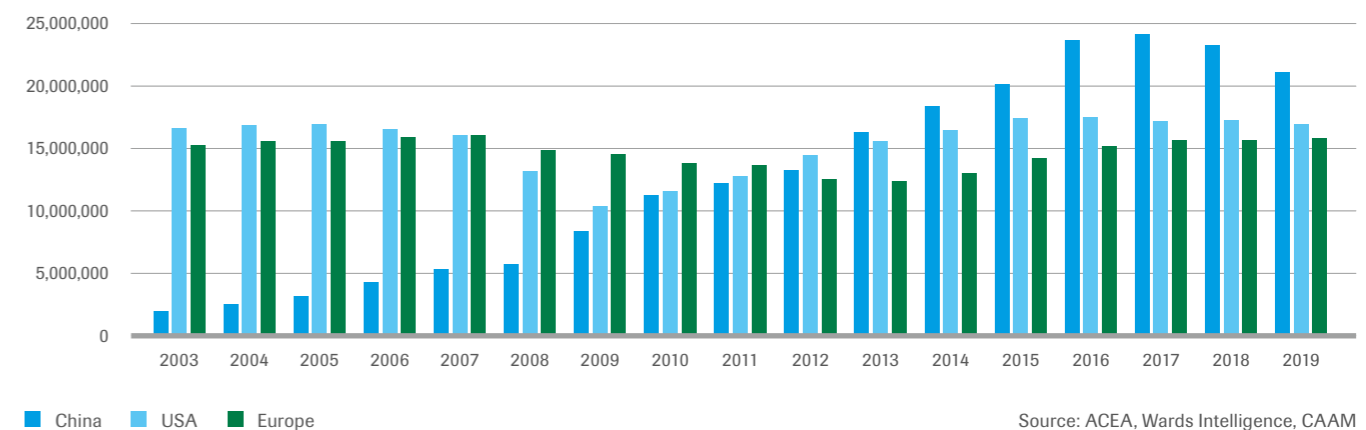
quence of the government's plans to create so-called smart cities; the vehicle becomes part of this ecosystem. China can rely on strong telecommunications companies such as Tencent, Alibaba, Baidu or Huawei in this field. The state thus also secures easy access to vehicle data.

The coronavirus pandemic plunged the Chinese economy into a deep crisis in early 2020. The Chinese government has adopted various economic measures. One of these measures is an infrastructure project: a 5G network will be built. This is a basic prerequisite for networked driving. China has a strong interest in cooperating with Germany in this area. Also at the initiative of the VDA, the Federal Ministry of Economic Affairs and Transport signed a memorandum of understanding with the Chinese Ministry of Economic Affairs on cooperation in the field of connected and autonomous driving in 2018. Regulations and standards are the focal points of this cooperation. On the German side, these project topics are controlled by the VDA.

## Networked and automated driving in China

Connected and automated driving is also the next step in the evolution of vehicles in China. It has not yet been decided in which form this megatrend will be realized in China. Two approaches are being considered in this regard. The most common approach is the one that is also pursued in Germany: the car must be so intelligent that it can be automated and later drive autonomously. The second approach assumes that the vehicles are controlled from a central data center. The vehicle is, for the most part, remotely controlled and has little intelligence. The second approach is a logical conse-

Long-term development of the passenger car and light vehicle markets in Europe, USA and China



Source: ACEA, Wards Intelligence, CAAM

# Significance of the Aftermarket

The Aftermarket business segment includes vehicle maintenance and repair as well as the sale of spare parts and services.

Like the automotive industry as a whole, the automotive aftermarket is undergoing a historic transformation. The aftermarket business includes the maintenance and repair of vehicles as well as the sale of spare parts and services. The complexity in the aftermarket is enormous, and massively accelerated technical changes (drive technology and increased activities for climate protection, importance of data and digitalization, etc.) cause an even sharper increase.

## “Future of sustainable parts supply” project group

Due to the growing number of variants caused by the customization of models, as well as further challenges due to alternative drive forms, companies face increased uncertainty regarding the demand for spare parts. In particular, electric components and assemblies containing the above are not available for the replacement period. This proportion is steadily increasing – driven by advancing vehicle electrification and automation. A rapidly increasing number of cancellations by suppliers and sub-suppliers, especially for components where automotive plays only a minor role (for example, electronics, granulates and steel), exacerbate this situation. Shorter lifecycles and technology leaps additionally complicate the planning of future service concepts.

Against this background, a project group has been established to identify possible approaches for the implementation of a sustainable, cost-efficient and environmentally feasible spare parts strategy for companies of the automotive industry. The core message is:

The supply of spare parts must be integrated holistically into the product lifecycle process (PLC) in order to create a resource-saving supply process and to ensure repair capability at cost-effective conditions. This means that product development in the companies – in addition to series production – must also focus on aftermarket supply from the outset in order to ensure resource conservation, cost-effectiveness and spare parts supply equally throughout the entire product lifecycle via early integration.

The supply of spare parts should be integrated into the life cycle.

## Aftermarket packaging: Standardization of packaging data

In 2019, the “Aftermarket Packaging” working group was reestablished in the Aftermarket department of the VDA. The aim of the members is to develop standards and norms in the packaging sector in order to reduce development times and effort through joint work. The first project to tackle the topic of the standardized exchange of packaging data was launched. For this purpose, content and formats of data exchange are defined and standardized and a standardized data sheet is further described. The data exchange is to be carried out electronically via an interface, which is also to be developed and described. This allows interested companies to import this data into their own systems.

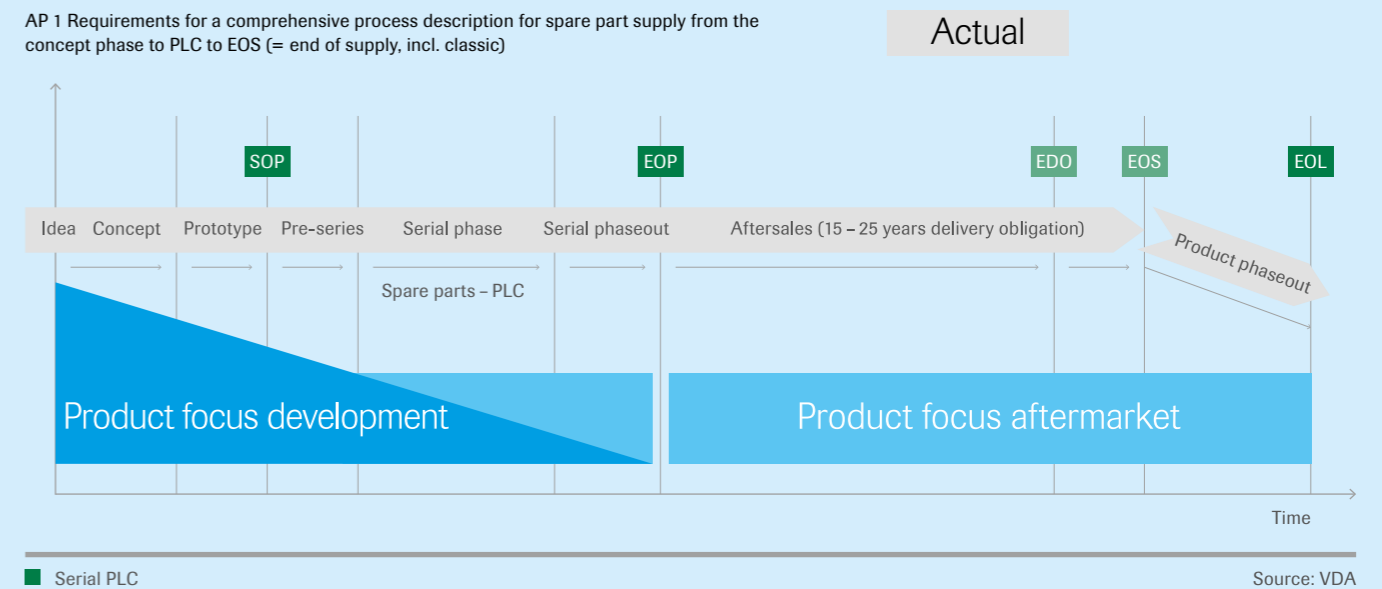
The results of both bodies will be published on the VDA’s homepage in the form of recommendations in German and English at the turn of the year 2020/2021 and will also be available for use free of charge by non-members.

Possible visualization future of sustainable ET supply:

### PG future of sustainable spare part supply

Figure: Typified process sequence from the automotive industry

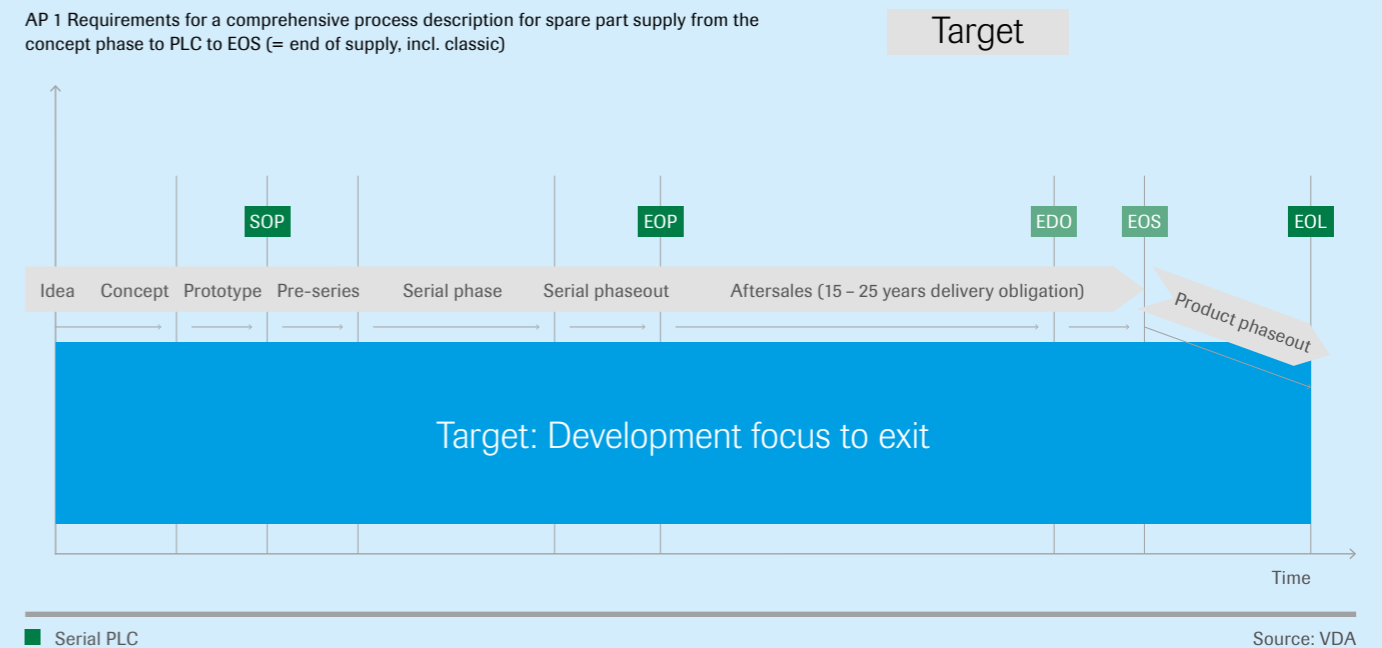
AP 1 Requirements for a comprehensive process description for spare part supply from the concept phase to PLC to EOS (= end of supply, incl. classic)



### PG future of sustainable spare part supply

Figure: Typified process sequence from the automotive industry

AP 1 Requirements for a comprehensive process description for spare part supply from the concept phase to PLC to EOS (= end of supply, incl. classic)





# Historic Vehicles

The fleet of vintage vehicles with H plates is growing more slowly.

German car manufacturers and suppliers preserve their history and thus strengthen their brands even today. The VDA supports its member companies in their traditional work. An essential objective is to safeguard political and technical conditions so that classic cars can continue to be operated on public roads without any problems. Rapidly advancing technical developments, especially stricter environmental requirements and requirements for vehicle safety, cannot be technically implemented in classic cars due to their very nature.

The Historical Vehicles department has been working in the VDA since 2007, to create and maintain the best conditions for classic cars. In many cases, in cooperation with other stakeholders, it has been possible to safeguard the interests of historic vehicle owners. For example, they can enter the environmental zones driving their H plate vehicles, are entitled to a red interchangeable license plate as well as the seasonal license plate, and they pay a standard rate for vehicle tax. These requirements are justified because classic cars are a cultural asset and a part of cultural heritage – they should be preserved for this very reason. Subsequent generations can thus learn from them in every aspect. Additional special rights are not sought by the VDA.

## Figures, dates and facts

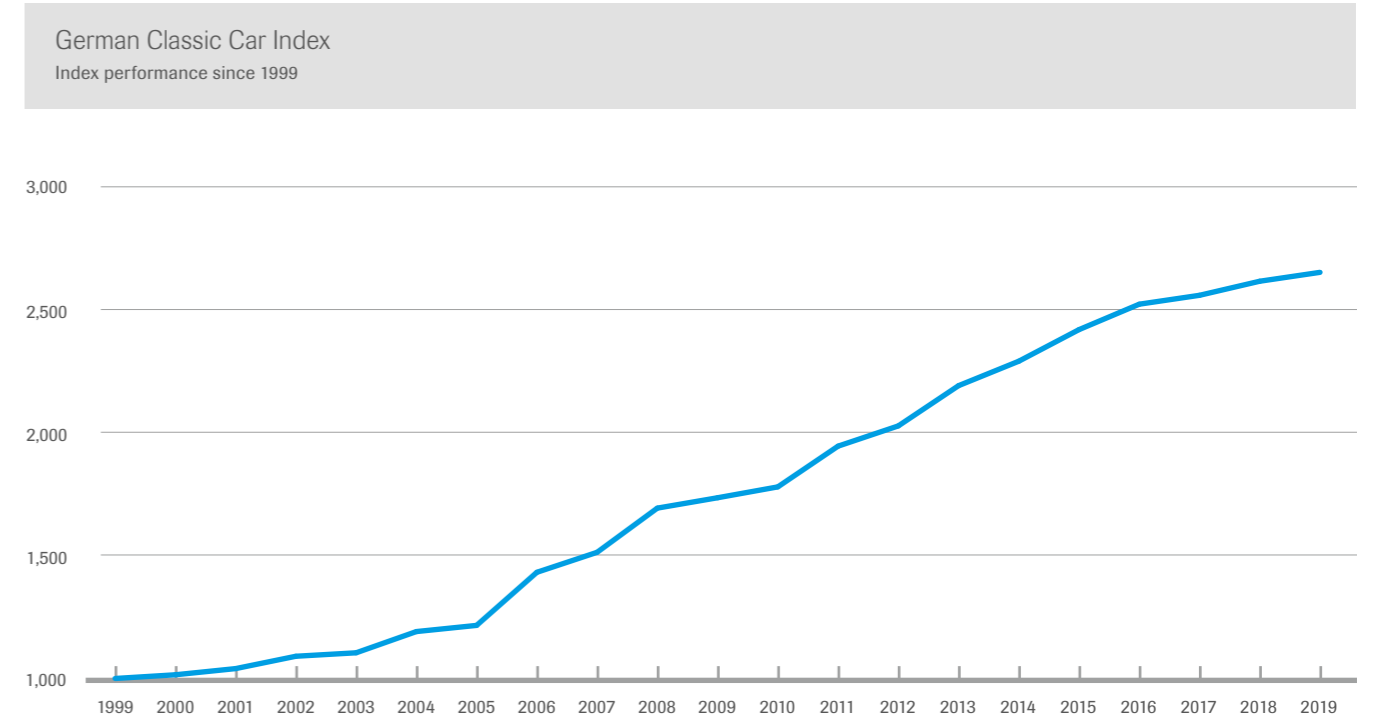
The VDA annually evaluates the figures of the German Federal Motor Transport Authority in order to provide its members from the automotive industry with the statistics they need for comprehensive aftersales support. The total fleet of all classic cars with H plates is now growing more slowly. As of January 1, 2020, there were 525,968 registered cars with H plates in Germany (2019: 474,516). The total fleet of classic cars with H plates remains negligible with a share of just over one percent of all cars, while the share of historic vehicles in the used-car market is marginal at 0.33 percent. Classic car owners keep their vehicles longer, sell them less often and preserve the cultural heritage. The diesel share of classic cars is a stable 5.4 percent.

The VW Beetle, VW Golf, Mercedes W123, W107 and W124 and Sachsenring Trabant, as well as the Porsche 911, are the top seven classic car models (about 25 percent of classic cars are located in Germany).

## German Classic Car Index

In order to be able to give a trend statement about the value development of classic cars in Germany, the VDA issues the German Classic Car Index every year. The vehicle values are determined by the valuation specialist “classic-analytics”. For this purpose, 88 representative vehicles are selected and weighted according to their registration figures. Vehicles that are particularly expensive to trade because of their rarity or history are not taken into account. The price dynamics for classic cars in Germany continue to slow down. The German Classic Car Index rose 1.4 percent in 2019. The index thus sends a clear signal that the sharp price increase of recent years for automotive classics has calmed down.

The German Classic Car Index signals that the sharp rise in the price of classic cars is slowing down.



Source: classic-analytics

### Influence of the environmental discussion on the future of the classic car scene

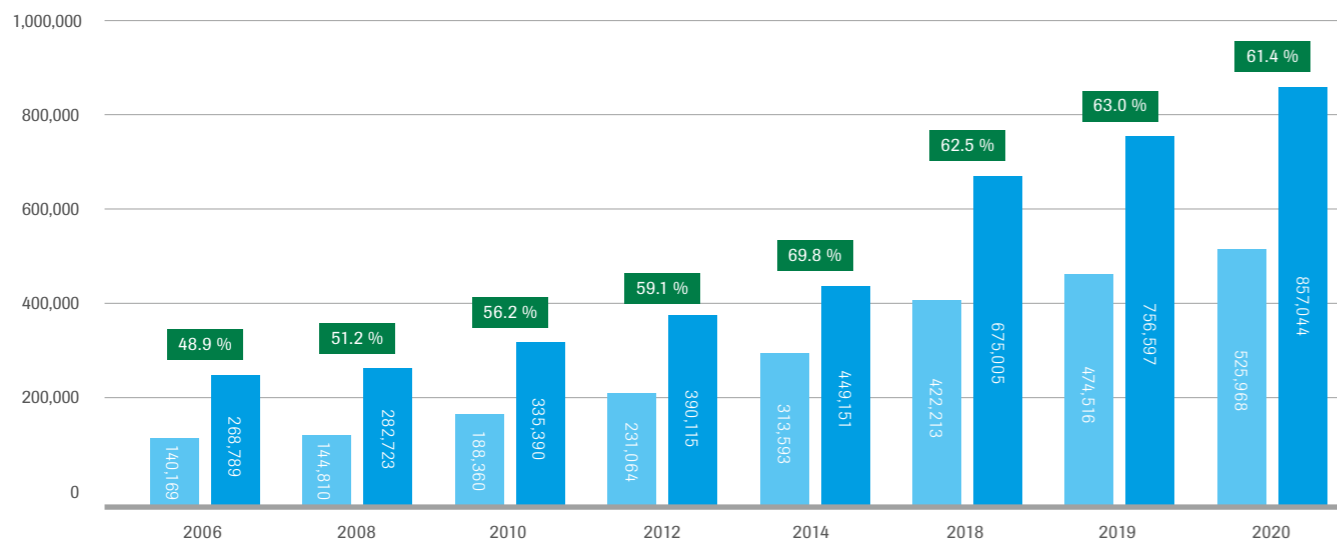
The VDA also pays attention to the perspective of future classic cars, their drivers and owners. In addition to ensuring the availability of spare parts, this includes the future acceptance of the classic car. The discussion about driving bans for gas engines of the EURO 2 class or lower leads to a controversial attitude towards automobiles in general. Today's "youngtimers" (20-29 years) have the chance to become classics and to continue the cultural heritage. This presupposes interest from younger owners and appropriate framework conditions. The VDA has derived a forecast model from the approval statistics. According to this, for example, the total number of EURO 2 youngtimers will shrink by 86 percent until they become classic cars. Driving bans for youngtimers, which have little relevance as a regulating factor in the short term, can weaken the preservation of cultural heritage in the medium term if this small amount is not preserved due to driving bans and dwindling interest.

### Electrification of classic cars

Numerous providers offer electrification conversions for classic cars. Due to the improvement in emissions, this may include the receipt of the H plate. The world classic car association FIVA has taken a clear position on this. Owners can remodel their vehicle at will. In order to preserve originality and cultural heritage, a complete reversibility of the conversion is proposed. However, electrical use is clearly not supported. The majority of manufacturers in the VDA share this view. Special rights, such as the H plate, are also formally permitted for these conversions, but are considered inappropriate. Due to electrification, the vehicle loses its originality, which characterizes the H plate.

Through electrification, a classic car loses its originality, which characterizes the H plate.

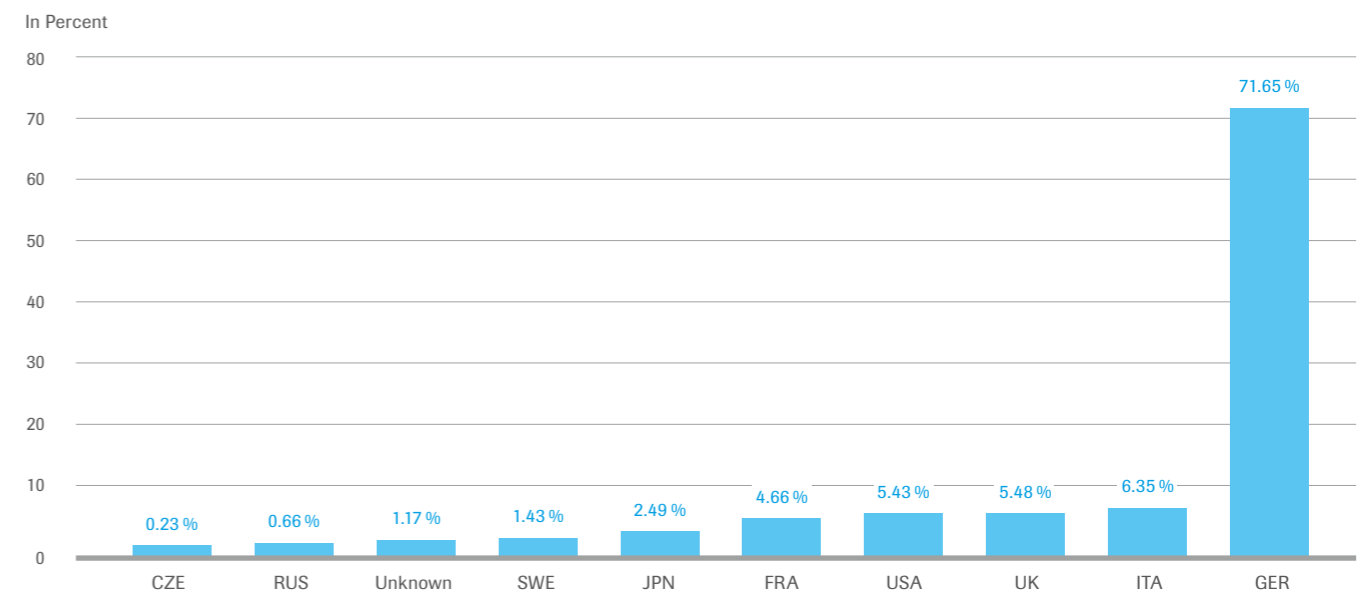
The stock – stable quota for H license plates



■ Classic cars ■ H license plates ■ Share H license plates in %

Source: KBA / VDA, values as of 01.01.2020

Classic car stocks by country of origin



Source: KBA / VDA, values as of 01.01.2020



# Automotive Banks and Leasing Companies Offer Stability during the Crisis

The German leasing industry contributes a significant share of the investment financing for German SMEs.

In the 2019 financial year, the banks of car manufacturers and leasing companies have also proven to be a strong sales engine for the German automotive industry. With new business of just under EUR 75 billion and a portfolio of around EUR 220 billion, including car leasing, the German leasing sector is making a significant contribution to the investment financing of German SMEs. New transactions for the leasing of passenger cars and commercial vehicles accounted for almost 80 percent in 2019. These include, for example, nursing services, ambulance vehicles, taxi operators, skilled trade businesses and freelancers. All these companies have made large investments in recent years, the continuation of which must be ensured during the crisis. In principle, more than 50 percent of all externally financed business investments are financed by leasing.

In 2020, the economic situation has deteriorated dramatically. The exceptionally severe and unforeseeable constraints on economic activity caused by the coronavirus crisis have led to unexpected liquidity shortages. Contract-backed, budgeted proceeds have been lost at short notice. Enterprises and freelancers in all sectors are reacting to this by trying to reduce or postpone expenditure. On the part of the leasing companies, this led to a massive increase in deferral requests.

The vast majority of deferral requests are expected to be from companies with a positive going concern forecast and where deferral is therefore an appropriate means of averting lasting damage and bridging the crisis. However, since the leased goods are mainly financed by banks in compliance with existing ma-

turities, leasing companies will hardly be able to respond to the already recognizable flood of deferral requests without exposing themselves to unacceptable risks.

In the case of credit institutions, it is envisaged that liquidity support for customers will be presented through various programs by KfW (Credit Institution for Reconstruction) with extensive liability exemptions (80 to 90 percent). Equal protection is also required for leasing companies and their small and medium-sized business customers. After all, leasing companies are financial services institutions supervised by the German regulator BaFin and are an important link between the financial industry (banks) and the real economy (investing SMEs). Against this background, the VDA and BDL (Federal Association of Leasing Companies) are arguing for equal treatment of leasing and credit institutions in the context of KfW protection.

## Payment protection insurance must be retained

The coronavirus crisis makes it clear that the much-requested instrument of payment protection insurance must be retained in motor vehicle financing contracts. Paragraph 50b of the Insurance Supervision Act (VAG-E) for the first time now stipulates a limit on the amount of commission that an insurance company may pay to an insurance agency for the conclusion of payment protection insurance. This is a serious interference with freedom of contract and competition, which should be carefully examined by the

legislator. Although this intervention is to be considered critical, the maximum final commission amount of 2.5 percent proposed in the draft – in relation to the amount of the loan or the other insured amount – can in principle be accepted. However, a reduction in the commission below this value should be avoided as the economic viability of the brokerage of payment protection insurance in the context of vehicle financing will otherwise no longer be guaranteed.

The structure and brokerage of payment protection insurance has been criticized for several years by the public and, in particular, by consumer protection agencies. In some cases, there were even calls for

a ban on the distribution of payment protection insurance at the automotive “point of sale.” For consumers, however, payment protection insurance is an important product with which they can easily protect themselves against various default risks such as death, accident, inability to work and/or unemployment.

With payment protection insurance, consumers can hedge against different default risks.







# Economic and Climate Policies

The automotive industry can only continue to invest in solutions for climate-friendly mobility on a sound economic basis. Every effort must be made to ensure that the vision of climate-neutral transport can become a reality.

02



# Economic Situation in Germany

The global COVID-19 pandemic has prevented an economic recovery in spring 2020.

At the beginning of 2020, the global economy, and with it the German economy, was already experiencing a two-year economic downturn. A possible, slight economic recovery, for which various leading indicators had spoken, was thwarted by the global COVID-19 pandemic. The automotive industry was by far the hardest hit, with a decline of 44 percent of its economic output during the shutdown phase. Since the first coronavirus restrictions were eased in May 2020, the economy has been slowly recovering. However, economic experts expect Germany's gross domestic product to fall approx. 6 percent in 2020 compared to the previous year. This would exceed the scale of the great economic crisis of 2009, when economic output shrank by 5.7 percent.

Strong economic stimuli are therefore needed to stabilize economic recovery. These include measures to improve the liquidity of companies, stimulate investment and also strengthen consumer spending. To this end, the stimulus package presented by the Federal Government at the beginning of June 2020 contains several important elements, even though the actual provisions are not quite far-reaching enough, such as the introduction of a declining-balance method, the postponement of import sales tax due dates and the extension of tax loss carryforwards. In order to increase consumer spending, proposals included a six-month reduction of VAT of 2 and 3 percentage points, as well as a doubling of the purchase premium for electric vehicles. It remains to be seen to what extent these instruments will increase consumer spending. In the run-up to the coalition decision, the VDA had warned that a premium limited to electric vehicles will only have limited economic impact since the volume of electric vehicles in demand in Germany is still too small.



The planned stabilization of the EEG surcharge for 2021 and 2022 and the temporary increase in the tax research allowance until mid-2026 are positive. In doing so, the Federal Government addresses two important areas in which the German economy has thus far been clearly disadvantaged in international competition. It pays the highest price for industrial electricity in the EU and, as in many competitive countries, there has been no tax support for research in this country until the end of 2019. In order to improve the international competitiveness of the German economy, it is to be hoped that electricity prices will not continue to rise after 2022 and that the path taken will be maintained to extend the still rather limited volume of tax research funding. In order to strengthen Germany as a business location, the Federal Government must also urgently resolve the backlog of reforms in corporate tax law, structurally modernize it, speed up procedures and tackle the reduction of the corporate tax burden towards the OECD average to a maximum of 25 percent.

The reduction of the EEG surcharge for 2021/2022 and the temporary increase in the tax research allowance are to be welcomed.

# European Policy

The importance of the European Union for the German automotive industry is enormous and can be illustrated by a few figures: About half of new cars registered in Europe were made by German group brands in 2019.

German car manufacturers produce in 15 EU countries.

The German automotive manufacturers produce in 15 EU countries and secure more than 670,000 jobs across Europe. German suppliers are also represented in about 940 locations in Europe. In 2019, automotive parts and accessories for EUR 35.9 billion were delivered from Germany to the EU. Imports from the EU were even higher at EUR 36.3 billion. The German automotive industry has long since become a European industry. More than any other sector, the automotive industry benefits from a well-functioning internal market. This makes it even more important to have a stable political and economic situation within the EU.

The coronavirus pandemic, which has been spreading across all continents since the end of 2019, has presented the global community with unprecedented challenges. Although the economic impact of the measures required because of the coronavirus varies widely across the EU member states, the overall impact is dramatic. The European Commission expects economic growth to fall by up to 7 percent in 2020 and subsequent growth of around 6 percent in 2021. Even before the coronavirus crisis, many manufacturers and suppliers in the automotive industry had to contend with declining sales figures. The COVID-19 crisis has greatly exacerbated this situation for the European car industry and its 13.8 million jobs. After the first shockwaves of the crisis between mid-March and May 2020, the EU market shrank by 41.5 percent in the first half of 2020.

National measures for economic recovery go in different directions – especially with regard to the automotive industry. For example, the Spanish government has mobilized EUR 3.7 billion and the French EUR 8 billion as part of their recovery packages for the automotive sector. On the European level, the EU Commission has presented the Next Generation EU recovery instrument for a total of EUR 750 billion. However, the automotive industry did not receive any particular mention in the draft. The EU Commission would be able to borrow the money for the recovery plan on the financial markets, a first in EU budgetary policy. The recovery plan is to be included in the EU budget totaling EUR 1.85 billion from 2021 to 2027. The EU Commission's proposal also provides for a number of other new EU self-financing measures, such as the extension of EU emissions trading, a CO<sub>2</sub> border adjustment mechanism and a digital tax.

central objective of the European Green Deal: Europe must become the first climate-neutral continent.

Under the leadership of EU Commission President Ursula von der Leyen, the EU Commission had initially set the right priorities for the current legislative period with the "European Green Deal" and digital policy. The Executive Vice-President Frans Timmermans, who is responsible for the European Green Deal, is playing a key role. The central objective of the deal: Europe is to become the first climate-neutral continent. To this end, the entire EU legal framework for energy, climate and transport policy needs to be revised. In this context, stricter fleet limit values for passenger cars are also being mentioned. Virtually ignoring the additional challenges posed by the coronavirus crisis, the European Commission, newly elected into office after the 2019 European elections, continues with its ambitious agenda. Other important issues on the EU Commission's agenda include a new EU industrial strategy, a European data strategy and a strategy for smart and sustainable mobility.

Several new rules, which are important for the automotive industry, were adopted by the EU Council and EU Parliament before the end of the last parliamentary term. After long and tough negotiations, new CO<sub>2</sub> fleet limits for passenger cars and light

commercial vehicles were decided for the years 2025 and 2030. For the first time, CO<sub>2</sub> standards for heavy-duty commercial vehicles were also established. In addition, the EU Council and EU Parliament have agreed on a revision of the General Safety Regulation. Formally, the legislative text was approved by the new EU Parliament and could be published in the Official Journal in early 2020. Many technical specifications of the mandatory technologies have yet to be specified. In addition, the European Commission has started work on new pollutant standards (post-EURO 6/VI) and plans to present a regulatory proposal by the end of 2021. Discussions on remote access to data generated in the vehicle have continued to gain speed. Having consulted a stakeholder expert group since 2019, the EU Commission is expected to present a regulatory proposal in early 2021.

In July 2020, Germany took over the EU Presidency for six months. In this capacity, the Federal Government has the task of moderating the negotiations on the EU budget and the EU recovery plan. The EU Council Presidency's top priority is to get out of the coronavirus crisis quickly. Nevertheless, other topics relevant to the German automotive industry are still on the agenda. After the Croatian EU Council Presidency had previously failed to achieve a general approach for the Eurovignette, Germany is now aiming for an EU Council position and the opening of three-way negotiations with the EU Parliament in 2020. It is also up to Germany's presidency of the EU Council to lead the three-way negotiations on the reintroduction of conformity factors.

Germany took over the EU Presidency for six months in July 2020.

Overall, the general political situation for the automotive industry in Brussels is still difficult. The loss of confidence for the entire industry as a result of the emissions manipulations of individual companies is still noticeable. Although the automotive industry has been hit harder than other industries by the coronavirus crisis, the EU Commission has little sympathy for the particular situation of this key industry. Instead, the political agenda that will lead to a massive transformation of the industry will continue. It is impossible to find a strong advocate for industrial growth in the new EU Commission. Supporters still exist in EU parliament, but they have little prospect of a majority. As a result of the 2019 European elections, the composition has shifted further to the detriment of industrial interests. There has been a massive weakening of the moderate parties and a sharp shift to the right in Europe. The informal grand coalition of the European People's Party (EPP) and European Social Democrats (S&D) no longer has a majority and relies on the votes of smaller parties, in particular the Green Party or Renew (European Liberals). The situation is also difficult in the EU Council. Many member states without a car industry in their own country are calling for tighter regulations and targets for the industry. The German Federal Government remains a crucial factor in the discussions in the EU Council. Here too, however, the willingness to stand up for the interests of the car industry can no longer be taken for granted.



# Road Transport on Its Way to Climate Neutrality

The German automotive industry has committed itself to the ambitious Paris climate protection goals.

The VDA and its members rely on a wide range of solutions to make mobility even more environmentally and climate-friendly and sees itself as an innovative driver of the development towards sustainable individual mobility. Manufacturers and suppliers of the German automotive industry are convinced that there is no long-term alternative to clean and climate-friendly mobility. The stated objective is to achieve carbon-neutral mobility by 2050. In this way, the industry is making its contribution to achieving the climate protection targets globally agreed in Paris. In addition to the overarching European targets, individual states have also adopted small-scale targets at national level and even for certain sectors. For example, the transport sector in Germany has the target of a CO<sub>2</sub>-reduction of 40 to 42 percent by 2030.

On the one hand, technological innovation, entrepreneurial commitment and skill are crucial in achieving these goals, but the overarching framework also plays a special role. For the automotive industry, a series of regulations determine the success of climate protection efforts.

The overarching goal of the automotive industry is to continuously improve its concept for the transformation towards a fully sustainable mobility system, while meeting the demands of politics and society. This means, first and foremost, serving society's demand for mobility goods and services. As a highly innovative industry, however, the automotive

industry not only wants to reactively comply with the requirements, but also lead the way and help shape the path to a sustainable society in the field of mobility and beyond. Within this, individual mobility should continue to be guaranteed in the future and contribute to the prosperity and freedom of citizens and the economy. Individual mobility is systemic and is not only limited to the car as a mode of transport, but also includes innovative, digitized transport concepts. Even in a future system, vehicles such as cars and trucks will inevitably be needed. The aim must therefore be to reduce the negative effects to a minimum.

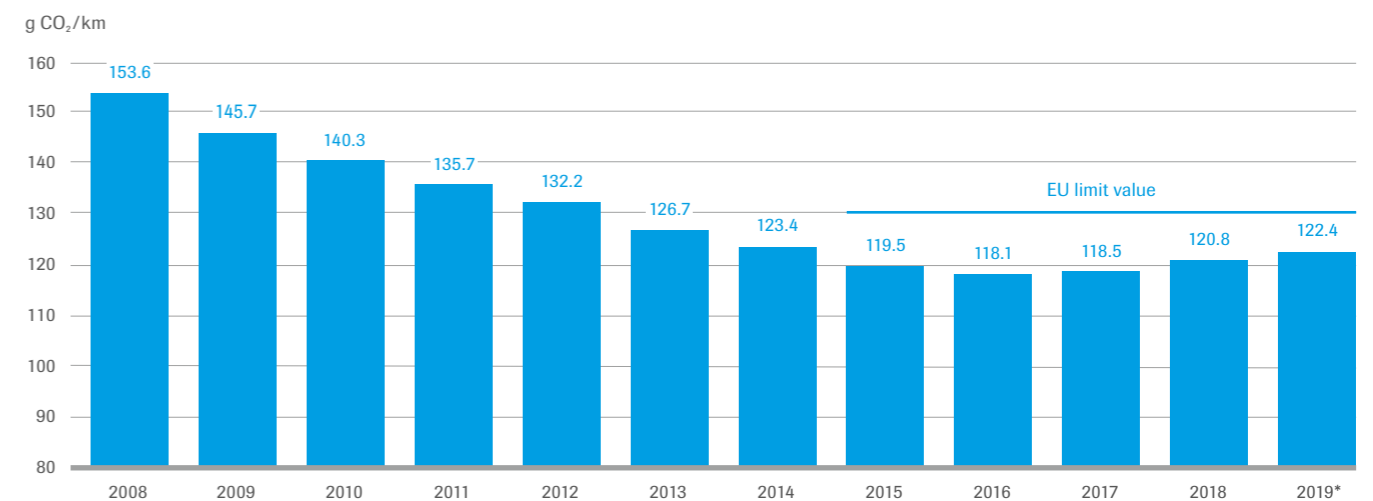
## CO<sub>2</sub> emissions and the role of regulation

For both passenger cars and light commercial vehicles, the permitted CO<sub>2</sub> emissions of newly registered vehicles are regulated by the EU. This means that the average emissions of a manufacturer's newly registered vehicles (each weight-based, so there is not only the "one" CO<sub>2</sub> value that all manufacturers have to comply with, but the 95 g, etc., reflect the European average of all new registrations) may not exceed a legally established target value in grams CO<sub>2</sub> per kilometer driven. After initially setting a target of 130 grams of CO<sub>2</sub> for passenger cars for 2015, the target for 2020 was tightened to 95 grams. Similarly, the average output of light commercial vehicles (transporters up to 3.5 metric tons) must not exceed 175 grams in 2014 and 147 grams from 2020.

In recent years, CO<sub>2</sub> emissions from newly registered cars in the European Union have fallen significantly. While in 2008 the average CO<sub>2</sub> emissions per kilometer were still 153.6 grams, in 2019 it was more than 20 percent less at 122.4 grams (or 5.3 liters of gasoline or 4.7 liters of diesel). Manufacturers had already exceeded the EU fleet limit of 130 grams, which had been in force since 2015, two years earlier. Between 2015 and 2019, the average CO<sub>2</sub> value of new cars was around

10 grams below the EU target. If this is extrapolated to absolute emissions (with the new registration figures and a life-cycle performance of 200,000 kilometers), this corresponds to around 150 million metric tons of CO<sub>2</sub>, which could be saved here after the NEDC (New European Driving Cycle) test cycle compared to the legal requirement. That is about as much as all road traffic in Germany emits in a year. It can therefore be said that in recent years the car industry has laid some groundwork in terms of the EU's CO<sub>2</sub> limit value.

Development of relative CO<sub>2</sub> emissions of new vehicles in EU



\* Preliminary

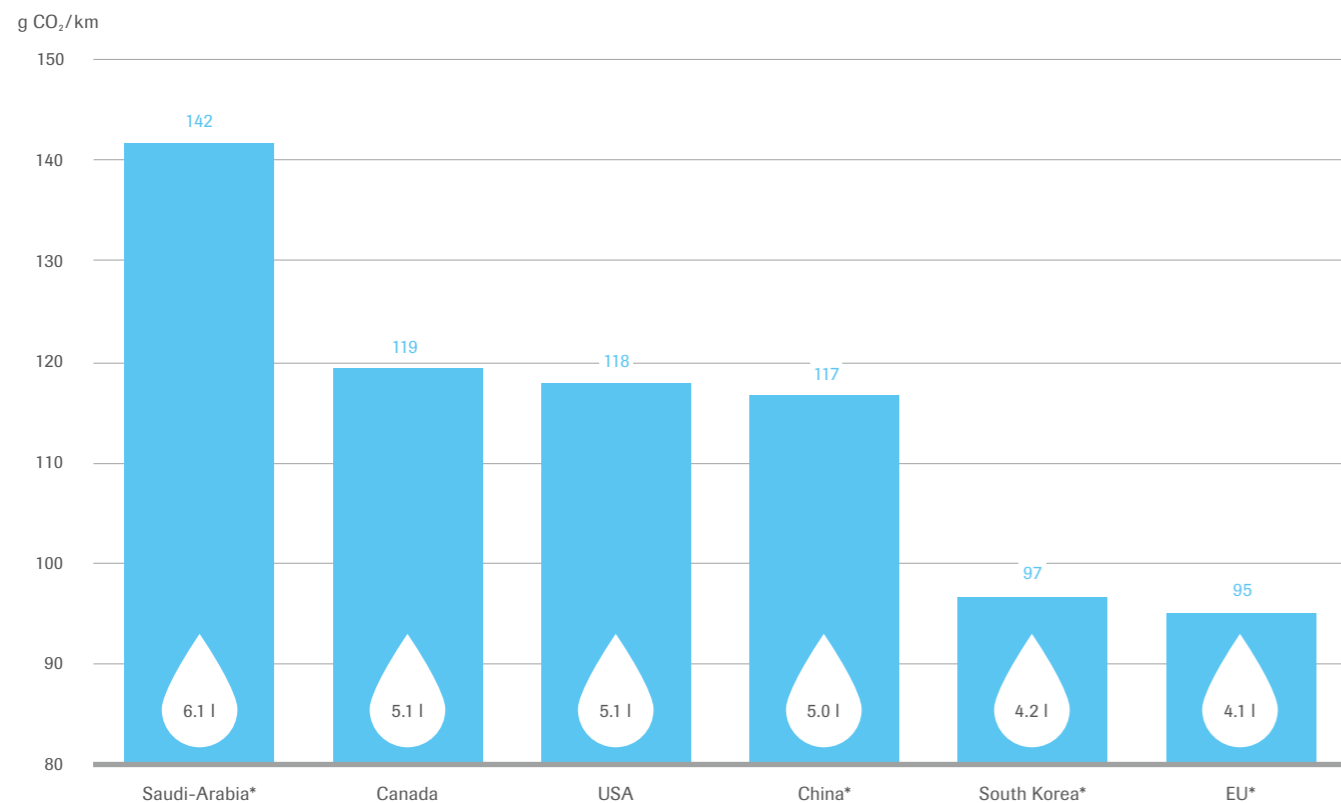
Source: EEA

### The EU's limit values are the most stringent in the world

The European automotive industry is under greater pressure than its competitors when compared internationally.

