

Annual Report 2018

The automotive industry in facts and figures





Annual Report 2018

The automotive industry in facts and figures



Thank You.

Mobility connects us. Lets us discover new things, meet our friends, get to work and run errands. It provides all of us with growth and prosperity.

Today's mobility is unthinkable were it not for the invention of the motorcar over 130 years ago. And mobility is constantly being reinvented. Resulting in increasingly safe, environmentally and climate-friendly mobility for the future.

This is due to the 820,000 people who have made Germany the world's leading automotive nation. Some of whom we present here.

And to all of whom we say: Thank you.

www.vda.de/en
www.mobilitaet-von-morgen.de



Foreword



*Ladies and gentlemen,
des fans of the automobile,*

The automotive industry is shaping the transformation of mobility. Our industry has initiated a transformation process that is fundamentally changing products, technologies and services. The challenges electrify us in the truest sense of the word, they motivate and inspire us. We want the car, we want to reinvent mobility. People are changing their mobility behavior faster than ever before. The company expects solutions for environmentally friendly, sustainable mobility. Our mission is to meet these expectations. Two innovation fields will be of great importance here: electromobility and alternative drives, on the one hand, digitization and automated driving, on the other.

Electromobility in particular is the key technology for the emission-free, climate-friendly mobility of the future. That is why German manufacturers are significantly expanding their range of models: from 30 to over 100 electric models by 2020. In the same period, manufacturers and suppliers are investing a total of 40 billion euros in alternative drives, with a focus on electromobility. And the German automotive industry is already globally successful as a leading provider of electromobility. In Western Europe, we have a market share of new approvals for electric passenger cars of around 50 percent. In addition to electric cars, German commercial vehicle manufacturers are launching

more and more electric buses, electric vans and electric trucks on the market. Nevertheless, electromobility will not be the only drive form. The efficient combustion engine also has a future. Natural gas engines, hydrogen and climate-neutral e-fuels also have tremendous opportunities.

In addition, we are advancing digitalization. A look at the global patent applications for networked and automated driving shows how successful we are here: around half of the patents in this field are registered by German companies. The German automotive industry is thus number 1 internationally. We are pursuing a clear goal with this new technology. Autonomous driving should be safer, more efficient and more sustainable. And not only are technologies changing with digitalization, but so too are the companies themselves. Manufacturers and suppliers will become service providers, which offer intelligent mobility solutions. Car sharing, ride pooling, e-scooter sharing, mobility platforms and mobility apps are only the start of this trend.

Mobility behavior will therefore also change. Using cars instead of owning them: that is the trend we are designing. And yet the need for your own car is growing. Global car sales are rising and 2017 and 2018 have been good years for

our industry. German car manufacturers produced 16.5 million cars worldwide in 2017 – a new record high. They produced 10.8 million cars at their locations abroad, so that the foreign production also achieved a new record. At the same time, domestic production remains at a very high level at just under 5.7 million. In addition to car manufacturers, commercial vehicle companies also form a significant part of the German automotive industry. Manufacturers of trucks, vans and trailers and bodies were also successful. Automotive suppliers form the backbone of the German automotive industry. With over 540 companies, they are by far the largest and most diverse group of manufacturers in the VDA. Whether electromobility, digitalization or autonomous driving, your innovations are crucial in the transformation process of the automotive industry.

While we are working on future innovations, we are keeping busy discussing the future of the diesel engine and air quality in cities. It is therefore an urgent concern for us to gain new confidence in the automotive industry and to restrengthen our credibility. This will not happen overnight. It will take time. This means that we do what we say and that reliability and transparency determine our actions.

And that is why we are working intensively to improve air quality. Software updates are being implemented on several million vehicles. German manufacturers are investing in the German government's Mobility Fund with a three-digit million sum. We have accelerated the renewal of the car stock with new low-emission vehicles with

our changeover premiums. In addition, our member companies support cities and municipalities in numerous projects and work on specific solutions.

It is just as necessary to objectify the debate. The fact is, nitrogen oxide emissions in road traffic have fallen by around 70 percent since 1990. And there is more progress. The annual limit for nitrogen oxide was exceeded in 90 cities in 2016. In 2017, it was only 65.

The automotive industry is Germany's key industry. It ensures added value and jobs. Over 820,000 people were employed by manufacturers and suppliers in 2017 – about 30,000 more than two years ago. We are investing in the future of Germany. No other industry here spends more on research and development – 22 billion euros per year at the last count. However, this prosperity and success must not be seen as a reason to sit back, neither for companies nor for politicians. The very good economic situation currently is misleading some in politics to think that Germany has to do no more to maintain its competitiveness. The Federal Government should again focus more on this economic-political task. Because new dangers are emerging internationally as well. Brexit or the new trade policy in the US may become serious threats to our globally networked supply chain. That is why we are supporting the Federal Government's policy and that of the European Commission, which advocate free trade and counter protectionism.

The automotive industry is aware of its responsibility towards people and the community. We are promoting new trust

and confidence. That's what I stand for personally. And we are by no means resting on our previous achievements. Manufacturers and suppliers are working together intensively on continuing to strengthen the international leading position of the German automotive industry. This annual report gives you an overview of the diverse topics and challenges that the VDA and its members have in common.

Bernhard Mattes, President
Verband der Automobilindustrie e. V.
(Automotive Industry Federation)

Content

Foreword	6
The Automotive Industry and its Markets	10
Current Automotive Market in the First Half of 2018	12
The Automotive Year 2017: Key Figures and Data	14
Research and Development	16
International Automotive Markets	18
German Market	22
German Automobile Manufacturers' Production and Exports	24
Markets for the Supplier Industry	26
Markets for Commercial Vehicles and Buses	28
Markets for Trailers and Bodies	30
Suppliers and Medium-sized Businesses	31
Aftermarket	36
Historic Vehicles	38
Auto Banks	41
Economic Policy and Infrastructure	42
Economic Situation in Germany	44
European Policy	46
Brexit	48
Trade and Investment	52
Energy Policy	58
Infrastructure	60
Passenger Transport	64
Urban Mobility	65
Freight Transport	68
Taxes and Customs Duties	70
Legal Policy	72
Environment and Climate	76
Road Traffic and CO ₂ Emissions	78
CO ₂ Regulations for Automobiles and Light Commercial Vehicles	80
CO ₂ Reductions in Heavy Commercial Vehicles	84
Decarbonizing Transportation	86
Automobile Energy Efficiency	88
Air quality	90
National Diesel Forum	94
European Chemicals Regulation REACH	96

Innovation and Technology	98
Diesel, Gasoline and Hybrid Engines	100
Combustion Engine Fuel Consumption and Emissions	102
Pollutant Reduction Technology	106
EU Type Approval	107
Electromobility	108
Other Alternative Drive Systems	114
Networked and Automated Driving	115
Research Association for Automotive Technology (FAT)	121
Logistics	124
Safety and Standards	126
Traffic Accidents in Germany	128
Commercial Vehicle Safety Systems	129
Pedestrian Safety	130
Anti-theft Protection	132
Quality Management	133
Standardization	136
Information Security	140
International auto show and events	142
Experience the Future: IAA Cars 2017	144
IAA Commercial Vehicles 2018	146
Initiative "Tomorrow's Mobility"	148
Events	150
Index	154
List of figures and tables	156
Index	158

The Automotive Industry and its Markets

At home, in Europe and in the world, the German automotive industry continues to be successful in 2017 and 2018. Groups and SMEs, car manufacturers and suppliers, truck, trailer and bus manufacturers – they all rely on two recipes for success: innovation and internationalization.



Susanne Jung, Slavicist & Economist, Global Assistant, Global Purchasing and Fleet Management, Kiekert AG Heiligenhaus

Current Automotive Market in the First Half of 2018



The balance sheet for the first half of 2018 in the international passenger car markets is predominantly positive. A total of 28.8 million vehicles were sold in the three largest sales regions of China, USA and Europe, representing an increase of one million vehicles compared to the first half of 2017. Russia, Brazil and India each posted double-digit percentage growth. Of the major markets, only Japan missed the previous year's level. Overall, the global passenger car market is expected to grow by 2 percent in 2018 to more than 86 million passenger cars – a new record. The automotive industry thus remains on a growth course.

German manufacturers' growth in China above average.

There follows a look at the individual regions. China, by far the world's largest car market, closed the first half of the year with 11.5 million cars sold – 6 percent more than in the previous year. With growth of 9 percent, German manufacturers posted stronger momentum than the overall market. Results were especially positive in the expanding SUV segment, in which German OEMs increased their sales by 15 percent in the first six months of the year. In the first half of 2018, the market share of German manufacturers in China stood at 21.4 percent and was thus higher than in the previous year (20.8 percent).

The market trend in the USA was also very pleasing. The light vehicle market (passenger cars and light trucks) grew by 2 percent in the first six months to 8.6 million new vehicles. The trend towards the light truck segment continues unchanged this year. Sales in this segment increased by 10 percent, while sales of traditional passenger cars fell by 12 percent. The market share of German manufacturers remained stable at 7.7 percent compared to the previous year.

Things are also going well in Europe (EU28 and EFTA), where 8.7 million new passenger cars were registered – around 3 percent more than in the same period of the previous year. The largest individual markets developed differently. Growth was again achieved in Germany (+3 percent) and France (+5 percent), with both countries marking their fifth consecutive year of growth. In Spain, which recorded growth of 10 percent after the first six months, the market is expected to grow for the sixth consecutive year, but nevertheless remains well below the level reached in the early 2000s. By contrast, the United Kingdom continued to decline (-6 percent). After peaking in 2016, the British car market is likely to see a setback for the second consecutive year in 2018. The Italian market (-1 percent) is slightly below the previous year's level after the first six months.

Record half-year for Europe.

With 2.3 million passenger car sales in the first half of the year, the automotive business in Japan remained below the previous year's level (-2 percent). However, the Japanese passenger car market grew surprisingly strongly in 2017.

In India, the sales volume in the first six months rose by 13 percent to just over 1.7 million passenger cars. There are many indications that the Indian market could overtake Germany as the fourth largest single market in the world this year.

There is also good news from Russia and Brazil. The Russian market for light vehicles continues to recover. During the year to date, the market volume of 849,200 new vehicles sold is some 18 percent higher than in the previous year. The situation was similar in Brazil, where the light vehicle market achieved 1.1 million units in the first half of the year, despite disruptions caused by the farmers' strike in May. This represents an increase of 14 percent compared to the first half of 2017. However, the volumes in both markets remain very low.

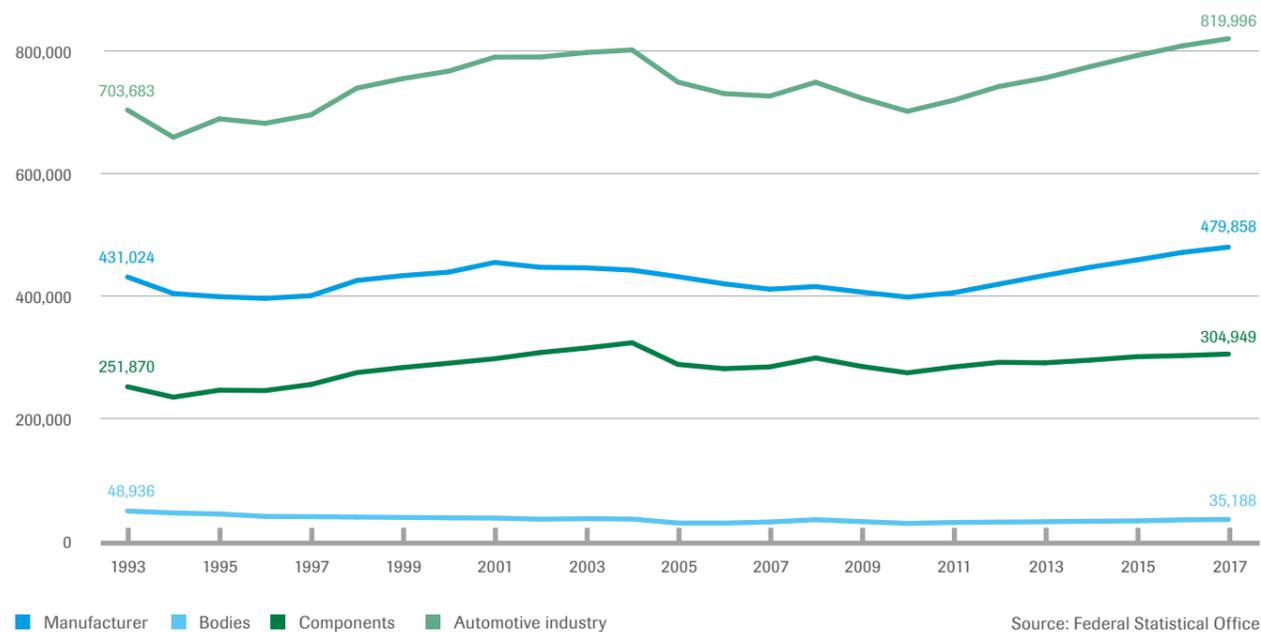
The Automotive Year 2017: Key Figures and Data

The global automobile market grew again in 2017. However, growth in the important individual automobile markets was by no means uniform. The growth rate in the Chinese market slackened. In the United States the light vehicle market contracted somewhat. In Europe, by contrast, most markets again grew. Germany even saw the highest level of registrations for the decade. In the United Kingdom on the other hand – Europe’s second-biggest market – the market dipped. Both Russia and Brazil saw a turnaround in their fortunes. The markets here, which in recent years had truly collapsed, returned to positive territory. Although both markets are still a long way from their previous peaks, they have made a start.

The commercial vehicle markets were also up. The global heavy commercial vehicle market grew strongly in 2017. Growth was especially strong in China, the world’s biggest commercial vehicle market. But more heavy commercial vehicles than the year before were also sold in the United States, in Europe, in India, Russia and Brazil.

The figures for 2017 also look good for the German automotive industry. Both sales and employment expanded. Admittedly, automobile production in Germany was not quite able to match the previous year’s high level. But the export quotient, namely the proportion of automobiles exported from Germany, was higher in 2017 than ever before. Global automobile production, namely German manufacturers’ output by their domestic and foreign sites, also reached a new high.

Employees in the German automotive industry

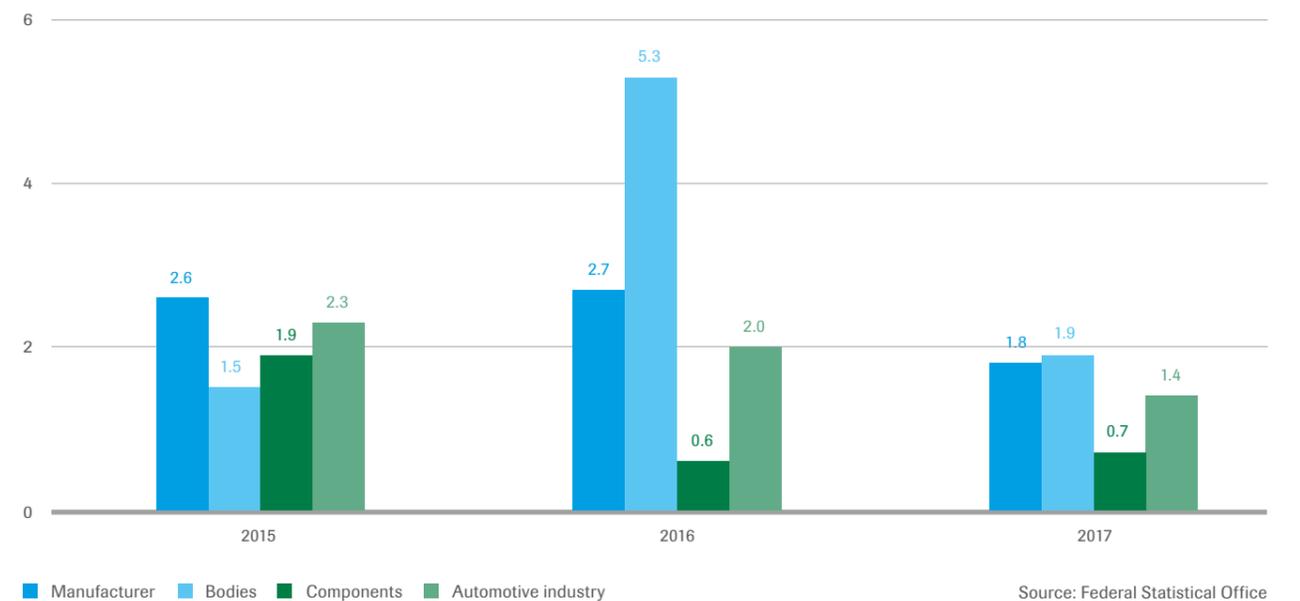


Employment

Last year the automotive industry again made an important contribution to positive growth in the German labor market. The permanent workforces in their operations in Germany expanded yet further. In comparison with 2016, mid-year employee numbers increased by 11,500 to 819,996. In comparison with 2010, automotive industry companies created more than 118,400 new jobs. Numbers are now at their highest level since 1991.

All three manufacturing groups recorded employment growth in the last year. At vehicle manufacturers, employment rose by almost 2 percent, or 8,600 employees, to a total of 479,858. The German supplier companies’ permanent employee base totaled 304,949 people. In comparison with 2016, this means growth of 2,250 employees. Manufacturers of trailers and bodies saw a 2 percent growth to 35,188.

Employees in the German automotive industry
Change in percent



Research and Development

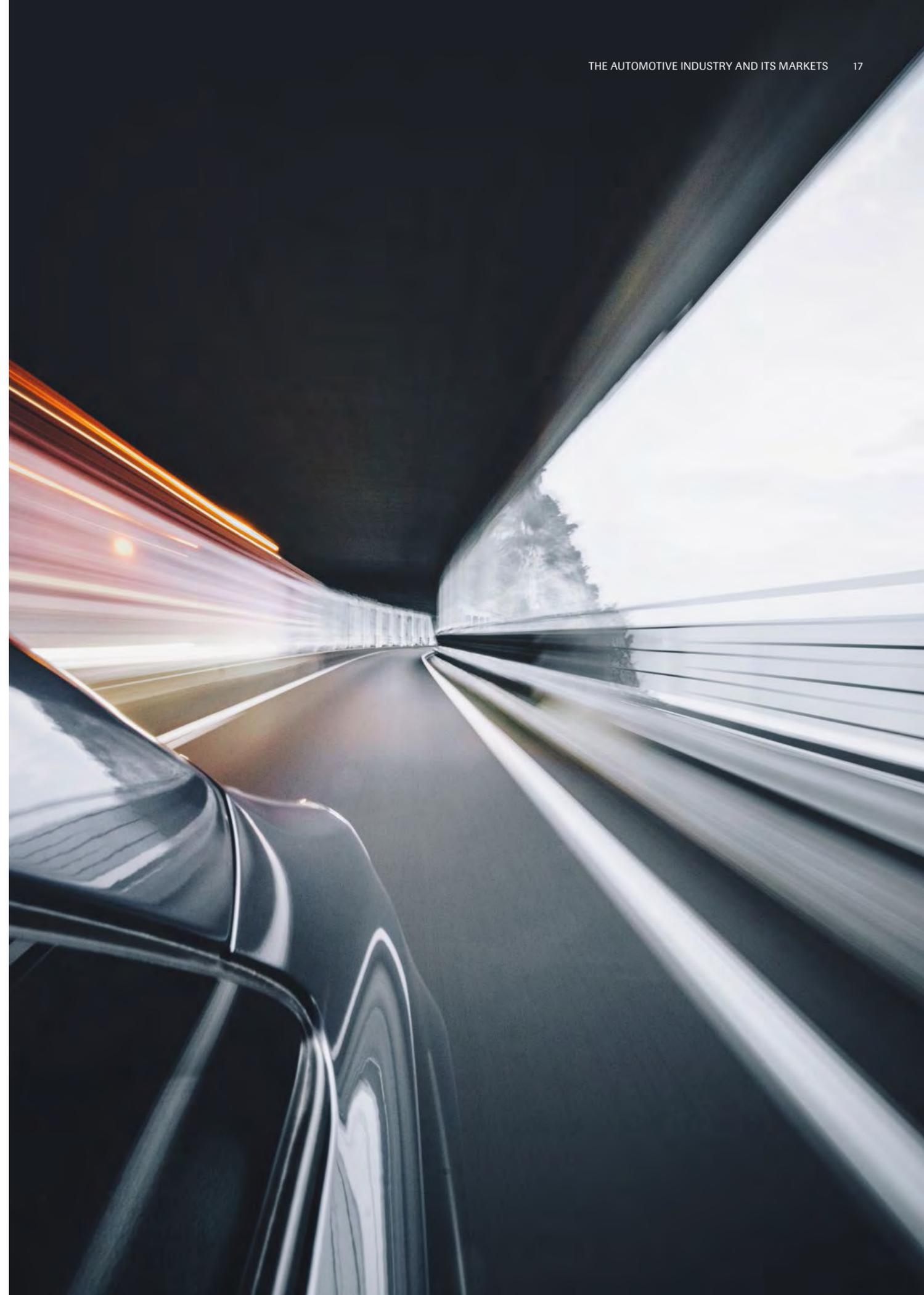
With the digitalization and development of alternative drives, the German automotive industry is engaged in a challenging process of transformation. German manufacturers and suppliers are researching more intensively than ever.

According to European Commission data, their global research and development (R&D) expenditure in 2016 increased to 40.2 billion euros – a year-on-year increase of 7 percent. German manufacturers and suppliers thus account for more than a third of the automotive industry's total worldwide R&D expenditure. That puts it in pole position – even ahead of Japanese and American companies. The top 10 companies with the highest R&D expenditure in the global automotive industry include four German groups.

A good half of R&D investment is accounted for by Germany. According to Stifterverband surveys, 2016 domestic R&D expenditure grew by 2 percent, to 21.9 billion euros. A good two thirds of this (68 percent) was accounted for by the vehicle manufacturers and almost one third (32 percent) by suppliers. The automotive industry thus accounts for 35 percent of total German industry R&D investment. No other sector in Germany invests as much.

The automotive industry's innovation departments in Germany number 114,000 highly qualified staff. In fact, 28 percent of R&D personnel in the German economy work in the automotive industry, namely more than one in four. Here too the automotive industry is the leader in a sector comparison. At the same time, the headcount in the R&D departments is increasing significantly faster than in the workforce as a whole: since 2010 approximately one new job in four in the German automotive industry has been created in the research and development area – more than 25,000 additional highly qualified jobs.

In addition to the constant optimization of combustion engines and investments in networked and automated driving, the development of alternative drive technologies in particular is a major R&D focus area. Between now and 2020 the German motor industry will be investing around 40 billion euros in alternative drive technologies.



International Automotive Markets

Economic development

The world's economy grew on a broad basis in 2017, despite political and economic risks.

Economic development gathered pace in 2017. Notwithstanding political and economic risks, there was broad-based growth in the global economy. Both industrial countries and emerging countries shared in the global recovery.

The 2017 growth rate in the USA was higher than the year before. In 2017 Japan's economy experienced its strongest growth in years. The upturn is continuing in Europe as well, thanks also to expansive monetary policy. The economy is now also visibly recovering in crisis-stricken countries, such as Italy and Greece.

The emerging countries as well are posting positive growth. China's growth continues virtually unabated. India's catch-up has also continued apace. Brazil and Russia have made significant steps to escape recession and should have put the worst of their economic woes behind them. Both economies benefited from rising raw materials prices.

China

In 2017 things were also going nicely for the Chinese automotive economy: a total of 24.2 million new automobiles were sold last year – growth of 2 percent. That means China remains far and away the world's biggest single market.

The lower value-added tax on new vehicles with up to 1.6 liter displacement also continued to play a critical role. These account for around 70 percent of new vehicles in China. In 2015 and 2016, purchasers of these cars only needed to stump up 5 instead of the usual 10 percent value-added tax. In 2017 the preferential tax rate increased to 7.5 percent, prompting customers to bring forward purchases to the closing months of 2016. The next year's growth was rather muted by Chinese standards, primarily because of this pre-emptive effect.

China is not just the world's biggest automobile market in total, but also when it comes to new registrations of electric cars and plug-in hybrids. Some 581,300 cars powered by an electric motor were sold there in 2017. That was 72 percent more than in 2016. The proportion of electric vehicles within the total market has therefore increased from 1.4 percent in 2016 to 2.4 percent in 2017. Last year the Chinese government decided to introduce an e-car quota. As of 2019, manufacturers must comply with minimum targets for the production and sale of vehicles with alternative drives. A complex points system was devised to that end. If a manufacturer fails to comply with the requirements, points must be purchased from other manufacturers or fines paid.

consumer climate. Notwithstanding three base rate increases by the US Federal Reserve bank, financing conditions remained favorable. Manufacturers also offered big rebates.

The trend to light trucks, apparent not only in the USA, continued in 2017. Whereas sales of pickups, SUVs, CUVs and vans increased by all of 4 percent to almost 11.1 million vehicles, basic car sales slumped 12 percent to approx. 6.1 million units. That made the light truck share last year almost 65 percent, its highest level ever.

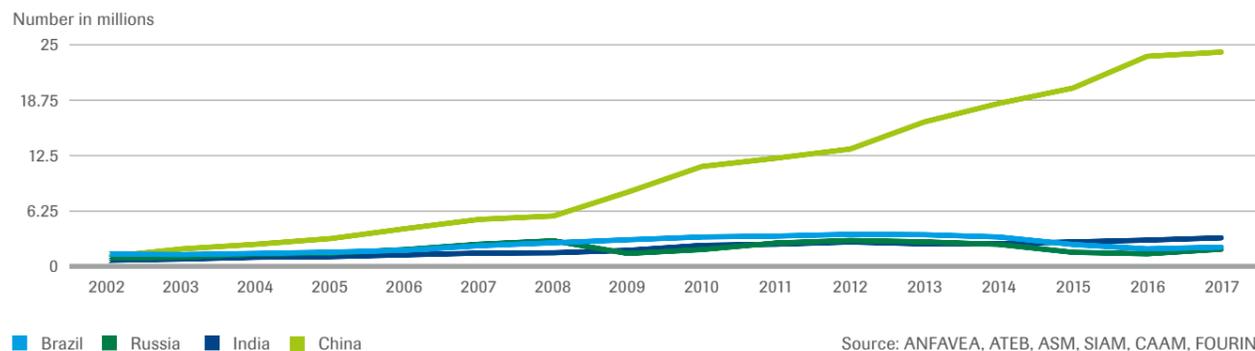
In the light truck category, the CUV (Cross Utility Vehicles) segment has been the most dynamic segment for years. Its share of the total market increased to 35 percent. For comparison: in 2005 the CUV share was only 13 percent. SUVs had an 8 percent share. Pickups, which have always been especially popular in the USA, accounted for a 16 percent market share. Vans were the only light truck subsegment to post a decline (minus 8 percent) last year. Their market share was 5 percent (year before: 6 percent).

USA

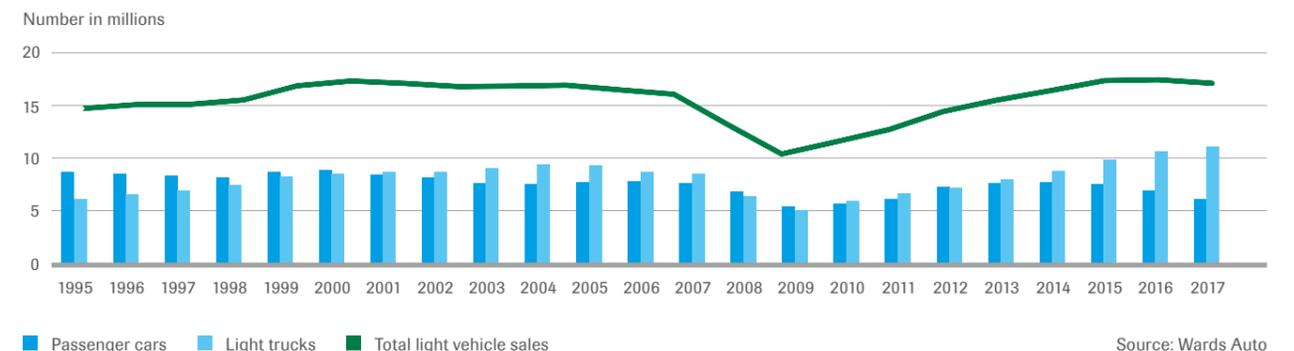
After seven years of growth and a record level of 17.5 million vehicles in 2016, in 2017 the US market showed some signs of saturation. Light vehicle sales fell by 2 percent to 17.1 million units. The two late summer hurricanes Harvey and Irma, which destroyed numerous cars, provided an exceptional boom. According to estimates, around 100,000 new vehicles had to be purchased as a result.

The environment in the USA was fundamentally good for the automotive economy. The price of gasoline was significantly lower in 2017 than the average for the previous five years. This was boosted by an excellent labor market situation and a strong

Sales volume of vehicles in the BRIC countries



Long-term LV sales in the USA



South America

The automotive year 2017 in South America was a successful one after the market lost 10 percent of its volume the year before. A market volume of around 3.9 million light vehicles was achieved – 13 percent more than the year before.

In 2017, South America's most important automotive market, Brazil, grew by 9 percent to 2.2 million units. But this was still around 40 percent off 2012's record level. Light vehicle sales in Argentina were up 23 percent thanks to a recovery in the overall economic situation. With 883,800 new registrations, 2017 was the second best year to date for the Argentinian light vehicle market.

India

India has potential: The density of cars is very low at 25 cars per 1,000 inhabitants.

The Indian automobile market remained dynamic in 2017 as well. More than 3.2 million automobiles were sold in India last year, almost 9 percent more than the year before. Nevertheless, there is still considerable headroom for the Indian automobile market. With almost 25 automobiles per 1,000 inhabitants, automobile density is comparatively low. Rising incomes and a growing middle class point to further growth. In the long-term, the Indian automobile market has the potential to achieve the highest sales volume globally after China and the USA.

Russia

The Russian light vehicle market recovered discernibly in 2017. With 1.6 million units sold, sales were around 12 percent above the previous year's level. The overall economic situation in Russia also improved in 2017. Rising oil prices in particular are benefiting the Russian economy, heavily dependent as it is on commodities. But economic sanctions continue to hobble the business climate. At the same time, Russia is using government programs to boost vehicle sales: preferential financing terms, scrappage schemes and investments in future technologies totaled around 1 billion euros. The prospects that the recovery will continue in 2018 are good.

Turkey

The Turkish automobile market has embarked on an astonishing expansion path since the end of the financial crisis, doubling its volumes compared with 2007 to 722,800 new automobile registrations in 2017. Automobile production in Turkey also grew by 20 percent in 2017 to a new record level of 1.1 million units. Year-on-year sales last year however fell by 5 percent. Price increases following the currency devaluation together with the hike in the special consumption tax (ÖTV) on automobiles in November 2016 slowed demand. All in all, the Turkish economy should have grown at least 6 percent in 2017. This growth is, first and foremost, the product of massive tax cuts and credit subsidies by the Turkish state following the political crisis since the summer of 2016. However, the economic programs have left a legacy of high inflation and a rising budget deficit.

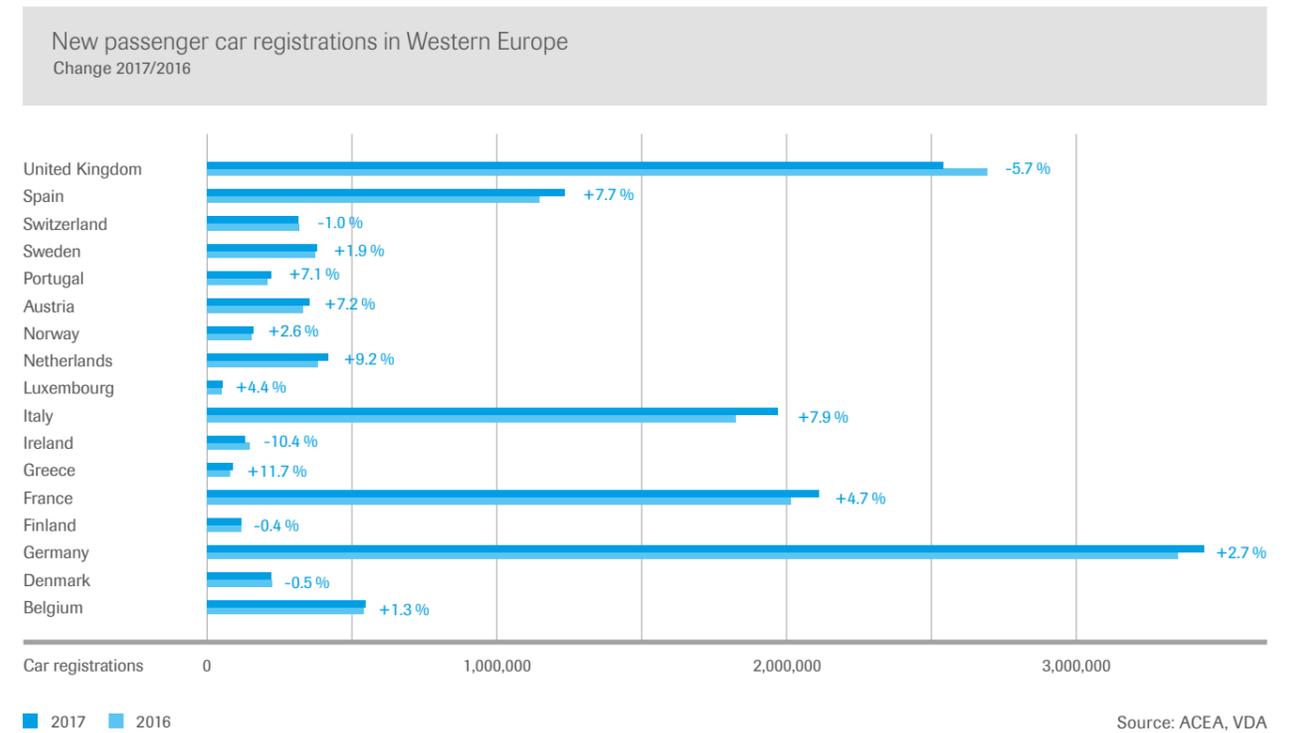
Europe

The Western European automobile market remained on a growth trajectory in 2017. There were more than 14.3 million new vehicle registrations last year in Western Europe – growth of almost 3 percent. That put the Western European automobile market almost back on par with its average pre-crisis level, and 13 countries out of 18 posted growth. Spain and Italy in particular again enjoyed robust growth. The German automobile market also proved to be a growth driver, achieving the highest market volume of this decade to date.

The year 2017 was not a good year for the British automobile market. New car sales fell 6 percent to 2.5 million vehicles. This was the biggest decline in the United Kingdom since 2009, when the Global Financial Crisis put a crimp in demand. Uncertainty about the consequences of Brexit and the concomitant devaluation in the pound sterling against the euro created a headwind.

New registrations in France increased by 5 percent to 2.1 million units. Especially in the second half of the year the market again gained momentum, with growth rates of fully 6 percent in the third quarter and 7 percent in the fourth. This marked the French market's return to pre-financial crisis levels. In 2017 the Spanish automobile market enjoyed a sustained good economic run. New registrations in Spain increased by 8 percent to 1.2 million units. In the process the market is continuing its recovery from its historic low in 2012 (700,000 new registrations). Again in 2017 there were almost 2.0 million new automobile registrations in Italy, growth of 8 percent. Both in Italy and Spain this is still more than 20 percent below the pre-crisis level.

In the new EU countries new automobile registrations increased by around 13 percent to more than 1.3 million vehicles. With 486,400 new registrations, Poland, as the biggest single market among the new EU countries, posted growth of 17 percent. The Czech market grew 5 percent to 271,600 units, a somewhat lower growth rate than 2016 (plus 12 percent).



German Market

In 2017 the automobile market in Germany reached its highest level this decade. There were 3.44 million new vehicle registrations in what remains a very robust macro economic environment. That was a 2.7 percent increase.

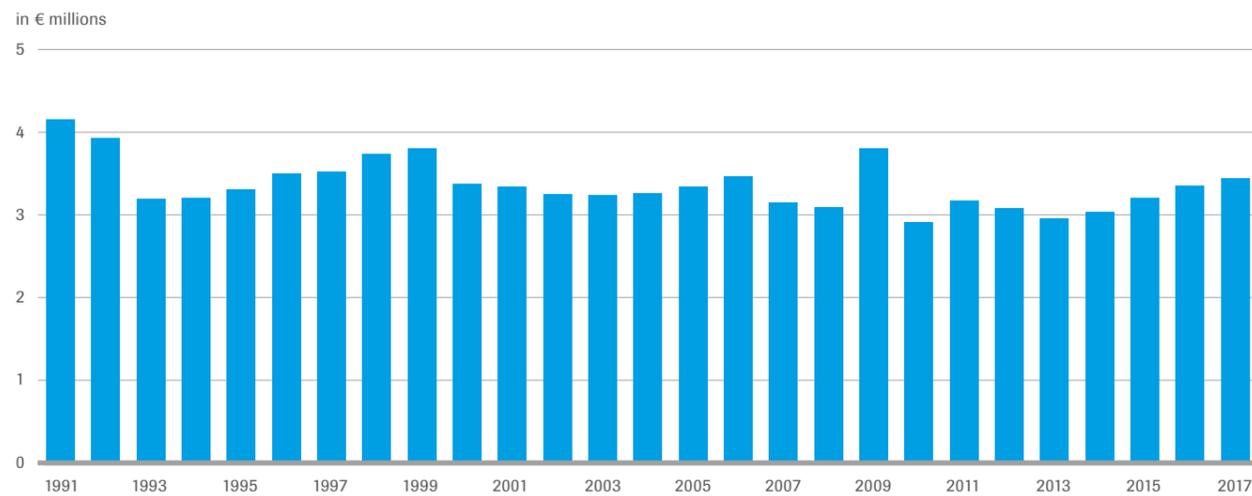
The manufacturers' trade-in incentives announced starting in August further boosted the economic momentum. At the same time, the ongoing debate about the future of diesel had a significant impact on market structure. The prospect of driving bans in particular had a noticeably unsettling effect on potential customers. This has significantly skewed automobile market shares by fuel type. New registrations of gasoline engine vehicles in particular grew significantly. Their market share during the year was just shy of 58 percent. Diesel's share fell accordingly. At the same time, electric-powered vehicles are becoming ever more important. Sales of battery electric cars and plug-in hybrids more than doubled to a total of 55,000 vehicles (plus 117 percent). This boosted the electric car share of the total market to 1.6 percent.

The trend to off-road vehicles and SUVs continued in 2017. This made it the most sought-after vehicle segment for the first time: 23.8 percent of new registrations were off-road vehicles or SUVs, a new record figure. Just behind, with 23.3 percent, were compact class vehicles. The upper mid-class also took a giant leap forward. In 2017 there were 18 percent more new vehicle registrations in this segment than the year before.

There were only minor changes in owner groups. The share of new registrations accounted for by private owners increased by 0.6 percentage points, new registrations by commercial owners fell by the same magnitude. That means that once again fully one third of new automobiles were purchased by private customers.

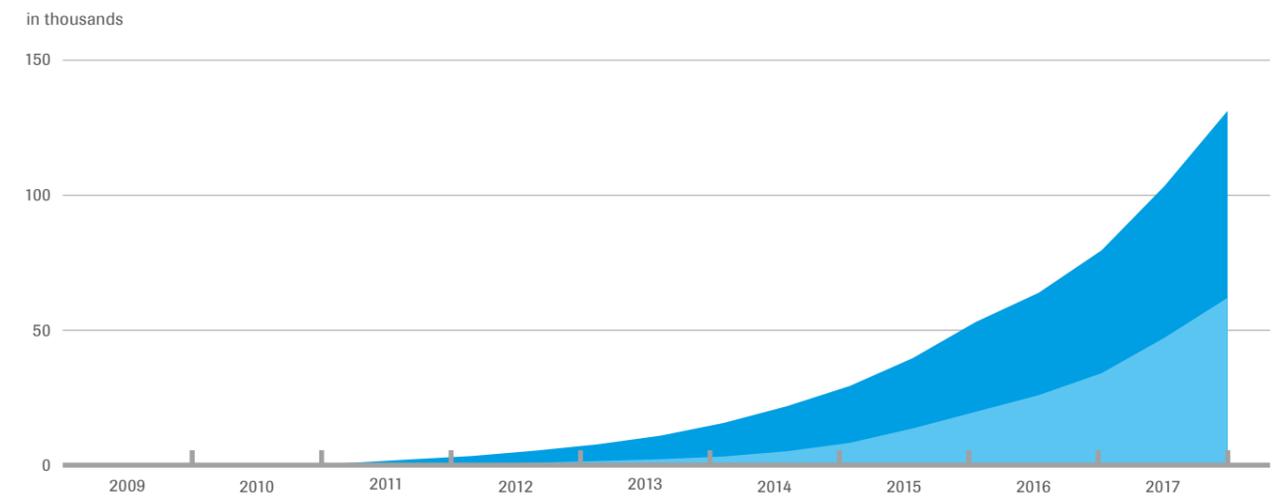


New automobile registrations
Annual basis



Source: Federal Department of Motor Vehicles

Cumulative new registrations
from January 2009 to December 2017



■ Cumulative automobile new registrations (BEV) ■ Cumulative automobile new registrations (PHEV) Source: Federal Department of Motor Vehicles

German Automobile Manufacturers' Production and Exports

Domestic production

Some 5.65 million automobiles rolled off assembly lines in Germany in 2017. That equates to a fall of 2 percent. As an automotive production location Germany is therefore defending fourth place in the global country rankings ahead of India and behind China, the USA and Japan. Germany remains the most important production country in Europe by a significant margin. Its lead even increased compared with Spain and the United Kingdom, both of whose output fell by 3 percent.

The German automotive industry's success is also based on the healthy balance between volume and premium models. In 2017 the premium segment's share of domestic production hit a new high of 59 percent; ten years ago it was just a shade over 50 percent.

Foreign production

The year 2017 saw German automotive manufacturers continuing to push ahead with their global expansion.

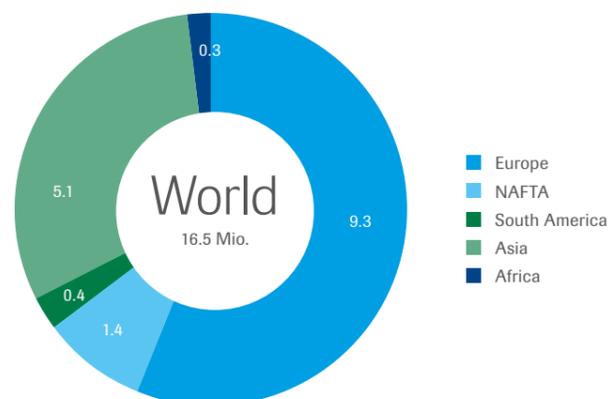
Production outside Germany increased by 7 percent to 10.8 million automobiles. The German manufacturers' most important foreign location remains China, where companies produced 4.9 million automobiles, 8 percent more than the year before. Three in every ten cars made by German groups are now built in China.

In the NAFTA region as well, 2017 saw an increase in German car production. German manufacturers' output increased by 11 percent to 1.4 million automobiles. Of this total, 804,000 were accounted for by the USA and 620,000 units by Mexico. In South America, Brazil is an important location for German manufacturers. The year 2017 saw a reversal in the trend; production started growing again, up by fully one quarter to 436,000 vehicles. Admittedly that is only barely half the record level of 2010.

German foreign production in Europe in 2017 increased by 5 percent to 3.6 million units. Heading the production country league with 858,000 units (plus 13 percent) was the Czech Republic, which overtook Spain (down 4 percent to 799,000 units) for the first time.

Global automobile production by German manufacturers 2017

in € millions



Source: VDA

Export

Cars "Made in Germany" again lost none of their allure in 2017. Automobile exports of 4.38 million almost equaled the previous year's high level (-0.7 percent). Growth in the past five years totaled 6 percent. The export quotient, namely the ratio of exports to total production reached a new record figure of 77.5 percent. This success in world markets depends very much on free trade. But behind the production of automobiles are to be found particularly complex cross-border value chains. The importing of the required raw materials and vendors components create jobs and prosperity in many countries, not just in one.

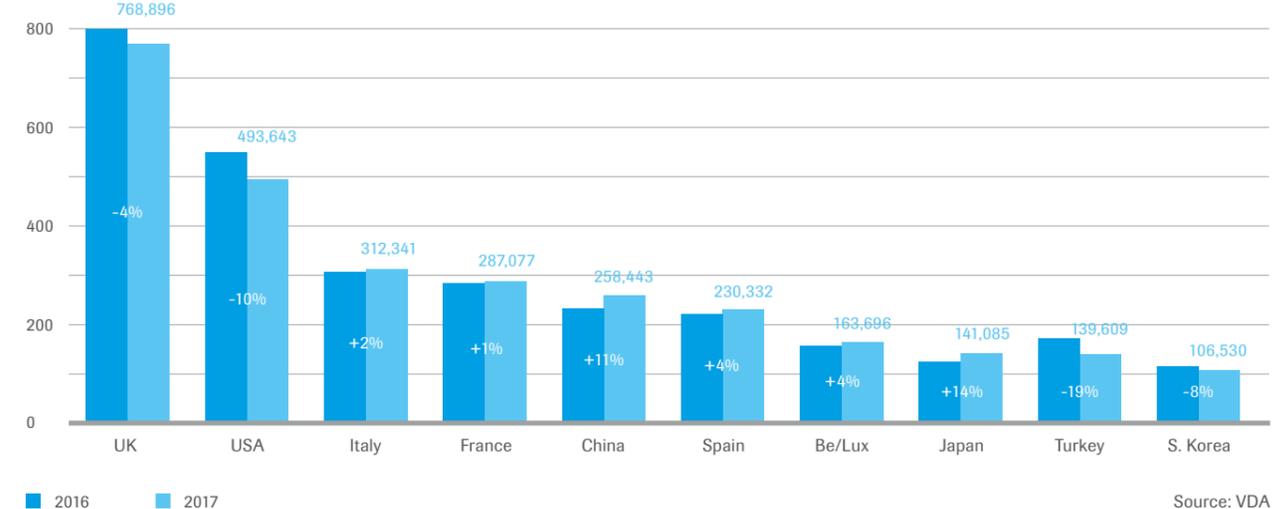
The EU internal market remained far and away the most important target region for German automobile exports in 2017, 57 percent of all exports or 2.5 million units (plus 1 percent) went to European Union member states. The most important purchasing countries in the EU were the United Kingdom, Italy, France, Spain and the Benelux countries.

