www.pwc.com/auto

Five trends transforming the Automotive Industry

eascy *– five letters that will shape the future of the automotive industry. In this study we present a coherent market model for a clear future strategy for your company.*

pwc

Welcome to the age of radical change in the automotive industry

Dear reader,

Since the introduction of the smartphone, it has become clear that customers are quick to adopt even highly complex and expensive technology if it makes their lives easier. In other words, users value convenience and ease. These core values turned the automobile into the defining technical cultural item of the 20th century. Now it is time to translate these properties into the context of today's – and tomorrow's – technology and society.

The automotive industry has the opportunity to shape this fundamental restructuring. When devising strategies and business models, companies should not only consider direct product purchasers but all users and groups affected by transport issues. The automobile has long since changed from a technical to a social commodity: it guarantees our personal mobility and social participation, shapes our cities and landscapes, and structures our temporal and spatial thinking. This is why we have to rethink the whole automotive industry – with the focus on the use rather than the production of vehicles, in order to make the lives of individual users more enjoyable, more efficient and safer: in other words, "eascy." This study sets out to show the promising prospects that will open up the way to restructuring the automotive industry.

The paper was written by Autofacts, a team of PwC industry experts who provide automotive insights and forecasts to clients around the world.

We would like to thank Dominik Schmidt, Michael Kofler and Philipp Schreiber from the Autofacts team for their support. Important suggestions and ideas were also contributed by Alex Koster, Alex Koster, Managing Director, Automotive and Digital at PwC Strategy&, and Dietmar Ahlemann, PwC partner, Technology Consulting.

In this report we hope to present relevant facts and correlations, and to offer long-term, sustainable strategic and operative suggestions. We look forward to discussing these with you.

Felix Kuhnert
Partner, Global Automotive Industry Leader

Christoph Stürmer
Global Lead Analyst, PwC Autofacts

"eascy" – Five trends that are driving the transformation of the automotive industry …

… and how companies should leverage them for their future prosperity.

1 It's gonna be so eascy: The automotive future is electrified, autonomous, shared, connected and yearly updated.

The mobility of the future will be much easier, more flexible and more individual for users. The vehicle of the future will be used on demand with shared ownership.

The car of the future is **electrified, autonomous, shared, connected** and **yearly updated** – or "eascy" for short.

- It will emit less exhaust fumes and noise into its environment because it is electric.
- It will take up less personal time and space because it moves autonomously.
- It will be more accessible because users will not need a driving licence to use it.
- It will be more affordable because it will no longer have to be bought outright but can instead be paid for in small amounts per use.

The automotive sector faces an unprecedented change with regard to the far-reaching effects it will have on the industry and its users. That is why this report sets out to predict the fundamental restructuring of the automotive industry in terms of timescale, volume and complexity. Basing our findings on key demographic trends, we look at how the mobility behaviour of users might change and what effects that could have. PwC Autofacts is convinced that the future will be much simpler, at least where users are concerned. Before we go into any more detail, we first want to define what exactly we mean by **electrified, autonomous, shared, connected** and **yearly updated**:

electrified

The transition to emissions-free individual mobility would hardly be possible without the electrification of the drive train. First, there is the issue of local components – the fact that cars now only emit very low levels of harmful substances, dust and noise. It also seems that going "emissions-free" will be a global initiative: The idea is that the electricity used to charge the vehicles will come from renewable sources to ensure CO_2-neutral mobility.

autonomous

The rapid progress made in areas such as artificial intelligence, machine learning and deep neural networks make it possible to achieve what until recently seemed utopian – namely the development of autonomous vehicles, which require no human intervention even in complex traffic situations. This will completely redefine the use of individual mobility platforms. New application scenarios are emerging that would have been unthinkable just a few years ago.

shared

For several years, many big cities have offered car-sharing facilities. While these are currently often run as pilot projects or citizen initiatives, sharing concepts will become economically viable with the introduction of autonomous vehicles. It will no longer be necessary to search for a shared vehicle in the surrounding area: instead it will be possible to order vehicles to wherever the user happens to be via a convenient "on demand" service.

connected

The fourth "eascy" dimension is the networking of cars with the outside world – summarised by the concept of the **Connected Car**. This term actually represents two concepts at once. On the one hand, it applies to Car2Car and Car2X communication, which is the networking of the car with other cars or with the transport infrastructure (such as traffic lights). On the other hand, the term also covers the networking of vehicle occupants with the outside world. In future, they will be able to communicate, work, surf the internet or access multi-media services during the journey.

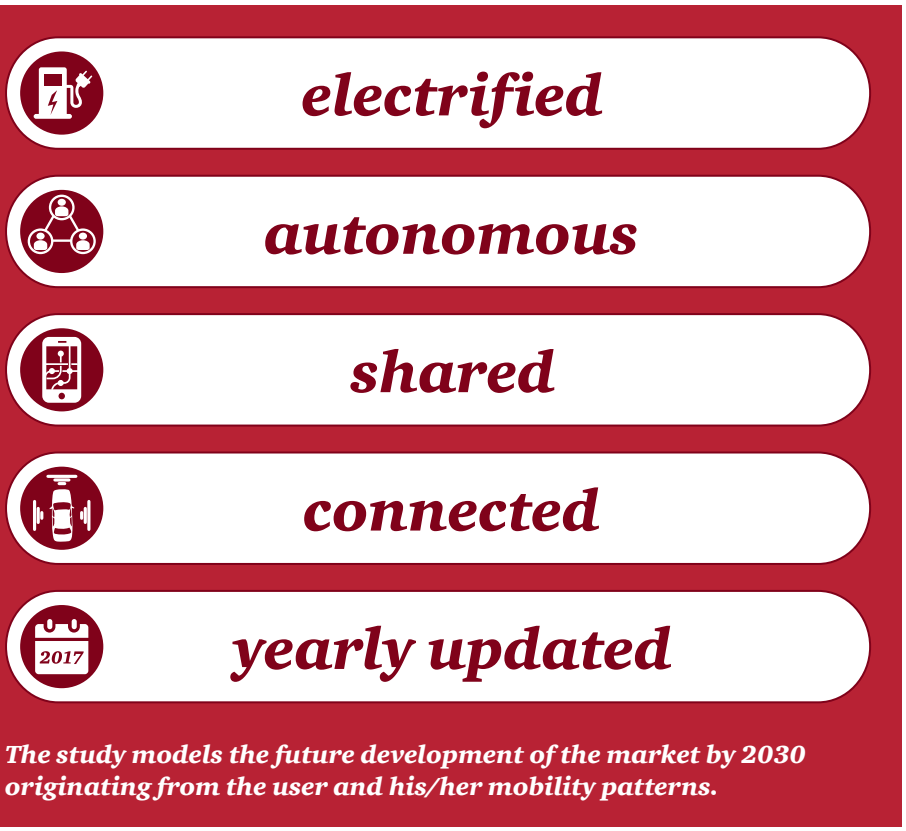
yearly updated

The development topics of **electrified, autonomous, connected** and **shared** will lead to a clear increase in the rate of innovation within the automotive industry. Model cycles of five to eight years, which have always been common in this sector, could soon be a thing of the past. Instead, the range of models will be updated annually in order to integrate the latest hardware and software developments. As customers will naturally not want to buy a new vehicle every year due to the high purchase costs, the short innovation cycles will enter the market primarily through regular upgrades of shared vehicles.

2017

From the customer’s point of view, the five dimensions are associated with numerous benefits. All predictions suggest that driving will become easier, safer, cheaper, and more comfortable. At the same time, the revolution in individual mobility will force the automotive sector to reinvent itself to a certain extent. In our whitepaper *Re-inventing the wheel*[1] we already addressed the key strategic and conceptual consequences of this trend. The present study goes an important step further. PwC Autofacts – a team of automotive industry specialists dedicated to ongoing analysis and prognosis of sector trends – has devised a mathematical model to determine the effects of restructuring on the key performance indicators of this sector. The main focus here is on the existing car inventory and new car sales. Ultimately, these two variables determine the value chain of automotive production – and are therefore critical for the future business models of manufacturers and suppliers in equal measure. For our study, we concentrated on the three largest car markets in the world, namely Europe, the US and China.

The study aims to model the future development of the market, starting from the user. The reorientation of the industry can be described through three external factors, three modelling results and three implications:



The study models the future development of the market by 2030 originating from the user and his/her mobility patterns.