It is absolutely right that Europe should pursue ambitious climate targets. However, the EU's targets must not move too far away from other regions of the world. Effective climate policy must also ensure cost-effectiveness and profitability, so that the companies concerned can succeed in international competition. The European car industry, whose main market is Europe, is under greater pressure than its competitors when compared internationally. The EU's CO<sub>2</sub> target for passenger cars of 95 grams in 2021 is the most stringent in the world. In the US, 118 grams of CO<sub>2</sub> per kilometer are mandatory, by 2020 it will be 117 grams in China and 97 grams in South Korea.

International comparison of CO<sub>2</sub> limit values of passenger cars 2021 (NEFZ\*\*)



\* 2020 \*\* New European Driving Cycle, fuel consumption in liters of gasoline

Source: ICCT

Based on the 2021 targets, manufacturers in the EU are expected to reduce CO<sub>2</sub> emissions from their new car fleets by 37.5 percent (light commercial vehicles 31 percent) by 2030. In 2025, a binding interim target with a reduction target of 15 percent will apply. Similarly, CO<sub>2</sub> regulation for heavy-duty commercial vehicles was introduced for the first time, with a reduction of 15 percent by 2025 and 30 percent by 2030. The assessment of these reductions for passenger cars and light commercial vehicles has been carried out since 2018 using the modern and realistic WLTP (world harmonized light-duty vehicles test procedure). However, the actual CO<sub>2</sub> emissions from road transport are ultimately the result of a combination of factors that go beyond pure vehicle efficiency – for example, driving performance and service life of the vehicle, the driving style of the user, the number of vehicles or the CO<sub>2</sub> content of the energy sources used. All these factors have a significant influence on absolute CO<sub>2</sub> emissions. A convincing and comprehensive political strategy therefore requires a holistic approach. The ambitious climate protection targets cannot be achieved in any other way.

### Climate neutrality in transport requires comprehensive regulation

The current regulatory concept leaves out reduction potentials outside vehicle technology, such as the driving style or the CO<sub>2</sub> content of the energy sources used (fuels, electricity). A comprehensive policy strategy should increase efficiency across all drives and fuels and regulate it as a whole – in the long term, for example, in the form of an overarching emission trading scheme. Especially biofuels and fuels based on electricity from renewable energies (e-fuels) offer considerable potential to reduce CO<sub>2</sub> emissions. Petroleum-independent e-fuels could be an option for climate-neutral mobility of the future in addition to alternative drives. In order to achieve the overarching climate protection goals, not only the optimization on the vehicle side, but also the use phase should be taken into consideration in the future. This is where much greater leverage exists. The improvement of the existing fleet by 1 gram, for example, by a CO<sub>2</sub> poorer fuel, is as effective in the short term as an improvement of 20 grams in the new car fleet. This example shows that climate protection requires comprehensive regulatory logic.

The German automotive industry is committed to sustainability and consistent climate protection. It supports the goal of greenhouse gas-neutral road transport and is working at full speed on products, technologies and services in order to achieve this goal by the middle of the century – while respecting individual mobility. The future lies in drives using regenerative energy; be it battery-electric vehicles, electricity-based fuels in internal combustion engines or the use of renewable hydrogen in the fuel cell. This technology spectrum has given Germany and Europe the opportunity to become the global leader in a systemic, cross-sectoral climate policy and to develop and export appropriate technologies. For this purpose, policy support is needed for a broad mix of technology.

Climate protection requires a comprehensive regulatory logic.



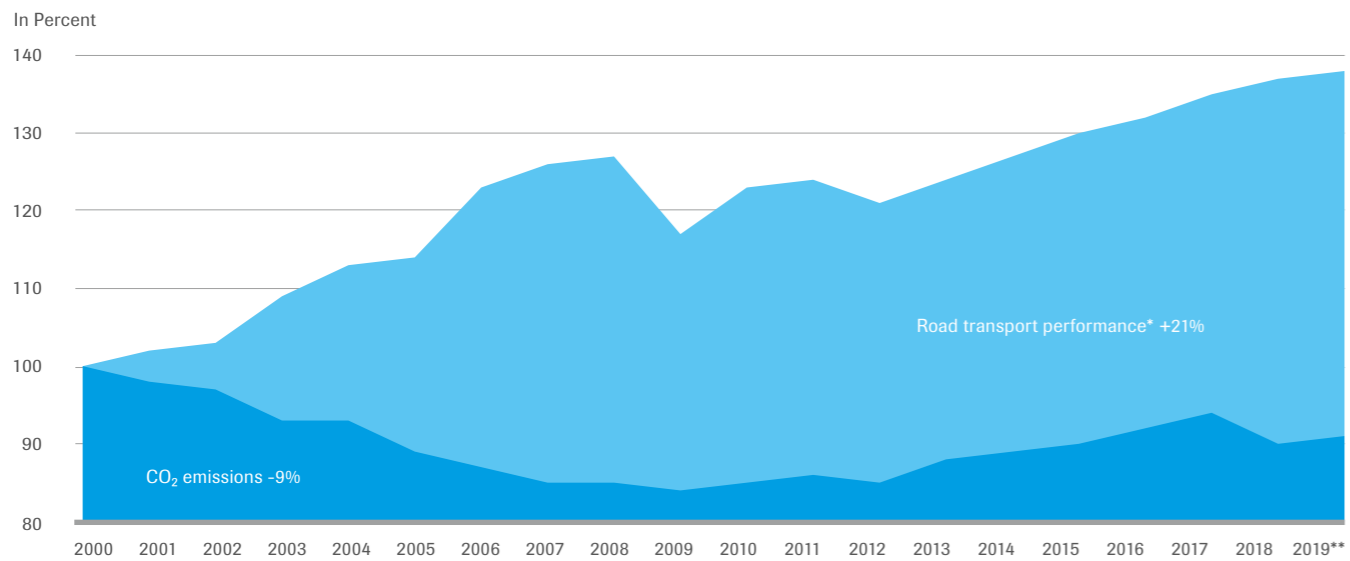
# Passenger Car Energy Efficiency

There is a positive trend in the total emissions of road transport in Germany. After the fall of the Iron Curtain in 1990, freight and passenger traffic initially increased significantly until 1999. Subsequently, CO<sub>2</sub> emissions from road transport fell by around 30 million metric tons by 2010. In 2018, total emissions were at the relatively low level of 1991, despite much higher shipping and transport services.

Today, around 33 megajoules of energy are needed per 100 passenger kilometers.

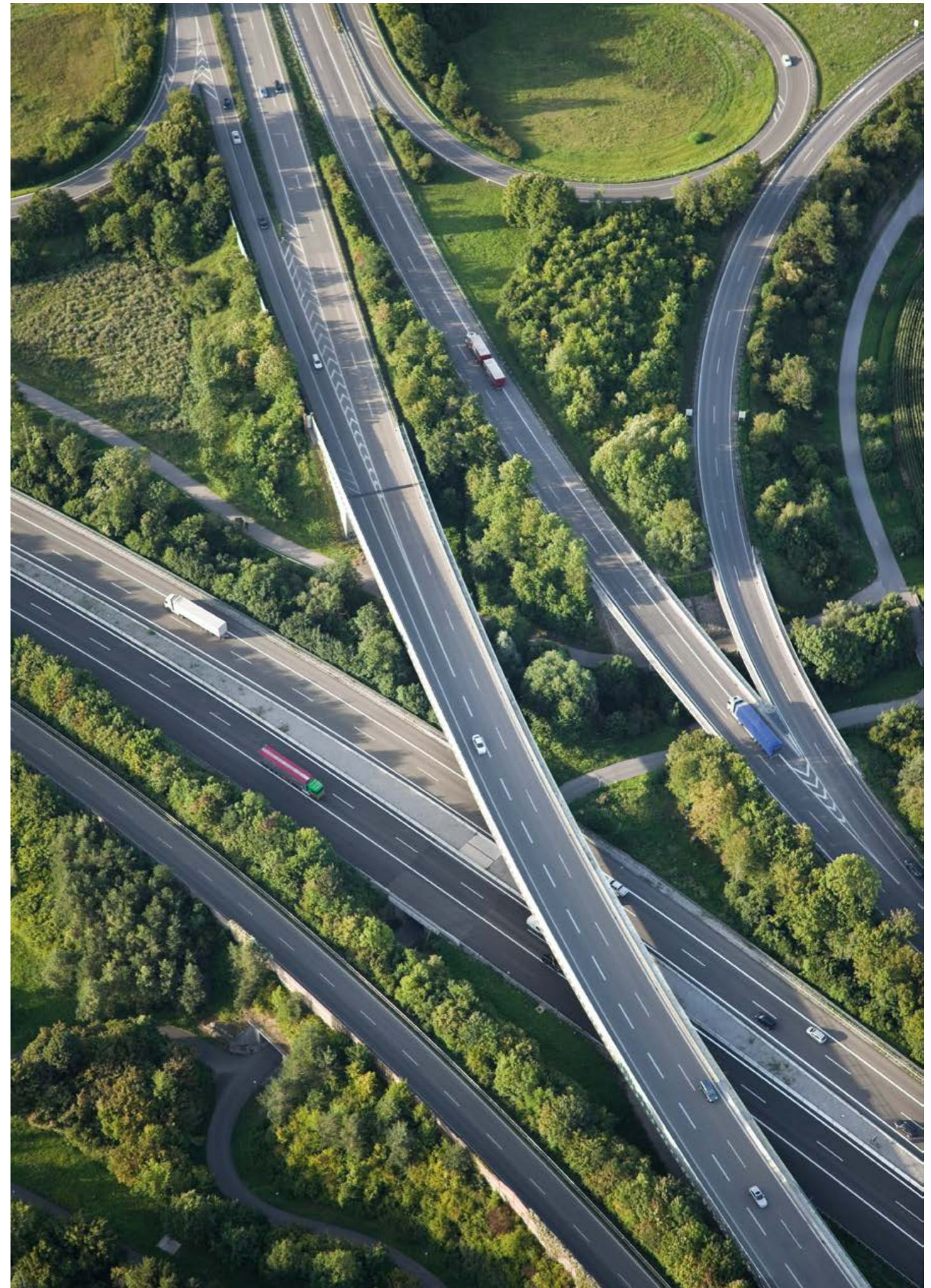
The reduction of the specific energy consumption per vehicle was a crucial factor. Today, around 33 megajoules of energy are needed per 100 passenger kilometers. In 1990, more than 55 megajoules had to be used for comparable performance. The fact that overall road transport emissions have not decreased to the same extent, despite this considerable increase in efficiency in individual vehicles, is mainly due to the following fact: Road transport performance, in passenger or ton kilometers, has increased significantly for many years; by around 38 percent since 2000 alone. Despite this significant increase, which affects both passenger and freight transport, absolute CO<sub>2</sub> emissions from road transport were reduced by 9 percent over the same period. The task of the next few years will be to continue along this path and, in particular, to increase the market penetration of alternative forms of propulsion in order to better reconcile people's mobility needs and their impact on the environment.

Efficiency increases in German road traffic



\* 1 ton kilometer corresponds 10 passenger kilometers \*\* Preliminary

Source: BMVI, UBA





# The “European Green Deal”: Challenges for the Automotive Industry

The fight against climate change is the central theme of EU policy. The new President of the European Commission, Ursula von der Leyen, has put climate and environmental policy at the forefront of her political agenda with the European Green Deal.

The European Green Deal will be the defining theme of this European parliamentary term.

The European Green Deal is the subject of an EU Commission communication describing the EU's regulatory and legislative agenda for the next five years. In the legislative period, which runs until 2025, almost all policy areas and regulations relevant to climate policy will be reopened and re-decided. In addition, the European Green Deal will touch on topics such as industrial policy, trade policy, transport policy, digitization, financial instruments and tax policy, but also structural policy and infrastructure policy. What is clear is that the European Green Deal will be the defining theme of this legislative period and will challenge all stakeholders – the EU institutions, member states, society, companies and associations – to follow and influence a wealth of decision-making processes.

The “heart” of the European Green Deal is that Europe is supposed to be climate neutral by 2050. To this end, the European Commission proposed a European Climate Act in March 2020 to establish the legal framework for the goal of climate neutrality by 2050. Another important building block is the tightening of the EU's climate target in 2030 – from a 40 percent reduction in greenhouse gas emissions compared to 1990 to at least 50 percent or even 55 percent. The EU Commission's proposal does not yet mean that these figures are legally binding. The EU member states and the European Parliament will make final decisions on these laws. Some member states, such as Luxembourg, Sweden and Denmark, have already called for the EU's climate target to be tightened to 55 percent. German Chancellor Angela Merkel also advocated a 50 to 55 percent reduction in greenhouse gases at the 2019 Petersberg Climate Dialog. In a non-legislative resolution of January 2020, Members of the European Parliament had already called for

a tightening of 55 percent. Individual groups, such as the Green Party with a demand of minus 65 percent and the European Left with minus 70 percent, wanted to go even further.

Tightening the climate target means that individual sectors will have to do more. This applies to the European Emissions Trading Scheme (EU ETS), but also to non-ETS sectors, such as transport, domestic heat supply and even agriculture. The lowering of the EU 2030 climate target ultimately means that the entire European framework legislation on energy, climate and transport policy for 2030 will have to be adapted.

By June 2021, the EU Commission will present a comprehensive package of measures containing coherent changes to the existing regulatory framework for climate, energy and transport policy. These include the European Emissions Trading Scheme, the Effort Sharing Regulation, the Renewable Energy Directive (RED), the Energy Efficiency Directive also the CO<sub>2</sub> standards for passenger cars and light commercial vehicles. Fleet targets for 2025 and 2030 were decided in 2019 after long disputes: for passenger cars minus 15 percent for 2025 and minus 37.5 percent for 2030, and for light commercial vehicles minus 15 percent for 2025 and minus 31 percent for 2030. At least the fleet target for 2030 will be subject to renewed discussion under the European Green Deal. This new discussion not only complicates business planning and investment decisions. The EU's fleet targets are already the most stringent in the world and pose enormous challenges for companies in the automotive industry. Even the agreed target values can only be achieved with massive electrification.

Virtually ignoring the additional acute challenges of a simultaneous supply and demand shock due to the coronavirus pandemic, the EU Commission is advancing work on highly ambitious legislative packages. As part of the “EU Recovery Plan” following the coronavirus crisis, it has declared environmental and digital transformation to be a new growth strategy. Support for industry should therefore be linked to climate requirements. If the leading voices in the EU Commission had their way, the pace and level of ambition for the European Green Deal would be further increased.

The German automotive industry stands behind the ambitious Paris climate goals and the European Commission's plan to make Europe climate neutral by 2050. Climate protection is a priority and must be economically, ecologically and socially acceptable at the same time. However, the associated objectives cannot be achieved by constantly setting new targets and intermediate targets. The automotive industry is currently responsible for around 13.8 million jobs in Europe and is the backbone of the European economy. Companies also need planning certainty to maintain these jobs in order to achieve the goal of climate neutrality by 2050. In general, the automotive industry is in a process of transformation that does also not end at European borders. Electrification and commitment to the fight against climate change, increasing protectionist tendencies worldwide and digitalization are just some of the challenges that the industry will face in the coming years.

The VDA aims to achieve a rapid and substantial reduction in greenhouse gas emissions on the way to a climate-neutral economy. For sustainable climate protection, however, investment and innovation are needed. In the wake of the economic crisis following the coronavirus pandemic, companies are running out of financial resources. This makes it all the more important to use funds on the principle of the best cost-efficiency. The current regulatory approach to road transport is neither effective nor cost-effective in the long term. The desired climate target will not be achieved through the CO<sub>2</sub> limit values for new vehicles alone. In addition, CO<sub>2</sub> avoidance costs in the road transport sector are much higher than in other sectors. The passenger car fleet target of minus 37.5 percent of CO<sub>2</sub> emissions in 2030 already requires a massive acceleration of the transformation process in the automotive industry. The transformation process is determined by limited production capacities, availability of raw materials and insufficient loading and refueling infrastructure for alternative propulsion systems, and also represents fundamental changes for production and the workforce. The demand side must also be taken into account.

Instead of constantly outperforming each other at the required level of ambition, policy-makers should first fix the systemic problems of the regulatory framework. The European Green Deal offers a unique opportunity to do this: a new climate policy should enable new measures to prevent CO<sub>2</sub>. For road transport, for example, this means the decarbonization of the existing fleets of vehicles with synthetic fuels. The path for emissions trading across all sectors should now be paved.

The transformation process of the automotive industry means fundamental changes for production and the workforce.

The German automotive industry is committed to the ambitious Paris climate goals.

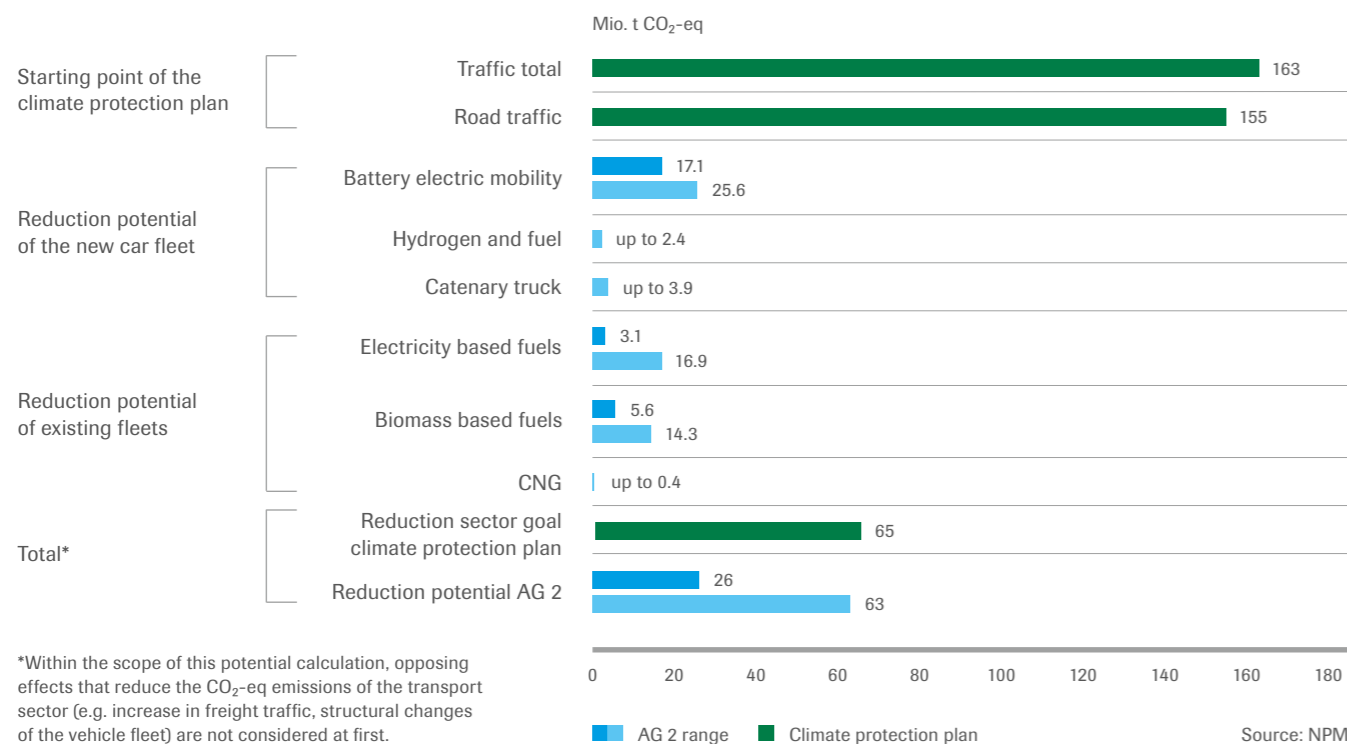


# E-fuels as the Perfect Complement to Electromobility

Highly efficient internal combustion engines powered by synthetic fuels are a promising way to meet CO<sub>2</sub> targets.

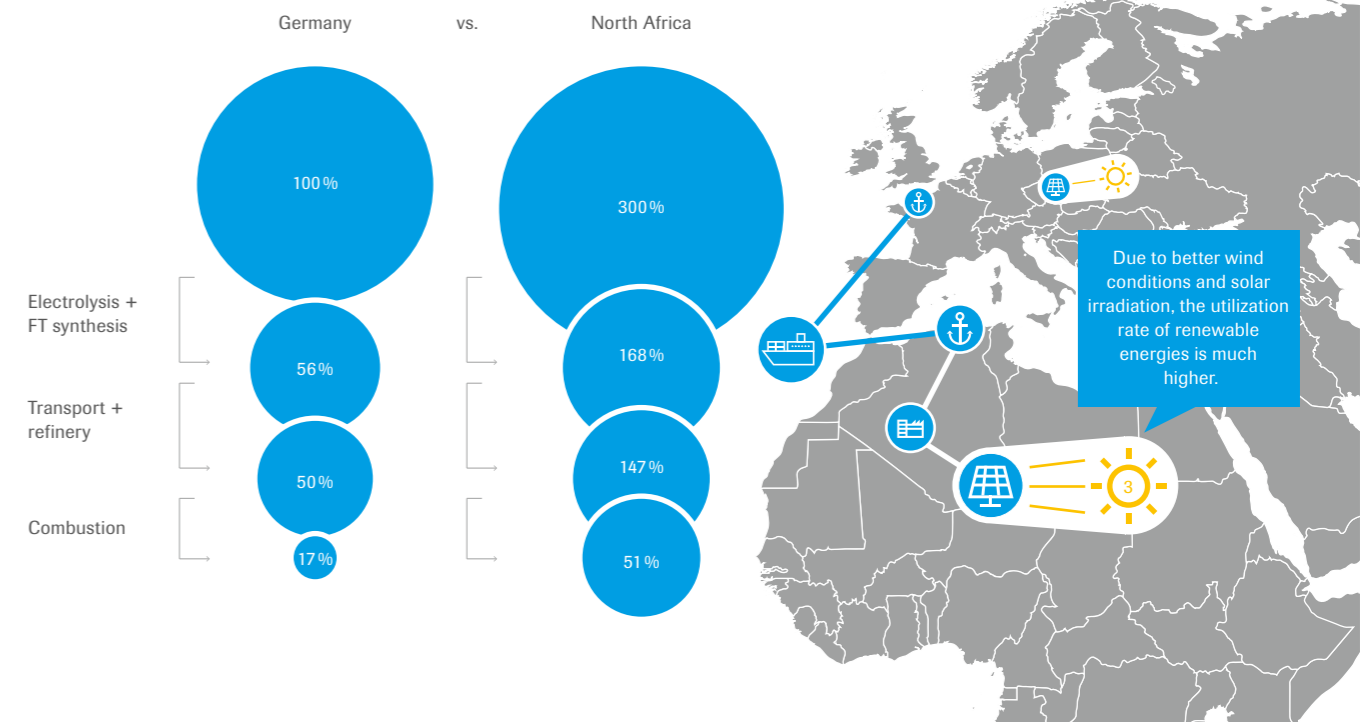
Even without further tightening by the “European Green Deal,” the adopted climate targets mean that by 2030 the current use of fossil fuels must be cut by 40 to 42 percent within the transport sector. However, in order to be able to meet society’s growing mobility needs at the same time, alternative drives, renewable fuels and new mobility concepts must be introduced to the market simultaneously. The ambitious climate goals can only be achieved in a joint and parallel market ramp-up of different technologies. The National Platform for the Future of Mobility (NPM) has calculated that even with an ambitious drive change of up to 10 million e-vehicles, a maximum transfer of traffic performance to rail and public transport as well as far-reaching efficiency measures on the vehicle, there is still a significant CO<sub>2</sub> gap, even if its extent is disputed. That is why the ambitious market ramp-up of renewable fuels has an important role to play. The VDA is committed to technical solutions and to achieve climate goals, and to ensure individual mobility in Germany and Europe as well as worldwide.

CO<sub>2</sub>-reduction potential of alternative drives and fuels until 2030



\*Within the scope of this potential calculation, opposing effects that reduce the CO<sub>2</sub>-eq emissions of the transport sector (e.g. increase in freight traffic, structural changes of the vehicle fleet) are not considered at first.

Efficiency depending on the place of production



Source: PtX-Allianz

## Sustainable, renewable fuels and what they will cost

Relevant fuels are advanced biofuels, which are clearly defined in the EU’s Renewable Energy Directive (RED), as well as hydrogen and synthetic fuels – so-called e-fuels. The latter are made from 100 percent renewable electricity, water and CO<sub>2</sub>. Power-to-X technology can be used to provide standard-compliant, renewable fuels. However, this still requires a very ambitious expansion of renewable energies. This does not only have to be done in Germany. A major advantage of e-fuels is that they are easy to store and transport. This makes them predestined for import. In the end e-fuels are stored, renewable electricity. They can be produced in many places much cheaper than in Germany, e.g., in North Africa. E-fuels are practically climate neutral, as during their production the exact amount of CO<sub>2</sub> that is taken from the atmosphere is later emitted again when used in the vehicle. They are used in internal combustion engines and can thus work in the existing fleet.

In addition, the VDA also defines advanced biofuels as relevant, sustainable energy sources. These fuels are derived from waste and residue materials. Conventional biofuels are produced from plants whose cultivation areas are in competition with food production; therefore, they are limited to a maximum of 7 percent in the “RED.”

The NPM expects the production costs for e-fuels to be between EUR 1 and 2 per liter in 2030. The Institute of German Economy has calculated that 10 percent of e-fuels in the fuel mix would increase the price of fuel by only 11 cents per liter by 2030. Combined with an increase in efficiency of up to 30 percent for internal combustion engines, as determined in the NPM, users’ fuel costs would not increase. The production costs include the development of renewable energies as well as efficiency losses in production. However, the efficiency losses can be offset if the utilization of renewable energies is considered in a global context. For photovoltaics and wind turbines the utilization is two to four times higher at suitable locations than for comparable

E-fuels are made from 100 percent renewable electricity, water and CO<sub>2</sub>.

Global production of e-fuels will be required.

plants in Germany due to better wind conditions and solar irradiation. For this reason, global production of e-fuels is required. The VDA, together with the Society for International Cooperation (GIZ), supports this development and further supports relevant cooperation with developing and emerging countries.

According to the latest biofuel evaluation report, 120 PJ (petajoule) of renewable fuels were used in the German fuel market in 2018, which resulted in a CO<sub>2</sub> reduction of 9.5 million metric tons. Some 36 percent of the fuels are biofuels from residual materials, which the VDA considers to be clearly sustainable. A majority (approx. 41 PJ) is biodiesel from used cooking oils. Another potential is gaseous fuels. According to the Biogas Association, 36 PJ of biomethane from residual materials can be produced in Europe. For trucks, the Dutch oil company Shell plans to build 40 LNG filling stations

in Germany. Bioethanol from residues has been successfully produced in demonstration plants and is gradually being introduced to the market. Like e-fuels, advanced biofuels can be produced worldwide.

The NPM has identified the potential of renewable fuels. By 2030, up to 270 PJ could be achieved by biofuels, which would then account for 16 percent of the fuel market. In addition, there is a potential of 190 PJ of hydrogen and e-fuels if an ambitious market ramp-up of Power-to-X technology is launched in a timely manner. To this end, the VDA, together with other stakeholders, has proposed a market launch program that provides for the expansion of 5 GW of installed capacity by 2026.

In order to generate long-term demand for these fuels, the appropriate regulatory framework is required. The Renewable

Energy Directive (RED) is the appropriate policy instrument for this purpose. REDII must be implemented into national law by the summer of 2021. In addition, REDII will be reviewed under the European Green Deal in June 2021.

The VDA recommends a 23 percent share of renewable energy in the transport sector and a minimum share of 5 percent of hydrogen and e-fuels by 2030. This should be done without any multiple crediting in order to achieve a clear CO<sub>2</sub> reduction. In addition, the requirements for electricity supply for fuel production should be designed in such a way that the first industrial plants are not disadvantaged. Furthermore, climate-neutral energy sources such as e-fuels should be exempt from energy tax. The European Energy Tax Directive is also being reviewed under the European Green Deal.

# Assessment of the National Hydrogen Strategy

The National Hydrogen Strategy is moving in the right direction

The ambitious climate protection targets can only be achieved if, in addition to electric mobility with green electricity, sustainable, renewable fuels are also used in the transport sector. E-fuels and hydrogen should therefore be promoted in addition to electromobility. The VDA is committed to an ambitious replacement of fossil fuels through regenerative alternatives.

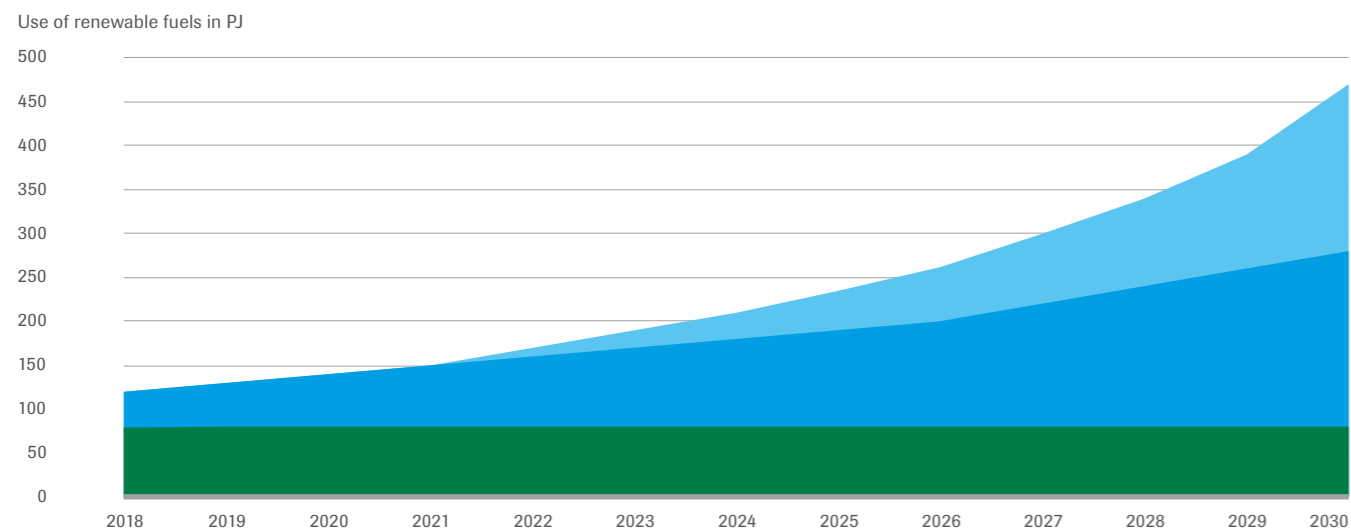
E-fuels and hydrogen should be promoted in addition to electromobility.

The National Hydrogen Strategy (NWS), adopted by the Federal Government in June 2020, is a first and positive step for a market ramp-up of green hydrogen-based drives. From the point of view of the VDA, however, the NWS offers positive and negative aspects. On the positive side, the Federal Government has recognized the importance of hydrogen for climate-neutral mobility by adopting such a strategy. The planned exemption of hydrogen and e-fuels from the Renewable Energy Surcharge (EEG) is positive, because it will drive the development of hydrogen technology forward in Germany. The VDA also welcomes the fact that the Federal Government and the NWS provide for the use of hydrogen in all transport sectors. Moreover, the international perspective of the strategy is an important element, because green hydrogen can be produced on a significant scale in countries with a sufficient supply of renewable energy.

Nevertheless, the National Hydrogen Strategy is not specific and ambitious enough in several areas. This includes, for example, the planned implementation of the Renewable Energy Directive (RED II). As mentioned, the VDA recommends that in 2030 there must be 23 percent of renewable energy in Germany in the national fuel market, along with a minimum share of 5 percent of hydrogen and e-fuels. Similarly, the strategy has not yet established an energy tax exemption for e-fuels. Currently, renewable energy e-fuels have the same tax rate as fossil fuels. The specifics of these points should be reworked in the legislative process.

Possible demand for e-fuels in Germany by 2030

When the proposed policy changes are adopted



■ Advanced biofuels from waste materials ■ E-Fuels ■ Conventional biofuels

Source: VDA

### 1. Ambitious REDII implementation / revision

- 23% renewable fuels by 2030
- 5% sub-quota for e-fuels by 2030
- Implementation of the delegated acts Articles 25 & 27 within the German EU Presidency

### 2. Reduction of energy tax

- Energy tax exemption for renewable energy sources

### 3. PtX launch program

- Promotion of 5 GW of installed capacity by 2026



# CO<sub>2</sub> Regulations for Heavy-duty Commercial Vehicles, Trailers, Bodies

By 2025, commercial vehicle manufacturers must reduce CO<sub>2</sub> emissions from new vehicles by 15 percent.

The EU's ambitious climate protection targets mean a fundamental turning point for road transport in terms of future drive technologies. Light, medium and heavy-duty commercial vehicles account for almost 30 percent of total greenhouse gas emissions in the European transport sector, although vehicle-related emissions have fallen significantly in recent decades. Nevertheless, the total amount of emissions has not decreased as a result of increasing transport services.

The EU therefore decided in 2019 to introduce a method for determining the CO<sub>2</sub> value of a commercial vehicle and to impose binding mitigation targets on manufacturers for the next ten years. Regulation (EU) 2019/1242 sets CO<sub>2</sub> emission targets for newly registered heavy-duty commercial vehicles and potential penalties for non-compliance. By 2025, commercial vehicle manufacturers will have to reduce CO<sub>2</sub> emissions from new vehicles by an average of 15 percent, and by 2030 the target is a 30 percent reduction compared to 2019/2020 levels.

Commercial vehicles have very different driving profiles due to their design.

In contrast to passenger cars, commercial vehicles have very different driving profiles due to their design and are used differently in daily operations. This leads to a wide range of possible driving cycles and resulting CO<sub>2</sub> emissions. In order to create comparability, CO<sub>2</sub> emissions from heavy-duty commercial vehicles are calculated using the digital simulation tool VECTO (Vehicle Energy Consumption Calculation Tool). As a result, different CO<sub>2</sub> values are calculated for the vehicle depending on the driving profile (short distance, long distance, inner city). Among other things, the parameters for rolling resistance, air resistance, masses and inertia, gear friction, auxiliary power and engine power are required as input values for simulating fuel consumption and CO<sub>2</sub> emissions for standardized driving cycles.

Since mid-2019, the relevant CO<sub>2</sub> values must be calculated and transmitted to the EU Commission for all newly registered heavy-duty vehicles over 16 metric tons with axle configuration 4x2 and 6x2; since January 2020 this includes all commercial vehicles from 7.5 metric tons with the axle configuration 4x2 and from mid-2020 also all commercial vehicles with the axle configuration 6x4 and 8x4. The calculation does not take into account the actual structure of a truck or the actual semitrailer for a vehicle combination, but provides for the calculation with a standard body or standard semitrailer. The values established since mid-2019 are used to define a reference value for the given CO<sub>2</sub> reduction targets.

The European Commission is planning a procedure that also determines CO<sub>2</sub> emissions for buses.

Currently, CO<sub>2</sub> Regulation (EU) 2019/1242 is limited to trucks. However, the EU Commission is already working intensively on a process to determine CO<sub>2</sub> emissions for buses. To this end, the VECTO program will be extended and the methodology revised. Especially in the bus segment, multi-stage type approvals are not uncommon, so that the final CO<sub>2</sub> value has to be determined by different manufacturers from a number of different CO<sub>2</sub> factors (chassis, drive, structure). In addition, the VECTO program is also currently expanding the calculation of hybrid drive concepts and taking into account new technologies (e.g., heat exchangers in the exhaust system).



The next step is for the EU Commission to draw up a proposal for a regulation on the inclusion of trailers in CO<sub>2</sub> certification by the end of 2022. In particular, a certification of closed semitrailers (curtainsider, cooler, box) is planned. Bodies that deviate from the standard structure (e.g., dump body, flatbed, silo, tank) are not taken into account in the initial phase. The extent to which actual body designs will be taken into account in a CO<sub>2</sub> certification in the future is currently not foreseeable. The variety of forms and different uses of these vehicles makes CO<sub>2</sub> certification more difficult and would lead to a complexity that is disproportionate to its usefulness. Furthermore, commercial vehicles for special applications have various auxiliary units, which have an influence on the CO<sub>2</sub> balance of the vehicle (e.g., climate units, hydraulic pumps). The inclusion of these consumers in the VECTO simulations is complex and CO<sub>2</sub> emissions are often difficult to quantify. Unfortunately, the EU Commission has thus far failed to justify CO<sub>2</sub> certifications in a comprehensive cost-benefit analysis. This concerns, in particular, the inclusion of trailers and actual types of bodies.

In a review planned for 2022, the EU Commission will assess the effectiveness of existing measures and define new targets for the years after 2030. These include, among other things, a review of the 2030 reduction targets, reduction targets for trailers, the assessment of CO<sub>2</sub> values on a VECTO basis in relation to real emissions, the analysis of the state of the market introduction of zero-emission vehicles, the assessment of the construction of a refueling and charging infrastructure, the assessment of credits for e-fuels and the assessment of the VECTO tool and the penalties set.

The regulatory requirements for trucks that have already been adopted cannot be satisfied simply by optimizing conventional drive technologies. Instead, in the future, it will be necessary to implement other drive technologies in the commercial vehicle (electric, fuel cell) in addition to CO<sub>2</sub>-neutral fuels such as biomethane or e-fuels. The electrification has begun with vehicles used in distribution transport and city buses and will also be introduced in long-distance transport with the further developing battery technology. At the same time, the fuel cell will lead to the use of hydrogen, especially in long-distance transport. A wide use of synthetic fuels will in particular improve the CO<sub>2</sub> balance of the vehicle fleet. However, the conditions for the provision of these fuels must be quickly created. The same applies to the construction of an efficient charging infrastructure for electrically powered commercial vehicles – both in distribution and long-distance transport. Battery-electric commercial vehicles require significantly greater charging capacities than are currently available for passenger cars at fast charging stations.

The use of synthetic fuels can improve the CO<sub>2</sub> balance of the vehicle fleet.

# Mass and Dimensions of Commercial Vehicles

Vehicle combinations could be more efficient if the ratio of transport volume to total vehicle weight were to change.

Today's masses and dimensions of commercial vehicles in Europe result from regulatory requirements to ensure the unrestricted operation of these vehicles across countries. The 2015 revision of the EU Regulation on Cross-Border Transports (EU) 2015/719 included a series of new measures, the technical details of which were gradually published in 2019. With the publication of (EU) 2019/1892, the framework conditions for the extension of cabs for trucks and the use of aerodynamic add-on parts on trailers and motor cars were described. This means that it is possible to mount wind control devices on the rear of the vehicle without violating the maximum vehicle lengths defined thus far. The same applies to the design of extended cabs that improve the energy efficiency of vehicles and implement new drive concepts more effectively.

In addition, Regulation (EU) 2019/1213 defined the requirements for on-board weighing systems. The member states now have the option of automatic monitoring of overloaded vehicles, in accordance with (EU) 2015/719. The EU rules explicitly leave the decision to the member states here, which unfortunately does not allow vehicle manufacturers to see a harmonized approach in Europe.

Against the background of the stringent requirements for CO<sub>2</sub> reduction in road traffic, not all options for realizing efficiency gains and CO<sub>2</sub> reductions by adjusting "mass and dimensions" are being exhausted.

A large part of the goods transported by road in Germany today are transported by long-distance articulated trucks in the form of a combination of a tractor-trailer and a semitrailer with a

length of 16.50 meters and a total vehicle weight of 40/44 metric tons. Only in European countries, where long trucks have been in use for a while, does the articulated train currently predominate in the form of a combination of motor cars and multi-axle trailers. As goods are the primary transport item in commercial vehicles, the available transport volume is usually exhausted before the permissible total weight is reached. This suggests that long-distance vehicle combinations could be used much more efficiently if the ratio of transport volume to total vehicle weight were to change. Since the width and height of a vehicle may not be increased beyond the limits defined today due to infrastructure, the vehicle length is the only variable. An extension also increases the number of axles for the total vehicle combination, which in turn leads to a reduction in single axle loads.

Therefore, in Germany, as in some other European countries, the use of long trucks with a total length of max. 25.25 m was allowed on a defined network. Two long trucks can replace three conventional trucks. This results in fewer journeys, less fuel consumption and less emissions. By using long trucks, fuel savings and thus lower CO<sub>2</sub> emissions of 15 to 25 percent compared to conventional vehicle combinations can be achieved per ton transported or per transport unit (for example, a pallet).

In addition, the so-called "long truck type 1" is registered in most German states, initially for a limited period until December 31, 2023. This involves a 1.38 meter extended semitrailer. Using the above can already lead to a reduction in fuel consumption and CO<sub>2</sub> emissions of around 10 percent.

The investigations carried out by the Federal Highway Administration on the long truck field test in Germany between 2012 and 2016 showed no negative effects with regard to road infrastructure, no technical vehicle problems or other restrictions. The long truck (max. 25.25 m) is currently in use in Belgium, the Netherlands, Denmark, Finland, Sweden, Portugal, Spain, the Czech Republic and Germany on certain roads or on the entire route network. In some European countries (Spain, Sweden, Finland) longer (31.50 m) and partly heavier (40 t + 36 t) vehicle combinations are also used. In principle, the use of such variants as a measure to reduce CO<sub>2</sub> emissions in transport in Germany should also be examined.

In order to ensure the efficient use of long trucks, the cross-border use of these vehicle combinations between the countries that now allow the use of these vehicles should be permitted as quickly as possible. This applies in particular to Germany, Sweden, Belgium, Finland, the Czech Republic and the Netherlands. As the EU does not specify this in (EC) 96/53, bilateral agreements are necessary. In addition, it would have to be checked whether semi-trucks with an extended semitrailer of 17.88 m length can also be defined in (EC) 96/53 and that the dimensions can be adjusted accordingly for this type in addition to the loading length and saddle pins.