A significant boost in demand for German automobiles in 2017 came from Asia. With 707,000 units, the previous year's level was exceeded by 7 percent. The demand for German cars was spearheaded by the most important Asian export partners China (plus 11 percent to 250,000 units) and Japan (plus 14 percent to 141,000 units).

Exports to North and South America fell 7 percent to 657,000 units. That is around 200,000 vehicles fewer than in the record year 2013. This significant decline is primarily attributable to the increase in local production.

Top ten automobile export partners

in thousands



Source: VDA

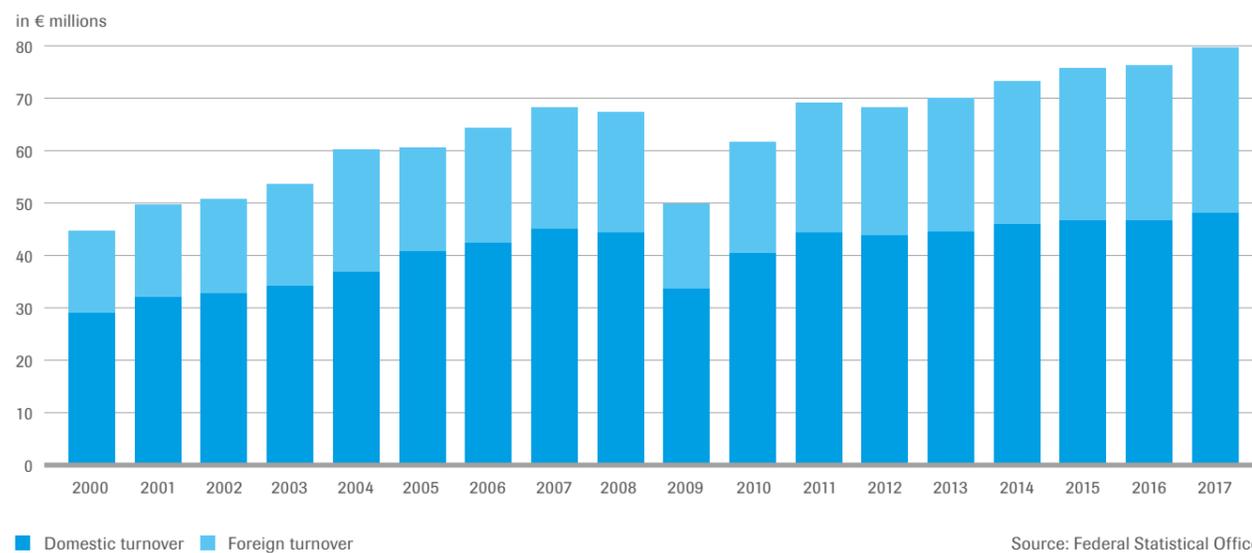
Markets for the Supplier Industry

German suppliers increased their revenue in 2017 by 4 percent to nearly 80 billion euros.

German suppliers can look back on a successful year 2017. The sector managed to increase sales for the fifth year in a row. At 79.6 billion euros, revenues exceeded the previous year's level by a good 4 percent. With domestic customers, manufacturers of components and accessories for motor vehicles turned over 48.0 billion euros (up 3 percent). Foreign sales increased by a solid 7 percent to 31.6 billion euros. Foreign sales have been increasing faster than domestic sales for years. Eurozone sales rose particularly sharply to 15.7 billion euros, plus 9 percent.

German supplier companies' permanent workforces numbered 305,200 in the past year. In comparison with 2016, this means growth of 1 percent, or 2,500 employees.

German supplier industry turnover performance



Markets for Commercial Vehicles and Buses

Heavy commercial vehicles

The world market for heavy commercial vehicles over 6 metric tons grew strongly in 2017. Global sales of trucks were all of 3.3 million. That was a 16 percent increase on 2016. The growth was driven by strong demand in China but markets in Europe, the USA and in India also posted growth. Brazil and Russia also resumed a growth trajectory.

China is the largest commercial vehicle market in the world. Four out of ten trucks in the world are sold there.

Four in every ten commercial vehicles worldwide were sold in China with the commercial vehicle market there reaching a volume of 1.35 million vehicles. The 40 percent increase on the year before translates to 384,000 units. The strong market growth is primarily attributable to the advance purchase effect to do with the introduction nationwide in China of the China National Stage 5 Emission Standard in the middle of the year. There was also a significant tightening up of checks to prevent overloading, which triggered additional demand for heavy trucks. India also saw a significant increase in heavy truck sales in 2017. The market grew by 13 percent to 295,000 trucks.

After two years of double-digit growth, new registrations in Western Europe last year were up only 2 percent to 291,000 heavy commercial vehicles. That is the highest level since 2008. Italy (plus 8 percent) and France (plus 7 percent) enjoyed the strongest growth among the volume markets. Whereas the German market slightly outperformed the previous year's level (plus 0.3 percent), the Spanish market minimally undershot it (minus 0.4 percent). The market in the United Kingdom contracted more markedly (minus 3 percent).

The US truck market in the second half of 2017 picked up significantly, offsetting the first-half losses. The net effect was market growth of 4 percent, with 415,000 new heavy truck registrations. The Heavy Duty Segment above 15 metric tons was particularly dynamic.



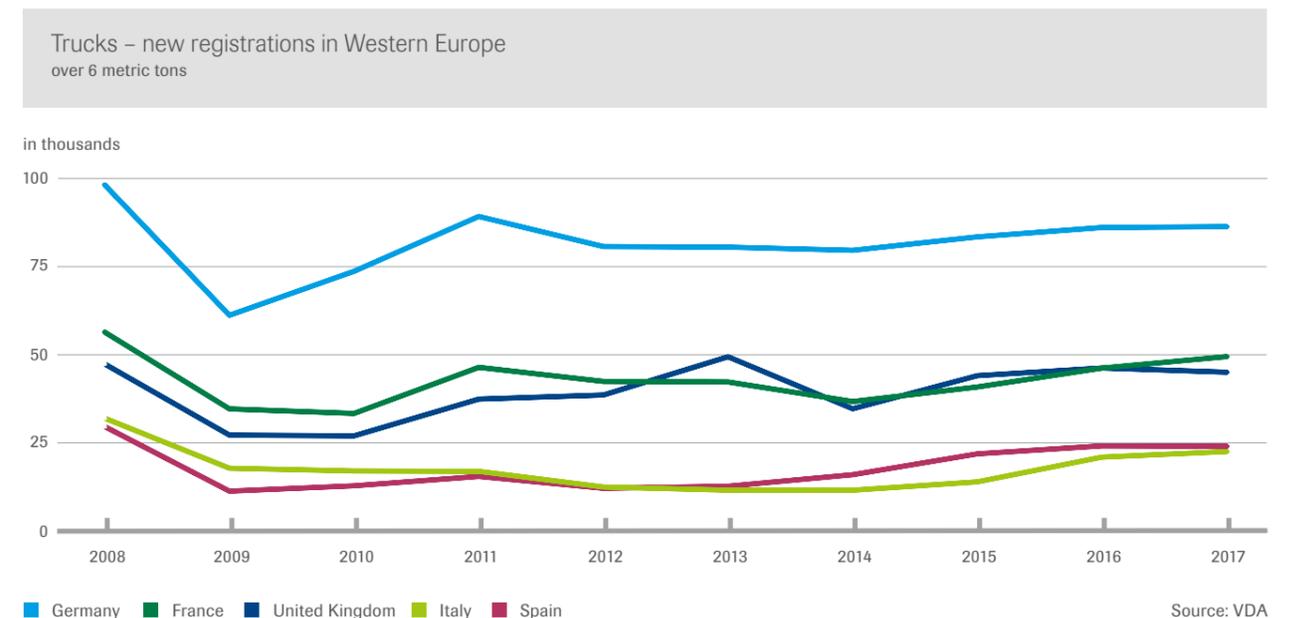
Buses

The West European market for buses over 3.5 metric tons fell just short of its previous year's volume. Some 36,300 new buses were registered (minus 3 percent). Sales in Germany stagnated with around 6,700 vehicles. Over 80 percent of registrations (5,600 units) were for buses over 8 metric tons. Demand from the long-distance bus market, which was liberalized in 2013, is sustaining the bus market in Germany at a higher level. Growth in the still young industry continues and service routes are being expanded further. Rising quality requirements, coupled with higher emissions and environmental standards, will continue to encourage the continuous updating of the fleet.

The Brazilian truck market in 2017 is bottoming out at a low level. After three years of double-digit falls, new registrations rose 3 percent to 48,000 units. That is less than one third of the record level of 2011. The recovery in the Russian market for heavy commercial vehicles, which had also contracted sharply in recent years, was significantly more dynamic. Sales increased here by almost half.

Vans

After three years of double-digit growth rates, the dynamism of the West European van market flagged somewhat. The past year saw sales of 1.93 million light commercial vehicles under 6 metric tons (plus 4 percent). However, the boom in online and mail order sales remains a long-term trend. It ensures an enduring need for new vans for home delivery. In addition, the replacement of the vehicle fleet in southern Europe largely continued. With the exception of Italy (minus 4 percent to 195,100 units) all individual southern European markets posted double-digit growth. In France, the largest single market, new registrations increased by 7 percent to 439,500 units. With 276,100 vehicles, Germany once again posted a new record (plus 4 percent). The Spanish market grew by 16 percent to 199,500 light commercial vehicles, overtaking the Italian market in the process. The United Kingdom was the only market in which new registrations fell, by 4 percent to 368,000 vans.



Markets for Trailers and Bodies

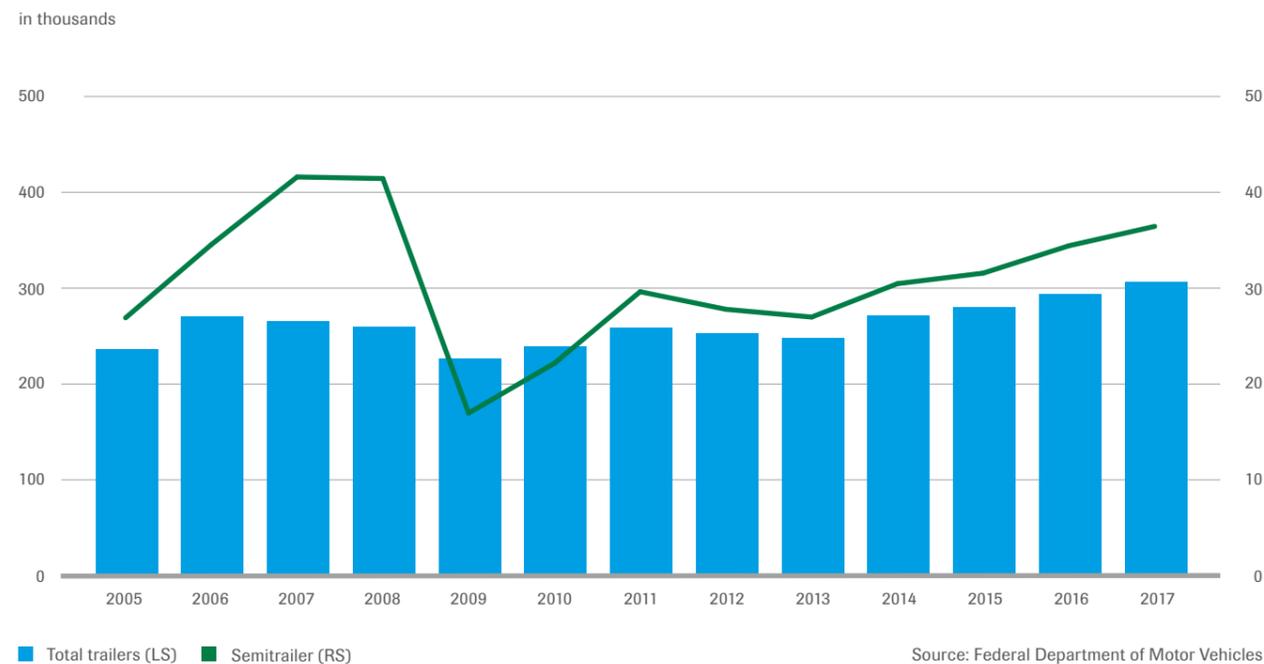
German trailer and body manufacturers were again able to profit from the economic recovery in the EU and growth in commercial vehicle markets in 2017.

In 2017 trailer sales in Germany exceeded the 300,000 mark for towed units for the first time. New registrations increased by a good 4 percent to 306,900 million trailers. Within this figure, the demand for semitrailers, with a 6 percent increase to 36,400 units, was particularly dynamic.

Measured by sales, trailer manufacturers can also look back on a successful year. Revenues reached a new high. Total sales increased by almost 5 percent year on year to 11.8 billion euros. Domestic sales grew particularly strongly, by 6 percent to 5.9 billion euros. But export revenues just edged it, with 6 billion euros. This reflects the German trailer manufacturers' strong international competitiveness. This sound business performance by

manufacturers of trailers and bodies also had a positive effect on the permanent workforces of factories in Germany. Their annual average employee headcount in 2017 was 35,200, or 2 percent higher employment than the year before. This is the highest employment level since 2004.

New registrations of trailers in Germany



Suppliers and Medium-sized Businesses

Overview

Automotive suppliers – the term merely hints at the diversity of the sector. The more than 540 suppliers within the VDA represent very different companies, ranging from the global system provider, via the highly specialized medium-sized company in family ownership to fast-growing development service providers and young start-ups developing tomorrow's technologies. Notwithstanding the enormous spectrum, what unites these companies is their spirit of innovation, expertise in products, integration and processes, sophisticated logistics and the pursuit of efficiency.

The globalization of the German automotive industry is not just down to the vehicle manufacturers. The suppliers are at least as nimble when it comes to building production facilities worldwide and acquiring new, international customers. The interconnectivity of their own supply chains requires them to be involved for longer and in many more countries than German manufacturers. VDA members are present on virtually every continent. In the early 1990s, German suppliers in North America had around 140 production locations. In 2015 there were more than 430. In Asia as well, the number of plants has almost trebled to more than 600.

German suppliers are internationally active. They have over 600 production locations in Asia.

This growth imposes considerable demands on these companies. Although very much easier for large system providers than for mid-size automotive companies, doing the splits between America and Asia, with the main center of operations in Europe, is and remains a mammoth undertaking.

But the global presence affords opportunities to do business with the international vehicle manufacturers in their domestic markets. A VDA study with the Center of Automotive Management corroborated this relationship. Nowadays, the interplay between German manufacturers and suppliers has been complemented by increased international collaborative ventures. German suppliers have also become American, Chinese and Korean manufacturers' development partners.

The global presence does not end with manufacturing in Mexico or India. In recent years the suppliers as well have given their development expertise a more global dimension. On the one hand, they are following the manufacturers' example. But on the other hand, they are also securing local expertise for themselves that can be critical for market success abroad. A profound understanding of regional peculiarities both on the manufacturer's and end customer's part, coupled with speed of response to customers' wishes, combine harmoniously with the German suppliers' pronounced spirit of innovation.

At the same time, Germany is and remains the VDA member companies' homeport. For large, globally active corporations or medium-sized companies alike, they would be less successful without the deep roots in their home region and their engineering virtues.



VDA promotes globalization

The association supports its member companies with globalization. The toolkit has expanded significantly in recent years. In addition to a detailed market observation in almost 100 countries, which the VDA has made available to member companies for more than a decade now, shared stands at important foreign trade fairs in particular have assumed greater importance. They help suppliers to make initial contacts for a foreign venture.

Medium-sized suppliers in particular are invited to take part in the shared stands. The shared stands are a special promotional tool for SMEs and part of the federal foreign trade fair program (AMP). The trade fair stands under the "Made in Germany" banner enjoy a particularly positive image and attract considerable interest. In addition to preferential exhibitor rates, participating companies appreciate the fact that the VDA supports the shared stands with press conferences and embassy receptions, thereby ensuring media attention. In recent years, suppliers with an interest in expansion used this platform to attend automotive trade fairs in China, Russia, South Korea, India and Iran.

The VDA also supports market entry with appropriate workshops and informational events. The supplier cluster that has been established within the VDA to help set up in Russia is very active and enjoys interest from the supplier industry.

The round table format that the VDA organizes in China and Mexico has become a firm fixture. Both initiatives have now attracted around 40 local CEOs apiece. Traditionally, the VDA invites a high-ranking representative of an international vehicle manufacturer to talk about local peculiarities, supplier strategy and possible collaborative ventures. This year is round 16 of the round table in China; in Mexico at the beginning of 2019 it will be the fifth such time that the format had been staged. But the focus is not just on companies that already have a country presence. A warm welcome also awaits companies thinking about a local investment and who would like to use the round table to make initial contact.

The VDA round tables are now firmly established in China and Mexico.



Suppliers' capacity for innovation

Vehicle manufacturer innovations are unimaginable without suppliers. Approximately three quarters of them originate from the supplier industry's laboratories and research institutions. It is precisely these product innovations that determine market success. Less visible but just as relevant are the numerous process innovations. The focus is not just on cost reductions. Ever higher quality, zero-defects targets, sustainable production processes that relieve the strain on man, machine and the environment, better logistics and optimized machinery maintenance are examples of process innovations by German suppliers. For more than a decade now, development service providers have been performing critical integration services in the automotive value chain, enjoying double-digit growth rates; their contributions range from development capabilities that customers can tap into, to designing entire derivatives. Which is why there is still great potential for development service providers as well to internationalize their footprint.

The automotive industry is currently faced with far-reaching technological challenges with the German suppliers driving innovation more than ever. They dominate the world rankings when it comes to patents for autonomous driving, for example. With their electric drive solutions they will continue to be indispensable partners for the vehicle manufacturers.

Suppliers are the drivers of innovation in the automotive industry more than ever before.

Automotive industry and start-ups

In addition to in-house research and development efforts, managing innovation in the automotive industry depends on a comprehensive dialog with external players. The importance of start-ups in this has increased sharply in recent years. Removed from the elaborate company processes and rigid structures of an automotive value chain, start-ups are frequently able to develop new ideas more quickly and apply them to products that they can then test.

Consequently, some automotive industry companies, especially the large ones, have long since forged partnerships with start-ups or opened offices in tech hot spots such as Silicon Valley, Tel Aviv or Berlin and are benefiting directly from the ideas, products and solutions of the start-up scene.

To prevent this potential for innovation from remaining the exclusive domain of automotive manufacturers and the larger suppliers, the VDA is promoting an in-house initiative to encourage networking and dialog between small and medium-sized automotive industry companies and start-ups from the entire mobility and production-related ecosystem. The VDA start-up initiative is based on the position paper published in 2017 *Deutschland als Cluster für die Mobilität von morgen* (Germany as a cluster for tomorrow's mobility).

Specifically, start-ups are included in VDA event formats, matchmaking offers are made for VDA members or else start-up tours are organized to tech hot spots around the world. Since the end of 2016, start-ups have also been able to become VDA members or showcase themselves on the automotive-collab.com collaboration platform for free.

The VDA is thereby acting in two directions. Small and medium-sized companies come into contact with start-ups via the VDA and can take advantage of their ideas, products and solutions. Start-ups receive support on technical standardization, regulation or market development issues via the VDA, in turn finding collaboration partners and clients in the automotive industry.

Automotive-collab.com

Entry into new sales markets, acquiring technical expertise, exploiting new business areas – the reasons for entering into collaborative ventures with other companies are many and varied. The quest for suitable cooperation partners is usually one of the biggest challenges here, which is why the VDA has set up a corporation portal for the automotive value chain.

In addition to a cooperation forum, www.automotive-collab.com is also home to an extensive company research database. The database contains company profiles of important suppliers with products and locations worldwide. Ultimately, the cooperation portal was also opened up for start-ups and innovative service provision companies.

A few clicks is all it takes for companies in the portal to announce their own activities, thus increasing awareness of themselves. For example the company's in-house Twitter channel can be embedded, company news written or event dates posted. The portal links automotive industry partners and is open to new interested parties.

Raw materials

The automotive industry is using some entirely new materials for technologies such as electro-mobility and networked and automated driving. Especially in the case of the suppliers, this is giving rise to demand for materials not previously used that are extracted beyond Europe. The reliable availability and price stability of these raw materials is increasingly important for the success of the German automotive industry. This is why it is imperative to develop supply chains in good time.

The electric motor, battery and electronics play a critical role in electric cars. The battery requires raw materials such as lithium, cobalt, nickel and graphite that were previously virtually insignificant in the automotive value chain. E-motor and electronics are based on raw materials such as rare earths and copper, which will in future be required on a significantly larger scale.

To support this transformation, the VDA and a number of member companies have founded the raw materials availability working party. Last year this working party set up a raw materials monitoring program. It will assist both the political and economic arena to be quick in identifying possible raw materials bottlenecks both for electro-mobility and networked and automated driving, with a view to strategic raw materials management.

Supply chain sustainability

Responsibility for people and the environment does not stop at one's own factory gate. Automotive industry companies nowadays are assuming ever more responsibility for their products and their entire supply chains.

In many sectors, in addition to statutory regulations, this has seen the emergence of sustainability standards that take account of customer and societal expectations. Responsible company management is increasingly becoming a global competitive factor that takes account of employee satisfaction, risk minimization and resource efficiency. Automotive industry companies place great value on responsible conduct, both for themselves and for their supply chain.

As regards sustainability, the VDA is also active in the supply chain. Manufacturing processes in the automotive industry entail many stages and are international. Many companies, especially small and medium-sized ones, are involved in vehicle production. An efficient, standardized methodology is required to ensure sustainability throughout the entire process and on the part of each individual player. To assess the sustainability of their own supply chain, VDA companies have developed various tools that build on one another, and which the VDA recommends.

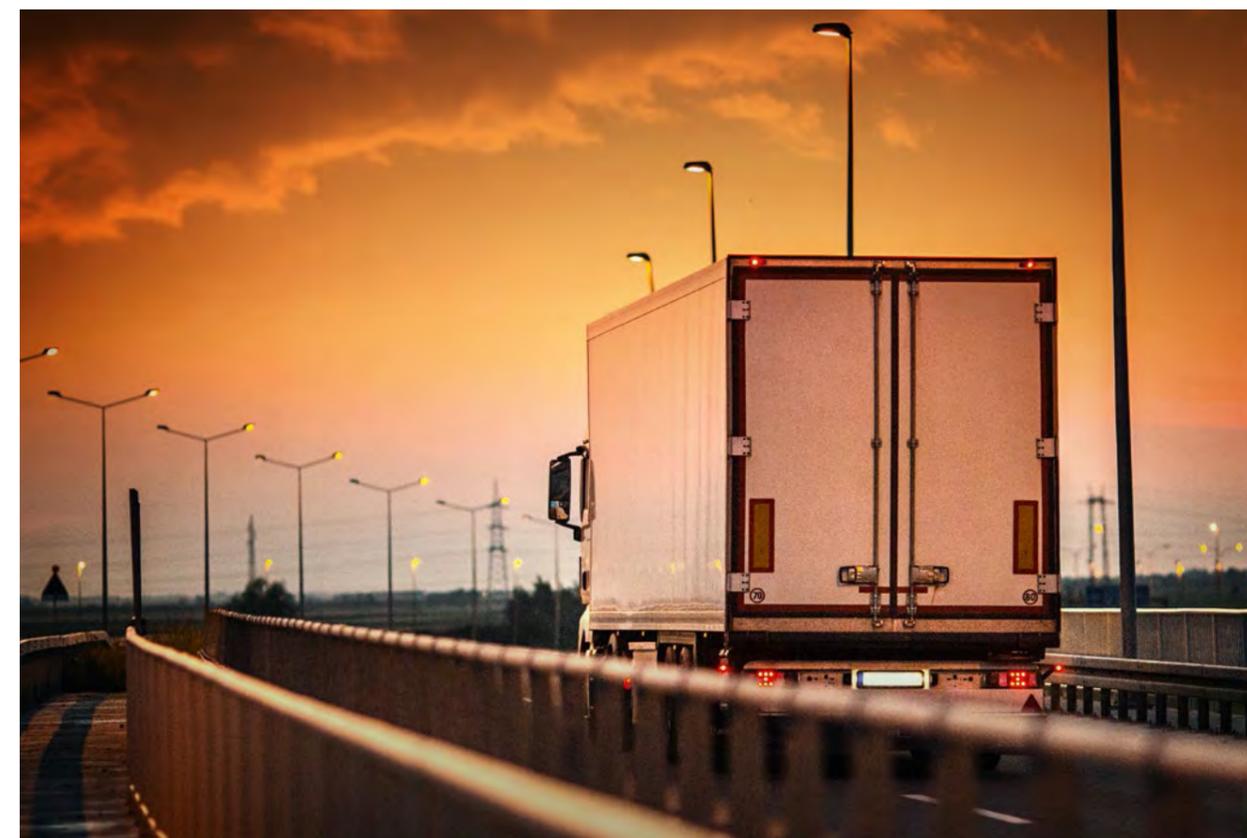
Medium-sized commercial vehicle industry

Guiding principles: manufacturers and suppliers have agreed on a non-legally binding "recommendation on guiding principles in the automotive industry to improve supply chain sustainability." These guiding principles are intended to be the basis for each player's corporate social responsibility.

Self-disclosure: the VDA recommends using the suppliers' standardized self-disclosure questionnaire to evaluate supply chain sustainability. Mutual recognition of self-disclosure enables the sustainability of the company in question to be assessed within a lean and efficient process, thus avoiding additional administrative cost.

On-site inspection: for more in-depth evaluation the VDA, together with some of its members, is developing a recommendation for on-site inspection. In the event that supply chain partners agree to on-site inspection, the inspection is to be carried out based on a recognized report. The goal is a lean and effective process for improving sustainability.

The commercial vehicle industry itself – with the exception of a few OEMs – is dominated by medium-sized companies, and is a significant overall factor in the German economy. The entire commercial vehicle industry has about 190,000 employees. Demographic changes, greater internationalization and increasing digitalization present new challenges for medium-sized German companies in the commercial vehicle business. They require nothing less than continual change and high flexibility, which the members of Manufacturer Group II within the VDA are addressing with various problem-solving approaches. For example, there is an increasing realization of the need to identify and harness the potential for digitalization in production, sales and, last but not least, in customer use. Family-run companies, most of which have been in family hands for several generations, are second to none in meeting ongoing development expectations of their products with respect to ecological and technical demands. No other country has such a high level of technological and quality thinking, as well as innovative ideas that flow quickly into manufacturing and innovative products in the trailer and superstructure industry.



Aftermarket

Just like the automotive sector as a whole, the automotive aftermarket is in a state of flux. The aftermarket business includes the maintenance and repair of vehicles, as well as sales of spare parts and services. The challenges it faces are many and varied:

For example the vehicle fleet in Germany is getting older, the average age having now reached 9.3 years, making familiar tasks even more challenging: Spare parts have to be provided at reasonable cost over an even longer period of time. This is compounded by completely new challenges, for example by the transition from old to new technologies or ongoing automation. Repair concepts and training requirements are changing as a consequence.

Logistics

Logistics is a critical success factor in the aftermarket. Experts are therefore continually at work improving processes. The VDA has already published several VDA recommendations on logistics issues.

A project group drawn from member companies is currently working on a standard for logistic information within a Data Matrix Code (DMC) as an integral part of the product packaging label. The background to this is increasing warehouse automation. This increases process speed and reduces errors. Scanners must be able to read information for this automation to work. If the supplier and customer agree on a common set of information within a Data Matrix Code, this supports scanning processes better.

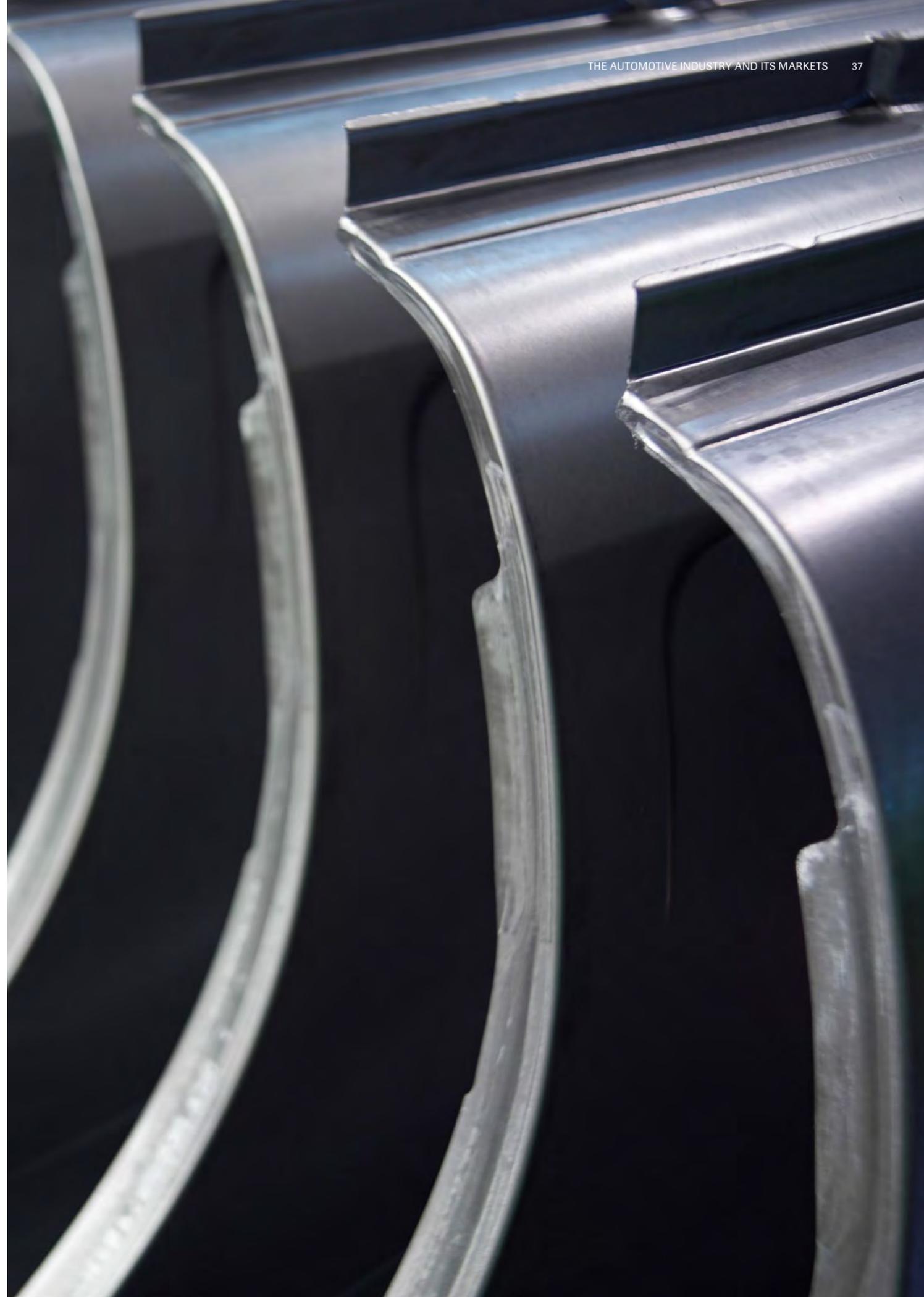
Integrating a Data Matrix Code into product packaging labels can also make trademark counterfeiting more difficult. This is achieved by serializing the DMC. This involves assigning a randomly generated, absolutely unique number per label. The VDA recommendation on the Data Matrix Code ("standardization of logistical information on product packaging in the aftermarket") is scheduled for the end of 2018. It takes account of the findings of VDA recommendation 9004 "Nomenclature for an Optically Neutral Identification Code for Spare Parts and its Verification."

Non-tariff trade barriers

Non-tariff trade barriers (NTB) continue to cause the vehicle and parts manufacturers major problems. Different regulations concerning certifications and labeling in particular make for unnecessary hurdles in the aftermarket. In principle the regulations are indeed sensible; they are intended to check whether quality and safety standards are being complied with. This is why standard UN regulatory requirements were instituted. However, there are additional sets of regulations, especially in the US and China. Ever more countries are introducing their own standards and regulations. In most cases, these provide no additional benefit to the consumer but increase supply chain costs and complexity in the aftermarket instead.

The VDA is working to raise the political and governmental awareness of the pressures created in the aftermarket by non-tariff trade barriers. The objective must remain to create global standards. At the same time, the association is helping its members to gain an overview of the plethora of trade barriers relevant to the aftermarket and to recognize the consequent need for action.

Also affected is so-called remanufacturing, namely the maintenance or refurbishment of defective used parts. These are often overhastily seen as waste, although after professional refurbishment they are again able to fulfill their original purpose. Using the definition of remanufacturing drawn up in 2013, the VDA, together with other associations, is advocating greater acceptance of it, because remanufacturing extends the product life cycle, making a valuable contribution to resource protection.



Historic Vehicles

German automotive manufacturers and suppliers cherish their history. In so doing they are bolstering their brands in the present day. The VDA supports its companies in their traditional work. An essential objective here is to safeguard the political and technical prerequisites so that classic cars can in future continue to drive on the public highway without problems. The rapid pace of technical development, in particular more stringent environmental regulations and vehicle safety requirements, are technically beyond the reach of classic cars.

The "historic vehicles" Department in the VDA and the committee of the same name have been working from as long ago as 2007 to maintain the best possible environment for classic cars. In collaboration with other players, it has often been possible to protect the interests of historical vehicle owners. For example, vehicles with H tags can drive in environmental zones, they are entitled to a red transferable license plate and to the seasonal license plate, and they pay a standard rate of vehicle tax. These provisions are justified because classic cars are a cultural asset - and should therefore be preserved. The VDA it is not seeking any additional special rights.

Dates, facts and figures

Every year the VDA assesses Federal Motor Transport Authority figures to provide its automotive industry members with the statistical wherewithal to provide comprehensive after-sales care. The total old-timer fleet - vehicles with a minimum age of 30 years and H tags - has been growing continuously for years. On 1 January, 2017 there were 422,213 registered automobiles with H tags in Germany. The number of H tag automobiles has grown by 157 percent since 2008, while the total vehicle fleet only increased by 11 percent. But with only a 0.91 percent share of the total automobile fleet, old-timers are still only a small minority of all registered vehicles. The historical vehicle share of the used car

market is also marginal at 0.33 percent. Classic car owners keep their vehicles for longer and therefore sell them less often. The diesel vehicle proportion of all automobiles aged over 30 years is 5.3 percent. This proportion is unlikely to change significantly, even in the near future. Diesel vehicles only began to be registered in large numbers in Germany from the mid-1990s.

German Old-timer Index

Every year the VDA issues the German Old-timer Index to be able to predict trends in the value appreciation of old-timers in Germany. The necessary vehicle value data is contributed by valuation expert classic-analytics. In 2017 the price dynamic for old-timers in Germany compared with the preceding turbulent years slowed considerably. The German old-timer index increased by only 1.4 percent. It reached a points score of 2,552 compared with 2,516 the year before. The increase was therefore less than the inflation rate (1.8 percent). The index is thus sending a clear signal that the steep increase in the price of classic vehicles in previous years has steadied.

Spare parts supply for old-timers

A crucial aspect of operating old-timers is ensuring a supply of spare parts. This is why manufacturers and suppliers are focusing more attention on finding possible solutions to ensure a long-term supply.

Increasingly there are particular challenges, with parts subject to ECE rules. These primarily concern safety or environmentally related components. The 1958 Convention prescribes that in the event of spare parts production being resumed, they can only be manufactured by the same supplier using the identical tools. The moment this no longer applies, then the spare parts

in question have to be redeveloped in accordance with the latest rules. For economic and also authenticity reasons such an approach is often problematic. The UNECE has recognized this problem. The third revision of the 1958 Convention therefore envisages that the original rules can be applied to new production of a part. The revision came into force in September 2017 and needs to be transposed into national law. A law to this effect is to be adopted in Germany in the course of 2018.

The electronic safety systems such as ABS and airbag available for premium vehicles from the beginning of the 1980s onwards are also increasingly causing problems. There is scarcely any availability of spares for the initially only rarely installed parts, or they cannot be produced economically. According to Federal Transport Ministry information, however, features such as these can be deactivated for individual vehicles under section 72 of the Vehicle Safety Regulations (StVZO). The precondition for this is that the system in question was not required by law at the time of registration. Deactivation needs to be performed by the manufacturer and documented.

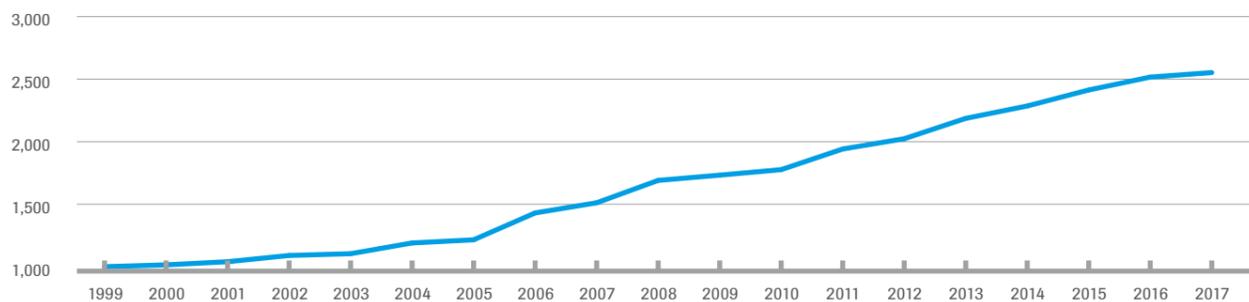
Temporary tags

As of 2016 so-called temporary tags may only be issued for vehicles following a valid inspection. These tags are very important for old-timer drivers as they are the only means they have of transferring an unregistered vehicle. The VDA therefore supports a change in the rules. One possibility would be a special temporary tag for old-timers.

The EU Commission is currently drafting a change to Regulation 1999/62/EC on levying fees for the use of particular highways. The revised paper envisages that this regulation, which previously applied only to heavy commercial vehicles, can in future also be applied to automobiles. Efforts are also in hand to change the basis for calculating the toll. In addition to taking account of distance, it is also intended to include environmental friendliness in the fee calculation. So far in Germany old-timer commercial vehicles have been exempted from the toll. The VDA is therefore advocating that the possible exemption of historical vehicles be included in the proposed amendment in individual member states, by analogy with Directive 2014/45/EU.

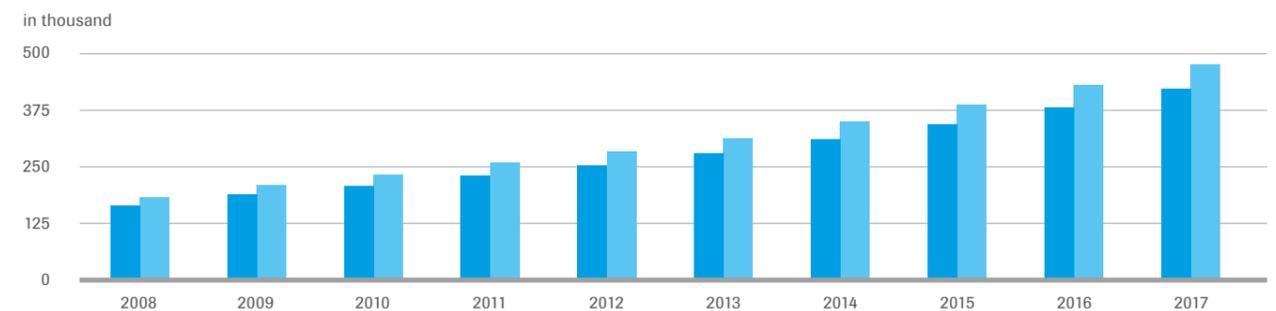
Temporary license plates: The VDA advocates special regulations for classic cars.

German Old-timer Index
Index trend since 1999



Source: classic-analytics

Changes in old-timer fleet



■ H-K automobile ■ H-K total

Source: classic-analytics

Fifteen million people in Germany are interested in classic cars.

Allensbach old-timer study

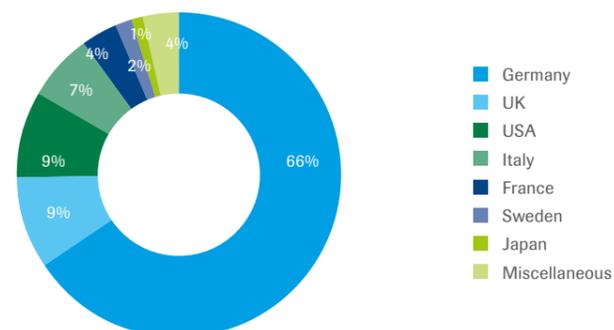
The Allensbach old-timer study investigates the old-timer segment in Germany. Originally intended mainly as media analysis, the ifD Allensbach old-timer study has developed into one of the most comprehensive surveys of the classic market anywhere in the world. One of the major findings of the 2017/2018 survey is that around 15 million people in Germany are interested in old-timer automobiles and motorbikes.

But 65 percent of all automobile drivers surveyed think that old-timers are an expensive hobby, which they cannot afford. The reality however is different: according to insurance industry data, the average value of an old-timer is around 20,000 euros, and many of the most commonly registered classic vehicles can be purchased for less than 10,000 euros. At the same time, the survey respondents put forward convincing arguments for purchasing a classic car: 61 percent attest to the old-timers' charm and 60 percent think that such a vehicle is something special that gets one noticed.

There is a clear public image of classic cars and their owners. More than 40 percent of the population is happy to see an old-timer on the road. They consider their owners to be individualists helping to preserve the technical cultural heritage. Two out of every five automobile drivers in Germany would like to drive an old-timer and no fewer than 20 percent would like to own one.

The average old-timer owner is male (90.4 percent) and aged 54.7. He owns 1.6 old-timers, driving 1,740 km a year in them. More than 20 percent belong to an old-timer club.

Countries of manufacture H-tag automobiles



Source: VDA

Auto Banks



Again in the financial year 2017 the automotive manufacturers' banks have proven themselves as a strong sales engine for the German automotive industry. New vehicle business grew by 8 percent to a record level of 44.65 billion euros. The total volume of all leasing and financing contracts under management grew by 10 percent and was at a historically high level of almost 125 billion euros at the end of the year.

Solid growth was seen both in the commercial and private customer markets. The auto banks concluded commercial leasing and financing contracts worth 26.8 billion euros, 6 percent more than the year before. Of this, 22.8 billion euros was accounted for by the traditionally strong commercial leasing contracts and around 4 billion euros by commercial financing contracts. The private customer market also grew significantly. With private leasing and financing contracts valued at 17.9 billion euros, the auto banks posted growth of 9 percent. The increase in leasing contracts in particular reflects the persistent trend towards use rather than ownership.

Mobility services are also experiencing strongly rising demand. These include automobile-related services, which the auto banks offer together with financing and leasing, for example vehicle insurance, warranty and repair insurance or maintenance services. In 2017, almost three million additional service contracts were concluded, 15 percent more than in 2016.

In the hotly contested used car market as well the manufacturer banks were again able to make good ground in 2017: With around 680,000 contracts they boosted their contract volume by a chunky 13 percent to almost 11.6 billion euros.

Economic Policy and Infrastructure

The world has become more turbulent. But stable political conditions are a crucial prerequisite for entrepreneurial success. Innovation-friendly economic policies, free trade and a good infrastructure can help to ensure prosperity and employment.



Economic Situation in Germany

Recovery continues

The German and global economy are in a strong and stable recovery. In 2017 the German economy grew 2.2 percent year on year, stronger than at any time since 2011. Germany continues to benefit from a large industrial sector by international standards. The manufacturing sector in particular is delivering especially dynamic growth. With 2.7 percent growth in 2017, it significantly outpaced other sectors of the economy. Industry is thus again proving to be the growth engine of the German economy.

The growth stimuli driving demand in 2017 were almost exclusively domestic. Buoyed up by a good employment and income situation, consumer spending grew appreciably, contributing 1.1 percentage points to GDP growth of 2.2 percent. Rising consumer demand encountered already high capacity utilization. The additional consumption therefore stimulated investment in new capacity to back up demand. There was comparatively little impetus from foreign trade in 2017, import growth outstripping exports.

Economic experts assume that the global economy and German economy will maintain their economic dynamism throughout 2018 and 2019. It is even anticipated that Germany's economic performance in 2018, with a growth rate of between 2.4 and 2.5 percent, will be somewhat stronger than in 2017. In 2019 as well the expectations are that dynamism will probably only slacken marginally. The forces driving this growth will probably shift yet further: away from consumption to investment, which is becoming ever more urgent because of the ever dwindling capacity headroom. Growth in private consumption should moderate slightly owing to rising inflation.

Securing long-term competitiveness

The strong economy has significantly muted discussion on how Germany's competitiveness can be safeguarded in the long term. But there is a need, especially now, to remove obstacles to growth and locational handicaps and counteract a possible deindustrialization of Germany. The necessary economic decisions need to be taken in good time and not only once the next downturn has set in.

That is why, in the first instance, it is very much to be welcomed that the CDU, CSU and SPD have come together again to form a government. The grand coalition offers dependable and stable political leadership, which Germany needs right now in turbulent times wherever one looks in the world. Current discussions with the USA illustrate this only too clearly. But the coalition also needs to take criticism on board: because Germany needs to achieve more. In this legislative period we have to work harder on Germany's competitiveness, because this is the only way of safeguarding employment, growth and prosperity in Germany.