External factors

- **Our mobility habits will change**
- **Personal and overall vehicle mileage will both increase**
- **Vehicles will be used more intensively**

Modelling results

- **The car inventory will decrease significantly**
- **Vehicle sales will rise regardless**
- **Autonomous driving and electrification will be mutually beneficial**

Implications

- **Rapid redistribution of R&D investment**
- **Decisions regarding the long-term structure will be made between 2020 and 2025**
- **Future business models will include the sale and operation of vehicles**

[1] PwC (2015): Re-inventing the wheel, https://www.pwc.com/gx/en/automotive/publications/assets/reinventing-the-wheel.pdf.

40 % *of the mileage driven in Europe could be covered by autonomous vehicles in 2030.*

External factors

Our mobility habits will change
Our mobility behaviour will change radically. As soon as the legal questions have been clarified and the main technological hurdles have been overcome, the percentage of shared and autonomous mobility in terms of overall road traffic will rise significantly. Our forecasts suggest that by 2030, more than one in three kilometres driven could already involve sharing concepts. At the same time, user behaviour will move more and more towards autonomous mobility. Here, PwC Autofacts calculates – again based on mileage – that by 2030 this may even rise to as much as 40%. Developments in Europe and the US are expected to happen at a roughly parallel pace. In China, by contrast, the penetration of shared and autonomous mobility will happen faster than in the Western world. This could make China the leading market for the transformation of the automotive industry.

More people will travel more kilometres
Due to rising population figures and higher mobility demands, mileage will continue to increase. At the same time, given that driving will be easier, safer and cheaper, general mobility trends will move even more strongly in the direction of individual mobility. In addition, individual transport could become an option for groups of people who have not had access to transport at all in the past, such as people with physical disabilities. Finally, another factor here, is the rise in mileage due to empty journeys made by autonomous vehicles. PwC Autofacts therefore assumes that personal mileage in Europe could rise by 23% by 2030 to 5.88 trillion kilometres. Forecasts predict an increase of 24% in the US and 183% in China.

The car of the future will be used much more intensively
Autonomous – and in particular – shared-autonomous vehicles will in the future be far better utilised in terms of capacity than is the case with traditional vehicle use today. The annual mileage will therefore rise dramatically. As a result, the cars will have to be replaced much sooner – even though their active lifetime mileage will increase. The assumption that the lifetime mileage of future cars will be higher has much to do with autonomous and connected driving resulting in fewer accidents. Maintenance and repair costs will drop and lower accident rates will mean that cars will be able to travel many more miles.

By 2030, personal mileage in the US may increase by ***24 %****.*

Future vehicles will be used far more intensively and will therefore be replaced sooner.

*By **2030** it is expected that Europe's vehicle inventory will reduce from 280 million to 200 million vehicles.*

Modelling results

The vehicle inventory will fall significantly in some markets …

In light of the increased utilisation of the fleet, fewer vehicles will be required in the future. PwC Autofacts estimates that the inventory in Europe of currently just over 280 million vehicles could drop by 2030 to around 200 million. This would be a decrease of over 25%. For the US, we forecast a reduction of 22% to 212 million vehicles. Due to the different market situation in China, the inventory there could grow by almost 50% in the same time period to 275 million vehicles, despite the higher utilisation.

… but vehicle sales will continue to increase

Despite the falling inventory, vehicle sales will visibly increase. Vehicles that are used in the traditional way will remain in the inventory for a comparatively long time. By contrast, autonomous, and in particular, shared-autonomous vehicles will be changed far more frequently, resulting in rising sales figures. Across Europe, new car sales could rise by 34% during the transformation process from around 18 million to just over 24 million units. For the US, PwC Autofacts assumes that there could be growth of 20% and new car sales of almost 22 million in the year 2030. For China, a rise of over 30% to 35 million units sold is expected.

Autonomous driving and electrification are mutually beneficial

The automation of driving (i.e. so-called autonomous driving) will initially increase primarily in narrowly defined and geographically restricted areas – most likely mainly in inner cities and on highways. This is also due to the fact that the dimensions **autonomous** and **electrified** are mutually supportive. For example, autonomous vehicles create a clear case for electrical drive since the “inner city” use case is aimed at just this scenario. One example of this is an automatic charging process that uses inductive charging. The reciprocal effect of these two dimensions results in a positive overall effect. It therefore seems possible that by 2030 there will only be a small, single-digit percentage of pure combustion engines among new car sales in the EU. In this scenario, more than 55% of new cars will already be fully electrified. Forty percent of new vehicles would still include hybrid drive technologies in combination with combustion engines.

In a theoretical **100% Robotaxi scenario**, the striking reduction in inventory could more than compensate for the effect of the shorter renewal rate and could lead to a drop in new car sales. In such a scenario, it is calculated that 14% of the existing inventory in the EU could be enough to satisfy the entire mobility demand – realistically, however, many more vehicles would need to be available to cover daily and seasonal demand peaks.

*Over **55 %** of all new car sales could be fully electrified by 2030.*

Future mobility services could increase the yield per vehicle and increase profits over its lifetime.

Implications

Rapid redistribution of R&D investment

It is already clear today that the automotive industry will start to invest less in product range. Within the framework of the *Global Innovation 1000 Study*[2], PwC Strategy& calculated that investment in this field could fall by 19% by as early as 2020. However, this is not necessarily a bad sign. The study came to the overall conclusion that those companies who invest their R&D budget in software solutions instead of product range are already showing stronger growth than their competitors.

This picture also suggests the direction that manufacturers and suppliers need to take. Apart from Tesla, not a single automotive company is ranked in the top 10 of the most innovative companies in the world (although five are ranked between 11 and 20) – even though the company with the highest R&D expenditure is a German automaker. In total, the R&D spent in the automobile industry decreased by 4% between 2015 and 2016[3] – and that in an era characterised by digital innovation and transformation.

Decisions about the long-term structure will be made between 2020 and 2025

Between 2020 and 2025 in particular, manufacturers and suppliers will be battling against sinking margins while at the same time they will have to invest heavily in customer-oriented innovations. The traditional automakers will have to consider how much they are prepared to invest in mobility services to ward off a potential decline in their core business. At the same time, the rising sales volume of new vehicles demands additional investment in production capacity for the necessary "hardware," and those companies that implement flexible and scalable concepts now will be in a position to play an active role in shaping the future from 2025.

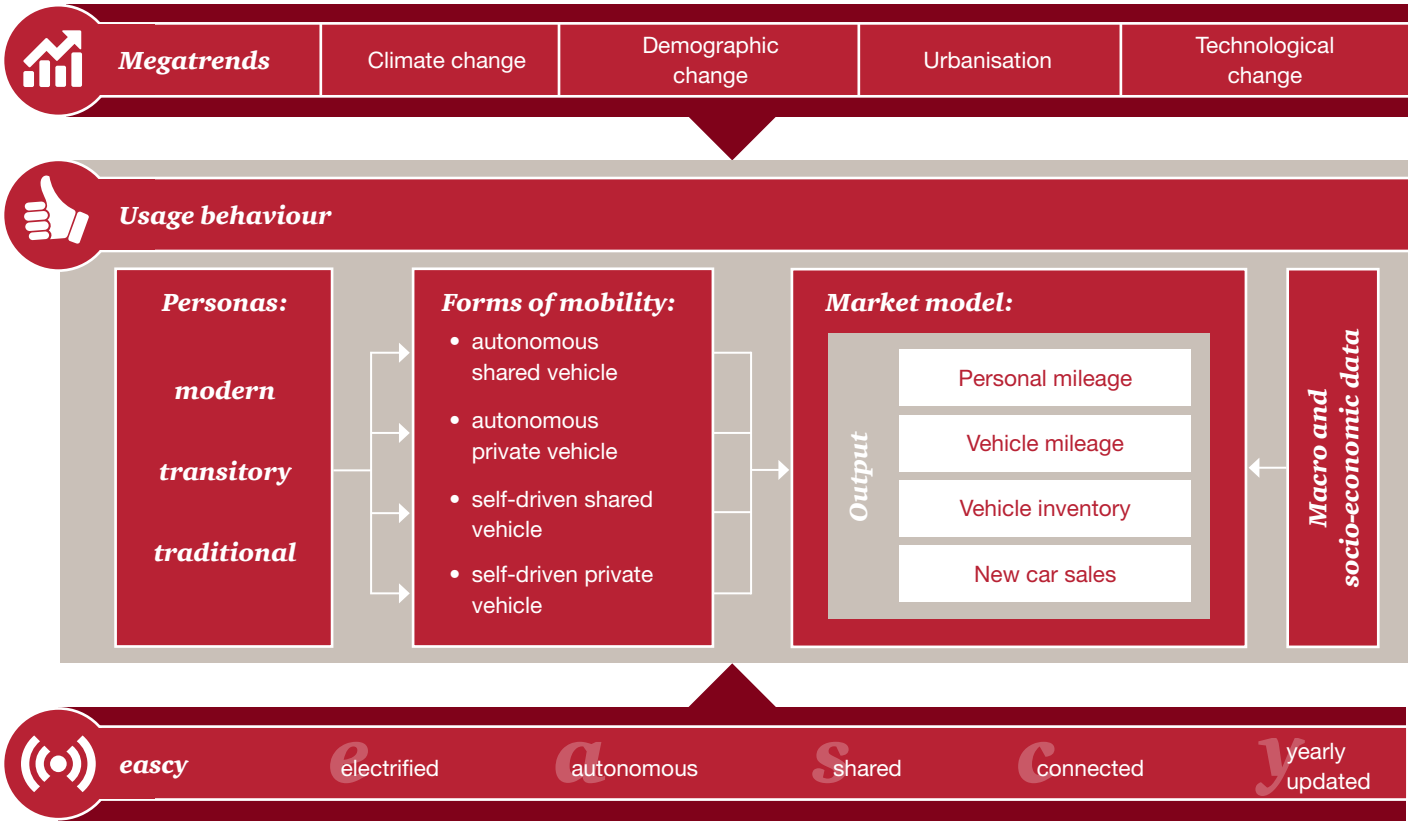
Future business models cover the sale and operation of vehicles