In addition to the adjustments to spatial dimensional limits, there are also discussions to reconsider the current weight limits. This could also improve energy efficiency in transports that are weight-critical and where the permissible total weight and not the volume of transport is the limiting factor. Expe-

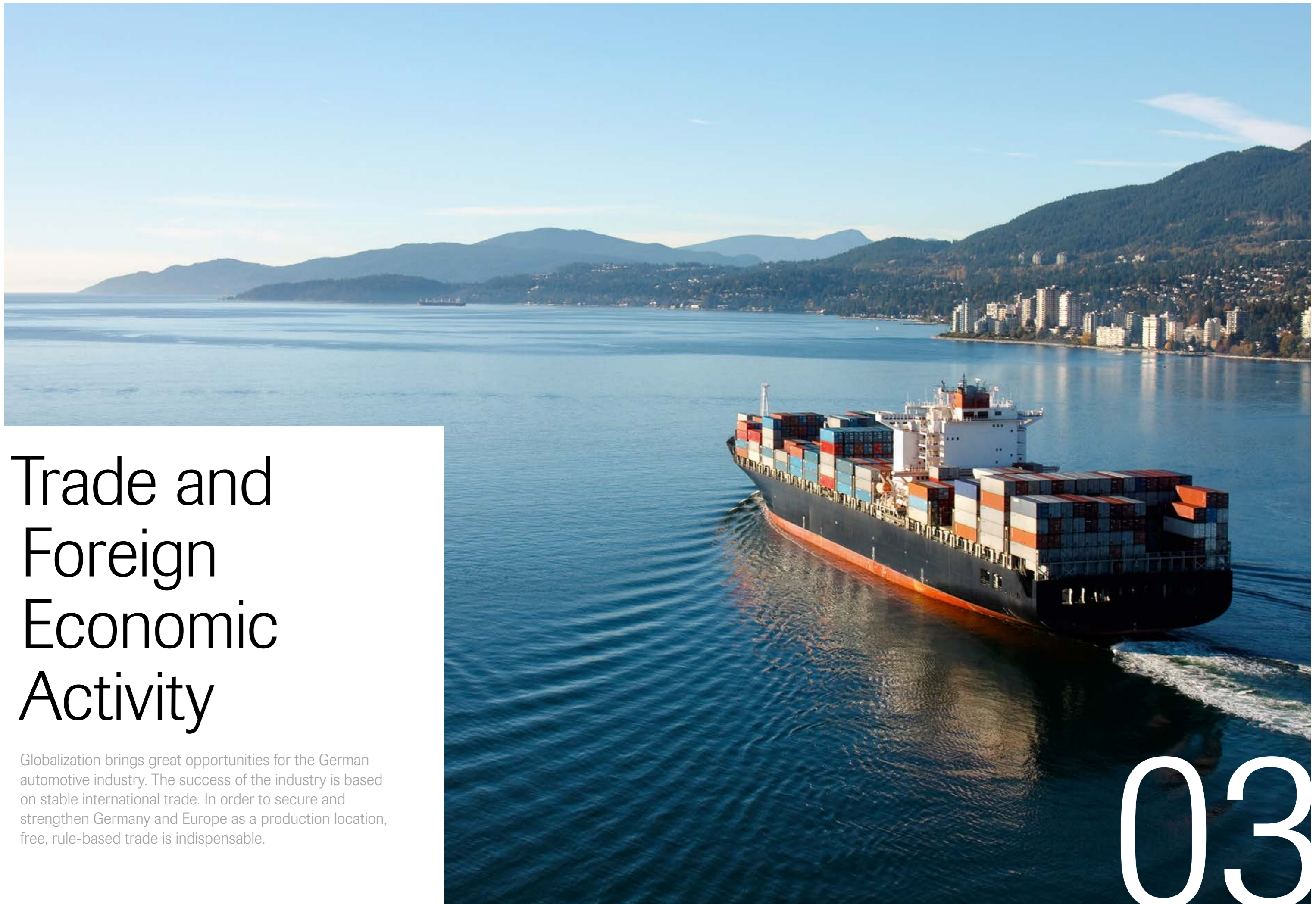
rience from other European member states suggests that it is not so much the overall draw weight that plays a decisive role when considering road safety and road load, but rather axle loads. This is demonstrated by the use of commercial vehicle combinations, which are very heavy from a German point of view, in the Netherlands, Denmark, Sweden and Finland.

An adjustment to the current weight limit of 40 metric tons could also be increased in the same way with the 44 metric tons limit applicable to the initial and final legs using combined transport. In any case, the first choice transport modes for the loading of heavy goods are rail and also inland waterway transport. All efforts should therefore continue to improve the efficiency of rail freight transport and to increase its capacity. Nevertheless, there will always be shipments that are transported by truck due to a lack of rail connections or for short transport distances. Opportunities to improve energy efficiency should also be used for these transports.

The efficiency of rail freight transport urgently needs to be improved.

Two long trucks can replace three conventional trucks.





# Trade and Foreign Economic Activity

Globalization brings great opportunities for the German automotive industry. The success of the industry is based on stable international trade. In order to secure and strengthen Germany and Europe as a production location, free, rule-based trade is indispensable.

# 03



# Brexit

Due to Brexit, the European Union has lost a strong member in the United Kingdom (UK). The German automotive industry regrets the exit of the United Kingdom from the EU and is appealing to the negotiating partners in London and Brussels to use the transition phase after Brexit for quick and comprehensive clarification of all open questions in future economic relations. Everything must be done to avoid a disruption of the cross-border trading relationships and value creation chains in the future.

In the area of car manufacturing, the economies of the EU member states and the United Kingdom are closely interlinked with one another.

With the exit of the United Kingdom from the EU on January 31, 2020, the so-called transition phase started, in which the previous regulations are to remain in place. It applies until the end of 2020 and should not be extended according to the intention of the UK, although it would have been possible. A hard Brexit was able to be avoided for the time being. In the area of car manufacturing, the economies of the EU member states and the United Kingdom are closely interlinked with one another. Many supplier parts from the UK are further processed and exported to other countries thereafter. The United Kingdom is the largest passenger vehicle export market for German manufacturers. In return, more than half of British passenger vehicle exports go to the European Union.

The automotive industry supports all efforts for a constructive new relationship between the United Kingdom and the EU.

The new relationship should be regulated comprehensively, and on the basis of the political declaration and the exit agreement, in order to retain a link that is as close as possible between the United Kingdom and the EU and continue guaranteeing robust trade. An end to the transition phase without, or with a less ambitious, agreement must be avoided in any event. It is important that the agreement for trade between the United Kingdom and the EU provides for a permanent waiver on levying customs duties. Customs formalities, if customs duties cannot be avoided, should be simplified in order to ensure a smooth-running flow of materials to the borders and minimize the administrative effort for companies, as well as customs and tax authorities. The new relationship must also take account of the regulatory cooperation.

The automotive industry supports all efforts for a close, constructive and trustworthy new relationship between the United Kingdom and the EU. The challenges facing the automotive industry on both sides of the English Channel must be jointly structured.

## Strong interrelationship in the automotive industry requires close cooperation

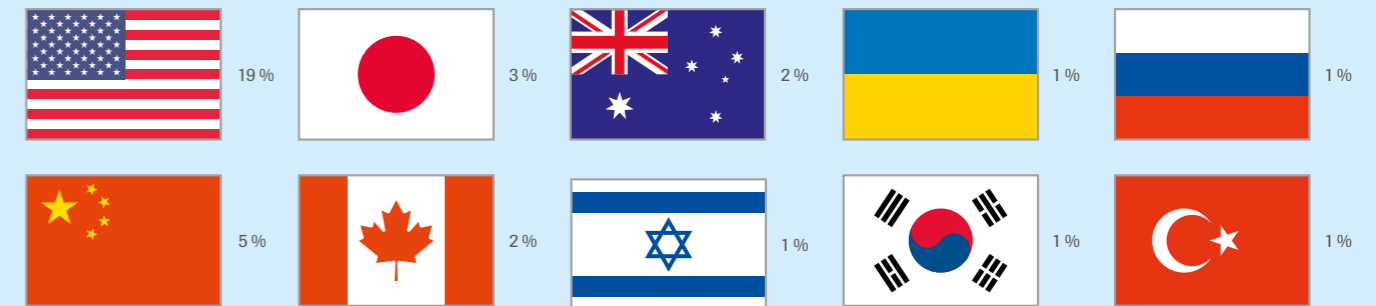
The United Kingdom and Germany are important partners in the automotive industry. German manufacturers and suppliers operate in more than 100 of their own production premises in the UK. Numerous suppliers are represented in the UK. The British factories are closely linked with those in the EU27, with parts sometimes crossing the channel several times before the vehicle is completed. Suppliers in the United Kingdom are highly dependent on the EU market.

German manufacturers and suppliers operate in more than 100 of their own production premises in the United Kingdom.

After Germany, the United Kingdom is the second-largest passenger vehicle market in Europe with approx. 2.3 million new registrations in 2019. However, motor vehicle production there has fallen to 1.3 million passenger vehicles in the last three years, and 81 percent of these vehicles were exported (2019). Some 55 percent of the exported vehicles went to EU countries. Companies that produce in the United Kingdom are therefore crucially dependent on exports to the European continent. Customs duties and other barriers would significantly impair this trade.

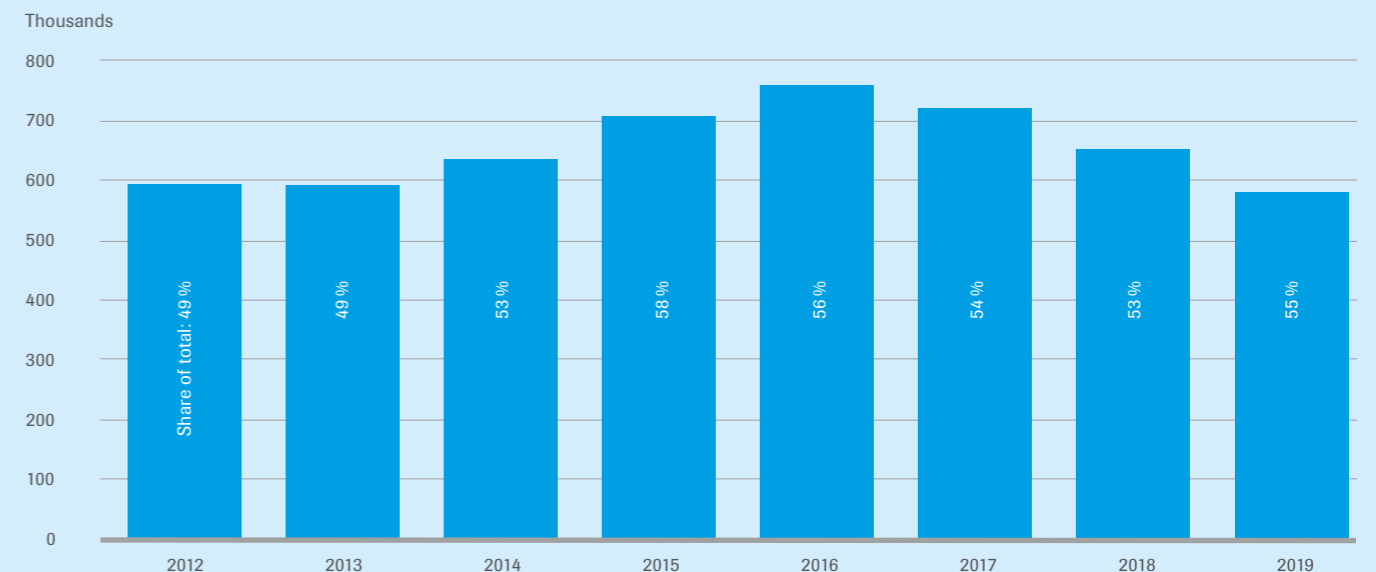
### Passenger vehicle exports from the United Kingdom

#### Top 10 buyers outside of the EU



### EU as the largest export market

#### From UK to EU





At the same time, imports account for a very large share of the British automotive market – 89 percent in 2019. The British automotive sector imported a commercial value of 57 billion pounds in 2018.

Based on this volume, the United Kingdom was the largest export market for German car manufacturers in 2019. Around 593,000 new vehicles were exported from Germany to the United Kingdom in 2019, which equates to 17 percent of all exported cars. Suppliers also export to the UK. From 2021, these will then be exports to a third country and no longer a single market.

### Outlook to the future relationship

From the perspective of the automotive industry, everything should be done for the free movement of goods and services, capital freedom and free movement of employees between the United Kingdom and the EU member states to also be retained in the future. The negotiations should lead to a result that guarantees the continued competitiveness and prosperity of the EU, as well as the United Kingdom.

A free-trade agreement is better for both sides than no agreement at all, but it will not be sufficient to guarantee completely frictionless trade.

The free movement of goods and services, capital freedom and free movement of employees between the United Kingdom and the EU member states should also be retained in the future.

#### The free-trade agreement should:

- comprise all economic sectors,
- not prescribe any customs duties and quotas,
- include simple rules of origin (incl. cumulation),
- include clear and restrictive regulations about subsidies,
- govern the regulatory cooperation between the EU27 and the United Kingdom, in order to prevent non-tariff barriers to trade,
- cover services and investments, as well as competition, public procurement and protection of intellectual property rights,
- create a structure for dispute settlement.

The continuing lack of clarity about the future relationships between the EU and the United Kingdom creates significant uncertainties for the automotive sector, which leads to negative implications on both sides.

### VDA Brexit Task Force

Since the exit vote, the VDA has provided detailed information about the implications and has particularly supported its members with the “VDA Brexit Task Force” appointed specifically for “Brexit.” Numerous Brexit information events have been offered and assistance given.

#### The VDA has prepared multiple position papers on the future relationship with the United Kingdom:

- A comprehensive paper entitled “VDA on the Future of the United Kingdom”; this paper is updated on a regular basis, most recently in June 2020. (QR code 1)
- VDA proposal for simplified customs handling between the European Union and the United Kingdom within the scope of self-assessment. (QR code 2)
- A VDA position on the rules of origin in the agreement with the UK: “Rules of origin in the prospective EU-UK free-trade agreement.” (QR code 3)
- VDA paper on lithium-ion cells and rules of origin in the EU free-trade agreement. (QR code 4)

Links to the following topics:



QR code 1



QR code 2



QR code 3



QR code 4

It is hoped that the negotiating partners will reach an agreement. The VDA is also relying on good cooperation with its partners from the UK in the future.

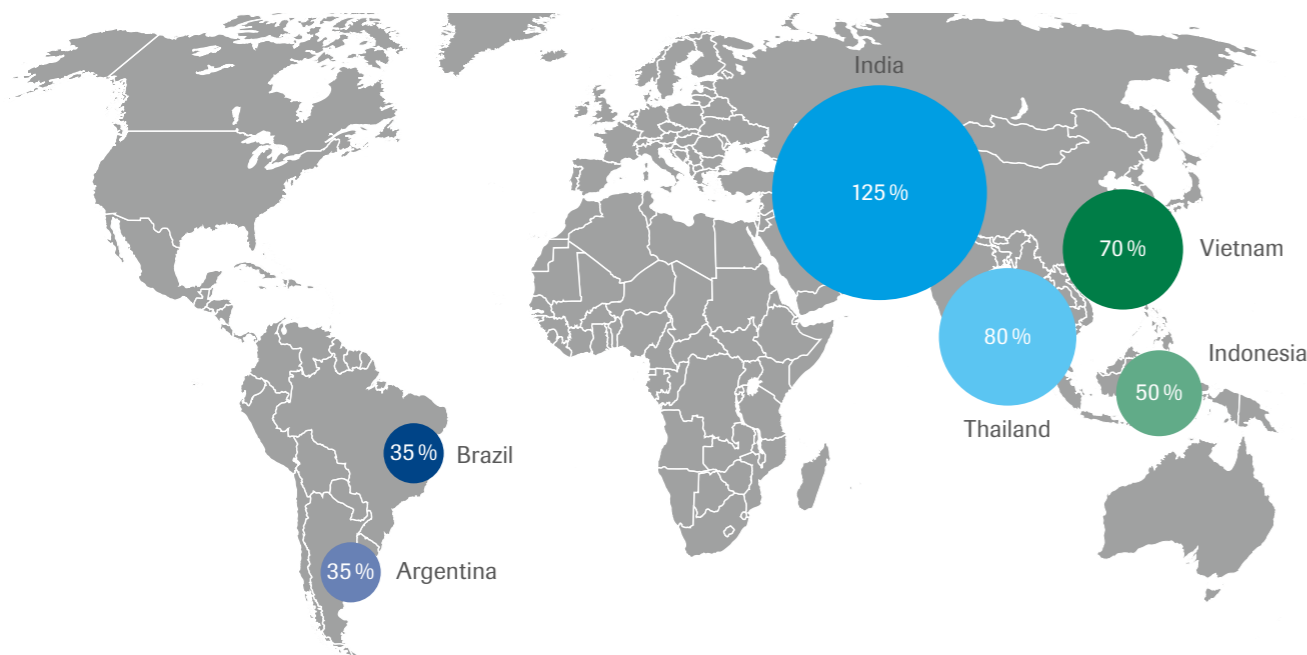
# Foreign Economic Activity

The German automotive industry is supporting the efforts of the EU to conclude free-trade agreements with important trading partners.

For the German automotive industry, access to global markets is of crucial importance. This applies to sales, as well as the production of vehicles and parts. Never before have so many passenger vehicles by German group brands been produced abroad as in 2019. At the same time, the share of exports in proportion to production in the home market of Germany is still very high, at 75 percent. More than 60 percent of the exports go to third countries outside of the EU27 and are, therefore, exposed to often high import duties and other non-tariff barriers to trade. To avoid these barriers, production often takes place in the respective market. The German automotive

industry is supporting the efforts of the EU to conclude free-trade agreements with important trading partners and bringing them to life. Trade can provide advantages for all parties involved, if it is fair and sustainable: This way, Germany and Europe will remain attractive as a production location and partner countries will also benefit from improved export opportunities.

Overview of countries with high customs duties  
Selected countries with high customs duties



Source: European Commission, VDA

## Free-trade agreements: Often criticized, but advantageous for all

Especially in the automotive industry, it is particularly important for the many medium-sized companies to have access to the global markets. For automobile manufacturers and particularly their employees, it is crucial to be able to produce under attractive framework conditions in Germany. The market opening efforts are therefore particularly important for employees in Germany. Many countries are still attempting to protect their market and attract investments with high customs duties (see figure).

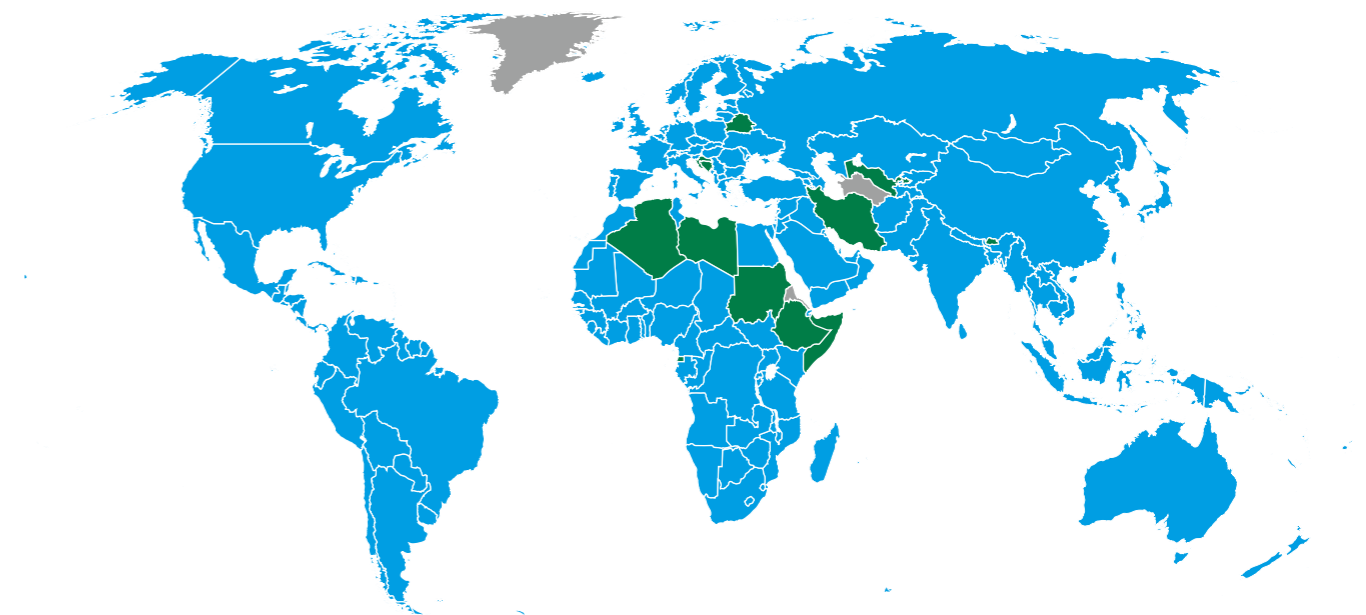
The coronavirus pandemic has rather caused the protectionist tendencies to increase: the trend towards buying local has increased significantly, which is perhaps understandable in view of the crisis. However, the global coronavirus crisis should not be used as a reason to

restrict the international cooperation and cross-border value creation chains over the long term. With all of its challenges, globalization has predominantly brought prosperity and, above all, an improvement in living conditions. Environmental protection must also be financed and, primarily, globally coordinated.

Protectionism and isolation quickly lead to further conflicts, as shown by the trade disputes between the USA, China and the EU. Constructive cooperation at a multi-lateral and bilateral level is preferable to national solo efforts in any case. Therefore, the German automotive industry is also supporting the work of the World Trade Organization (WTO) and its reform.

Trade and globalization continue to be drivers of prosperity and employment.

WTO members



■ WTO members ■ Observers in accession negotiations

Source: WTO



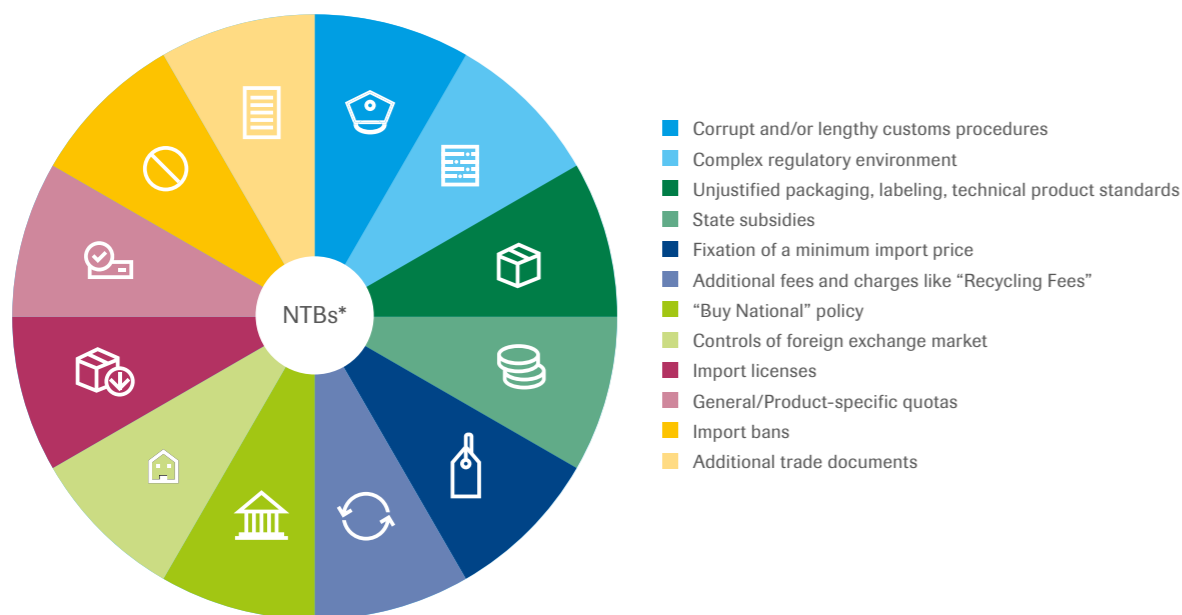
Strengthen the WTO as a guarantor of fair trade.

In no other organization do as many trading partners come together as in the WTO in Geneva. At present, the WTO has 164 members and another 24 so-called “observers.” Since it was founded as a successor organization to the GATT in 1995, the global economy has overcome multiple crises and globalization has continued to progress. The WTO builds on consensus among its members – which can also lead to major problems. The functional crisis of the arbitration court on the basis of judiciary positions not being filled by the USA shows how sensitive the relationship is. Therefore, it is important that a compromise is found with the USA and the other members, which ensures the functionality of the WTO.

The increasing protectionism is challenging the production location of Germany and the EU.

High customs duties and other non-tariff barriers to trade (“NTB” – non-tariff barriers) in many countries are creating a challenge for the location of Europe. Exports are becoming more expensive or even impossible. Examples of this are levies, some of which account for 100 percent of the price – such as on exports to India. Many countries in the ASEAN network charge customs duties significantly above 50 percent. In the large countries of the MERCOSUR, importers pay 35 percent import duty on passenger vehicles. There are also high customs duties for utility vehicles: the USA requires 25 percent and the EU also levies 22 percent import duty on large utility vehicles. A great deal can still be achieved here with the negotiation of free-trade agreements – if both parties are prepared to do so. The German automotive industry supports the EU with its efforts to push forward the reduction of barriers to trade.

Non-tariff barriers to trade



\*Non-tariff barriers to trade

Source: VDA

However, at the same time, it must be ensured that the EU does not build up any new barriers, which lead to conflict. The introduction of a border adjustment for CO<sub>2</sub> (“Carbon Border Measure”) announced by the European Commission has the potential to create conflict with other trading partners. Therefore, it should be structured in a WTO-conforming manner in consensus with the trading partners and not lead to new administrative burdens for companies. The VDA has published its position regarding the idea of border adjustment (QR code) and is constructively supporting the process.

VDA position on a possible CO<sub>2</sub> border adjustment measure:



Protectionism is not always openly identifiable. Many states rely on non-tariff barriers to trade in their policies. The reasons for this are manifold. One may be that customs duty increases are not possible on the basis of agreements. For example, after joining the WTO, Russia introduced new levies, such as the so-called recycling levy for vehicles. This levy must be paid immediately with an import and therefore functions like a customs duty, although it is not officially one. Due to the partially prohibitively high recycling levies, previous exports declined considerably, particularly in the area of utility vehicles. Russia offers subsidies to local producers as compensation. This example makes it clear that, in addition to the import duties, local aid must also be analyzed in order to obtain a comprehensive picture of the competitive situation.

Free-trade agreement as support for the industry

The international trade and cross-border supply chains are significant components and success factors for the global automotive industry. Isolation and barriers to market entry lead to high costs, prices and trade conflicts. This is why the German automotive industry is advocating free trade, which offers a level playing field for all and takes account of the respective development status of the involved parties.

For the elimination of barriers to market entry, free-trade agreements play a central role. The EU has a network at its disposal, which extends from Mexico to Canada and as far as Singapore and South Korea, and is constantly being extended or renewed (see table). With the treaty between the EU and the MERCOSUR states, the first free-trade agreement is imminent, which the South American network is concluding. The MERCOSUR treaty has a high priority for the German and European automotive industry as the countries of the MERCOSUR are important future markets. At 35 percent, Argentina and Brazil levy very high import duties on vehicles, and customs duties of up to 18 percent are levied on supplied parts. The already negotiated, but not yet finally adopted treaty, will also improve the cooperation in respect of regulatory issues and non-tariff barriers. Ultimately, an in-depth cooperation in times of uncertainty and the burgeoning protectionism offers major opportunities to jointly master the challenges in the area of sustainability and environmental protection.

The countries of the MERCOSUR are important future markets.

The industry in Europe and in the MERCOSUR is jointly behind this treaty, offering enormous opportunities for both sides, as the EU also still levies very high customs duties on imports, in some cases. Unfortunately, there is opposition in the EU to the conclusion of the treaty, particularly from the agricultural sector and from NGO, which are critical of the deforestation of the Amazon region, for example. However, it also applies in this respect that solutions are more likely to be found through cooperation than through confrontation.

Treaties with China (investment treaty), the ASEAN states and India are additional priorities for the German automotive industry. Trade and investment treaties contribute to the strengthening of the business sector and the creation of new jobs in the automotive industry. They help companies to stay competitive. Through these, German

and European companies can compete better internationally and export more to countries and regions outside of the EU. At the same time, partner countries benefit from improved market access to EU markets. Market access and competitive prices are also door openers for the required raw materials and other purchases along the entire added value creation chain.

### The future of globalization and rule-based trade

The coronavirus crisis must not lead to more nationalism and protectionism. The implications of the pandemic show how closely people are linked worldwide and how important it is to cooperate and work jointly on a solution.

Not only since the beginning of the coronavirus crisis have there been demands for the return transfer of production and, therewith, allegedly lost added value. The safeguarding of the locations in Germany and the EU is an important task, however, it is only achievable through maintaining and constant improvement of competitiveness and not through isolation. From the perspective of the German automotive industry, globalization has made a significant contribution to maintaining and developing value creation and jobs in the home market. At the same time, the companies in the German automotive industry are investing abroad and are thereby creating knowledge transfer and jobs for less developed regions in the world.

With more than 2,500 production premises and the corresponding jobs abroad, the member companies of the VDA are making a very significant contribution to global prosperity. At its core, the German automotive industry is a European industry through the numerous suppliers, production sites and complex customer relationships. A "reshoring", i.e., return transfer of production to Germany would therefore also have negative implications for European value creation. The coronavirus crisis and the rising protectionism, however, will lead to an attentive examination and possibly also to diversification of the current supply chains. However, nationalism and isolation cannot be the answer to the crisis. Constructive, multilateral cooperation under the umbrella of the WTO is more important than ever before. Supranational organizations, such as the G20 and the associated Business Community of the "B20" (Business 20, the voice of the economy of the G20 countries) are also important bodies in which free trade is decided on as a consensus.

A return transfer of production to Germany would have negative implications for European value creation.

### Important free-trade agreements for the automotive industry

Partner region	Content of the agreement	Status of the negotiations	Customs duties on passenger vehicles
United Kingdom	Comprehensive free-trade agreement	Three out of five negotiation rounds completed. More progress in the issues of goods and services than in the issues of "Level Playing Field" and fishery	-
China	Investment treaties; investment protection and market access	Negotiations since 2013	25%
USA	Agreement on conformity assessment and customs concessions for industrial goods	Mandate award in April 2019, further steps being planned	2.5% passenger vehicle 25% (utility vehicle)
India	Comprehensive free-trade agreement	Negotiating mandate since 2007, after 12 negotiation rounds, interruption since 2013, discussions underway about continuation	Up to 100%
Mexico	Modernization of the existing agreement	Agreement on the trade part in April 2018. EU-internal final consultation process underway.	0%
Mercosur	Negotiation directives of 1999	After nearly 20 years, agreement on the trade part in June 2019. EU-internal final consultation process underway.	35%
ASEAN	Comprehensive agreement with ASEAN as a region	Negotiations started in July 2007. Continuation of the negotiations from 2009 in a bilateral format. From 2018, discussions about starting regional negotiations	Up to 80% (tbc)
Malaysia	Free-trade agreements	Negotiations since 2010, currently paused	30%
Indonesia	Free-trade agreements	Negotiations since 2016	50%
Philippines	Free-trade agreements	Negotiations since 2016	30%
Thailand	Free-trade agreements	Negotiations since 2013, frozen since 2014 military coup	80%



# Promotion of Foreign Trade and Development Cooperation

## Traditional promotion of foreign trade in the VDA

Due to the great importance of foreign production and exports, the VDA supports its members with market access worldwide. In addition to accompanying the development of political processes, the VDA offers its members information about markets and framework conditions. In the case of definite problems, the association arranges discussions with the relevant stakeholders. Another important instrument is the support in foreign markets through delegation trips and the organization of B2B events. Furthermore, the VDA takes part in the official foreign trade fair program of the German Federal Government (scan QR code for more information). In consultation with its members, the VDA chooses selected trade fairs and applies for their support. Successful appearances have taken place in past years, inter alia, in China, India, the USA, Russia, Brazil and South Korea. In addition to the traditional instruments of promoting foreign trade, the development cooperation takes on an important role in the VDA.

Foreign trade fair programs of the German government 2020



## Development cooperation in the VDA

The German automotive industry has been involved in developing and emerging countries for many years. The successful cooperation between the VDA and the German Federal Ministry of Economic Cooperation and Development (BMZ), as well as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) within the scope of the so-called EZ Scout Program, is being continued and expanded. The German development cooperation has a close-knit network of locally domiciled experts at its disposal, as well as a wide range of funding and cooperation opportunities. This partnership is mutually beneficial: it helps the automotive industry to gain access to often difficult markets and take advantage of market opportunities arising in cooperation with the local and regional structures. At the same time, it is in the interest of development policy to improve the perspectives on-site, create jobs in partner countries and thereby also combat the causes of migration indirectly through the involvement of the private economy.

For example, the VDA and the companies in the automotive industry are participating in setting up training centers, robust supply chains, innovative logistics concepts, mobility offers and new association partnerships. Furthermore, the cooperation is also being intensified with developing and emerging countries during the course of the international turnaround in energy policy. The aim is to set up local production capacities for electricity-based fuels (e-fuels), which can be provided in regions with favorable conditions for renewable energy production at competitive costs. The "EZ Scouts" domiciled in the VDA are available to members as contacts for development cooperation projects.

For many years, the German automotive industry has been involved in developing and emerging countries.

## Association partnership with India

Thus far, only around three percent of the Indian population owns a car – however, in Germany, it is nearly 70 percent. But India's share of the global automobile market will nearly double by the year 2025, according to current forecasts. Therefore, India is an important growth market for the German automotive industry, which offers diverse opportunities as a production location and supplier base.

The VDA supports the sustainable development of the automotive industry in India. The association partnership between the "Society of Indian Automobile Manufacturers" (SIAM), the "Automotive Manufacturers Association of India" (ACMA) and Verband der Automobilindustrie (VDA), established since 2017, intends to strengthen the exchange between the actors of the automotive industry and provide the VDA member companies with assistance in market access, with the support of the Federal Ministry of Economic Cooperation and Development (BMZ) and sequa GmbH.

Since 2017, a partnership has existed between the "Society of Indian Automobile Manufacturers" (SIAM), the "Automotive Manufacturers Association of India" (ACMA) and the VDA.

During the course of conferences, workshops and joint studies, the association partnership is conducting an intense dialog about the future issues of the industry, with the involvement of member companies from both countries – particularly including electric mobility, alternative fuels and autonomous driving. However, free and fair trade between both countries and the challenges with the supply chains, as made evident by the coronavirus crisis, are issues of the partnership. This cooperation creates a close link between the German and Indian automotive industries, with the support of the German and Indian governments.

### The association partnership supports VDA members in various ways:

- Assistance with managing barriers to market access (technical regulations, etc.)
- Advice on investment projects
- Information about quality management
- Arranging contact to ACMA and SIAM and their members

- Arranging contact to other actors in the Indian automotive industry and chambers, as well as the IGCC (Chamber of Commerce)
- Support with trade fair appearances in India (German Pavilion, Car Expo in New Delhi)

The association partnership between the VDA and the Indian sister associations, ACMA and SIAM, has been extended by the BMZ through a second phase until December 2022, due to the successful development. During the course of the project, the VDA has its own contact in Berlin, as well as in the project office in New Delhi.

Association partnership Germany – India



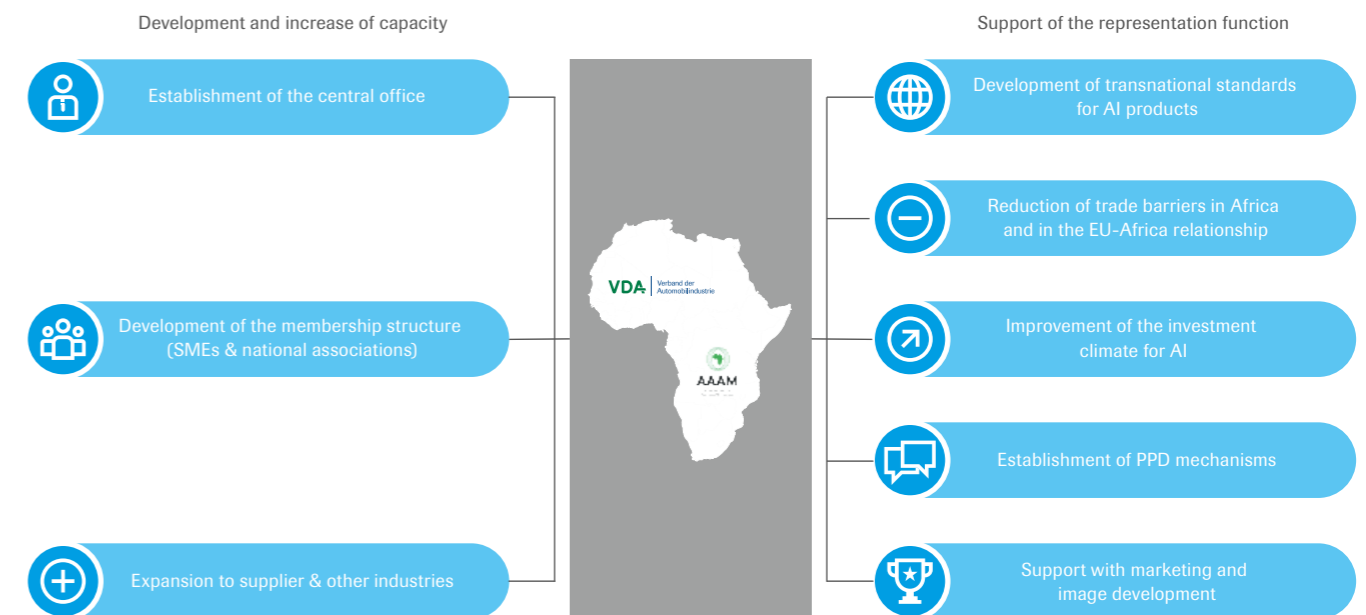
### The “PartnerAfrica” project

The population in Africa is continuing to grow. More and more young people are streaming into the labor market and hope to find employment, which secures their livelihood and promises prospects for the future. The demand for new jobs is at around 20 million per year. Many of these could be created by up-and-coming African companies or the investments of foreign companies. However, barriers to investment and trade restrict the activities of the private economy in Africa significantly. Insufficiently qualified skilled workers, a lack of infrastructure and underdeveloped markets present the private sector with major challenges. The Federal Ministry of Economic Cooperation and Development (BMZ) is supporting German, European and African companies and investors with their involvement in Africa through the “Special Initiative Training and Employment.” The association partnership between the “Association of African Automotive Manufacturers” (AAAM) and Verband der Automobilindustrie (VDA) intends to strengthen the establishment of the partner association within this context and ultimately contribute to the further industrialization of the African continent.

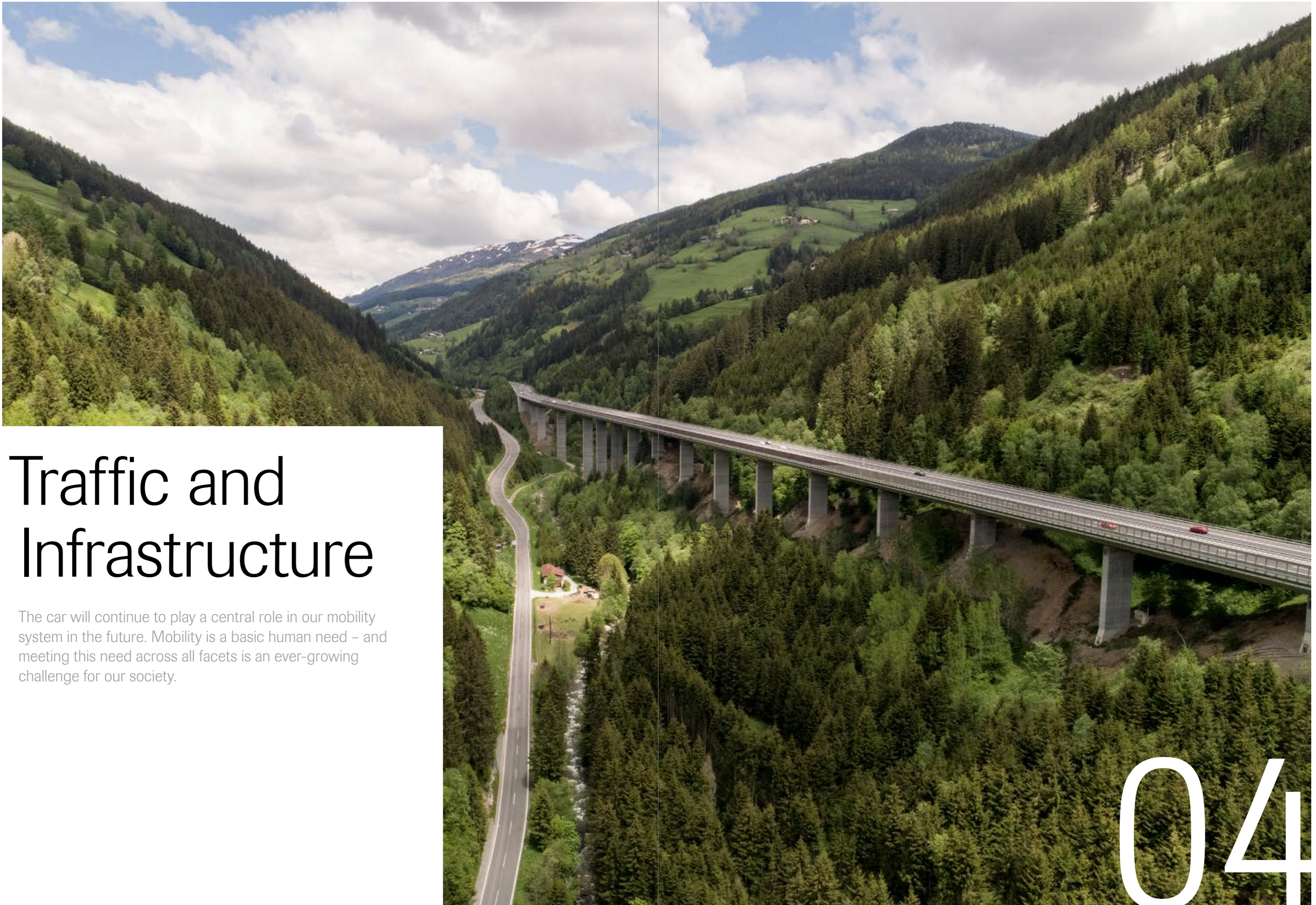
The automotive sector offers major innovation, growth and job potential for the African continent.

Areas such as the digital economy and sustainable mobility have particularly high development potential. The automotive and logistics sector is taking on a key position through its sustainable value creation in the supplier networks, assembly plants, distribution structures and pan-African trade relationships and offers major innovation, growth and job potential for the African continent. Within the scope of the association partnership, the VDA has its own contact in Berlin, as well as in the project office in Johannesburg. The term of the project started on June 1, 2020, and will provisionally end in December 2023.

Association partnership Germany – Africa  
Activity fields







# Traffic and Infrastructure

The car will continue to play a central role in our mobility system in the future. Mobility is a basic human need – and meeting this need across all facets is an ever-growing challenge for our society.



# Infrastructure

The investments in German federal highways continue to lag behind demand.

For many years, too little has been invested in the German road network. As a result of this, the investment backlog, which the treasury has been putting off, has continually grown. In 2016, the Federal Ministry of Transport assumed that around EUR 7 billion needs to be invested for needs-based financing of federal highways. Institut der Deutschen Wirtschaft even estimated more than EUR 8 billion for this. In fact, in spite of rising revenues of the treasury from road traffic in the years 2000 to 2016, the investments only had an average level of EUR 5.3 billion.

Today, even more than the EUR 7 to 8 billion estimated in 2016 would need to be budgeted for needs-based financing. The reason: until 2019, according to the Federal Statistical Office, the costs for road construction measures grew by more than 17 percent. In addition to this, the investments in federal highways grew noticeably since 2016, but remained behind demand. The investment backlog created and to be worked through in the future must also still be calculated in.

Because the upgrading did not progress for so long, the traffic jams added up to 1.42 million kilometers in length in 2019 – and that was only in the freeway network. That cost drivers 521,000 hours. This does not yet include the time that is spent when important bridges are blocked for heavy vehicles over months or even years, and these vehicles must then take very long

detours in some cases. Not least, unnecessary liters of fuel are consumed during the course of this and many thousands of metric tons of CO<sub>2</sub> are emitted.