The challenges are obvious: in a Cologne Institute for Economic Research (IW) survey on the biggest obstacles to investment, 50 percent of companies mentioned "bureaucracy and regulation." Skilled labor shortages (49 percent), labor costs (43 percent), energy costs (34 percent) and corporate taxes (32 percent) were also identified as the most frequent problems.

Just how much overly ambitious regulation can compromise Germany's attraction as a location can be seen in climate policy, for example. Germany has set itself a particularly ambitious CO₂ reduction target. Whereas by 2030 the EU is aiming to have cut greenhouse gases by 40 percent compared with 1990, Germany is targeting a reduction of 55 percent. Unilateral national action on climate protection is however counterproductive on two counts. It increases costs in Germany more than elsewhere.



And via the emissions trading system it even generates cost advantages abroad.

Skilled labor shortages are becoming increasingly noticeable as an obstacle to growth. The absence of qualified applicants from technical professions primarily affects industry. According to companies, the shortage is already causing delays in production and delivery. Twenty percent of companies even report that they are having to decline orders owing to skilled labor shortages.

In addition, high energy prices are a particular challenge in Germany. Of all the 28 EU countries Germany has the highest industrial electricity prices – purely as a result of high taxes and charges. Equally problematic is the absence of predictability, because prices largely depend on political dictates. Fully 12 percent of German industrial companies report deferring investment in Germany because of energy policy. The reluctance to invest is particularly pronounced in the energy-intensive sectors. In the past 15 years only between 80 and 85 percent of depreciation in the sectors has been replaced by new investment. That means companies are running down production capacity and gradually exhausting their existing substance.

Finally, by international standards, Germany unfortunately does not enjoy an attractive corporation tax rate. At 30.2 percent it is significantly higher than the average corporation tax rate of 24.7 percent for OECD countries. This is becoming significantly more topical as a result of the tax cut in the USA at the beginning of 2018. The American government has reduced the corporation tax rate in the US from 38.9 percent to 24.8 percent. This makes it even more attractive to create new production capacity in the USA and not in Germany or Europe. Further fiscal policy challenges are explained in the "Taxes and customs duties" chapter.

Coalition agreement

The coalition agreement between the CDU and CSU provides only incomplete answers to these questions. Admittedly, there are plans for various initiatives to counter the skilled labor shortage. These include the skilled worker immigration act. But the price of industrial electricity is set to rise yet further in the next few years. Because with the further expansion of renewable energies, the EEG contribution will continue to rise. With corporation tax as well, the planned EU minimum tax rate and the desire to avoid tax competition means that a reduction is not on the cards.

But it is the two sides of industry that are primarily responsible for labor costs. Between 2007 and 2016, unit labor costs in Germany's manufacturing sector have increased by an average of 1.4 percent p.a., compared with only 0.6 percent abroad. This puts Germany in the upper quartile for unit labor costs in the international league table. Unit labor costs in Germany are 6 percent higher than in the eurozone and 26 percent higher than in the USA.

European Policy

Ten years after the outbreak of the global economic and financial crisis the European Union remains in dire straits. Admittedly, the automotive industry has since almost recovered to its pre-crisis level. From a macroeconomic perspective as well the economic recovery has gradually consolidated into an economic upturn. In 2017 the EU's economy grew faster than at any time in the past decade. The unemployment rate fell to the lowest level since 2008.

But the situation in some EU countries remains critical. At almost 170 percent, Greece's national debt is far and away higher than the 60 percent prescribed by EU convergence criteria. The country's growth performance remains near zero. Developments in Italy, the fourth biggest economy in the EU, are also worrying. Not only was the 0.9 percent economic growth this southern European country posted in 2016 below average, but its national debt of more than 2,300 billion euros was also the highest of any EU member state. And in Spain as well the national debt of around 100 percent does not contribute to stability. At the same time, the unemployment numbers have at least improved in Spain. But the labor market situation remains uncertain. The Portuguese economy grew by 1.4 percent in 2016 and unemployment fell to 7.8 percent in 2017. However, in this country as well the national debt is too high at around 130 percent. This puts Portugal in third place behind Italy and Greece.

But even if European economic recovery has slowly set in – the simmering political trouble spots are absorbing a considerable amount of the capacity available to political decision makers and the EU's administrative apparatus. In addition to severe financial and economic challenges, the European union is still struggling to cope with migration flows, negotiations on the United Kingdom's withdrawal from the Union and the rise of right-wing populist and nationalist parties throughout much of the EU. Consequently, boosting European competitiveness is not commanding the necessary attention. The fragile political situation is also hindering rather than helping the investment climate. Although the European Commission set itself the target at the beginning of the legislative period of increasing industry's share of value creation to 20 percent, it continues to stagnate at around 16 percent. The increasing global challenges to European industry require a strengthening in European competitiveness.

But there are glimmers of hope. In the presidential elections in Austria and France, pro-European forces prevailed over anti-European candidates. The election of Emmanuel Macron in particular, who campaigned on an overtly pro-European program, has infused a new dynamism. The new French president has embraced the advancement of the European project. In particular against the backdrop of the Brexit negotiations, the EU's institutions have addressed the future and possible reforms of the European Union. The EU Commission, EU Council and EU Parliament submitted discussion papers and proposed reforms during 2017. In addition, 25 member states have decided to collaborate more closely on security and defense policy. However, the dynamism was initially brought to a standstill for reasons including the protracted process of forming a government in Germany.

The current legislative period is now nearing its end. A new European Parliament will be elected as early as spring 2019. Many draft laws are in their final phase, others are mired in the legislative process, others on the other hand should be set in motion as quickly as possible. The challenges facing the German automotive industry in Europe have never been as great as they are now. The relevant political topics for the Ger-

man automotive industry, such as transport, environmental and employment policy, are increasingly being handled at European level. In 2017, the European Commission submitted to the comprehensive mobility packages containing a whole string of legislative and non-legislative initiatives. Yet another mobility package followed in May 2018.

Against the backdrop of a fragile economic situation in Europe, discussions at European level are dominated in particular by climate and environmental policy. Following protracted negotiations, the EU has agreed new rules for emissions trading for the period 2021 to 2030 and, in the context of effort sharing, defined new national targets for greenhouse emissions for those sectors that do not fall within emissions trading, such as transport, buildings, agriculture and waste disposal. The substantial legislative package "Clean energy for all Europeans" ("Clean Energy Package") has largely been concluded. This includes inter alia energy efficiency regulations for buildings, prescribing specific requirements for electro-mobility charging points when undergoing renovation. Regulations for alternative fuels were also reviewed when revising the Renewable Energy Directive. In 2017, the European commission submitted a proposal for CO₂ limits for automobiles and vans post 2020. In May 2018, the EU Commission also submitted a regulation for heavy commercial vehicles. Political deliberations in the Council and Parliament are in full swing to conclude both dossiers before the legislative period expires.

There has been progress also with other important automotive industry topics. In addition to proposals to regulate CO₂, the EU Commission has also instituted a revision of the Toll Directive ("Eurovignette") as well as a review of the regulations governing public procurement of clean vehicles ("Clean Vehicles Directive") and submitted an action plan for alternative fuels infrastructure. The reform of the European type approval process was concluded. The high-level group "GEAR 2030," which looked at the competitiveness of the European automotive industry, submitted its final report. The round table on networked and automated driving initiated by EU Commissioner Günther Oettinger was continued under the leadership of the new Commissioner for Digital Economy and Society, Mariya Gabriel. In October 2017, the European Commission also initiated an EU battery alliance with the aim of promoting European battery cell production. The intention is to better coordinate collaboration between various industries and with member states.

The automotive industry has suffered a massive loss of confidence among political decision makers in Brussels. The EU Commissioner responsible for industrial policy, Elżbieta Bieńkowska, repeatedly criticized the absence to date of the cultural change promised by the automotive industry. In many of his

speeches and statements the EU Commissioner for the Energy Union, Maroš Šefčovič, uses metaphors such as "Tesla moment" or "Kodak moment." Kodak, once the world's leading manufacturer of photographic technology, had failed to make the transition to digital photography, rapidly losing market share as a result. A similar fate faces the European automotive industry faced with new competitors such as Tesla.

The member states within the Council of the European Union are also currently facing a difficult situation. Because of the protracted process of forming a government in the wake of the federal elections in 2017, on the one hand, and because of interministerial differences on the other hand, the federal German government was unable to express a position within the EU Council on important policy areas. Meanwhile, governments of other member states are taking up positions inimical to the industry's interests. It is not only governments of member states without any automotive industry worth the mention that are voicing criticism, but also increasingly governments of countries with relevant locations. The French government recently demanded CO₂ limits for automobiles and vans in excess of the 30 percent tightening up by 2030 demanded by the EU Commission. Seven other member states (Luxembourg, Austria, Belgium, the Netherlands, Ireland, Slovenia and Portugal) have expressed similar views. There has not yet been any real lightening of the mood in the European Parliament since the revelations of the manipulation of emissions by individual automotive industry companies. In the debates in the European Parliament's committee of inquiry it was repeatedly emphasized that the automotive industry had lost the trust of consumers and politicians. In the final report, the demand of member states included emission tests under real driving conditions and appropriate compensation for the owners of older diesel automobiles who had been affected.

Boosting European competitiveness is currently not commanding the necessary attention.

Brexit

On March 29, 2017, for the first time in the European Union's history, a member state declared its withdrawal from the union. This had been preceded by a referendum in June 2016 in which the British electorate voted by a narrow majority for Brexit, namely Great Britain's withdrawal from the EU. In its notification of March 2017 the British government formally informed the European Council of its intention to withdraw, thus triggering the process under Article 50 of the Treaty on European Union. According to this process a withdrawal agreement has to be negotiated and ratified within two years of notice being given. The EU Council can unilaterally extend this period for an indefinite duration in agreement with the member state in question.

The heads of state and government of the EU have tasked the European Commission with conducting the negotiations on the withdrawal agreement with the British government. The negotiations fall into two phases. The first phase discussed all those points directly affecting the withdrawal. These included in particular Great Britain's financial obligations, the rights of EU citizens in Great Britain and of British citizens in the EU as well as border issues, such as in Northern Ireland. The second phase is intended to negotiate in particular on details of a possible transitional phase and an agreement on the framework of future relations between the United Kingdom and the EU. The future relationship, also including a possible trade agreement, can only be negotiated once the withdrawal has been formally concluded, namely once Great Britain has "third country" status.

Trade with Great Britain

Deep economic ties have been forged between the countries of the European Union and the United Kingdom over a period of decades. The trade in goods alone between Great Britain and the European mainland totals almost 370 billion euros annually. The ties are even closer from a German perspective: 12 percent of German goods exports to the EU, approximately 86 billion euros, were to the United Kingdom in 2016. Imports from Great Britain accounted for 6 percent of total imports from the EU, namely approximately 36 billion euros.

The bulk of goods exports from Germany to Great Britain is accounted for by the automotive industry: In 2016 it exported vehicles and parts worth 28.5 billion euros across the Channel. Great Britain sent vehicles and parts worth 6.2 billion euros to Germany. The bulk of automotive trade – almost 80 percent – is accounted for by finished automobiles or trucks. German suppliers exported goods worth 5.5 billion euros to Great Britain and imported vehicle parts worth 1.3 billion euros.

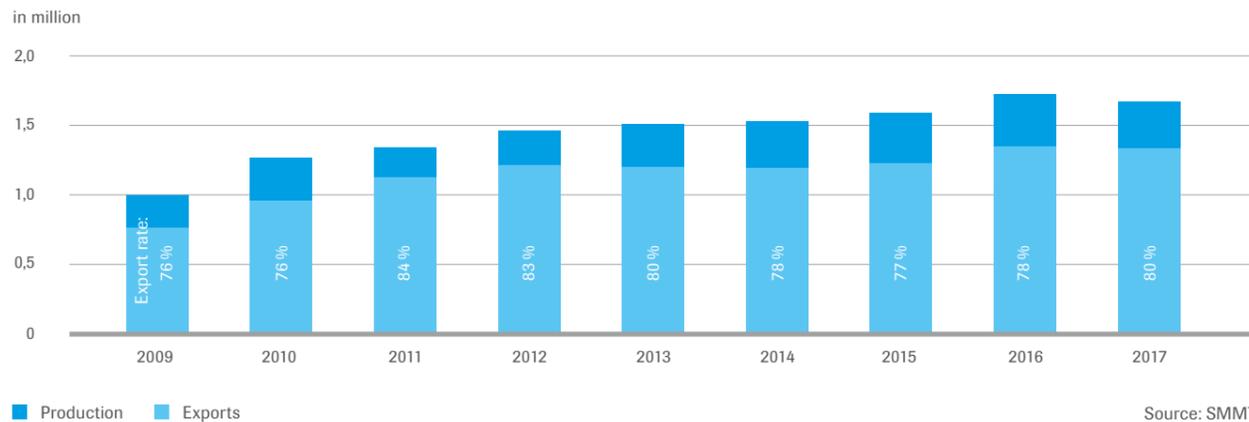
British automotive industry

The figures illustrate that Germany enjoyed a significant surplus in automotive trade with Great Britain. However, the British automotive industry is also enormously dependent on exports, primarily to Europe. For example, Great Britain produced 1.67 million automobiles in 2017. Around 1.3 million automobiles were subsequently exported. That means that four out of every five automobiles manufactured in the United Kingdom are for export. More than half of them, almost 54 percent, were sold in the European Union. That makes the EU far and away the British automotive industry's biggest sales market. The automobile market in Great Britain itself is also characterized by vehicles traded across national borders. New automobile registrations in Great Britain are accounted for by imported vehicles, significantly more than 80 percent. In 2017 Germany manufactured around 4.4 million automobiles for export. With almost 770,000 automobiles, Great Britain was the biggest market for German automobile exports. That means that approximately 18 percent of German automobile exports go to Great Britain. Imported vehicles are also very important in the German automotive market as well: in 2016 the import ratio was 64 percent; there were 2.2 million new vehicle registrations.

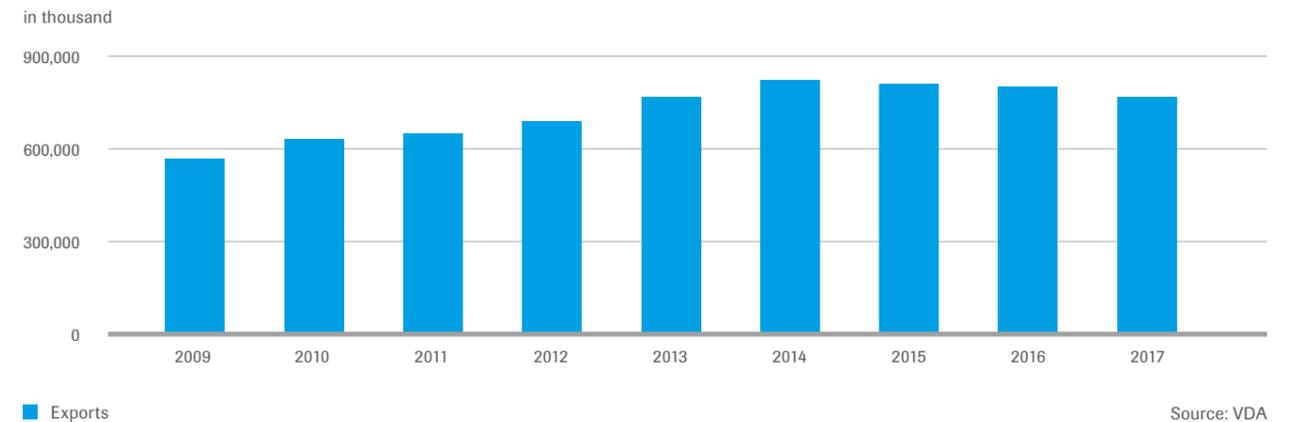
The high export and import ratios both in Great Britain and Germany illustrate that value chains do not stop at national borders. British automotive manufacturers' supply structures also have an international focus. Nowadays, around 50 percent of parts for a car manufactured in Great Britain originate in another country. This pronounced internationalization of production chains means, however, that transaction costs (customs duties or border controls) can have a major influence on suppliers and manufacturers when it comes to collaboration. Brexit can therefore adversely affect automotive trade between Great Britain and the European Union in many ways.

More than half of British car exports go to the EU.

British automotive industry export ratio



German automobile exports to Great Britain



Currency effect

The influence of Brexit on the exchange rate between the euro and the British pound is already clearly visible. The pound suffered an immediate devaluation after the Brexit referendum. The background to the devaluation was the expectation that the growth of the British economy would be weaker after Brexit. There are already indications of this in current economic data. One factor in this the major uncertainty about the future framework. Since the referendum, investors have been holding off from new investments in Great Britain. This is putting a damper on macroeconomic development. This is all the more important as the British automotive industry is strongly characterized by foreign manufacturers' investment.

The exchange rate changes the fundamental trade framework. A weaker currency generally goes hand in hand with improved competitiveness because exports are cheaper while, at the same time, imports are more expensive. For British consumers this means, above all, price rises for imported vehicles. As the British market is for the most part served by imports, this affects whole swathes of the new automobile business.

Impact on production in Great Britain

Until such times as the future relationship between the EU and the United Kingdom is clarified, exact forecasts about economic development in the post-Brexit era are nigh impossible. Every new impediment to trade flows can potentially result in a decline in economic exchanges. Customs duties in particular, but indirectly non-tariff barriers as well, have the effect of increasing costs on traded goods. Higher costs reduce the breakeven point or else prices have to rise. The cross-border trade in products becomes less attractive. Cross-border value chains are also sensitive to practical trade barriers such as border controls. Waiting times at borders make just-in-time production, for example, significantly more difficult. It is thus evident that Brexit will potentially weaken Great Britain, especially as an automotive location. For companies producing in Great Britain this either means relocating to the EU or increased production costs.

For companies in the UK, Brexit may lead to production relocation or higher costs.

Customs clearance after Brexit

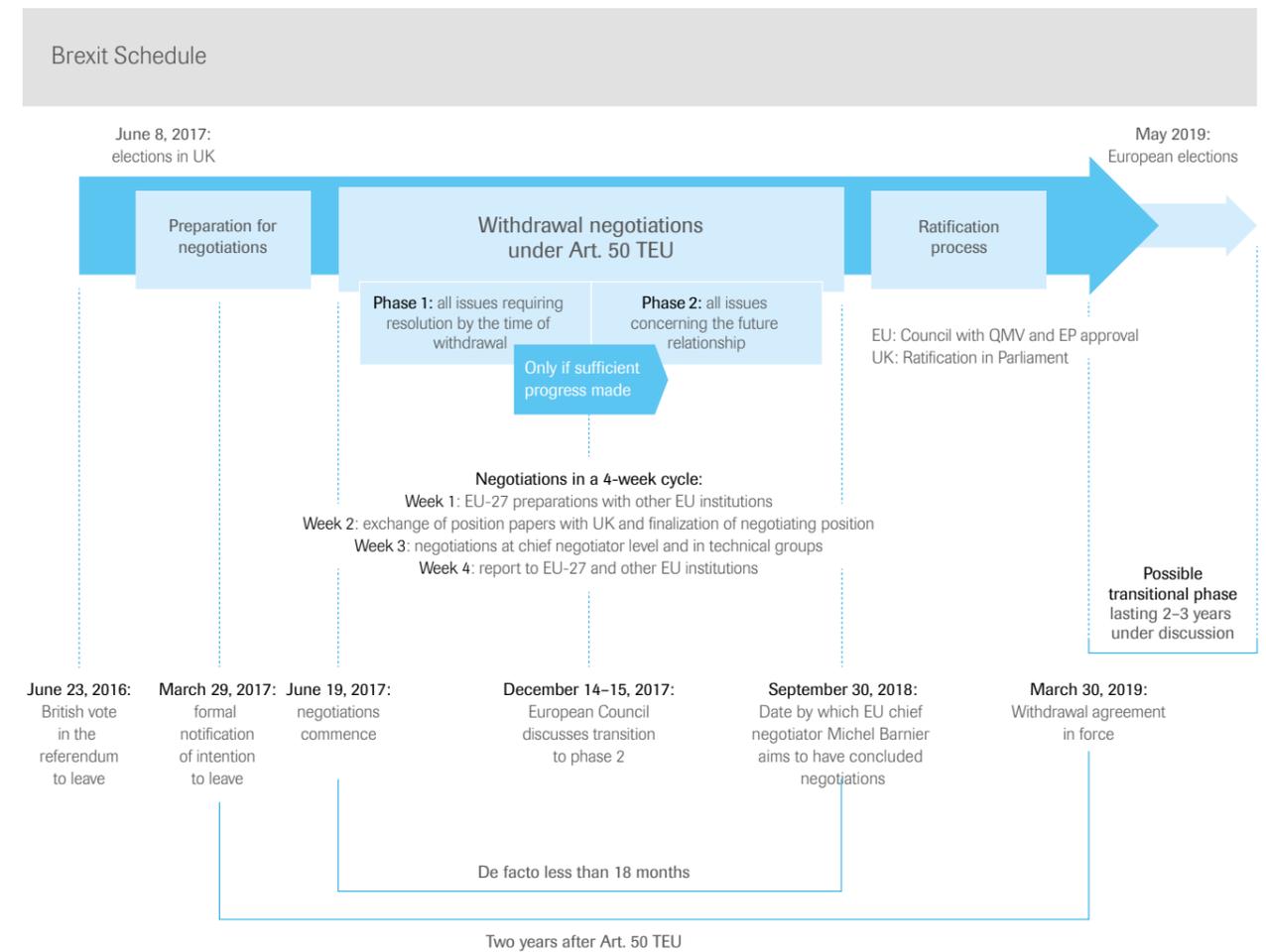
In addition to the possible cost of new customs duties after Brexit, customs clearance could in practice also pose considerable problems. The VDA is therefore proposing a simplified customs clearance procedure based on self-assessment that guarantees a frictionless trade in goods without any additional administrative burden, both for companies and customs and tax authorities in the EU and the United Kingdom.

Irrespective of whether the future relationship between the United Kingdom and the EU is governed by a free trade agreement or a customs union, companies will have to perform customs clearance for the cross-border trade in goods as well as comply with customs declaration obligations. Even the simplified import and export procedures possible under European Union customs legislation do not satisfy a close EU-UK partnership and would mean restrictions on the free trade in goods. The procedure proposed by the VDA would enable goods to be supplied as before with no interruption in the flow of goods. In this way, production locations in the EU and in the United Kingdom could in particular exchange the materials and goods they need without hindrance.

Avoiding trade barriers

The German automotive industry hopes that the negative effects of Brexit can be minimized. The objective should be to design the future relationship between the EU and Great Britain on the basis of the four fundamental freedoms. In addition to customs clearance other individual issues are also important to the automotive industry. For example, type approvals in the EU and in Great Britain should continue to be valid, irrespective of where they were issued. Also at issue is whether new automobile registrations in Great Britain should continue to be included in European CO₂ regulation.

The uncertainties that the British Brexit verdict has caused are already negatively impacting economic growth, especially in Great Britain. The German automotive industry has a major interest in relations between the United Kingdom and the EU remaining as close as possible. Great Britain is an important partner for German automotive manufacturers and suppliers. New customs duties or other trade barriers can therefore be in nobody's interest. However, in the event of Brexit, there is a clear economic and political priority for the EU and Germany: the cohesion of the 27 Member States. Ultimately Brexit is unlikely to be a successful model for Great Britain.



Trade and Investment

Globalization poses challenges for the German automotive industry, while also affording major opportunities. On the one hand, German locations benefit from open markets: Almost 80 percent of automobiles produced in Germany go for export. At the same time, the German automotive industry has greatly developed its worldwide presence: Automotive manufacturers and suppliers have production sites at around 2,400 locations abroad.

Protectionism

But the German automotive industry's global network also creates new risks: restrictions on free trade by individual countries or regions can significantly affect the automotive value chain. The VDA therefore advocates a global dismantling of tariff and non-tariff trade barriers. As far as possible customs tariffs should be eliminated. Technical regulations or certification requirements should be designed in such a way that they do not operate as a trade barrier. The objective should be an

open trade and investment policy in Europe and with partner countries worldwide. Unfortunately, there is a continuing trend in many countries towards protectionism.

There is a wealth of examples of measures countries deploy in an attempt to make market access more difficult and to protect or boost certain domestic industrial sectors. But experience shows that protectionist measures such as these typically do not yield the anticipated success. Not only do they tend to make market entry more difficult for suppliers wishing to import, but for potential investors as well. Markets with few barriers and a good network, on the other hand, are significantly better able to attract investment and prosper in the long-term. Examples of this are Mexico and the European internal market.

Examples of trade barriers in the automotive sector

India	Africa	Russia
In some cases import duties on components for automotive production are being doubled from 7.5 to 15 percent. The measure follows the "Make in India" strategy. The consequences, however, are legal uncertainty and increased production costs in India.	There is an increasing trend for African countries to apply protectionist measures in order to promote their own automotive industry: for example Algeria (import quotas) or Egypt (local content and postponement of customs reductions).	Russia's automotive policy promotes local investment. In some instances this has been in violation of WTO principles, an organization Russia joined only a few years ago.
Brazil	Iran	China
Brazil's automotive policy has been reported by the EU Commission to the WTO, where it has been found to be discriminatory. Negotiations are underway.	With the lifting of sanctions imposed on Iran, the country wishes to return to the global automotive industry. However, Iran has immediately instituted high local content requirements that operate in a protectionist way. Iran is not a WTO member.	China opened up following its accession to the WTO; numerous customs duties and local content conditions were dismantled. But there are still restrictions on investment and special technical regulations governing imports.

Source: European Commission, VDA

Future of the WTO

The World Trade Organization (WTO) is the custodian of free trade. Its clout and the support of important members are constantly on the line. At the same time, the WTO is an important forum for global collaboration and economic development.

The WTO was founded in 1995 and currently numbers 164 member states. The WTO's objective is to dismantle trade barriers of every description. It deals not just with industrial products but also services, intellectual property and agricultural produce. But the accession of new members and protracted rounds of negotiations have exposed the WTO's limits. For example, the Doha Round on the dismantling of trade barriers came to grief in part because of resistance on the part of developing countries to lowering their customs duties. Negotiations on dismantling trade barriers are tough especially in the agricultural sector. Compromises are often virtually impossible in the automotive sector as well.

Notwithstanding the WTO's difficulties in achieving a consensus on trade matters, it has important responsibilities as the custodian of free and fair trade. For example, WTO members are required to notify their national trade regulations to the WTO ("notification"). This is intended to ensure that no trade partner is caught unawares by changes, while providing an opportunity to comment. The WTO also provides a dispute settlement process. Countries can "sue" other WTO partners within a multistage process. If the dispute settlement body finds that the bringing of the action was legitimate, countervailing measures may be taken in the form of punitive tariffs. Ultimately, the WTO monitors the development of trade barriers and analyzes global trade. The WTO therefore, remains the anchor of multilateral, rules-based trade policy. A weakening of the WTO is to be avoided under any circumstances.

USA trade policy

Under the leadership of President Trump the USA has taken itself in a new direction on trade policy. The cancellation of multilateral agreements such as TPP or NAFTA were concrete steps delivering on campaign promises. The USA will play no further part in the TPP free trade area; NAFTA is to be renegotiated. The Trump administration's declared objective is to increase the value-added share in the USA.

In imposing additional protective tariffs on steel and aluminum exports, NAFTA partners Canada and Mexico were promised exemptions if they comply with certain other US demands. Other partners as well were offered negotiations. The EU rapidly threatened countermeasures should the USA enact their punitive tariffs. The EU's assumption here is that the tariffs are intended to protect domestic industry rather than serve security interests, as officially stated.

At the same time, the German automotive industry was constantly cited by President Trump to accuse the EU of allegedly unfair conduct in transatlantic trade. However – together with European partners and hand in hand with the US automotive industry – the VDA has vigorously championed the conclusion of a transatlantic free trade agreement. President Trump's criticism of EU tariffs is therefore intended as a pretext to open new negotiations on market access conditions. The German automotive industry would be more than ready to do so.

The USA's economy is integrated with global value chains and strongly networked into other economies. Potential trade conflicts are therefore also primarily a threat to jobs and prosperity in the USA itself. Because the German automotive industry as well has a strong foothold in the USA: German manufacturers and suppliers did not just export to the USA, but created many jobs and local value as well. German manufacturers and suppliers had a total workforce of more than 116,000 employees in the USA in 2017. The bulk of these jobs in the USA, around 80,000, are provided by German suppliers.

Overview of current duties in transatlantic trade

Motor industry duties in trade between the EU and US (import duty in %)

Trading partner	Automobiles	Light vehicles	Commercials	Parts
EU	10	10/22*	22	2-5
USA	2.5	25	25	0-2.5

* Depending on engine type, weight and displacement capacity

Source: European Commission

Trade and investment agreements

The USA continues of course to be an important export target country for the German automotive industry, but on a downward trend. In 2017 automotive manufacturers exported around 494,000 cars to America. That is a decline of one quarter compared with 2013. Exports are worth a total of 19.4 billion euros. At the same time, manufacturers have significantly increased their production at US locations, by more than 180,000 units to 804,000 vehicles since 2013. Companies are therefore producing more than 300,000 more cars in the USA than imports from Germany.

The German manufacturers' production also makes a considerable contribution to the USA's automotive trade balance: a good half of all cars that German manufacturers produce in the USA are exported to countries outside the NAFTA area, to Europe, Asia and the rest of the world. That is around 430,000 vehicles. The German share of total US exports of light vehicles, around a quarter, is three times higher than the US market share.

That means that German automotive industry companies value the USA as a production location and export hub. They have continued to develop their presence in recent years. The situation can hardly be described as unfair.

Since the collapse of the Doha Round, bilateral free trade agreements have been an important tool for improving reciprocal market access. The EU has concluded various agreements with 31 countries, 16 more agreements are at least partially in force. For example, there are free trade agreements with Mexico and South Korea. The EU is also negotiating new agreements with many other partners. Agreements with the Mercosur bloc, the ASEAN countries and India are particularly important for the German automotive industry. An investment agreement is being negotiated with China that is intended to eliminate restrictions on investment in the form of the compulsory joint venture, and other multilateral, production measures.

Most agreements take many years for negotiations to reach a successful conclusion. That applies for example to the Mercosur talks or the planned free trade agreement with India. But the focus is on the opportunities afforded by collective trade agreements. The absence of agreements on the other hand, entails risks such as those currently apparent in the relationship with the USA. Political stability also goes hand in hand with economic cooperation, an important factor that is often forgotten in the argument over globalization.



Important free trade agreements for the automotive industry

Partner region	Agreement content	Status of the negotiations	Duties on cars
China	Investment agreement: Investment protection and market access	Negotiations since 2013	25%
USA	Transatlantic Trade and Investment Partnership (TTIP) (until 2016)	15 negotiating rounds since 2013, "put on ice" in 2016; resumption, possibly in slimmed-down form, conceivable	2.5% (cars) 25% (commercials)
India	Comprehensive free trade agreement	Negotiating mandate since 2007, interrupted since 2013 after 12 negotiating rounds, talks on resumption ongoing	Up to 100%
Japan	Comprehensive free trade agreement (Economic Partnership Agreement)	2017 agreement on content but still needs to clear national parliaments and European Parliament	0%
Mexico	Modernization of existing agreement	Agreement on fundamental content in April 2018	0%
Mercosur		Negotiations since 1999, intensively again since 2016, stringent Mercosur rules of origin requirements for vehicles currently obstructing agreement	35%
ASEAN	Comprehensive regional agreement with ASEAN	Negotiations with 7 ASEAN member states began in July 2007. In March 2009 the committee agreed to put regional negotiations on hold.	Up to 80% (tbc)
Singapore	Trade and investment agreements	Based on the ASEAN 2007 guideline, 2014 negotiations concluded, subject of a lawsuit before the ECJ, Council of Ministers assent outstanding	0%
Vietnam	Free trade agreement	Text published in 2016, entry into force anticipated end of 2018	50-70%
Malaysia	Free trade agreement	Negotiation since 2010, currently on hold	30%
Indonesia	Free trade agreement	Negotiations since 2016	50%
Philippines	Free trade agreement	Negotiations since 2016	30%
Thailand	Free trade agreement	Negotiation since 2013, frozen since military coup	80%

Foreign trade promotion and development cooperation

The internationalization strategy of the German automotive industry leads to increased activities in developing and emerging countries. To facilitate market access by German automotive industry companies in these countries, the VDA cooperates with the German Federal Ministry for Economic Cooperation and Development (BMZ). The BMZ uses local experts to procure access for these companies to these new markets and provides a wide variety of promotional opportunities.

The German government is setting a clear regional focus in its cooperation with business with its “*Marshallplan mit Afrika*,” “Pro! Africa” and “Compact with Africa” initiatives. The intention is to create local prospects and jobs, and combat the reasons why people flee their own countries.

The VDA and automotive industry companies make a critical contribution to this and play a role in various countries in developing training centers where people receive technical career training. The twofold aim is to enable indigenous professionals to become qualified and encourage international investors to settle.

The international energy transition in the transport sector also affords opportunities in developing and emerging countries. Competitive electricity-based fuels (e-fuels) for decarbonizing the transport sector can be created in these countries, and local value chains developed, by fostering favorable conditions for renewable energies.

Yet another development cooperation focus area is raw materials and supply chain sustainability. This primarily entails creating and adhering to environmental, energy and social standards. Activities help companies achieve sustainability targets while, at the same time, promoting the economy in developing and emerging countries.

Association partnership in India

In December 2016, VDA, the Society of Indian Automobile Manufacturers (SIAM) and the suppliers association Automotive Component Manufacturers Association of India (ACMA) launched a new association partnership. The joint project is being funded for an initial three years by the German Federal Ministry for Economic Cooperation and Development. The association partnership expands on the already existing successful cooperation between the three associations built up over many years. New focus areas for the relationship with India are being created in addition to established formats such as the IAA India Day and the Indo-German Working Group on Automotive Sector.

India remains on a growth trajectory: gross domestic product grew almost 7 percent in 2017. Equally high growth is expected in 2018. The Indian car market is also experiencing dynamic growth: by a good quarter between 2014 and 2017 to 3.2 million new cars.

The cooperation is focused on future topics such as electro-mobility and alternative fuels, the framework for bilateral trade and quality management. The partnership program is intended to significantly step up the dialog on these topics. To this end, two new project coordination departments have been created on the VDA and Indian sides, financed from project resources. The kick-off was in July 2017 with a project planning workshop in New Delhi at which the partners agreed on three pillars, with the partners initiating joint studies, workshops and seminars in close cooperation with their member companies.

Association partnership objectives on three levels

Pillar 1	Pillar 2	Pillar 3
Intensive industry dialog on future topics	Successful exchanges between Indian and German stakeholders with a view to tangible collaboration	Additional offerings for the reciprocal enhancement of quality and technological expertise
Joint studies and publications Stepping up the work of the Indo-German Working Group on Automotive Sector	Stepping up trade fair collaboration IAA India Day B2B meetings Reciprocal invitations to relevant industry meetings (e.g., VDA Technical Congress), delegation visits	Collaboration between the VDA QMC and the ACMA Center for Technology Reciprocal exchange of employees and experts

Source: VDA



Energy Policy

Electricity prices

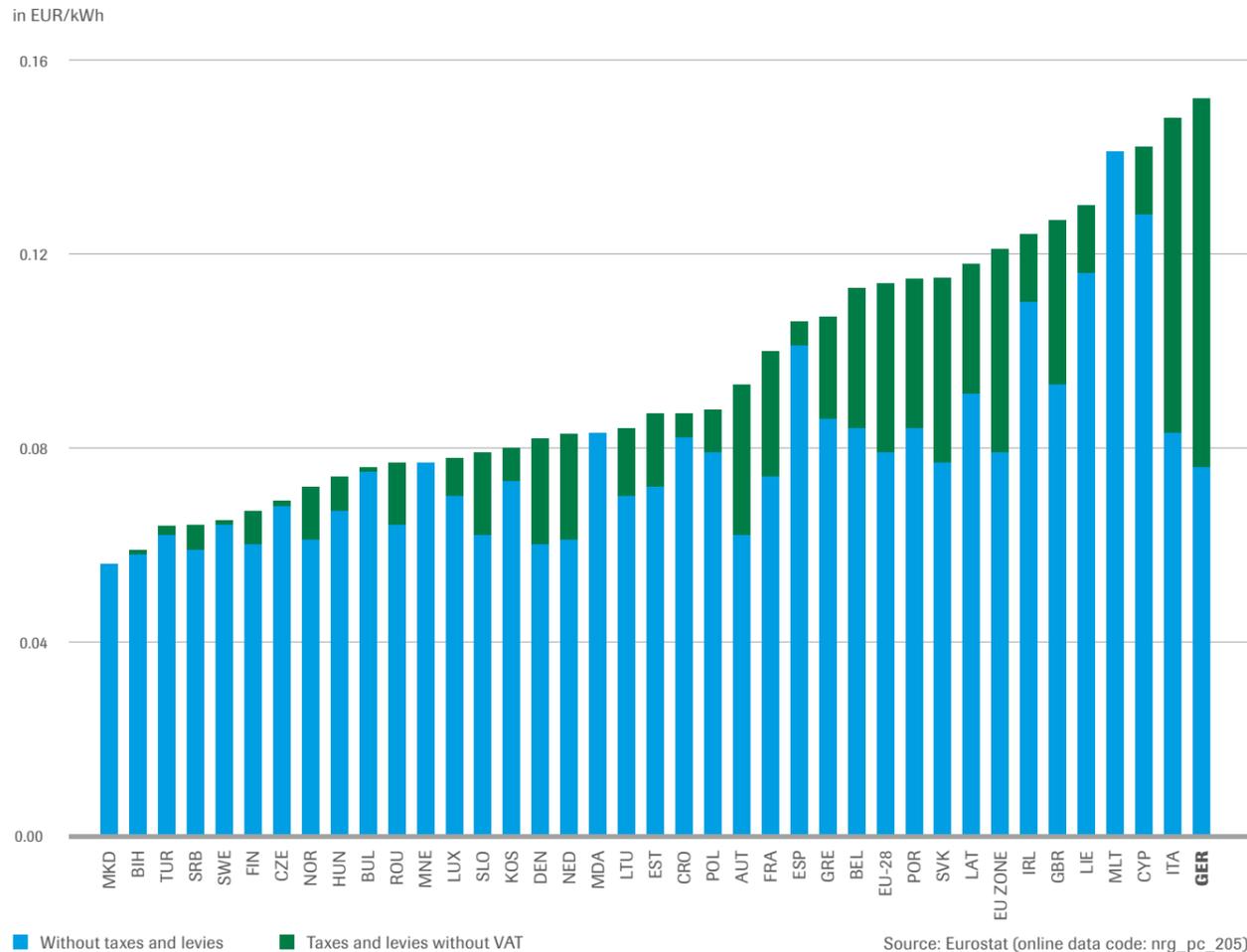
The average industrial electricity price in Germany again rose significantly in 2017, by 9 percent compared with 2016. That means that companies in Germany are again paying the highest energy prices in Europe. At an average of 17.2 cents/kWh German industrial companies pay approximately twice as much as competitors in Poland, Austria or France. The high energy price is a clear competitive disadvantage for German industry. As such it can also have a negative impact on location and investment decisions.

More than half the electricity price is accounted for by taxes and charges that are higher in Germany than in any other EU country. The energy providers' costs for procurement, networks and sales, on the other hand, are not quite 48 percent of the price.

The industrial electricity price German companies are required to pay is therefore the result of an artificial price increase driven by taxes and charges. The biggest single item among the taxes and charges is the EEG contribution with a 39 percent share. The EEG contribution is admittedly marginally down in 2018. But according to Agora Energiewende forecasts, a further significant increase of around 10 percent is on the cards for 2019.

In its coalition agreement the new German government announced "a greater market orientation" of investment in renewable energies. Furthermore, "the EEG and system costs are to be kept as low as possible." It is open to question how these objectives are to be achieved and a further electricity cost increase avoided with location interests in mind.

EU industrial electricity price comparison



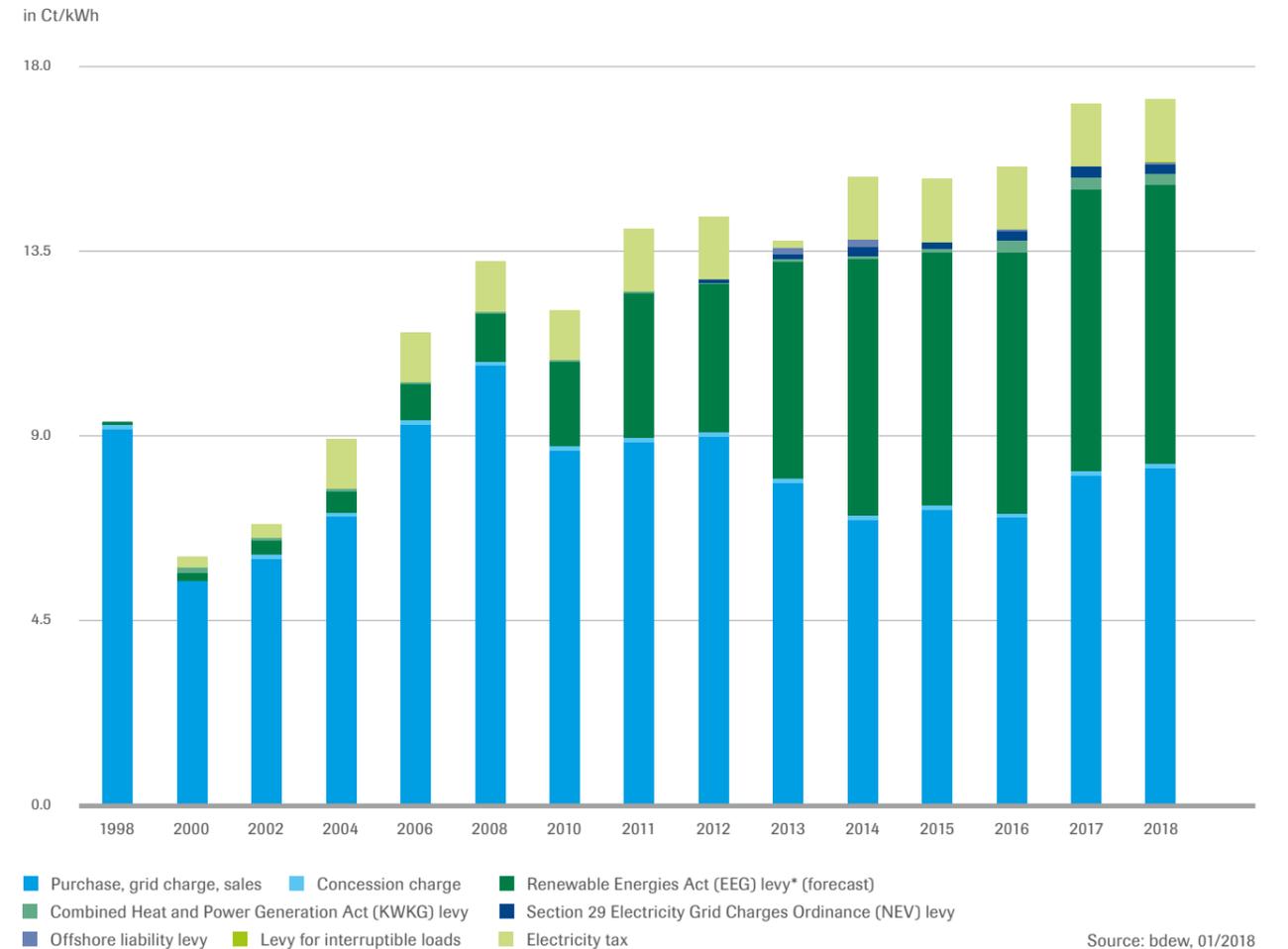
Automotive industry in-house power production

The automotive industry has long produced a large proportion of its electricity in its own power plants. This decentralized in-house power supply supports the energy transition. On the one hand, it predominantly uses resource-saving combined heat and power, and on the other, it relieves pressure on public networks because the electricity is generated where it is consumed. In-house power supply thereby reduces the pressure to develop electricity networks, which in any event is one of the most difficult energy transition challenges.

The financial burden of in-house power supply, however, has increased considerably. Since the beginning of August 2018 companies are required to pay a 40 percent EEG contribution on electricity generated in power stations for in-house power

supply. As of the beginning of 2018 the EU Commission no longer accepts this 40 percent cap under the state aid rules. Accordingly, since the beginning of 2018 operators of combined heat and power installations that came on stream after August 1, 2014 have been required to pay the full EEG contribution. But without the EEG contribution cap many CHP installations risk becoming uneconomical. The VDA is therefore championing a grandfather clause for CHP installations that were already in operation at the end of 2017. In future the EEG is to be updated for new installations built in 2018.