In the future, it will no longer be enough to focus purely on the production and sale of vehicles. Manufacturers and suppliers need to rethink their business model in order to manage the changes across the five dimensions of the "eascy" model. The automotive value chain will no longer finish at the factory door, but will extend across all types of use over the entire lifetime of the vehicle through its eventual recycling. The customers and target groups of the automotive industry will no longer be just direct buyers of vehicles, but all users of the products – in private and shared usage models. Software-based, direct interaction with every user – supported by the brand experience which is already such a key feature – will lead to higher revenues over the lifecycle of the customer relationship.

Companies that invest **25 %** *of their R&D budget in software applications are rewarded with strong growth.*

[2,3] Strategy& (a PwC network business) (2016): Global Innovation 1000 Study, https://www.strategyand.pwc.com/innovation1000.

Fig. 1 **Market model of the transformation of the automotive industry**



"eascy" focuses on the mobility needs of the customer, not on the technical product itself.

2 The focus is on the user.

Younger, technically savvy generations will be a significant driver in the development of more sustainable and convenient mobility solutions in the next few years.

Different mobility uses

If manufacturers and suppliers expand their business models to cover "operational" elements, then the classic target figures of the sector – namely vehicle sales and vehicle inventory – will become less important. Even so, it is naturally crucial for companies to know how these two figures will change over the coming years. The mathematical model developed by PwC Autofacts, which is the first to quantify the effects of the five "eascy" dimensions, therefore starts with the user ("persona"). By modelling usage behaviour, it is possible to calculate the individual personal mileage and therefore the overall car mileage in a particular market. From this basis it is easier to predict with greater certainty the vehicle inventory and vehicle sales.

In order to model usage preferences within the markets under review, we defined three different segments[4]. These so-called "personas" categorise the population based primarily on their attitudes and openness to various forms of mobility and how they use them. In doing so, some major regional and cultural differences must be considered. Additional distinguishing features within the user groups are the age structure and whether they live in an urban or rural environment. This segment logic also enables us to take into account changes in the percentage of the population in each user group over time.

The transformation of the automotive industry will be driven to a large extent by younger, technically savvy generations.

[4] Strategy& (a PwC network business) (2017): Digital Auto Report, https://www.strategyand.pwc.com/.

Fig. 2 Comparison of global personas

	EU	US	China
modern 2017 ***33 %*** 2030 ***38 %*** ***+5*** percentage points, relative increase of ***+15%***	• Technical innovations are part of everyday life: Use of smartphones and apps for urban transport • Sustainable and healthy lifestyle demands pragmatic view of cars as transportation • Increased inter-modal transport (car versus public transport) • Car ownership less important as a status symbol • Rural areas still use cars *e* + *a* + *s* ++ *c* ++	• Huge interest in digital technology and innovative mobility concepts • Young, urban users in particular choose variety of transport options that do not involve owning a car • Rural areas are still dependent on cars due to insufficient infrastructure for long-distance travel • Journeys in urban areas often rely on inter-modal approach (e.g. Park+Ride) *e* + *a* ++ *s* ++ *c* ++	• Young, urban generation experiences economic upswing • New technologies are actively embraced • Car-sharing and ride-sharing services very popular (e.g.: Didi Chuxing App with >400 m users) • Need for own car limited to social status • Long-distance journeys in rural areas continue to rely on own car *e* ++ *a* ++ *s* ++ *c* ++
transitory 2017 ***41 %*** 2030 ***39 %*** ***–2*** percentage points, relative decrease of ***–5%***	• Individuality and consumption behaviour promote the formation of different mobility profiles • Primarily young, urban users use alternatives such as car-sharing • The still traditionally-oriented user group continues to prefer owning a car for reasons of comfort, status and flexibility *e* *a* *s* + *c* +	• Both traditional and modern values • Car ownership is anchored in mobility attitude • Public transport plays a bigger role in cities • Basically open to new mobility alternatives *e* + *a* *s* + *c*	• Symbolic for the start of the economic upswing • Shared attitude to modern mobility solutions • Traditional prevailing use of own car in rural areas • Widespread use of public transport *e* ++ *a* + *s* + *c* +
traditional 2017 ***26 %*** 2030 ***23 %*** ***–3*** percentage points, relative decline of ***–12%***	• Mainly rural population that tends to shy away from technological innovations • Ownership or access to own car is the norm • In urban environments, they often turn to public transport to avoid congestion and parking problems *e* – *a* –– *s* – *c* –	• Predominantly older groups of society with deeply entrenched values and convictions • Larger share of rural population in segment comparison • Mobility is almost exclusively equated with own car • Not interested in innovative mobility concepts *e* *a* – *s* – *c* ––	• Public transport preferred, especially in cities • Comparatively open to technological developments • Car use for reasons of flexibility and comfort • Car ownership to express social status *e* + *a* *s* – *c*

Source: The 2017 Strategy& Digital Auto Report.

Development 2017 to 2030

The young, technically savvy generation will be a significant driver in the development of more sustainable and convenient mobility solutions in the next few years – and will also characterise the attitudes and behaviour of successive generations. By contrast, people in middle age tend to look at the development of new mobility solutions with a degree of scepticism, at least initially. However, there will inevitably be a shift in the percentage of the population towards personas with a more modern orientation – both in Europe and the US as well as in China. This process is likely to be even quicker and more dynamic in China, where the technological change will enjoy the best cultural and political conditions. By 2030, the percentage of the population of "traditional" users will be in strong decline in China. The establishment of autonomous electric taxis and the widespread electrification of public transport will play a major part in this transformation.

In its urban regions, China will likely have caught up with the US and Europe by 2030 in terms of technological development – and may have even pulled ahead. The varying levels of air pollution in China's cities (which goes hand in hand with street congestion) is a factor in the move to the introduction of car-sharing and ride-sharing services within a few years in urban settings. These could soon be seen as an equal alternative to traditional forms of mobility.

Fig. 3 Regional comparison of personas

China

Modern persona

- Daiyu (26), single
- Occupation: Start-up founder
- Lives in: Shanghai (city)

Daiyu prefers:

2017	2030
• Mobile connectivity • Inter-modal transport • Ride hailing, public transport and Didi	• Shared services • Autonomous taxis and buses • Electrified public transport

US

Transitory persona

- Eve (37), married with 2 children
- Occupation: Housewife
- Lives in: Pleak, Texas (rural)

For Eve, mobility means:

2017	2030
• Long-distance journeys and daily use of own car • Car is shared within the family	• Public transport • Auto focus still present • Safety and connectivity facilities

EU

Traditional persona

- Wilhelm (66), widowed
- Occupation: Retired public servant
- Lives in: Forst, Germany (rural)

Wilhelm's attitude to mobility:

2017	2030
• Cars are the preferred means of transport • Some public transport • Modern mobility options play no role	• Own car (not electric) • Assistance systems for health and safety reasons • Semi-autonomous taxis

Source: The 2017 Strategy& Digital Auto Report.