But the investment backlog not only takes a large amount of time and causes additional environmental pollution; it is also a safety problem: at the last quality measurement in the years 2017/2018, according to the Federal Ministry of Transport, around 17 percent of the route kilometers exceeded the warning value on freeways. This means the condition of the road surface gives reason for intensive monitoring. If necessary, the planning of suitable measures will be necessary for improving the poor condition. Road safety is jeopardized by the fact that there are far too few HGV parking spaces along the freeways. The upgrade has not kept in step with the growth of long-distance traffic. According to a survey by the Federal Ministry of Transport, 23,000 parking spaces are currently missing. That makes it difficult for HGV drivers to comply with their prescribed rest breaks.

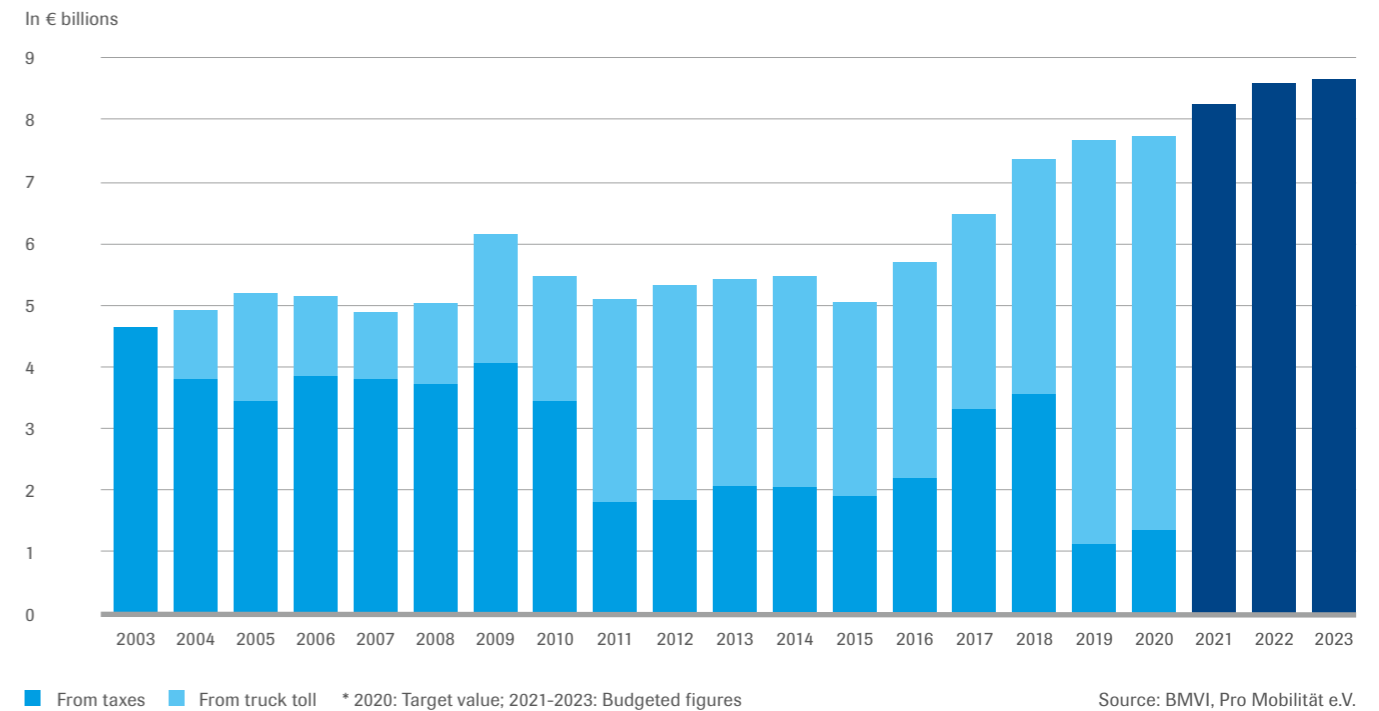
Up to 23,000 parking spaces are missing for HGVs on German freeways.

Politicians have identified the need for action and have been noticeably increasing the federal highway investments since 2017. In 2020, the investments grew to EUR 7.8 billion and according to the medium-term financial planning of the Federal Government from July 2019,

it is intended to grow to EUR 8.7 billion in the following years (2023). Therefore, investment will at least be close to the needs-based level for the first time. In the meantime, however, a new capacity bottleneck is occurring. It appears that the road construction authorities no longer

have sufficient traffic planners and construction engineers for planning out and implementing the projects. It must also be ensured that the investment backlog is not replaced by a planning backlog in the future.

Federal highway investments 2003 – 2023





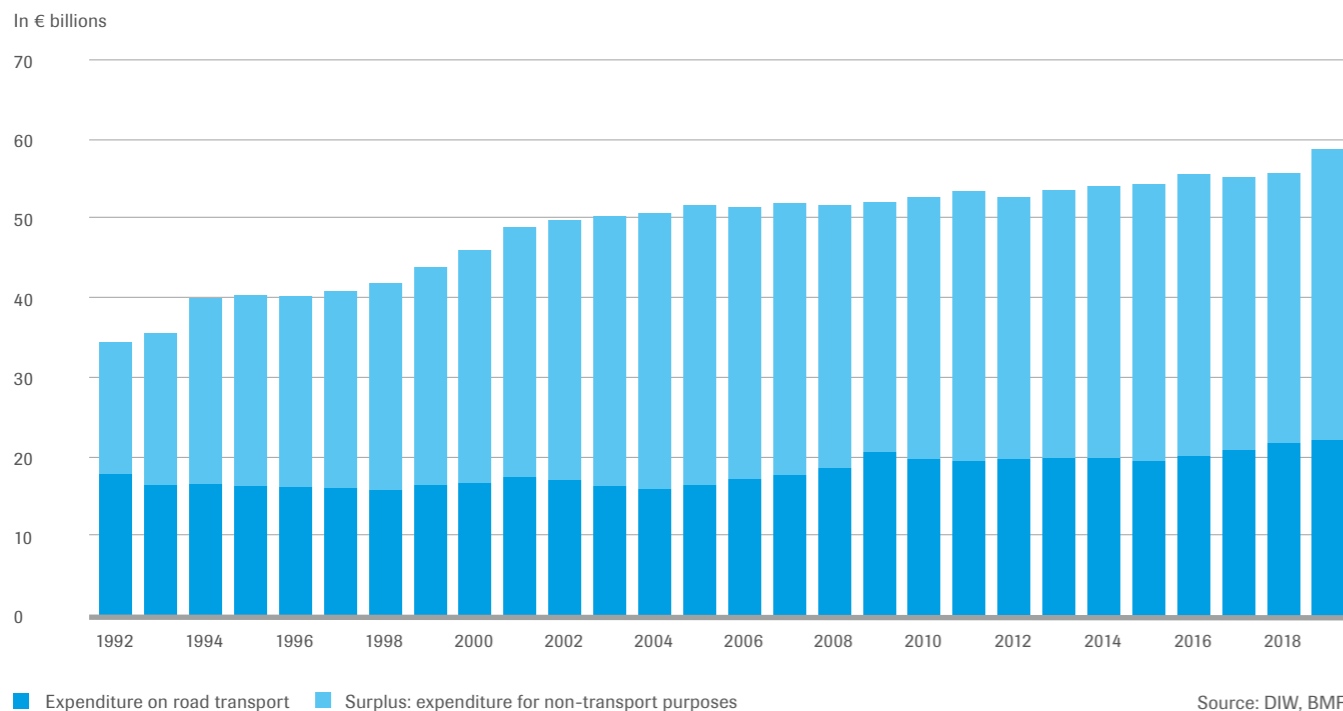
### The toll charge is rising

The increase of the investment line is being financed by the Federal Government through an increased charge for road users: the HGV toll has been expanded further. In the meantime, more than 85 percent of the federal highway investments are counter-financed through toll revenues (2019). Only a small share of nearly 15 percent originates from budgetary funds. The HGV toll, which was only charged on a very small part of the federal road network until then, was expanded to all federal highways in mid-2018. In 2019, the investments in road traffic only grew by EUR 300 million in comparison to the previous year, but the toll charge grew by EUR 2.7 billion due to the inclusion of all federal roads.

For needs-based federal highway financing, however, an expansion of the toll being boosted further and further would not have been required. From the mineral oil tax, the sales tax on the mineral oil tax, the motor vehicle tax and the HGV toll, the public authority generated around EUR 59 billion in 2019. Only around EUR 22 billion flowed back into the road infrastructure (including federal state, district and municipality roads) – as in the previous years, only around 37.5 percent. The public authority used the rest for other purposes “outside the field.”

Through the introduction of the CO<sub>2</sub> pricing approved by the grand coalition from the year 2021, the road-transport-specific levies will already increase by another EUR 4 billion in the first year.

### Use of road-transport-specific levies



# Passenger Traffic

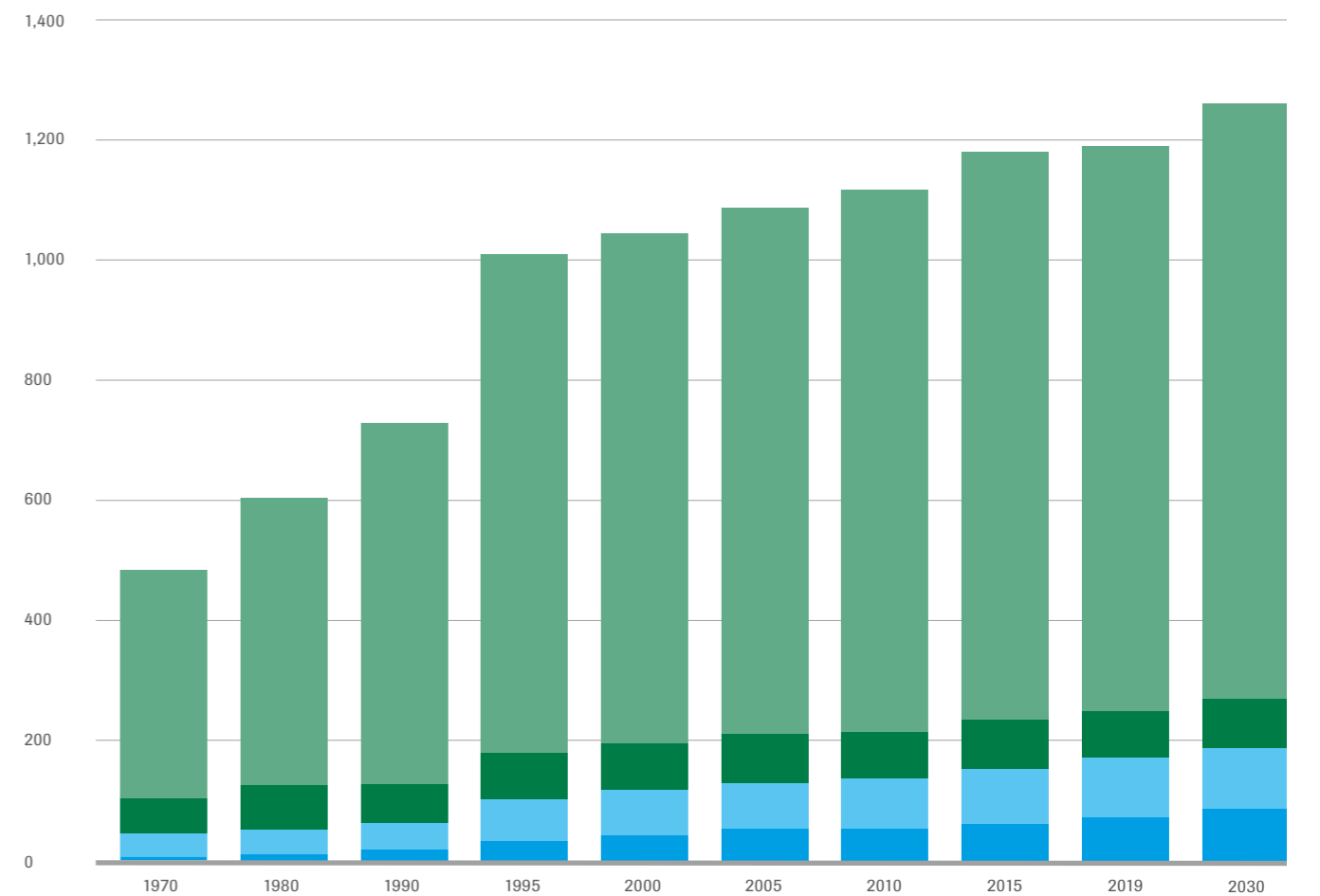
### The car – No. 1 means of transport

The car is still by far the most important means of transport for people in Germany. With it, they traveled more than 940 billion passenger kilometers in 2019 – 79 percent of total passenger traffic. According to an estimate by the Federal Government, it will remain at this magnitude until at least 2030, as the degree of motorization will also continue to grow. However, the growth rates of passenger traffic in Germany will be only moderate going forward. This is typical for a society that on average is essentially stagnating in terms of numbers and aging. The traffic performance of motorized private transport in 2019 in comparison to the previous year also only grew by +0.6 percent.

In 2019, Germans traveled over 940 billion passenger kilometers.

### Passenger traffic in Germany

In billions of passenger kilometers



\*Change to the recording methodology in the official statistics from 2017

■ Air traffic ■ Railroad ■ Public road passenger transport ■ Car traffic

Source: DIW, BMVI

# Future Mobility

The automobile will also retain a central role in our mobility system in the foreseeable future – whether as an own car or as part of new forms of use, such as car sharing and ride pooling. Various trends suggest this.

The degree of motorization in small towns and villages is far above the German average.

Increasingly more people are moving into cities and rural areas are emptying. This trend makes it ever more difficult for local public transport providers to bundle the routes of their passengers in the countryside. This is causing an increasing burden on the economic viability of conventional local public transport supply. In the rural areas, having an own car is already essential. According to the latest “Mobility in Germany” (MiD) study for the Federal Ministry of Transport, the degree of motorization in small towns and villages of 607 cars/1,000 inhabitants is far above the German average (527 cars/1,000 inhabitants) and has also grown by another 22 percent there since 2002. The importance of having an own car has increased in all age groups.

Furthermore, it can be observed that the growing share of the population of older people has much more affinity with cars than ten or twenty years ago. They own and use an own car much more frequently than before. This also applies to the urban area. People of a very old age often lose their mobility, because they no longer have the confidence to drive a car and also fear using traditional local public transport, due to difficult access routes, for example. Ride pooling and automated driving will open up new opportunities as a new local public transport model and create a transport service from door to door with a “built-in chauffeur.” Both will give older people their mobility back.

The young, urban milieu is the only group where a decline in car use is currently identifiable. With the households in metropolises, which are comprised of under-35 year olds without children, the share of households without cars has increased from 47 percent to 54 percent since 2002. These people are very pragmatic in their choice of means of transport; they use local public transport, bicycles and car sharing. However, the MiD study also establishes that these people will not necessarily retain their car-abstinent mobility behavior in later years of their life. The cultural “aversion of young people to the car” in terms of lifelong car abstinence also does not thus far apply in the urban area. Furthermore, it is likely that many people from the young, urban milieu will increasingly rely on ride pooling, because it links the current advantages of the classic local public transport and private car with one another – the advantages are utilized door-to-door transportation, the privacy of a very small group, there is no need to search for a parking space and the driving time can be used for alternative activities.

## Transport policy for the city of the future

Urban life is inconceivable without mobility and logistics. The mobility requirements of the residents of urban centers must be taken into consideration in exactly the same way as the residents of the surrounding area or the requirements of commercial transport. However, at the same time, this must occur in a city-compatible manner. With vehicles that are becoming lower and lower in emissions, safer and quieter, the automotive industry is making an important contribution to sustainable urban mobility. However, the growth of the cities and their densification is also increasing the competition for the tight supply of public spaces; the use of space by car traffic is increasingly being put into question. However, it falls too short, as a consequence of this, to reduce the number of parking spaces in the city. If citizens do not have mobility alternatives to their own cars available to them, which are suitable for daily use, the search for parking and illegal parking will increase. Therefore, an overall concept for urban mobility

is required, which offers users a variety of needs-based mobility alternatives that are networked with one another. Mobility platforms and apps simplify selection and access for the user.

Within the meaning of “lived co-modality,” all means of transport have their justification – the own car, the shared car (car sharing), ride pooling, the classic local public transport with bus and rail, as well as bicycle and pedestrian traffic. Sharing and pooling models are essential for this. The automotive industry has already identified this requirement at an early stage and created relevant offers. With a market share of more than 75 percent, the German car manufacturers are now the leading providers in the car sharing market in Germany. However, even more potential is seen in ride pooling. The automotive industry also has offers on the market in this respect.

## Politicians must finally allow ride pooling models

Unfortunately politicians have not yet done their homework in this field. According to the current version of the Passenger Transport Act (PBefG) in Germany, commercial ride pooling is not permitted. On the basis of an experimental clause of the PBefG, there are currently only pilot projects in individual cities, which are not only time-limited, but also limited to a small fleet size. The grand coalition has agreed on opening the PBefG for new forms of operation in the area of shared use, in its coalition agreement. This reform should now be promptly implemented. The aim of this must be facilitating modern mobility services with permanent legal certainty and guaranteeing fair competitive conditions for new and established providers.

## Platform Urban Mobility – automotive industry and cities in dialog

The urban mobility of tomorrow requires the interaction of all involved parties. Therefore, the VDA initiated the Platform Urban Mobility (PUM) in 2017 in order to facilitate dialog between cities and the automotive industry. The PUM is supported by the awareness that neither cities nor the automotive industry can manage the transformation alone. Therefore, joint cooperative solutions for urban mobility and logistics are being developed and coordinated with one another. These are then to be transferred into concrete local applications. Furthermore, the PUM intends to be a driving force for the improvement of framework conditions. The subject areas that are processed in the PUM include mobility services, traffic management, networked and automated driving, electric mobility and operational mobility management.

An overall concept for urban mobility must offer users a variety of needs-based mobility alternatives that are networked with one another.

With a market share of more than 75 percent, car manufacturers are now the leading providers in the car sharing market in Germany.

Modern mobility services must be enabled quickly with legal certainty.



# Freight Traffic

The backbone of freight traffic is the utility vehicle.

In 2019, 502.7 billion ton-kilometers of traffic performance took place on the road in Germany. That was more than 73 percent of the total traffic performance, which was handled on road, rail and federal waterways in total. This shows that the utility vehicle continues to be the backbone of freight traffic. With this share, Germany is approximately at the European average. Compared to the previous year, the transport performance on the road in 2019 grew by +0.4 percent – around the same amount as the total freight traffic performance of the three modes of transport in the country. The total freight traffic performance in 2019 only gained +0.5 percent due to the weak economy. It is assumed that the freight traffic performance of all modes of transport will show a drastic slump in 2020 due to the coronavirus crisis. However, with the subsequent normalization of economic development, freight traffic will return to its development path.

The long-term traffic forecast, which the Federal Ministry of Transport issued in 2014, estimated that road freight traffic will reach a level of 607 billion ton-kilometers in 2030. That would be a rise of more than 20 percent compared to 2019. With this, the current market share of the HGV would remain more or less stable.

The HGV primarily has its flexibility to thank for its importance. Only the HGV can reach from the loading ramp to the house door. It also has an advantage economically and ecologically for the transportation of small consignments and over shorter distances. As a rule, the railway only reaches its efficiency threshold in freight traffic from payloads of more than 300 metric tons. Combined road and rail traffic is also only viable for distances of far more than 300 kilometers. However, nearly 80 percent of the freight volume in road traffic takes place on routes of around

Nearly 80 percent of the freight volume in road traffic takes place on routes of 150 kilometers.

150 kilometers. This results in a division of responsibilities between the modes of transport. The HGV is ideal for transports with low volumes and on short routes. Railways and barges are more competitive for high-volume transport over long distances. A good example of this is the transport of factory-new automobiles. The German automotive industry uses rail in the main run for far more than 50 percent of its transports of newly produced vehicles. The modes of transport are therefore far less in competition with one another than mostly assumed, due to their system-based advantages and disadvantages. In fact, they complement one another.

## Further development of the HGV toll

In 2017, the EU Commission submitted proposals for the amendment of the Toll Directive (“Eurovignette Directive”). However, no agreement has thus far been reached on it in the Council of Ministers. The EU Commission proposals must be assessed in a differentiated manner. Among other things, they prescribe that an HGV toll should apply from 2020 for all utility vehicles with a permitted total weight of more than 3.5 metric tons. For this, the toll requirement in Germany would also need to be extended to HGVs under 7.5 metric tons and buses. However, as the share of international transport is significantly lower with these vehicles, in contrast to heavy HGVs, a requirement for European harmonization cannot be identified in this respect. Therefore, it would be better for the charging of tolls for this group of vehicles to remain within the freedom of choice of the EU member states, within the meaning of the subsidiarity principle. This should also apply to questions of whether time-based fees or a mileage-based toll should apply. The

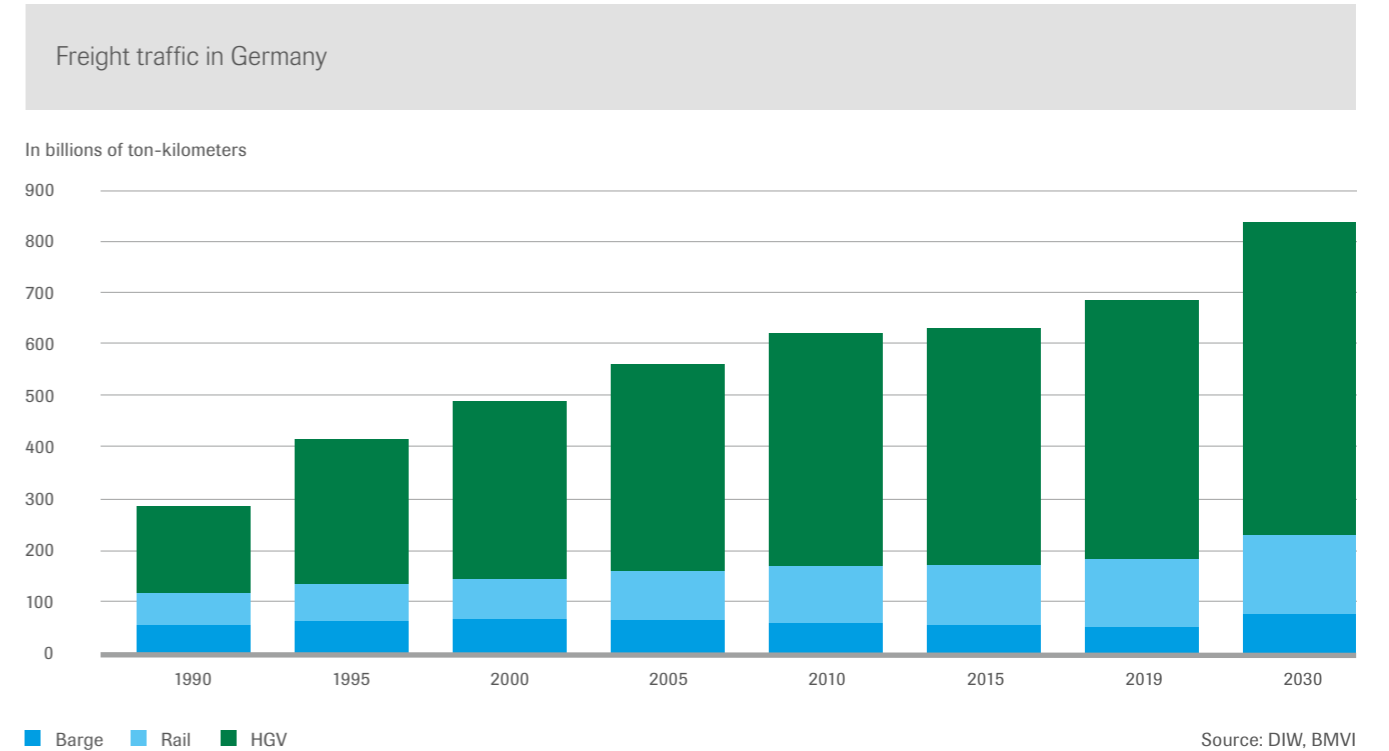
allocation of traffic jam costs to the toll, which is proposed by the EU Commission, is also viewed critically. Traffic jam costs in the form of time loss are already borne by the users themselves. Calculating it into the toll would therefore lead to an unjustified double burden.

Furthermore, the EU Commission proposal provides for burden-neutral spreading of the toll amount according to CO<sub>2</sub> emission. Such spreading of the toll according to CO<sub>2</sub> emission is welcomed. It can provide additional incentives for investment in relevant consumption-efficient, CO<sub>2</sub>-efficient and, particularly, emission-free vehicles and technologies. Such spreading has already proven itself in the past: the toll differentiation according to EURO levels has driven forward the modernization of fleets with low-polluting vehicles. Therefore, the path should now be

cleared as quickly as possible at the EU level for a CO<sub>2</sub>-based HGV toll and introduced in Germany.

During the course of the National Climate Protection Program adopted in 2019, the Federal Government has announced such a differentiation with a CO<sub>2</sub> surcharge for the further development of the HGV toll. The incentive effects for investments in emission-free and low-emission vehicles could still be strengthened in this way. In any case, everything should be done to implement the CO<sub>2</sub> toll in Germany in 2023, as announced in the Climate Protection Program.

Toll spreading according to the CO<sub>2</sub> emission of the vehicles would be viable.







# Taxes, Customs, Legal Policies

A competitive fiscal and legal framework is an essential requirement for maintaining the attractiveness of Germany as an automotive location.

# 05



# Tax Policies

The VDA is advocating that tax and financial policies flank Germany's competitive capability as an industrial location. The focus of this is particularly on coping with the consequences of the coronavirus pandemic and poses enormous challenges for the entire community of states, each individual and especially also the automotive industry in Germany. It is all the more important to lay down the right tax policy tracks for the future now.

Germany needs internationally competitive tax laws.

A modern tax system in Germany is an essential building block for sustainably bringing the economy back onto the growth path. Germany has a significant catch-up requirement in this respect; the reform bottleneck of the last years must now be dissolved. In addition to a competitive tax charge, it must particularly involve fundamental structural improvements and the acceleration of administrative procedures. Classic headquarter functions must be strengthened in order to also safeguard the attractiveness of the location in a restart after the crisis. Reforms for internationally competitive tax laws must be put off no longer. The partial abolition of the solidarity surcharge, which was enacted in 2019, does not go far enough. The delayed reform of the foreign tax law, and particularly the controlled foreign corporations regime, shows the coalition's unwillingness to modernize. The operating assets must not be jeopardized. A wealth tax or a (one-off) capital levy on operating assets would be completely the wrong signal and an aberration of tax policy, particularly on the way out of the crisis.

The VDA has successfully advocated the introduction of taxation research funding. This entered into force on January 1, 2020. In particular, success has been achieved in making the funding accessible to companies in all size classes. However, the volume of the funding remains significantly behind what would be necessary to send a strong signal for Germany as an innovation location. Current developments, such as the expansion of electric mobility and the advancing digitization, require comprehensive new activities in the area of research and development. That is why VDA continues to plead for an expansion of the funding as part of the proposed evaluation. The doubling of funding as part of the economic package is a good step in the right direction. Today's R&D expenses lead to tomorrow's innovations, and the coronavirus pandemic is once again stressing how important digitization is. It must be guaranteed that Germany does not fall behind in the area of research and development.

## Global discussion about a reform of tax laws and the introduction of a minimum taxation

In 2019, a discussion was initiated at the level of the OECD about a redistribution of the global taxation rights. In view of the far-reaching consequences, the VDA has become involved in the debate and pointed out the specific potential implications for the business models and structures of the automotive industry. A wealth of questions is still not clarified. A global understanding about this is intended to take place by the end of 2020. A failure of the international negotiations could have unforeseeable consequences, which would also seriously affect the automotive industry. Uncoordinated national tax measures and the resulting further escalation of global trade conflicts would be feared.



In parallel with this, the improvement of international dispute settlement instruments must be put right at the top of the agenda. The intended minimum taxation should be used as a reason in Germany to clear out the "jungle" of existing tax abuse avoidance norms.

## Taxation of motor vehicles and fuels/electric mobility

In the discussion about the pricing of CO<sub>2</sub>, the VDA has advocated the inclusion of traffic in emissions trading. The CO<sub>2</sub> price enacted in 2019 is a correct instrument for climate protection. However, for mobility to remain affordable, in return, it is just as important that relief is achieved with the electricity price through the reduction of the EEG levy. The result of this is that it will increase the attractiveness of electric driving. Furthermore, from 2021, car drivers who are particularly affected will be relieved by the increased commuter allowance.

A reduction of the EEG (Renewable Energies Act) levy would also increase the attractiveness of electric mobility.

Over and above this, the tax framework conditions for the market launch of electric mobility were also able to be improved in 2019. The existing tax allowances, such as for the taxation of electric and hybrid vehicles as company cars, were extended until 2030 and expanded. It is particularly positive that an incentive was also set for heavy goods vehicle traffic to invest in environmentally friendly electric vehicles. The measures of the economic package can give further impulses.



As part of the Climate Protection Program 2030, a reform of the motor vehicle tax was announced in 2019 and, subsequently to the economic package, initiated in 2020. The VDA is closely following the ongoing discussions regarding the structuring of the motor vehicle tax and sees a fair compromise in the reform proposed by the Federal Government, which requires concessions from all involved parties. It could prospectively be useful to set an incentive over and above a pure CO<sub>2</sub> perspective for acquiring new vehicles with the lowest emission values, which would also have an impact on the vehicle fleet.

### Customs handling

The completion of Brexit will not only result in significant customs costs for the automotive industry, but also lead to practical problems with customs handling in order to ensure a functioning supply chain like that before it. Therefore, the VDA has already been promoting a simplified customs handling system since 2018 as part of self-assessment, which guarantees smooth-running goods traffic without additional administrative effort for companies, as well as the customs and tax authorities, in the European Union and the United Kingdom of Great Britain and Northern Ireland. The VDA proposal can form the basis of relevant considerations at the European level.

To retain the Customs Union, IT systems need to be modernized.

The VDA is advocating the modernization of IT systems for the Customs Union vis-à-vis the European Commission, as well as at the national level, which forms an important element for the functioning of the European Union. There is a substantial need for action and improvement in order for the Customs Union to not only exist on paper, but also in business practice.

The free-trade agreements of the European Union play an important role for German automobile manufacturers and their supplier industry. By applying the agreements, customs duties can be avoided or reduced when importing motor vehicles, as well as motor vehicle components, in the treaty partner states. To structure the exchange of information required for this regarding the origin of goods beyond country borders more efficiently, the VDA is advocating an industry-wide, uniform electronic data exchange procedure and format.

### Origin rules for battery cells

Origin rules for battery cells must be adapted and expanded.

Electric and hybrid vehicles are accounting for an increasingly larger share in the product portfolio of car manufacturers. For the use of the current and future free-trade agreements of the European Union, particularly also with the UK, it is therefore urgently necessary to adapt and expand the origin rules accordingly. This is a question of strategic importance for the industry, as well as for the EU. The VDA has compiled a position in this respect and introduced it to the European Commission, as well as at the national level.

### Export control/sanctions

For companies in the automotive industry, numerous questions arise with respect to list positions of technologies and products, which are increasingly being used for networked and autonomous driving in car manufacturing. The VDA has addressed this subject area and identified potentially affected technologies in order to create legal certainty and transparency in good time, as well as counteracting excessive administration. The year 2019 was particularly marked by the increased use of sanction regulations with an extraterritorial impact, particularly on the part of the USA. The companies in the German automotive industry regard themselves as being faced with incalculable risks in this respect. The existing legal certainty and the associated planning certainty is met by the VDA with regular monitoring of the current, global developments in this area, as well as with promptly providing information and exchanging information with its members.





# Legal Policies

## Extension of collective redress through EU class action lawsuit not viable

European consumers should be able to enforce their rights against companies more easily in the future through the introduction of a class action. After the EU Commission already proposed a regulation for a European class action in 2018, the EU member states agreed on a common line for its introduction in November 2019. Concretely, EU ministers agreed that qualified institutions, such as consumers' associations, can file a collective lawsuit against companies on behalf of injured parties – both within a country, as well as on a cross-border basis.

The aim of the class action is an injunction or a remedy order, which can obligate the contractor to compensation, reparation, replacement, reduction contract termination or reimbursement. However, particularly for domestic lawsuits, it should be left to the member states to determine exactly how the lawsuit will be structured. In principle, the EU Commission, EU Parliament and EU Council agree to introduce a class action by means of a regulation. However, the details must still be consulted on. The tripartite negotiations, which were interrupted for several months due to the coronavirus pandemic, were resumed at the beginning of June 2020. Only after agreement can the new regulation enter into force, which in turn, would need to be implemented in the member states. The introduction of such a class action would be difficult to reconcile with the basic principles of German law. Provided that a narrow precondition is not set for the right of the associations to bring an action, misuse is also feared, in which, for example, unsuitable associations could bring an action.

## Basic principles for the German and European digital economy

The VDA is following the discussion, also initiated by the German Federal Government, regarding digital strategy and the associated issues of legal regulation of the digital economy with great interest. Digitization of the industry and its products, which has been progressing for a long time, requires a careful examination of the relevant legal framework. Digitization and the associated networking of motor vehicles has already triggered tough innovation competition, which not only relates to the economic usability of data, but also to the access of associated technologies, such as the telecommunication area. An important feature of the discussion about (mobility) data must be the international/European dimension in view of cross-border availabilities of data, as well as the partially disruptive boosts to innovation and the high competitive pressure for the (industrial) companies involved. Government regulation should take the necessary flexibility of the involved companies and the barely assessable innovation potential into consideration at the beginning of the development of motor vehicle digitization.

## Data protection for customers in the motor vehicle

The VDA issued policies for the protection of data in motor vehicles for the first time in 2014. In 2016, a joint data protection declaration was prepared in cooperation with the independent data protection authorities of the German federal and state governments. The joint declaration deals with the data protection aspects of using networked and non-networked motor vehicles. The state-of-the-art motor vehicle already requires and produces numerous data.

In 2018, the VDA and data protection authorities then agreed on another document, in order to effectively inform consumers about data processing in the motor vehicle. This VDA pro-forma text for the operating instructions is now available to all manufacturers as a recommendation for implementation. This pro-forma text includes, inter alia, the following explanations:

In accordance with valid data protection law, consumers have specific rights vis-à-vis the companies that process their personal data. According to this, a free-of-charge and comprehensive disclosure claim exists vis-à-vis the manufacturer, as well as third parties (e.g., appointed breakdown services or workshops, providers of online services in the motor vehicle), insofar as they have stored personal data. Disclosure can be requested regarding which data is stored about data subjects, and for which purpose and where the data originates from.

## Data access contractually controllable

The introduction of general data access claims in German or European law is not necessary, as contractual regulations at the B2B and B2C level can solve this appropriately. This particularly applies to the Anti-Trust Law and the current Amendment of the Act Against Restraints of Competition (GWB). It speaks against a general claim to data access within the scope of the “essential facilities doctrine” that the relevant data, as a rule, has been provided by the user free-of-charge and voluntarily. Within the scope of the NEVADA Concept of the VDA, access to the data in motor vehicles is to be granted to third parties via a neutral service indiscriminately. Furthermore, an increased risk of misuse associated with cyber risks would exist if data access was granted within the scope of the “essential facilities doctrine.”

In light of the above, the VDA also regards individual elements of the planned reform of the competition law in Germany critically, such as the substantiation of general data access rights in the Act Against Restraints of Competition. The cartel-law misuse supervision is primarily aimed at the prevention of harmful behavior by market-controlling companies. A reinterpretation into an “innovation promotion duty” obligation vis-à-vis companies to make their own databases accessible to third parties could have an innovation-impeding effect over the longer term and benefit free riders. Tightening of the misuse control through the creation of data access rights would also not occur

Brussels is planning to introduce a European class action option in order to strengthen the rights of consumers.

Digitization requires a careful examination of the relevant legal frameworks.

A VDA pro-forma text on data processing in the motor vehicle is available to all manufacturers as a recommendation.

The introduction of general data access claims in German or European law is not necessary.

by way of a national solo effort. Instead, a European solution would need to be found. In any case, national solutions contradict the idea of creating a “Digital Single Market” within the EU. Companies that are active on a cross-border basis require more and not less harmonization.

### No ownership regulation for the digital economy

There are thus far no ownership rights to data, either in Germany or in the EU.

German industry has also been conducting a discussion for a long time with respect to “Industry 4.0” regarding the question of the legal framework and the necessity of the legal allocation of data. Considerations regarding possible regulatory approaches must be guided by the fact that they allow digital business models and do not impede innovative developments. There are thus far no ownership rights to data, either in Germany or in the EU. The allocation of data can be regulated viably and efficiently with licensing agreements between the actors. A new ownership right, comparable to chattel and real estate property law, cannot be constructive, as electronically stored and transmitted data cannot be allocated to an individual legal entity. A digital ownership regulation would, in fact, build up additional obstacles for the digital economy without promoting its innovative development.

### Design protection for motor vehicle repair parts

Industrial property rights are necessary for combating product and trademark piracy.

The introduction of a “repair clause” into the German design law, adopted by the Federal Cabinet in May 2019, constitutes a critical intervention in the system of industrial legal protection. Automobile design extends into the details of exterior mirrors, headlights, panels, doors and bumpers. Unreserved design protection is an important precondition for motor vehicle manufacturers and suppliers worldwide in order to be able to invest in innovation. Industrial property rights are necessary from the perspective of the automotive industry in order to effectively combat product piracy and guarantee the safety of drivers. It is demonstrable that replicated spare parts impair the safety, as well as the intrinsic value of the vehicle and thereby constitute a significant customer disadvantage. Particularly in the area of spare parts, it has been observed at an international level how trademarks, packaging and products are counterfeited by product pirates in large numbers.

The abolition of design protection in Germany would also mean the relaxation of property rights in other areas and, thereby, do a disservice to other areas and Germany as an innovation location. Such an exception clause can serve as a case of precedence for similar regulations, for example, in patent law. Germany’s national solo effort is now enlarging the legal hotchpotch in Europe. For reasons of the single market, a uniform regulation within the EU should have been expected. *Ceteris paribus*, repair costs in the EU are also not lower in those countries in which no design protection exists. In terms of pricing, Germany is within the lower range of the EU. However, the change to design law still requires the consent of the Bundestag, which has thus far not been able to formulate a uniform position.

### Patent law reform and injunctive relief

With regard to the networked car, legal disputes are being conducted regarding infringements of patents between the automotive and telecommunication sector, which have significant implications for the established value creation structure of the automotive industry. These essentially relate to two case groups, namely the judicial handling of the injunctive relief in Germany, on the one hand, and the access to licenses to standard essential mobile communication patents, on the other hand.

A disadvantage exists for Germany as an industrial location due to the currently valid patent law situation. According to this, the owner of a patent – even if the patent is only a subordinated subcomponent of a complex product – can demand an injunction, without its proportionality being examined. This also applies if nullity proceedings are pending in respect of this patent. Therefore, the VDA welcomes the fact that the Federal Ministry of Justice and Consumer Protection (BMJV) submitted a draft bill of

A disadvantage exists for Germany as an industrial location due to the currently valid patent law situation.



a second law on the simplification and modernization of patent law (2nd PatMoG) in August 2020.

The VDA supports the BMJV proposing a discussion draft of an examination of proportionality entrenched in Section 139 PatG (Patent Act). In this context, the assessment of the constitutional ranking of the proportionality principle is important in the draft bill.

However, the submitted draft to Section 139 (1) PatG only prescribes a proportionality check if specific reasons exist. This may not result in an inadmissible reduction of the proportionality principle to specific causes, as a manifestation of the rule of law and required under European law. The proposed supplementary causal clause proposed in the draft to Section 139 (1) must conform to Article 3 of Regulation 2004/48/EC of the European Parliament and the Council dated April 29, 2004 for the enforcements of intellectual property rights (“Implementation Regulation”) in the opinion of the VDA, and must also comprehensively cover the various problem aspects regarding “Non-Practicing Entities” (NPE) in order to cause a reliable change in this respect with the case law from the courts of lower instance.

The lawsuit of a NPE vis-à-vis an industrial company operating in Germany is frequently based on the situation that, on the basis of an individual patent, only a functional and subordinated subcomponent of a complex product, in terms of value, is affected and an injunction can nevertheless be aimed against the production or sale of the complex product (e.g., a car). In the automotive industry, this scenario particularly plays a very critical role with respect to the production premises situated in Germany. Due to the extremely complex structure of the development processes, the approval processes to be conducted worldwide (type approvals, general operating licenses), the supply chain over various levels of suppliers, as well as the logistics and production processes, the damage that is incurred by the production stop can be extremely disproportionate to the value of the invention protected by the patent.



### Competition-compliant licensing of standard essential patents

Manufacturers and suppliers rely on the use of SEP.

The patents for the networking technology of motor vehicles are in the telecommunication area for foreign companies, which are integrating their technologies into the new mobile communication standards such as 5G with patent protection. This is why these property rights are referred to as standard essential patents (SEP). The German manufacturers and suppliers are reliant upon the use of the SEP, which also need to be licensed for competition reasons – to suppliers and manufacturers. However, the SEP owners only grant licenses to the vehicle manufacturers in order to generate significantly higher license fees. Manufacturers and suppliers have already complained to the EU Commission and the Federal Cartel Office about this questionable practice under cartel law. A decision is still outstanding regarding the initiation of proceedings.

In 2017, the VDA already advocated that the license to a SEP and/or SEP portfolio must be offered by the patent owner to every participant in the supply chain who makes a unit implementing the SEP or SEP portfolio available for a product that conforms to the standard. The standard conformity can be determined, for example, through the certification of the unit or a subsequent unit in the supply chain, whereby multiple certifications are not necessary in the supply chain. The license must be able to cover all previous and subsequent levels of the respective supply chain and all of the standard forms of use of the unit in the standard-compliant end product, for example, via a portfolio license.

### No specific corporate criminal law required

The Federal Cabinet submitted the draft “of a law for strengthening the integrity of the economy” in June 2020, with which a new sanction law is to be introduced for companies. From the perspective of the VDA, the intended reform of the corporate sanction law is not required and goes far beyond the valid and sufficient administrative offenses law. The criminal law also provides a well-functioning system of sanctions based on the fault principle, whose amendment by a “corporate criminal law” leads to multiple economic and legal problems.

The draft prescribes a broad attribution of criminal offenses of individual managing persons, without it depending on an organizational fault of the company itself. Companies, which have a compliance organization that they put into practice at their disposal, must remain factually free from sanctions. However, the compliance efforts will only be taken into consideration for the attribution of the punishment. In doing so, the draft still leaves open what is expected from the companies. The legislator should at least enshrine the key points of appropriate compliance in law. In light of the above, the far-reaching sanction framework of up to 10 percent of the Group-wide annual turnover is regarded critically. Particularly in the current economic crisis, in which many industrial companies must anticipate losses that threaten their existence, the draft legislation is a counterproductive signal by the Federal Government.

### Reform of trailer liability – implementation by insurance companies

Due to the critical implications of a BGH (Federal Court of Justice) judgment on trailer liability, the VDA advocated a reform of the Road Traffic Law (StVG). While prior to this judgment, indemnity insurance of the towed vehicle was only required to a minor extent, as the liability risk was predominantly domiciled with the towing vehicle, the towing and towed vehicle now needed to be insured in equal parts – with corresponding implications for the premiums for trailers.