Average industrial electricity prices in ct/kWh, incl. electricity tax



Infrastructure

Boosting investment

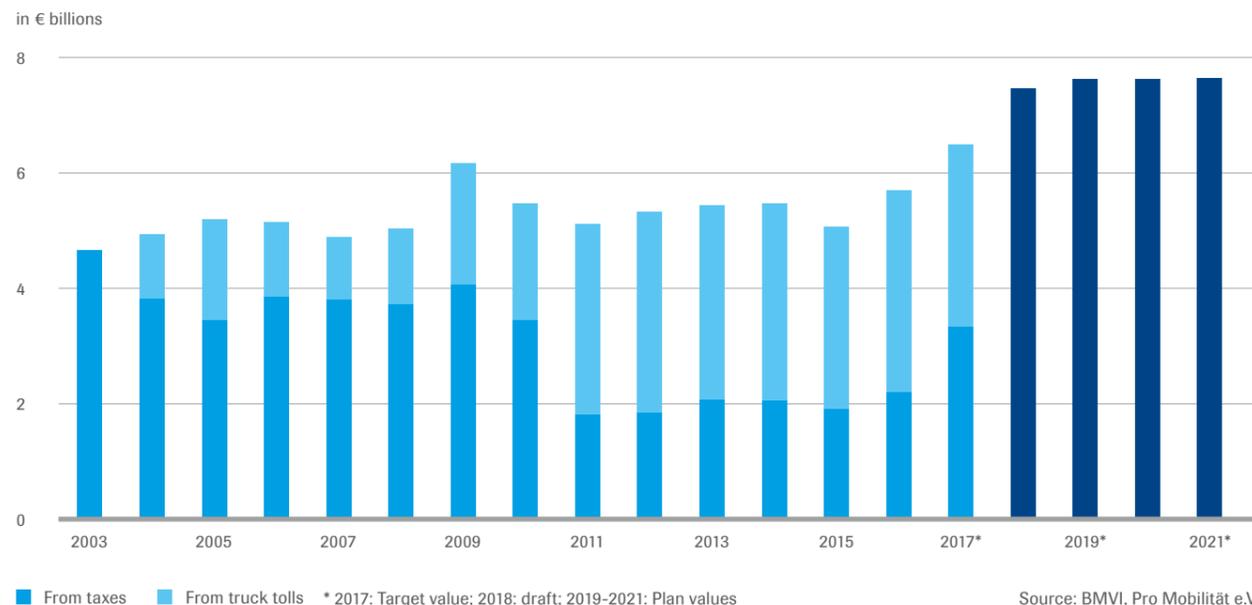
The road network has been under invested in for years. This has caused the backlog of investment to get bigger and bigger. The Federal German Transport Ministry estimates that financing the federal highways will cost around 7 billion euros a year if they are to be fit for purpose. The Institute for Economic Research (DIW) puts the need even higher at 8.3 billion euros. Despite steadily rising revenues from road traffic the actual investment between 2000 and 2015, was only 5.2 billion euros on average.

In 2017, car drivers in Germany spent 457,000 hours in traffic jams on highways.

The consequences of this long-standing neglect of the infrastructure is immediately evident to every motorist. Because also expansion has been at a standstill for so long, traffic jams in 2017 – on the freeway network alone, totaled fully 1.45 million kilometers. This cost motorists 457,000 hours. Many millions of liters of fuel are being unnecessarily consumed in the process and many additional thousands of metric tons of CO₂ emitted. The investment backlog is also causing a safety problem. According to Federal Transport Ministry data the last comprehensive quality measurement in 2013/2014 revealed that almost 20 per cent of freeway sections exceed the warning value; i.e., the state of the carriageway surface provides grounds for close observation and analysis of the reasons for the poor condition. For main roads these stretches account for as much as 36 percent.

Because of the scale of the need for action, the federal government began significantly increasing the level of investment back in the previous legislative period. Investment in road building increased to 5.7 billion euros in 2016 and 6.5 billion euros in 2017. The federal government has estimated an envelope of between 7.46 and 7.64 billion euros for the years 2018 to 2021. That puts it within reach of the amount the traffic experts see as being fit for purpose. In the new coalition agreement the CDU, CSU and SPD expressly stand by the previous financial program.

Investment in national main roads 2003-2021



Toll burden growing

National government is financing the increased investment of around 2 billion euros annually by a massive extension of user financing. As far back as 2015 the federal government began extending the truck toll to ever more roads and vehicle categories. This year saw an additional initial 1,100 kilometers of main roads subject to tolls. The toll limit also fell from 12 to 7.5 metric tons permissible all-up weight. That made significantly more trucks liable to road charges than before. The two measures brought in additional income of 380 million euros p.a.

In a further step, the truck toll will be extended to all national main roads without exception in mid-2018. The tax authorities are expecting this to raise an additional 2 billion euros p.a. The VDA criticized this extension of the truck toll to national main

roads: national main roads act as transport arteries for the medium-sized business economy and for short, and medium-haul regional supply. The national truck toll does not therefore just hit the medium-sized business economy; it also disadvantages regions with little infrastructure and that are not close to motorways. Moreover, road costs per kilometer driven are around two and a half times higher on the main road than on the motorway. The reason is that main roads' fixed costs have to be spread over a lower mileage as compared with a motorway. As the intention is to continue applying a flat rate toll to the entire network, future toll rates will therefore be significantly higher than the current motorway toll rates.



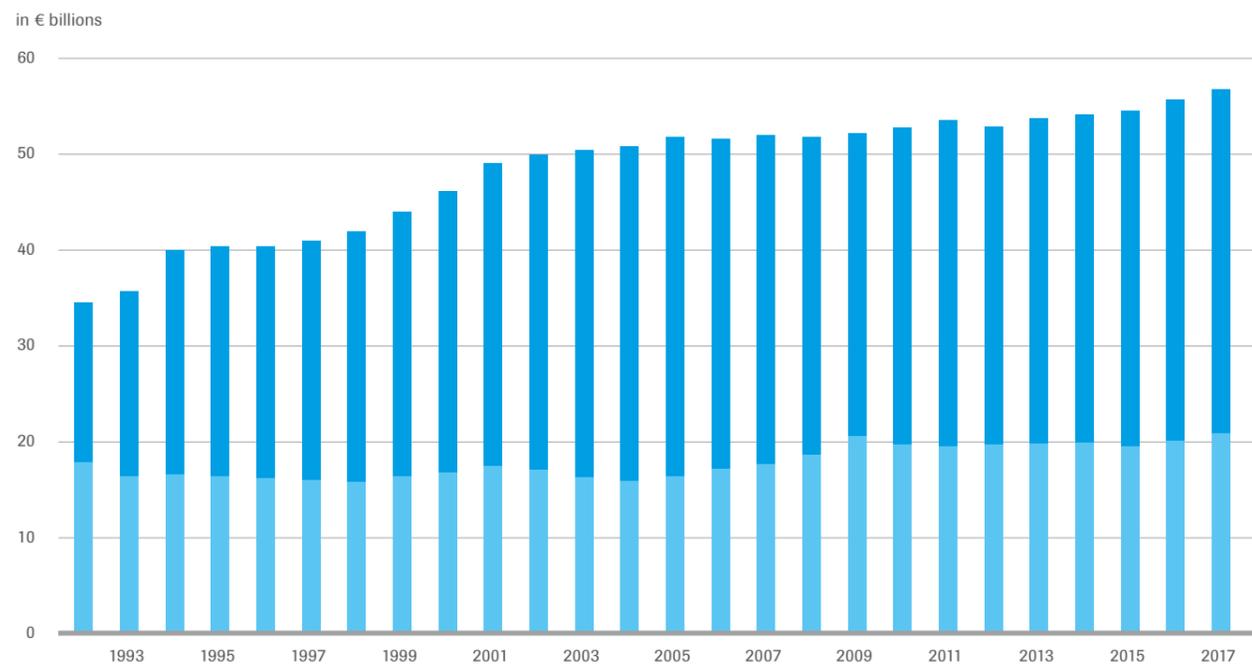
Automobile toll on its way

But the government doesn't just want to raise money from freight traffic but from automobile traffic as well. In March 2017 the Bundestag and Bundesrat passed the act introducing the automobile toll. The EU Commission had previously given the green light and confirmed that the scheme complied with EU law. That means that as of 2019, or 2020 at the latest, all owners of domestic and foreign automobiles and recreational vehicles have to pay a toll. The so-called infrastructure levy will be in bands by engine displacement and pollution category and applied on motorways and national main roads. German vehicle owners will have to purchase an annual vignette costing a maximum of 130 euros. But they will receive a reduction in their vehicle tax of at least an equal amount. Net, namely after deducting the tax rebate and system costs, the federal government is anticipating annual revenue of 500 million euros. Alternative estimates by traffic experts, however, arrive at significantly lower sums and don't even exclude a zero-sum game or even a loss.

On the one hand, tapping ever new sources of money to finance the investment boost by one means or another poses transport policy problems. A national main road toll has undesirable regional economic effects. An automobile toll could cause toll-free neighboring countries to introduce an automobile toll as well, which German motorists will end up having to pay. After all, the Netherlands has already joined Austria's action before the European Court of Justice against the German automobile toll. On the other hand, however, the imposition of ever new financing instruments is also unjust and unnecessary. Because the money to finance a national main road building program that is fit for purpose should be available. In 2017 the public purse raised almost 57 billion euros from mineral oil tax, the value-added tax on the mineral oil tax, from vehicle tax and from the truck toll. Only around 21 billion euros, namely 37 percent, flowed back into the road infrastructure. The public purse uses the remainder for other purposes unrelated to building, maintaining and operating the road infrastructure.



Use of transportation-specific fees



■ Surplus = expenditures for other purposes than transportation ■ Expenditure on roads

Source: DIW, BMF

Future format of the truck toll

In May 2017 the EU Commission submitted proposals to amend the Eurovignette Directive. One of the planned provisions is that a truck toll should apply for all commercial vehicles with a permissible all-up weight over 3.5 metric tons with effect from 2020. In Germany this would require the toll to be extended to trucks under 7.5 metric tons and to buses. As these vehicles' share of international transport moments is rather small, however, no European harmonization would be required here. The imposition of tolls on these vehicle groups should continue to be at EU member states' discretion. This should also apply to the question of whether time-related fees or a mileage-related toll are applied. Another point of criticism is the EU Commission's proposal for congestion charging within the toll. Congestion charges in the guise of lost time are already borne by the users themselves. Inclusion in the toll would therefore result in unjustified double charging. What is to be welcomed, on the other hand, is that the EU Commission envisages a cost-neutral sliding scale toll amount based on CO₂ emissions, once the CO₂ values of the various vehicle types have been identified and officially determined by the EU Commission. Such a sliding scale of the toll based on CO₂ emissions can provide additional incentives to invest in fuel-efficient and low-emission vehicles and technologies.

Infrastructure company

A reform of the national main road contract management regime had been on the political agenda for a long time. The old division of responsibilities between federal and state level was frequently inefficient. Under the previous regime, the federal government determined the development and new build requirements and made the funds available to the federal states. The federal states, on the other hand, were responsible for the detailed planning of individual building projects using their own staff. In the process they prioritized projects according to their own state interests. One of the results was that federal objectives for the national main road network were not always implemented.

The setting up in 2017 of a federal transport infrastructure company can eliminate these inefficiencies in the previous coordination between national level and federal states. The intention is to transfer the motorways at a minimum to federal administration. To achieve this an infrastructure company will be incorporated as a limited liability company to assume one-stop shop responsibilities for the planning, construction, operation, maintenance and financing of federal motorways. A critical point, on the other hand, is the company's ongoing reliance on annual allocations from the federal budget. The sought-after multiyear time horizon of infrastructure financing therefore remains patchy. A genuine multiyear time horizon would have required the toll income and a hypothecated element of the mineral oil tax revenue, for example, to accrue directly to the limited liability company as own income without any detour via the federal budget.

Passenger Transport

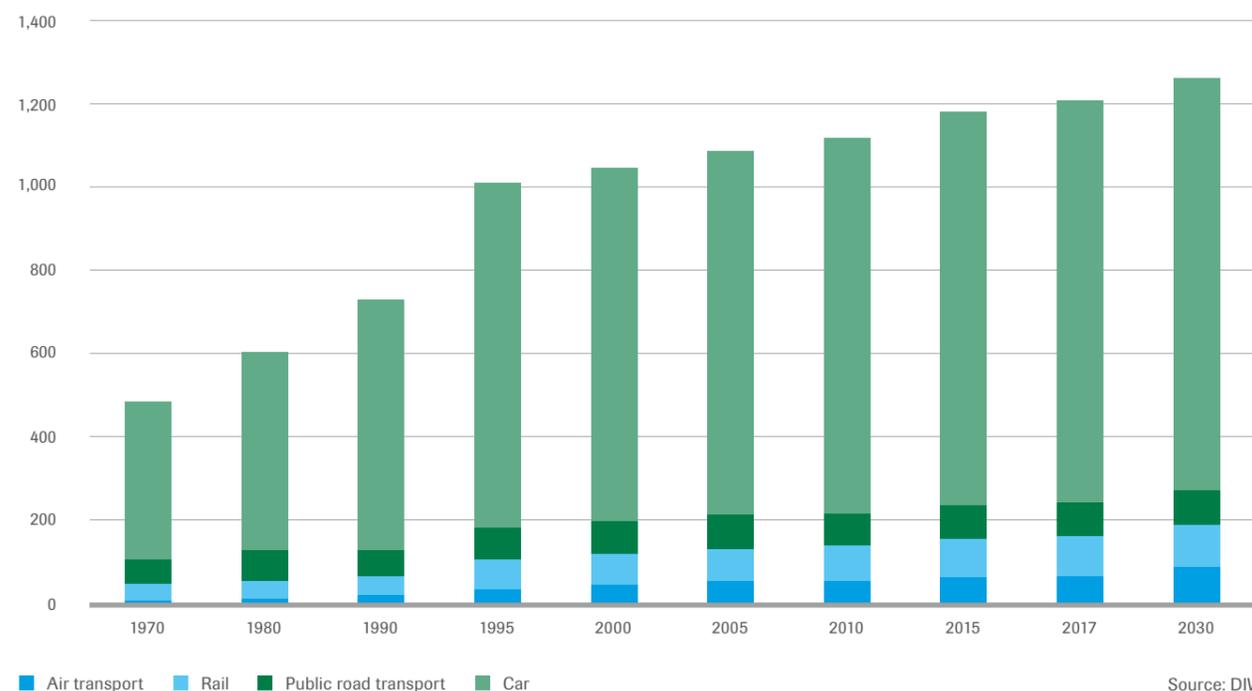
The automobile remains the number 1 means of transport

In Germany the automobile is used for around 80 percent of passenger transport. The automobile is thus far and away the most important means of passenger transport. In the federal government's judgment this will not change until at least 2030: the automobile's share of traffic volumes will remain of this magnitude. Further evidence of this is that the automobile fleet in Germany continues to grow from year to year. Admittedly, passenger traffic growth rates are now only moderate. That is a typical development for a country with an essentially stagnating and aging population. For example, individual motorized transport volume in 2017 increased from 961.9 to 973.2 billion passenger-kilometers compared with the year before, namely only 1.2 percent.

Passenger traffic in Germany is only growing moderately, i.e., by 1 percent in 2017.

Passenger transport

in billions of passenger-kilometers



Urban Mobility

Mobility culture is changing

One of the major challenges for the future is to find answers to global urbanization. The growth of cities is a global trend particularly evident in developing and emerging countries. The United Nations assume that two thirds of the world's population will be living in cities in 2050. Admittedly, this speed of urban growth is not to be seen in Germany. Nevertheless, experts anticipate that the population of Germany's five biggest cities will grow by between 10 and 30 percent by 2030. The need for urban mobility will therefore also grow.

But it isn't just an increase in mobility that is to be anticipated in the cities. A transformation in mobility culture can also be seen. Younger people in particular tend to be pragmatic in their choice of means of transport. Means of transport are used increasingly flexibly and in combination with one another. The choice of means of transport and route depends far more on the situation and the reason for the journey than before. Another crucial factor in this is the availability of online mobility information. Local public transport is used even if one has a car of one's own. Other people, on the other hand, postpone the purchase of their own car to a later phase in life, using local public transport and cars haring offerings in the meantime. Consequently the number of car sharing users in Germany has increased 42-fold since the year 2000, from 40,000 to more than 1.7 million.

Automotive industry becoming a mobility service provider

One driver of this development is the automotive industry: nowadays its car sharing offerings represent around three quarters of this market – on an upward trend. The automotive industry is thus evolving from pure-play automotive manufacturer to mobility service provider. A further step in this direction is its involvement in the multimodal routing and journey mediation space. Today it is one of the most important providers. Its apps provide information on the quickest and most economical choice of means of transport in each case, including car shares, bike shares, taxis and local public transport. To this end, the automotive industry has entered into collaborative ventures with local public transport companies. Recently these have been supplemented by its own ride sharing services, which the automotive industry will, in future, use to offer on-demand mobility in the cities, with links to local public transport, including for those without their "own" car. Here too, the automotive industry has entered into collaborative ventures with local public transport companies.

Car manufacturers are increasingly developing into mobility service providers.

What is apparent in any event is that it makes most sense to develop urban mobility solutions within an integrated approach. For example, local political players and local transport companies are indispensable partners when developing urban mobility solutions. Because they define the town planning requirements and provide local transport infrastructure.

The mobility of the future will also be data-driven, especially in the urban space. Data enables customized mobility solutions to be offered for each individual case. Last but not least, start-up companies are constantly acting as highly innovative sources of inspiration and ideas, and as creative incubators for new solutions – for example in developing apps for sharing car parking spaces or for managing the use of public space charging stations.

Urban Mobility Platform

The automotive industry has set itself the task, together with all involved parties, of developing solutions for viable and sustainable urban mobility. To this end the VDA has created the "Urban Mobility Platform," which now involves nine major cities in addition to numerous automotive and supply industry companies. The platform aims to develop a shared understanding of future urban mobility design and, based on this, launch joint pilot and implementation projects in the individual cities. The spectrum of issues ranges from networked driving, traffic management and optimized use of space via electro-mobility to the development of intermodal and multimodal offerings, and designing mobility in individual districts. It is about the ongoing medium- to long-term strategic development of the urban mobility system as a whole.

Activities to reduce nitrous oxide emissions

The automotive industry is also engaged in a close dialog with cities to identify and implement measures with a short- to medium-term impact specifically for reducing nitrous oxide emissions in cities. These include initiatives to accelerate the electrification of open vehicle fleets, initiatives to optimize employee mobility at automotive industry sites or initiatives to improve traffic flow. For example, studies have shown that intelligent network management that takes account of the total traffic volume within the urban road network and optimally synchronizes the traffic lights can reduce nitrous oxide emissions by a third. Initiatives such as these are more likely to achieve their intended purpose and are fairer than driving bans for diesel automobiles in certain cities. Because these would adversely impact city dwellers and commuters as well as industry.



Freight Transport

Road goods transport

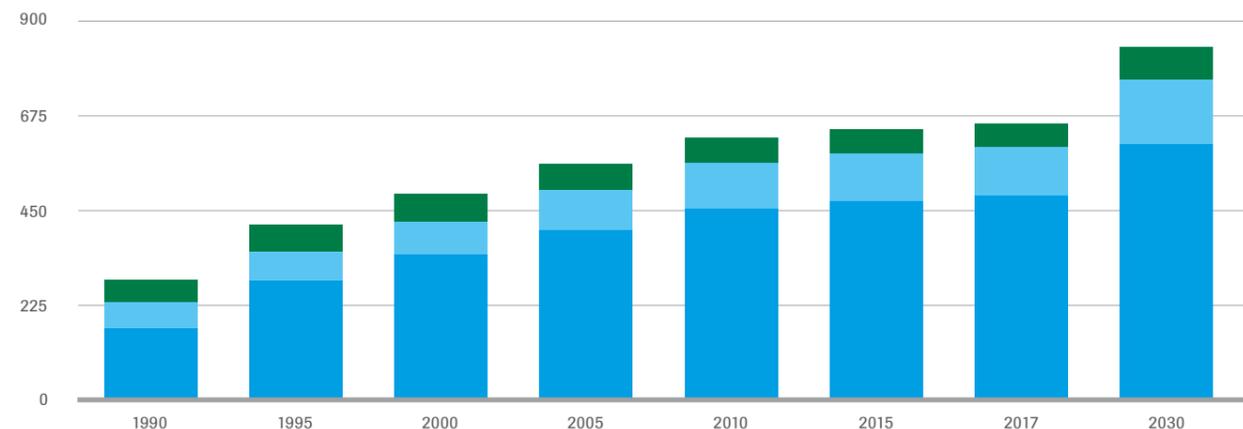
The truck continues to be the backbone of freight transport in Germany. Its freight transport performance in 2017 totaled 484.2 billion tonne-kilometers. That was more than 74 percent of total land-based freight transport – namely on the road – by rail and on waterways. With this share, Germany is about average for Europe. In comparison with the previous year, traffic volume on roads has risen by 1.7 percent. In its latest transport forecast, the Federal Transport Ministry assumes that road freight transport will increase to 607 billion metric ton-kilometers by 2030. That would be 20 percent more than in 2017. The truck's current market share will remain broadly stable.

No other mode of transport is as flexible and universally usable as the truck.

The significance of the truck is largely due to its flexibility. Only the truck is capable of driving to any destination, from the loading ramp to the customer's front door. It also has the economic and ecological advantage for transporting small loads and over short distances. Railroads only reach their economic viability threshold for freight transport at payloads of over 300 metric tons. Combined road and rail transport also only makes sense at distances significantly greater than 300 kilometers. But almost 80 percent of the road freight transport volume is on stretches of less than 150 kilometers. This results in a division of tasks between transport carriers: the truck is ideal for shipments of low volume and over short distances. Rail and inland waterways are more competitive for high-volume shipments and over great distances. A good example is the transport of a factory-new automobile. The German automotive industry uses the railway for the bulk of the journey for more than 50 percent of its shipments. Freight carriers therefore compete less with each other than is often thought, due to their system-based advantages and disadvantages. Rather, they complement each other.

Freight transport in Germany

in billions of metric ton-kilometers



Source: DIW, TCI, BMVI

Light commercial vehicles

In times of ever increasing online commerce, vans are indispensable, especially in cities. There are more than 3 billion parcel deliveries a year in Germany. Light commercial vehicles have established themselves in supply and value chains as the link between logistics centers, the retail trade and the consumer. But the van is also a mainstay of fast and flexible long-distance freight and goods transport, and in courier and delivery services. It is impossible now to imagine life without light commercial vehicles for transportation over the last mile. Since the year 2000 the number of consignments in the German courier, express and package market has increased by a total of 74 percent. The van will continue to grow in importance.

Thanks to ever better safety systems, modern-day vans are just as safe as automobiles. Every year the automotive industry spends a significant part of its research and development investment on improving this vehicle safety. A great deal of innovative effort continues to be plowed into minimizing fuel consumption and further reducing pollutant emissions. Alternative drive systems will become much more important in vans in future: hybrid or pure electric drive systems are outstandingly well suited to these vehicles in particular, which do a lot of urban driving. The automotive industry continues to channel effort into innovations making light commercial vehicles even more attractive for cities and people alike. The possibilities are far from having been exhausted.

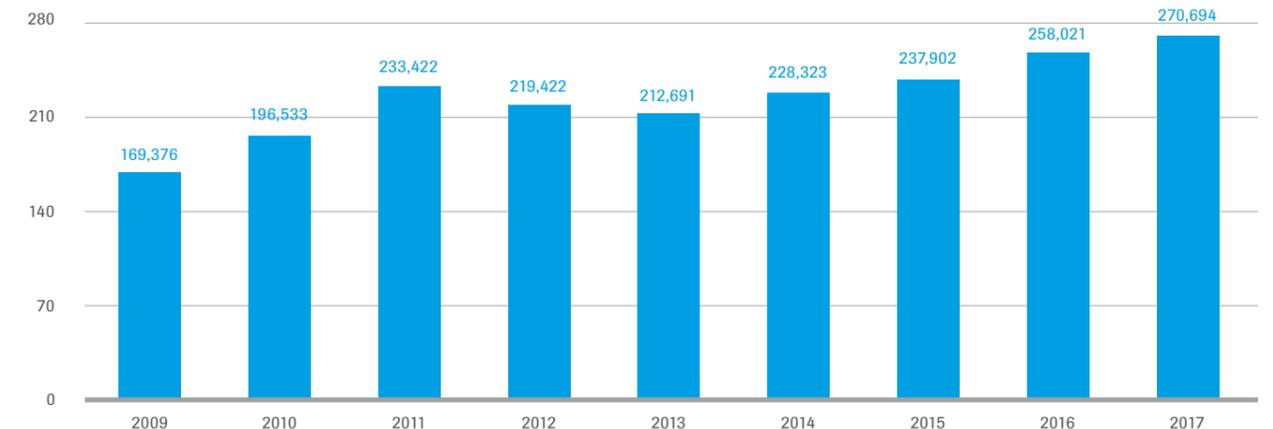
Long truck

Road freight transport is to become more sustainable and climate-friendly. Innovative commercial vehicle such as the long truck make an important contribution to increasing efficiency in road freight transport and in transport chains. It has been possible to operate these vehicles in Germany since 2011. The permissible all-up weight of long trucks is limited to 40 tonnes, and to 44 tonnes in the delivery and collection phases of combined transport. These maximum weights also apply to conventional trucks. But long trucks have an overall length of up to 25.25 meters. Although they cannot transport more weight, they do have up to 50 percent more cargo volume. The long truck offers significant efficiency gains precisely because it is cargo volume and not weight that is the limiting factor for around 80 percent of shipments.

After several years of field trials with scientific support by the Federal Highway Research Institute (BAST) long trucks have been in regular operation since the beginning of 2017. But they continue to be confined to the existing positive network. The federal states are constantly assessing additional route requests by interested companies for their suitability and reporting them to the federal government. This is the basis on which the road network is regularly updated by the Federal Transport Ministry. The positive network for long trucks defined in this way currently has a length of almost 11,600 kilometers, around 70 percent of it motorway. In some federal states however, including North Rhine- Westphalia and Saxony-Anhalt, only the so-called stretched trailer is used. The long truck's proven positive potential for efficiency and climate protection should in future also be leveraged in cross-border road freight transport.

New registrations of commercials up to 3.5 t in Germany

in thousand



Source: KBA

Taxes and Customs Duties

Tax policy

The VDA advocates boosting Germany's competitiveness as an industrial location in the new legislative period by means of tax and financial policy. In the first instance this means avoiding further incremental tightening. The measures contained in the G20/OECD's BEPS package to combat tax competition and profit shifting need to be implemented with a sense of proportion. The structural backlog of tax law reform also needs to be replaced by a corporate tax reform. This requires replacement of the current business tax. With an eye to European and international developments, it is proving increasingly to be a brake on the required fiscal policy flexibility. At the very least a first step should be a law finally eliminating, or at least restricting, the perverse non-income-related elements of business tax.

Tax breaks for research funding also need to be brought in quickly: the German automotive industry is the most research-intensive sector in Germany. Current developments such as the expansion of electro-mobility and the onward march of digitalization are creating technological challenges that require extensive new R&D activities. Germany therefore needs to draw level with other countries and introduce a tax rebate for all companies engaged in R&D activities.

The question of the tax burden, namely tax rates, is becoming ever more urgent, especially as other industrial countries have also announced tax reductions – with the USA leading the charge. There is also an urgent need to develop and improve international tax law yet further. This concerns in particular the overdue reform of the existing German Controlled Foreign Corporation tax regime. Legal protection also needs to be improved by means of efficient neutral agreement procedures. The objective must be the early removal of legal uncertainty on the part of companies as a result of the risk of double taxation, interest charges or penalties.

Vehicle and fuel taxation

The VDA is advocating a balanced overall concept in the discussion on designing vehicle tax to be more ecological and on fuel taxation. An appropriate taxation of the various types of drive system also needs to ensure that the CO₂ and pollutant emission reduction targets can be achieved. This is why preferential treatment of diesel fuel continues to make sense.

Digitalization

In 2018 the European Commission is drawing up proposals for higher taxation of the digital economy. Possible measures such as the introduction of an equalization tax or the introduction of a virtual business establishment may impact automotive industry digital business models. This poses a particular risk of double taxation and a possible additional administrative burden. Because there is no clear dividing line between the digital economy and traditional industry: industry is already digital. What is therefore critical is an internationally coordinated approach at OECD level that avoids countries going it alone or "shooting from the hip" and, above all, tax increases for the real economy.

Research funding: Germany needs to promote research and development in companies even better.



Export control

The EU Commission wants to have overhauled the Dual-Use Regulation by the end of 2018. The regulation is the legal basis for export controls on dual-use goods. It is assumed that these goods can be used for both civil and military purposes. The reform aims in particular to introduce additional controls on the export of surveillance technology, as well as including human rights aspects in export controls.

The VDA supports stricter export controls on cyber surveillance technologies to ensure export controls provide greater protection of human rights. These controls should, however, be efficient and not impose an excessive administrative burden on companies. Instead of so-called catch-all rules, the EU legislator should look to clear and long-proven goods and country lists. Topics of the future, such as digitalization and Industry 4.0 should also not be held back, especially in the IT security arena. The VDA criticizes the extraterritorial application of sanctions, illegal under international law, as repeatedly practiced by the USA. In a global and networked world, partners must be able to rely on one another, and contracts honored.

Rules of origin

Rules of origin assume critical importance in negotiations on free trade agreements. Their intended purpose is to dismantle tariff barriers and enable the free trade in goods between the negotiating partners.

Consistent standards and legal certainty are essential prerequisites for determining the origin of the goods in corporate practices. Amending existing free trade agreements or negotiating new European Union free trade agreements therefore, require standards to be implemented that enable an appropriate real-world calculation of preferential tariffs. The VDA it is therefore drawing up a standard for the "electronic exchange of long-term suppliers' declarations" and for "rules of origin for European Union free trade agreements."

As a matter of principle, compliance with preferential rules of origin should be determined based on processing rules. The compliance of goods with preferential rules of origin is thus determined by means of handling or processing assisted by processing rules. To this end, the specific processing rules in existing EU free trade agreements should be used and contain particular standards. For the European economy this ensures that the advantages arising from a free trade agreement could be used in IT systems and operational processes with only few adjustments.

"Rules of origin" are usually of crucial importance in talks regarding free trade agreements.

Legal Policy

Collective legal protection

There is a call in Germany and in the EU for the introduction of class-action or model lawsuits. Class actions in the USA have now reached such a high level of abuse that the industry in question incurs considerable costs purely in defending itself against unfounded lawsuits. There are also considerable misgivings about the introduction of representative actions with the aim of achieving a ruling on a test case – on the one hand, as concerns their usefulness in promoting consumer interests and, on the other hand, because of their negative economic consequences, in particular for small and medium-sized companies. The creation of money-spinning business models for counsels should not be permitted. Likewise, associations, also acting in concert with lawyers' organizations, should not be incentivized to finance their activities with model lawsuits.

In this context the German legislative proposal appears somewhat inappropriate, substantiated as it is by an amalgam of consumer interests and protection of competition. An unfair competitive advantage through a breach of the law is already effectively prohibited by warnings based on Section 4a UWG (Unfair Competition Act). It is also not apparent why the introduction of a German test case action should result in a more effective assertion of consumer interests and greater protection against unfair competition.

Even if only certain associations are to have legal standing, entrusting the upholding of consumer interests to private entities is

not safe from abuse. Financial and political interests could lead to a situation in which associations use the new mechanism selectively and combine it with their public relations activities. As a result, small and medium-sized companies in particular, for example in the automobile trade, could come under considerable pressure to reach a settlement. The collaboration between associations and particular law firms could induce the latter to use this tie-in to support individual consumers' downstream performance lawsuits.

Furthermore, it may result in an undesirable footrace between potential test case plaintiffs, and thus ultimately in worse legal protection for consumers and an additional workload on courts. Also, the phenomenon of a "rational disinterest" that allegedly prevents the consumer from asserting claims has not thus far been substantiated. Instead, the recourse, for example, to the civil jurisdiction of German courts and the large number of rulings—for example on disputes concerning the purchase of a new vehicle—shows that the judicial system is operating as it should.

Especially in the automotive field there is already extensive negative experience with class actions. The legislator's objective in the USA was for class actions to serve a more efficient assertion of similar interests by particular groups of injured parties. The reality, however, is that this intention has largely come to nothing. On the contrary, class actions are frequently

abused, as a consequence of which not only do individual entitled persons receive no compensation but they are also excluded from the future assertion of claims. Experience shows that plaintiffs' counsels in US proceedings frequently put their own pecuniary interests before those of their clients. The practical outcome of this is that settlement agreements are frequently sought that are highly lucrative for the counsels concerned but which provide for comparatively low compensation payments to the plaintiffs.

New data law

The VDA welcomes the discussion initiated by the federal government on the legal classification of data from a technical, economic and legal perspective. From the automotive industry's perspective this question, which is so important for its competitiveness and capacity for innovation, requires further detailed examination. The international and/or European dimension given the cross-border availability of data, surges in innovation, some of them disruptive, and the strong competitive pressure on the companies concerned should feature prominently in the discussion on mobility data. Government regulation should take account of the necessary flexibility of the participating companies and the scarcely estimable potential for innovation at the outset of the technical and economic development of the networking and digitalization of industry and consumer products, for example vehicles, both with each other and with the infrastructure. Especially from a competitive perspective, regulation in this arena should initially be extremely restrained.

IT security and data protection, and vehicle safety as well, are already being factored into product development. When new vehicles are brought to market their integrated protection systems are state of the art. Protection against misuse and manipulation is regularly checked and brought up to the latest technical standards. With the increasing use of automated and networked vehicle functions, the associated protective measures will in future play an even more important role. Political principles of protection against unauthorized access should ensure it continues to be possible to implement individual manufacturer safety technologies and architectures.

Concerning Industry 4.0, German industry has for some time been discussing the question of the legal framework and the need to legally attribute data. Back in 2015 the BDI (the German industry association) addressed inter alia the relevant legal questions in a legal opinion on the digital economy and Industry 4.0, pointing out inter alia that there should be no precipitate action, and that account should be taken of the European legal framework.

This discussion should also take account of the fact that the economic discussion also sees exclusivity and access rights to data as being critical. According to the aforementioned opinion there is no principle whereby rights to data should be attributed to a specific legal entity. Personal data privacy legislation does not legitimize control over the use of data as such or in downstream data markets, nor are exclusive data usage rights to be conferred on the owners of things generating data via sensors.

Patents

Patent law plays a critical role in the automotive industry in protecting manufacturers' and suppliers' innovations. A further, final step is required to introduce a European patent with a consistent protective effect: the entry into force of the Unified Patent Court Agreement (UPCA). This requires the ratification of the UPCA by at least 13 contracting member states, with the mandatory inclusion of the three states with the most current European patents (Germany, France and the United Kingdom). In Germany the Federal Constitutional Court is still to decide on ratification.

Increasing vehicle networking means that the use of telecommunication standards is becoming increasingly important for the automotive industry. The necessary communication technologies are typically the subject of international standards. They are frequently protected by numerous standard-essential patents (SEP). The SEP owners typically undertake – in the form of declarations to that effect in the course of standardization – to grant a license on FRAND terms ("fair, reasonable and non-discriminatory"). However, as yet there is no common understanding of what specifically is to be understood by such FRAND terms.

It is imperative for the automotive industry to be given access to the technologies required for networked vehicles on predictable terms and to avoid interruptions in supply caused by injunctive relief lawsuits. The VDA has therefore developed criteria for licensing under FRAND terms and injunctive relief rulings from the SEP. The VDA welcomes the process initiated by the EU Commission with its SEP communication to create greater clarity for licensors and licensees as a first step. However, further steps are required before there is to be an infrastructure for research, development and technology standardization that offers all market participants simultaneous access to standardized technologies. In the VDA's opinion two things are needed: enforcing an entitlement to a license for everyone who, judged by objective criteria, is bringing to market a product that complies with the standard, and enforcing the proportionality assessment for injunctive relief rulings arising from standard-essential patents.



Design protection

In the EU and in the automotive industry's export markets, industrial property rights are an essential platform for marketing vehicles, spare parts and accessories. A unilateral restriction of patent or design rights is therefore no more acceptable than rowing back on measures to combat product piracy in industrial and emerging countries.

In Europe, however, there are repeated calls to abolish design protection for parts by means of a so-called repair clause. However, this would put a spoke in efforts to move emerging countries, in particular, in the direction of better protection of intellectual property. Abolishing the all-important design protection in Europe would open the floodgates to a further relaxation in other areas.

Parts protection – namely design and also patent protection – is an important prerequisite for vehicles' and parts' manufacturers worldwide enabling them to invest in innovation. Successful automobile design extends to the details of exterior mirrors, lights, headlights, sheet metal, doors and bumpers. Unrestricted design protection is necessary and justified. The same goes for patent protection. For example, numerous external parts contain patented technologies.

Industrial property rights also defend against product and brand piracy. If a spare part patent or design is infringed, this is a breach of property rights. The large-scale exploitation of such an infringement can be described as product piracy. Especially for parts, numerous instances of counterfeiting of brands, packaging and the products themselves are commonplace in Asian markets.

On the other hand, lower repair parts costs are not to be expected from doing away with design protection. What can be seen in the EU is that repair costs are not any lower where no design protection exists. German prices are at the lower end of the range in the EU, as demonstrated again in 2017 by a Deutsche Automobil Treuhand (DAT) comparison. The DAT comparison proved there is no direct relationship between design protection and spare parts prices.

In 2015, the EU officially withdrew its proposal for a repair clause to abolish design protection. It cannot currently be predicted whether a new harmonization proposal will be submitted at EU internal market level. In the meantime, individual member states should not create a hotchpotch of special regulations to restrict the protection of intellectual property.

Public procurement

Following the reform of EU-wide awards above the EU thresholds, the award of public contracts at national level below the EU thresholds was also reformed. February 2017 saw the publication of the new lower threshold awards code (UVgO) for the award of supplies and services. The new UVgO replaces the procurement and contract code for supplies and services (VOL/A Section 1). The comprehensive digitalization of awards is a key element of the new legal framework. It is intended to result in a significant reduction in bureaucratic costs.

As the UVgO is an administrative regulation, it does not come into force upon publication, but is only implemented by the general administrative regulations for Section 55 of the Federal Budget Code or, for the federal states, by the equivalent federal state regulations. The UVgO was coordinated between the federal government and federal states on its way to the statute book. Whereas the federal government introduced the UVgO at the beginning of September 2017, most federal states are lagging behind. Currently only Hamburg, Bavaria and Bremen have introduced the UVgO. Some other federal states are planning to introduce it in the course of 2018. While others seem to want to dispense with it altogether. Unfortunately that could mean that the objective pursued by the legislator whereby the federal states and local authorities implement the UVgO instead of their state public procurement laws is not achieved. National promulgation of the procurement legislation would however be extremely desirable.



Environment and Climate

The German automotive industry is committed to climate and environmental protection. Manufacturers and suppliers are consistently working on making combustion engines cleaner and more economical. At the same time, they are developing alternative drives for the emission-free mobility of the future.



Sabine Mayer, Bachelor of Engineering – Industrial engineering, Quality engineer, MAN Truck & Bus AG, München

Road Traffic and CO₂ Emissions

Road traffic and CO₂ emissions

In 2017, the German automotive industry succeeded in holding its newly registered automobiles' CO₂ emissions and fuel consumption virtually at the previous year's level. Average CO₂ emissions by German manufacturers' newly registered automobiles increased by 0.7 percent compared with 2016, to 128,1 grams of CO₂ per kilometer. A ten-year comparison, however, reveals a significant reduction: the average CO₂ value fell by more than 25 percent compared with 2007. But the currently falling diesel share of all new automobile registrations is making achievement of the ambitious EU target of 95 grams of CO₂ per kilometer (g) by 2021 more difficult. Alternative drive systems, in particular electro-mobility, will play an increasingly important role in achieving the target.

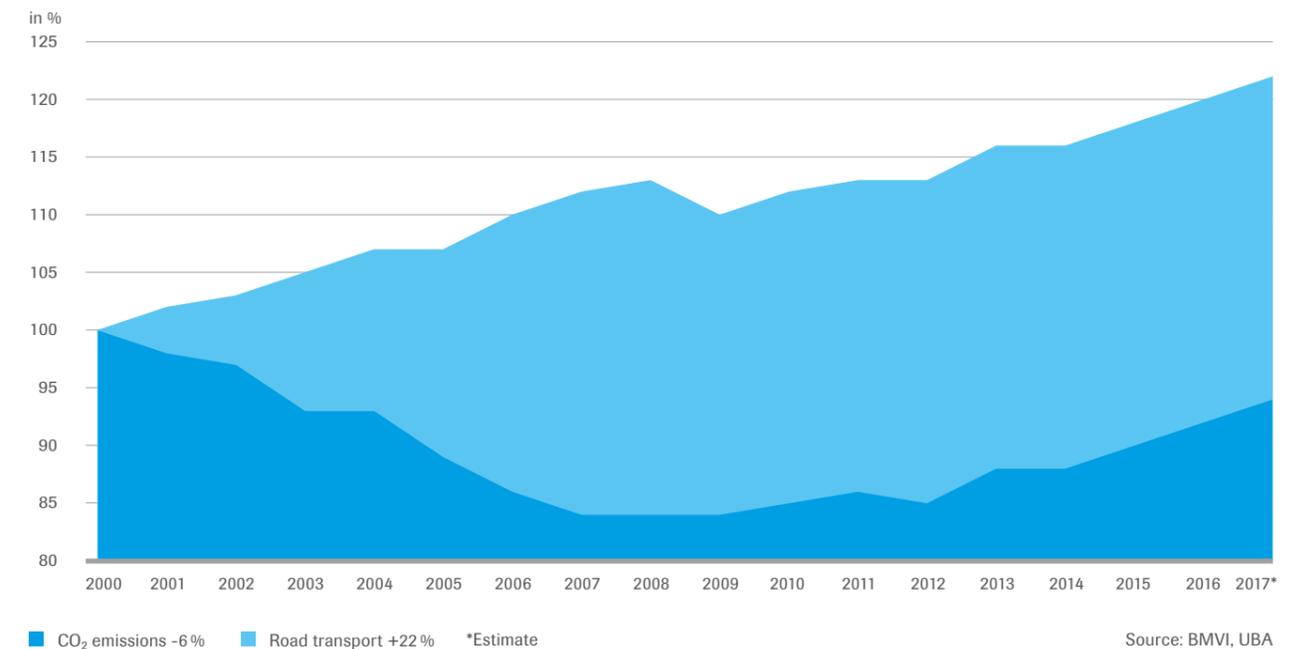
On average, German manufacturers' spark-ignition automobiles currently consume only around 5.6 liters of gasoline per 100 kilometers. With an average of 4.9 liters of diesel fuel per 100 kilometers, diesel vehicles have even dropped below the 5 liter mark. At the end of 2017, German group brands had more than 1,200 models in their range with CO₂ emissions of less than 120 grams. Their offering also included 220 models emitting less than 100 grams – that equates to fuel consumption of less than 4 liters per 100 kilometers. This number has almost doubled within three years. 111 models sporting a German group logo are even below 95 grams.

The overall emissions from road traffic in Germany also show a positive trend. After the iron curtain fell in 1990, passenger and freight transportation increased greatly, as did CO₂ emissions. Following the rise in the 1990s, according to German Federal Department of the Environment figures, CO₂ road traffic emissions in Germany then declined by around 30 million metric tons between 1999 and 2010. Today, notwithstanding far higher transport and traffic performance, total emissions are at the relatively low level of 1991.

The dominant decisive factor was the reduction of specific energy consumption per vehicle. Today around 34 megajoules of energy are required per 100 passenger-kilometers. In 1990 more than 55 megajoules were required for a comparable performance. There are reasons why total road traffic emissions have not also fallen significantly notwithstanding this reduction: road traffic has been increasing significantly over many years, by one fifth since 2000 alone. Despite this significant increase in passenger and freight transport alike, it has been possible to reduce absolute road traffic CO₂ emissions in the same period by 9 percent. This shows that significant efficiency gains have been made in recent years. The task in the years ahead will be to progress further down this path, and especially to increase the acceptance of alternative drive systems in order to align people's need for mobility even more closely with its impact on the environment.



Road traffic efficiency increasing



Source: BMVI, UBA

CO₂ Regulations for Automobiles and Light Commercial Vehicles

Regulation through 2020

For automobiles and light commercial vehicles alike, permitted CO₂ emissions are regulated by the EU. That means that the average emissions by a manufacturer's newly registered vehicles are not permitted to exceed a statutorily defined threshold in grams of CO₂ (g) per kilometer driven. Following the setting of an initial target of 130 grams of CO₂ for 2015, the target value for 2021 was lowered to 95 grams. By the same token, emissions by light commercial vehicles (vans up to 3.5 metric tons) may not exceed 175 grams in 2014 and 147 grams with effect from 2020.

CO₂ regulations do not, however, mandate the total European fleet value of 95 grams for automobiles and 147 grams for commercial vehicles for each individual manufacturer. Such an approach would be tantamount to a single European value, irrespective of the characteristics of the products being sold. Rather, a specific limit is calculated for each manufacturer on the basis of the average vehicle weight of the manufacturer's fleet. This therefore ensures, based on the average for all manufacturers, that the European value is achieved.

Noncompliance with the limits incur penalties related to the amount by which the target is missed. To promote the ramping up of alternative drive systems on the market, super credits are used to award multiple offsets to especially fuel-efficient vehicles. So-called eco-innovations are intended to provide a similar incentive effect. These include technologies that cannot be captured in the official measurement method (NEDC and/or WLTP), such as the conversion of waste heat from the motor into electrical energy.

From 2021, new passenger cars will only be permitted to emit an average of 95 grams of CO₂ in the EU, for vans the limit will be 147 grams.