3 What does future mobility look like? Who is mobile and how?

40% of personal mileage in Europe in 2030 could be autonomous. Personal mileage in Europe could rise by 23% by 2030 to 5.88 trillion kilometres.

Mobility needs and preferences are changing

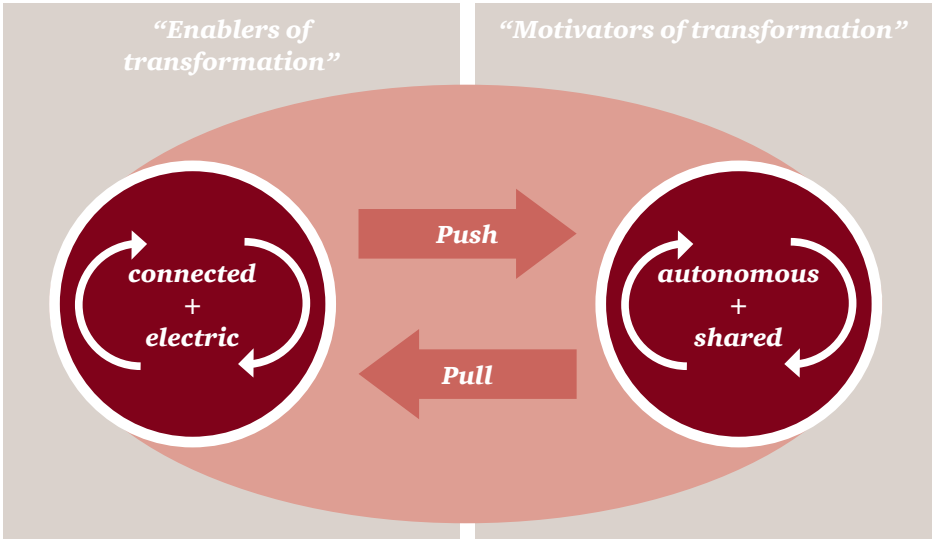
The change in the "personas" means that mobility needs will also change in the years ahead. The various "eascy" dimensions each have their own individual drivers. The primary drivers of **autonomous**, for example, are time savings and greater safety. **Sharing**, on the other hand, is aimed first and foremost at the cost factor. **Connected** and **electrified** in turn can be seen as hygiene factors in the automotive transformation. After all, the market penetration of electric vehicles is not initially driven by the market economy demand structure, but is primarily a political and regulatory issue.

The "yearly updates" arise from the high speed of innovation of the other "eascy" dimensions, especially in the field of "autonomous" and "electric" – fundamental technical improvements are already happening in such quick succession that they can no longer be integrated into the classic model cycles. Instead of the more cosmetic exercise of "model years," the automotive industry will have to keep bringing out "annual models" using the latest technology – in some cases including the option of retrofitting earlier annual models to bring them up to date.

Using instead of owning

Changes in behaviour will characterise the mobility of the future. The breadth and depth of mobility options will increase markedly. This is already being demonstrated by the rising number of suppliers in this segment. Innovative start-ups are fighting for market share with established automotive, transport and logistics companies. There are two different manifestations of shared mobility: car-sharing and ride-hailing.

Fig. 4 User motivation for electric, autonomous, shared and connected mobility



Car-sharing vs. ride-hailing

There are two manifestations of car sharing, namely station-based and free-floating. The basic difference lies in the availability of the vehicles. While station-based car sharing means that the vehicles can only be collected from pre-defined stations, the area of availability for free-floating car-sharing reflects the business area of the supplier. Ride-hailing, by contrast, is about sharing a journey. This concept is growing in popularity and can no longer be seen as a fringe phenomenon. In 2017, the number of users worldwide is estimated to rise to 338 million[5]. On the whole, there are three different manifestations here:

- Online car sharing agencies to create driving communities
- Online platforms that act as brokers for drivers offering journeys in private cars
- Taxi companies that offer their services via an app

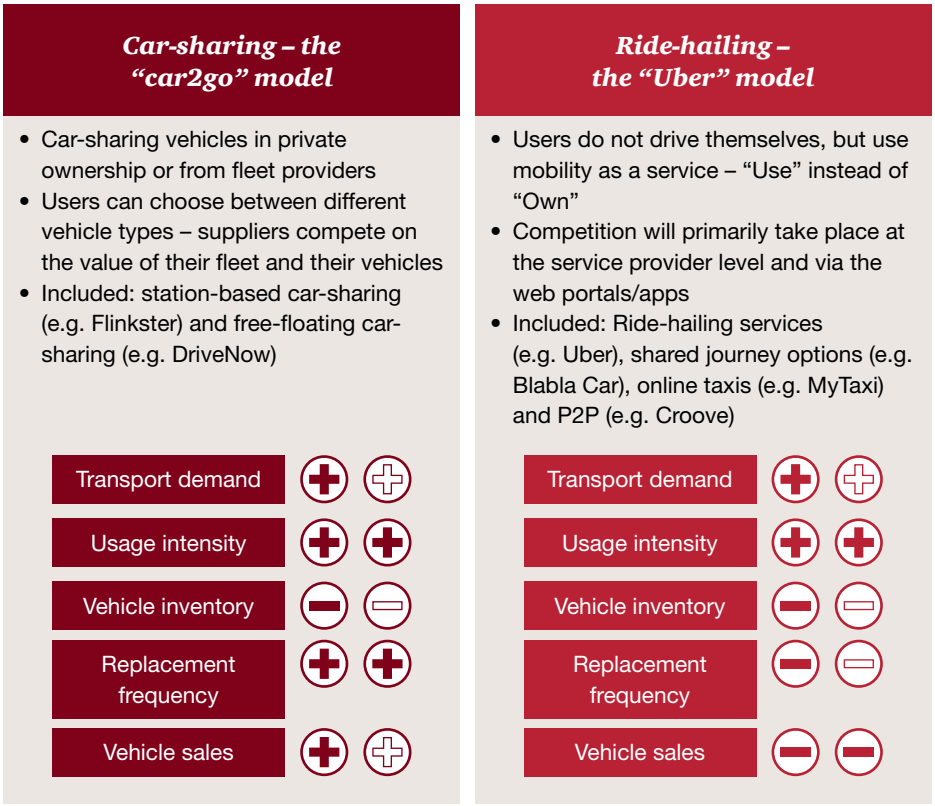
The customer wants to use autonomous vehicles

Where does car sharing stand in connection to the *autonomous* dimension: in other words, to the automation of driving? In order to be able to give a standardised classification to the level of automation, a stage model of 0 to 5 has been introduced at the national and international level. The German classification comes from the Federal Highway Research Institute [Bundesanstalt für Straßenwesen, or BaSt][6].

[5] Statista (2017): eTravel: Mobility Services, https://de.statista.com/download/outlook/whiterpaper/Mobility_Services_Outlook_0117.pdf.
[6] German Association of the Automotive Industry [Verband der Automobilindustrie] (2015): Automation – from driver assistance systems to automated driving, https://www.vda.de/dam/vda/publications/2015/automatisierung.pdf.

Even if it appears that there are strict divisions between the different levels of automation, this is a matter of constant public debate. For example, some automakers see Level 4 as the optimal use case for car-sharing vehicles in a specific geographical area – such as within a particular city. According to this interpretation, a Level 4 vehicle would be allowed to drive autonomously in this area in order to collect customers who have ordered the vehicle "on demand"[7]. Beyond this there are preferred areas of application depending on the level of automation. Vehicles classed as Level 1 to Level 3 are primarily used for overland and highway journeys, as this use case is relatively easier to realise from a technical point of view.

Fig. 5 Which sharing models are available?



The primary use case is found above all in car sharing in urban areas. More and more young people in the city have no car of their own and use sharing concepts in combination with public transport.