With effect from August 1, 2020, the legislator has now made a change to the StVG and the Insurance Contract Act (VVG). According to this, Sections 19 and 19a StVG shall be newly inserted, with which the liability for accidents with trailers and rigs in road traffic will be legally regulated on the basis of valid law and the regulation practice of the insurance companies: In Section 19 StVG, the legal regulations now contain the liability of the holders of trailers and, in doing so, also regulate the liability of the holder of the towing vehicle and trailers in relation to one another, as well as in relation to possible additional accident participants, i.e., additional vehicle holders, third parties, vehicle drivers and other liable parties from risk in order to create legal certainty. If a rig is involved in the accident, for the holder of the towing vehicle and trailer it is henceforth expressly legally specified that in the internal relationship between this holders, the loss of other accident participants must, in principle, be borne by the holder of the towing vehicle in such case the

trailer has not exceptionally caused an increased risk on a case-by-case basis. For this, the mere towing of the trailer is generally not sufficient. The responsibility under liability law is now explicitly on the respective risks set by the holders involved in a rig accident. The liability of the trailer and rig driver is regulated separately in the new Section 19a StVG. In the Insurance Contract Act, the principle that the insurance follows the liability is explicitly adhered to. The VDA is now expecting the insurers of trailers and rigs to adapt their insurance contracts to the new legal situation as soon as possible and thereby relieve the logistics companies accordingly.

New legal situation will relieve logistics companies.

# Environmental Policies and Air Quality

With its “European Green Deal”, the European Commission has set out an ambitious climate protection plan for Europe. The companies in the automotive industry are moving climate and environmental protection forward with ideas and innovative products.



06



# Air Quality and Air Pollution Control

The VDA considers its assessment to be confirmed that the renewal of the passenger car fleet and software updates for already registered passenger cars are the most effective measures for improving air quality (nitrogen oxide emissions) in German cities quickly, sustainably and significantly. As surveys carried out by the Federal Environmental Agency show, the number of cities still above the annual nitrogen oxide limit is steadily decreasing. This is primarily due to the fact that an increasing number of new EURO 6 diesel passenger cars with minimum emissions have been registered and, accordingly, the number of old cars has decreased. This cycle is continuing.

Although the volume of traffic has increased, nitrogen oxide emissions from road traffic have fallen by around 70 percent since 1990.

Air quality in German cities is therefore steadily improving. Nitrogen oxide emissions from road traffic have fallen by around 70 percent since 1990 – even though the volume of traffic has increased by 50 percent over the same period.

Air quality is continuously monitored in Germany in an effort to comply with the European Air Quality Directive, which sets limit values for particulate matter, nitrogen dioxide (NO<sub>2</sub>) and ozone. The pollutant concentrations in the air are measured by the federal states and the Federal Environmental Agency at over 600 measuring stations throughout Germany. Like industry, households and agriculture, road transport contributes to air pollution with its emissions. Here, the aim is to ensure that the total emissions of all sectors are low enough to meet air quality targets.

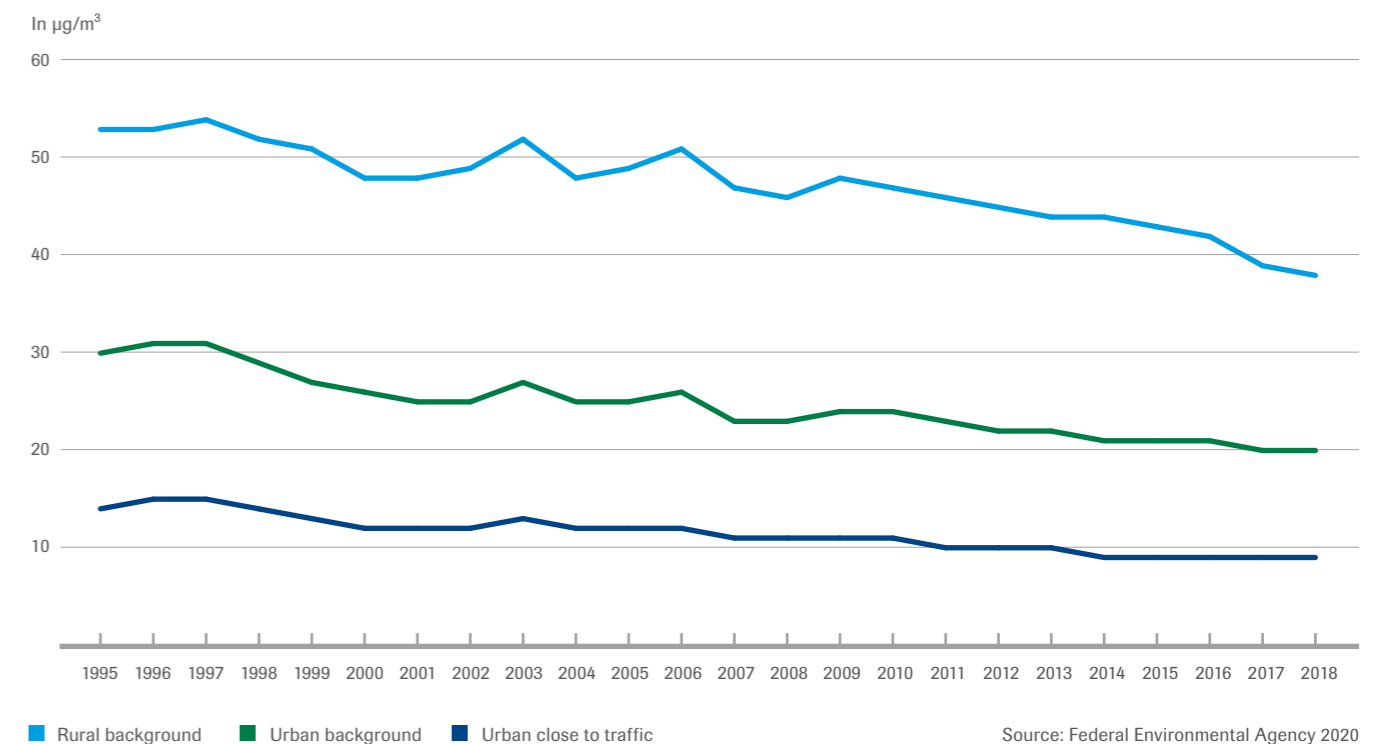
Ozone pollution is largely dependent on the weather, and road traffic only has a minimal effect. Road traffic's contribution to particulate matter pollution continues to decline since vehicles nationwide are being equipped with particulate filters, so that last year, for the first time, no single limit value was exceeded nationwide. Urban traffic-related particulate matter pollution has fallen by more than 30 percent in the last ten years (from 28 µg/m<sup>3</sup> to 19 µg/m<sup>3</sup>). Particulate matter pollution, however, varies strongly dependent on the weather. For ultra-fine dust (PM<sub>2.5</sub>), the limit value of 25 µg/m<sup>3</sup> applies in Germany, which has not been exceeded since 2015.

The annual limit values for nitrogen dioxide (NO<sub>2</sub>) are still being exceeded at just over 20 of the measuring stations close to traffic in Germany. According to the Federal Environmental Agency, this is a reduction in exceedances of around 50 percent compared to 2019. Road transport has a special responsibility here, as it is the main emitter of NO<sub>2</sub> at the urban traffic stations. There, NO<sub>2</sub> air quality has improved by 30 percent in the last ten years (see graph UBA).

Nationwide compliance with the annual NO<sub>2</sub> limits is in sight. The automotive industry is doing its part to achieve this, in particular by rapidly penetrating the market with the cleanest passenger cars and trucks in the EURO 6d and EURO VI<sub>d</sub> emission categories and by upgrading the current fleet of diesel cars with software updates. The past year has shown that the measures implemented by the automotive industry are effective: the positive trend in air quality continues. Driving bans, as is often called for, are therefore not necessary and, above all, not appropriate considering the current air quality trends.

## Development of NO<sub>2</sub> annual mean values

averaged over selected measuring stations in the respective pollution scheme, 2000 – 2019



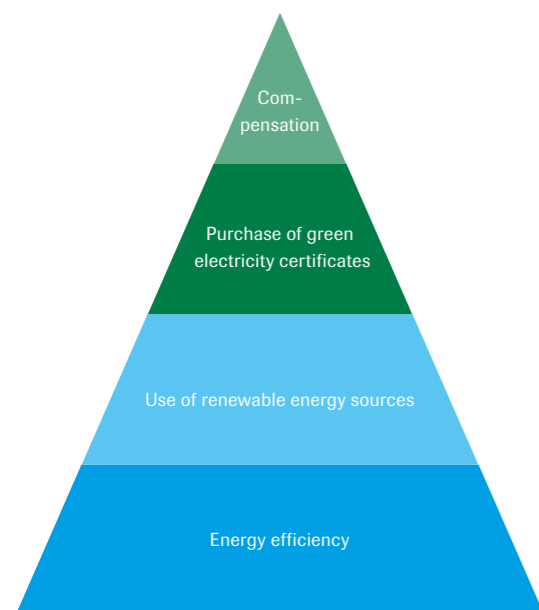
# Climate and Environmental Policies for Germany as an Industrial Location

Europe is supposed to be climate neutral by 2050.

Society became aware of environmental protection and climate change by 2019 at the latest, when the European Commission set out the climate protection plan for Europe with its "European Green Deal." By 2050 at the latest, the European Community is not supposed to release more greenhouse gases than it consumes. The ambitious goal is climate neutrality. Climate policy is becoming a location policy. The fields of action are energy, industry, the building sector, transport, agriculture and finance.

Companies in the automotive industry have defined ambitious goals for themselves for achieving climate neutrality at their own production sites. But what does it even mean to be "climate neutral"? The bottom line is that one's own (economic) actions do not contribute to climate change. On the other hand, it does not mean to operate emission-free.

## Climate neutrality guideline for action



A four-step hierarchy is a guideline for action on the way to achieving the objectives:

- Offsetting the remaining CO<sub>2</sub> emissions
- Purchase of green electricity certificates
- Use of renewable energy sources (electricity, heat) at home; keywords: new clean power
- Minimizing one's own energy needs by increasing efficiency

Source: VDA

Depending on the initial situation, the relevant ratio of the four elements can vary in each company. Those who have already optimized their processes in terms of energy demand – ISO 50001 is a valuable tool for building systematic energy management – will inevitably have to focus on the remaining three elements. Offsetting actions should be allowed, especially at the beginning of the process. They can and should, with appropriate implementation or expansion of the remaining three building blocks, be reduced throughout the timeline.

In order for the companies in the German automotive industry to actually achieve the ambitious goal of climate neutrality, politicians still have to set a number of new directions. For example, at the end of 2019, the share of renewable energies in Germany's electricity supply accounted for 42.9 percent [Source: bdeu].

German car companies take their responsibilities seriously and see their role as global. Production sites outside Germany and Europe are also included in the overall strategy for climate neutrality. The VDA can assist in climate change mitigation. For many years it has been publishing the VDA emission factors, a compilation of over 50 regions worldwide for calculating the emissions associated with the production of electricity, heat and fuels. The VDA emission factors are available on the VDA homepage as a free pdf download.

Production sites outside Germany and Europe are also included in the overall strategy on climate neutrality.

The European Commission's Green New Deal is an unusually large and ambitious policy package. It directly affects industry in many places. In addition to the objective of climate neutrality, the following two aspects are worth mentioning from the point of view of the automotive industry:

- The circular economy
- Zero pollution

Energy generation in Germany (energy mix 2019)		
Energy source	in billion kWh	in %
Nuclear energy	71	13.7
Lignites	102	19.8
Hard coal	49	9.5
Natural gas	54	10.5
Renewable	236	46
Included in the above are:		
Hydropower	19	3.8
Wind energy	126	24.8
Solar energy	46	9.1
Biomass	44	8.6
<b>Total energy generation in 2019</b>	<b>513</b>	

Source: BMWi, Destatis, Agora Energiewende, IWR, Fraunhofer, BDEW, ZSW, AEE, AGEB



## The circular economy

In its communication, the European Commission states: "About half of total greenhouse gas emissions and more than 90 percent of biodiversity loss and water scarcity are caused by the extraction of raw materials and the processing of materials, fuels and food." It continues: "Only 12 percent of the materials used come from recycling." The EU Commission therefore wants to create incentives to increase the use of recyclates in products. The implementation of Article 9 of the EU Waste Framework Directive (Directive 2008/98/EC) is a current example of the shortcomings of this fundamentally correct approach. A classic interface between manufacturer responsibility, hazardous materials law and waste law. This obliges the supplier of a product to provide information on so-called SVHC substances in accordance with Article 33 of the REACH Regulation (Regulation (EC) No. 1907/2006). This information will then have to be available to the disposal company at the end of the lifecycle of a product in order to remove these substances from the material cycle if necessary.

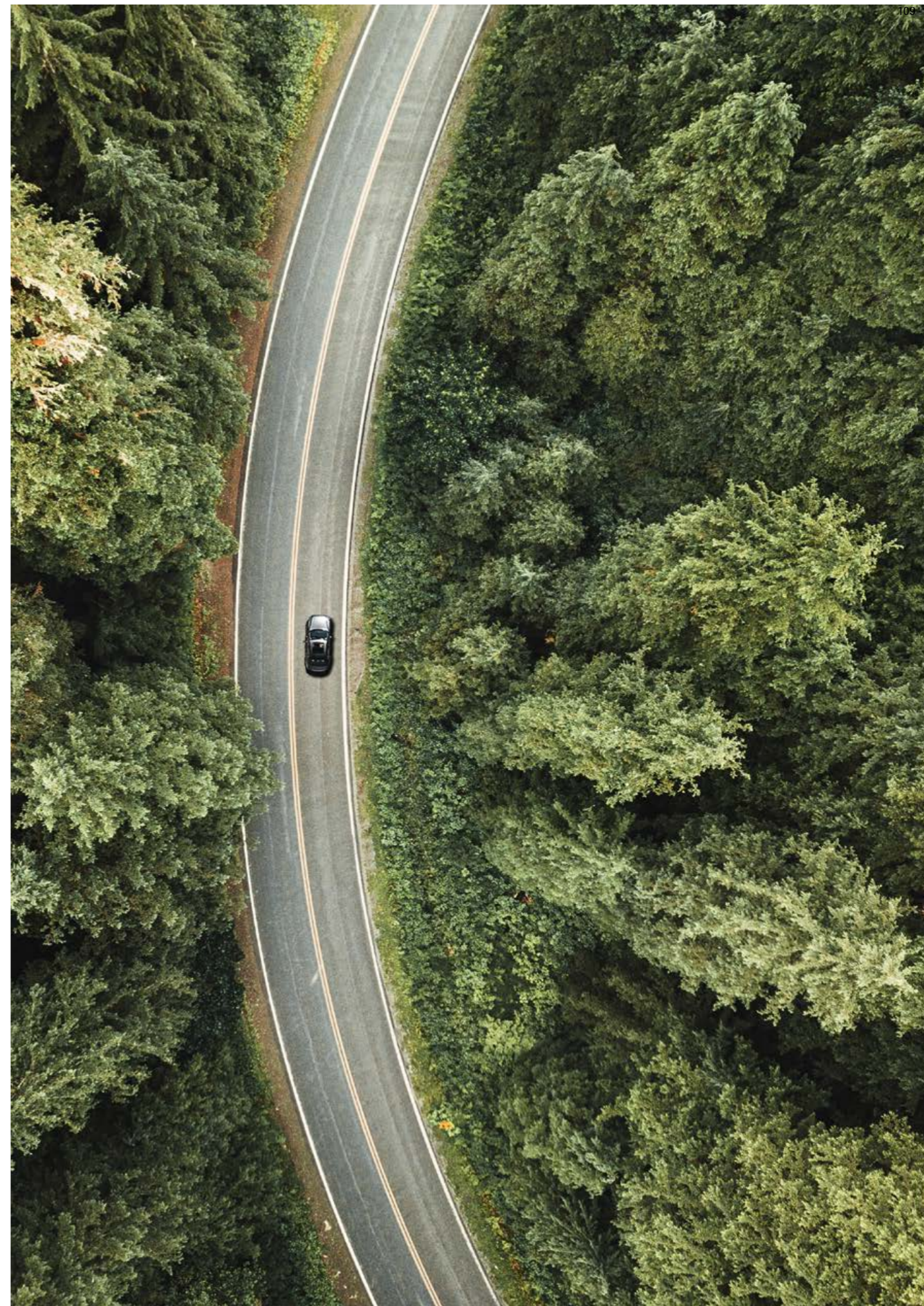
When implemented, i.e., in the ideas of the European Chemicals Agency, ECHA, this leads to the creation of a gigantic database on SVHC substances in products. It shows how far theory and practice can diverge. Completely excessive and unrealistic requirements for the design and completion of this SCIP database (SCIP: Substances of Concern in Products) misses the point – the transfer of relevant information on SVHC substances in products that have become waste to the disposer. Here, it would be desirable to focus on the actual amount of information required to close material cycles.

## Zero pollution

The Green New Deal also includes the "zero pollutant target for a pollutant-free environment." Here, the European Commission announces:

- A revision of air quality standards to better adapt them to the recommendations of the World Health Organization (WHO).
- A review of EU measures to combat pollution from large industrial installations (Directive 2010/75/EU on industrial emissions).
- Cooperation with member states to better prevent industrial claims. (Reference to Directive 96/82/EC, Seveso III Directive).

At national level, the amendment of the Technical Instructions on Air Quality Control (TA Luft) is also expected to provide a fundamentally important administrative instrument for plant licensing. All topics are addressed in the VDA Working Group on Industrial Emissions.







# Innovation and Technology

Tomorrow's mobility is the result of innovation. The German automotive industry invests more in research and development than any other sector. The further development of classic drive systems and alternative fuels, the expansion of electromobility and the digital revolution in the car, including automated driving, are the major topics of the future.



# Diesel, Gasoline and Hybrid Engines

"Thermodynamic efficiency" is higher for diesel than for gasoline.

When directly compared to the gasoline engine, the diesel engine impresses with its lower fuel consumption. Its combustion process makes much better use of the energy in the fuel. The so-called "thermodynamic efficiency" is higher for diesel than for gasoline. It is what makes the diesel so economical. This advantage stems from higher compression and higher peak temperatures in the cylinder of the diesel engine. However, these extreme conditions in the combustion chamber also create more pollutants, which require additional, complex measures for exhaust aftertreatment. Diesel engines of the current generation are therefore all equipped with a so-called SCR catalytic converter and a diesel particulate filter, which subsequently breaks down pollutants produced during combustion. Exhaust aftertreatment reduces emissions by 90 to 99.9 percent, and even the most stringent EURO 6d limit values can be safely met with the help of these technologies.

Online article of the "auto motor und sport" magazine to the RDE exhaust emission test VW Golf 8 Diesel:



Numerous tests confirm that vehicles of the EURO 6d standard also comply with the legal limit on the road.

Within the current EURO 6d emissions legislation, the vehicles and their drives provide proof that the legally prescribed limits are actually complied with on the road under all normal driving conditions. The strict requirements mandate compliance with emissions even under stricter conditions, i.e., for pass journeys in winter. Vehicle drives are developed for these extreme conditions in order to even meet the legal requirements in the field. The result is that modern vehicles, and diesel vehicles are explicitly included here, are virtually pollutant-free in normal operation. This is confirmed by independent tests carried out by Emission Analytics or independent car magazines (scan

QR code). Even under extreme driving and general conditions, emission values between 9 and 19 mg NO<sub>x</sub> per kilometer were measured on the road, for example, in new passenger car models from German manufacturers. This is about 80 percent below the valid EURO 6 limit value.

The ADAC (General German Automobile Association) also gives EURO 6d good ratings. In independent tests, the ADAC confirms that EURO 6d diesels have very low emissions, even at low temperatures. On average, these were 20 mg NO<sub>x</sub> per kilometer. Individual German models had emissions of only 1 mg/km NO<sub>x</sub>. Emissions are therefore close to the detection limit. The ADAC confirms that all vehicles of the EURO 6d standard comply with the legal limit also on the road.

The German automotive industry has done its homework in this area. The debate on bans of internal combustion engines is outdated with reference to air quality and is therefore objectively speaking neither ecologically nor economically justifiable. The German automotive industry's clear electrification strategy notwithstanding, the modern and efficient combustion engine still represents an important basic component of mobility.

From 2021, all new cars registered in the European Union will have to comply with the average CO<sub>2</sub> limit of 95 grams per kilometer: a major challenge that requires the optimization of propulsion from combustion to power transmission. Every percentage point of efficiency must be used to achieve this goal. Diesel emits about 10 to 15 percent less CO<sub>2</sub> than a comparable gasoline engine and is thus making an important contribution to complying with the European CO<sub>2</sub> limit value.

The modern gasoline engine approaches the efficiency of the diesel engine, as it adopts principles of the diesel engine through so-called direct injection and can thus increase its efficiency. However, engine and exhaust after treatment technology is less complex in the case of gasoline. Its economy and cleanliness are particularly impressive in the small car segment, and for shorter and medium-range distances. The gasoline engine is also particularly suitable for the so-called hybridization of the power train. It represents a partial electrification of the drive system and is a combination of the classic combustion engine and electric drive. This allows the efficiency advantages of the electric drive to be combined and optimized with the internal combustion engine. Depending on the degree of electrification, efficiency can increase by approximately 25 percent.

Classic hybrid drives usually have a high-voltage supply in the range of 200 V and above. Although this makes high-performance drives possible, high-voltage technology is complex and cost-intensive and therefore often

not economical for price-sensitive drive segments. An alternative is 48 V technology, because it not only allows the replacement of the classic 12 V on-board network with a modern high-performance on-board network, but also the use of electric drives in the range of several kilowatts of drive power at this lower voltage level. Thus, the principle of a hybrid drive in combination with a modern on-board network can be used cost-effectively.

The so-called full hybrid has a long electric range and a powerful battery. The plug-in hybrid, a powerful full hybrid with a built-in socket and an enlarged battery, is the bridge between the full hybrid and the electric vehicle. With plug-in hybrids, the built-in combustion engine is becoming less and less important as, thanks to the electrical outlet, much of the driving energy no longer comes from the combustion engine. A plug-in hybrid typically has an all-electric range of about 70 kilometers – ideal for typical commuter and short-haul trips.

New cars will only be allowed to emit a maximum of 95 grams of CO<sub>2</sub> in the EU from 2021.

Plug-in hybrid vehicles have both an electric drive and an internal combustion engine and can be recharged externally.

# Combustion Engine Fuel Consumption and Emissions

The WLTP (Worldwide Harmonized Light Vehicles Test Procedure) has been in force for type approval of new passenger cars across the EU since 2017, succeeding the NEDC, which has been applicable since 1992.

Gasoline and diesel engines burn fuel – usually gas, diesel or natural gas. These fuels consist of different hydrocarbon chains. The combustion of these hydrocarbon chains therefore creates the end products H<sub>2</sub>O (water) and CO<sub>2</sub> (carbon dioxide). The carbon dioxide from the exhaust is precisely measured and is strictly limited by the European CO<sub>2</sub> fleet legislation. The CO<sub>2</sub> fleet legislation measures CO<sub>2</sub> emissions on the basis of the so-called NEDC (New European Driving Cycle). This cycle was developed by the European Commission to provide a uniform benchmark for consumers and policies in Europe. The NEDC has proven itself over many years as a uniform, binding basis for the comparison of different vehicles or model generations. In addition to determining CO<sub>2</sub> emissions, the driving cycle also served to determine classic pollutant emissions and fuel consumption.

The NEDC method previously used in Europe no longer satisfied this requirement – it was developed in the 1990s primarily for the measurement of pollutant emissions as a theoretical measuring run. Therefore, the member states of the 98 UN/ECE Agreement (including all European countries, Japan, the USA, China, Russia, India and others) have decided to develop a new test procedure under the umbrella of the UN/ECE, which is intended to cover the driving behavior of a vehicle worldwide – the so-called WLTP (Worldwide Harmonized Light Vehicles Test Procedure). The automotive industry has been instrumental in supporting and advancing this initiative.

The new WLTP is based on real driving data from a total of three continents (Asia, Europe, the USA) and twelve countries, and is therefore much more representative. The measuring runs required for this included a total of 750,000 kilometers, which were carried out in metropolitan areas of emerging markets such as India as well as on freeways in Europe and the USA.

Since September 1, 2018, certified WLTP measurements must be available for all newly registered passenger cars. Since September 1, 2019, this also applies to light commercial vehicles. This means that fuel consumption, CO<sub>2</sub> and pollutant emissions of all vehicle types and variants are determined and documented under this new test procedure.

Compliance with emission limits is a requirement for issuing type approvals for new vehicles. Along with the CO<sub>2</sub> value determined concurrently, fuel consumption is an essential factor in the customer's purchase decision and is the basis for vehicle taxation in many countries. Although the WLTP cannot represent the full range of actual vehicle use, it provides a better information base for car purchase decisions by making results more realistic.

In Germany, the so-called "Energy Consumption Labeling Ordinance" regulates which consumption and emission value is binding for customer information. As of March 2020, however, it has not yet been updated to the WLTP, so that car buyers cannot yet be informed about this more realistic figure for the consumption of new vehicles, and manufacturers still have to communicate the outdated NEDC value. The VDA is committed to adapting this Energy Consumption Labeling Ordinance as quickly as possible in order to be able to provide information about the new WLTP.

Although the WLTP is not yet used for customer information, it is used for calculating vehicle tax. Here, the Federal Ministry of Finance has implemented the conversion quickly. Since the CO<sub>2</sub> values according to the WLTP test procedure are higher than those based on the old NEDC standard, the tax rate based on the unit "grams of CO<sub>2</sub> per kilometer" would actually have to be reduced by 20 percent for calculating German motor vehicle tax, because the WLTP is more realistic and increases fuel consumption figures by about 20 percent on average. Therefore, vehicle tax for new vehicles increases by approximately 20 percent if this adjustment is not made.

Since the CO<sub>2</sub> fleet legislation was still developed on the basis of the old NEDC, the European Commission has decided not to adjust the CO<sub>2</sub> limit for new passenger car models, but to recalculate their CO<sub>2</sub> emissions determined in the WLTP as if they were NEDC values. This is done using software developed by the EU Joint Research Center (JRC) CO2MPAS. However, since these recalculated NEDC values are based on the stricter framework conditions of the WLTP test procedure, they will be slightly higher than those based on the original test procedures. As a result, the fleet regulation is indirectly tightened by about 6% for the manufacturers.

In the meantime, WLTP and (usually calculated) NEDC values are available for all newly registered vehicles. For the calendar year 2020, a CO<sub>2</sub> fleet value based on the new WLTP can therefore be determined for the first time. This is expected to happen by spring 2021. Future CO<sub>2</sub> legislation for the years 2025 to 2030 can then be based on WLTP values. In Europe, the NEDC will then be replaced once and for all. Internationally, however, there are still many states that continue to apply the NEDC. Examples include the North African states and Australia. In order to be able to authorize vehicles in these markets, vehicle manufacturers must continue to measure vehicles in the NEDC.

In 2020, a CO<sub>2</sub> fleet value based on the new WLTP can be determined for the first time.



# European Emission Legislation and Pollutant Reduction Technology

For newly type-approved passenger cars, laboratory measurements are supplemented by pollutant emission measurements on the road, the so-called Real Driving Emissions (RDE).

Since September 2015, EURO 6 emissions legislation has been in force for passenger cars and light commercial vehicles. In the heavy-duty sector, EURO VI has already been in force since 2013. In the case of passenger cars as well as trucks, the EURO 6/EURO VI emissions legislation has been gradually adapted and expanded. A special step within the new legislation was the introduction of a new portable measurement technology for the direct measurement of pollutant emissions in real individual road operation. This so-called PEMS measurement technology was introduced for the first time in the heavy-duty sector, where it is used for field monitoring and verification of conformity of vehicles already registered.

Over the past few years, this measurement technology has been improved to be applicable to passenger cars with the introduction of the EURO 6d emission level. Today, the so-called RDE (Real Driving Emission) test is the key element of exhaust emissions legislation.

With RDE, vehicles must not only comply with the limit values on the test bench in the WLTP, but also under real driving conditions, and almost any environmental conditions. The legislator merely allows the measurement tolerance of portable emission devices to be taken into account, and for the transition period of 15 months after the introduction of RDE a slightly higher limit value (conformity factor = 2.1 including PEMS measurement tolerance) to enable the entire passenger car fleet to be converted to these new RDE limits.

## Real Driving Emissions (RDE) Regulation – Effective Dates and Conformity Factor

### Conformity factor

Measurement tolerance of PEMS devices (currently 0.5) already included in factors

### Effective date

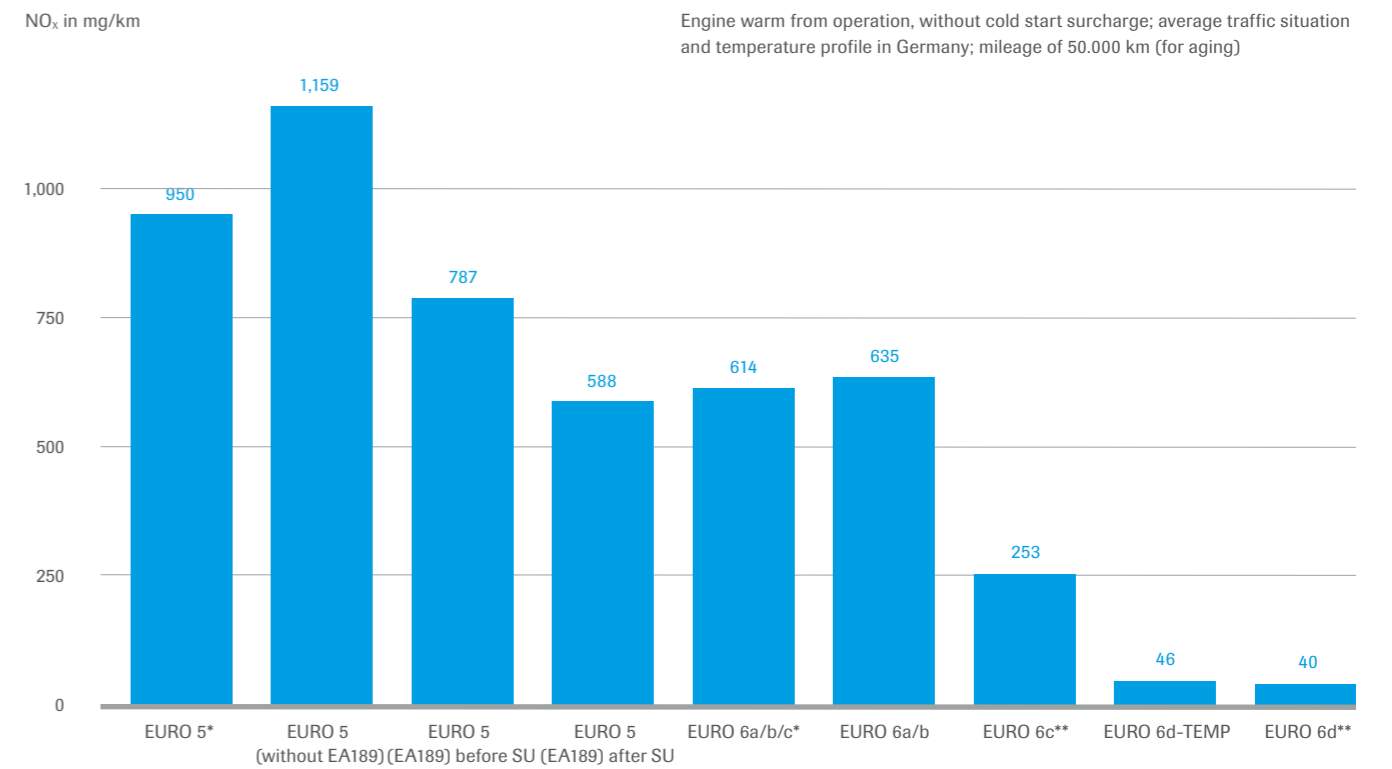
New types: all models type approved after the specified date; all new registrations: all vehicles newly registered after the specified date; light commercial vehicles: one year later in each case

	Conformity factor	Effective date	
			New models
			All new registrations
First step	2.1	September 2017	September 2019
Second step	1.5	January 2020	January 2021

Source: EU Commission

The Federal Environmental Agency (UBA) recently assessed the impact of the new legislation using the so-called “Manual for Emission Factors” (HBEFA). For this purpose, the emission behavior of different vehicle categories is measured and evaluated under different driving and environmental conditions. Cold start or the aging of the vehicle are also taken into account. The UBA states that current diesel cars emit on average only half as much nitrogen oxide as the limit value allows. With an average of 46 mg/km NO<sub>x</sub>, current cars are about twenty times cleaner than a diesel car of the EURO 5 emission level. The so-called real conformity factor is therefore 0.5, and thus about a factor of 4 below the currently permissible conformity factor of 2.1, and also half as high as the binding conformity factor of 1 from 2021.

Average NO<sub>x</sub> emissions in mg/km for EURO 5 and EURO 6 diesel cars



\*Aggregation for fleet composition in 2018 \*\*Technology Estimate

Source: Umweltbundesamt



The modern diesel thus provides proof that it is clean: on the road, in the city, on cross-country trips, in summer as well as in winter. This was made possible by the development of a completely new engine and exhaust gas design with the primary goal of complex thermal management, which allows the engines to reduce pollutants in a stable and efficient manner. The development of these concepts was already started during EURO 5 times and makes it possible to comply with today's strict emission legislation.

The actual reduction of pollutants is achieved with the exhaust after treatment technologies developed for this purpose. Here is an overview:

### Particle filters

In order to clean the exhaust gas of the diesel engine from pollutants generated by combustion, additional after treatment systems must be used. The first stage is the oxidation catalyst. Here, pollutants are converted into harmless exhaust components.

In a second stage, the diesel particulate filter cleans the exhaust gas of liquid or particulate matter. To clean the filter as required, the stored particles are incinerated. The soot filter has an efficiency of almost 100 percent. This makes the diesel

virtually soot-free. With the introduction of EURO 6, the particulate filter was also introduced in the gasoline engine.

The gasoline engine did not have this technology on board until now, because it produces fewer particles than a diesel. As a result, the gasoline engine has been able to comply with the applicable limit values in the past even without a filter. With the new stage of exhaust gas legislation, the particulate filter is now standard even for direct-injection gasoline engines. This allows particulate emissions at the same low level as with state-of-the-art diesel engines. The operating principle of the gasoline particulate filter differs from that of the diesel particulate filter in that it continuously reduces particulates and no regeneration phases are necessary. Therewith, the gasoline particulate filter has no significant influence on fuel consumption.

### Nitrogen oxide after treatment and AdBlue

To reduce nitrogen oxide (NO<sub>x</sub>) emissions, the third stage uses two technologies that can also be used in combination: the NO<sub>x</sub> storage catalyst and the SCR catalyst.

The NO<sub>x</sub> storage catalytic converter removes the nitrogen oxides from the exhaust gas and stores them until its absorption capacity is reached. For its regeneration, the engine electronics temporarily add slightly more diesel fuel to the combustion mixture, similar to the particulate filter. The storage catalyst has an efficiency of around 80 percent in the warm operating range. The additional consumption of a vehicle with a NO<sub>x</sub> storage catalyst is on average about 2 percent due to regeneration.

In the SCR (selective catalytic reduction) catalyst, NO<sub>x</sub> emissions are reduced by adding the AdBlue reducing agent. AdBlue is a non-toxic and odorless urea solution. It is sprayed into the exhaust gas stream as required and converts NO<sub>x</sub> emissions into the neutral components nitrogen (N<sub>2</sub>), water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>) in the SCR catalyst. When the engine and exhaust system are at operating temperature, the SCR catalyst removes more than 90 percent of NO<sub>x</sub> emissions from the exhaust gas. The SCR technology is the key factor for compliance with the EURO 6d legislation on diesel. This applies to cars as well as to trucks.

The customer recognizes this technology by means of the blue tank nozzle directly next to the diesel filling nozzle. Behind it is a special AdBlue tank with a volume ranging from 8 to 20 liters, depending on the model. AdBlue has to be refueled every 3,000 to 10,000 kilometers depending on the tank size. Therefore, a dense, Europe-wide AdBlue infrastructure at gas stations had become necessary. This infrastructure was created with the introduction of EURO 6d.

The German automotive industry has actively supported the construction of this AdBlue tank infrastructure through the "Find AdBlue" app and the "FindAdBlue.com" website. The app helps motorists find gas stations that offer AdBlue. This initiative was supported by the VDA

member companies Audi, Bosch, Daimler, Opel, Volkswagen, and Shell. AdBlue is a registered trademark of the Association of the Automotive Industry.

### EURO 7

Although the final stage of EURO 6d is not yet binding, the EU Commission has launched initial activities to update this legislation and is currently discussing internally and with stakeholders what the new package should include. An expert group has been set up: the Advisory Group on Vehicle Emission Standards (AGVES), which includes representatives from various Directorates-General (GROW, ENV, CLIMA, RTD, MOVE, JRC) as well as experts from member states and stakeholders. The AGVES meets approximately every two months.

In March 2019, the CLOVE consortium was commissioned by DG GROW to conduct a study to evaluate the current EURO 6/VI standards. The study will last 18 months. CLOVE's work is structured along the following tasks:

- Task 1: Review, comparison and experience of emission regulations in other regions
- Task 2.1: Evaluation of the effectiveness of emission standards in the EU
- Task 2.2: Development of new and improved test series
- Task 2.3: Testing different technologies and fuels with the new test series

Preliminary results will be presented successively at stakeholder workshops at AGVES. The final report of this study is expected at the end of October 2020. A legislative proposal is currently scheduled for the end of 2021.

AdBlue is a registered trademark of the Association of the Automotive Industry.

Work is under way on a new EURO 7 legislation.

Pollutants are reduced with various exhaust after treatment technologies.



# EU Type Approval

The discussions in the AGVES thus far show the following efforts of the Commission for a EURO 7/VII:

- Further tightening of existing legislation by extending RD
- Addition of new previously unregulated pollutants (e.g. NH<sub>3</sub> or N<sub>2</sub>O)
- Increased durability requirements combined with the claim that a vehicle is “clean” over its lifetime
- Inclusion of on-board measurement information for permanent emission monitoring
- Harmonization of cars/trucks

According to the EU, the so-called annual mean value must not exceed 40 micrograms of nitrogen oxide per cubic meter of outdoor air at the measuring stations.

With the increasing market penetration of clean EURO 6d/VId vehicles, the air quality in Germany and Europe is steadily improving. According to current figures from the Federal Environmental Agency, the number of measuring stations where the annual air quality limit value was exceeded fell by around 50 percent in 2019. The current emissions legislation is therefore having an effect. With the further increase in the number of state-of-the-art vehicle concepts in line with the latest emissions standards, which will be mandatory from 2020, the air quality in Europe will continue to improve.

VDA position on EURO 7/VIII:



In the VDA's view, the primary aim of EURO 7/VII is therefore no longer a blanket reduction in emissions, but rather to make the legislation clearer, streamline it and adapt it to new technological developments. In this sense, the VDA is in favor of the development of modern EURO 7/VII emissions legislation. New emissions legislation must have clear benefits for people and the environment. Improvements that have only marginal benefits but, at the same time, involve disproportionate costs for individual mobility must be avoided. In other words, regulations must be capable of effectively achieving the EU's air quality targets. In this context, the VDA proposes to develop a top-down impact assessment based on EU air quality targets and to derive from it cost-effective requirements that can achieve the targets set with regard to road traffic.

The type test will examine whether all EU rules for new models are met. In September 2020, the previous Directive 2007/46/EC, which sets out the framework for the type approval of vehicles of categories M, N and O, will be replaced by the new Framework Regulation (EU) 2018/858. This is a fundamental reform of the European type approval procedure. Among other things, market surveillance has been significantly expanded. The powers of national authorities will significantly increase. In addition, market surveillance by the EU Commission will be introduced at European level.

Whereas previous procedures have mainly involved testing prototypes prior to approval, member states will now also have to regularly randomly test vehicles already on the market in the countries concerned. The results will then be made publicly available.

When new vehicle types are type-approved, this data is checked by technical services under the control of the respective national approval authority – in Germany the Federal Motor Transport Authority. The European Union has thus further harmonized the handling of type testing. Type-approval authorities and technical services must now comply with stricter requirements and undergo checks or audits. National licensing authorities will be able to initiate inspections if there is a suspicion of false information from a manufacturer. Type approval for the whole vehicle will be limited to five years if no

addendum is made for approval. For commercial vehicles and trailers, the period is limited to seven years if no addendum is made. It is also planned that the software in electronic systems will be disclosed to approval authorities and technical services. In this way, manipulations are to be prevented.

EU type approval affects around 13 million passenger cars and 2 million commercial vehicles each year. The basic concept of the existing type approval will remain unchanged – but with increased transparency in all processes. The authorities have wide-ranging control and intervention options.

The new regulation also establishes rules for access to repair and maintenance information, uniform implementation of recalls across the EU and the publication of information on recalls. As there is limited experience with the type approval regulation, the BMVI (Federal Ministry of Transport and Digital Infrastructure) has set up a national “Type Approval and Market Surveillance” forum for processing open questions regarding the new type approval regulation and for dealing with software updates.

The financing of market surveillance is the responsibility of the member states. In Germany, the German Federal Motor Transport Authority plans to inspect 70 vehicles in the medium term, and up to 200 vehicles per year in the long term.

New rules for the European type approval procedure have been in force since September 1, 2020.

The basic concept of the existing type approval will remain unchanged – but with increased transparency in all processes.

# Development of Electromobility in Germany

The German automotive industry agrees that the ambitious CO<sub>2</sub> target for 2030 must be reached primarily with electric cars (BEV, PHEV). The automotive industry cannot meet this challenge alone. Many stakeholders must play their part. The most important task now is to rapidly expand the charging infrastructure for electromobility. This is because customers who do not have confidence in a nationwide charging infrastructure are hesitant about purchasing an e-vehicle.

## Charging infrastructure – the foundation for electromobility

The coalition agreement already sets out ambitious targets at the federal level for the further expansion of public charging infrastructure, and for simplifying the construction of charging facilities in the private sector. The installation of charging equipment for electric vehicles by tenants and homeowners will be made easier by law. In addition, it is planned to improve the legal conditions for user-friendly payment systems. The aim is to make at least 1 million public charging stations available for electric vehicles by 2030.

The VDA and its member companies support the consistent implementation of the charging infrastructure master plan and the “National Control Center for Charging Infrastructure” initiated by the Federal Ministry of Transport and Digital Infrastructure (BMVI), which is responsible for coordinating federal and state activities in addition to the calculation of requirements and the planning of the coordinated construction of a Germany-wide fast charging network. This includes supporting local authorities in planning and implementing the construction of charging infrastructure.

The VDA and its member companies support the implementation of the charging infrastructure master plan.



In June 2020, the Coalition Committee adopted a EUR 50 billion future package to combat the consequences of the coronavirus crisis, and to safeguard Germany's prosperity and strengthen Germany's future viability. It includes, among other things, future investments in climate technologies and investments in electromobility, such as:

- The extension of the currently applicable ten-year motor vehicle tax exemption for pure electric vehicles until December 31, 2030
- A doubling of federal premiums as a new “innovation premium”
- Research and development in the field of electromobility and battery cell production
- The modernization of bus and truck fleets with alternative propulsion systems, in particular the promotion of e-buses and their charging infrastructure
- The procurement of municipal commercial vehicles with fuel cell drive including the necessary hydrogen infrastructure
- Fleet exchange programs for “social services and craftsmen”
- Development of a modern and customer-friendly charging infrastructure



### Germany is one of the leading markets for electric mobility

The market share of German group brands in electric cars is increasing.