Elements of CO₂ regulation for passenger cars and light commercial vehicles for 2020 or 2021

Definition	Automobiles		Light commercial vehicles	
	2012 target	2021 target	2014 target	2020 target
Weight-based approach The manufacturer-specific CO ₂ threshold is based on the vehicle weight and is individually calculated.	130 CO ₂ /km (Regulation EU 443/2009) Calculation formula: CO ₂ = 130 + a (M-M0) • a = 0,0457 • M = weight of the road-ready passenger car in kg • M0 = 1,372 kg (ø weight), since 2016 M0 = 1,392 kg • ø weight adjusted in line with the moving three-year average w.e.f 2016	95 g CO ₂ /km (Regulation EU 443/2009 amended 2014) Calculation formula: CO ₂ = 95 + a (M-M0) • Flattening of the gradient to a = 0,0333	175 CO ₂ /km (Regulation EU 510/2011) Calculation formula: CO ₂ = 175 + a (M-M0) • a = 0,093 • M = weight of the road-ready passenger car in kg • M0 = 1,706 kg (ø-weight) • ø weight adjusted in line with the moving three-year average w.e.f 2018	147 g CO ₂ /km (Regulation EU 510/2011 amended 2014) Calculation formula: CO ₂ = 147 + a (M-M0) a = 0,096
Penalty payments If manufacturer fails to achieve the designated CO ₂ targets, a staggered penalty will be paid depending on the amount by which the target has been exceeded.	Target exceedance for 1st gram CO ₂ : € 5 2nd gram CO ₂ : € 15 3rd gram CO ₂ : € 25 4th gram CO ₂ : € 95 per vehicle	€ 95 per gram Amount by which target missed per vehicle	As for automobiles	As for automobiles
Phasing-in Staggered introduction: increasing proportion of vehicles required to meet the new requirements (by 2015 or as from 2020)	New vehicle fleet percentage, which must comply with the limit: • 2012 65% • 2013 75% • 2014 80% • 2015 100%	New vehicle fleet percentage, which must comply with the limit: • 2020 95% • 2021 100%	New vehicle fleet percentage, which must comply with the limit: • 2014 70% • 2015 75% • 2016 80% • 2017 100%	No phasing-in
Super credits Promotion of highly efficient vehicles by multiple offsetting in the CO ₂ balance.	Vehicles with less than 50g/km CO ₂ are offset in • 2012/2013 3.5-fold • 2014 2.5-fold • 2015 1.5-fold • w.e.f 2016 at par without limitation	Vehicles with less than 50g/km CO ₂ are offset in • 2020 2-fold • 2021 1.67-fold • 2022 1.33-fold • w.e.f 2023 at par with a limit to max. 7.5 g over period 2020-2023	Vehicles with less than 50g/km CO ₂ are offset in • 2014/2015 3.5-fold • in 2016 2.5-fold • in 2017 1.5-fold • w.e.f 2018 at par without limitation	No super credits
Eco innovations Technologies that cannot be measured in the official test method (NEDC), but that have clear CO ₂ savings potential	Can be offset against the fleet average up to a maximum of 7g. of CO ₂ (examples include solar roofs, waste heat recovery etc.)		As for automobiles	
Derogations Exception rules safeguard the economic existence of small fleet manufacturers.	<ul style="list-style-type: none"> Manufacturers with registrations below 1,000 units are ignored altogether. Manufacturers with registrations between 1,000 and 10,000 units are set a target that is individually agreed with the EU Commission. 		<ul style="list-style-type: none"> Manufacturers with registrations below 1,000 units are ignored. Manufacturers with registrations between 1,000 and 22,000 units are set a target that is individually agreed with the EU Commission. 	
Pooling Grouping of various vehicle manufacturers within one group	Manufacturers with 10,000 – 300,000 registered passenger cars in the EU: reduction target of 25% relative to emissions in 2007	Manufacturers with 10,000 – 300,000 registered passenger cars in the EU: reduction target of 45% relative to emissions in 2007	Possible	

Regulations post 2021

It's true that Europe is pursuing ambitious climate targets. But the EU must not distance itself too far from other regions of the world. Because effective climate policy must also ensure cost efficiency and profitability so that the companies in question can survive in the face of international competition. The European automotive industry, whose main sales market is of course Europe, is however under greater strain than its international competitors. The reason is that the CO₂ target of 95 grams for automobiles imposed by the EU for 2021 is the most stringent in the world. The target in the USA is 121 g CO₂/km by 2020, in China 117 grams and in Japan 105 grams.

Ultimately, the actual road traffic CO₂ emissions arise from a combination of various factors. Vehicle efficiency, distance driven and the vehicle's life expectancy, the customer's driving style, the existing vehicle fleet or the CO₂ content of the energy sources employed influence absolute CO₂ emissions. A convincing and comprehensive political strategy therefore requires a holistic perspective.

At the end of 2017 the European Commission published its plans for CO₂ regulations after 2021. Manufacturers are to reduce their new automobile and light commercial vehicle fleets' CO₂ emissions by 30 percent by 2030. A binding intermediate target with a reduction requirement of 15 percent is to be in force in 2025.

From today's perspective it is questionable whether the proposed CO₂ targets are achievable. Firstly the ability to further optimize economical diesel and gasoline engines is starting to butt up against the limits of what is technically and economically feasible. Secondly, ever fewer low CO₂ emission diesel models are being sold and thirdly there is still uncertainty surrounding electro-mobility.

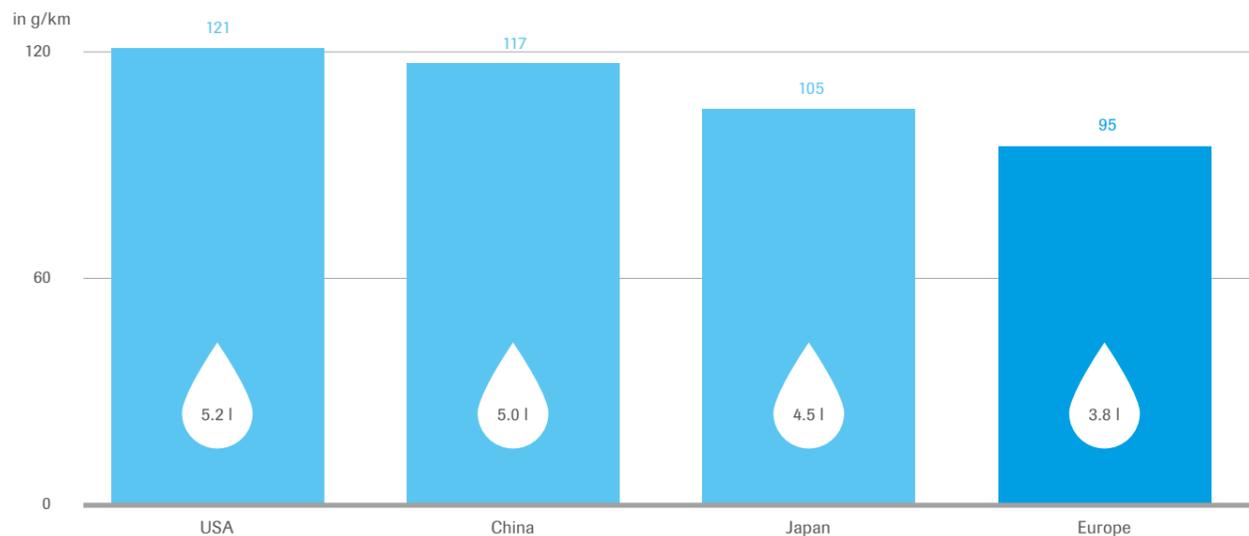
The binding intermediate target for 2025 in particular is pushing things too far. Because it is only four years from 2021 to 2025. As car product cycles are around five to seven years, requirements such as these are hard to achieve. Development and product cycles for commercial vehicles are even longer at up to ten years. Because of these enormous uncertainties, the reduction

requirements for 2030 should be looked at again no later than 2024 – as part of a mid-term review. If the environment for alternative drive systems follows a different trajectory to current assumptions then the reduction requirements should be adjusted up or down. The 2030 target has to be based on a clear premise: The targets need to match the environment.

In order to sustain its strong future competitive position, the German automotive industry depends on a political framework that supports the development of innovation in a way that is constructive and technologically open. That is why it is right for the EU Commission not to mandate any fixed sales quota for e-vehicles and to rely instead on a flexible solution allowing for offsetting for low-emission vehicles. The incentive system should however be designed so that not only purely battery propelled vehicles but plug-in hybrids as well receive a sizable bonus. Because on average they drive just as far on electric power as purely electric vehicles and as such are able to save just as much CO₂. All in all, the EU Commission's proposals for promoting innovation don't yet go far enough. A stronger stimulus would, in particular, be desirable for electro-mobility.

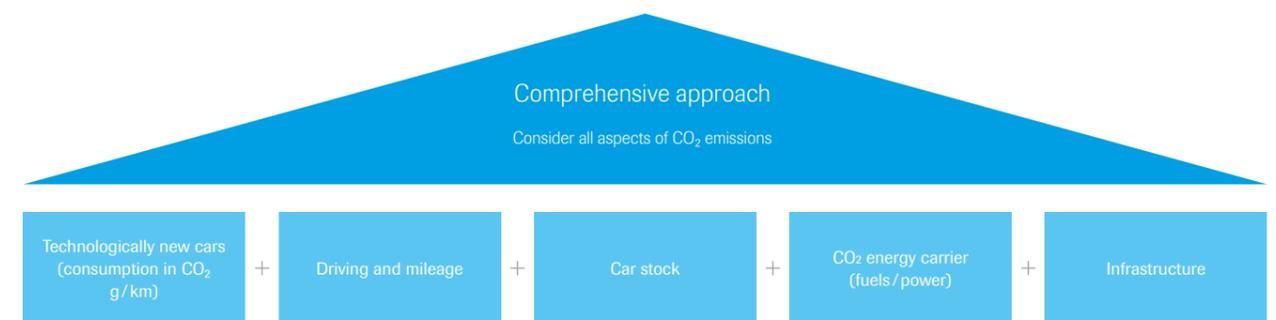
The previous regulatory concept also ignores potential reductions beyond the scope of vehicle technology, such as driving style or the CO₂ content of the energy sources being used (fuels, electricity). A comprehensive political strategy should increase efficiency across all propulsion systems and fuels. There is considerable CO₂ reduction potential to be had especially in biofuels and fuels based on electricity from renewable energies (e-fuels). In addition to alternative propulsion systems, e-fuels that are independent of crude oil could be an option for future climate-neutral mobility. To achieve the overarching climate-protection targets, future optimization should not just look at the vehicle side but the upstream chain and user phase as well. Because the leverage here is far greater: Improving the existing fleet by 1 gram – for example by a fuel with a lower CO₂ content – is just as effective as a 20 gram improvement in the new vehicle fleet.

The EU's 2021 CO₂ target is the strictest in the world



Source: German Economic Institute (IW), VDA

Climate protection policy in road transport should not be narrowed-down to the efficiency of new cars



Source: VDA

CO₂ Reductions in Heavy Commercial Vehicles

Heavy commercial vehicles play an indispensable role in freight and passenger transport in Germany and Europe. With over 480 billion metric ton-kilometers, they account for about 74 percent of freight transported in Germany.

At the same time, heavy commercial vehicles are responsible for only around 5 percent of total CO₂ emissions in Europe, with the long-distance and regional distribution segments in particular contributing around two thirds of this total. Vehicle manufacturers have embraced numerous technological innovations in recent decades, significantly reducing commercial vehicle fuel consumption, and CO₂ emissions with it. For example, heavy commercial vehicle consumption figures have been falling by around 1 percent each year for years, purely as a result of market forces – without any statutory regulation of CO₂ emissions.

Regulation of heavy commercial vehicle CO₂ emissions therefore needs to be seen within the specific market context. Heavy commercial vehicles are used exclusively with commercial considerations in mind. With a share of approx. 30 percent, fuel costs are frequently the biggest single item within a transport company's cost structure. What that means is that nobody is more interested in low fuel consumption than the truck operators themselves. They therefore exert substantial market pressure on manufacturers to continue reducing vehicle fuel consumption, and thus CO₂ emissions. Commercial vehicles also operate in an extraordinary range of guises – from long-distance routes, via regional and urban distribution, to coaches and city buses, and construction vehicles. Depending on their use, there are substantial differences in fuel consumption. For example, the same vehicles, used on long-distance routes, consume only around 1.5 liters per 100 metric ton-kilometers, but around 5 liters per 100 metric ton-kilometers in urban distribution traffic.

The commercial vehicle manufacturers have always been under enormous market pressure to build economical trucks.



There is scarcely a commercial vehicle that rolls off the production line in a finished state. Instead, trailer and body manufacturers finish off the individual vehicles, without the vehicle manufacturers even being aware of it. At the same time, bodies and trailers considerably influence vehicle fuel consumption in terms of weight, aerodynamics, etc. Finally, unlike automobiles, as yet there is no universally applicable test cycle for heavy commercial vehicles, and consequently no recognized information about fuel consumption and CO₂ emissions.

That being the case, a few years ago the EU Commission decided to make a start by creating a common and comparable baseline to create transparency regarding heavy commercial vehicle fuel consumption and CO₂ emissions. From 2019 onwards the VECTO (Vehicle Energy Consumption Calculation Tool) will enable realistic and certifiable calculation of the fuel consumption and CO₂ emissions of heavy commercial vehicles and combinations. VECTO makes it possible to look at entire vehicles and vehicle combinations with semitrailers and bodies. Various vehicle parameters and their effect on fuel consumption can also be analyzed. This will further significantly increase fuel consumption transparency for commercial vehicle operators. At the same time, this increases the competitive pressure between vehicle manufacturers to cut fuel consumption yet further.

Commercial vehicle CO₂ emissions based on VECTO will be captured and monitored from 2019 onwards. This will be the basis on which fuel consumption and emissions reduction targets will be defined, as intended by the EU Commission. In the process, account needs to be taken of the commercial vehicle sector's long investment and technology cycles and transport companies' high cost sensitivity. For example, powerful incentives can be created by varying the truck toll according to CO₂ emissions. However, an effective reduction in CO₂ emissions requires more than a focus on newly registered vehicles. What is required above all is an integrated approach that fully harnesses the potential for CO₂ reduction in road freight transport. This ranges from technical vehicle initiatives, via renewable fuels, to optimized vehicle operation. All European commercial vehicle manufacturers, their suppliers and system partners, and numerous other stakeholders have pledged their support.

Decarbonizing Transportation

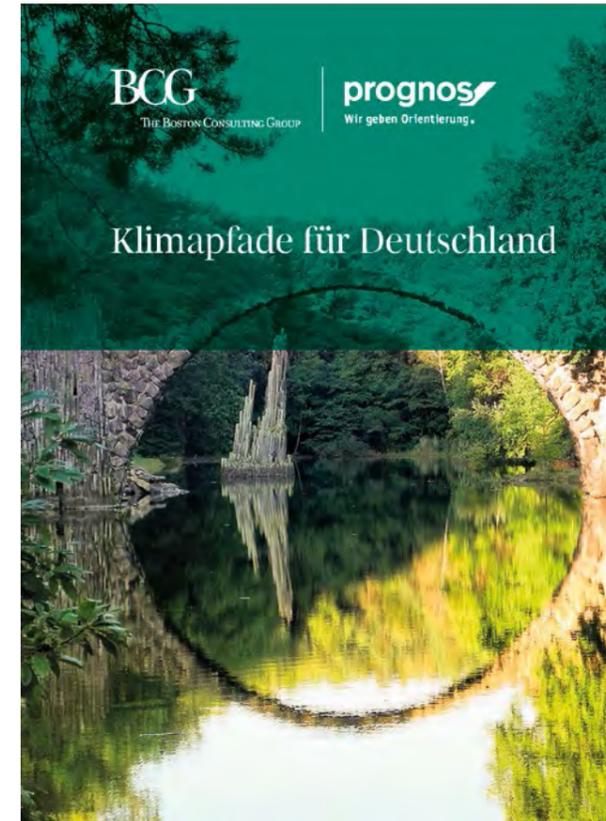


The automotive industry is committed to the goals of the Paris Agreement.

Subsequent to the Paris Agreement on climate change the German government has set a target of significantly reducing greenhouse gas emissions in Germany by 2050. The German automotive industry fundamentally shares this political objective. However, ambitious political objectives are only one side of the coin. They are not an effective tool for its technological implementation. Political objectives must be technologically credible, intelligently regulated and feasible in the most cost-efficient way possible. They must act as an engine of economic success and enjoy broad public support, failing which they will be unachievable, and unsuitable as an export model for German innovative prowess.

German industry has submitted a comprehensive, cross-sectoral forecast with the BDI project "climate paths for Germany." It identified the greenhouse gas reductions German industry and its various sectors can achieve by 2030 or 2050, and the underlying political, technological and economic assumptions.

The clear finding of the study is that climate protection in the transportation arena requires an integrated approach beyond just EU fleet regulation. Vehicle technology, infrastructure, alternative fuels, energy mix and digitalization, plus the interplay between the various modes of transport – all these factors need to mesh with one another. It is also clear that in addition to electro-mobility the combustion engine - using fuels from renewable energies - will remain critically important.



The fact that so-called e-fuels from renewable sources are needed if the EU's climate protection targets for the transport sector are to be achieved was also highlighted by a German Energy Agency (dena) study. In future, climate-neutral liquid and gaseous fuels from renewable energies will be needed, not just in air, shipborne and road freight transport, but in the automobile fleets as well. These synthetic fuels enable existing filling stations and engines to remain in use. This means that e-fuels will make themselves felt on the entire EU vehicle fleet, not just on new registrations. They are therefore an effective CO₂ reduction lever.



However, e-fuels in no way contradict the development of electro-mobility. Wherever technically possible and environmentally sensible, transport should be electrified and partially electrified. However, e-fuels will be indispensable, especially for transport applications for which—as far as we can see at the moment—no electric drive systems will be available. The mobility of tomorrow requires a mix of different technologies and fuels. Germany, as the heartland of the automotive industry, cannot dispense with any of these technologies, let alone prohibit them.

Automobile Energy Efficiency

As with the energy efficiency label for household appliances, the automobile label with its color-coded scale indicates how efficient the vehicle is compared with other vehicles. The customer can see at a glance what CO₂ efficiency category their new vehicle falls into, and what fuel and vehicle tax costs they can anticipate.

The basis in European law for the automobile label is EU Directive 1999/94/EC; it states that consumers are to be informed in a standard format about new vehicle fuel consumption and CO₂ emissions, both in the advertising and on the vehicle. Exactly how this information is to be presented will however be left to individual states.

Manufacturers and dealers are required to provide information about fuel consumption and CO₂ emissions for new passenger vehicles under the passenger vehicle energy consumption labeling regulation (Pkw-EnVKV). Since the end of 2011, instead of a simple fact sheet, there has been a color scale. Vehicles with significantly better than average CO₂ figures are divided into green categories, average vehicles into yellow and worse than average vehicles are categorized red.

As of September 2018, all vehicles' fuel consumption and emissions have to be measured according to the new WLTP test procedure. This changeover, in the same way as for CO₂-based vehicle taxation, requires the national passenger vehicle energy consumption labeling regulation and communication to be modified accordingly. Such an adjustment at national level is expected in the course of 2019. Consideration is also being given to revising the regulation at European level, which would enable the label to be standardized in all EU countries.

The energy label provides car buyers with an easy-to-understand color scale showing the fuel consumption of a particular model.

German passenger car label

Information regarding fuel consumption, CO₂ emissions and current consumption in the meaning of Pkw-EnVKV (Car Energy Consumption Identification Ordinance)

Brand:	Fuel:
Model:	Other energy carriers:
Capacity:	Weight of vehicle:

Fuel consumption	combined:	/100 km
	inner city:	/100 km
	outside:	/100 km
CO₂ emissions	combined:	g/km
Current consumption	combined:	kWh/100 km

The values indicated were determined in accordance with specified measurement procedures (Art. 2, Nos. 5, 6, 6a Pkw-EnVKV, in the version currently in force). CO₂ emissions incurred by the production and provision of the fuel or other energy carriers are not taken into account in the determination of the CO₂ emissions in accordance with Directive 1999/94/EC. The data does not relate to an individual vehicle and does not form a constituent part of the bid, but serves solely for comparison purposes between the different types of vehicles.

Note with regard to Directive 1998/94/EC:
The fuel consumption and CO₂ emissions of a vehicle depend not only on the efficient utilization of the fuel by the vehicle, but are also influenced by driving behavior and other non-technical factors. CO₂ is the greenhouse gas mainly responsible for global warming. A guideline to the fuel consumption and CO₂ emissions of all private car models offered for sale in Germany can be obtained free of charge at any point of sale in Germany at which new models of private cars are on display or offered for sale.

CO₂ efficiency

On the basis of the CO₂ emissions measured and determined by taking the weight of the vehicle into account

B

Classification of the specific vehicle into the efficiency class

Annual tax for this vehicle	Euro
Energy costs with a run performance of 20,000 km:	
Fuel costs () at a fuel price of ___ euro/payment unit	Euro
Current costs at a current price of ___ euro/payment unit	Euro
	Prepared on:

Vehicle-specific data

Information regarding official consumption and CO₂ values

Color bars for visualization of the CO₂ efficiency scale

Classification of the specific vehicle into the efficiency class

Fuel costs and motor vehicle tax per year

Air quality

According to official Federal Environment Agency figures, for road traffic alone, the total amount of nitrous oxide emissions has fallen by 70 percent since 1990. That was achieved notwithstanding considerable increases in transport performance and the vehicle fleet since the end of the 1990s. Nowadays, therefore, modern vehicles are far less polluting.

As a result, air quality in today's cities is significantly better than it was in the past. Despite that, the average annual value for nitrous oxide emissions in some German cities is still above the legally permitted threshold.

The atmospheric pollutant immission requirements, namely air contamination as measured, are derived from the European air quality directive (2008/50/EC). They are transposed into German law by the 39th Federal Pollution Control Act.

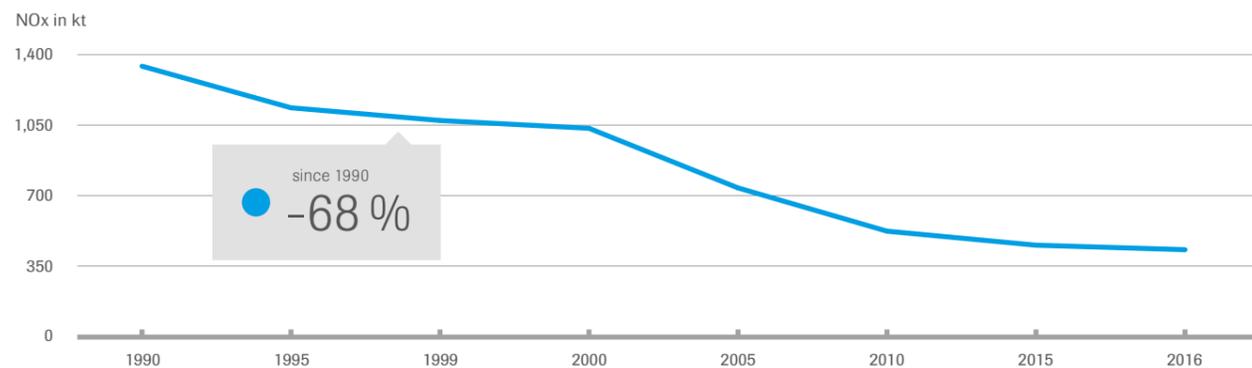
Nitrogen oxide

Nitrogen dioxide (NO₂) is especially relevant when it comes to nitrogen oxide pollution. The regulation stipulates two limit values for this substance; this being so NO₂ contamination is not permitted to exceed an average annual value of 40 micrograms per cubic meter of outdoor air over the entire year. However, especially at measuring stations situated close to traffic, there are still isolated cases of the average annual value for nitrogen

dioxide being exceeded. These are situated in urban areas, which often exhibit particular topographical characteristics (e.g., in a basin), which makes a free exchange of air problematic. The number of cities exceeding the maximum limit is, however, in significant decline. According to the Federal Environment Agency, 70 German local authorities reported excessive NO₂ pollution in 2017; the year before it was 90. Only in a few instances was the permissible average annual value for nitrogen oxides significantly exceeded. In the overwhelming majority of cases the immission limit was almost achieved or else the figure was below it.

The second limit value concerns average NO₂ pollution over an hour. It is 200 micrograms per cubic meter of air. This value is primarily an indicator of peak pollution levels. At any one measurement location, it may not be exceeded more than 18 times a year. Over ten years ago (2006) this value was exceeded 853 times at the Neckartor in Stuttgart. Compared with only three times in 2017. This was the first time that the hourly average requirements for the whole of 2017 were achieved in Stuttgart.

Emission trends for nitrogen oxides in the transport sector (road traffic) for Germany since 1990, NOx in kt



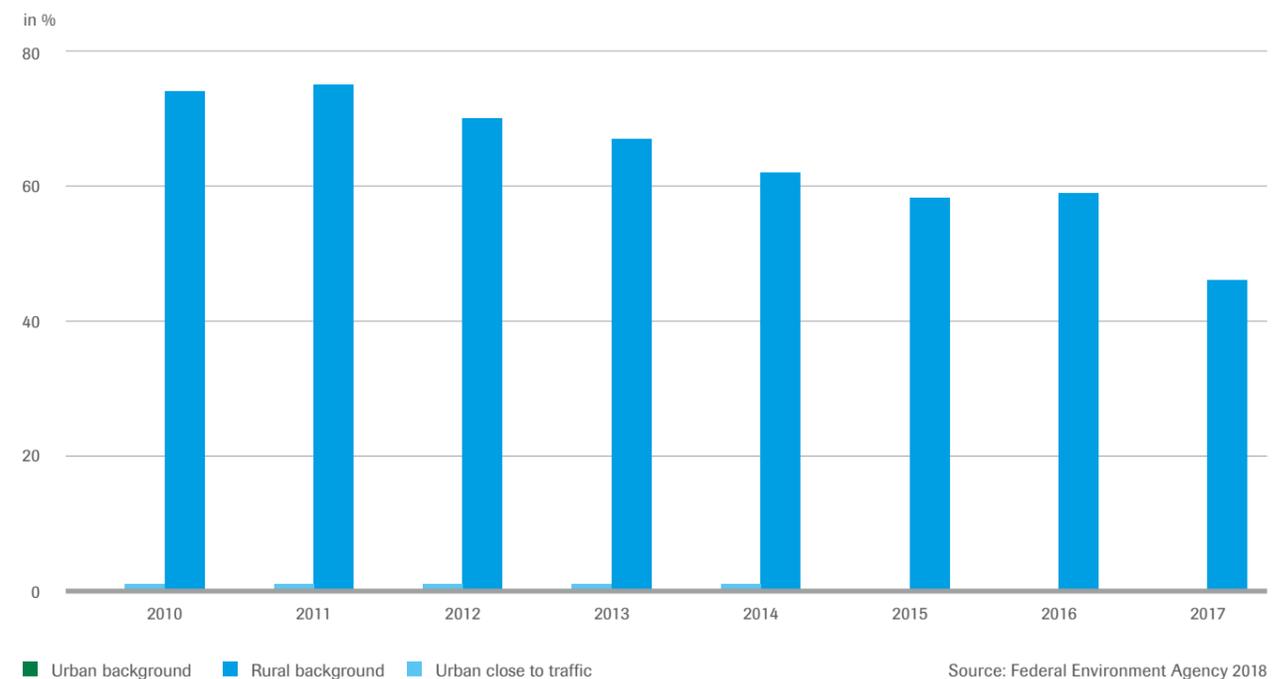
Source: German Environment Agency (UBA)

International comparison

A further improvement is anticipated in the years ahead. Purely as a result of the renewal of the fleet with diesel vehicles that comply with the Euro 6 and RDE limits (see the combustion engine consumption and emissions chapter), NOx emissions are falling, which translates into sustainable compliance with air quality limits. In future, therefore, it can be assumed that air quality targets will also be achieved even at measuring stations where the traffic is heavy thanks to the progressive renewal of the fleet.

The guide value of 40 micrograms for nitrogen dioxide in the European air quality directive is based on a World Health Organization (WHO) assessment. The WHO itself points out that it is not possible to derive a specific average annual value for nitrogen dioxide from specific studies. Despite that, given the available data, it deems it necessary to protect the population at large against chronic nitrogen dioxide emissions. Since the year 2000, the WHO has therefore been proposing 40 micrograms per cubic meter as the guide value for air quality. However, to quote one example, the US environment agency (EPA) permits up to 100 micrograms – 2.5 times as much.

Proportion in percent of measuring stations exceeding the limit for average annual NO₂ in the relevant pollution regime for the period 2010-2017



Source: Federal Environment Agency 2018

Difference in the workplace

Workplaces in buildings need to be differentiated from the immissions limits for outdoor air. The permitted limit for industrial workplaces is more than 20 times higher than outside; the applicable value here is 950 micrograms per cubic meter. This is based on the Technical Rules for Hazardous Substances (TRHS), published by the German Federal Ministry of Labor and Social Affairs. Workplace limits are average shift values for a typical eight hours a day, five days a week exposure throughout a working life. The guide value for office workplaces is 60 micrograms.

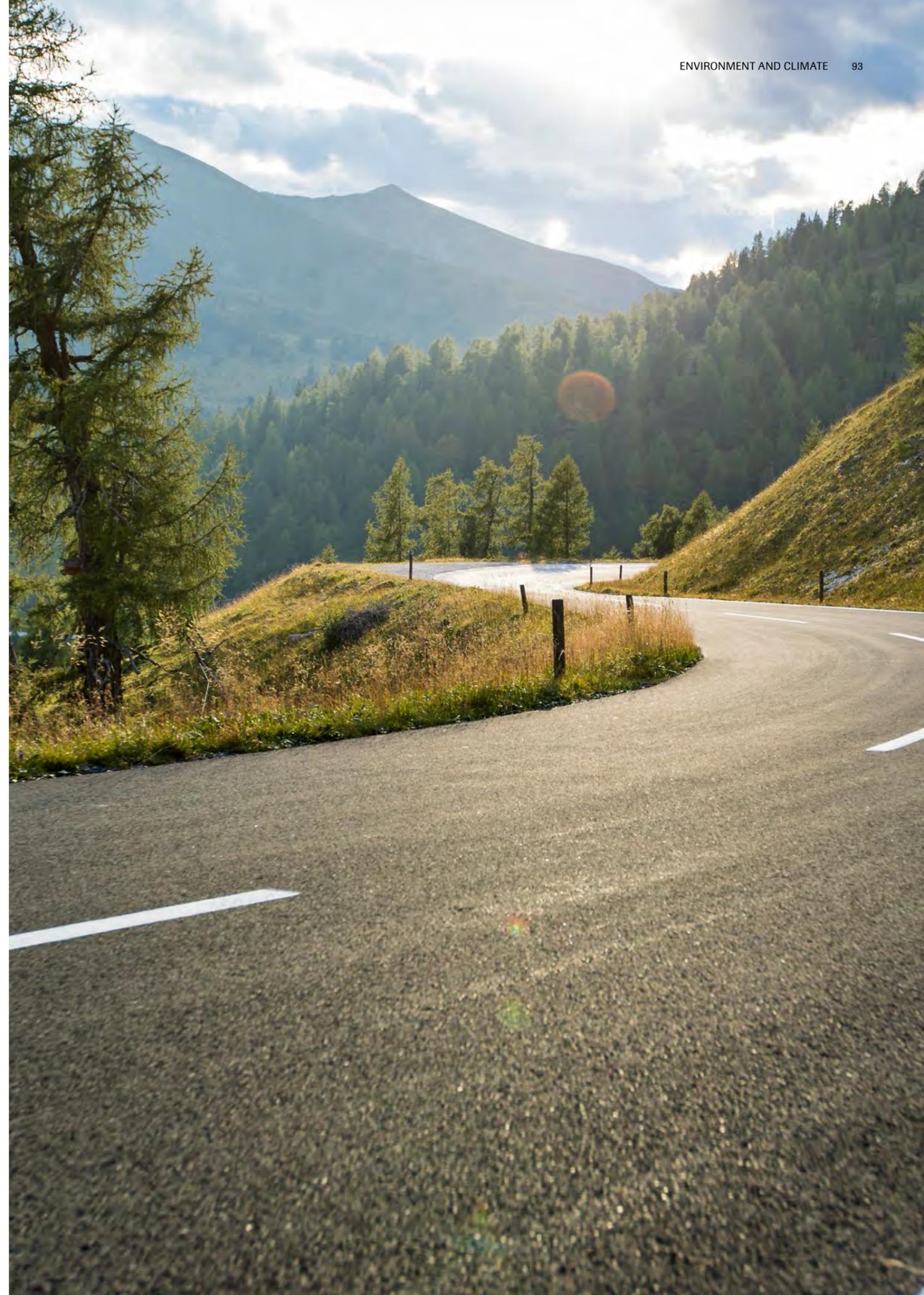
Particulate matter

Whereas reducing nitrogen oxide immissions still remains a significant challenge, considerable progress has been made in recent years with particulate matter. The relevant limits nowadays are complied with almost nationally.

The daily average value is particularly important for particulate matter (PM₁₀). It is 50 micrograms per cubic meter of air. This value may only be exceeded a maximum of 35 times in a calendar year. In 2017, the limit value was only exceeded more than 35 times in one measuring location in Germany – at the Neckartor in Stuttgart. Even there, success in improving air quality is clearly evident. From 187 exceedances in 2005, by 2017 the number of exceedances had been reduced to 45 within ten years.

Cases of heavy particulate matter pollution nowadays are primarily caused by the weather. That was also apparent in 2017: the average daily values for particulate matter were exceeded primarily in the winter months. This is mainly attributable to extensive winter high-pressure systems characterized by dryness and high insulation. In the summer, in contrast, exceedances of daily limits are considerably rarer. Levels above the limit are also often observed simultaneously across large areas. The example of the particulate matter alarm in Stuttgart at the beginning of 2016 shows that road traffic can hardly be made responsible for levels above the limit anymore. Although fewer vehicles were traveling on the road, particulate matter levels rose significantly on the days when the particulate matter alarm was in effect. The automotive industry has played its part in minimizing particulate matter. In the case of modern automobiles, particulate matter engine emissions are virtually a thing of the past.

The weather has a major impact on the actual level of particulate pollution in cities.



National Diesel Forum

Possible driving bans

The options for reducing road traffic nitrogen oxide emissions are legion: from technical vehicle measures to intelligent traffic management-based solutions. But some local authorities are also considering restricting the entry of high-emitting vehicles.

Politicians and industry have a common objective of avoiding driving bans while continuing to improve urban air quality. This is why the German government, federal states, local authorities and industry have jointly put together a package of measures within the national diesel forum, the so-called diesel summit, that is intended to improve air quality in short order, thereby making driving bans superfluous.

The measures that the German automotive manufacturers alone are taking are supposed to reduce nitrogen oxide emissions by the beginning of 2019 by between 12 and 14 percent compared with the beginning of 2017.

Software updates and trade-in incentives

Approximately half of these savings are to be achieved through extensive updating of engine software. This predominantly concerns exhaust gas 5 standard models, but some Euro 6 automobiles as well. The updates enable vehicles to achieve an average nitrogen oxide reduction of between 25 and 30 percent. The manufacturers' software updates are upgrading a total of more than five million vehicles to a significantly better emissions level in Germany alone.

Many German automotive manufacturers have offered individual trade-in incentives for older diesel automobiles as an additional building block. This purchase bonus is intended to motivate owners of diesel vehicles that are Euro 4 standard or older to switch to modern diesel, gasoline or electric-powered vehicles.

These incentives accelerate the natural fleet renewal process. The reason is that fleet renewal also makes an important contribution to nitrogen oxide reduction: today's newly regis-

tered modern diesel vehicles are significantly less polluting on average than earlier generations of automobile. The higher the proportion of Euro 6 automobiles becomes within the total fleet, the quicker the nitrogen oxide limits are reached.

Diesel fund

BMW, Daimler and Volkswagen also contribute a three-figure sum in the millions of euros to the so-called diesel fund. The German government created the "Sustainable Mobility" fund immediately after the diesel summit, thereby supporting cities experiencing air quality problems with concrete emission reduction measures. In an initial phase, the Federal Transport Ministry, which is responsible for the fund, is promoting the development of master plans ("green city plans") by the cities concerned. Based on these plans the intention is to then promote projects financed by the fund in a second phase. Half of the available resources are to be used for digitalization and networking initiatives.

Improving air quality

The manufacturers within the VDA have also pledged to provide intensive support to especially heavily polluted cities in Germany. The particular challenges in the cities in question are to be identified in the process and specific measures for effective air quality improvement developed. The German manufacturers are looking to collaborate closely with individual German cities.

Upgrading diesel vehicles

The automotive industry's measures are centered on a voluntary software upgrade that is free of charge to owners. A modern automobile engine is monitored and controlled by an electronic control unit. New or improved software can therefore change the way in which the engine works.

It is primarily Euro 5 and some Euro 6 vehicles that are being upgraded. Exhaust after-treatment technologies have come a long way since then. For example, control strategies have been optimized, thereby significantly extending exhaust gas recirculation temperature ranges. Owners of older vehicles, whose engine electronics are receiving a software update, are now benefiting from this knowledge as well.

Hardware retrofits not appropriate

In addition to software upgrading, critics are also calling for hardware retrofits. The idea is to convert the automobile's technical components. The changes entailed however are very large. Many models even lack the space to fit the necessary components, such as the SCR catalytic converter or the tank for the AdBlue liquid injected into the SCR catalytic converter. Hardware retrofitting solutions would therefore have to be specially developed and tested for each individual model – a protracted process that also has to encompass winter and summer testing. The authorities would then also have to issue the necessary sign offs.

There is also the risk that retrofitting AdBlue systems might also result in higher fuel consumption, as available test results confirm. This would invalidate the type approval as there would no longer be compliance with CO₂ values. This would also be counter-productive for climate protection reasons.

This is why the German automotive industry is convinced that hardware retrofits are typically not appropriate, both technically and economically.

The technical challenges associated with hardware retrofits are very large.

European Chemicals Regulation REACH

Chromium trioxide

The REACH chemicals regulation continues to preoccupy the automotive industry.

Even in the tenth year after it came into force, the automotive industry is still feeling the effect of the European chemicals regulation REACH. As of September 2017, chromium trioxide can only now be used with authorization or only so long as the EU Commission has not yet turned down an application for authorization. In the case of some applications for authorization the verdict has not yet been reached. Chromium trioxide is particularly important as a process chemical for the hard chromium plating of vehicle components subject to high stress contact, such as valve rods and shock absorbers. However, it is now classified as carcinogenic and mutagenic and is therefore subject to the authorization procedure. As yet there are no alternative materials possessing comparable characteristics in terms of function and durability.

The VDA became involved in the chromium trioxide consultation process at an early stage and demanded that authorization be granted for a minimum of twelve years. In particular, companies must also be able to guarantee the supply of spare parts throughout this period. A potential risk arises only in the factory chromium-plating process. However, the protection of workers in this process is consistently regulated at a high level by EU directives and national regulations.

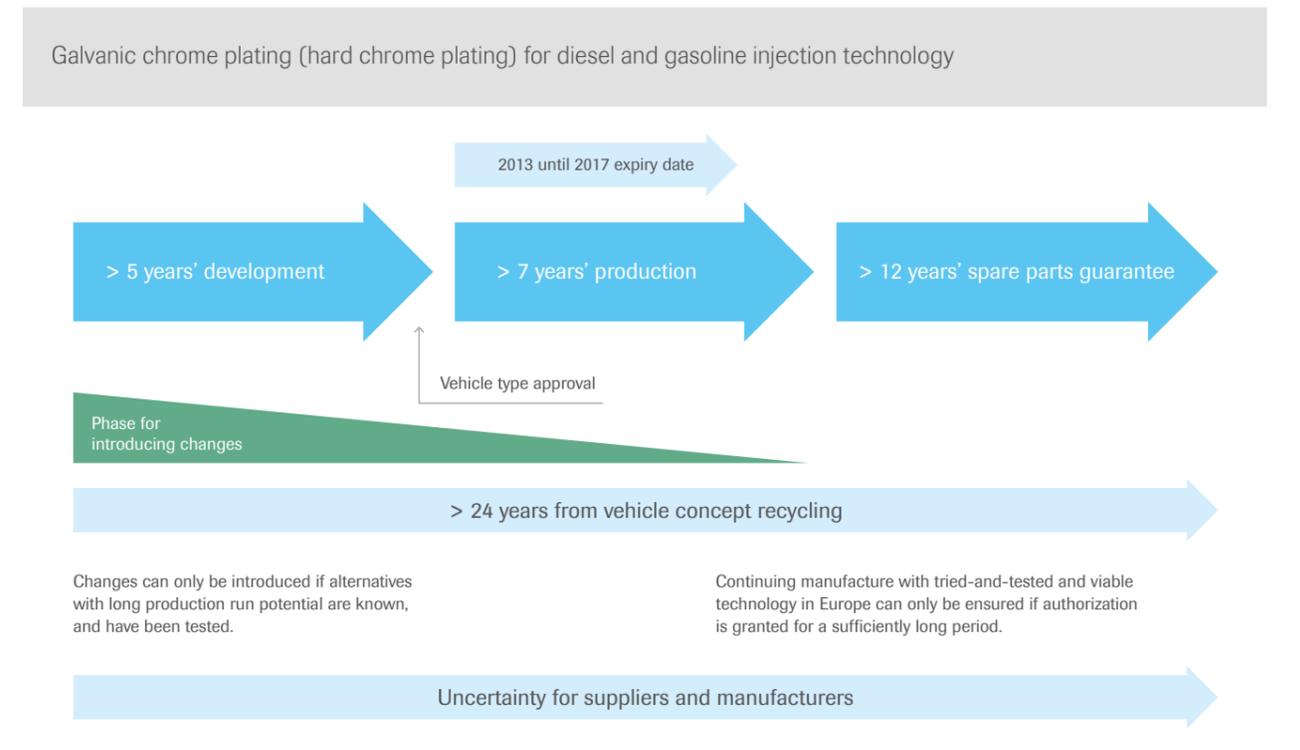


Isocyanates

The automotive industry is also affected by restrictions on isocyanates. Isocyanates are required and in common use both in production and in workshop vehicle repairs. Isocyanates characteristics make this group of materials indispensable for many areas of automotive manufacturing. They are used as adhesives, primers and sealants in vehicle assembly and in bodywork construction. They are also used as cast resins and as curing agents for clear coats in series painting operations and manual painting. Any restriction on isocyanates therefore has far-reaching repercussions on automobile development, manufacture and repair in Europe.

Isocyanates possess sensitizing characteristics and can trigger allergic reactions of the skin and airways. Inhaling isocyanates in vapor or aerosol form is particularly dangerous. That is why occupational safety precautions in particular are required. What is important, however, is that restriction requirements be designed with real-world use in mind. The German automotive industry became involved here at an early stage in the official consultation process and called for realistic requirements for training in the handling of the chemical.

Regarding the use of isocyanates, the automotive industry takes the necessary precautions in terms of occupational safety.



Innovation and Technology

Digitalization, networking, alternative drives, electromobility – the automotive industry is right in the middle of a technological change. Our claim is clear: “Made in Germany” mobility technology should continue to set standards in the future.



Diesel, Gasoline and Hybrid Engines

Diesel and gasoline engines

The diesel engine has always outscored its gasoline counterpart with its lower fuel consumption. Its combustion process makes far better use of the energy stored in the fuel. Admittedly, diesel combustion generates more pollutants, necessitating additional elaborate exhaust gas aftertreatment measures. The dynamic tension between fuel consumption, emissions, driving performance and vehicle costs sees diesel- and gasoline-powered vehicles pitting their respective strengths against each other in different vehicle classes. A modern gasoline engine makes compact cars with moderate annual mileage affordable, whereas an advanced diesel with a tendency for higher mileage delivers lower fuel consumption. The ability to choose between gasoline and diesel helps to accommodate customers' individual needs – especially in terms of cost. It is no coincidence that the diesel engine dominates business fleets, including those of the skilled trades.

Hybrid

The hybrid engine is able to increase the effectiveness of the drive system, thereby reducing fuel consumption and CO₂ emissions. A full hybrid reduces fuel consumption by between 20 and 25 percent. The reduction is predominantly achieved in city center traffic where the hybrid can play to its strengths: brake energy recovery (recuperation), all-electric driving, for some of the time, and optimized load point shifting of the combustion engine. On main roads and motorways, on the other hand, the combustion engine is already operating close to the optimum, which is why a hybrid can only achieve moderate efficiency gains.

However, global efforts to reduce CO₂ emissions point to a clear trend in electrification of the power train. The VDA assumes that hybrid drives – in various guises – will become the standard in the medium term. The full hybrid possesses high-performance electrical drive components and a rechargeable high-voltage battery permitting all-electric driving. Mild hybrids are increasingly using 48 V electrical networks. They enable greater electrification of the power train and improved recuperation. Greater synergies are also created in relation to increased electrical system requirements as a result of new electrical equipment.

Diesel cuts CO₂

Despite everything, the diesel engine still plays an important short and medium-term role in achieving European CO₂ reduction targets. For example, a comparable diesel is up to 15 percent more efficient than a gasoline engine. A liter of diesel also contains approximately 10 percent more energy than gasoline. Measured in liters, a diesel engine, consumes up to 25 percent less fuel than a gasoline engine. On the other hand, on combustion a liter of diesel also releases a good 13 percent more carbon dioxide than a liter of gasoline. All in all, a diesel vehicle emits approximately 15 percent less CO₂ per kilometer.

In Germany last year, 39 percent of all newly registered automobiles were diesels, the proportion in Western Europe was 44 percent. With their comparatively low CO₂ emissions, diesel automobiles make an important contribution to remaining within the European CO₂ limit. Average CO₂ emissions across all new automobiles in 2017 was 127.1 grams. If diesel vehicles only had been registered in Germany, emissions would be significantly lower at an average of 120.4 grams.

With 3.4 million new automobile registrations last year in Germany and an assumed average annual "mileage" of 15,000 kilometers, purely diesel transportation would have been able to save 583,000 metric tons of CO₂ a year. That is broadly the equivalent of the carbon dioxide emissions of a city the size of Friedrichshafen with around 60,000 inhabitants. If, on the other hand, all newly registered automobiles had had gasoline engines, the CO₂ emissions would have been correspondingly higher.