Technical availability and legal considerations are the bottleneck

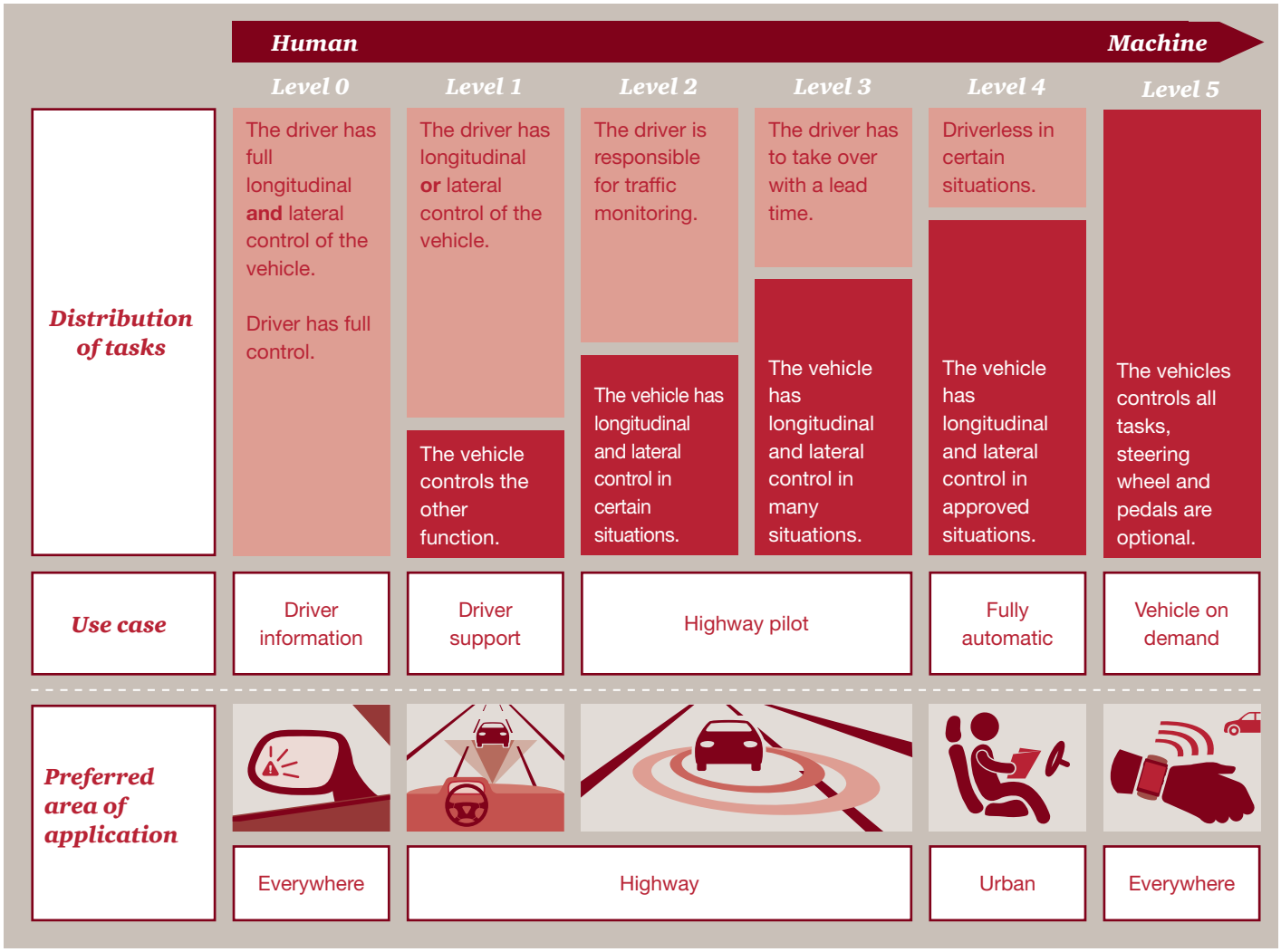
PwC Autofacts assumes that the demand for autonomous vehicles will be different in the large markets of Europe, the US and China. However, customer personas tend to have a positive attitude towards this technology per se in all of these regions. The development is currently limited – apart from technical issues – by a lack of legal principles. Nowadays, there are very few vehicles on the streets that are classified as automation Levels 2 and 3. From a technical point of view, more manufacturers and vehicles would be in a position to offer these levels, but the legal framework is still unclear. The current assumption is that vehicles with a Level 4 classification will not come on the market until 2022–2023 at the earliest – even though technically speaking the functionalities could be available sooner. Various automakers have already announced vehicles of Levels 4 and 5.

[7] Vogt, Agnes (2017): Engine on, eyes closed, in: Automobilwoche, Sonderheft Das Prinzip CASE, p. 29.

Autonomous and shared

If you combine the two trend dimensions of *shared* and *autonomous*, you get four forms of mobility, namely 1) unshared and not autonomous, 2) already shared but not yet autonomous, 3) still unshared but already autonomous, 4) already shared and already autonomous. The most popular form of transport today is still the self-driven private car (therefore "unshared and not autonomous"). However, the self-driven shared car (in other words, "already shared but not yet autonomous") is growing in popularity. The self-driven private car ("still unshared, but already autonomous") is not yet available on the market, but that could well change within a few years. That would also prepare the way for the self-driving sharing car ("already shared and already autonomous") and the absolute correlation of the two dimensions **autonomous** and **shared**.

Fig. 6 Levels of autonomous driving



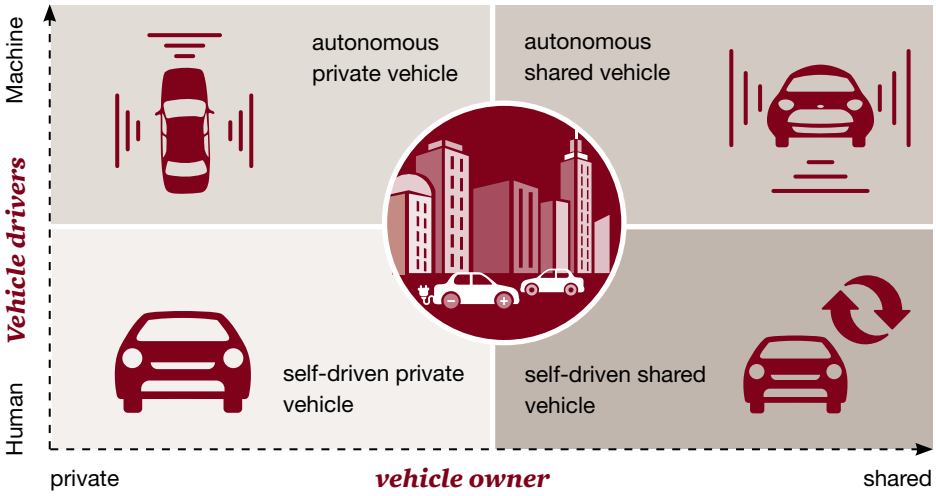
Autonomous vehicles will have a strong positive impact on sharing concepts.

In this form of mobility, car-sharing and ride-hailing are technically on a par, as neither requires a driver. However, there are still differences in terms of the business model, as the car-sharing user chooses a particular product brand for a particular vehicle, while the ride-hailing user is interested in a particular transport service from a particular service provider brand. Individual users will certainly switch between both models, which means there is clear potential for both approaches.

Urban vs. rural

It can be assumed that the two shared forms of mobility will find their primary area of application in urban areas. The Robotaxi ("already shared and already autonomous") is particularly well suited for urban applications. Autonomous vehicles can help to prevent accidents while also reducing congestion, meaning that the efficiency of the transport infrastructure will allow it to absorb the rise in traffic. The use case for private vehicles, whether they are autonomous or self-driven, remains predominantly in rural areas. The connection to a widespread Robotaxi network will reduce the use of autonomous private vehicles in urban settings. Autonomous private vehicles would tend to be more of a status symbol for those customers who still attach importance to owning their own vehicles.

Fig. 7 The four manifestations of the mobility of the future



Progressive vehicle differentiation

Despite the changes in the forms of motorised mobility, we are still assuming that there will be progressive vehicle differentiation in terms of size and segment. Shared vehicles will be found in both the premium and the volume segments, but due to the primarily urban area of application these are most likely to be smaller vehicles with fewer seats. The autonomous private vehicles will, by contrast, tend to consist of larger cars, especially those from the premium sector.