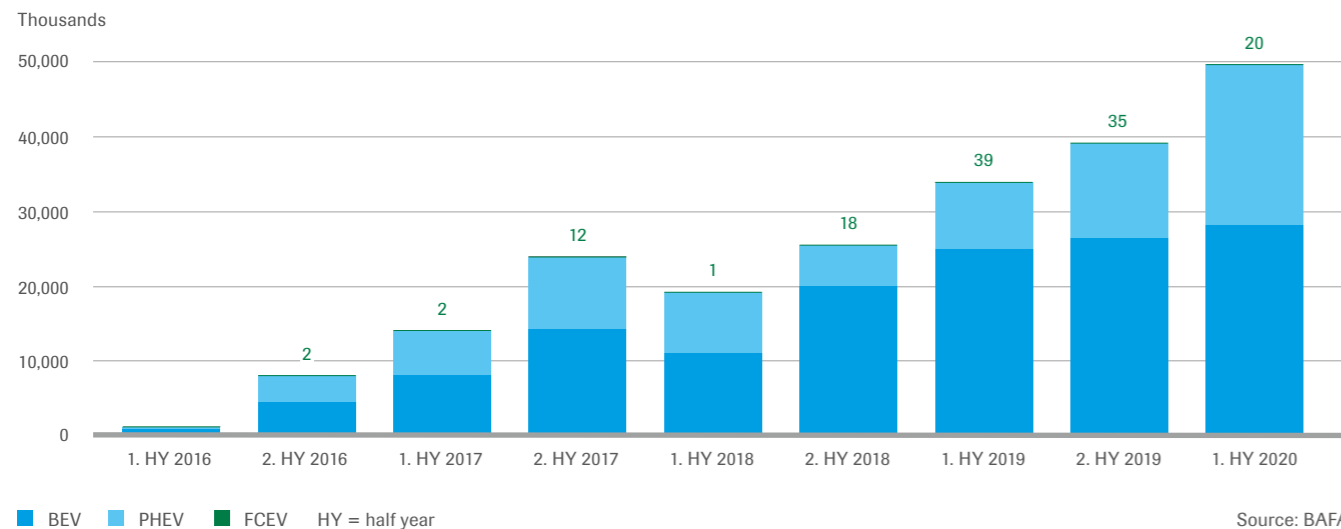
The German automotive industry is pressing ahead aggressively with its electrical offensive. In the first five months of 2020, the number of new registrations of electric cars in Germany almost doubled to 75,100. The market share of German group brands has risen to 66 percent (previous year: 48 percent). Seven of the ten best-selling e-models are made by German manufacturers. There are currently around 70 e-models available, and by 2023 this number will more than double to upwards of 150 models. On June 1, 2020, the total of the German electric car fleet was approximately 300,000. By 2024, the VDA member companies will invest EUR 50 billion in electromobility. The innovation dynamics of the automotive industry can also be demonstrated by patent statistics: Four out of ten patents granted for electric drives come from suppliers and manufacturers from Germany.

### Environmental bonus – strong leverage for a successful market ramp-up

The environmental bonus will promote the replacement of the automotive fleet with more climate and environmentally friendly electric vehicles. According to the interim report of the Federal Office for Economic Affairs and Export Control (BAFA), 214,269 applications for the environmental bonus had been received by June 30, 2020.

From 2020, federal funds of EUR 2.09 billion are earmarked for the increased bonus until it is paid out in full, at the latest until 2025. Funding is provided by the Federal Government and the automotive industry. This environmental bonus remains unaffected by the “innovation premium” decided in the light of the coronavirus crisis. Upon fulfillment of all requirements, the environmental bonus will be granted from June 4, 2020 until December 31, 2021 in the amount of EUR 9,000 for purely electric vehicles, and EUR 6,750 for plug-in hybrids at a maximum net list price of EUR 40,000. Above a net list price of EUR 40,000 up to a maximum of EUR 65,000, an environmental bonus of EUR 7,500 is granted for purely electrically powered vehicles, and EUR 5,625 for plug-in hybrids. This means, for example, that up to a net list price of an electric vehicle of up to EUR 40,000, federal funding increases from EUR 3,000 to EUR 6,000. For the taxation of purely electric company cars at 0.25 percent, the purchase price limit is raised from EUR 40,000 to EUR 60,000.

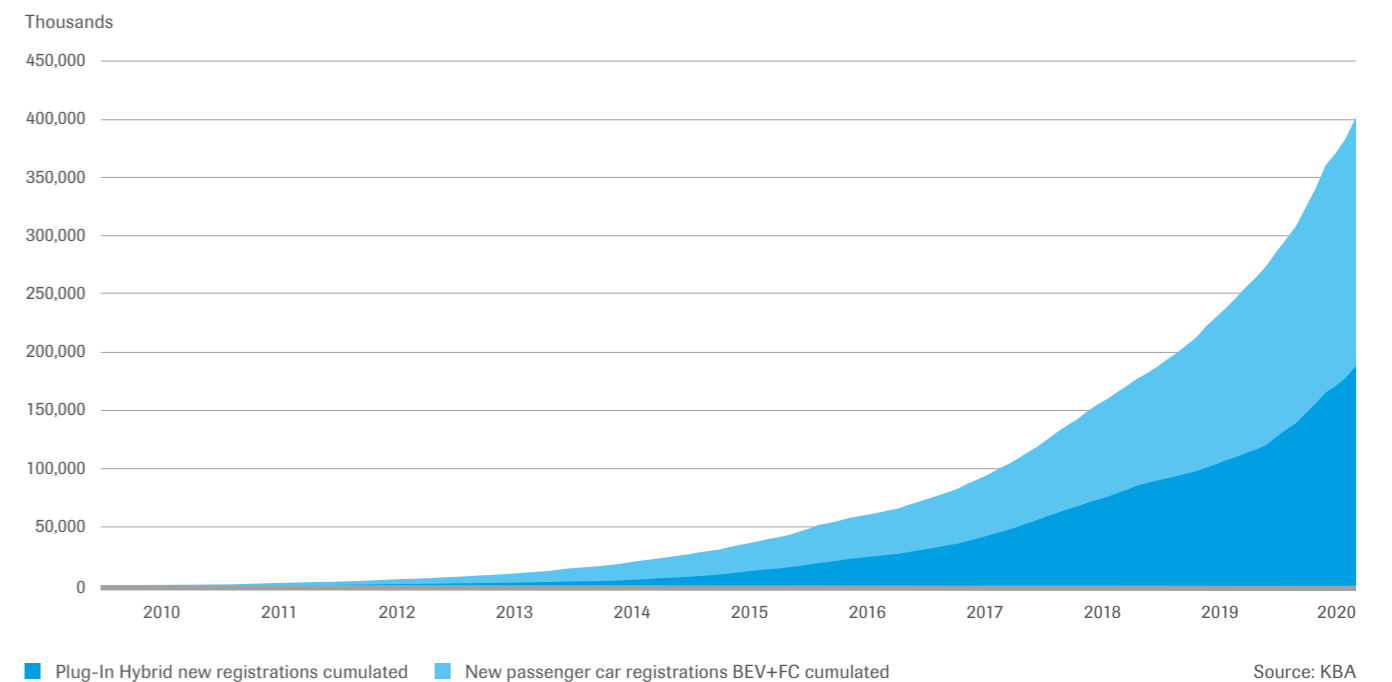
#### Environmental bonus



### Market ramp-up by 2030

The National Platform for the Future of Mobility (NPM) is a body set up by the Federal Government to monitor and analyze current and future trends in the field of mobility. The VDA and its members participate in the NPM working groups and address relevant issues in the steering group. The aim is to ensure a high level of employment along the entire value chain and the leading position as an industrial, scientific and technological location. Based on the scenarios developed by Working Group 1 “Climate Protection and Transport” for achieving the climate protection targets, the VDA has calculated a run-up scenario with the target figure of 10.5 million electrically powered vehicles in the vehicle fleet, which shows the development of the share of e-vehicles in all new passenger car registrations from 5 percent in 2020 to 69 percent in 2030. Based on the conservative extrapolation model of the NPM, Europe would have several, about 33 million, electric vehicles in 2030.

Cumulative new passenger car registrations until 30.06.2020



### Electric Mobility International

The e-models offered in many markets are dominated by German group brands. In Germany and Japan, just over 60 percent of the models are made by German group brands. As a result, German group brands were able to increase their market share in the first four months of 2020 due to their model offensive in the majority of the countries surveyed. This applies to both the domestic market (from 46 percent to 65 percent) and Norway (from 30 percent to 53 percent). For the EU, including the UK, the increase is 12 percentage points to 43 percent. In China, the market share jumped from 4 percent to 11 percent in a significantly declining market. In the United States, the 8 percent market share from a year ago was increased by 1 percent. Both Japan and South Korea recorded slight market share gains.

### Plug-in hybrid vehicles –an essential part of the transformation

Plug-in hybrids can only reach their potential with the appropriate charging infrastructure.

The plug-in hybrid combines the best of two worlds: locally it runs emission-free, and on long-distance routes it has no range problem. Therefore, it is the right approach to promote the PHEV as modern mobility – especially as a bridging technology until electric mobility has become widely accepted. Every PHEV helps to improve the air in cities, and to protect the environment. By expanding the charging infrastructure in line with demand, plug-in hybrids could also make much better use of their potential. The German automotive industry supports the goal of plug-in vehicles (PHEV) being reloaded as regularly as possible, to operate them as efficiently and sustainably as possible.

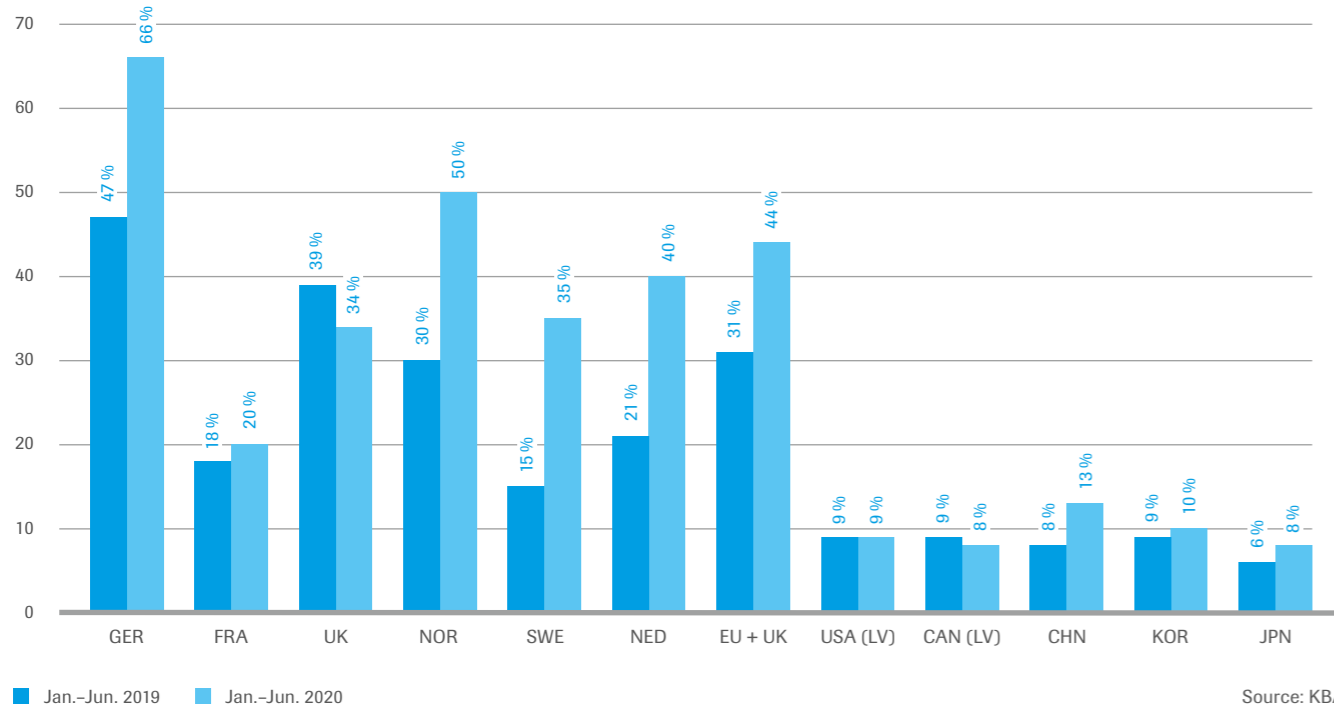
Starting on January 1, 2021 at the latest, all newly registered passenger cars will have on-board data storage (OBD), which stores the energy consumption of the vehicles. This can be read out via the OBD interface. The interface and the data to be stored are regulated in a standard way in Europe.

Electric models approved in international markets (January to March 2020)

Market	Number of models	Thereof German	German share
Belgium	119	59	50%
China	390	31	8%
Germany	106	69	65%
France	164	68	41%
United Kingdom	106	53	50%
Japan	44	23	52%
Canada	53	20	38%
Netherlands	126	57	45%
Norway	116	53	46%
Sweden	115	61	53%
South Korea	35	14	40%
USA	49	13	27%

Source: KBA

Market shares of German group brands (January to June 2020)



Source: KBA

### Emission-free commercial vehicles in cities

Public passenger transport and urban freight transport are facing a profound change. Electric transporters and buses are already available on the market today. Especially on the “last mile” they provide lasting relief. The requirements can already be easily met today by electrically powered light commercial vehicles. Electric mobility in commercial vehicles offers enormous potential, also in terms of new logistical concepts. For example, quiet and local emission-free commercial vehicles could make it possible to supply and dispose of supplies to and from inner cities, even at night, in order to relieve rush hour traffic. Not to mention the use of electrically powered buses in public transport. For a sustainable conversion of bus fleets to alternative drive systems, however, not only the vehicles but also a suitable charging infrastructure and operation management systems are required. Heavy, electrically powered commercial vehicles, and commercial vehicles with fuel cells, will be used in long-distance transport.



# Other Alternative Drives

Hydrogen can be produced cleanly from renewable energies and can be stored in large quantities.

The German automotive industry continues to pursue a diversification strategy to reduce, supplement and eventually replace fossil fuels. The main aim is to make use of promising intermediate stages on the way to CO<sub>2</sub>-neutral mobility, which facilitate and, above all, speed up this transformation.

This includes, in particular, the use of natural gas in the transport sector, as natural gas has a CO<sub>2</sub> advantage of more than 20 percent over gasoline. CO<sub>2</sub> reductions of up to 10 percent can also be achieved compared to diesel.

## Natural gas

In the case of heavy-duty commercial vehicles, liquefied natural gas (LNG) can also become a promising alternative to diesel fuel. Above all, liquid natural gas has the necessary energy density, allowing long ranges. This makes LNG particularly suitable for long-distance freight transport. The VDA therefore welcomes the EU initiative to promote LNG infrastructure in the EU to facilitate the breakthrough of LNG mobility. In perspective, natural gas can also be used in diesel engines using the so-called HCCI process. What is needed here is "dual-fuel operation," which ultimately permits the combustion of natural gas in the diesel engine and thus has significantly higher efficiencies than use in a gasoline engine. However, these complex combustion processes are not yet ready for series production. Moreover, natural gas can already be replaced to a large

extent by biomethane today, which means that these vehicles can be operated in a largely climate-neutral manner in terms of their carbon footprint and their overall performance from fuel production to combustion.

## Fuel cell

In order to succeed in this energy transition, Germany must have the capacity to efficiently store and transform regenerative energy. Fossil hydrocarbons must be gradually replaced by regenerative alternatives. Hydrogen can be produced cleanly from renewable energies and can be stored in large quantities. With hydrogen, a space and time separation of energy production and energy use is possible.

Hydrogen is not only available to transport as an energy source but can also be linked to other applications in industrial sectors and household heat generation. Green hydrogen is the basis for green refinery and hydrocracking processes, an indispensable storage medium for volatile renewable electricity and an activator for sector coupling. After all, hydrogen is needed in industry, in the heat and energy sector and in the transport sector.

It can be assumed that between 8,000 and 12,000 PJ (petajoules) of e-fuels (including the use of pure hydrogen) are necessary to make the transport sector climate-neutral throughout Europe. This corresponds to a share of energy sources in the transport sector of more than 80 percent.

In order to achieve the EU-wide CO<sub>2</sub> fleet targets in 2025 and 2030, all vehicle manufacturers are relying on battery-electric mobility, mainly because of short-term targets. However, the fuel cell remains an area of focus in the automotive industry, because the use of a fuel cell enables long distances to be covered safely with a battery that is small compared to a battery-powered vehicle. Hydrogen propulsion will therefore play an important role, especially in automotive applications that can thus far only be covered by combustion engines. In this context, the Federal Government has developed a National Hydrogen Strategy and underpinned it with an action plan, which is to be further developed on an ongoing basis. The Federal Cabinet adopted the National Hydrogen Strategy on June 10, 2020. In addition to the climate policy aspects, hydrogen technologies also create many sustainable jobs, new value creation potentials and a global billion-dollar market. The aim is for Germany to maintain its global leading role in hydrogen technologies.

In the meantime, several production vehicles are on the road, and numerous demonstration projects are underway. In addition to its use in passenger cars, hydrogen and fuel cell technology is also suitable for heavy vehicles traveling longer distances. Several large cities are also impressively showing that hydrogen as a fuel for public transport can be a clean response to the high levels of particulate matter, exhaust fumes and noise that often occur in urban areas. The industrialization of the fuel cell and storage remains a challenge.

The fuel cell convinces by an exceptionally low dependence on raw materials compared to battery technology (only Pt, to >97% recyclable). The fuel cell is also relevant for Europe in terms of industrial policy.

By the beginning of 2020, the hydrogen filling station network in Germany is expected to grow to 100 stations. In the medium and long term, a dense Europe-wide H<sub>2</sub> filling station network has to be developed, which can serve both passenger car and truck equally and provides not only pressurized hydrogen, but also liquid H<sub>2</sub>. This requires the reinforcement of joint European initiatives such as H<sub>2</sub> Mobility Europe.

However, hydrogen is not only important in the transport sector, but also in the energy, industrial and electricity sectors. It would therefore generally make sense to set up efficient hydrogen production and infrastructure from the freeway to private households.

In addition to use in passenger cars, hydrogen and fuel cell technology is suitable for use in commercial vehicles traveling long distances.

# Networked and Automated Driving

Through automation and networking, mobility becomes more efficient, safer and more environmentally friendly.

Technical progress already allows for high levels of automation.

## The future of mobility

Today, mobility systems face a wide range of challenges. Globalization and urbanization are rapidly increasing traffic volumes and can bring transport systems to their capacity limits. Prosperity, growth and technological developments lead to a more mobile society and new mobility options. By 2050, 70 percent of all people are expected to live in cities. Automation and networking offer the opportunity to successfully meet these global challenges by making individual mobility more efficient, safer and more environmentally friendly. The ultimate objectives are to make transport even safer and more efficient. The challenges lie in achieving this with the increasing volume of traffic.

Thanks to technological progress, modern vehicles today have an increasing number of intelligent driver assistance systems. Through further development of sensor technology and improved and new system architectures in conjunction with high-performance algorithms, high levels of automation can already be achieved today. The increase in connectivity with other vehicles, road users and infrastructures allows the coordinated planning of driving maneuvers and rapid response to unexpected events. This leads to safer and more efficient mobility. Driverless driving and parking are important elements of this development.

Narrow parking spaces, confusing and dark parking spaces, cumbersome maneuvering or full parking spaces and garages are, in addition to the sometimes tedious search for a parking space, an integral part of today's parking experience for many drivers. One possible solution to the above challenges is automated valet parking, AVP for short. Currently available systems on the market already offer

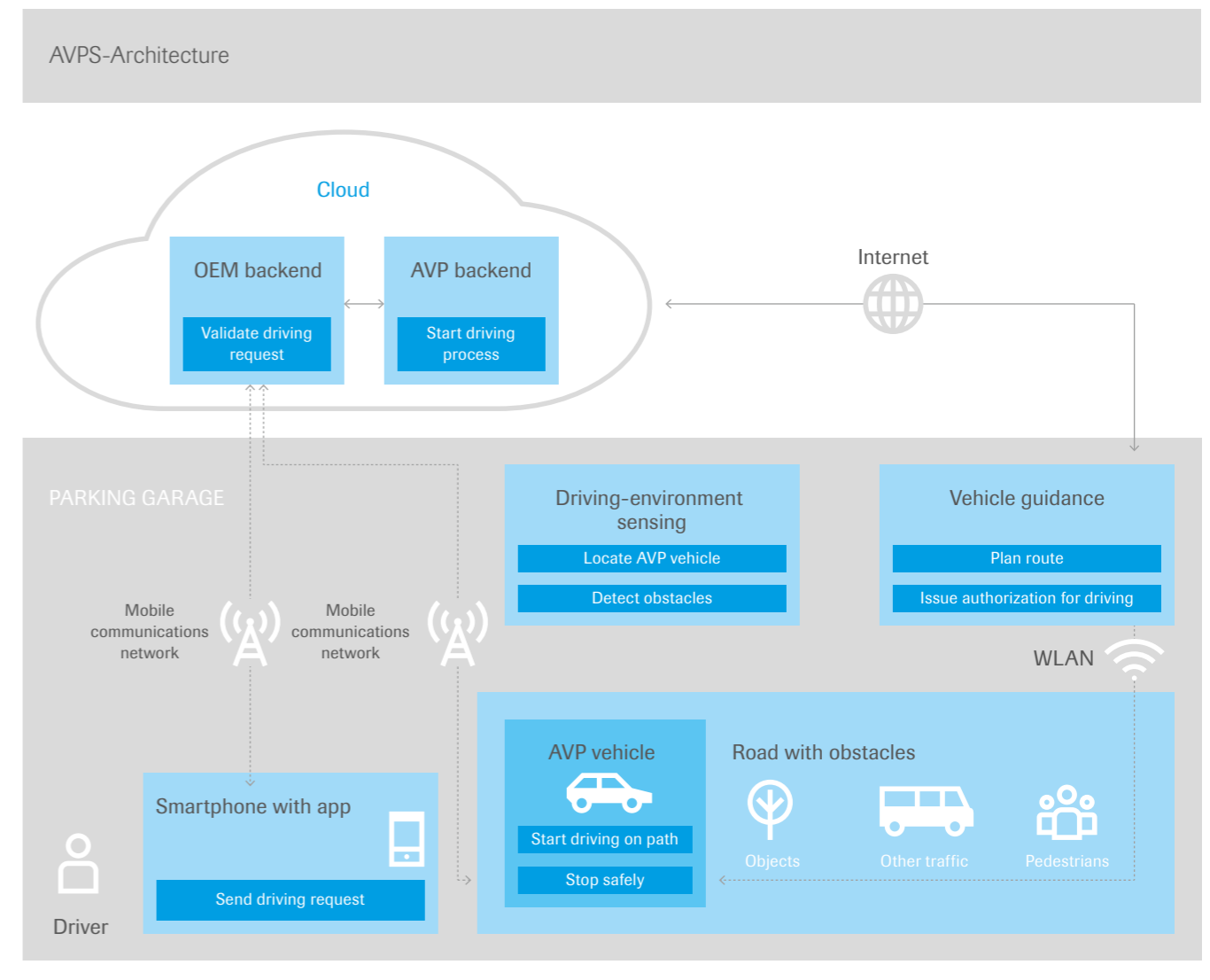
various functions that make parking more comfortable in difficult situations. However, the driver remains in charge of the parking process. With AVP, car manufacturers and suppliers offer a fully automated parking system. The driver hands over his vehicle at a so-called "drop-off area" and the vehicle drives independently, i.e. driverless, to a parking lot assigned to them. When the driver wants to take over the vehicle again, they communicate this via an app, for example, and the vehicle then drives itself to a "pick-up area" where the driver can collect it again. The advantages are obvious. For the driver, the AVP means more time and comfort, stress-free parking and a massive reduction in the number of possible parking violations. For the car park or parking area operator, parking space usage becomes more efficient, safety is increased, new customer services can be offered and the traffic flow is optimized.

Through the VDA, the German automotive industry is pushing ahead with the development of standards for the definition of a uniform "interface" between the parking garage infrastructure and vehicle, as well as ensuring compatibility and thus the availability of the systems. The automatized valet park system (AVPS) is expected to be one of the first SAE Level 4 automated driving functions to be launched. This will allow end customers to experience the future of autonomous driving and will also consolidate the leadership of German industry in the field of automated and networked driving.

Proof of the technical feasibility of the AVPS has been provided for various versions in different demonstrators and scientific projects. However, there are still several major challenges to be overcome for industrial and pre-commercial implementation. This includes, above all, the standardized interaction of parking

infrastructure and vehicle, including industrial feasibility, safe perception and situation interpretation (prevention of accidents and damage), legal approval and certification of the overall system and subsystems, and the business model of the involved stakeholders. All these

challenges cannot be handled by the automotive industry alone, but have to be solved in a corresponding industrial consortium involving partners from the automotive industry, AVPS providers and parking space operators.





## National Platform Future of Mobility (NPM)

In order to shape the change in mobility, the Federal Government has convened the National Platform for the Future of Mobility (NPM). The aim of the NPM is the development of intermodal and interlinking paths for a largely greenhouse gas-neutral and environmentally friendly transport system, which guarantees efficient, high-quality, flexible, available, safe, resilient and affordable mobility in both passenger and freight transport. The VDA and its members support the NPM and actively participate. The NPM's Working Group 3 "Digitalization for the Mobility Sector" looks at the key areas in which digitalization is the prerequisite for making tomorrow's mobility more environmentally and climate-friendly, more efficient, more comfortable, healthier and more affordable. At the end of 2019, AG 3 focused on the topic of autonomous mobility in road transport in its second interim report "Recommended Actions for Autonomous Driving." The key areas of identified action require results-oriented and concerted cooperation between industry, politics, civil society, the Federal Government, the states and municipalities. AG 3 recommends demonstrating autonomous mobility within the framework of a real 2020/2021 laboratory as

a space for innovation in the field of digitalization and mobility. This is actively supported by the VDA and its members.

## 5G - prerequisite for the traffic of the future

5G means a tenfold data transfer rate, compared to the currently available mobile standard 4G. Not only smartphone users expect this new technology – 5G also provides an important basis for the traffic of the future. Assistance systems that include networked and automated functions are already in use in many vehicles. A congestion assistant, for example, brakes and accelerates in slow-moving traffic within the lane, depending on how the vehicle in front behaves. But how quickly networked and automated driving beyond individual assistance functions will become established in Germany in the coming years depends to a large extent on the digital infrastructure in Germany. By 2025, a nationwide, dynamic mobile phone network should be available and all main traffic routes and urban areas should be covered by 5G. This is the only way to fully exploit the potential of networked and automated driving.

An efficient digital infrastructure is not only needed on the road, but also during the industrial production of ve-

hicles. Flexible, wireless-based communication technologies are necessary for efficient and agile production, and 5G technology provides them. In the age of the Internet of Things, automobile manufacturers and suppliers are focusing on automated production processes, for example, for real-time monitoring and control in production. In addition, 5G can be used to implement completely new industrial applications that place the highest demands on the reliability and real-time capability of transmission. For example, driverless transport systems can be linked with mobile robots or wirelessly networked, highly flexible production modules can be combined.

In 2019, the Federal Network Agency set a major course for the development of 5G technology in Germany. In June 2019, for example, the bidding process for mobile radio frequencies in the 2 GHz and 3.6 GHz ranges was completed. Mobile operators can not only use the frequencies for 5G network expansion, but can also use them for improved mobile coverage in Germany. In November 2019, the Federal Network Agency launched the application procedure for local networks for the frequency range from 3,700 to 3,800 MHz. The frequencies can be used in particular for Industry 4.0, but also for agriculture and forestry. Local frequencies are the basis for private 5G networks on factory premises and for geo-

graphically limited industrial applications. They give the VDA member companies the necessary leeway to expand 5G safely, quickly and efficiently, and independent of network operators. Local networks complement the nationwide network expansion of mobile operators and guarantee the necessary supply density with 5G for industrial applications.

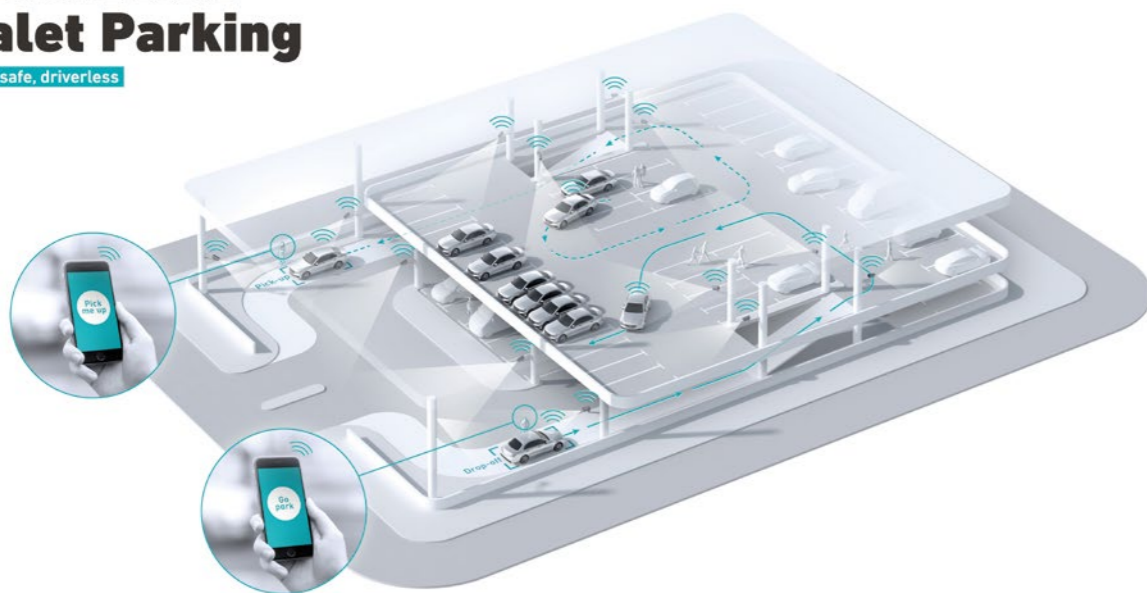
5G is about the country's digital future – the German automotive industry can be a pioneer as an innovative user of technology. A rapid introduction of 5G strengthens the business location and contributes to establishing Germany as the leading market and leading provider for this technology.

5G is an important prerequisite for the traffic of the future.

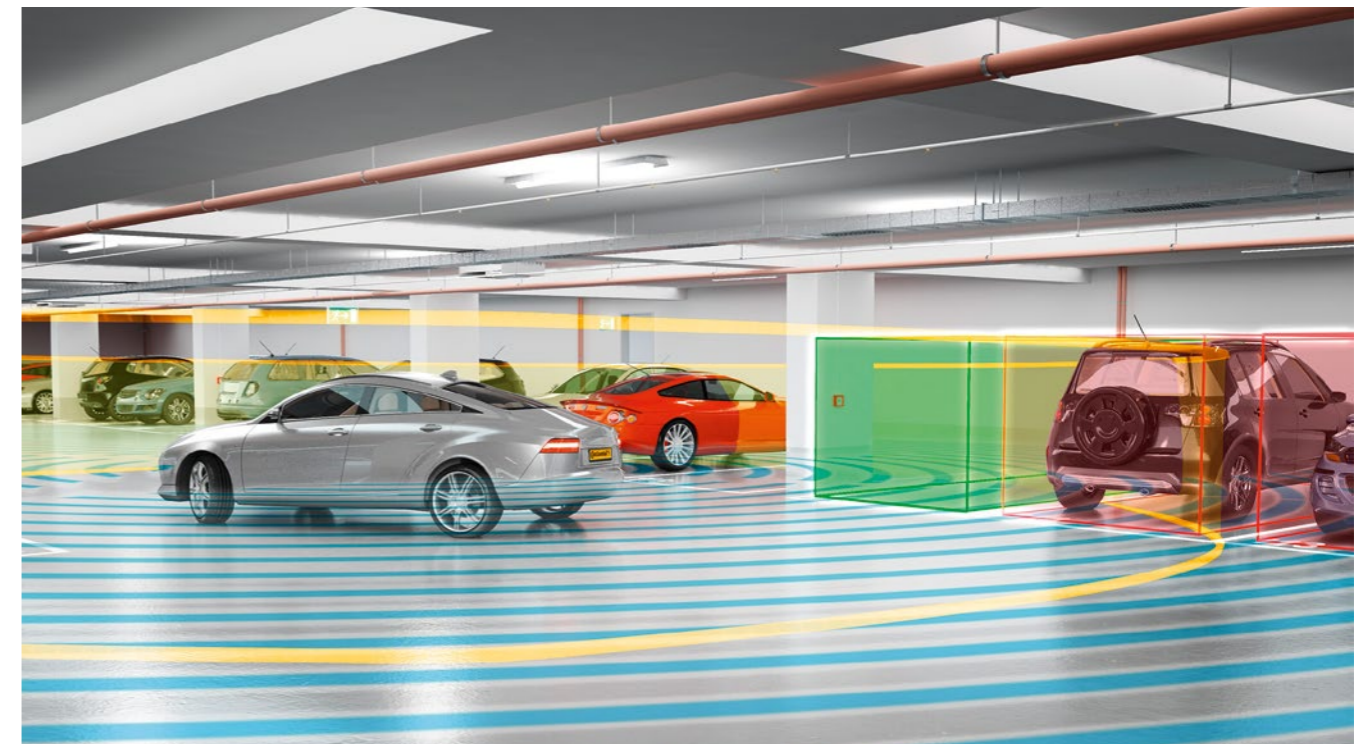
5G strengthens Germany as a business location.

## Automated Valet Parking

Fast, safe, driverless



Source: Robert Bosch GmbH



Source: Continental AG



# Research Association for Automotive Technology (FAT)

The Strategy Group for Research, Innovation and Funding Policy aims to shape the transformation process of mobility with society, science and politics.

## Development of an industry technology roadmap

Strengthening the German science and innovation system requires close cooperation between the federal and state governments, science and industry. Using a holistic approach, the Strategic Group for Research, Innovation and Funding Policy (FIF) of the Research Association for Automotive Technology (FAT) wants to shape the transformation process into the mobility of the future together with society, science and politics.

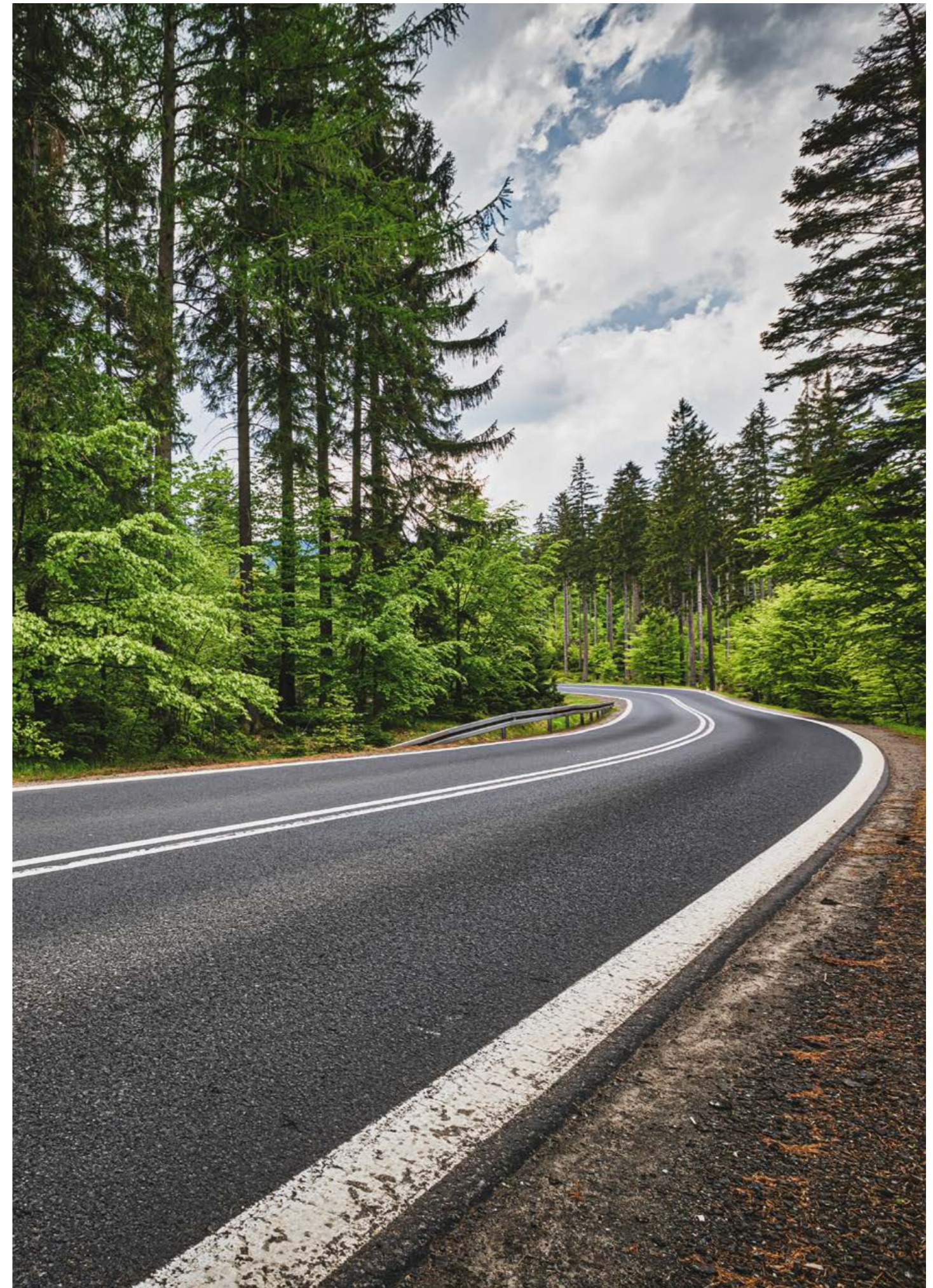
A key element is the development of long-term, interdisciplinary research roadmaps. In this context, the industry defines key topics for its future research activities and takes into account innovation policy trends in the areas of climate protection, digitalization and public participation. These key topics will be examined in greater depth with the support of the scientific community, mirrored in existing funding programs, and future funding requirements will be discussed jointly with politicians.

Need for action identified for research and innovation in six areas.

Alternative drives and automated and networked driving shape the vision of the vehicle of the future. These trends are accompanied by a greater integration of the automobile into the infrastructures and networks for energy, data and transport. At the same time, providers of mobility and logistics in urban areas are faced with the challenge of adapting products and services to individual customer needs, on the one hand, and reconciling them with the collective expectations of the public regarding the fair use of land and resources, on the other.

In view of the transformation described above, automotive engineering is facing a whole series of unresolved tasks. From the perspective of the German automotive industry, there is a particular need for research and innovation in the following areas:

Infrastructure	Production
Fuel and storage technology	Mobility and logistics concepts
Drive and vehicle (cars, trucks + trailers, buses)	Connected and automated driving
Substances and Materials	





The products, services and production processes required for transforming the automobile and mobility involve great leaps in innovation, offering great potential for added value for society, the economy, and the environment. However, they require special framework conditions. Without public funding, there is a danger that opportunities will be wasted and the established position of the German automotive industry in international competition jeopardized. The six areas of action mentioned above are to be further developed in joint workshops in dialog with science and politics. The detailed research and innovation roadmap then available can serve as a suggestion for national and European funding policy.

Other companies are invited to participate in this process.

### Fast, broadband data transmission between truck and trailer as a prerequisite for the highly automated driving of articulated vehicles

The FAT Working Group 9 has taken up the urgent question for commercial vehicles of how trucks and trailers of different brands can communicate in a standardized way in the future. To this end, a research project was initiated, which has been carried out by the Research and Transfer Center e.V. of the Westsächsische Hochschule Zwickau University of Applied Sciences since January 2019. The EU General Safety Regulation, which is currently being revised, will contain a number of active safety features relevant for approval in the commercial vehicle sector. This will increase the number of assistance systems in new vehicles.

Numerous sensors are installed in the vehicles for the identification of objects in the environment, which are networked with each other and analyze the incoming data via increasingly powerful computing units. However, additional sensors also require increasingly powerful in-vehicle bus systems that are capable of meeting the necessary requirements for data rate or response times. In the passenger car sector, these new systems are relatively easy to launch on the market, as they are the sole responsibility of the relevant OEM. In contrast, commercial vehicle combinations consist of articulated trucks and semi trailers from different manufacturers, which are often interchanged in practical operation. The development of a powerful and standardized interface for data communication between vehicles is the key challenge here. Today, the displays and actuators are mainly located in the towing vehicle. However, additional sensors in the trailer are required to map other future functions. Furthermore, the usage time must also be taken into account, which usually considerably exceeds that of passenger cars. New developments have to be stored in addition to existing systems in the vehicles for a long time, which leads to higher system costs.

Currently, two CAN connections with a 125 kbit/s data rate are used for data transmission between truck and trailer (Figures 1 to 3). Some of the messages transmitted here are relevant for ECE R 13 and are already provided with response times, making a further increase in the bus load difficult. The CAN data rate between the towing units and the trailers is not sufficient for the sensors used for environmental detection for highly automated driving functions. The use of communication systems with higher data rates and shorter response times will therefore replace or supplement this CAN data transmission in the foreseeable future.

A FAT working group is investigating how trucks and trailers of different brands can communicate in a standardized way

The development of an interface for data communication between vehicles is the crucial challenge.

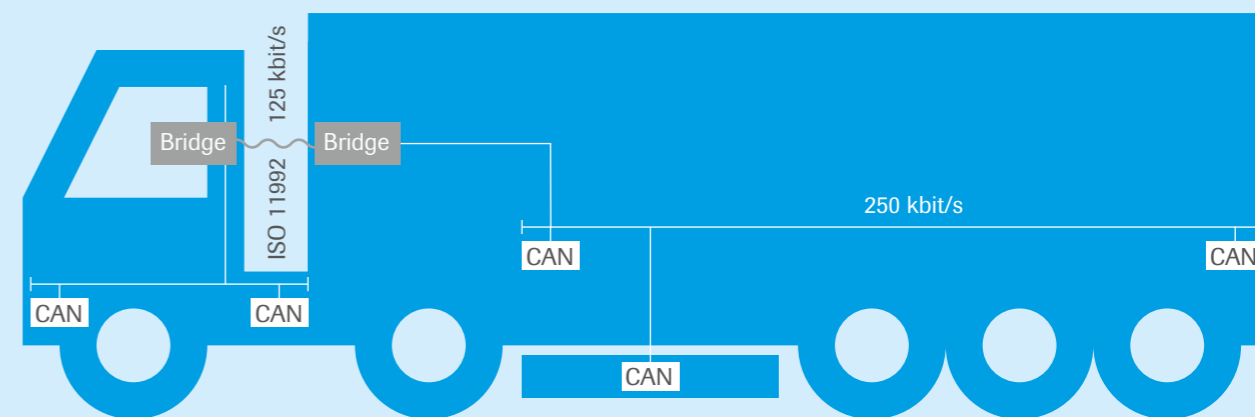


Figure 1: ISO 7638 spiral cable, 7 pins, 1 CAN pin pair



Figure 2: ISO 12098 spiral cable, 15 pins, 1 CAN pin pair

Figure 3: Schematic representation of ISO 11922 CAN in commercial vehicles as a point-to-point connection for a CAN line



Source: Schematic representation of the FAT WG 9 "Driving dynamics of commercial vehicles"

In the current research project, two possible paths for a new interface with data transfer rates of 100 Mbit/s and 1 Gbit/s are therefore being investigated. The different variants are being tested and will be used to make decisions regarding a future standardization.