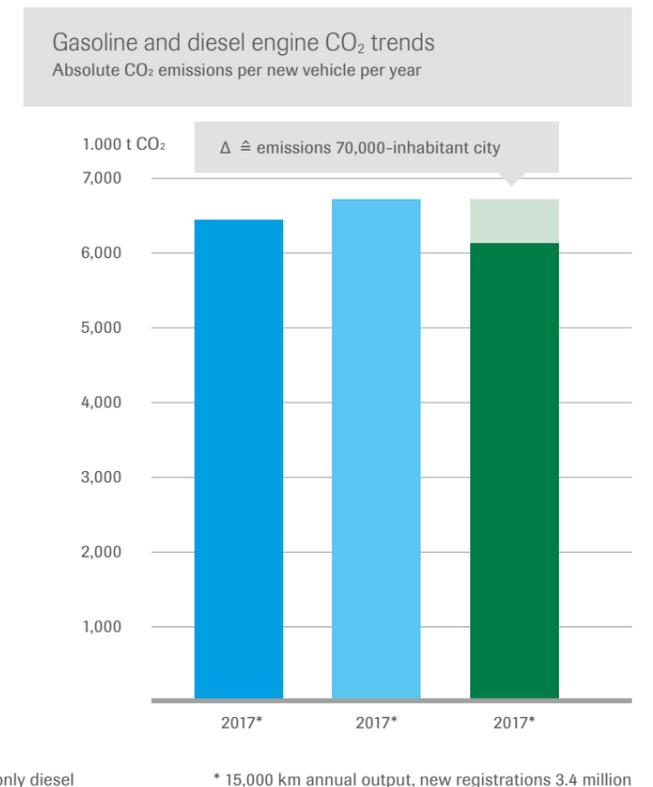
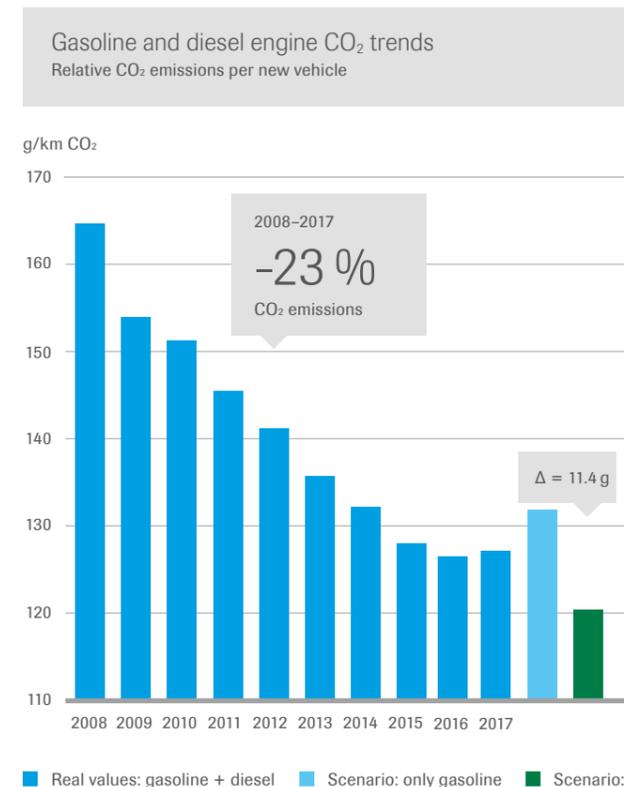
The Federal Environment Agency and some NGOs on the other hand frequently assert that the CO₂ advantage of diesel exists only on paper. Diesel, they say, keeps the fuel consumption of large and heavy automobiles within tolerable bounds. That has – so the critics say – the counterproductive effect that more such vehicles come onto the market. This criticism overlooks the fact that the trend towards SUVs comes from the customer and can be observed worldwide. In the USA and China their proportion is significantly higher even than in Europe. Admittedly the vehicles driven there almost all have gasoline engines, with the result that their CO₂ emissions are correspondingly higher. In Europe, on the other hand, there are efficient diesel engines available, which significantly improve these vehicles' CO₂ balance. The diesel is not therefore behind the worldwide SUV trend. Instead, it ensures that these vehicles as well can be driven economically.

Economic importance

Last but not least, combustion engine technology is also of considerable economic importance to Germany as a location. Banning combustion engines, a recurring topic of conversation, would therefore have a significant negative impact on employment and value creation in Germany. The ifo Institute also arrived at this assessment in a study on the repercussions of prohibiting the registration of vehicles with a combustion engine. According to ifo, more than 600,000 jobs in industry today would be directly or indirectly affected. That is 10 percent of German industrial employment. 436,000 jobs would be in jeopardy in the automotive industry alone; in the case of small and medium-sized enterprises within the industry up to 130,000 jobs would be at risk.

In terms of value creation, the negative effects of prohibiting combustion engines from 2030 onwards would be even starker: a total of 13 percent (around 48 billion euros) of German industry's gross value creation would be impacted.

The study also reveals that German manufacturers and suppliers lead the international league tables for propulsion system patents. One patent in every three worldwide in the electromobility (34 percent) and hybrid drive (32 percent) fields originate in Germany. The figures are based on the period 2010 to 2015. The old trope whereby German automotive manufacturers are allegedly neglecting efforts to develop alternative drive technologies because of their strong position in combustion engines is therefore untenable.



* 15,000 km annual output, new registrations 3.4 million
Source: KBA; VDA

Combustion Engine Fuel Consumption and Emissions

WLTP

After around 25 years the NEDC was out of date: the urban driving element is too high; accelerations are too low. It also does not take into account varying landscape topography and faster expressway driving. The maximum speed of 120 km/h is driven for only ten seconds. The average speed of the NEDC is unrealistically low at 34 km/h. Equipment which nowadays goes without saying, such as air-conditioning, radio or heated seats, is also not included. The essential aim of these statutory guidelines was to ensure comparability between different vehicles. It soon became clear that there is a difference between the test bench results and the values on the road.

Difference between lab and road

There are several reasons for this. For example, the driver's usage behavior has a substantial effect on fuel consumption and emissions. Drivers who travel in the mountains a lot, drive faster on the expressway more often, or use a lot of comfort functions, consumes more energy, and hence fuel, than others. There is not just one vehicle consumption level on the road. The different load and dynamic requirements play a critical role in exhaust emissions as well. Many technologies developed in recent years to reduce CO₂ also have a greater effect on the test bench than on the road. An example is start-stop technology, which is in widespread use nowadays. In the NEDC it reduces fuel consumption by about 10 percent. In reality, a driver experiences such a fuel consumption advantage only in heavy traffic with a lot of stopping and starting. Yet another reason for the discrepancy between lab and road is the fact that because vehicles are becoming ever more efficient, the value measured in the test cycle is also falling. If the additional consumption due to features such as air-conditioning and the navigation system remain constant, then the percentage deviation that they cause will rise, although the absolute level of consumption is lower.

The NEDC is being replaced by the modern WLTP test standard. With a higher average speed, top speeds of up to 131 km/h, greater variations in speed and more strict test procedures, the WLTP provides a better overall picture of fuel consumption under real driving conditions. Like the NEDC, the WLTP cycle is also run on a test bench. It specifies standardized, reproducible and comparable test conditions for certification in Europe. It provides customers with a better yardstick for comparing the consumption and emissions values of different vehicle models. It provides manufacturers with a legally reliable basis for certifying new vehicles. Nevertheless, the WLTP will not reflect fuel consumption on the road and real emissions in all circumstances either. Fuel consumption and emissions still depend on driving style and environmental conditions.

Conversion from NEDC to WLTP affects not only fuel consumption measurements, but also CO₂ fleet monitoring and CO₂ laws in Europe. The 95 g fleet target value was established on the basis of the NEDC. If the measurement method for determining CO₂ emissions is to be changed, then the target value must also be adjusted accordingly. On average, the automotive industry expects a nominal increase in fuel consumption values of between 15 and 20 percent when using the WLTP to determine fuel consumption. This needs to be borne in mind as regards the 95 g fleet target.

The EU Commission has therefore developed a procedure for incorporating the WLTP into CO₂ legislation. This will entail WLTP measurements being recalculated as virtual NEDC values for a transitional period. That means that the CO₂ fleet target of 95 g based on the NEDC can remain unchanged for the time being. Thereafter, individual manufacturer CO₂ target values can be calculated based on the new WLTP, thereby enabling the introduction of the WLTP to be completed. A similar arrangement applies for eco-innovations, whose CO₂ contribution should also be fairly applied to the new WLTP.

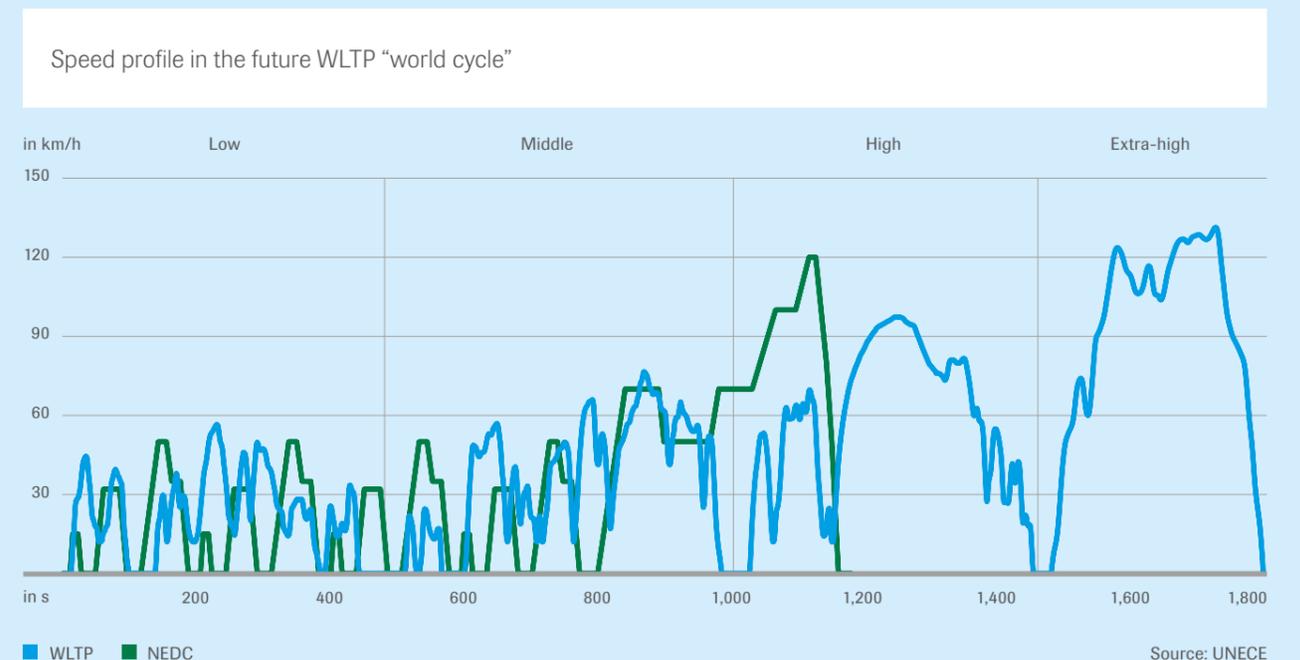
WLTP-Special:
<https://bit.ly/2CH1sSN>



To measure how much fuel an automobile consumes and whether it complies with exhaust gas limits, the legislator prescribes standardized test procedures. Since September 2017, the type approval of new automobiles throughout Europe has been subject to the new "Worldwide Harmonized Light-Duty Vehicles Test Procedure" (WLTP). This replaces the NEDC (New European Driving Cycle) in force since 1992.

New WLTP cycle		
	WLTP	NEDC (New European Driving Cycle)
Starting temperature	Cold	Cold
Cycle time	30 min.	20 min.
Idle time element	13 %	25 %
Cycle length	23.25 km	11 km
Speed	Average: 46.5 km/h – Maximum: 131 km/h	Average: 34 km/h – Maximum: 120 km/h
Propulsive power	Average: 7.5 kW – Maximum: 47 kW	Average: 4 kW – Maximum: 34 kW
Influence of special equipment and air-conditioning	Special equipment is considered for weight, aerodynamics and onboard electrical system (quiescent current). No AC	Currently not considered

Source: VDA



Source: UNECE

Real Driving Emissions (RDE)

Measurement of pollutant emissions, such as particulate matter or hydrogen oxide will also be converted to the WLTP in future. However – unlike the CO₂ targets – this will not affect the pollutant limits. The WLTP laboratory measurement is supplemented by the so-called RDE test (Real Driving Emissions). This new road test will measure vehicle pollutant emissions directly on the road in real traffic. The legislator is thus creating greater transparency. For the Real Driving Emissions test, vehicles will be equipped with so-called PEMS devices (Portable Emissions Measurement System) for mobile emissions measurement.

RDE requires vehicles to adhere to the emission limits, not only within the cycle but also under real driving conditions and almost any normal road traffic environmental conditions. The legislator's only concession is to factor in the measurement tolerance of the portable emission devices. This tolerance is currently 50 percent. This yields a so-called conformity factor of 1.5. The EU Commission is currently investigating whether progress in measurement technology permits a reduction of this tolerance and thus a reduction in the conformity factor. A slightly increased road limit value will apply for a transitional period following the introduction of RDE. Accordingly, a vehicle may exceed the required NO_x limit by 60 percent. The particulate limit must however be complied

with during this intermediate stage. The only addition is the measurement tolerance, yielding a total so-called conformity factor of 2.1 for NO_x and 1.5 for particulates.

Automobiles that comply with RDE requirements then belong in exhaust gas standard Euro 6d temp or Euro 6d final. Euro 6d temp has applied to new types of vehicle since September 1, 2017 and to all new vehicles with effect from September 1, 2019. Euro 6d final will then apply to new types of vehicle from September 1, 2020 and to all new vehicles with effect from September 1, 2021.

Initially only a few RDE type-approved vehicles were unveiled owing to the late publication of the RDE legislation in the summer of 2017. But this is progressively changing. All new automobile registrations must comply with Euro 6d temp no later than from September 2019 onwards.

The introduction of the new RDE standard will have a considerable positive impact on air quality. The VDA commissioned an effect analysis showing that the introduction of Euro 6 and RDE will achieve air-quality targets in Germany. For example, NO₂ air-quality exceedances at measuring stations located close to passing traffic will fall by 83 percent in the next ten years purely as a result of the renewal of the fleet.

Real Driving Emissions regulation (RDE)

Deadline and conformity factor

		Conformity factor	Limit value	Entry into force	
		Measurement tolerance of PEMS devices (currently 0.5) already included in factors	NO _x (Diesel) mg/km	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.	
				New models	All new registrations
1. Step	Euro 6d temp	2.1	168	September 2017	September 2019
2. Step	Euro 6d	1.5	120	January 2020	January 2021

Source: VDA



Pollutant Reduction Technology

Particulate filter

Cleaning combustion pollutants out of diesel engine exhaust requires the use of additional aftertreatment systems. The first step is typically the oxidation catalytic converter. Here, pollutants are converted into harmless exhaust gas components. The diesel particulate filter cleans soot and particulate matter out of the exhaust in a second step. The cleaning that the filter requires is done by burning off the embedded particles. The cleaning can only be successful, however, if the particle filter temperature is at least 350 °C. In urban traffic this is frequently not the case and the filter needs to be actively burned off. To achieve this, the engine management system briefly increases the exhaust gas temperature to 600 °C. A new automobile's soot filter is almost 100 percent efficient. This means that the diesel is nearly free of soot.

Nitrogen oxide aftertreatment

To reduce the nitrogen oxide (NOx) emissions there is a third stage featuring two technologies, which can also be employed in tandem: the NOx storage catalytic converter and the SCR catalytic converter. The NOx storage catalytic converter removes the nitrogen oxides from the exhaust and stores them until its storage capacity is reached. To regenerate it, the engine electronics briefly add a little more diesel fuel to the combustion mixture, much like what is done for the particle filter. The storage catalytic converter can store NOx only in a temperature range between 150 and 500 °C. The cold start is therefore critical, if the engine has not yet reached the desired temperature. It is different under normal driving conditions where it achieves its maximum efficiency of around 80 percent at an operating temperature of between 300 and 400 °C. Regeneration increases the fuel consumption of a vehicle with a NOx catalytic converter by around 2 percent on average.

In the SCR converter (selective catalytic reduction), the NOx emissions are broken down by adding the reducing agent AdBlue. AdBlue is a non-toxic, odorless urea solution. It is sprayed into the exhaust flow as needed and converts the NOx emissions into the neutral components of nitrogen (N₂), water (H₂O), and carbon dioxide (CO₂) in the SCR catalytic converter. For the SCR catalytic converter as well, significant NOx reduction rates can be achieved only above approximately 200 °C. Once the engine and the exhaust gas system are at operating temperature, the SCR catalytic converter removes up to 90 percent of the NOx emissions from the exhaust gas. As AdBlue has become more available and customer acceptance has grown, the use of AdBlue has expanded. This has reduced NOx emissions and continues to do so. The German automotive industry is the leader in the field of SCR technology. All German manufacturers offer models with this technology.

AdBlue

The most prominent feature of the AdBlue technology is the second tank nozzle behind the filler door. Behind it is a special AdBlue tank with a capacity of between 8 and 20 liters, depending on model. AdBlue has become standard in diesel automobiles with the introduction of Euro 6 and the introduction of RDE legislation. Depending on tank size, AdBlue needs to be replenished every 3,000 to 10,000 kilometers. That is why a dense AdBlue infrastructure is needed at filling stations across Europe. In principle, this AdBlue infrastructure exists, but predominantly still in the form of AdBlue bottles or containers, which can be purchased in the filling station shop. The main reason for this is that AdBlue technology for automobiles is new and the fleet is only now growing in Europe. Replenishing AdBlue at the filling station is therefore still relatively new.

The German automotive industry has therefore launched an initiative to help motorists find filling stations with AdBlue. Motorists throughout Europe can find the nearest filling station stocking AdBlue on the www.FindAdBlue.com website. This initiative is sponsored by VDA member companies Audi, Bosch, Daimler, Opel, Volkswagen and Shell. AdBlue is a registered trademark of the German Association of the Automotive Industry.

www.FindAdBlue.com

Gasoline particulate filter

The particulate filter has been standard on diesel engines for more than a decade. A gasoline engine did not previously feature this technology because a gasoline engine produces fewer particulates than a diesel engine. This is why the gasoline engine was previously able to comply with the applicable limits without a gasoline particulate filter (GPF). With the new phase in exhaust gas legislation and the introduction of WLTP, the GPF will now be introduced in the direct injection gasoline engine as well. All new vehicles with direct injection gasoline engines will be fitted with a particulate filter by autumn 2018 at the latest. This will restrict particulate emissions to the same low level as state-of-the-art diesel engines with a particulate filter, thus ensuring that the limits are adhered to. The gasoline particulate filter requires no maintenance and has no discernible effect on fuel consumption.

EU Type Approval

The European Union reformed European type approval yet again in 2018. The provisions of the new regulations come into force on September 1, 2020.

The regulation is in addition to the responsibility that national authorities in the member states have for type approval. Previously they alone were responsible for checking whether new vehicle types comply with all the requirements. In future, the EU Commission will also be able to act as a market supervisory authority. Because of Brexit, the regulations will probably be applied in 27 EU member states.

The European Union wants to use this power to further harmonize the execution of the type test across Europe and strengthen its market supervision. Type-approval agencies and technical services will meet stricter requirements and must undergo inspections or audits. At the European level, the EU Commission itself wants to establish market monitoring. At the same time, national approval agencies are to gain the ability to initiate retesting if there is any suspicion of false test data from a manufacturer. The type approval for the entire vehicle, and for systems and components, will also be limited to five years. Finally, it is planned that software used in electronic systems be disclosed to the approval agencies and technical services. This is intended in particular to prevent manipulation. From the VDA's perspective, software such as this must be checked and used on a strictly confidential basis.

The use of individual approvals, stepwise production of commercial vehicles, and expiring series will be improved greatly: up to now, national approvals were required, but in the future they will apply Europe-wide.

International type-approval system

In addition to the reform of European type approval, there are also efforts to establish an international type-approval system. Experts from Europe, Japan and Russia are developing just such a set of rules within the UNECE. This is the so-called International Whole Vehicle Type Approval (IWVTA).

The intention behind a worldwide type approval is primarily the harmonization of vehicle requirements for whole vehicles, or the mutual recognition of such requirements. The administrative expense for vehicle manufacturers could also be reduced and trade barriers dismantled.

ECE-based international type approval could in the long-term supplant EU type approval. A simplified international whole vehicle type approval (IWVTA of Limited Recognition) with restricted validity is envisaged to enable emerging countries with their lower statutory requirements to apply this type approval.

The type approval is to be harmonized even further and monitored by the EU.

Long-term goal: International type approval.

Electromobility

Leading Market and Provider

Germany is to become the leading market and provider for electromobility.

The German government, industry, unions and civil society representatives have been working within the National Platform for Electric Mobility (NPE) to promote electromobility in Germany since 2010. To this end, the platform has developed essential objectives that are to be achieved in close cooperation: by 2020, Germany is to be the leading electromobility provider and leading market with one million electric vehicles. The NPE's 2018 progress report takes stock of current electromobility developments in Germany and looks ahead to 2020 and 2025.

Critical to the development of the mass market is the quality of the total electromobility system. The various aspects of electromobility, from the vehicle via energy supply and charging infrastructure to the legal environment, must be integrated with one another. The reason is that it will take more than mere electrification of the automobile power-train for electromobility to catch on.

German electric automobiles

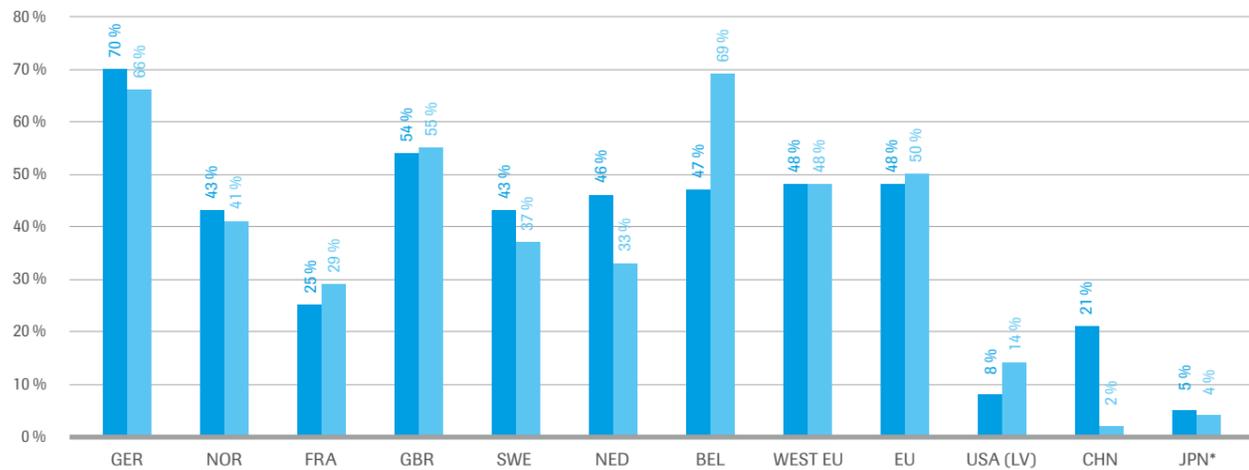
With the exception of China, the German manufacturers' market share for electric automobiles is greater in all major markets such as Western Europe, USA and Japan than the equivalent market share for automobiles. In Western Europe more than half of all electric vehicles are made by German manufacturers. The market share in the USA is around 16 percent – compared to approximately 8 percent for conventional vehicles. In China, on the other hand, with a 2 percent market share, German manufacturers' electric vehicles play a somewhat minor role. The Chinese market is dominated by domestic brands to the tune of 90 percent.

Leading European market

Electric automobile sales in Germany in 2017 enjoyed very dynamic growth. New registrations increased by 117 percent to a record figure of 54,617 vehicles. Both battery electric vehicles (BEV) with 25,056 units (+120 percent) and plug-in hybrids (PHEV) with 29,459 units (+114 percent) grew significantly. The environment bonus in particular boosted the market in 2017, with the purchaser structure coming into line with the total automobile market. A third of electric automobiles is now registered by private buyers; a year ago, it was only one quarter. Another third of new electric automobile registrations is accounted for by company cars, as more narrowly defined. That means that more than 130,000 electric automobiles have been registered in Germany since 2010.

The share of electricity in the overall market more than doubled from 0.8 percent in early 2017 to 1.8 percent by July 2018. By the end of July, a total of 39,607 electric cars had already been registered in 2018. Germany is thus only behind Norway, currently the most important electric car market in Western Europe.

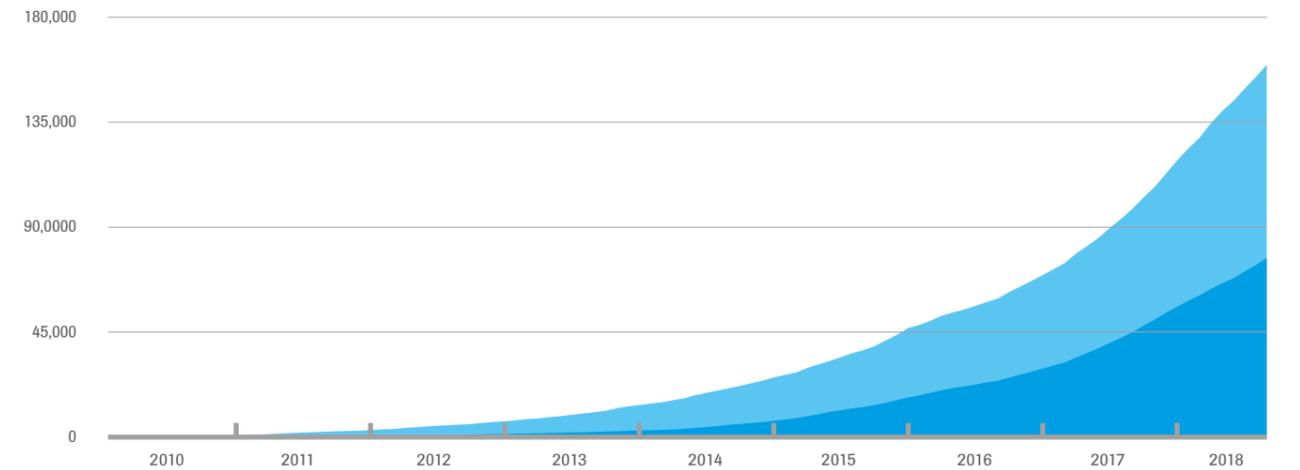
Market shares of German OEMs 2017
Electric automobiles vs. total automobiles



■ Total Jan. - June 2018 ■ Electric Jan. - June 2018 * Jan. - Mar. 2017

Source: KBA, Ward's, Fourin

Cumulative new registrations
from January 2010 to December 2017



■ Cumulative New Automobile Registrations (PHEV) ■ Cumulative New Automobile Registrations BEV+FC

Source: Federal Motor Transport Authority

Model range

The German manufacturers' main contribution to the success of electromobility is a comprehensive model range. Germany is one of the leading providers internationally. There are currently more than 30 electric-powered production vehicles available from German brands. In the next two to three years our manufacturers' offering will treble to more than 100 e-models. In the next five to eight years, German manufacturers will be putting more than 150 new electric-powered models on the road. Before this decade is out, electric propulsion (PHEV, BEV) will be represented in all segments, from the compact class to the SUV. We will then be experiencing ranges greater than 500 kilometers on one charge.

To this end, the German automotive industry is redoubling its research and development efforts. Manufacturers and suppliers will be investing a total of more than 40 billion euros in alternative drive systems (electric drive, fuel cell technology and more) by 2020. Earlier investments contributed to today's leadership position: around one third of all patents worldwide in the electromobility (34 percent) and hybrid drive (32 percent) fields come from Germany.

Environmental bonus

The positive development electromobility has enjoyed in Germany is also attributable to the political framework the German government has created since 2016. In addition to the fiscal and legal framework, the comprehensive package of measures include the environmental bonus and support for the public charging infrastructure.

A key component is the environmental bonus. Since May 2016, purchasers of electric automobiles have received a bonus financed 50-50 by the German government and automotive manufacturers. The bonus is 4,000 euros for battery-electric automobiles (BEV); plug-in hybrids (PHEV) receive a subsidy of 3,000 euros. The funding will last until no later than mid-2019, unless the funding pool, worth a total of 1.2 billion euros, runs out earlier. The fund is managed by the Federal Office of Economics and Export Control (BAFA). A total of 46,897 applications were received by the end of 2017, 58 percent being accounted for by BEV and 42 percent by PHEV. The number of applications rose steeply in the second half of 2017; there were more than 4,000 applications for the environment bonus every month since October. Almost half the applications are accounted for by private individuals; the environmental bonus has had the effect of significantly boosting private demand for electric automobiles.

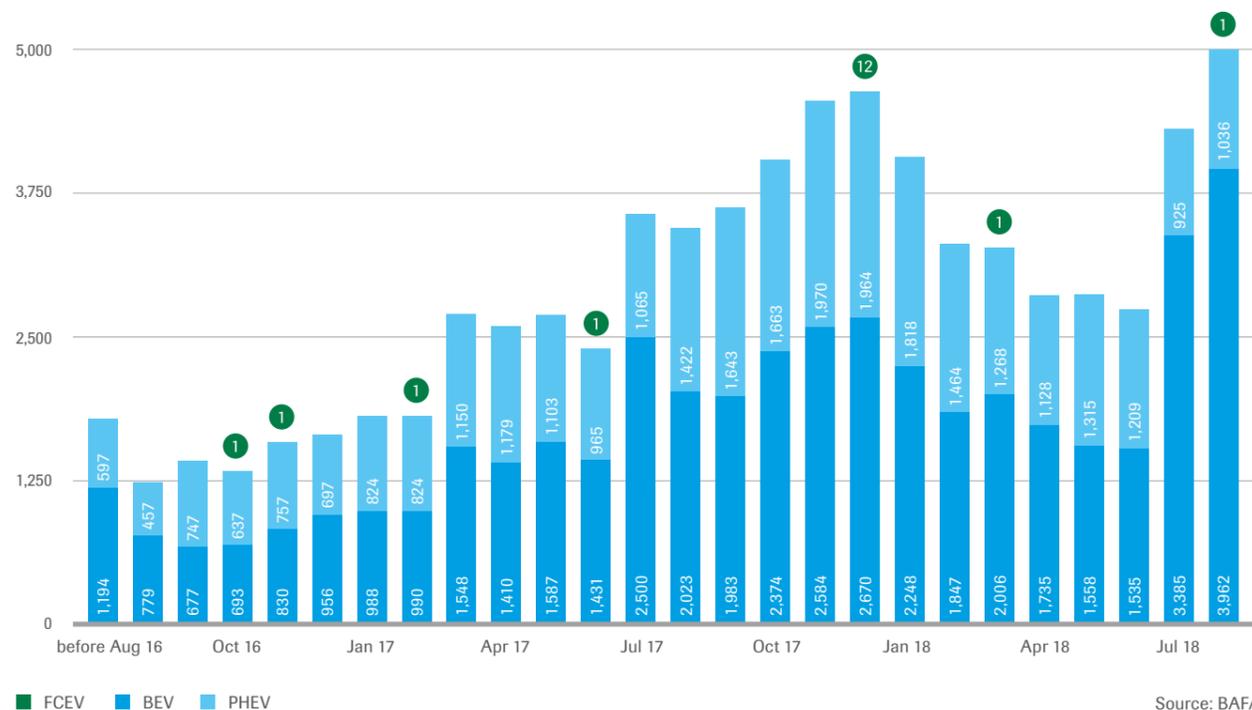
Collaboration between experts in the National Platform for Electric Mobility is paying increasing dividends for Germany as a location. A reliable political framework gives industry confidence and planning certainty, and prompts suppliers and consumers alike to invest in electromobility. This creates a firm foundation for further market development. Nevertheless, further efforts are required to secure Germany's position as a location for electromobility innovation. To this end, the automotive industry recommends monitoring market growth and adjusting funding if necessary. Annual research funding of 360 million euros from the federal budget should be continued. Germany's economic framework as an industrial location also needs to be developed. Both the publicly accessible and private charging infrastructure requires further development. Finally, the legal framework needs to be enhanced, for example by amending building and home ownership laws.

charging stations. The remaining target shortfall needs to be made good by additional support measures.

The first funding call approved applications for 1,600 fast charging stations and 7,600 normal charging stations. The second funding call is to create a further 8,600 normal charging stations; 1,000 fast charging stations are also being funded – attracting around three times as many funding applications. The number of normal charging stations can therefore be expected to increase from 10,000 now to approx. 26,000. This would represent achievement of around one third of the NPE target of 70,000 charging stations. The number of fast charging stations could even increase fivefold, from 530 in 2017 to more than 2700. That would also represent achievement of around one third of the NPE target of 7,100 fast charging stations. For 2025, the NPE is forecasting a requirement of up to 190,000 normal charging stations and 19,000 fast charging stations.

The automotive industry is contributing in its own right and investing in the development of charging infrastructure. Daimler, BMW, Ford and the Volkswagen Group are jointly installing a fast charging network on European freeways. To this end, the manufacturers' own consortium, Ionity, is installing several hundred high-performance charging stations under European corridor projects. Germany is the first country with a nationwide fast charging infrastructure on freeways that is constantly being developed and its performance upgraded.

Applications for environmental bonus

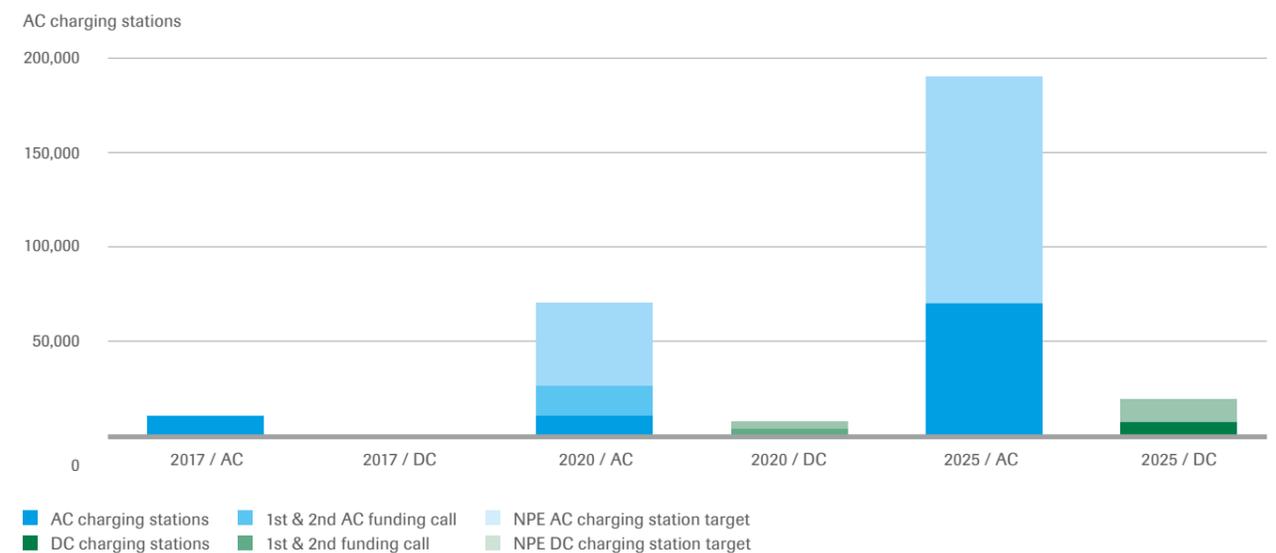


Source: BAFA

Charging infrastructure

The German government's charging infrastructure funding guideline for electric vehicles in Germany will invest 300 million euros in development of the publicly accessible charging infrastructure by 2020. Of this, 200 million euros is being earmarked for development of fast charging infrastructure and 100 million euros for normal charging infrastructure. This important start-up financing to develop a charging infrastructure that is fit for purpose paves the way for the NPE's forecast requirement for 7,100 fast charging stations and 70,000 normal

Charging infrastructure



Standardization roadmap

The German standardization roadmap is intended to coordinate and merge the diverse standardization activities of different industries and industrial sectors. For example, consistent international norms and standards have been developed to ensure user-friendliness and investment security for vehicle and charging infrastructure investment. For example, in accordance with European requirements and the German charging station regulation, all new public charging stations since the beginning of 2016 feature a charging system that complies with the CCS (Combined Charging System) standard. The intention in future is to create the vehicle and infrastructure prerequisites for charging with powers of between 150 kW and 400 kW. Standards are already being developed today to deliver ubiquitous wireless charging.

CCS charging technology has been the standard for all new charging points since 2016.

Decisions concerning information linking technology are also required to enable simple, user-friendly charging at any charging station as well. Among other things, this requires a standardized authentication concept. In this context the NPE is recommending a standardized, pan-European structure for unique vehicle identification to enable interoperable, transnational charging – for contract customers and ad hoc, spontaneous charging alike.

E-commercial vehicles

In future, not just automobiles but vans, trucks and buses as well will increasingly be electrified. Transportation, both in the city center and close to it, is characterized by daily recurring, predictable and short routes involving a regular return to depots or distribution centers. For example, approximately 80 percent of vans drive no more than 50 kilometers per day and attain relatively low average speeds. Electric-powered vans already satisfy these requirements. Electric-powered buses also will in future assume an ever increasing role in city-center transportation.

The economic viability of these vehicles, however, depends very much on their individual intended purpose and local circumstances as the battery's storage capacity needs to be designed accordingly. The standardization of the relevant charging infrastructure components and the development of the charging network are also essential conditions.

Electric-powered vans, buses and trucks with different ranges are already available to some extent for use in the city center and its environs. German manufacturers will considerably expand the product offering yet further in the next few years.

Vans, buses and trucks will also increasingly be powered by electricity in the future.



Other Alternative Drive Systems

Natural gas

The German automotive industry continues to follow a diversification strategy to reduce, supplement and ultimately completely replace fossil fuels. The primary goal is to back more than one horse and promote various promising technologies for alternative drive systems. Natural gas is an especially promising fuel: it has a CO₂ advantage of over 20 percent compared with gasoline. Even compared with diesel engines, CO₂ reduction of up to 10 percent can be achieved. However, natural gas vehicles have made up only a small proportion of total vehicles to date. In Germany there are about 80,000 passenger cars powered by natural gas. Compressed natural gas (CNG), as used for automobiles, is available at around 900 filling stations. Across Europe there are over 3,000 natural gas filling stations.

For heavy commercial vehicles, liquefied natural gas (LNG) is an alternative to diesel fuel. Above all, liquefied natural gas has the energy density required for long-range travel. This makes LNG particularly well suited for long-haul freight transport. The VDA therefore welcomes the EU initiative for promoting LNG infrastructure in the EU in order to facilitate a breakthrough in LNG mobility. Measured by energy content, natural gas is currently taxed at a rate of 13.90 euros per megawatt-hour (mwh). In comparison, the rate for diesel is 47.20 euros/MWh. This difference contributes greatly to making natural gas an interesting alternative fuel for consumers and companies.

Fuel cell

Hydrogen technology can play a significant role as a particularly sustainable alternative power system in the future. In combination with hydrogen storage, the fuel cell is an excellent source of power and is more rich in energy than a battery. Like pure electric drive, it is completely emission-free. Its cruising range, however, is comparable to current gasoline engines. Refilling is also fast, so a future fuel-cell vehicle could offer the flexibility and comfort of a current vehicle with an internal combustion engine. The possibility of flexible hydrogen production using excess renewable energy opens up additional potential. The fuel cell is ready for series production – the first models from German manufacturers were unveiled at the IAA 2017. The focus now needs to switch to construction of a hydrogen filling station infrastructure. This is what H2 Mobility is working on, an initiative sponsored by the mineral oil industry and automotive industry. The initial objective envisages 100 hydrogen filling stations coming into operation in seven German open areas, as well as along highways and freeways, by 2019. These are to be followed by another 300 as vehicle numbers ramp up.



Networked and Automated Driving

Traffic in Germany continues to increase. Society, business and politicians are working on various solutions to prevent our roads from becoming congested. Automated or even autonomous driving without a human has the capacity to be one part of the overall solution for relieving the strain on roads and road users.

The German automotive industry is busy at work on new technologies. In 2017 the German Bundestag passed an amendment to the Road Transport Law so as to be able to promote the development of automated driving in Germany. The amendment says that only vehicles possessing highly or fully automated systems are able to drive on roads. However this still requires a driver standing by to take over. More needs to be done if the potential of automated driving is to be exploited to the full: information exchange is required in addition to capturing information via on-board sensors. However, greater networking of vehicles between one another, with the infrastructure or a server, also poses risks. It makes it more likely that hackers with a variety of motives will attack vehicles and the infrastructure to which they are connected. Relevant vehicle functions and personal data must therefore receive particular protection. To that end, the German automotive industry, under the VDA umbrella, is developing concepts for the secure use and transmission of vehicle-generated data, and to protect the vehicle.

Automated and autonomous (driverless) driving

Since the introduction of ABS in 1978, new driver assistance systems are constantly being developed. Nowadays, lane assist systems, automated systems such as speed control, autonomous cruise control (ACC) and others relieve the strain on the motorist and road traffic alike. Assistance systems are gradually taking over ever more aspects of the driving task. They are helping to reduce the number of road traffic accidents.

Automated functions will be developed gradually on the basis of established driver assistance systems and incorporated into more and more new cars. Drivers are being introduced to automation step by step. Automated driving will probably make its customer debut on the freeway and in special digital car parks. In both cases, a vehicle can detect its surroundings with its own sensors, and the situations are easily controllable. On freeways, notwithstanding higher speeds, the traffic is comparatively structured as there is no oncoming or crossing traffic. In car parks, on the other hand, speeds are low, making the situation manageable notwithstanding a high degree of complexity; the parking process here is also taking place within an enclosed space.

Automated driving will first be experienced on highways and in digital parking garages.



Driverless parking

Parking assistants have become an increasingly prevalent automated and driverless feature in recent years. In their initial guise the steering was automated (lateral control), with the driver still operating the pedals and gearbox (longitudinal control). Latterly the market has seen the emergence of parking assistance with combined longitudinal and lateral control. The year 2016 saw the first appearance of systems enabling this combined longitudinal and lateral control to be operated from outside. These technologies are yielding the first convenience benefits for the driver and passengers of these vehicles. The burdensome precise parking task is performed by the vehicle and the occupants can leave the vehicle before it maneuvers into a tight parking space.

Other innovations were announced and demonstrated in research vehicles. These highly automated parking systems are not just taking care of maneuvering into a parking space but the upstream driving maneuvers as well, such as driving to the car park and navigating inside it. This avoids motorists having to wait at the entrance to the car park, the time-consuming search for a space in the garage, parking maneuvers, or even dents and scratches. One can also imagine automatic payment services or automated inductive charging of electric vehicles.

It also creates additional opportunities for fleet operators. For example, if trucks can park and maneuver automatically in loading yards or in logistics centers. Vehicle drop-off and provision, or changing location within segregated business sites, could take place automatically.

Intelligent road traffic and networking

However, driver assistance systems and automated and driverless features are only one part of the solution to the challenges of mobility. Equally important is the exchange of relevant information, also known as networking. It ensures that vehicles do not merely act intelligently themselves and support the driver. Networking enables vehicles, drivers and occupants to benefit from communication with other road users (vehicle to vehicle, V2V) and the infrastructure (vehicle to infrastructure, V2I) as well. The umbrella term for networking vehicles with their environment is vehicle to X communication (V2X), where X can stand for any conceivable communication partner.

This increasing networking of vehicles with one another and with the infrastructure makes road traffic safer and more efficient: for example, vehicles, communicating with traffic lights can make better use of the green phases. Vehicles that are networked with one another can respond unhesitatingly to emergency braking. Intelligent traffic management systems can evaluate vehicle data in real time and suggest alternative routes to drivers in the event of traffic jams, or guide them to vacant parking spaces. Around one fifth of all traffic jams and one third of traffic caused by looking for a parking space could be avoided by networked driving. The necessary technology for this is already on the starting blocks. There are numerous pilot projects testing various types of networking. For example, the requirements for "networking for value-added services" (streaming of online content on the back seat) differ significantly from those for safety-related and automated driverless features (e.g., live HD card, black ice alert).

With increasing vehicle networking, vehicle communication has become an ever more relevant topic, especially in the safety and efficiency feature field. The adoption of the European strategy for cooperative intelligent traffic systems (C-ITS) by the EU Commission at the end of 2016 marked an important milestone on the way to cooperative, networked and automating mobility.

Wi-Fi and mobile telephony

V2X can be differentiated between direct and indirect communication by reference to transmission channels. It is delivered via different technologies presenting specific advantages depending on use. Two independent communication technologies are available for direct communication. One of them is automotive Wi-Fi, which is already available today. There is already fully operational road infrastructure in Europe capable of communicating in this way. Automotive manufacturers have also announced that mass production models equipped with this technology will be introduced from 2019 onwards. Mobile telephony-based systems will also be available starting in 2023 (LTE-V2X) and 2025 (5G), respectively.

The German automotive industry and other sectors as well require a good political framework when introducing mobile telephony technologies. Quality assurance, nationwide availability with seamless and reliable coverage and fair costs are indispensable to the emergence of innovations. Some features require the necessary operational and traffic infrastructure prerequisites to be put in place. The German automotive industry recommends a nationwide networking of the V2I communication infrastructure. A digital infrastructure that is fit for purpose supports the rapid introduction of new innovative technologies. Technical development is to be accompanied here by a parallel monitoring process.

The automotive industry recommends a comprehensive infrastructure network.

Vehicle-generated data

Germany leads the way in vehicle development and manufacturing, and in optimizing vehicle safety. It continues to build on this position with the development of new safety-related systems. Increasing automation is driving the installation of more data-generating sensors and control devices in the vehicle. Vehicle networking, however, conceals data protection challenges. This is why the VDA published its Principles of Data Protection for networked vehicles back in 2014. Subsequently, the data protection authorities of the federal and state governments, together with the German Association of the Automotive Industry, developed a declaration on data protection aspects in the use of networked and non-networked vehicles and published it in January 2016.

Link to the Joint Declaration of the independent data protection authorities of the federal and state governments, together with the German Association of the Automotive Industry:



<https://bit.ly/24kod48>

NEVADA – Share & Secure

With "NEVADA – Share & Secure" the German automotive industry has now submitted a concept for secure access to vehicle-generated data. NEVADA stands for "Neutral Extended Vehicle for Advanced Data Access". The concept is intended to make it possible to access and transfer vehicle-generated data and allow it to be harnessed by public authorities and companies. It is consistent with European data protection requirements.