With the car of the future, however, it will not just be a matter of the **shared** and **autonomous** dimensions, but also **connected** and **electrified**. Due to the rapid development of electrical drive systems, it can be assumed that the vast majority of Level 4 and 5 autonomous vehicles will be e-cars. These will also show an ever greater degree of connectivity – partly because this will be a prerequisite for widespread, autonomous driving. In addition, the connected car dimension covers various vehicles and connected services. For a comprehensive insight into this dimension, please refer to the *Digital Auto Report* produced by Strategy&.[8]

Autonomous and shared mobility expand the area of application of electric vehicles.

[8] Strategy& (a PwC network business) (2017): Digital Auto Report, https://www.strategyand.pwc.com/.

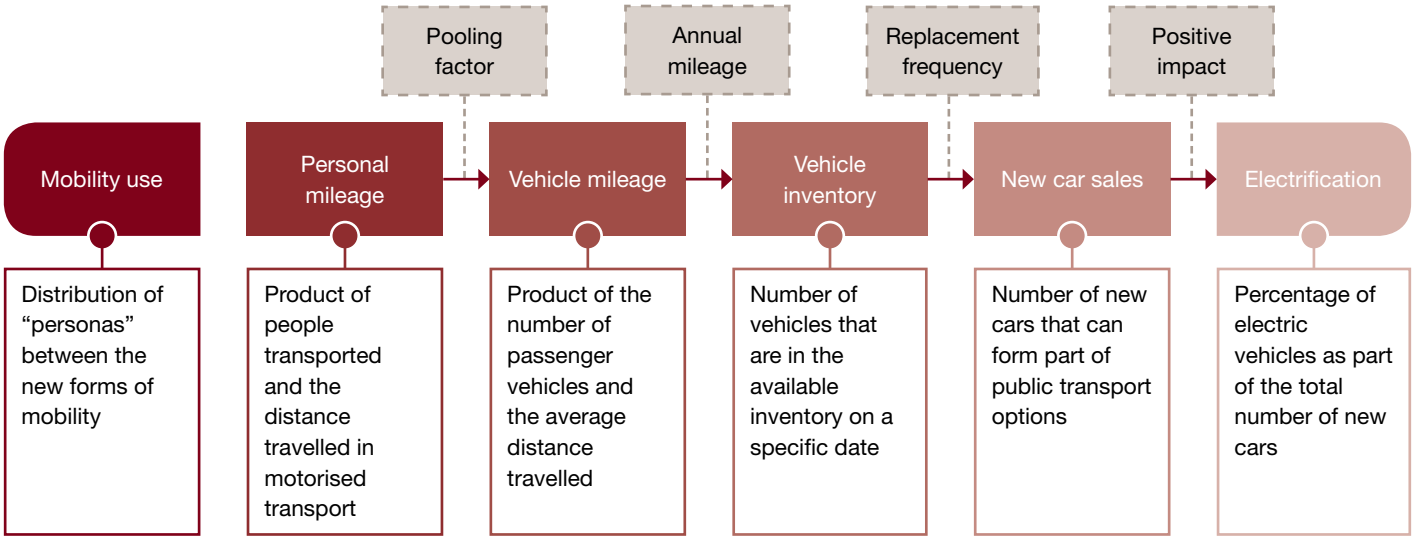
4 How is the global automotive market changing?

The foreseeable trends of social "personas" suggest that autonomous and shared forms of mobility will increase greatly in significance by 2030.

Using the notion of personal mileage as a base, we have calculated the percentage of electric vehicles that will make up the overall total of new car sales. We initially studied the pooling factor, which expresses the average occupancy per vehicle (we explain the pooling factor in more detail later in this document). This factor helps us to turn personal mileage into vehicle mileage. In turn, that enables us to determine the inventory required for the annual mileage. The turnover rate of vehicle inventory for individual forms of mobility and the changes in that inventory allow us to calculate the new car sales required for the EU, the US and China. The increase in shared and autonomous forms of mobility and the associated changes in levels of automation have a positive effect on possible electrification scenarios.

Fig. 8 Structural foundation of the market model

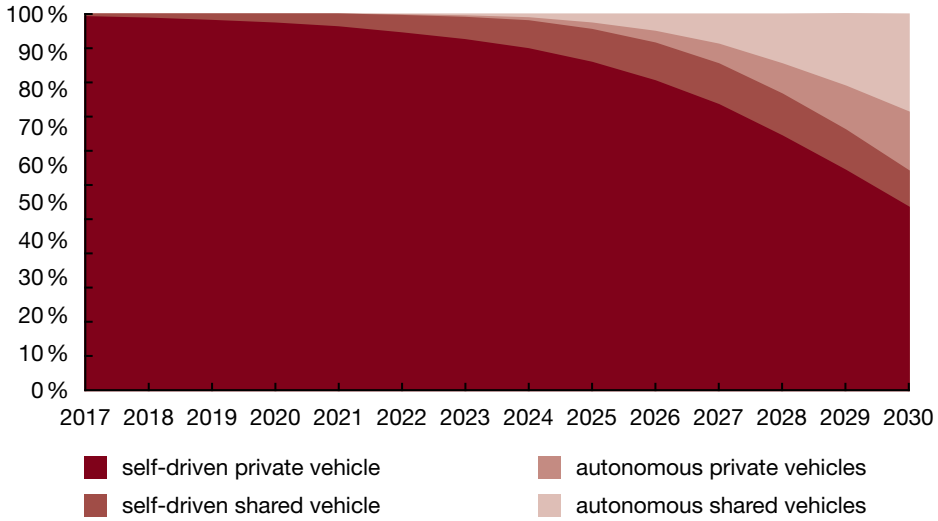
What does the market model of the future look like?



Mobility use will change

The foreseeable developments of the social personas show that autonomous and shared forms of mobility will become much more prevalent by 2030. Not only will this have an impact on driving styles, but also who the vehicles will actually belong to in the future.

Fig. 9 Europe: Percentage of mobility forms (2017–2030)

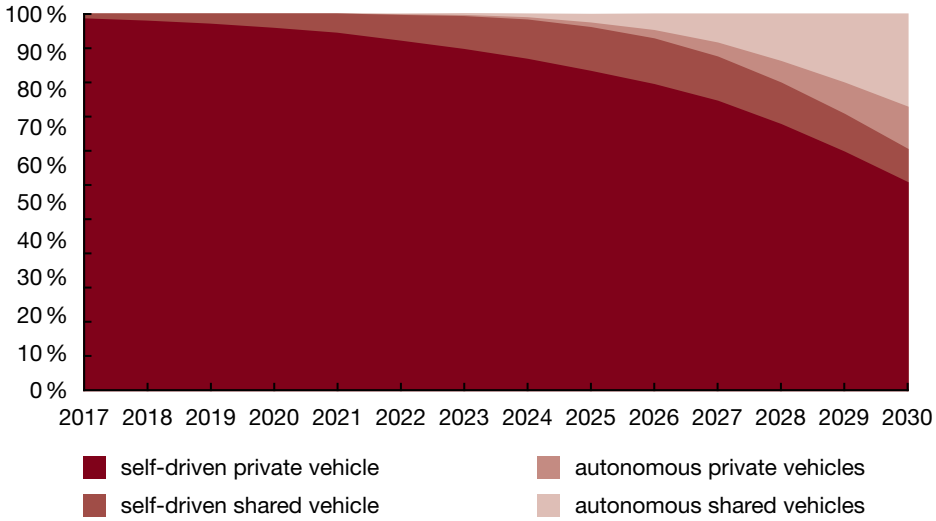


Europe

Less than 1% of all journeys in Europe are currently made using sharing services. With a compound annual growth rate (CAGR) (2017–2030) of over 20% by 2030, this percentage will increase sharply and could reach more than 10% of mileage travelled by the second half of the 2020s. Vehicles that have at least Level 4 classification could come on the market from around 2022. The first of these fully automated cars may be aimed primarily at sharing concepts, since that is, as previously described, their preferred area of application.

This will give a huge boost to sharing services, as the "human cost factor" will no longer apply. Between 2022 and 2030, the market share of autonomous shared concepts could increase on average by over 70% per year – and thus make up more than 25% of mobility forms by 2030. According to our prognoses, by then not even half of all vehicle mileage will be covered in a classic, self-driven private car. Autonomous forms of mobility could in the meantime account for more than 40% of all vehicle mileage.