# Production and Logistics

The first half of 2018 was dominated by the VDA committee reform. In cooperation with the VDA Logistics Committee, the classic structure of steering committees, working groups, task forces and expert groups was transformed into a lean and efficient project structure. Working groups from other fields were spun off or dissolved. The focus is now on logistics core competencies. The committee has become a strategic steering body that, supported by five working groups, flexibly initiates and directs projects on current issues.

## Logistics

The "Sustainable Transport" project is intended to tap the potential of manufacturers, suppliers and carriers.

The economic megatrends of sustainability, digitalization and automation also shape the agenda of logistics. Sustainability is about reducing CO<sub>2</sub> emissions in the so-called Scope 3 (supply chain). Here, the committee founded the "Sustainable Transport" project in order to tap the potential of manufacturers, suppliers and carriers.

Digitalization is about the even closer networking of vehicle manufacturers and suppliers. Against the background of low inventories and long supply chains, networking is indispensable for stabilizing material flows and production. In addition to the existing "Auto-ID KLT" and "Digital Vehicle Logistics" projects, a new project for supplier evaluation was launched. It provides for a uniform structure for catalogs for measuring logistic process deviations. Furthermore, delivery reliability will be introduced as a new key figure that evaluates the criteria "quantity" and "time." XML formats for electronic data transmission will be created for both measurements. The topic of deviations will be additionally introduced to the project QDX interface of the VDA-QMC. An international recommendation with AIAG and Odette is also planned.

The focus of automation in logistics is on mapping the increased range of variants resulting from new drive types. This must take place in a static or even ever smaller traffic areas and logistics (for example, shrinking storage areas and narrower drive-ways for forklift trucks). In this area, the "FTS Communication Interface" project was continued. This interface enables production companies to use the conveyor technology of different manufacturers in an overall system and to allow intersection traffic. Due to the above-mentioned space problem, this recommendation is the basic prerequisite for modern production processes within the framework of Industry 4.0.

## Production

In 2018 the VDA board decided to set up a new committee for production, the supervision of which was entrusted to the VDA's Logistics Department (renamed to Production and Logistics). After a kickoff meeting in November 2018, the board was established in February 2019. The VDA's production work focuses on the effects of digitalization on production, the training and further training of production personnel, the safeguarding and further development of production-relevant location factors, and the standardization of processes at the interface between human and machine. To this end, three projects were initiated in May 2019. The project groups will publish position papers on the topics target image of automobile production, CO<sub>2</sub> neutrality in production and data acquisition, and processing in the production environment. The target image identifies the challenges facing automotive production by 2030 and develops scenarios for how they can be met. The result is a vision of what automobile production could look like in 2030. On the important topic of CO<sub>2</sub> neutrality, concrete milestones for automotive production are being set in order to achieve the Paris climate target for 2050. Finally, the data collection group in production handles issues involving the use, protection and ownership of the data produced by plants and smart devices to optimize production processes.

In February 2019, a new Production Committee was established.

## The impact of the COVID 19 pandemic on the work of the committees

At the beginning of March 2020, the two committees for production and logistics began holding extraordinary meetings on the coronavirus, which were then held weekly when the shutdown began. Ad-hoc project groups were set up to prepare all the necessary measures for a stable start-up of industry. In logistics, the necessary communication processes between manufacturers and suppliers and the required lead times for production program adjustments were coordinated. Subsequently, all manufacturers on the committee complied with the eight to ten days' notice of the start of production. This ensured a stable supply chain during the restart. In the area of production, a VDA recommendation on infection protection in production, logistics and administration was developed within three weeks. This gave manufacturers and suppliers a coordinated list of measures that they could implement in their companies to protect employees and ensure production.

A stable supply chain is essential for the relaunch of production.

Link to the recommendation





A close-up, black and white photograph of a car tire tread. The tread pattern is visible, showing several grooves and sipes. The image is slightly blurred, focusing on the texture of the rubber. In the bottom right corner, the number '08' is printed in a large, white, sans-serif font.

# Safety and Standards

The German automotive industry makes its contribution to road safety by continuously developing and refining safety technologies for the protection of all road users. In addition, data protection and data security have top priority for the industry.

# Traffic Accidents in Germany

New historic low for road traffic fatalities.

Road traffic is safer today than in the past. In 2019, the number of road fatalities in Germany declined by a significant 6.6 percent to 3,059 compared to the previous year, reaching a new low. Compared to 1970, when well over 19,000 road fatalities were recorded in the Federal Republic alone (excluding the GDR), this is a decrease of over 84 percent – even though the traffic volume has more than tripled since then. In terms of traffic volume, this is a drop of more than 95 percent – from 81.6 fatalities per 1 billion vehicle kilometers to 4.0 fatalities.

## Speed limit – flexible and intelligent instead of rigid and blanket

In the second half of 2019, the public discussion about the introduction of a general speed limit picked up momentum again – among other things with the argument that such a limit would improve road safety. In fact, however, there is no clear statistical correlation between a general speed limit and road safety. This is demonstrated by both national and international comparisons. On German autobahns, for example, it can be seen that in some years the number of fatalities per 1,000 kilometers is even higher on limited sections than on unlimited sections. In other years, the opposite was true.

Fatalities per 1,000 kilometers of BAB  
(unlimited sections were safer than limited sections in 2015 and 2017)

	2015	2016	2017	2018*
With speed limit	15.6	15.6	15.3	16.4
Without speed limit	16.9	14.4	17.4	16.0

Source: Traffic accidents, Technical Series 8, Series 7, Federal Statistical Office and BaSt surveys; prepared by DVR  
\*Data for 2018 were calculated by VDA using DVR methodology

An international comparison also shows that a rigid speed limit does not necessarily make autobahns even safer. In Austria, France, Belgium and Italy, for example, between 1.76 and 3.53 people die in accidents per billion kilometers driven – more than in Germany, where 1.66 people die for every billion kilometers driven.

In 2019, the number of fatalities on German autobahns fell by 16 percent to 354 compared to the previous year. The last time there was a comparably strong decline was in 1992, when road safety increased sharply due to the rapid modernization of the former East German vehicle fleet. This decline far exceeded the decline in the overall road network (minus 6.6 percent).

In view of the available data, the VDA is against a blanket speed limit. Much more sensible are targeted speed limits at accident-prone spots or situation-dependent speed limits depending on the current weather, weather conditions and the current traffic situation – indicated by traffic control systems. They can best address traffic requirements and have been proven to be much more acceptable to road users. Rigid speed limits, indicated by metal signs that always specify one and the same maximum speed for all traffic and weather conditions, and for all times of day and night, do not fit into a modern, digital traffic system of the 21st century.

Rigid speed limits do not fit into a modern, digital transport system of the 21st century.



# Safety Systems for Commercial Vehicles

Driver assistance systems have been proven to increase safety and relieve the driver in critical situations.

Automatic emergency braking systems (AEBS), proximity control systems, electronic stability programs (ESP) and lane departure warning systems (LDWS) are only a small selection of the driver assistance systems currently in use in commercial vehicles, which have been proven to increase safety and relieve the driver in critical situations. The most frequent causes of serious truck accidents in recent years have been rear-end collisions, as well as lane accidents and accidents caused by departing from the lane. In order to prevent these accidents even more effectively in the future, the EU gradually declared automatic emergency braking systems, electronic stability programs and lane departure warning systems to be mandatory equipment for all new commercial vehicles.

Since 2019, this path has been continued with the publication of the revised General Safety Regulation (EU) 2019/2144. It defines numerous new requirements for commercial vehicles, which must be implemented from 2022 for new vehicle types, and from 2024 for all new vehicles. The background to this extensive revision is that the number of traffic fatalities is to be further reduced, and cyclists and pedestrians are to be protected to a greater extent than at present. The list of new systems to be introduced is long, and also covers numerous accident scenarios that have thus far received little attention.

For light commercial vehicles (N1), this means that in the future they will also have to meet the requirements for frontal, lateral, rear and side impact in accordance with UN R34, UN R94, UN R95, UN R135 and UN R137. In addition, all commercial vehicles, including buses, will in the future have to be equipped with tire-pressure monitoring systems, intelligent speed assistants with traffic sign recognition, accident data memories and warning systems in the event of tiredness and decreasing driver attention and concentration.

A number of new requirements for commercial vehicles are intended to ensure better protection for pedestrians and cyclists.

In addition, the operation of automated driving functions requires the mandatory installation of numerous systems for driver and vehicle monitoring. Particular attention is being paid to better protection of pedestrians and cyclists with a series of new requirements for all commercial vehicles. These include an advanced emergency braking system that reacts to pedestrians and cyclists, a collision warning system for pedestrians and cyclists, a blind spot assist, a reversing assist and improved direct forward vision by means of specifications for an extended field of vision.

Since pedestrians and cyclists, in particular, are often seriously or fatally injured in collisions with heavy-duty commercial vehicles when starting or turning in urban areas, the EU Commission sees the need for comprehensive improvements in this area. Some vehicle manufacturers and suppliers have already been offering the first turning assistance systems as original equipment, or for retrofitting, for some time. However, it is clear that equipping the entire vehicle fleet is a long-term process.

The German Federal Ministry of Transport therefore pushed ahead at an early stage with the UNECE in Geneva to define a new UN regulation for so-called "Blind Spot Information Systems" and initiated a national funding program for retrofitting cur-

rently registered commercial vehicles. This new UN Regulation 151 was adopted in March 2019 and will be implemented in European law with the revision of the General Safety Regulation. This is the first part for better protection of cyclists and pedestrians, which is currently being supplemented in various UNECE working groups by other new UN regulations that are being coordinated. As the first deadlines for the application of the General Safety Regulation have already been set for mid-2022, work on defining the technical requirements is progressing rapidly. In spring 2020, for example, the drafts for the two new UN regulations on reversing and starting assistance to protect pedestrians and cyclists in front of or behind the vehicle were presented. In the second half of 2020, the draft regulation on improved direct vision for heavy-duty commercial vehicles is to be completed.

In this work, the commercial vehicle manufacturers and their suppliers contribute their extensive expertise and assess the validity of the defined requirements with regard to their technical feasibility in elaborate test series.

A new UN regulation for so-called "Blind Spot Information System" was adopted in March 2019.

## The following systems are addressed in particular:

- The proximity cruise control automatically controls the speed of the truck and the distance to the traffic ahead.
- The emergency braking assistant (AEBS – Advanced Emergency Braking System) supports the driver in the event of inattention and initiates emergency braking if a collision scenario is imminent.
- With the turning assistant, various sensors monitor the kerb side of the vehicle and detect stationary and moving objects. In critical situations, a visual and acoustic warning is triggered.
- The lane departure warning system (LDWS) alerts the driver if the vehicle inadvertently leaves the lane.
- The intelligent light assistant uses a camera to detect oncoming vehicles and vehicles in front and adjusts the headlights so that they are not glared.
- The starting aid is an extension of the braking system that maintains braking pressure when starting on downhill gradients until the driver presses the accelerator pedal, to prevent the vehicle from rolling away.
- The topography-based adaptive cruise control (GPS and cloud) is an assistance system that uses stored map material and GPS position data to adapt the driving style to the conditions in a fuel-efficient manner.
- The assistance system for rear area monitoring uses ultrasonic sensors to automatically monitor the rear area when reversing. If a static or moving object is detected at a remaining distance of 20 to 200 cm, the system emits a warning to prevent a collision.

# Existing eCall Transmission Networks Must Be Maintained

Innovative driving safety and assistance systems have played a crucial role in improving road safety in recent years. The automatically activated eCall (emergency call) system, which was made mandatory for all car manufacturers throughout the EU on April 1, 2018, is a vital component in this context. This is because it combines vehicle sensors and mobile radio technology and thus contributes to improving road safety by shortening the alert and arrival times of rescue services.

The planned switch-off would mean that a life-saving technology, which was only made mandatory last year, would no longer function in certain European countries, even in new vehicles, from 2020 onwards. However, this is considered unacceptable by the automotive industry, and thus, also by many motorists. An update of existing eCall systems is technically impossible; even for the development of new eCall systems based on 4G or 5G, there are currently no binding technical standards.

The EU regulation stipulates that this data, which is important for rapid rescue operations, can be reliably transmitted throughout Europe, even from inaccessible locations and weakly structured regions. For this reason, the emergency call equipment in the vehicle must be developed and manufactured in such a way that it uses the most widely used mobile phone standards GSM (2G) and UMTS (3G) for eCall.

The EU Commission estimates that the eCall function can reduce the response time of emergency services in rural areas by 50 percent, and in urban areas by up to 40 percent. A significant reduction in the number of fatalities and serious injuries can therefore be expected.

The eCall system combines vehicle sensor technology with mobile phone networks that are available nationwide. This means that the vehicle involved in the accident immediately and automatically dials the 112 emergency number, which is valid throughout Europe, and establishes a phone connection to the nearest emergency control center. This automated function is triggered by the so-called crash sensors and the airbag controls. If the occupants do not react, for example, if they are unconscious, the control center can directly initiate a rescue operation. This is because eCall simultaneously transmits GPS data on the location of the car and the direction of travel via the mobile phone network. In addition, eCall can be activated manually by pressing a button.

However, many large mobile network operators are now planning to gradually switch off 2G/3G networks over the next few years as part of the rollout of 5G technology in order to free up the corresponding frequencies (starting in the first countries from 2020). In Germany, for example, 2G/3G networks are expected to be shut down between 2021 and 2025. In November 2019, the automotive industry appealed in the name of road safety to mobile network operators, as well as the relevant regulatory authorities and ministries, to maintain the existing eCall transmission networks. Therefore, notwithstanding the urgent need to roll out 5G technology, 2G and 3G networks must be available to maintain eCall functionality until at least 2035.

Much quicker response times of emergency services through eCall function.

Decommissioning of 2G/3G networks between 2021 and 2025.

# Quality

## Quality management in the automotive industry

For the automotive industry, the quality of its products is a key factor for business success. Quality is the core principle throughout the entire product creation process: from development and production to use by the customer. The VDA coordinates the entire quality management system of the German automotive industry. Its aim is to be a trendsetter for world-class quality methods. In addition, it is necessary to anticipate what is to be developed and implemented in quality management on the basis of megatrends. And finally, a high level of commitment to implementation in the value chain must be achieved. Extensive quality management (QM) methods and tools are used to achieve this. As part of the association's work, the VDA Quality Management Center (QMC), controlled by the Quality Management Committee (QMA), develops, implements, and internationalizes harmonized QM methods.

The entire quality management system of the German automotive industry is coordinated by the VDA.

## VDA Quality Management Center (QMC)

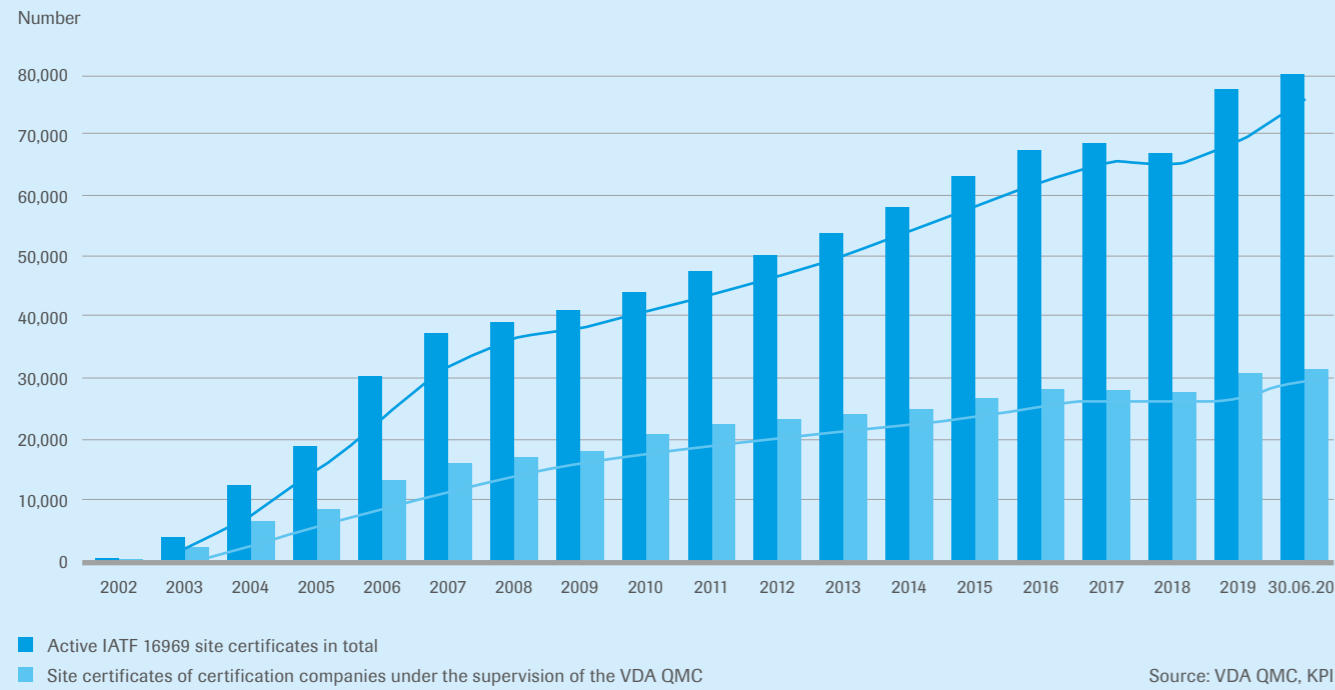
The VDA Quality Management Center (QMC) works with manufacturers and suppliers to develop new methods and techniques for quality management. The VDA QMC publishes all jointly developed definitions, regulations and requirements for quality management in the automotive industry. The highest VDA quality body, the Quality Management Committee (QMA), defines and further develops the VDA quality standards. It is made up of representatives of the VDA, the automobile manufacturers and the suppliers, and sees itself as a joint platform for developing and implementing harmonized quality strategies and methods. In the quality management working groups, experts from the companies prepare the decisions in detail.

Quality standards are defined and developed further in the QMA.

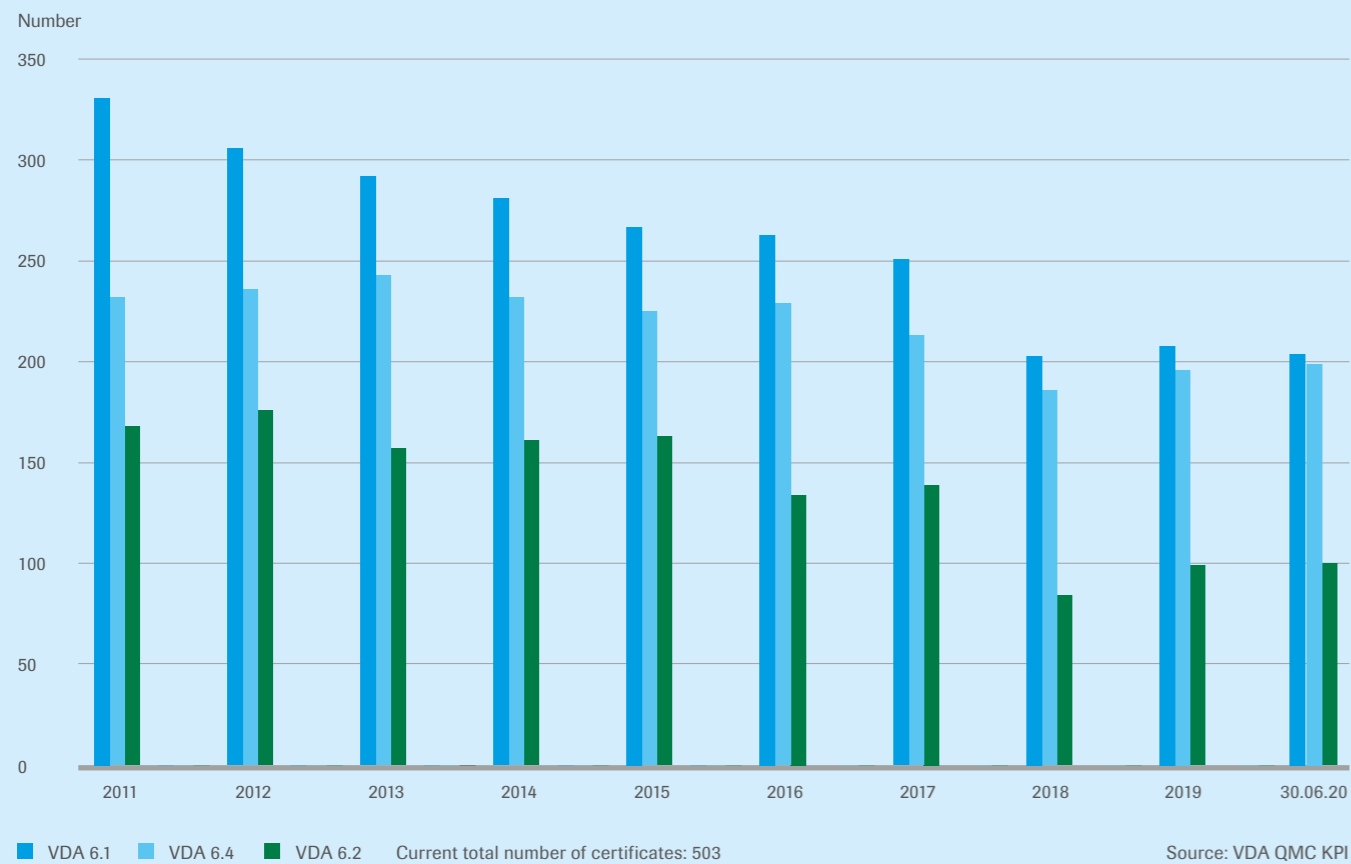
As the operational center, the QMC implements the decisions of the QMA. The QMC publishes and markets the VDA QMC volumes in which standards are published. In addition, it offers VDA QMC training courses in its own training and further education courses. Employees of manufacturers and suppliers are trained in the use of the QMC systems and standards. In addition to its own training and further education, licensed partners also offer QM training. The QMC is both a contractual partner and a supervisory body of the certification companies. Based on special certification schemes of the QMC or the International Automotive Task Force (IATF), of which the QMC is a member, these companies check the quality management systems of companies in the automotive industry worldwide and issue certificates. Compliance with the processes and standards of the QMC is usually a prerequisite to becoming a supplier for a company of the German automotive industry.



Development of ISO/TS/IATF certificates "Total IATF" vs. VDA QMC CBs

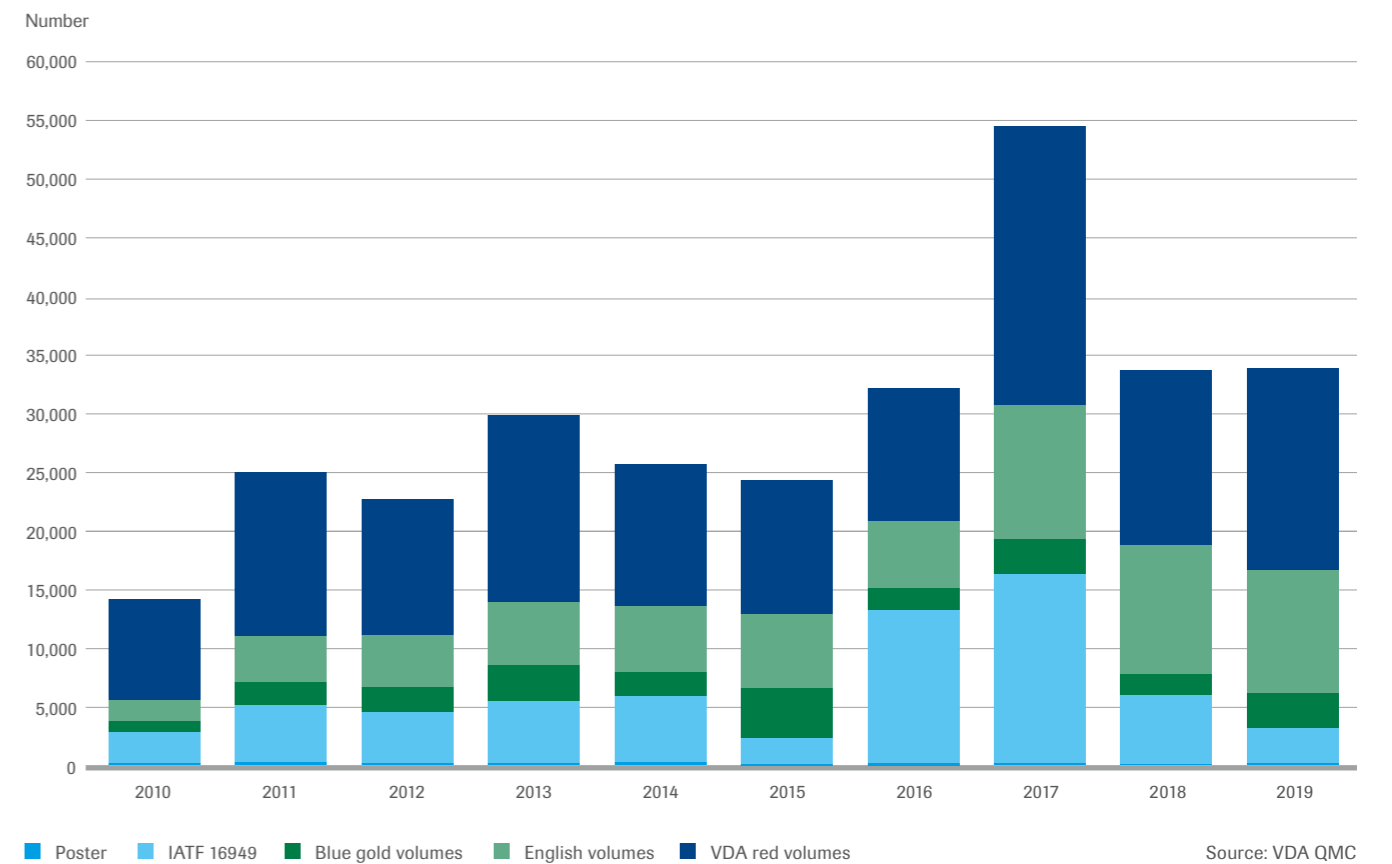


Development of VDA 6.x Certificates from 2011-2020

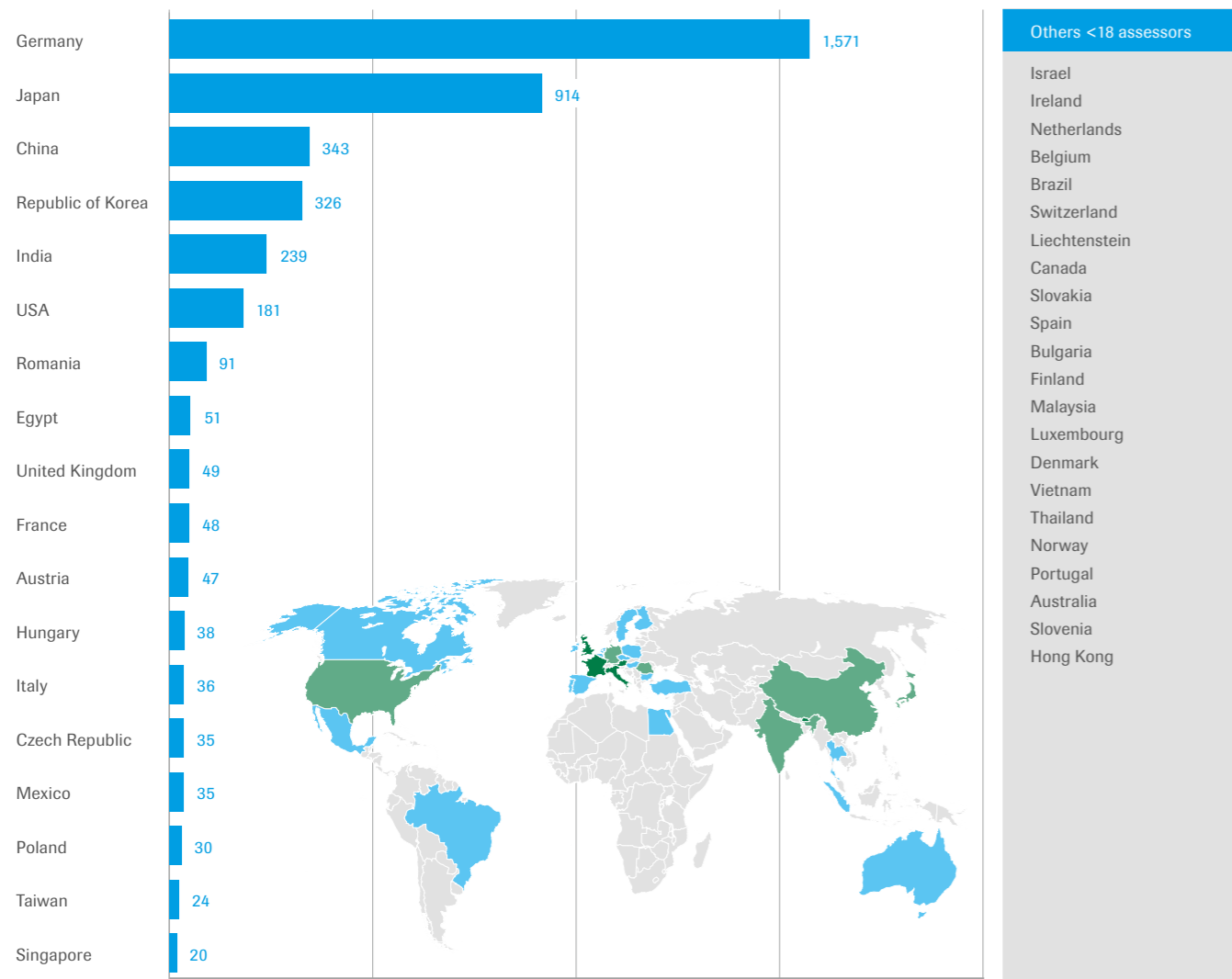


Examples of new, innovative technologies are AUTOMOTIVE SPICE (industry-specific standard dealing with the analysis, evaluation and improvement of processes in software-based system development. "SPICE" stands for "Software Process Improvement and Capability Determination"), working groups on the topic of car security management system, software over-the-air updates or 3D printing. These topics are frequently prepared in the Automotive Quality Institute (AQI) prior to work in the working group, and are also presented and controlled in the QMA. Globalization, sustainability and new technologies are the major challenges in quality management.

Development of VDA / IATF publications



Globalization Automotive SPICE

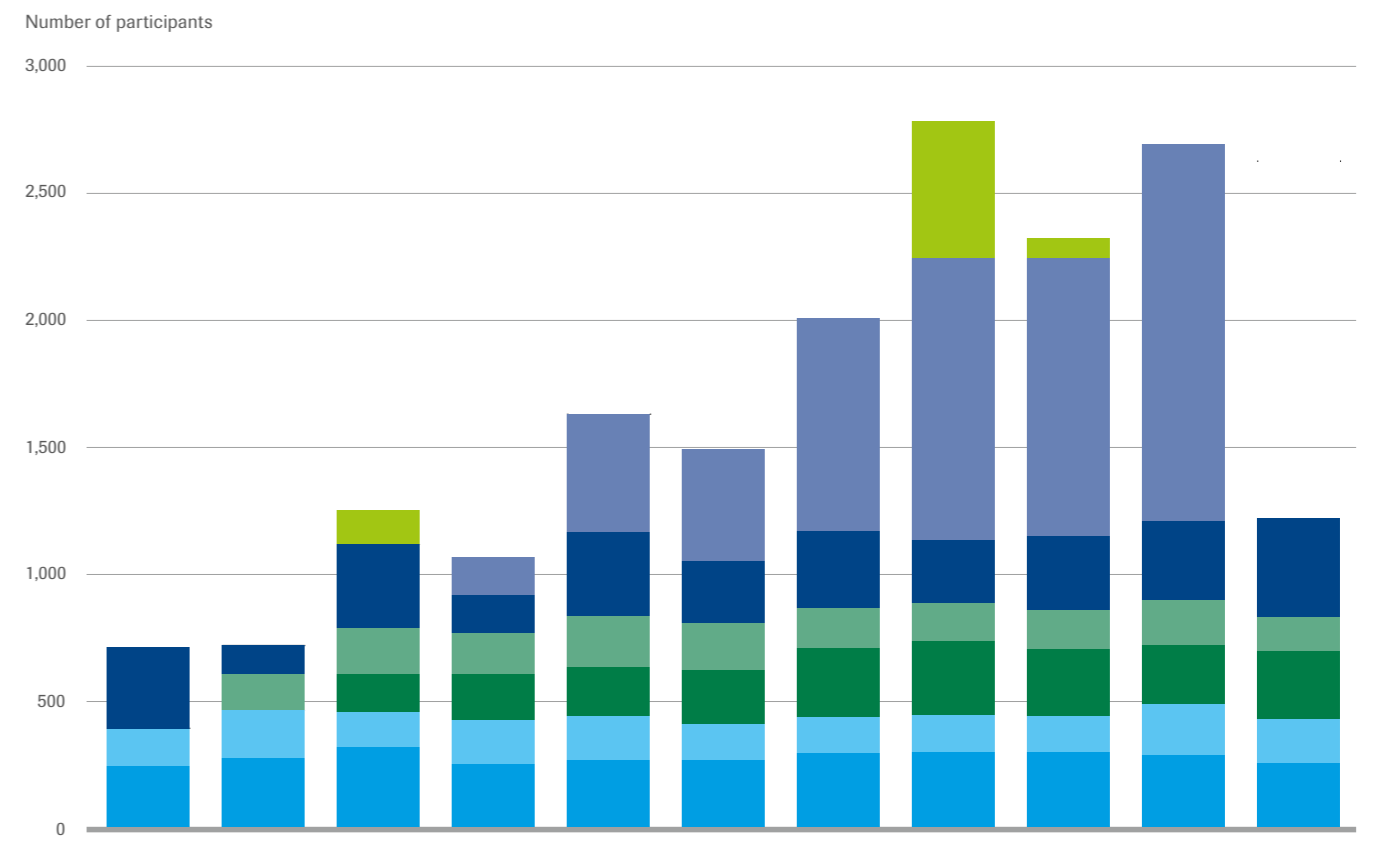


■ <20 assessors ■ 20-50 assessors ■ >50 assessors

Source: VDA QMC

The QMC also offers events and conferences as a platform to present new topics to the industry. Every year, around 2,500 participants attend regional conferences, symposiums, summit meetings and automotive SYS or PSCR events and are part of the discussions and presentations on current and forward-looking topics.

Number of participants in QMC events



■ VDA QMC committees ■ Symposium ■ Automotive SYS ■ Summit meeting ■ IAA ■ Regional conference ■ IATF / VDA 6.3 conference

Source: VDA QMC



Some 22,500 people worldwide took part in VDA QMC training sessions.

### International activities of VDA QMC

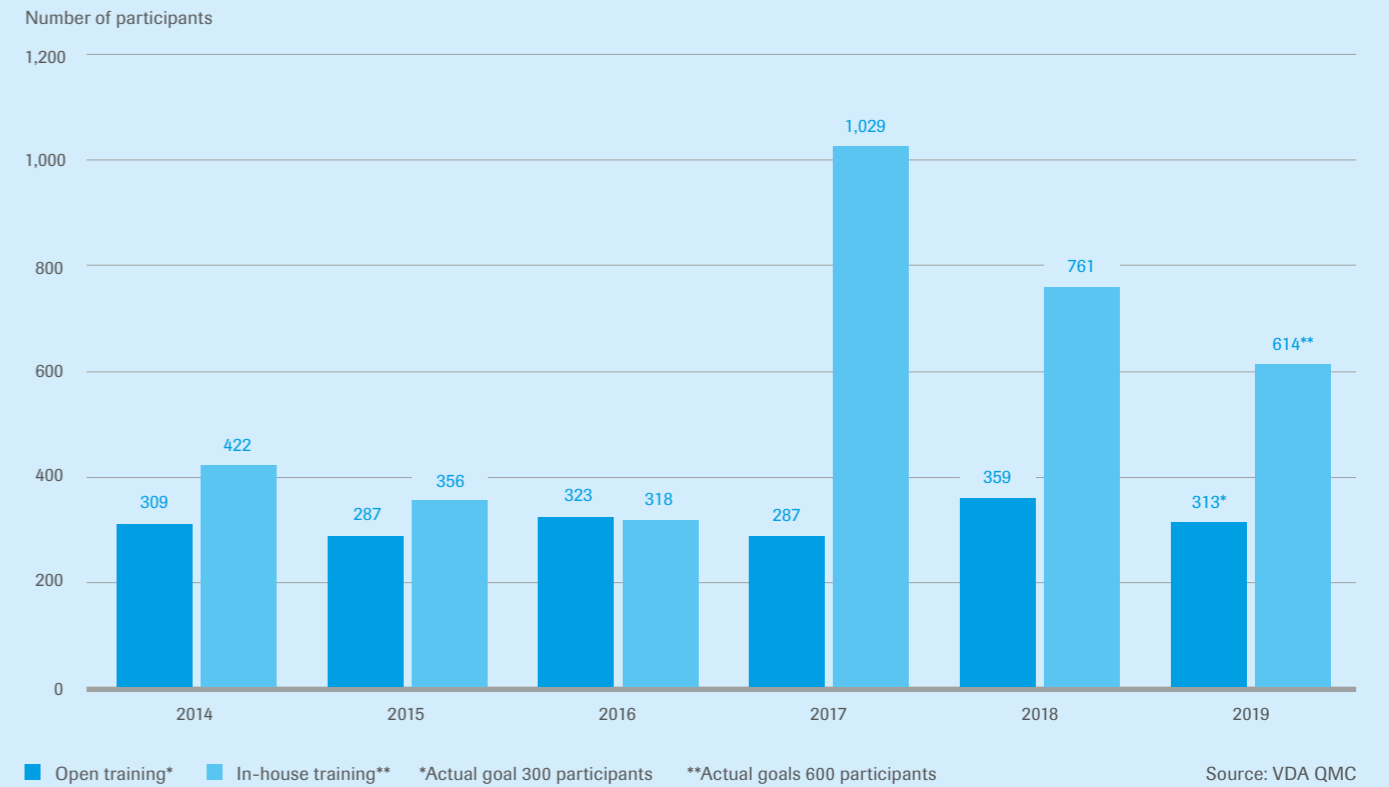
In 2019 the VDA Quality Management Center was able to stabilize its international activities at a high level. Worldwide, some 22,500 people took part in VDA QMC training courses. In China, the number of training participants rose to 5,500. VDA QMC training courses were also well attended in Russia, where over 900 participants were trained. With the new FMEA standard (Failure Mode and Effects Analysis), which was developed together with the American AIAG (Automotive Industry Action Group), a new milestone was reached in the cooperation during development, and subsequent implementation, of a publication.

### The tasks of the quality manager in the automotive industry

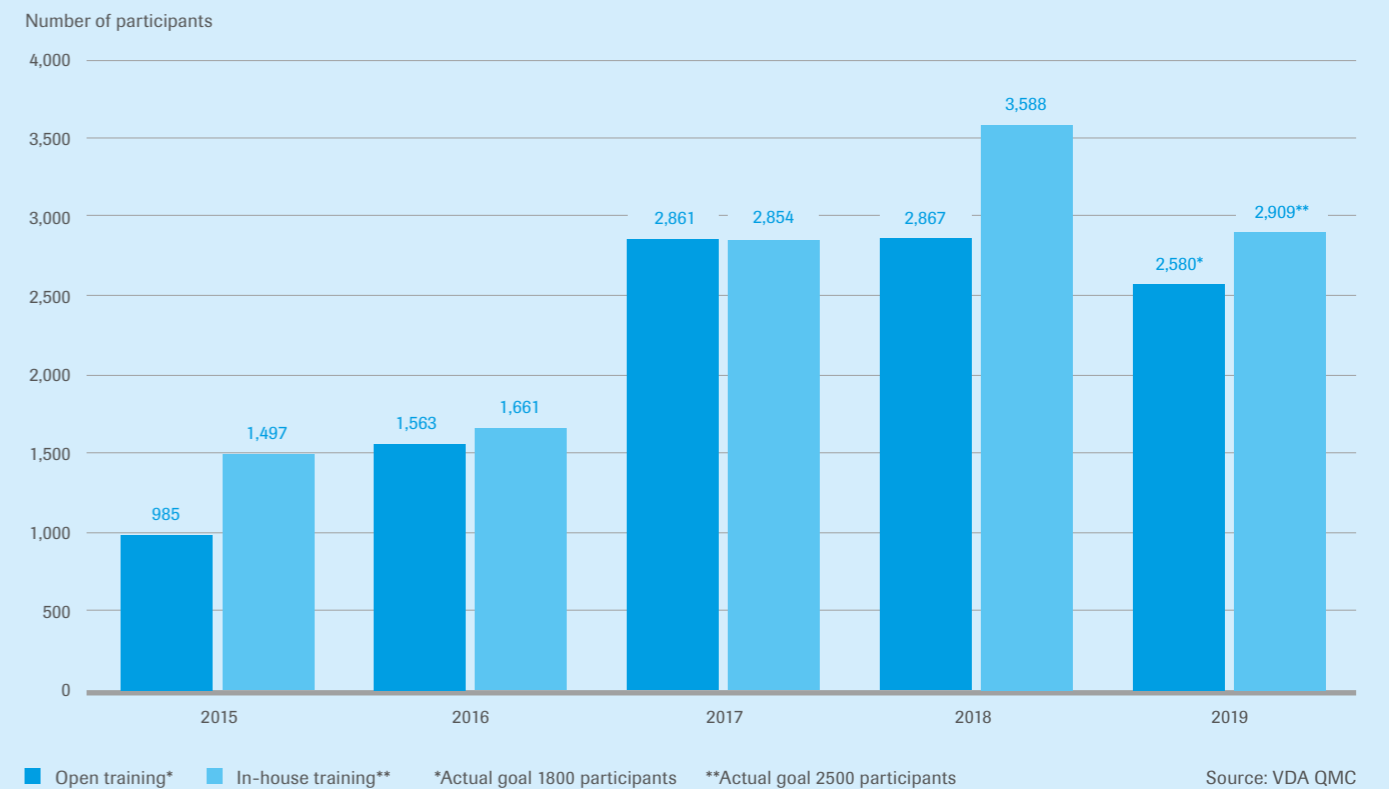
The quality manager is responsible for maintaining quality standards within a company. Their work covers the entire value-added chain. The quality managers monitor quality standards and, moreover, they continuously improve them. This not only involves the quality standards of the products manufactured within the company, but also the quality of the materials used. These may have to be checked on-site at the suppliers' premises, and quality engineers are also required to travel for work. The aim of the quality manager's work is to ensure that product quality meets customer requirements. However, quality costs must be kept to a minimum, processing times must be shortened and the production processes must be effective in this respect.

However, quality management does not just begin with production. The quality manager accompanies the development of a product from the very beginning. They establish the quality standards for new products, analyze the necessary processes, optimize them, draw up instructions on how to comply with the standards and monitor the entire development process. A major change in the job description of the quality manager is the continuous development of quality assurance instruments and procedures. Process-oriented regulations, guidelines and standards must be updated at shorter intervals. Afterwards, the new quality techniques and work instructions must be introduced into the company. During all work steps of the quality manager, even closer and integrated cooperation with other departments of the company will become indispensable: from development, design, production, materials management and procurement, and, if necessary, also with technical marketing, to sales and product management. Social skills will also become more important. Development is increasingly moving towards change managers and consultants.