The automotive industry's provision of data, for example to the fire service or police, contributes to improving road traffic safety. This is done in a way that neither impairs vehicle integrity nor adversely affects traffic safety. This enhances road safety yet further while supporting the development of digital innovation and new business models.

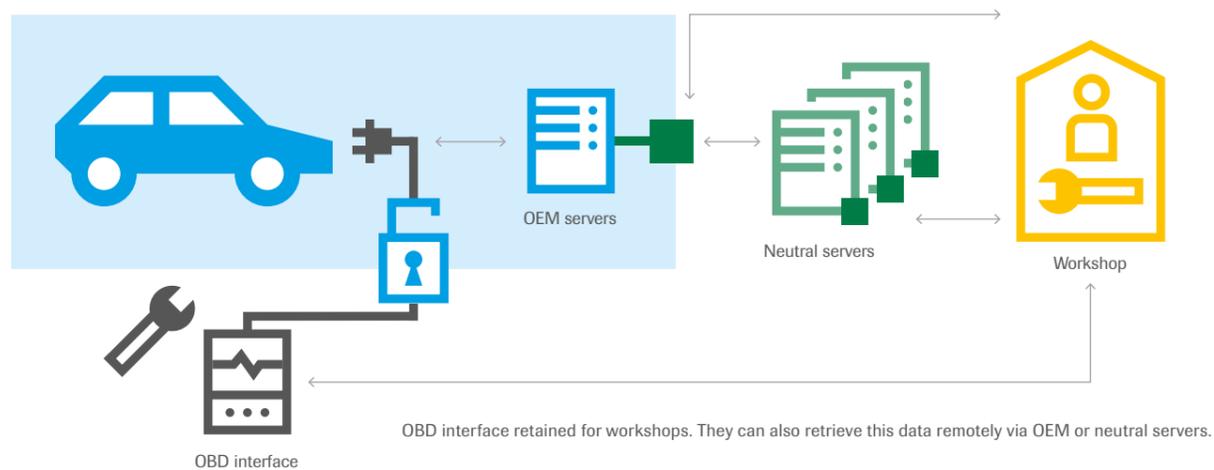
Depending on their privileges, companies can receive the same vehicle-generated data at the same time as vehicle manufacturers. Companies can obtain and use this data from the vehicle manufacturers' own servers, or from neutral servers, via a standardized interface. The NEVADA - Share & Secure concept thus enables consumer-oriented services to be implemented and prevents discrimination. It also provides a framework for the collation and immediate transmission of vehicle-generated data, which can be captured and retrieved on an event-driven and time-defined basis.

To protect vehicle safety only the vehicle manufacturer should be entitled to remotely interrogate vehicle-generated data directly from the vehicle or perform updates. The manufacturer has exclusive authority to access the vehicle remotely because they are responsible for the vehicle's safety aspects. This authority enables them to use individual safety systems. Statutory access to vehicle data for repair and maintenance activities via the OBD-2 diagnostic interface installed in the vehicle is retained.

Manufacturers are responsible for vehicle safety. They are the only ones who should access the vehicle remotely.

Maintenance is possible

Target state



Automotive security

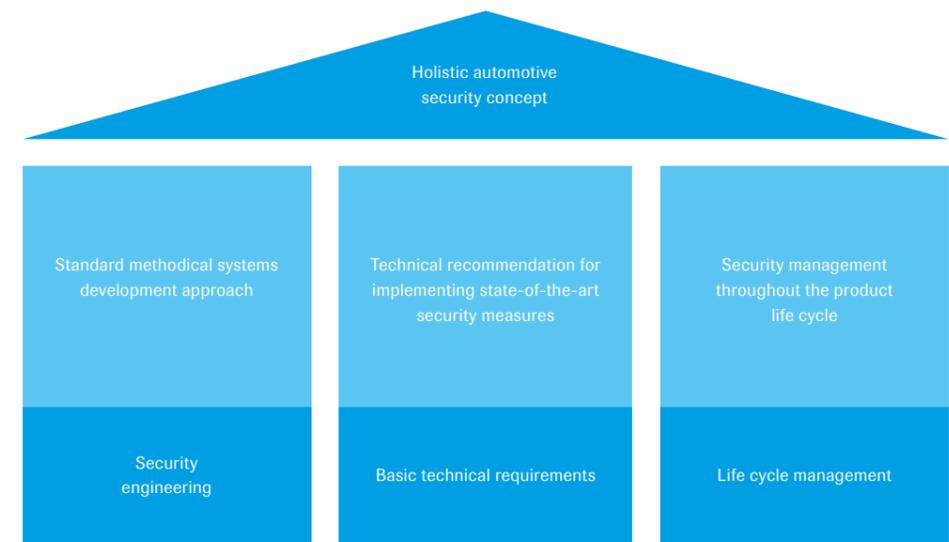
The vehicle holder has full sovereignty over their personal data transferred from the vehicle at all times. They can decide for themselves which data they wish to make available to whom and for what purpose, and which providers' services they use. As such, the vehicle owner can decide which services will be linked with the data generated in their vehicle, and revoke or extend this permission at any time. The added value for the consumer increases in proportion to the permission that is granted to use the data for personalized applications. This is the prerequisite for an exchange of one's personal data in exchange for personalized services.

The transfer and use of data envisaged in the concept is consistent with European Union directives, the guidelines of the "Ethics Commission on Automated Driving" and of course with German laws. With NEVADA - Share & Secure, the German automotive industry has developed a concept capable of pointing the way for the cross-sectoral transfer and use of data, and for the development of new business models and innovations.

In addition to the safe use and transmission of data, however, the functional safety of the overall system also needs to be borne in mind. The challenge here is to protect both the vehicle and user data, and other vehicle features besides, against unauthorized access and manipulation. The task for "automotive security" is therefore, to protect customer data (privacy) together with the vehicle, its components and its functional safety. The automotive industry recognized these automotive security requirements early on and is investing massively in developing and protecting its products. Security measures are enshrined in three pillars throughout the vehicle's entire life cycle.

Security engineering is there to ensure that new products have an adequate level of security. A standardized, methodical approach to developing vehicle systems and their networking is described and used in industry. This approach entails essential process steps: identifying and evaluating security risks, defining appropriate risk reduction measures, implementing, securing and verifying, testing and releasing measures.

Holistic automotive security concept

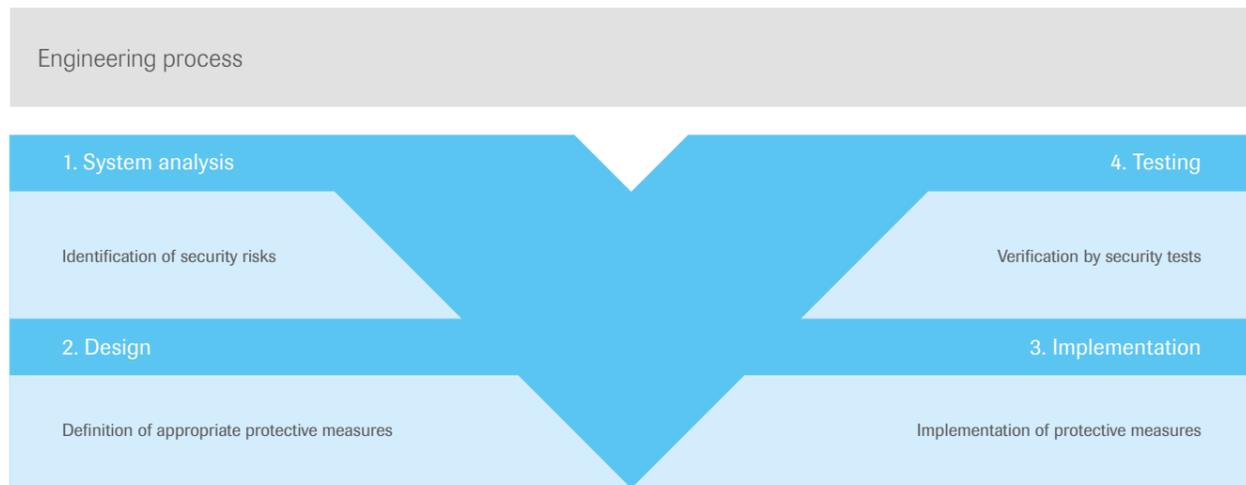


Life cycle management is also important because the effectiveness of security measures after the development phase can change over the product's entire life cycle. Various external influences can result in a lower security level over time. For example, the effectiveness of technical security measures, such as cryptographic algorithms, deteriorate. Ongoing technical development (for example, available computing power) and general progress provide attackers with more effective tools. New vulnerabilities and possible means of attack are also constantly being discovered and disseminated. New tools are emerging from the hacker scene so that initially complex and time-consuming attacks become easier over time, or can be automated.

In addition to individual solutions, platforms have been established within the industry, enabling information on security topics to be exchanged so that threats can be countered as quickly as possible. These include the Automotive Information Sharing and Analysis Center (AUTO-ISAC) in the USA, supplemented by committees of experts within the VDA. In this way, security experts actively cooperate in research, development and technical conferences. As an additional measure, manufacturers and suppliers also operate so-called Product Security Incident Management. These are standardized organizational and

technical processes for responding to recognized or suspected security risks. In addition to the manufacturers, the VDA is also a point of contact for reporting vulnerabilities, which it submits to members' appropriate departments for further and prompt analysis, followed, as the case may be, by countermeasures.

To protect vehicles from external attack, manufacturers' individual solutions are often better than off-the-peg solutions. If standardized, industry-wide safety systems are used in different brands' vehicles, then individual security loopholes can make millions of vehicles vulnerable. Conversely, the hackers' job is made significantly more difficult if manufacturers develop different solutions to achieve security objectives. Any regulation should bear that in mind: it should define better security objectives but not mandate specific technical measures. Manufacturers can then individually implement the practical solutions for achieving these objectives in the context of their overall security architecture.



Source: VDA

Research Association for Automotive Technology (FAT)

Restructuring

Forschungsvereinigung Automobiltechnik e.V. (FAT) (Research Association for Automotive Technology) is where the joint, pre-competitive research of the automotive industry is concentrated under the VDA umbrella. FAT has begun a process of restructuring with the goal of reflecting the industry's current priority topics within an efficient structure.

A new cluster structure has been adopted and work begun on updating its working groups' topics. The ongoing change process enables FAT members to define and develop topics as well as pursue avenues in their own company's interest.

A total of 55 member companies are currently engaged in FAT. The 37 ongoing research projects have a total budget of almost 21 million euros. The budget is made up of members' contributions, subsidies and partner finance. New research topics include cyber security, virtual validation and alternative drive systems.

Main research					
Cluster	Safety, Automated driving	Digitization, Networking	Environment, System road traffic	Materials, Methods	Commercial vehicles
Issues	<ul style="list-style-type: none"> Accident research Active/passive security Post-security Automated driving Driving dynamics 	<ul style="list-style-type: none"> Electronics and sensors SW security, - robustness and - Architecture Cyber security 	<ul style="list-style-type: none"> Technical environmental research Energy management E-Lock/control Climate/heating Alternative drives System road/traffic 	<ul style="list-style-type: none"> Lightweight Mixed construction CAE in concept finding FE methods (plastics, joining technology, metals ...) Multidisciplinary / optimization Virtual validation 	<ul style="list-style-type: none"> Commercial vehicle emissions Commercial vehicle safety Commercial vehicle driving dynamics Commercial vehicle logistics and efficiency
Working groups	AK2: Human as driver AK3: Accident Research biomechanics AK20: Driving dynamics	AK8: Cyber security AK23: EMV AK31: Electrics and SW	AK1: Car and environment AK5: Air conditioning AK6: Aerodynamics AK7: Optimization System road traffic AK30: Electrical energy	AK17: Lightweight construction AK25: Joining technology AK27: Simulation methods and virtual validation	AK4: Tires Commercial Vehicles AK9: Vehicle Dynamics Commercial Vehicle AK22: Safety Commercial Vehicles

Source: VDA

Impact of automated driving

Determining the impact of partially and highly automated driving on highway infrastructure capacity was the objective of a 2017 FAT study by Munich Technical University and Karlsruhe Institute of Technology (KIT). Segments of the highway network were investigated using computer simulation and the findings extrapolated to the entire German highway infrastructure.

The speeds of road users are to be harmonized by automated driving. This will lead to fewer traffic jams.

It can be concluded from the simulation findings that infrastructure capacity can be increased if automated vehicles can drive in close proximity to one another. In some sections of the network, capacity increases of more than 35 percent would be possible. Conversely, large distances between vehicles would adversely affect infrastructure capacity. It was also apparent that traffic gridlocks are less likely if road user speeds can be harmonized. Cooperative changing lane behavior can also result in less congestion.

To extrapolate the effects to the entire freeway network a model was developed that estimates how the prevalence of automated features will evolve between now and 2050. The assumptions are based on previous experience with the penetration of already available assistance systems.

The biggest increase in capacity is only discernible at above 50 percent uptake. If all vehicles are so equipped, the average capacity gain in the network is approx. 30 percent. In the years before that point is reached, on the other hand, with a high proportion of non-communicating vehicles, minor capacity decreases are to be expected on average.

The (present-day) transportation demand was then applied to the network with the changed capacities to calculate driving times and lost time. In the fully equipped state, with networked, highly automated vehicles, the time lost as a result of congestion falls by more than half. This saves 6 percent of the total driving time within the freeway network.

Finally an economic assessment was conducted in which the time saved in passenger and freight transportation was monetized using Federal German Transport Plan cost data. The achievable reduction in driving time corresponds to annual savings of approx. 2 billion euros.

The study "Impact of partially and highly automated driving on highway infrastructure capacity" appeared in the FAT publication series (FAT 296).

<https://www.vda.de/en/services/Publications.html>

Commercial vehicle aerodynamics

Increasing environmental requirements and increasingly stringent fuel consumption and emissions targets are influencing the development of new generations of commercial vehicles. New vehicles need to be more economical, more environmentally friendly and more efficient. This challenge requires every possible reduction in fuel consumption to be exploited to the full. Optimizing the commercial vehicle's aerodynamics can therefore make a critical contribution. It is appropriate here to look at the tractor unit and trailer as a single unit.

In several successive projects, FAT investigated inter alia the aerodynamic behavior of articulated truck and turntable-drawbar combination. Specifically these are articulated truck tractor units with box trailers, tip-trailers and tank trailers, as well as tractor vehicles with box semitrailer.

The first project was about creating a generic geometry for an articulated truck with box body, based on various manufacturers' production models. To this end, wind tunnel tests and calculations with a modified cab and measures affecting the trailer (tailgates) were performed. Estimates were made of potential fuel savings with a frontal airflow. An air resistance reduction potential of up to 10 percent was recorded for individual measures.

In several studies, FAT [Research Association for Automotive Technology] studied how the commercial vehicle aerodynamics can be improved.

Another project developed five generic commercial vehicle configurations and analyzed them using CFD simulation. The investigations did not just focus on the aerodynamic behavior of the road train when driving straight ahead. Side wind influences as well, which predominate in overland transport, were modeled and evaluated. It was observed that measures to reduce air resistance on the trailer become more effective in the presence of a side wind compared with driving straight ahead.

In the project, which has now concluded, real driving trials and air resistance measurements were conducted and compared with the simulated air resistance coefficients. It transpired that the simulations with three different CFD tools yield up to 20 percent better air resistance coefficients than the driving trial measurements. The variance in air resistance observed as a result of adding measures to reduce air resistance compared with the initial state exhibits significantly smaller variations of less than 4 percent between trial and calculation, which demonstrates that the CFD calculation is very well suited to assessing the potential of these measures in development.

The commercial vehicle aerodynamics studies are to be found in FAT papers FAT 237, FAT 260, FAT 281 and FAT 298.

Logistics

The dominant themes for automotive logistics in 2017 were digitalization and automation. Thanks to new digital technologies, automotive industry companies are now able to process data on an unprecedented scale. For automotive logistics this affords the opportunity for a great leap forward in transparency throughout the supply chain. This supply chain, which links vehicle manufacturers and their suppliers, has long since borne scarcely any resemblance to the traditional transport business and conventional warehousing. Instead, it comprises complex and finely tuned networks in which various stakeholders such as suppliers, carriers, logistics service providers, quality managers and OEMs are interlinked like a precision watch movement. It is this highly sophisticated logistics above all that is behind the extreme efficiency of today's automotive industry production process.

Supply concepts are increasingly refocusing away from conventional warehouses to just-in-time even just-in-sequence concepts. With Just-In-Time deliveries, the inventory is sufficient for a few hours; with Just-In-Sequence deliveries, often one hour at the most. However, this high efficiency presupposes that all those involved in the supply chain are closely linked, incidents are communicated promptly and can be resolved with emergency processes. If not, as was the case with cyclones Xaver and Herwart in the autumn of 2017, the consequence can be disruption for days on end. Many German companies suffered production losses. The dramatic situation illustrated just how important a tightly integrated supply chain is. The more data and information is available to all the relevant players in good time, the better the stability of the processes can be maintained.

RFID small load carriers

The German automotive industry has used standardized reusable containers to transport small components to the production lines for around 30 years. These so-called small load carriers (KLT) were developed in the VDA and have been used in circulation over 100 million times now. The RFID-KLT project aims to develop a new generation of the successful VDA-standard small load carrier (KLT). The new KLTs are made of an improved and more robust material and come with a RFID tag. This is a chip on which information is stored. This information can be captured by scanners using radio frequencies. The principle is as follows: the number stored on the RFID tag is unique; no other container in the world has the same number. This number enables the container, and the goods being transported in it, to be captured in the various stages of the supply process. All the parties involved are therefore able to track where a specific load is at any moment and in which process step it is. The RFID-KLT project is slated to run for a two-year period and will conclude in 2019. To cover the intervening period, the VDA created the so-called retrofit solution in December 2017. This entails container manufacturers installing RFID tags on new load carriers of the current KLT generation. RFID tags are small transponders containing RFID markings as stored data that is transmitted to RFID scanners.

The RFID-KLT is only one measure for creating greater transparency in the supply chain. Capturing data is only of any use if it can also be analyzed. There is no use knowing that a particular container has reached a particular location at a particular time. Just as important is linking this to information about the material it contains, where it has come from and its intended destination. This is why the VDA has set up another project – EPCIS.

Digital supply chain

EPCIS stands for Electronic Product Code Information System and was originally developed by the trade organization GS1, but is now available globally as an ISO standard. This system operates in the same way as a database: all the essential events in the production and supply chain (e.g., the packaging of material in RFID-KLTs, the picking of these containers on pallets, loading the pallets onto some means of transport, tracking the means of transport, etc.) are captured automatically and transmitted to central computers by means of standardized messages akin to a telegram. This creates a virtually real-time digital map of supply chain status. Control processes can be fine-tuned, abnormalities or disruption can immediately be responded to and long-term trends identified. In its recommendation, the VDA added automotive industry events and processes to this system originally developed for commerce.

The VDA is now developing a database based on EPCIS as a service to its members and to users of the new RFID containers: the database enables the VDA RFID-KLTs to capture related events such as production, cleaning, repair etc.

The VDA KIT working party has also developed a recommendation for a completely modernized container management process. Full container processes are now being complemented with an equally seamless empty container process. This gives equal consideration both to fully automated processes and the needs of smaller suppliers, who prefer to exchange information via portal applications.

Outbound delivery

The VDA's projects do not however just look at inbound logistics – namely the transport of parts to the production site. There is also a focus on outbound logistics by which is meant the delivery of the finished vehicles from the manufacturer's plant to the car dealer. To this end, the vehicle logistics digitalization project group was set up in 2017. Its objective is the automation of logistics processes, including order communication between manufacturers, service providers and vehicle dealers.

Logistics automation

In addition to the many examples of progress in digitalizing the supply chain, the automation of automotive logistics is a second focus area. It has become a trend in in-plant material flows. Where previously forklift trucks and tigger trains were used for delivering production supplies, driverless transport vehicles (DTV) are becoming more prevalent. The various DTVs are combined within a driverless transport system (DTS). This is a non-static conveyor technology. As such it is therefore able to transport material flexibly from various sources within the plant to the most varied destinations. Individual vehicles are controlled by a central guidance system. One problem of present-day driverless transport systems is that the various vehicles use manufacturer-specific languages or transmission protocols and cannot therefore yet be used within a common system. However, because this is imperative if automotive logistics are to continue to develop, the DTS communication interface project group was set up in 2017. Together with DTS manufacturers in the VDMA it is working on standardizing communication between vehicle and guidance system.

Where forklifts used to drive through plant halls, driverless transport vehicles are now on the move.



Safety and Standards

No compromises when it comes to safety and quality – that is the basic principle for companies in the German automotive industry. Standards and norms are decisive instruments for steadily raising the level across the industry.



Sandra Piturro, Bachelor of Engineering,
project engineer QS - tyre assembly,
OTTO FUCHS KG Meinerzhagen

Traffic Accidents in Germany

Road traffic is safer than it has ever been. The number of road traffic fatalities in Germany in 2016 fell by 7 percent compared with the year before, to 3,216 – a historic low. In 2017 the total fell again, by 0.9 percent to 3,177.

Compared with 1970, the historic high point, when there were significantly more than 19,000 road accident fatalities, this is a decline of 83 percent. The distance driven has more than trebled in the same period. Compared with mileage the decline is even 95 percent. Compared with 81.6 fatalities per 1 billion vehicle kilometers, in 2016 there were only 4.1 fatalities per 1 billion vehicle kilometers.

rest of the network. With a fatality rate of 1.6 per 1 billion kilometers, the probability of dying while driving on the freeway is 70 percent less than on the rest of the network (5.3 fatalities per 1 billion kilometers).

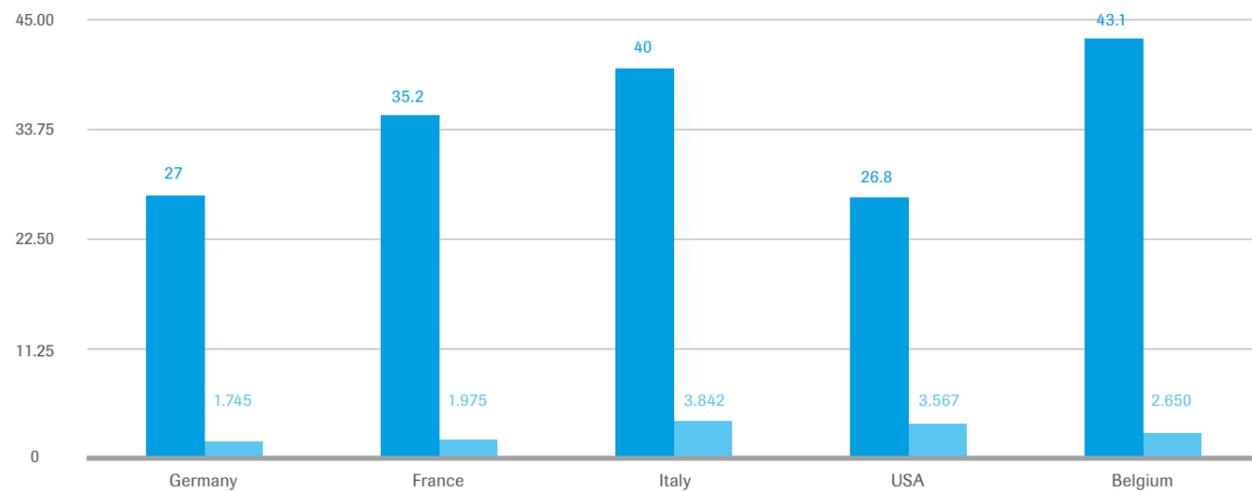
Even compared to other countries' highways German freeways are extremely safe. For example, there are between 2.0 and 3.8 fatalities per 1 billion kilometers in France, Italy, Belgium or in the USA – and therefore more than in Germany. A general speed limit, such as exists in these countries, does not necessarily make freeways any safer.

Freeways are the safest roads

If one looks at individual road categories it has been evident for many decades that freeways are the safest roads. There were 409 freeway fatalities in 2017. The figure was 2,771 for the

Freeway fatalities

per 1 billion vehicle kilometers in different countries (2015)



■ 1970 ■ 2015

Source: IRTAD accident database

Commercial Vehicle Safety Systems

Safety technologies have made a major contribution to ever increasing commercial vehicle safety. The innovations' main aim is to avoid especially frequently occurring accidents involving heavy commercial vehicles. These include collisions, lane guidance accidents and accidents as a result of vehicles leaving their lane. As of November 2015 – with few exceptions – all new trucks in the EU are required to be equipped with emergency braking assistants and lane-keeping assistants. ESP has been compulsory since 2014.

Emergency braking assistant

Emergency braking system requirements are described in UNECE Regulation 131. It also stipulates that the systems should be capable of being overridden or disabled. The German government is calling for significant restrictions on this ability to disable the system. The automotive industry shares this political objective. However, a revised regulation should also take account of the fact that in certain situations it makes sense for an emergency braking system to be temporarily disabled. This applies, for example, when negotiating narrow and winding construction site areas, but also when recovering damaged commercial vehicles. There are also vehicles (winter services, road cleaning, road maintenance, fire services, etc.) fitted with front end extensions that require disablement.

Blind spot assistant

Especially in urban traffic, truck accidents involving cyclists or pedestrians can be particularly serious. In many situations, with the existing mirrors, truck drivers find it hard to spot cyclists, or only catch a glimpse of them. Confusing junctions and lane changes, poorly designed cycle lanes and the absence of safe havens for cyclists at traffic light stop lines regularly result in critical situations when turning. Blind spot assistants can use sensors to recognize hazardous situations such as these and warn the driver. These systems can therefore make a major contribution to avoiding serious accidents. The first such blind spot assistance systems are already available. The Federal Transport Ministry submitted a proposal for new regulations at the UNECE, describing requirements for future “blind spot assist systems” and addressing the accident scenarios described above. This proposal is endorsed by German commercial vehicle manufacturers. A UNECE working group is also working on a proposal on how to define direct vision from commercial vehicles in future.

Turning assistants can detect dangerous situations with cyclists and warn truck drivers.

Pedestrian Safety

Almost one quarter of all road users' fatalities in Europe are pedestrians. The figure in city centers is as high as one third. The EU Commission undertook extensive research on pedestrian safety, which provided the basis for statutory regulation of pedestrian safety in vehicle type approval. The so-called first phase starting in 2005 mandated collision tests with crash test dummies on the vehicle hood and impact tests with leg and pelvis crash test dummies against the bumper. This resulted in redesigned hoods and modifications to the front end structures incorporating shock absorbing characteristics. Manufacturers and suppliers have also developed active hoods that pop up on impact, thereby further reducing the risk of serious head injuries.

In recent years these and other measures have helped to reduce the number of pedestrian fatalities in Europe by approx. 25 percent. There are similar positive trends in Japan and Korea as well, where comparable statutory requirements had been defined.

The year 2009 saw the adoption of Global Technical Regulation 9 (GTR 9) under the auspices of the UNECE, harmonizing pedestrian safety requirements worldwide. GTR 9 has been continuously refined ever since. It now uses the new, more anatomically realistic leg crash test dummy, the so-called "Flexible Pedestrian Legform Impactor" (FlexPLI). Following the GTR, UN Regulation 127 was also developed to ensure the mutual recognition of passenger protection type approvals in those countries that recognize the 1958 UNECE Agreement. As such UN-R127 has assumed the lead role in pedestrian safety worldwide, making use of the FlexPLI a legal requirement since the end of 2017. At the same time the new legform impactor is also used in Euro NCAP and in other consumer protection programs.

Development of legform impactor continues

Japan first presented research work on a further enhancement of the legform impactor in mid-2015. This work focuses on the connection between the previous legform impactor, comprising the lower leg, knee and upper leg, and an additional component representing the influence of the human body's weight during an impact on the legform impactor. The combination of this component, the so-called "Simplified Upper Body Parts," with the legform impactor culminated in the development of an "advanced Pedestrian Legform Impactor" (aPLI). To harmonize this crash test dummy internationally and promote its enhancement,

having regard to improved bio-fidelity, robustness and use as a measuring instrument, Japan applied for an official ISO standardization project at the end of 2017 following some preliminary work in an ISO working group. Most partners have since given their consent. Compared with the FlexPLI, the aPLI legform impactor is intended to enable better analysis of the severity of the injury to the human leg under different conditions, for example in the event of an oblique impact and rebound. At the same time, bio-fidelity compared with the FlexPLI is to be improved, with ligament damage in the knee of particular interest. New injury criteria and their specific risk functions are also to be identified. As far as possible, the new test dummy should avoid the previous bio-mechanical limitations in the use of the FlexPLI.

Injury risk functions study

In addition to a sound knowledge of current accidents, identifying and evaluating injury risk functions is also important to improvements in pedestrian safety. These risk functions are important to an objective evaluation of the risk of injury, thus enabling appropriate measures for further optimizing protective measures to be derived. In close collaboration with the road traffic accident research institute at TU Dresden (VUFO), VDA members have issued a study on the "methodology for generating accident risk functions from real accident data." In addition to evaluating different techniques for generating such functions, this study also defines updated injury risk functions for adults and older people as a function of collision speed. The data resource for the evaluation is an analysis of the GIDAS database (German In-Depth Accident Study) with the focus on new vehicles that have come onto the market from 2000 onwards. The binary logistic regression statistical model is the basis for the injury risk functions in accidents involving automobiles and pedestrians. The automobile's speed on collision with a pedestrian is the best predictor of the gravity of the ensuing injury to the pedestrian when impacting the front of the automobile. The pedestrian's age is another important parameter. It encompasses several direct and indirect physiological influences such as body size, bone density, musculature and reflexes. But the actual influence of age is individually very different and therefore hard to predict with any accuracy. The study's findings will, inter alia, inform work on developing the legform impactor and can also be used as a basis for evaluating new safety concepts to improve pedestrian safety.



Newly developed aPLI legform impactor for pedestrian safety tests (clothed and unclothed).

Developing pedestrian safety

In addition to measures to improve passive safety, active safety is also coming to the fore. Systems mitigating the severity of an accident, or which are capable of avoiding an accident involving a pedestrian altogether, currently promise the greatest potential. Innovative emergency braking assistance systems that recognize pedestrians and cyclists are able to reduce collision speeds or avoid accidents altogether in many critical situations. The biggest challenge here is reliable detection of a critical situation so that the vehicle can be braked in good time. Reliable detection of pedestrians and cyclists in city-center traffic situations by day and night and in difficult weather conditions is critical. However, one should not forget that further development of vehicle safety should also be accompanied by the systematic implementation of measures to improve the infrastructure, e.g. priority lights for pedestrians at junctions or crossing aids at wide street crossings. Only a holistic approach will bring about a sustainable improvement in road safety.

Emergency braking assistance systems must be able to reliably detect critical situations with pedestrians or cyclists.

Anti-theft Protection



The number of car thefts has declined by three quarters.

According to German insurance industry statistics, the number of automobile thefts in Germany has fallen by more than three quarters in the past 20 years – from 76,266 incidents in 1996 to only 19,026 in 2017. The number of automobile thefts has been around the same extremely low level for around ten years.

That also demonstrates that Keyless Go systems have not increased the risk of theft. Even if isolated cases have attracted considerable attention, customers using Keyless Go need have no fears that their automobiles are at any greater risk than others. At the same time, they appreciate the significantly greater convenience. The figures also illustrate that the many and diverse measures that automotive manufacturers have taken to improve anti-theft protection have been very effective, and still are.

For customers who want absolute security, the latest generation of Keyless Go keys provides the option of deactivating the Keyless Go function by pressing the key's lock button twice. This affords protection against attacks using radio wave extension. Each additional press of the key button reactivates the Keyless Go function.

But there will always be attempts to defeat these security mechanisms by using special technology coupled with criminal energy. Manufacturers and suppliers continue therefore to develop protection mechanisms. They are also in discussion with the security authorities. Knowledge of the latest attack and theft methods is quickly shared in full and flows directly into further optimization of vehicle technology and into prevention.

Quality Management

The quality of its products is a key factor for business success in the automotive industry. Quality is a key principle throughout the entire product development process, from development through to customer use. The VDA coordinates the overall quality management of the German automotive industry. The objective is to be the trendsetter for world-class quality methods. As well as looking at automotive industry megatrends to anticipate what needs to be developed and implemented in the quality management field. And finally, the challenge is to achieve a high degree of commitment when it comes to implementation in the value chain.

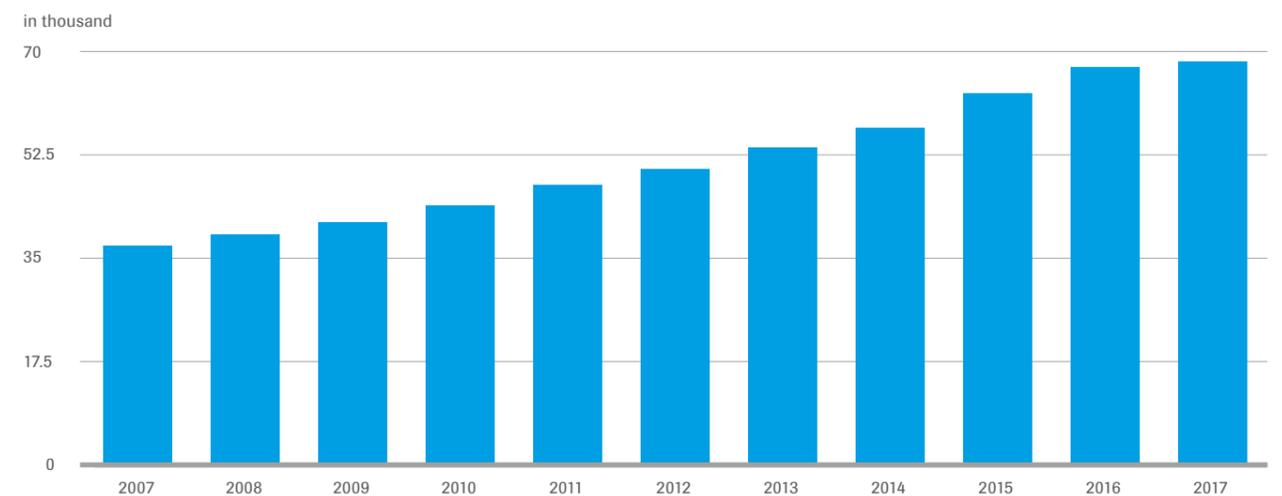
Quality Management Center (QMC)

The VDA Quality Management Center (VDA QMC) is where new quality management methods and techniques are developed in partnership with manufacturers and suppliers. The VDA QMC publishes all jointly developed definitions, rules and requirements for quality management in the automotive industry. The Quality Management Body (QMB), the VDA's supreme quality body, is where the VDA's quality standards are designed and

developed. It is made up of representatives of the VDA, the automotive manufacturers and suppliers, and sees itself as a common platform for devising and implementing harmonized quality strategies and techniques. Experts from the companies prepare the decisions in detail in quality management working groups.

As an agency, the QMC implements the QMB's decisions. The QMC publishes and markets the VDA QMC guidelines, which is where standards are published. It also provides VDA QMC training courses in its own education and training forums, where manufacturer and supplier employees are trained in the application of QMC systems and standards. Besides its own education and training programs, licensed partners also offer QM training. The QMC is both a contracting partner and supervisory authority of the certification bodies. These bodies review automotive industry companies' quality management systems worldwide and issue certificates in accordance with special certification schemes operated by the QMC or International Automotive Task Force (IATF), of which the QMC is a member. Compliance with the QMC processes and standards is usually a prerequisite for becoming a supplier for a company in the German automotive industry.

Number of active certificates
IATF (and ISO/TS) 16949



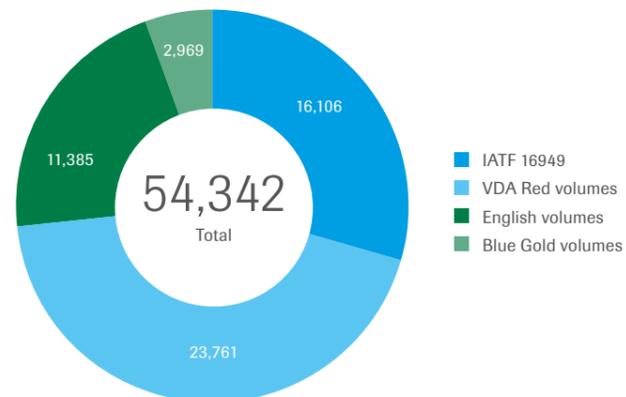
Globalization, sustainability and new technology are the biggest challenges in quality management.

QMC strategy

The German automotive industry's quality management is especially active in three strategic action areas: globalization, sustainability and new technologies. Globalization is achieved through product internationalization, such as the training courses and VDA QMC publications. The sustainability action area is addressed through an international zero-defect culture, AUTOMOTIVE SPICE and various QM techniques and tools such as harmonization of FMEA. New technologies have already found their way into the QMC's action strategies in the guise of car security, over-the-air updates, networked driving and electrification; these topics are predominantly dealt with within the Automotive Quality Institute (AQI).

Number of volumes sold 2017

in thousand



Source: VDA

International activities

The VDA QMC's international activities were further expanded in 2017. A total of 48,300 QMC training course participants were recorded worldwide, a year-on-year increase of a good 60 percent.

In China the total number of training course participants increased by 77 percent; 2,861 participants were registered at the open training courses and 2,854 at QMC China's in-house courses, and 1,929 certified 6.3 auditors were also registered in China.

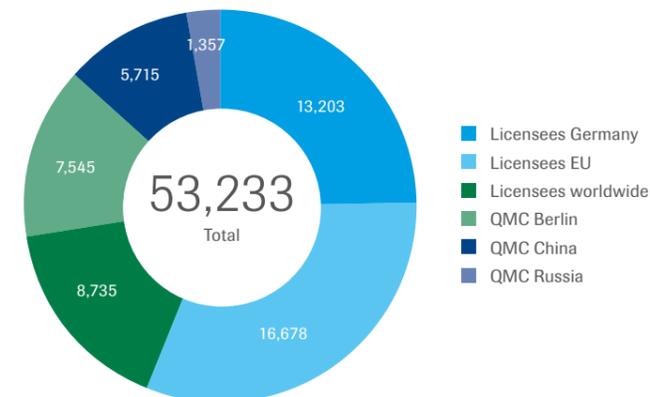
Russia also saw an increase in people attending QMC training courses. QMC Russia's in-house training courses numbered 1,029 participants. This was more than double the number in 2016. Some 328 people attended open training courses in Russia.

Training activities continue to be centered on Europe and Germany. For example, more than 7,500 people underwent initial or further training at QMC training courses in Germany in 2017. A further 13,759 participants attended a QMC training course in other EU countries.

In 2017, the VDA Quality Management Center significantly expanded its international activities.

Number of training participants 2017

in thousand



Source: VDA

Standardization

Communication on electric vehicle charging

Even if electric vehicles play no great role in today's road traffic, they will be an important element in the future development of road transport. To ensure their successful integration, the development of charging infrastructure and its intelligent networking in both the private and public space is essential. Since 2010, an ISO working group has been collaborating with International Electrotechnical Commission (IEC) experts on a standardized, intelligent communication interface between the charging station and the electric vehicle. This gave rise to development of the ISO/IEC 15118 standards family, the first version of which has been in publications since 2014.

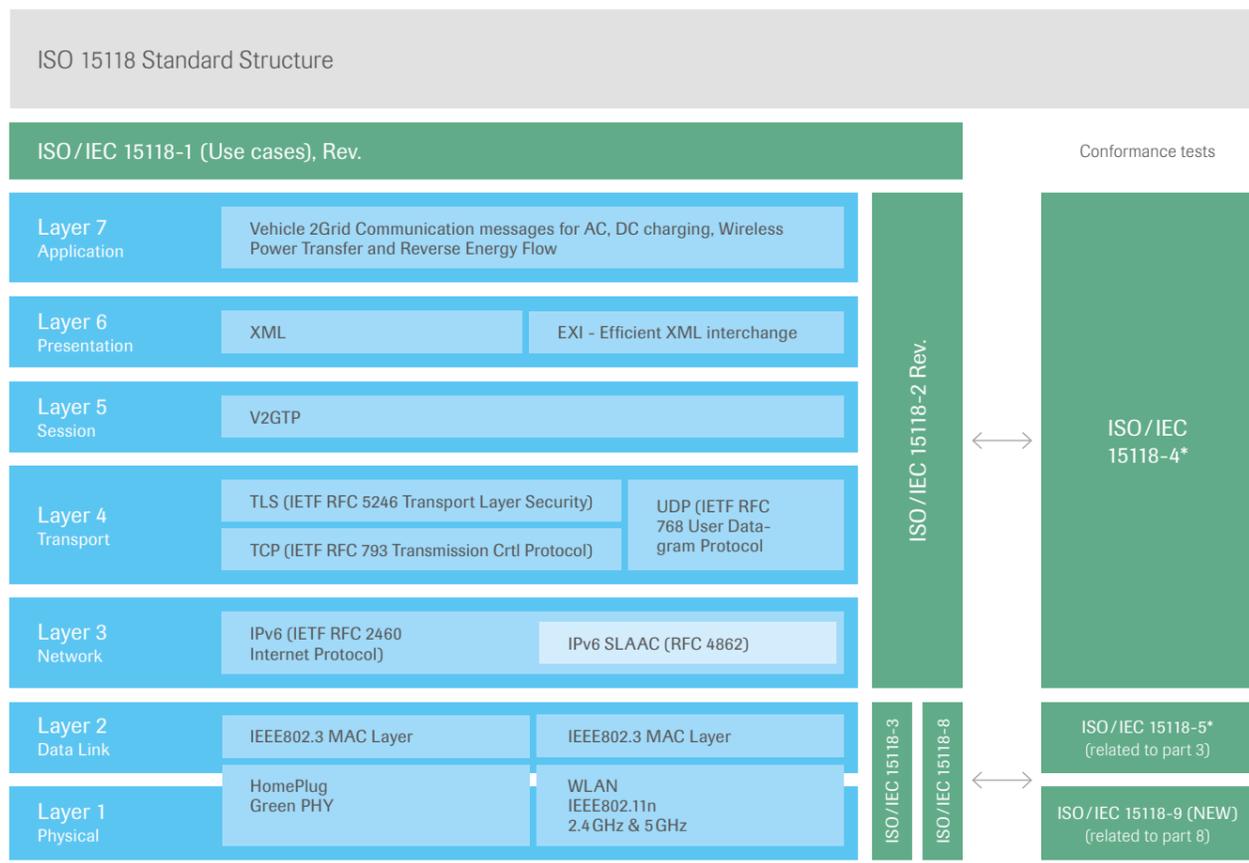
The requirements are largely derived from the interests of the energy suppliers, network operators, vehicle manufacturers and, of course, the customers. For example, the energy suppliers want to know how much energy needs to be provided for charging, and when. The network operator needs to distribute the required quantity of energy and ensure that subnetworks are not overloaded (smart charging). The vehicle manufacturer has the objective of maximizing the life expectancy of the energy storage systems, which requires intelligent charging cycles, for example. Customers want to

have their inexpensively charged vehicle in front of their door at the desired time.

In order to satisfy all these demands and wishes, the standards family takes account of numerous requirements: time-controlled charging, different prices, secure data transmission and data protection. Different types of charging are also included, such as fast charging, direct current and alternating current charging as well as wire-line or inductive charging. In the latter case in particular, wireless communication must be possible. Finally, energy feedback also needs to be taken into consideration.

To ensure the ISO/IEC-15118 standards are robust and widely applicable, the international working group regularly holds testing symposia. This entails a review of interoperability between all the interested partners.

<http://www.testing-symposium.net/>



Source: VDA

Networked and automated driving

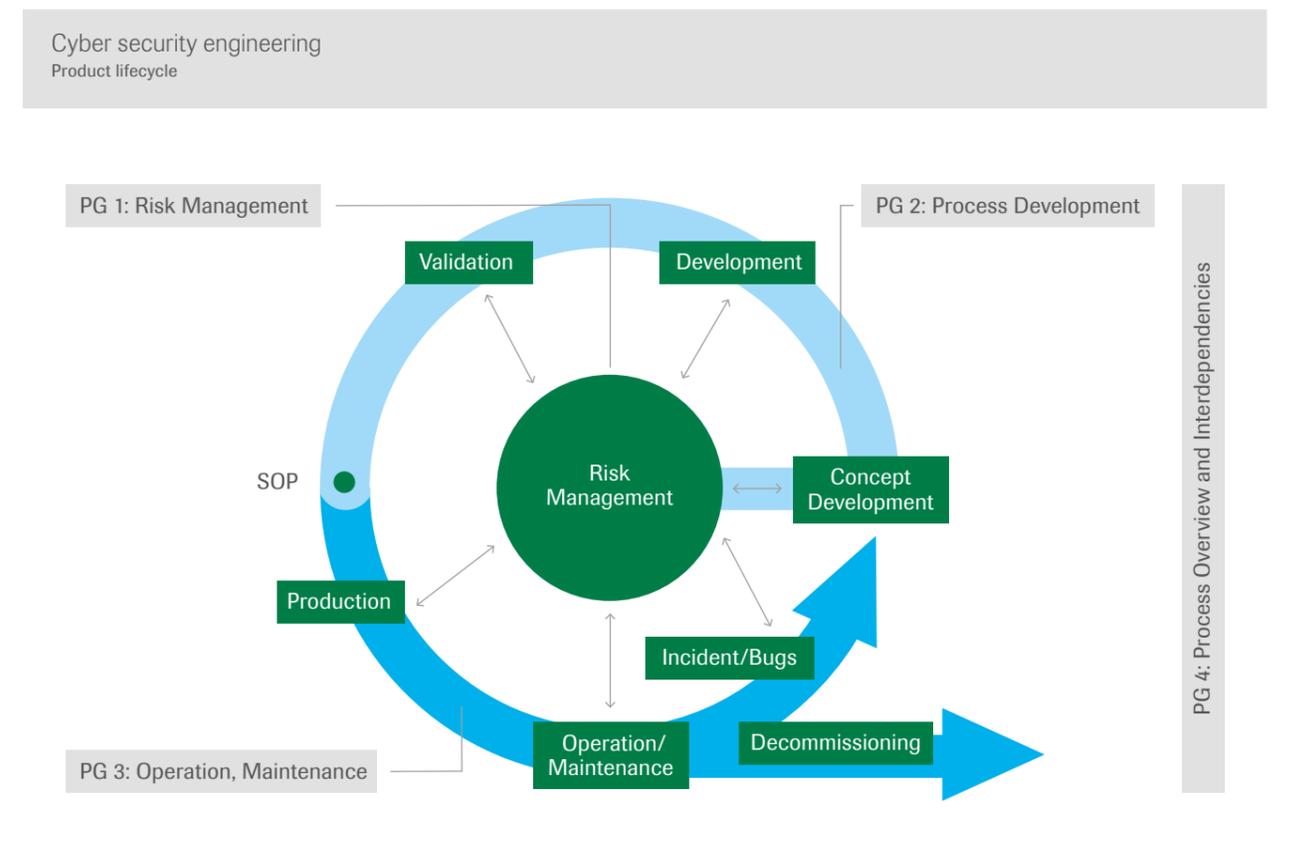
Standardization activities in the networked and automated driving arena are already conducted by numerous different standardization bodies. The VDA launched the development of the standardization roadmap in 2017 to achieve an all-encompassing view of the various activities. This is about various standardization issues to do with networked and automated driving, such as requirements on sensors and actuators, or man-machine interfaces. Data communication, driver assistance systems and simulation models are also analyzed.