Fig. 10 US: Percentage of mobility forms (2017–2030)

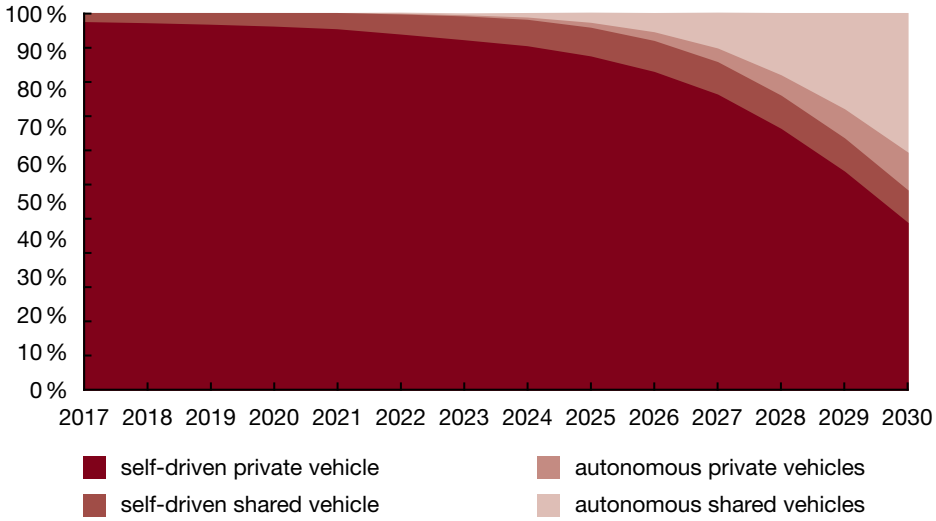


US

In the US just over 1% of personal vehicle mileage is currently covered through sharing concepts. In 2021 that could be more than 5% and in 2030 as much as 33.5%.

Almost 10% could then shift to self-driven shared vehicles and almost 24% to autonomous shared vehicles. Moreover, by the year 2030, almost 36% of personal mileage completed in the US could be in autonomous vehicles.

Fig. 11 China: Percentage of mobility forms (2017–2030)



China

The percentage of shared vehicles is likely to rise even faster in China. There are already restrictions in some cities on the registration of new vehicles, which is bound to have a positive impact on the use of shared concepts. We consider it possible that in 2030 more than 45% of all personal mileage will be covered using shared vehicles.

Due to the high level of acceptance and demand for autonomous vehicles, China will see the fastest adoption. In 2030, almost half of all miles travelled could be in autonomous vehicles.

Downside scenario

Future forms of mobility are caught between various factors, which cannot be predicted with any great accuracy. Both legal and technical conditions are changing all the time, which leads to a certain amount of latitude in the adaption of new forms of mobility. Customer attitudes towards and acceptance of autonomous and shared vehicles depend on future developments. It is possible to confirm a clear movement towards **autonomous** and **shared**, but unforeseeable key events, such as a fatal accident due to technical failure, could have a long-term impact on the levels of acceptance and demand.

PwC Autofacts has therefore decided to present both an upside and a downside scenario. The weaker scenario assumes, depending on the region and the country, a penetration of 10 to 15% of vehicles using autonomous technology. In this scenario, the technical and legal principles and levels of customer acceptance are not covered in any great detail.

What are the likely scenarios?

Fig. 12 Europe: Percentage of forms of mobility – Downside (2017–2030)

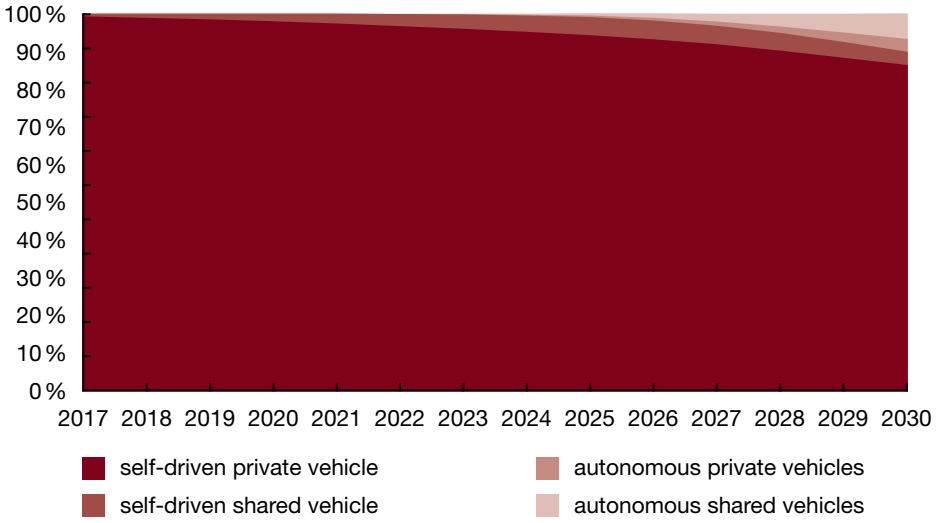
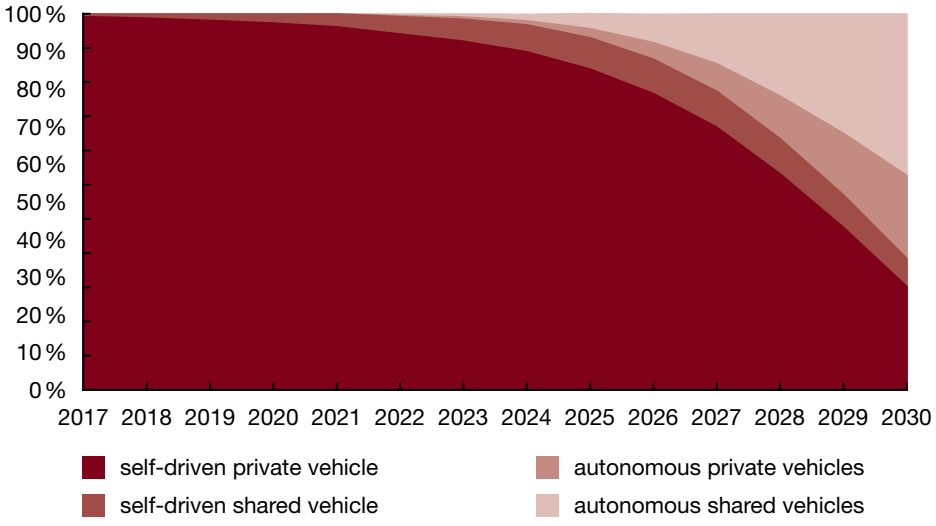


Fig. 13 Europe: Percentage of forms of mobility – Upside (2017–2030)



Upside scenario

The upside scenario, on the other hand, assumes an extremely high adoption rate. In this case, more than 60% of all personal mileage could be covered in autonomous vehicles by 2030. Neither customer demand nor legal and technical requirements pose any obstacles to the development of new forms of mobility.

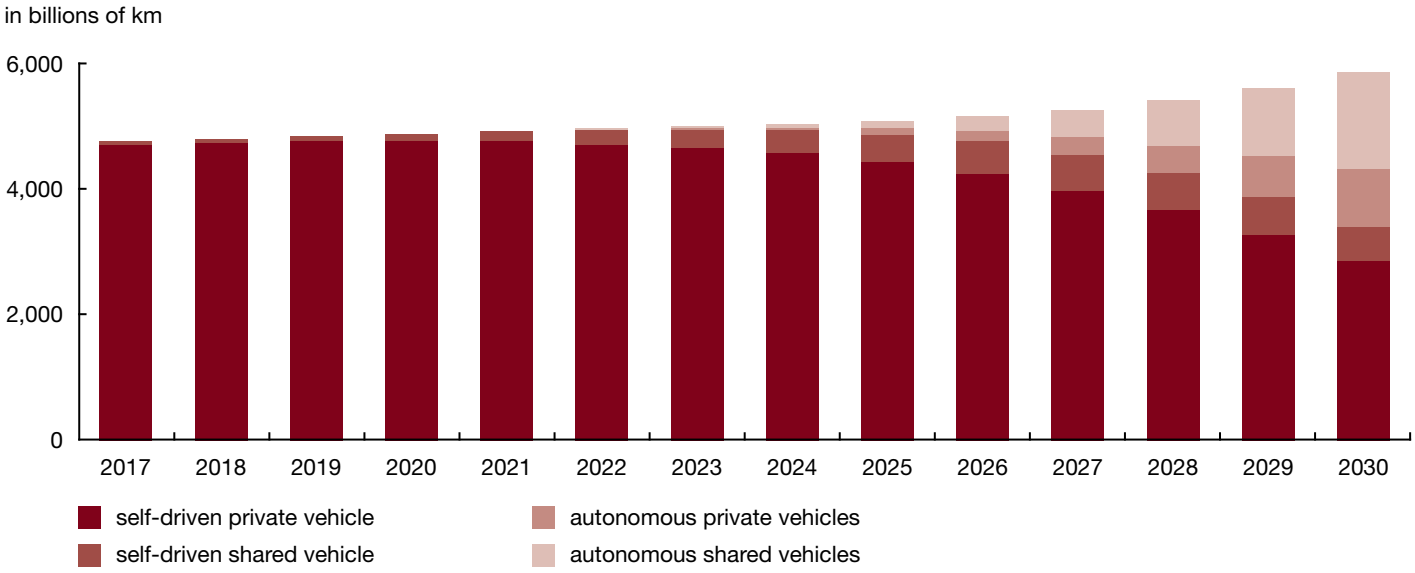
Both personal mileage and vehicle mileage will increase