### Development of QMC trainings in Russia



### Development of QMC trainings in China



# Automated Driving Safety

Industry-driven standardization is an important complementary instrument to the regulatory requirements issued by the state bodies. In addition to these specifications, development engineers need more detailed information to design new functions safely, also with regard to product liability. Such technical requirements, including relevant tests, as well as requirements on quality or interfaces between systems, functions or components, are usually described in norms and standards.

DIN or ISO create standards and specifications according to clear rules and ensure competitive neutrality and quality.

Today, technological developments are very dynamic. New functionalities are being introduced in vehicles almost seamlessly. With the products “technical specification” (TS), “public specification” (PAS) and “technical report” (TR), standardization offers instruments to make experience from test series, approaches to solutions or simulation results publicly available. For the development engineer, these publications also offer an important source of information. Renowned organizations such as the German Institute for Standardization (DIN), or the International Organization for Standardization (ISO), create standards and specifications according to clearly defined rules, thus ensuring competitive neutrality and quality.



DIN's Automotive Standards Committee, which is supported by the VDA, currently plays a leading role in coordinating the following important international standardization projects for the German automotive industry:

## ISO 21448 “Road vehicles – Safety of the intended function”

This document, published in 2018 as a “Public Specification”, is now being developed into an international standard.

## ISO TR 4804 “Road vehicles – Safety and cybersecurity for automated driving systems – Design, verification and validation methods”

This technical report summarizes the results of the development work of leading automobile manufacturers and their suppliers. The conversion of the TR into an international standard has already been decided.

## ISO 21434 “Road vehicles – Cybersecurity engineering”

This future, international standard regulates the secure management of data during the development and operation of vehicles, thus contributing to compliance with statutory data protection regulations.

The VDA also coordinates participation and opinion-forming in Germany with the following projects:

## ISO 24089 “Road vehicles – Software update engineering”

This project complements the regulatory requirements for handling software updates during operations.

## ISO 39003 “Road Traffic Safety (RTS) – Guidance on safety ethical considerations for autonomous vehicles”

This standard is intended to set ethical limits for the operation of autonomous vehicles. In the course of the further expansion of automated driving functions, it is to be expected that the automotive industry will launch further projects in the coming years to amend the regulatory specifications with additional requirements based on field experience. This is the only way to continue meeting product safety requirements for the increasingly complex systems for automated driving functions in a legally compliant manner.



# Standardization Roadmap for Automated and Networked Driving at VDA and NPM

## Quality management in the automotive industry

The standardization roadmap for automated driving presents the standardization committee landscape and provides an overview of existing standardization projects.

Standardization roadmaps on specific topics have established themselves as a tool to visualize and synchronize committee work. The VDA standardization roadmap for automated driving also offers an outlook on future standardization requirements.

Standardization has a long-term orientation. It is therefore important to ensure long-term participation and to keep an eye on activities. In order to efficiently use resources and to demonstrate the benefits of standardization in the field of automated and networked driving, the VDA published a standardization roadmap in February 2019. As was also published in the Electromobility Standards Roadmaps in the National Platform for Electric Mobility (NPE), the National Platform for Mobility (NPM) is also drawing up various priority roadmaps for intelligent load management, automated and networked driving, and sustainable mobility.

NPM's priority standardization roadmap is based on the VDA standardization roadmap including new projects initiated since February 2019, and further input from the newly involved stakeholders. In addition to content-related topics, procedural aspects of standardization were also examined. This standardization roadmap creates a cross-industry overview of which activities are already underway, and provides impetus for future activities in standardization.

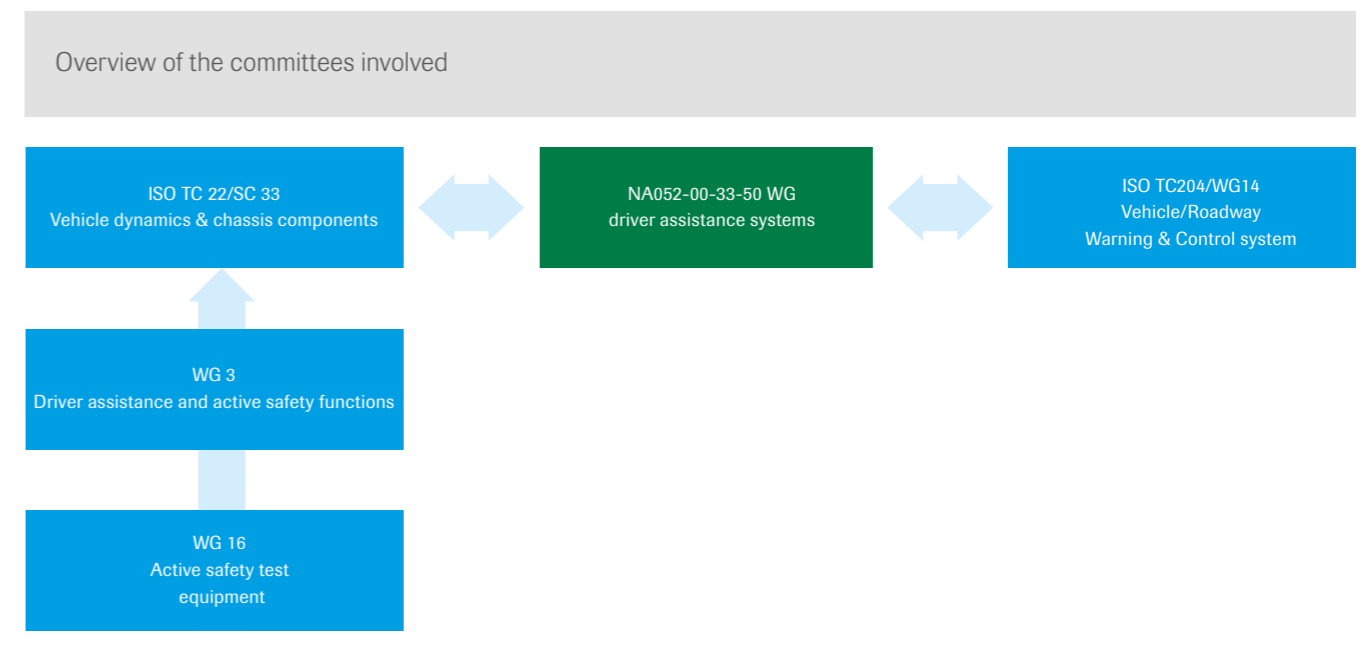
Standardization Roadmap for Automatic Driving.



# Driver Assistance Systems (State of Standardization)

The standardization of driver assistance systems has a long tradition in ISO. As early as 2011, an update on the activities of the ISO TC 204/WG 14 working group was published in the VDA Annual Report. In the meantime, the corresponding national mirror committee coordinates further activities within ISO that supplement the actual standardization of driver assistance systems. On the one hand, these are conformity tests of certain systems (e.g. Lane Keeping Assist) in ISO TC 22/SC 33/WG 3, and requirements for targets based on Euro NCAP in ISO TC 22/SC 33/WG 16. The following picture shows the interaction of the national mirror committee AK 50 (green) with the ISO committees mentioned.

In the field of driver assistance systems in particular, definitions of terms for the different levels of automation play an important role. Many different activities have been started in the past for this purpose. In Germany, for example, the BAST had combined the definitions of levels 0–5. In the end, however, the SAE with its standard J3016 has (for the time being) prevailed in use and general language usage. In 2017, however, it was decided – supported by an agreement between ISO and the SAE – to publish under the number ISO/SAE/PAS 22736 to give the document an international character. The transfer of the contents was already completed in the beginning of 2019; at the moment, however, the publication fails due to some formal unclarified points.





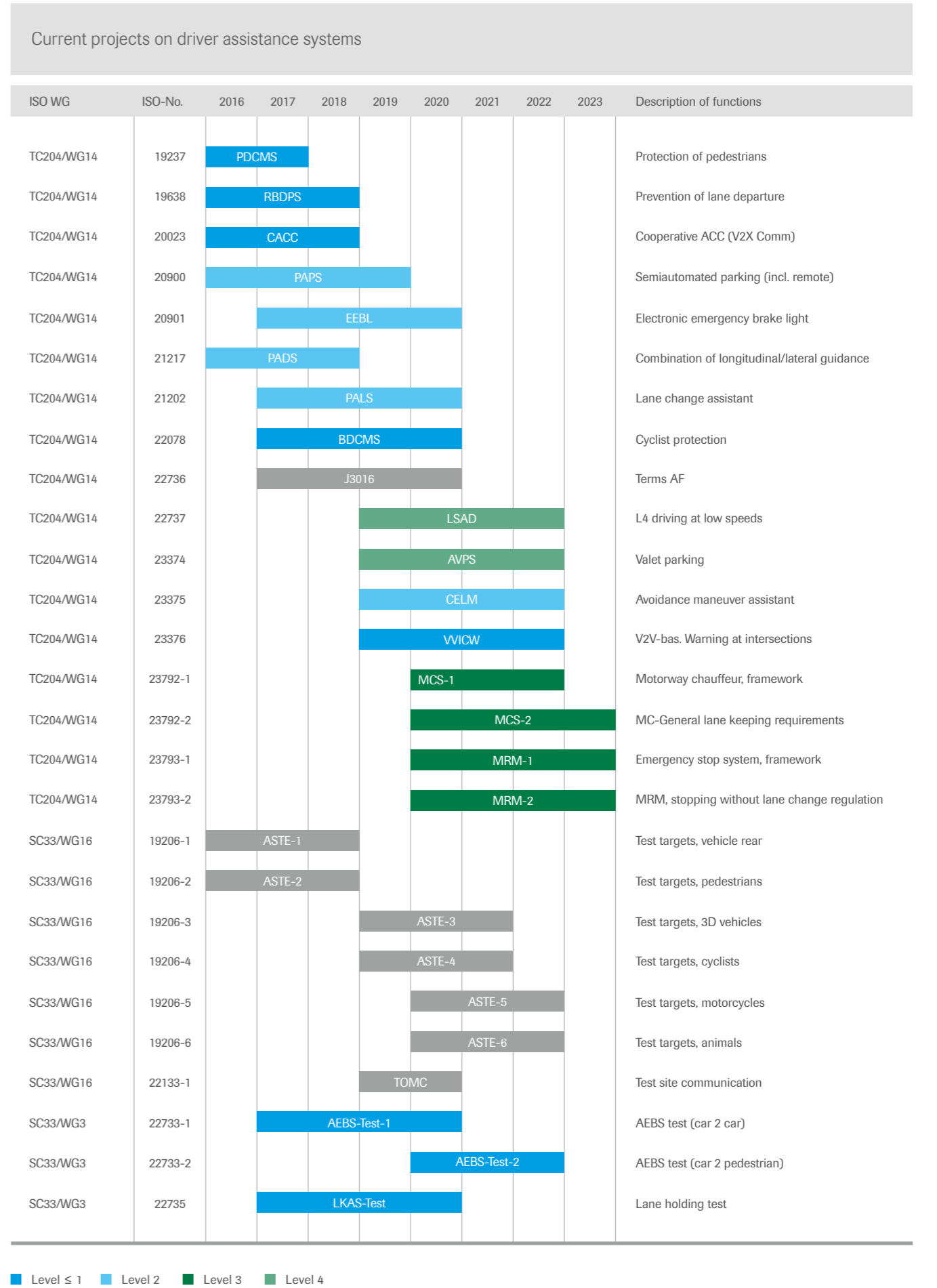
The following table gives an overview of all current and planned standardization projects that are nationally assigned to AK 50, as well as the color classifications of the ISO/SAE 22736 (J3016) levels.

To date, standards for driver assistance systems have been defined based on systems that were already on the market, and for which empirical values were available. These standards serve as a template for homologation tests. This "state-of-the-art handling" has changed fundamentally with the introduction of Level 3 systems. Work is currently underway on system standards for which there is not yet a legal basis. This requires close coordination between the standardization and legislation in order to avoid deviations in system requirements.

German experts are specifically involved in the Level 4 project "Automated Valet Parking" (AVPS). An Automated Valet Parking System is characterized by two key elements:

- The interface between the user and the service provider, through which search requests and reservations for parking spaces are controlled and the parked vehicle can be requested.
- The automatic operation to drive the vehicles to the free parking space from the point where the customer leaves their vehicle (and vice versa).

To implement these elements, different subsystems are required to resolve these functions, different roles need to be assigned and defined. Compared to the standardization of "conventional" driver assistance systems, the definition of system and test requirements in the AVPS standard requires a much higher level of detail, even if only taking into account the various stakeholders involved (vehicle manufacturers, system suppliers, car park operators) and legislation.





# Sensor Interfaces for the Integration of Complex Sensor Setups for Automated Driving

In 2018, the standardization project of a standardized sensor data interface for automated driving functions in ISO was started as a German initiative. Well-known German vehicle manufacturers and suppliers expect the following benefits from this initiative:

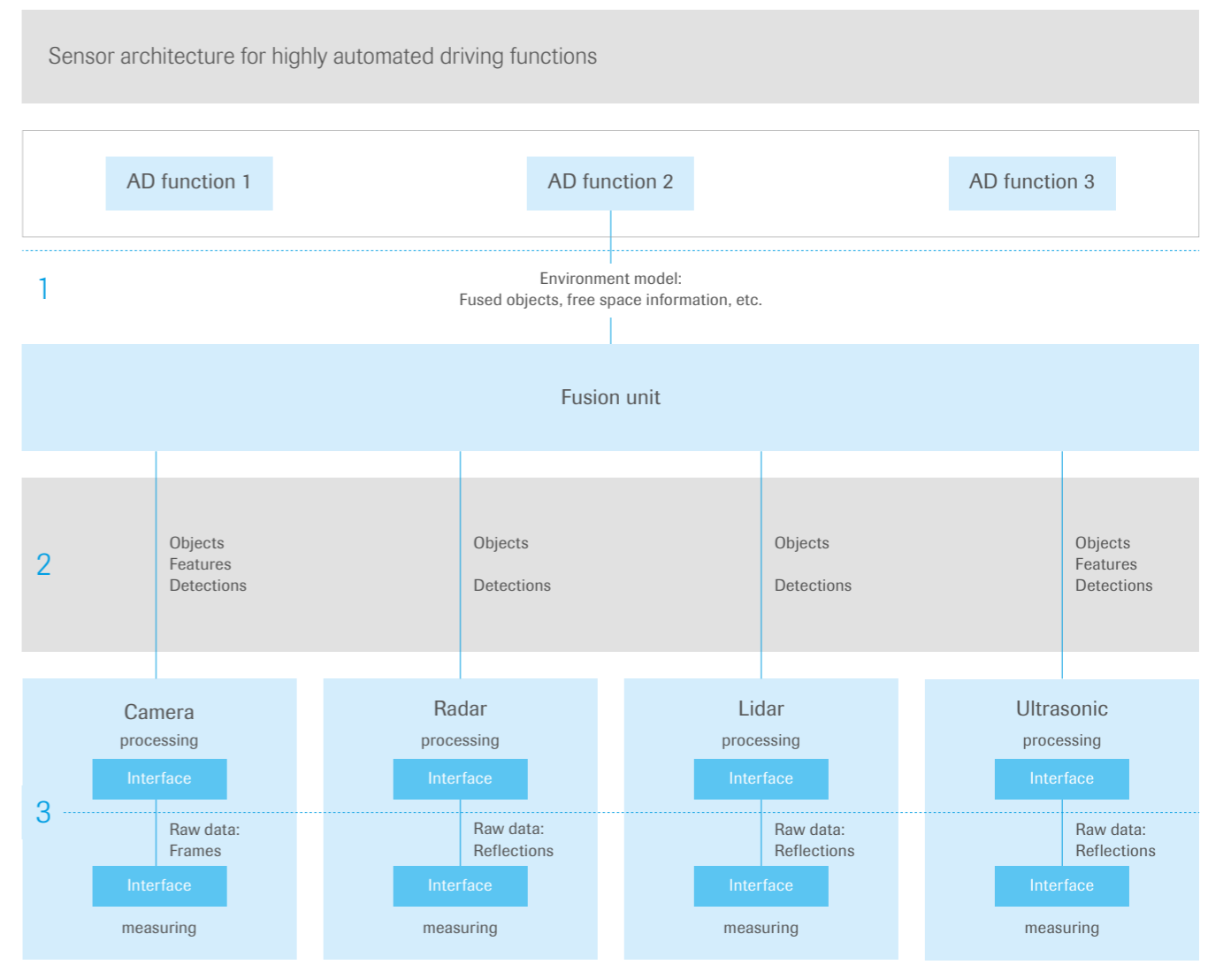
- Faster application of sensors from different sensor manufacturers in development.
- Reduced integration and testing effort: This minimizes effort and costs for both the OEM and the supplier.
- The interchangeability of individual sensors is simplified.
- Reuse and exchange of recorded validation data in the simulation (machine learning).

To detect the vehicle environment, technologies such as radar, lidar image recording and ultrasound are used for automated driving functions.

In order to implement highly automated driving functions, road vehicles must be able to recognize and understand the vehicle environment as a whole. For the fast and reliable detection of real objects, different, very fine sensors are necessary, which deliver their information to an interface in the vehicle. Technologies such as radar, lidar, image recording and ultrasound with different detection capabilities are used. A so-called fusion unit, where all recorded information converges, analyzes the different sensor signals and uses them to generate a dynamic environment model.

As current semi automated functions only use certain objects (e.g. vehicles, pedestrians or road markings) to generate a simple environmental model, future highly automated driving functions will not only need to combine the detected objects, but will also need to integrate further sensor-specific features and characteristics of these objects to form a coherent environmental model. A standardized, logical interface between sensor systems and fusion units is necessary and useful for sensor and system suppliers to minimize the development effort for sensors and the fusion unit, and to maximize the reusability of development and validation efforts for the different functions.

The following figure describes an exemplary architecture of a highly automated driving function. The goal of the initiative is the standardization of interface 2: the logical interface between an intelligent sensor (with data preprocessing) and a fusion unit. These can be data interfaces on an object, property and detection level.



Source: ISO/DIS 23150

With strong German participation by vehicle manufacturers and sensor and system suppliers, ISO 23150 was developed and submitted to ISO in March 2020 as the "Draft International Standard" (DIS) for international comment. The publication of the first edition is expected in spring 2021. At the same time, the experts of the working group are collecting further features that are to be considered in a second edition of the standard.

# Information and Data Security

TISAX is an audit and exchange mechanism for information security in companies and allows the common recognition of audit results.

Car manufacturers carry out a large part of product development together with their suppliers. Protecting the data provided or exchanged in the process is very important. In all matters of information security, it must be ensured that all participants in the value chain have a comparable level of security. In order to ensure a uniform level of information security between all participants, the TISAX model (Trusted Information Security Assessment Exchange) was developed under the umbrella of the VDA. It is a common testing and exchange mechanism for information security of companies and facilitates a common recognition of test results among the participants.

More than 2,800 companies have registered for TISAX since 2017.

TISAX has enjoyed high acceptance since its market launch. Well over 2,800 companies with 5,100 sites have registered since the beginning of 2017, and over 2,600 tests have been carried out during this time. In the past two years, more than 25,000 improvements in information security have been achieved in the participating companies.

"NEVADA Share & Secure" is a concept for secure access to data generated in the vehicle.

The operator of TISAX is the ENX Association, which has been entrusted with the implementation by the VDA as a neutral body. On behalf of the ENX Association, several globally operating testing service providers are accredited to carry out testing at service providers and suppliers. The exchange of test results within TISAX is reserved for registered participants or, after express approval by the audited company, available for requesting companies. The advantage of the TISAX model is that the effort, time

and costs of VDA members and their suppliers are reduced with regard to security testing.

TISAX is based on the Information Security Assessment (VDA ISA) developed by the VDA – a catalog of questions based on the ISO 27001 standard, which covers the information security requirements of the automotive industry accepted throughout the industry. The VDA ISA question catalog has already been used in the past for audits of suppliers and service providers that process sensitive information from the respective companies.

## Security and data

Lifecycle management is also important. This is because the effectiveness of security measures can change after the development phase over the entire lifecycle of the product. It is therefore essential to protect both vehicle and user data, as well as other vehicle functions, against unauthorized access and manipulation. Against this background the automotive industry has presented "NEVADA Share & Secure" ("Neutral Extended Vehicle for Advanced Data Access"), a concept for secure access to data generated in the vehicle. This concept makes it possible to provide data in a way that neither impairs vehicle integrity, i.e., safety and security, nor negatively affects traffic safety. The development of digital innovations and new business models will be supported. The information will be made available to public authorities and companies in a fair,

competitive and secure manner and will take into account the interests of the consumer in the long term. The vehicle owner has full control over their personal data transmitted from the vehicle at all times. They can decide for themselves which data they want to make available to whom for what purpose, and from which providers they obtain services. This allows the vehicle owner to determine which services are linked to the data generated in their vehicle, and to revoke or extend this usage authorization at any time. The added value for the consumer increases depending on the extent to which they allow the use of the data for personalized applications.

With this approach, the legally required access to vehicle data for repair and maintenance measures or mandatory tasks, such as a general inspection and exhaust emission test via the OBD-2 diagnostic interface installed in the vehicle, will not be affected, but will continue to be maintained for these purposes. From within the VDA, this concept was also introduced to the European partner associations and the political process.

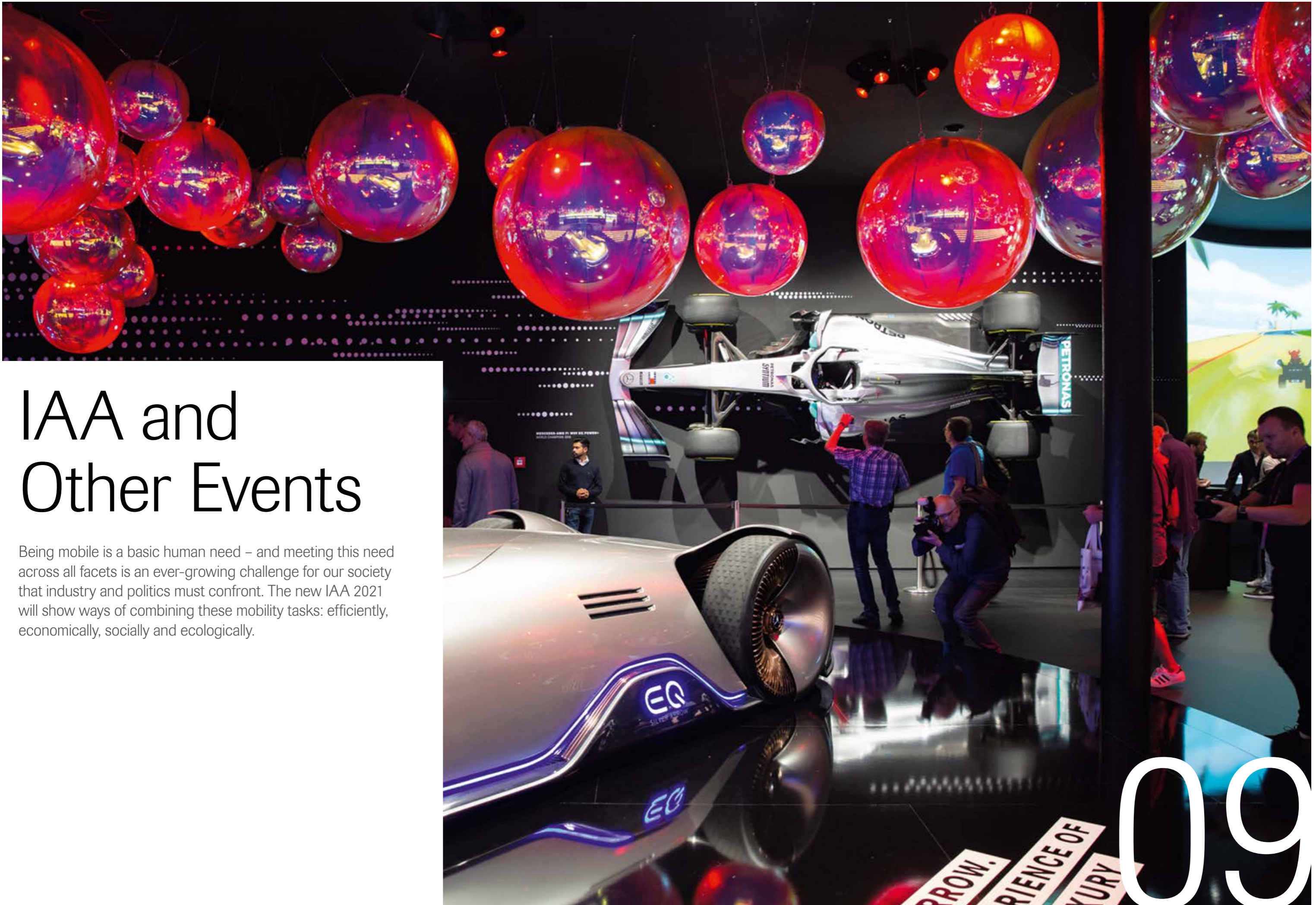
## BSI and VDA: Working together for greater cybersecurity in the car

The Federal Office for Information Security (BSI) and the German Association of the Automotive Industry (VDA) will be working closely together on cybersecurity issues in the future, in order to ensure that the

area of digitalization, which is so important for Germany as a business and automotive location, remains secure. VDA President Hildegard Müller and BSI President Arne Schönbohm signed a joint declaration of intent to this effect in Berlin on June 8, 2020. The aim of the cooperation between BSI and VDA is to establish a common understanding of the subareas of cybersecurity in vehicles and information security in the automotive industry, and to identify the necessary action, for example, in the area of standardization. Subsequently, recommendations for action for politics and the automotive industry are to be jointly developed. To prevent possible cyberattacks from having an impact on driving safety and to integrate suitable protective mechanisms, relevant threats must be taken into account early on in the development cycle of new vehicle models.

VDA and BSI cooperate in the field of cybersecurity.





# IAA and Other Events

Being mobile is a basic human need – and meeting this need across all facets is an ever-growing challenge for our society that industry and politics must confront. The new IAA 2021 will show ways of combining these mobility tasks: efficiently, economically, socially and ecologically.



# The IAA 2021: New Thinking, New Format, New City

Over the course of its 123-year history, the IAA has constantly evolved, but the year 2021 is set to become a fundamental new beginning. Mobility is frequently presented as an “either-or” choice – driving pleasure versus sustainability, urban versus rural, individual versus public, car versus bicycle. But mobility is always a diverse “AND.” It is precisely this “AND” that will be at the heart of the new IAA: New thinking, new format, new city.

VDA and Messe München (Munich Trade Fair Center) cooperate on the mobility platform of the future.

The IAA 2021 will be reorganized at the new Munich location: the first IAA in Munich will take place from September 7 to 12, 2021. The focus will be on automobiles with fascinating technology, sustainable mobility, intelligent transport solutions and dialog formats. The new IAA in Munich can be experienced in trade fair halls, on city center squares and on major transport routes. It is intended to be perceived by visitors with all their senses, and to be “experienceable” in the truest sense of the word. And in addition to presenting great cars and the latest intelligent mobility solutions, it will also become a forum where the future of mobility is debated.

IAA to provide impetus for turning the city into a smart city.

The IAA 2021 will give broad attention to the topics of climate protection and sustainability: with clean, economical drives and the latest generation of cars, with a comprehensive mobility mix including cars, e-bikes and e-scooters, and the integration of public transport. The IAA in Munich will be developed into a leading platform that reflects the entire new ecosystem of mobility. From car manufacturers and suppliers, technology companies, mobility service providers and public transport to start-ups: the IAA is to become the meeting place for innovators from Silicon Valley to Europe and Asia. The allure of cutting-edge cars will also play an important role at the new IAA. In addition, the world's leading trade fair for the industry is transforming itself into one of the driving forces for further developing a city with over a million inhabitants to become a smart city with intelligent traffic concepts and innovative networking of transport modes – sustainable and geared to people's needs.

The aim is to get into conversation with car drivers, experts and unconventional thinkers during the trade fair. International exhibitors, mobility providers and start-ups will be addressed with an integrated concept on automobiles and mobility.

## The new IAA will present three formats

The “Summit” on the exhibition grounds combines brand and product presentations with conferences for professionals. In the “Open Space,” Munich's most beautiful locations will become forums for the exchange of ideas about mobility concepts of the future. The “Blue Lane,” a link between the city and the trade fair center, will be a test track where future-oriented mobility can be “experienced” in the truest sense of the word. In addition, the IAA will be more compact and shortened to six days.

Holding the IAA 2021 in Munich presents a great opportunity for the entire automotive industry and the discussion on the future of mobility – both nationally and internationally. It will be a driver for the successful transformation and, thereby, for the future viability of the automotive industry. In 2021, Munich is set to become the innovation hub of the entire automotive and mobility industry.

VDA President, Hildegard Müller, and Messe München CEO, Klaus Dittrich, presented the concept of the new IAA 2021 on July 1, 2020 together with Bavarian Minister President, Markus Söder, and Munich's Chief Mayor, Dieter Reiter. In front of invited guests and journalists, the key players committed themselves to the new concept and the new location. The message of the “concept release” was that the new IAA will show ways of combining the mobility tasks of the future: efficiently, economically, socially and ecologically. The event on the trade fair grounds was recorded and can be watched in its entirety at [www.iaa.de](http://www.iaa.de).

## Cancellation of the IAA Commercial Vehicles 2020 due to the COVID-19 pandemic

The IAA Commercial Vehicles is the world's leading platform for transport, logistics and mobility. As a global meeting place for experts and decision makers from the entire transport and logistics sector, its strength is its international range of both exhibitors and visitors. Direct personal contacts are at the heart of the show.

The health risks of the COVID-19 pandemic and the associated measures to contain it, such as the lack of travel opportunities, have made it impossible to hold the IAA Commercial Vehicles 2020.

Against this background, the VDA already decided in May 2020 to cancel the IAA Commercial Vehicles, which was to take place in Hanover from September 24 to 30, 2020. It was a difficult decision for the VDA to make. Yet in view of the overall situation in Europe and around the world, the VDA did not see any possibility of holding the IAA in 2020 in its familiar form as a platform for exhibitors and visitors.

The VDA immediately informed the many exhibitors who had already registered for the IAA 2020 about this decision, as well as all service providers, Deutsche Messe AG and all partners in politics and business. The exhibitors and service providers were informed of the cancellation as early as possible in order to keep the economic consequences for the companies to a minimum. The next IAA Commercial Vehicles will take place in September 2022.

The IAA Commercial Vehicles could not be held in its familiar form in 2020.

The next IAA Commercial Vehicles will take place in September 2022.



# IAA 2019 – the Transformation into an Event Platform for Mobility



The IAA is transforming itself from a purely automotive trade fair into a comprehensive mobility platform.

In September 2019, the 68th IAA took place in Frankfurt am Main. With its four pillars – IAA Conference, IAA Exhibition, IAA Experience and IAA Career – the IAA 2019 covered a broader range than ever before. From September 12 to 22, 838 exhibitors from 31 countries showcased their products and services. They included global players from the automotive industry, suppliers, providers of new mobility solutions, innovative tech companies and up-and-coming start-ups. At 49 percent, around half of the foreign exhibitors came from Europe, followed by Asia/Australia with 42 percent and America with 9 percent. Suppliers were again the largest exhibitor group with 28 percent, occupying 17 percent of the exhibition space. Over half a million visitors came to the IAA 2019. The proportion of foreign visitors rose to 22 percent in 2019. As in previous years, the average age of visitors to the IAA was around 34 years.

The IAA opened up to a dialog with critics and citizens.

The sociopolitical environment of the IAA 2019 was unique. The dominant theme of the IAA, on and off the Frankfurt exhibition grounds, was climate protection. Various NGOs had already announced demonstrations associated with the IAA weeks before the start of the trade fair; in addition, on the first IAA Sunday, other car-critical groups planned a IAA blockade carried out by around 500 car opponents. In order to make society's zeitgeist and also critical voices heard, the VDA had already offered NGOs and citizens a dialog at an early stage. A panel discussion with critical voices took place before the IAA in Berlin, and a citizens' dialog during the IAA in Frankfurt invited interested and critical citizens and high-ranking representatives of the automotive industry, politics and trade unions to exchange views.

Despite demonstrations and blockades, around 110,000 visitors came to the Frankfurt exhibition grounds on the first IAA weekend. The security authorities acted prudently and responsibly. It remained peaceful and the safety of IAA visitors and all other citizens was always guaranteed.

## IAA Exhibition

The IAA as an exhibition has always been unique because it focuses on the entire value chain, not just on manufacturers and their products. As never before, the IAA 2019 was able to show the entire ecosystem of mobility: technology companies along with manufacturers, suppliers, mobility service providers and start-ups. The New Mobility World (NMW), as part of the IAA Exhibition, was open on the first six days of the IAA. Here, digital companies met automotive players and suppliers – key players such as Hella, IBM, Microsoft, Samsung, Siemens and Vodafone were among the participants. At the NMW, 192 exhibitors were able to develop and elaborate ideas, technologies and products for tomorrow's mobility. Four national pavilions reflected the international nature of the format. The Turkish joint stand, the UK Pavilion, the Netherlands with the European High Tech Pavilion, and Business Finland were represented. In the center of the NMW and the IAA Conference, the start-up zone presented itself with 40 companies. A separate start-up challenge also offered further opportunities for interaction: In four workshops over the course of two days, interested parties could learn from experienced professionals and work together on solutions.





## IAA Conference – the IAA's new discussion platform

With top speakers such as Virginia Rometty, CEO of IBM, Ola Källenius, Chairman of the Board of Management of Daimler AG, John Krafcik, CEO of Waymo and the former Formula 1 world champion and greentech entrepreneur, Nico Rosberg, the IAA Conference stood out as a key event of the IAA. The event format offered a deep insight into the world of "Individual Mobility of the Future" with over 240 international speakers on four stages, almost 1,000 participants and over 50 hours of high-quality content. Numerous critical voices were also heard. Around a quarter of the participants in the IAA Conference were female; 45 percent of all conference attendees came from abroad. The European region in particular was strongly represented with 58 percent.

## IAA Experience

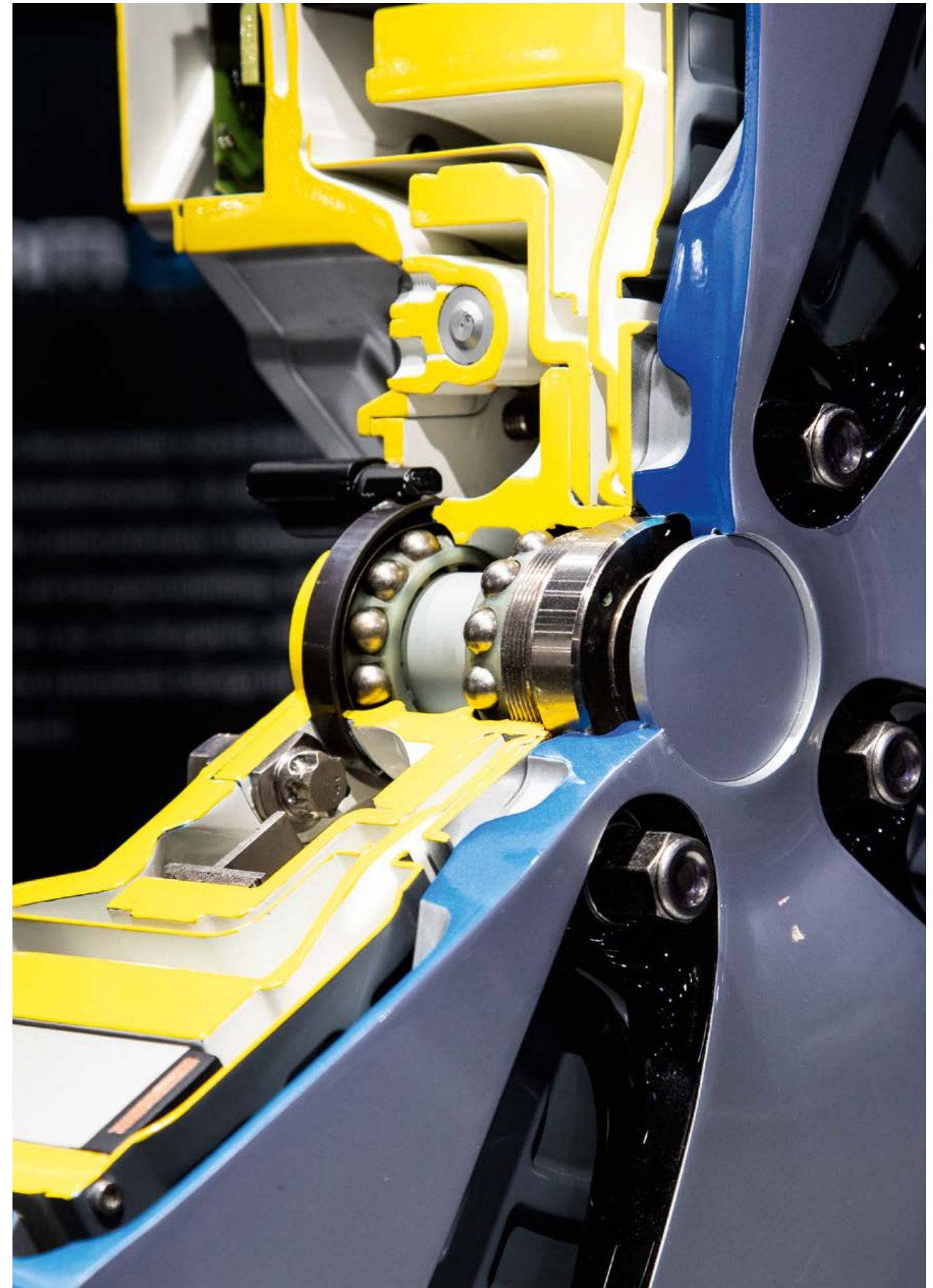
The IAA Experience was a highlight of the IAA 2019, with full capacity and a high number of test drives. By the end of the event, visitors had taken 7,846 rides on the e-move track, over 8,600 rides on the test drive course and 28,710 rides on the off-road course. Visitors had to wait up to two hours for their ride on the off-road course – that's how busy the event was. The off-road course was thus ranked number 1 on the popularity scale of offered experiences. In addition, up to six people were able to experience autonomous driving live at the same time with Continental's autonomous "CUbE."

## IAA Career – a rally over the site

The career and recruiting event took place in a new form at the IAA 2019: as a rally over the site, where participating companies could be visited and direct contacts made. The IAA school class campaign allowed 20,734 teachers and schoolchildren to visit the exhibition grounds.

Overall, a digital reach of over half a billion followers (566,908,305) was achieved during the IAA event period – a significant increase compared to previous years. Around two thirds of all published articles on the IAA were written in languages other than German – further proof of the international character of the IAA.

Test drives were already fully booked in the morning on every day of the fair.





# Additional VDA Events

## “Quality managers on the move”: The 16th Quality Summit of the VDA QMC

The 16th Quality Summit of the VDA QMC took place on November 13, 2019 in Potsdam. Under the motto “Quality managers on the move,” some 150 participants from the automotive industry discussed current issues in the field of quality management. For quality managers, the future means more electronics, more software, more complexity and, in addition, the increasing role of artificial intelligence (AI). Quality managers in particular are expected to master the new technologies and areas of responsibility. According to the tone of the event, the focus of all quality efforts will continue to shift from hardware to software. The positive feedback from participants showed that the quality summit has established itself as the prominent quality management event in Germany.

VDA Managing Director, Dr. Kurt-Christian Scheel, paid tribute to the work of the quality managers in the Quality Management Committee (QMA), whose work in the VDA had ensured that the topic of quality met the highest standards. The VDA QMC (Quality Management Center), he said, was the mainstay of the success of quality work in the VDA alongside the QMA. This is reflected in the high level of professionalism, the stringent work in the working groups and, not least, in the international publications – which in 2018 alone announced to more than 45,000 books in fifteen languages.

## Forum Automotive Logistics in Leipzig with around 500 participants

At Europe's largest logistics industry meeting, the Forum Automobile Logistics, on February 5 and 6, 2020 in Leipzig, the focus was on how production and logistics can be more effectively integrated. Networking and digitalization are the key success factors for the development of the automotive industry. Experts from the logistics industry discussed how the transformation of the automotive industry can be shaped so that it can continue to be a global leader in the future. “We are convinced that a networked organization achieves the best overall result through communication and cooperation,” said VDA President, Hildegard Müller, at the opening of the Automotive Logistics Forum at the Congress Center Leipzig. With some 500 participants and over 60 exhibitors, it was the largest European meeting of the automotive logistics industry. The German Logistics Association (BVL) and the German Association of the Automotive Industry (VDA) jointly organized the forum for the eighth time. Saxony's Minister President, Michael Kretschmer, emphasized in his welcoming address to the forum participants: “Automobile manufacturing has a long and solid tradition in this country – vehicles from the automobile state of Saxony have stood for mobility, progress and prosperity for 120 years. Every eighth car manufactured in Germany today comes from Saxony.”

Together with VDA Managing Director Dr. Joachim Damasky, Prof. Dr.-Ing. Thomas Wimmer, Chairman of the BVL Managing Board, led through both days of the forum. He also emphasized how important it is to tear down borders. This was particularly true for logistics and supply chain management, which has always had many interfaces with the areas of procurement, quality, production and purchasing.

Among the key topics of the 2020 forum were the interaction between the subareas of production and logistics, and the potential that comes with it – including a look at various future scenarios. The focus was also on specific application options and opportunities of digital technologies, for example, in the “digital factory,” in the planning and organization of supply chains, in spare parts management, or for automation and transparency in intralogistics.

## VDA Logistics Award 2020

Porsche Leipzig GmbH was presented with the VDA Logistics Award 2020 at the Forum Automobile Logistics. The Saxon subsidiary of Dr. Ing. h. c. F. Porsche AG received the prize for an innovative logistics concept that relies on intelligent planning tools, highly automated processes, and energy-efficient storage and order-picking technology.

“Porsche's logistics concept for supplying the Leipzig plant provides great inspiration for the logistics of the future. Strongly integrated, intelligently automated and trimmed for maximum reliability and efficiency, it shows innovation potential for the Leipzig plant, the automotive industry and also for

logistics in other industries,” said Prof. Dr. Wolfgang Stölzle, Managing Director of the Institute for Supply Chain Management at the University of St. Gallen, explaining the jury's decision. The basis of Porsche Leipzig's logistics concept is a planning tool that optimizes the incoming supply flows and makes optimum use of available warehouse capacities. It serves as the basis for an automated small parts warehouse with efficient shuttle technology, dynamic order picking, for which Porsche has applied for a patent, and several driverless transport systems. With this new logistics concept, suppliers can now deliver individually and at optimal intervals directly to the plant.

## 21st VDA Technical Congress in Berlin

The 21st Technical Congress organized by the VDA took place on March 14 and 15, 2019 in Berlin. At the most important technology symposium of the automotive industry in Europe, some 700 participants from industry, politics and science discussed the future of mobility. The focus was on digitalization, networked and automated driving, and urban mobility. Artificial intelligence, data management and cybersecurity were also discussed in plenary sessions. A total of 40 high-ranking representatives from politics and business spoke. The symposium was also accompanied by 27 exhibitors.





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