The roadmap is initially intended to provide an overview of already existing standards and bodies on networked and automated driving. Standards or recommendations from private sector standardization (consortium standardization) are also to be included in addition to ISO and DIN standards. The analysis is intended to identify gaps in the standards body and the potential for future standards. The roadmap will make recommendations on specific actions.

General recommendations are also to be made. Owing to the complexity of the new technology, new standardization process methods need to be developed.

Cyber security engineering

Digitalization, and in particular networking vehicles with their environment, poses cyber security risks, which the automotive industry intends to address. Cyber security is an increasingly important challenge for standardization as well. This is why standard ISO/SAE-21434, for example, is intended to ensure that cyber security becomes an essential and fundamental component in every participating company's development process. Requirements relating to the processes and activities of the various phases of the product life cycle are being defined to achieve this goal. A core component here is risk management. Each development project is to be preceded by an analysis of possible threats to the cyber security of the product to be developed, with risk-based requirements for its development then being derived. The risk-based approach also forms the basis on which decisions are made for what happens in subsequent phases of the product life cycle.



Source: VDA

Battery safety

Recent years have already seen basic requirements on the safe operation of battery cells and battery systems in electric vehicles codified in standards. These standards were primarily developed based on years of experience in other areas. In the meantime, manufacturers are increasingly gaining insights from the practical use of batteries in electric automobiles. These are now finding their way into revised standards. For example, ISO standard 6469-1 has been reworked and is the principal open technology standard for energy storage system safety. However, this standard is concerned with vehicle operation and not with a crash.

The fire risk with lithium ion especially poses a particular challenge for standards experts. The safety objective here is clearly defined: the vehicle's occupants must have sufficient time to leave a vehicle unscathed.

The challenge is not, however, verifying whether the driver and passengers are given timely warning of a battery system reaching a critical state. What is required instead is to minimize the risk of a battery fire per se. This requires the development of tests to evaluate the behavior of a battery system if a cell catches fire. Such a test should be applicable to all common types of cell and yield comparable results.

At the VDA's initiative, just such a project to complement ISO 6469-1 has now got underway in Technical Committee 22 of the International Organization for Standardization (ISO). The revised standard will probably be published in 2018; the supplement for the test to assess the danger of a battery fire should be available in 2020.

New methods need to be developed to test the safety of batteries.



Thermal dumper body

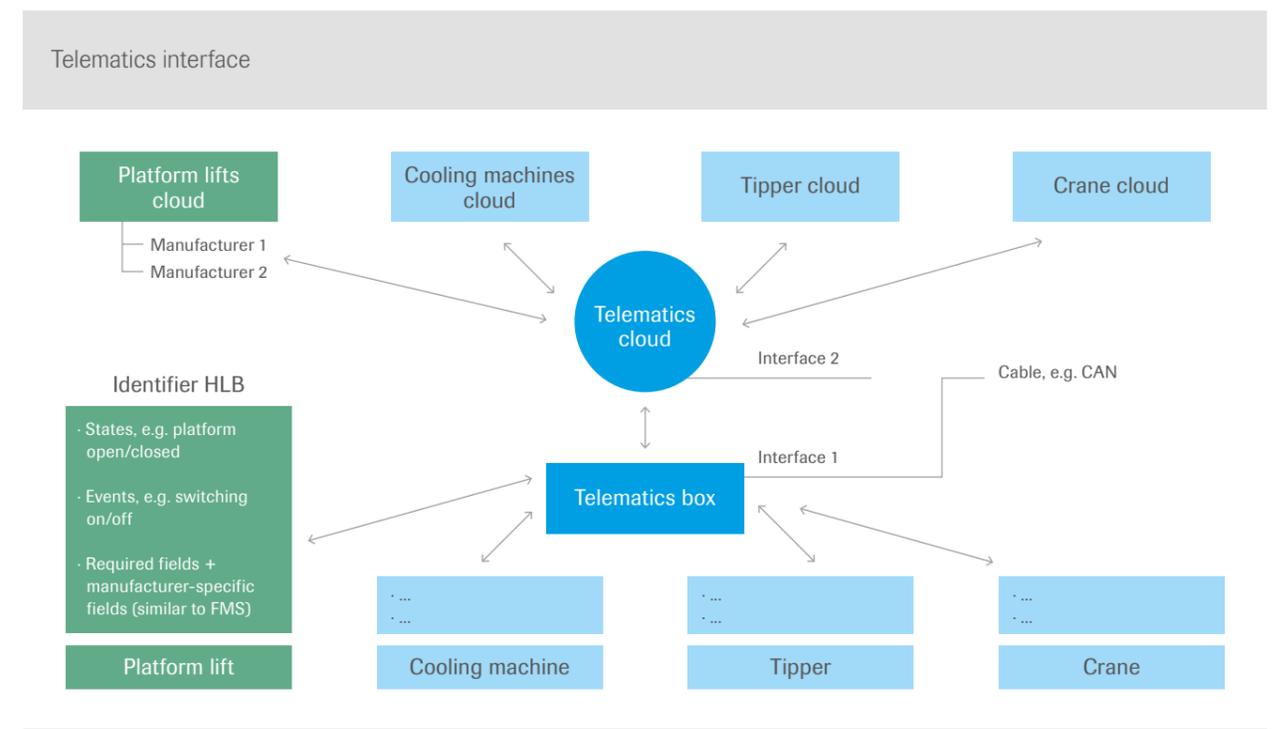
Following extensive research work, the use of so-called insulated dumper bodies for laying asphalt on German federal highways has been required for several years now, or recommended in some federal states. Special insulation of the dumper body keeps the mix being transported (typically asphalt) at a high temperature. This ensures that the asphalt is of high quality during construction, which in turn has a positive effect on the quality and durability of the road surface. To avoid any uncertainties, the dump truck makers initially developed a common calculation rule in a VDA working group. This has now been written into a DIN standard. A manufacturer's certificate confirms that the thermal dumper body has been designed according to a DIN standard.

Telematics interface

The digitalization of logistics can only work if vehicles or their component parts can be networked with one another. Currently, vehicle chassis and trailers feature different telematics systems because there are no standardized interfaces between the components and the telematics systems.

However, commercial vehicle operators would like all their vehicle component data to be displayed in a consolidated way. Typically this entails such high costs that for many applications, exploiting potential improvements makes little economic sense.

That is why a standardized interface needs to be created to enable chassis, semitrailers, bodies or other components to be connected with one another. The automotive industry has been busy at work in the standards committee since the end of 2017 drawing up the requirements on such a communication interface. The future DIN standard 4630 is intended to regulate how systems can be connected to a telematics unit in the vehicle.



Information Security

Together with their supplier companies, automotive manufacturers account for a large part of product development. Protecting data that is entrusted to them or exchanged with them in the process is very important. Especially where prototype protection issues are concerned, there has to be an assurance that all those involved in the value chain possess a comparable level of IT security.

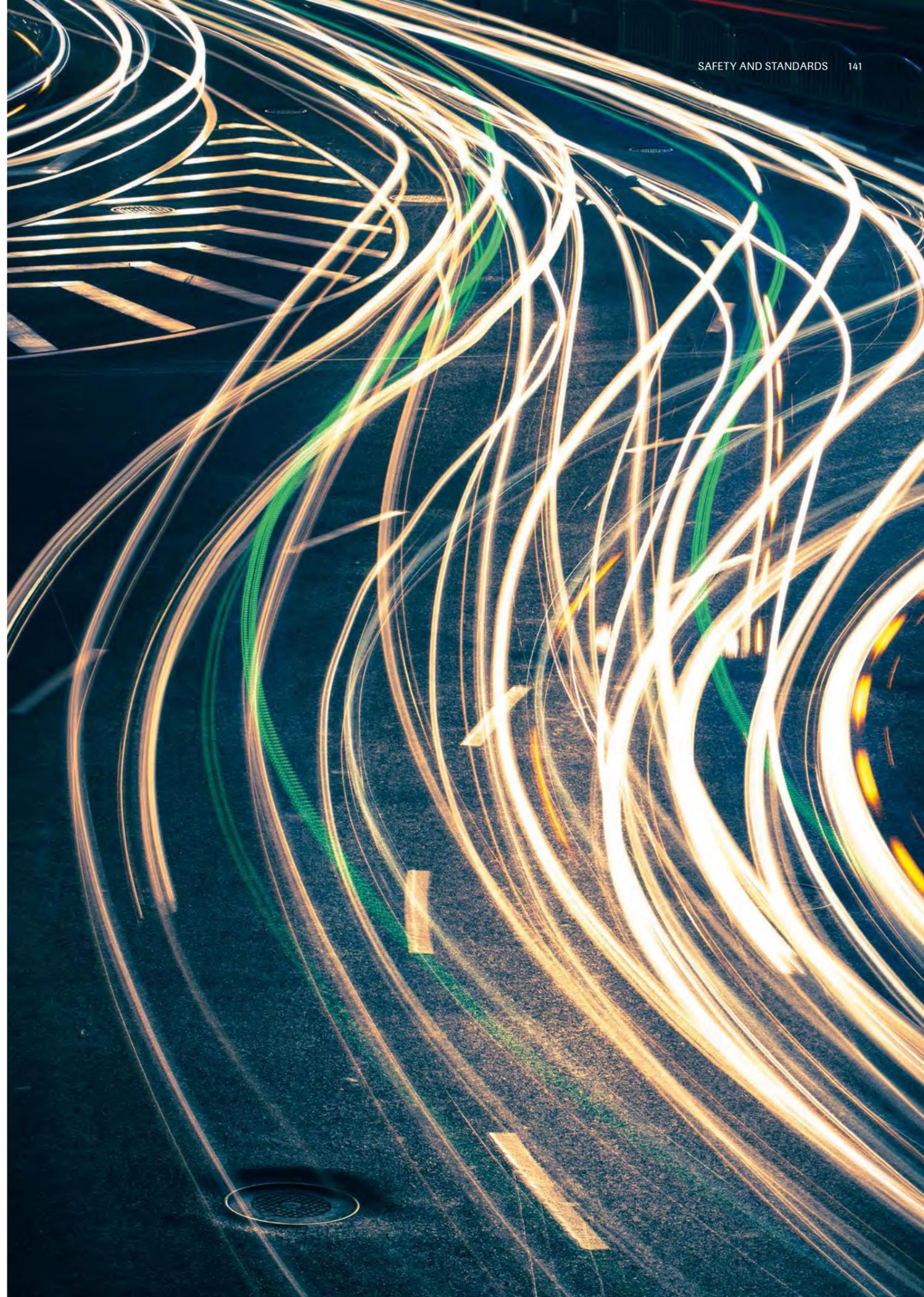
The exchange of information between manufacturers and suppliers must be ensured. This is what TISAX is for.

Over 1,400 companies with 1,000 locations in 40 countries participate in TISAX.

The TISAX model (Trusted Information Security Assessment Exchange) was developed under the aegis of the VDA to ensure a consistent level of information security between all parties involved. It ensures recognition of information security assessments in the automotive industry across company boundaries and creates a common test and exchange standard to achieve this. TISAX makes the automotive industry the first industry anywhere in the world to offer an assessment based on a standardized list of questions, thereby mutually recognizing test results throughout the entire value chain.

TISAX has enjoyed high acceptance since its market launch. Considerably more than 1,400 companies with 1,000 locations in 40 countries have signed up since the beginning of 2017; more than 950 tests have already been conducted. TISAX is operated by the ENX Association, a neutral authority to which the VDA has entrusted the running of the system. The ENX Association accredits several international test service providers who carry out the auditing with service providers and suppliers. The results can then be requested or provided by VDA members, subject to the consent of the audited companies. The advantage of the TISAX model is that it reduces the cost of security testing for VDA members in terms of time and money.

TISAX is based on the Information Security Assessment (ISA) developed by the VDA – a questionnaire based on ISO standard 27001. The ISA questionnaire was also previously used for testing suppliers and service providers processing sensitive information from the various companies.



International Auto Show and Events

Experiencing tomorrow's mobility, today – the IAA is the best place to be. Whether cars in Frankfurt or commercial vehicles in Hannover. Once each year, the IAA becomes the focal point of the world of mobility.



Experience the Future: IAA Cars 2017

A total of 994 exhibitors from 39 countries showcased their innovations from September 14 to 24, 2017 in Frankfurt am Main, under the slogan “Experience the future.” New exhibitors from the IT sector and New Mobility World made the IAA yet more diverse, underlining the claim to be the leading international event for mobility.

More than 50 automobile brands were represented, including the biggest automotive manufacturers from Europe, the USA and Asia. With 39 percent of the total, supplier companies were once again the biggest group of exhibitors in 2017. In terms of internationality, IAA Cars more than lived up to its claim to be the leading trade fair: 41 percent of exhibiting companies were from abroad, occupying 30 percent of the exhibition space. IAA visitors were treated to 363 new products, including 228 world premieres – more than ever before at an IAA.

Some 810,400 visitors again made the IAA far and away Germany's most heavily frequented trade fair. Not only were they shown the entire spectrum of mobility innovations; they were also able to experience it firsthand. The many and varied driving experiences were a particular highlight. The average age of IAA visitors is 34. Gratifyingly, the number of female visitors has been increasing steadily since 2011. In 2017 it was 23 percent, the highest figure so far.

New Mobility World

The New Mobility World (NMW) has been a successful IAA format for all new players in the mobility world since 2015. In 2017 it took a considerable conceptual step forward with the addition of an outdoor circuit for driving demonstrations.

The NMW brings together innovators from all industries, engaged in developing new solutions, technologies or products for the mobility of tomorrow and thereafter. The three formats HALL, FORUM and PARCOURS (obstacle course) provided common ground for mobility providers, service providers and start-ups alike in terms of content, and a cross-industry presentation space for interdisciplinary dialog.

The framework for these three forms of participation in 2017 were the five topic areas “Connected Car,” “Automated Driving,” “E-Mobility,” “Urban Mobility” and “Mobility Services”.

The dialog-oriented FORUM format took place from September 14 to 17. Some 8000 participants preregistered for the 40-hour program with its 200 national and international speakers, with far more ultimately taking part.

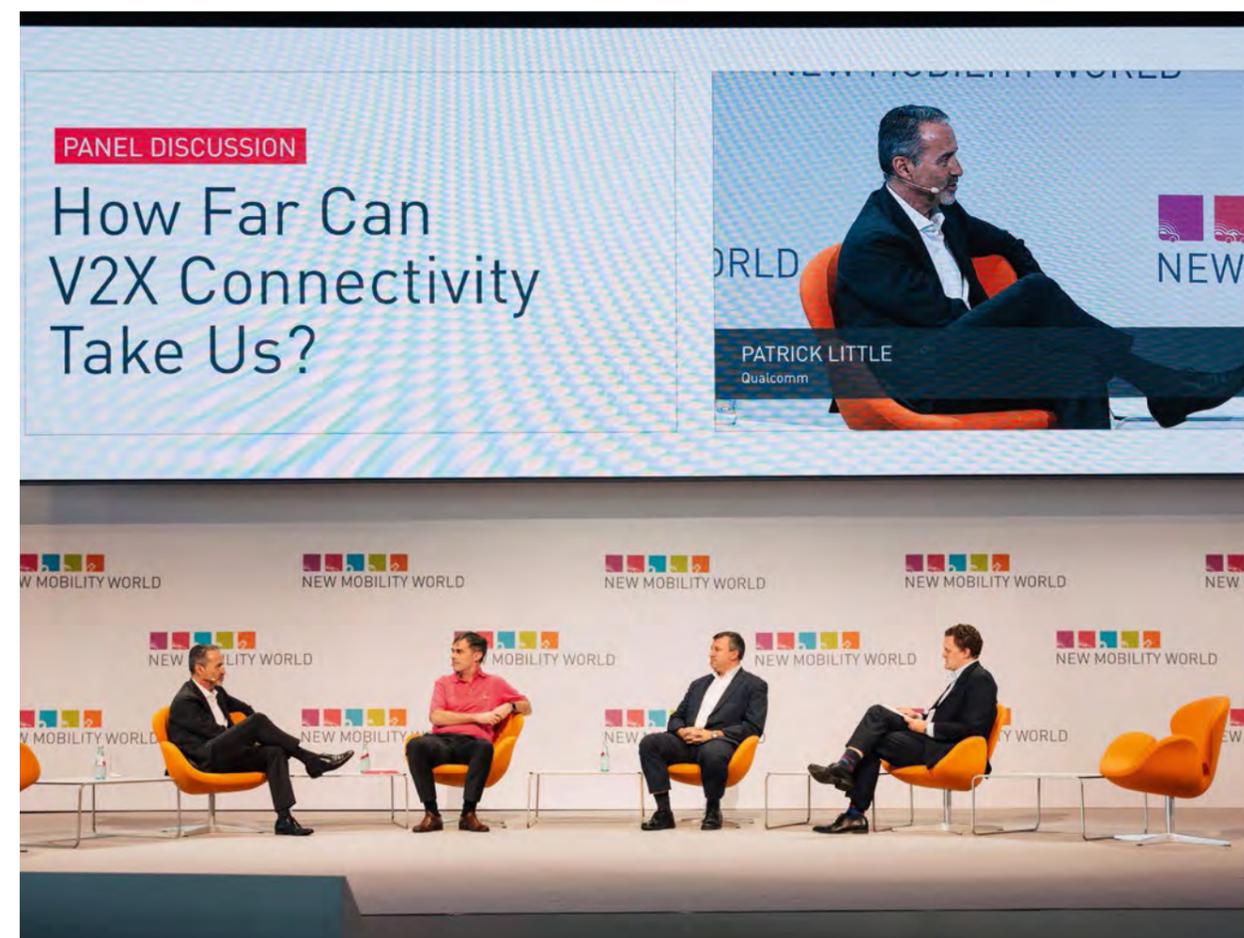
The interactive elements of the New Mobility World – LIVE and PARCOURS – were very popular: driving demonstrations enabled visitors not just to see the mobility of tomorrow but to experience it live. More than 18,000 visitors took advantage of the opportunity to take an active part in the driving experiences on the outdoor circuit. Some 112,000 stand spectators followed the action on the open-air “Agora.” The indoor PARCOURS in Hall 3.1 wowed 14,500 participants.

Other NMW highlights were the meeting between EU transport ministers on the opening day with driving demonstrations on the Agora, the start-up competition NMW Lab17 with the most innovative international start-ups, the approximately 25 VIP tours, the themed guided tours, which went down very well with media, trade and public visitors and politicians, and the media night on the first press day with numerous international press representatives.

A total of 257 companies took part in the NMW, including famous players from the IT and tech sectors such as Facebook, Google, Qualcomm and SAP. The New Mobility World attracted more than 250,000 visitors.

IAA program

The IAA itself also offered visitors a wide-ranging program, including 13 special shows and activities and around 20 specialist events. Various exhibitors also laid on numerous events and shows of their own at their stands, such as visits by well-known athletes and actors. It was yet another successful blend of entertainment and information events by the IAA.



The International Motor Show has been actively pushing four formats in the training and careers space for many years now: a national classroom initiative, goING, working and job and career at IAA. The career and recruiting arena “job and career at IAA” was an opportunity for companies to put themselves forward as top employers within the industry. Even before the trade fair began, lists of job advertisements by all participating companies were to be found on a dedicated online job portal.

In addition to this, the VDA and various manufacturers and suppliers put on the goING and working activities for new up-and-coming talent. In cooperation with exhibiting companies, school and higher education students were invited to these formats where they were informed about engineering careers, both in lecture form and practically at exhibitors' stands. Around 800 pupils registered for the five-day goING initiative, aimed at pupils aged 15 to 16. Around 140 students from different disciplines had an opportunity to chat with employees of participating companies during the two-day working format.

The IAA's classroom initiative also alerted younger school-children to industry topics. The cooperation with exhibitors reached more than 28,000 young guests. Classes and courses from neighboring countries such as the Czech Republic, the Netherlands and Austria now regularly take advantage of these opportunities.

Media response

The IAA 2017 enjoyed a big response from media representatives from around the world. The 11,436 accredited journalists from 95 countries reporting on the wide range of topics was an increase on 2015. Some 40 percent of journalists were from abroad.

The IAA 2017 achieved a total reach of almost 1 billion contacts via social media. A successful social media innovation was the IAA social network lounge: collaboration with bloggers and influencers from the automotive arena and fashion and lifestyle space was actively and comprehensively stepped up and developed.

Visitor interest in the IAA remained high in 2017. The internationality of the event, the gathering of the entire automotive value chain, the record number of world premieres and the satisfaction of exhibiting companies again confirmed the IAA's claim to be the leading international mobility event.

The 68th IAA Cars will be held at the trade fair grounds in Frankfurt am Main from September 12 to 22, 2019. The trade visitor days will be held in advance on September 12 and 13.

IAA Commercial Vehicles 2018

Leading international trade show sets new standards with 435 world premieres and 282,000 square meters of exhibition space – Clinched sales aplenty – Digitalization, electro-mobility and urban logistics take center stage – High visitor quality – Strong presence includes social media.

The IAA 2018's motto was "Driving tomorrow." This slogan – comprehensively showcasing the future of mobility, transport and logistics in Hannover – was delivered on in spades.

Exhibitors from 48 countries were present in Hannover. The trade show occupied 282,000 square meters of exhibition space – up by a good 4 percent, making it a new IAA record. The exhibitors showcased 435 world premieres – a new all-time high and a disproportionate increase of 31 percent. What is particularly gratifying is that, compared with 2016's already very good result, visitor numbers are again slightly up, pushing 250,000, despite days when the weather oscillated between heat, storms and rain.

The IAA 2018 demonstrated that electro-mobility is going into series production in commercial vehicles; 36 electric models were available for test drives, which were very well received. Numerous E-vans and E-buses celebrated premieres. Medium-duty trucks are also being electrified for urban distribution traffic. This type of propulsion plays to its strengths in urban logistics: quiet, emission-free, maneuverable – and with a range that fully meets requirements.

The new digitalization trend was to be encountered with virtually every exhibitor at the IAA: from the truck and bus manufacturer via the trailer industry to large, medium and small suppliers and telematics providers – investment, research and development can be seen across the board.

The New Mobility World provided a platform for the automotive industry and new target groups such as technology companies, mobility providers, start-ups and the digital economy to engage in robust and controversial debate with each other as well as with high-ranking representatives of politics and science, and of society at large on the future of mobility, to showcase innovations, and bring tomorrow's mobility to life. That was catered for by the EXPO, FORUM and LIVE event formats.

What was especially surprising was the strong interest shown by visitors in the New Mobility World FORUM: for four days this was the setting, along with Pavilion 11, of a large, international conference program boasting 20 forums and panels involving more than 100 speakers. This provided the IAA with a focus for discussing tomorrow's mobility from very different perspectives.

The IAA also lived up to its claim to be the leading international trade fair: 60 percent of the 2,174 exhibitors came from abroad.

The top five international exhibiting countries were headed by China. Most of them were suppliers on shared stands, primarily using the IAA to make contact with other companies. With our Chinese exhibitors as well the focus was clearly on digitalization and electro-mobility. In second place was Italy, followed by the Netherlands, Turkey and France.

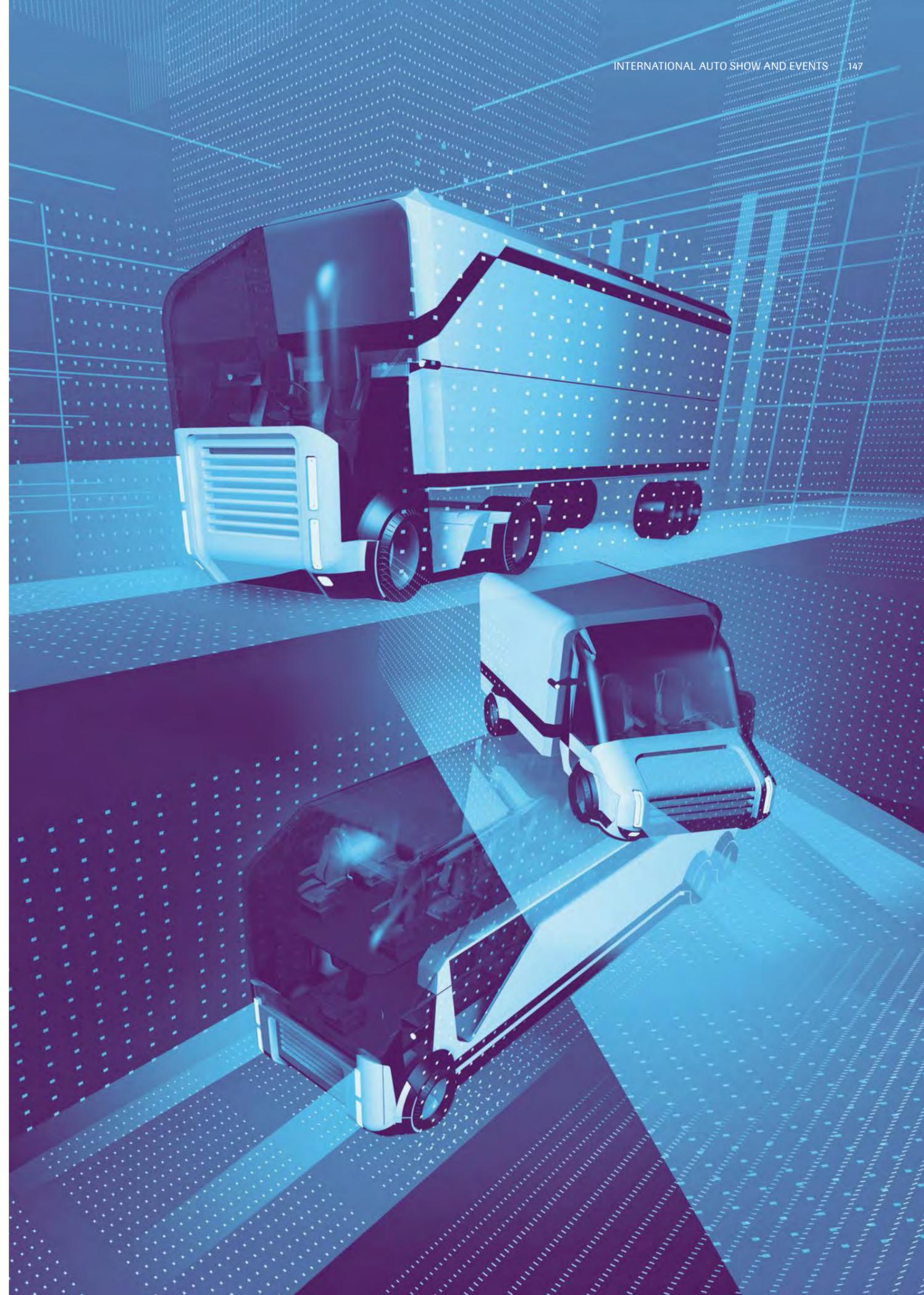
More than ever, the IAA Commercial Vehicles was a professional trade fair for decision makers: trade visitors accounted for 86 percent, with eight out of every ten being decision makers, with the proportion being even higher among foreign trade visitors. This industry's managers – both national and international – know how important the IAA is for their business.

Like the exhibitors, the visitors are becoming more international as well: one in every three trade visitors came from abroad, topping 40 percent on peak days. Most of the foreign visitors were from China, followed by Japan and the Netherlands.

The IAA Commercial Vehicles is also the mobility trade fair with the biggest media coverage. Over 2,100 journalists from 54 countries obtained accreditation. A good 80 press conferences were held on the two press days.

The IAA was also very well attended online: there was a good deal of advance discussion of IAA news and highlights. From mid-August there was a total of more than 75 million contacts worldwide, of which 60 million took place during the trade fair itself. Half the total of more than 10,000 posts was written in English – further evidence of the IAA's international importance.

The 68th IAA Commercial Vehicles will be held from September 24 to October 1, 2020.



Initiative “Tomorrow’s Mobility”

October 2016 marked the beginning of the “tomorrow’s mobility” initiative, a joint project between the VDA and automotive industry partners. Two years on it is evident that the initiative has been well received in all the communication channels employed. And in difficult times it has helped to maintain the dialog between politicians and decision makers and bolster confidence in the industry’s future viability and capacity for innovation.

The debate series “tomorrow’s mobility under discussion” was established as an important forum for debating industrial policy. The top economic, political and media decision makers met at the VDA’s Berlin premises for a total of eight evening events and discussed current challenges facing Germany as an automotive location. With guests from the political arena, including ministers and members of parliament, the media and social media, the target groups were made to measure.

The mobilitaet-von-morgen.de website is the central content hub for the initiative’s subject areas. The ongoing editorial overview and curating of current developments in the news-room situates the offering within the relevant set of the target group. Various formats of high journalistic quality – from moving images to reporting to text features – convey the initiative’s objectives and perspectives.

On course for the future: innovations ahead

The public debate about software manipulation, emissions and exhaust values that has now been ongoing for more than two years has helped push the future viability and efficiency the automotive industry has demonstrated in recent decades out of the media spotlight. Yet the industry’s engineering accomplishments

are making a critical contribution to reinventing mobility – and thus to solving urgent questions for the future. The “tomorrow’s mobility” initiative aims to demonstrate to relevant stakeholders and the interested public just what exciting innovations German manufacturers and suppliers are currently working on.

Following its launch in October 2016, the initiative will be continued in 2019 after two successful years and solid results.

Partners in the dialog: top industry and political decision makers

The events in the VDA offices follow a format that has been very positively received by those involved throughout the debate series: after the welcoming address by the VDA President, the prominent guests start with a brief introductory talk on the topic of the event.

The panelists then discuss what they have just heard, deliberately not pulling any punches with critical questions. This critical dialog is then thrown open to a question and answer session with the public.



A get-together rounds off the afternoon or evening and affords the opportunity to take topics and discussions to the next level. Each event is accompanied by Twitter and documented both in text and video on the initiative’s website.

Eight events in all have taken place since the debate series began in October 2016. The participants in the discussions read like a who’s who of the automotive industry: Dieter Zetsche (CEO Daimler), Volkmar Denner (chairman of the board of management of Robert Bosch GmbH), Elmar Degenhart (CEO Continental AG), Gunnar Herrmann (chairman of the board of management of Ford-Werke), Peter Schwarzenbauer (member of the board of management for Digital Business Innovation at BMW Group), Andreas Renschler (member of the board of management at Volkswagen AG), Matthias Müller (former CEO of VW), Wolf-Henning Scheider (CEO of ZF Friedrichshafen) and Oliver Blume (CEO Porsche) report on current challenges and opportunities for the automotive industry.

The interlocutors from the political, economic and media worlds were drawn from members of the senior decision-making echelons, all the way to the very top: from chancellor minister Peter Altmaier (CDU) via Holger Appel (head of the technology and engines department at newspaper FAZ), Stefan Bratzel (Director of the Center of Automotive Management), Winfried Hermann

(Baden-Württemberg transport minister, Greens), Sören Bartol (SPD MP, deputy parliamentary group chairman for transport) to Winfried Kretschmann (Prime Minister of Baden-Württemberg, Greens) and federal transport minister Andreas Scheuer (CSU).

Dedicated website aggregates information

The content hub is the initiative’s information center. The very latest projects, initiatives and challenges facing the German automotive industry can be followed via four subject areas: from “drive technologies” via “digitalization” and “safety” to “urban mobility.”

In addition to these areas, the “dialog” chapter provides comprehensive articles and video clips on the debate series’ events.

The content of the debate series and websites are also disseminated by the now almost 2,000 followers of the initiative’s Twitter channel (@mobilmorgen).

Events



International Press Workshop

Some 120 journalists took part in the international press workshop.

Digitization, networking, autonomous vehicles and alternative drive technology are spearheading innovation in commercial vehicles. These topics were the focus of the International Press Workshop, which the German Association of the Automotive Industry (VDA) traditionally hosts in advance of the IAA Commercial Vehicles trade fair. More than 120 international journalists assembled on July 10 and 11 to find out about the most important trends at this year's leading trade fair for transport, logistics and mobility. The program included presentations by numerous high-ranking representatives from the commercial vehicle industry. VDA President Bernhard Mattes: "Digitization in transport is opening up completely new ways to make mobility in urban areas and beyond smoother and more efficient. This will also lower emissions. Above all, digitization, networking and autonomous vehicles are enabling a quantum leap in traffic safety." He also added: "We are facing important political decisions regarding climate protection policy. The commercial vehicle industry wants to make its own contribution here. However, the manufacturers cannot master these challenges alone. What is needed is an integrated approach that even-handedly encompasses vehicle manufacturing and use as well as fuel and infrastructure."



SME Day

The VDA's SME Day is the annual meeting of the small and medium-sized companies within its membership. The event took place for the 18th time in 2018 with a program that was specifically tailored to SME's and included high-level speakers across a variety of topics. VDA President Bernhard Mattes addressed around 200 entrepreneurs: "At a time marked by many new upheavals — political, economic and technological — the political sphere is required more than ever to strengthen Germany's competitiveness as an industrial location. Growth, prosperity and employment are closely linked to free access to markets. The framework conditions in Germany also need to be improved." As chairman of the VDA's SME Day, Arndt G. Kirchhoff, Managing Partner & CEO, Kirchhoff Automotive Holding GmbH & Co. KG, delivered the following message: "The motto of this year's meeting of the shareholders and managers of

predominantly family-run SME's is 'agile, efficient and innovative: SME's in transition.' New technologies, innovative forms of mobility and topics that were niche issues just a few years ago are resulting in disruptive challenges for the automotive industry. In particular, digitization, networking and autonomous vehicles are driving the transformation."



Technical Congress

The Technical Congress is the technology symposium for Europe's automotive industry.

With over 900 participants from business, science and politics, the Technical Congress is the most important technology symposium for the European automotive industry. The 2018 event took place in Berlin on February 27 and 28. Numerous high-ranking industry representatives discussed the central issues facing the mobility of the future. The event focused on the topics "Environment, Energy and Electromobility" as well as "Vehicle Safety and Electronics". As the most important industry meeting for the automotive sector, the event was also attended by 33 exhibitors. Over 50 senior representatives from the automotive industry spoke at the congress, including Prof. Dr.-Ing. Peter Gutzmer, Deputy Chairman of the Executive Board and Chief Technology Officer of Schaeffler AG, Dr. Ing. Ulrich Eichhorn, Head of Research and Development at the Volkswagen Group, Dr. Ing. Markus Heyn, Managing Director of Robert Bosch GmbH, and Gunnar Herrmann, Chairman of the Board of Ford-Werke GmbH.



Automotive Logistics Forum

Around 450 experts from the automotive industry, logistics and science attended the Automotive Logistics Forum in Frankfurt a. M. at the end of January 2018. Together with the Bundesvereinigung Logistik (German Logistics Association, or BVL), the VDA organized the largest European industry meeting for automotive logistics for the sixth time. VDA President Matthias Wissmann addressed the participants with the following words: "Data is the currency of the future. This also applies to logistics. Used correctly, they create flexibility and networking in the supply chain. This makes transportation more efficient, less expensive and even more attractive to our customers." During the forum, the VDA Logistics Award was once again presented — and for the first time, to two companies: Bosch was honored for its networked intralogistics solution for manufacturing plants, and MAN also received the award for its innovative and transport-cost-optimizing "ConMa" software for empties management.



QMC Summit

The Quality Summit of the VDA QMC is Germany's most important conference for automotive quality management. The event, which was opened by VDA President Matthias Wissmann, welcomed around 200 international participants in Berlin on November 21 and 22, 2017, under the title "QM Systems with Conflicting Priorities. Innovative Mobility & Product Safety." Among the speakers were Dr. Georg Schütte, State Secretary at the German Federal Ministry of Education and Research, Dr. Ing. Anton Heiss, Head of Corporate Quality, BMW Group and Chairman of the VDA Quality Management Committee (QMC), Dr. Ing. Jörg Burzer, Executive Vice President of Quality Management, Mercedes-Benz Cars, Daimler AG, and Gunnar Herrmann, Chairman of the Management Board at Ford-Werke GmbH. In addition, numerous other high-ranking experts reported on quality management topics within the industry.

Index



Tianli Xia, Business Development Director Asia
VINCENZ WIEDERHOLT GmbH, SchmitterGroup AG,
Holzwickede

List of figures and tables

The Automotive Industry and its Markets

Employees in the German automotive industry	14
Employees in the German automotive industry - Change in percent	15
Sales volume of vehicles in the BRIC countries	18
Long-term LV sales in the USA	19
New passenger car registrations in Western Europe	21
New automobile registrations	22
Cumulative new registrations	23
Global automobile production by German manufacturers 2017	24
Top ten automobile export partners	25
German supplier industry turnover performance	26
Trucks – new registrations in Western Europe	29
New registrations of trailers in Germany	30
German Old-timer Index	38
Changes in old-timer fleet	39
Countries of manufacture H-tag automobiles	40

Economic Policy and Infrastructure

British automotive industry export ratio	48
German automobile exports to Great Britain	49
Brexit Schedule	51
Examples of trade barriers in the automotive sector	52
Overview of current duties in transatlantic trade	53
Important free trade agreements for the automotive industry	55
Association partnership objectives on three levels	56
EU industrial electricity price comparison	58
Average industrial electricity prices in ct/kWh, incl. electricity tax	59
Investment in national main roads 2003-2021	60
Use of transportation-specific fees	62
Passenger transport	64
Freight transport in Germany	68
New registrations of commercials up to 3.5 t in Germany	69

Environment and Climate

Road traffic efficiency increasing	79
Elements of CO ₂ regulation for passenger cars and light commercial vehicles for 2020 or 2021	81
The EU's 2021 CO ₂ target is the strictest in the world	82
Climate protection policy in road transport should not be narrowed-down to the efficiency of new cars	83
German passenger car label	89
Emission trends for nitrogen oxides in the transport sector	90
Proportion in percent of measuring stations exceeding the limit	91
Galvanic chrome plating for diesel and gasoline injection technology	97

Innovation and Technology

Gasoline and diesel engine CO ₂ trends	101
New WLTP cycle	103
Speed profile in the future WLTP “world cycle”	103
Real Driving Emissions regulation (RDE)	104
Market shares of German OEMs 2017	108
Cumulative new registrations	109
Applications for environmental bonus	110
Charging infrastructure	111
Maintenance is possible	118
Holistic automotive security concept	119
Engineering process	120
Main research	121

Safety and Standards

Freeway fatalities	128
Number of active certificates	133
Number of volumes sold 2017	134
Number of training participants 2017	135
ISO 15118 Standard Structure	136
Cyber security engineering	137
Telematics interface	139

Index

Symbole

95 grams › 78
(Research Association for Automotive Technology) › 121

A

AdBlue › 95, 106
aerodynamic › 123
Africa › 56
aftermarket › 36
air quality › 90
air quality directive › 91
anti-theft protection › 132
association partnership › 56
automated driving › 122
automobile label › 88
automobile toll › 62
automotive-collab.com › 34
automotive logistics › 124
Automotive Logistics Forum › 153
automotive manufacturers' banks › 41
automotive security › 119
Automotive suppliers › 31
autonomous driving › 115

B

Battery safety › 138
Brazil › 20, 24
Brexit › 48, 50
buses › 29
business tax › 70
bus market › 29

C

carsharing › 65

CCS (Combined Charging System) standard › 112
charging infrastructure › 111
China › 18, 24
chromium trioxide › 96
classic cars › 38
climate paths › 86
climate policy › 82
CNG › 114
CO₂ emissions › 78
CO₂ regulations › 80
coalition › 45
cobalt › 34
combustion engine › 100
commercial vehicle business › 35
commercial vehicle market › 28
commercial vehicles › 123
consumer spending › 44
corporate social responsibility › 35
corporation tax rate › 45
customs clearance › 50
CUV › 19
Cyber security › 137
Czech Republic › 24

D

data › 73
Data Matrix Code › 36
design protection › 74
developing and emerging countries › 56
development cooperation › 56
diesel › 100
diesel summit › 94
Digitalization › 70
Domestic production › 24

driver assistance systems › 115
driverless transport vehicles (DTV) › 125

E

eco-innovations › 80
EEG contribution › 58
e-fuels › 87
electric car › 19, 22
electricity price › 58
electro-mobility › 110
Employment › 15
energy efficiency label › 88
environmental bonus › 110
EPCIS › 124
Euro NCAP › 130
European Union › 46
export › 25
Export control › 71

F

fast charging stations › 111
financing the federal highways › 60
foreign location › 24
Foreign production › 24
Foreign trade promotion › 56
France › 21
FRAND › 73
free trade agreement › 54
freight transport › 68
fuel cell › 114

G

gasoline › 100
gasoline engine › 22

Gasoline Particulate Filter (GPF) › 106
German economy › 44
German Federal Ministry for Economic Cooperation and Development › 56
German Old-timer Index › 38
Germany › 22
Germany as a cluster for tomorrow's mobility › 34
Germany's competitiveness › 44
globalization › 32
Globalization › 52

H

heavy commercial vehicles › 28
Heavy commercial vehicles › 84
historic vehicles › 38
H tag › 38
hybrid › 100
Hydrogen › 114

I

IAA › 144
India › 20, 56
industrial electricity prices › 45
information security › 140
infrastructure › 60
infrastructure company › 63
in-house power supply › 59
innovations › 33
integrated approach › 85
investment › 52
Isocyanates › 97
Italy › 21

J

Just-In-Time › 124

K

Keyless Go › 132
KLT › 124

L

leading providers › 110
Lifecycle management › 120
light trucks › 19
lithium › 34
long truck › 69

M

Macron › 46
mobility service provider › 65
model lawsuits › 72

N

NAFTA › 24, 53
national diesel forum › 94
natural gas › 114
Neckartor › 90
NEFZ › 102
networked and automated driving › 137
NEVADA Share & Secure › 117
new EU countries › 21
New Mobility World › 144
Nitrogen dioxide › 90
nitrous oxide emissions › 66
nitrous oxide emissions › 90
Non-tariff trade barriers › 36
normal charging stations › 111
NOx storage catalytic converter › 106

O

old-timer study › 40
online commerce › 69
oxidation catalytic converter › 106

P

particle filter › 106
particulate matter › 92
passenger transport › 64
patents › 73
pedestrian safety › 130
pickups › 19
Poland › 21
premium › 24
Press Workshop › 150
product piracy › 74
protectionism › 52
purchase bonus › 94

Q

QMC › 133
quality management › 133
Quality Summit › 153

R

railway › 68
rare earths › 34
Raw materials › 34
raw materials monitoring › 34
R&D › 70
REACH › 96
recuperation › 100
remanufacturing › 36
research and development › 16
road freight transport › 68

Road Transport Law › 115
round table › 32
Rules of Origin › 71
Russia › 20

S

SCR catalytic converter › 95, 106
Security engineering › 119
semitrailer › 30
Skilled labor shortages › 45
small load carriers › 124
small load carriers (KLT) › 124
SME Day › 151
software updates › 94
South America › 20
Spain › 21
standard-essential patents › 73
standardization roadmap › 112
start-ups › 33
super credits › 80
suppliers › 26
sustainability › 34
SUV › 19, 22

T

Tax breaks for research funding › 70
tax law › 70
Tax policy › 70
Technical Congress › 152
Telematics interface › 139
TISAX › 140
TPP › 53
trade › 52
trailer › 30
Trailers and Bodies › 30

trucks › 28
truck toll › 61
Trump › 53
Turkey › 20
type approval › 107

U

unfounded lawsuits › 72
United Kingdom › 21
urbanization › 65
urban mobility › 66
Urban Mobility Platform › 66
USA › 19
used car market › 41

V

V2X › 116
value-added tax › 18
van › 29
vans › 69
VECTO › 85
vehicle tax › 70
vehicle-to-infrastructure, V2I › 116
vehicle-to-vehicle, V2V › 116
vehicle-to-X › 116

W

Western Europe › 21
WLTP › 103
Workplace limits › 92
WTO › 53

Imprint

Author	Association of the German Automotive Industry (VDA) Behrenstraße 35, 10117 Berlin www.vda.de
Copyright	Association of the German Automotive Industry (VDA)
Editing	VDA Press Department VDA Communications Department
Design/Layout	DANGEROUS. Werbeagentur GmbH
Print	DCM Druck Center Meckenheim GmbH, Meckenheim
ISSN	1869-2915
Status	November 2018
Cover	Patrick Liesenfeld, engine building engineer, team leader serial planning driver's cab, MAN Truck & Bus AG, Munich



Association of the German Automotive Industry (VDA)
Behrenstraße 35, 10117 Berlin
www.vda.de
Twitter @VDA_online

VDA | Verband der
Automobilindustrie