Personal mileage and vehicle mileage represent a key point of our model. The correlation between these two figures – as referred to briefly above – is determined by the average occupancy rate of a vehicle. With regard to the issue of *shared* and *autonomous*, we describe this as the pooling factor. This stands for the higher occupancy rate of a shared vehicle (such as the uberPOOL).

The essential starting figure for describing mobility in a country is personal mileage. Divided into the forms of mobility dictated by the usage behaviour of the personas, the mileage forms the basis for calculating vehicle inventory and also indirectly for calculating the number of new car sales. Reasons for the rise in personal mileage include population growth and a rise in the motorisation rate as well as changes in relative and absolute mobility costs. Forecasts for these and other macro- and socio-economic factors determine the plausibility of the trends, assuming largely stable economic progress in the three regions examined in the study.

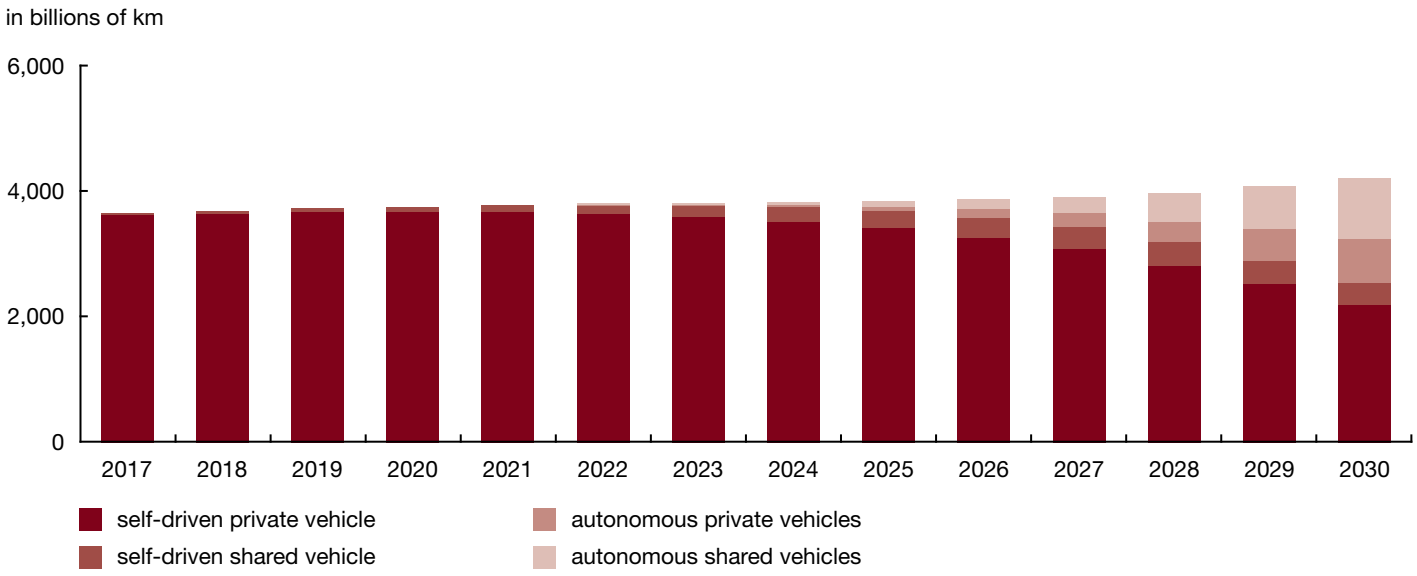
More people can participate in motorised individual transport through autonomous and shared vehicles. Elderly people, those with physical disabilities, population groups on low incomes and those without a driving licence – especially children and young people – can actively participate and thus contribute to the rise in personal mileage.

Fig. 14 Europe: Personal mileage (2017–2030)



*The average occupancy rate of **1.3 persons per vehicle** could rise in the future.*

Fig. 15 Europe: Vehicle mileage (2017–2030)



Europe

In Europe, almost 3.7 trillion passenger vehicle kilometres are currently travelled. At an average occupancy rate of 1.3 persons per vehicle, this amounts to almost 4.8 trillion personal kilometres travelled per year. Occupancy rates vary according to the form of mobility. With shared vehicles, we start by assuming a higher pooling factor.

*In **2030** the vehicle mileage in Europe could reach 4.2 trillion kilometres.*

Fig. 16 US : Vehicle mileage (2017–2030)

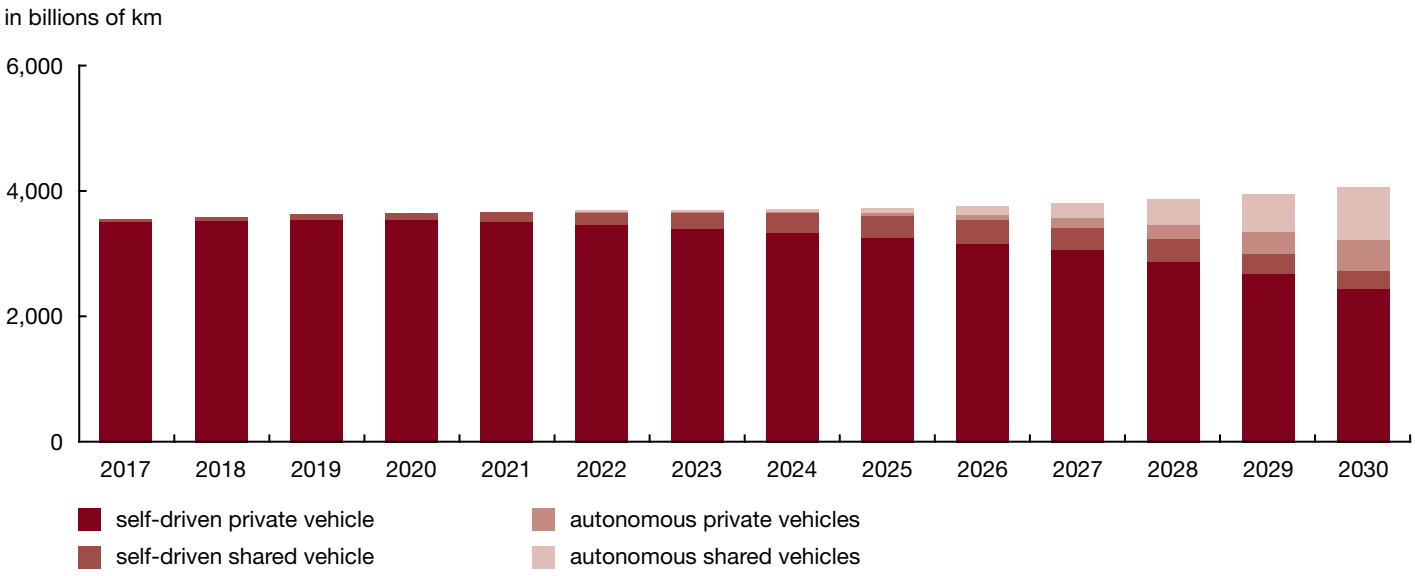
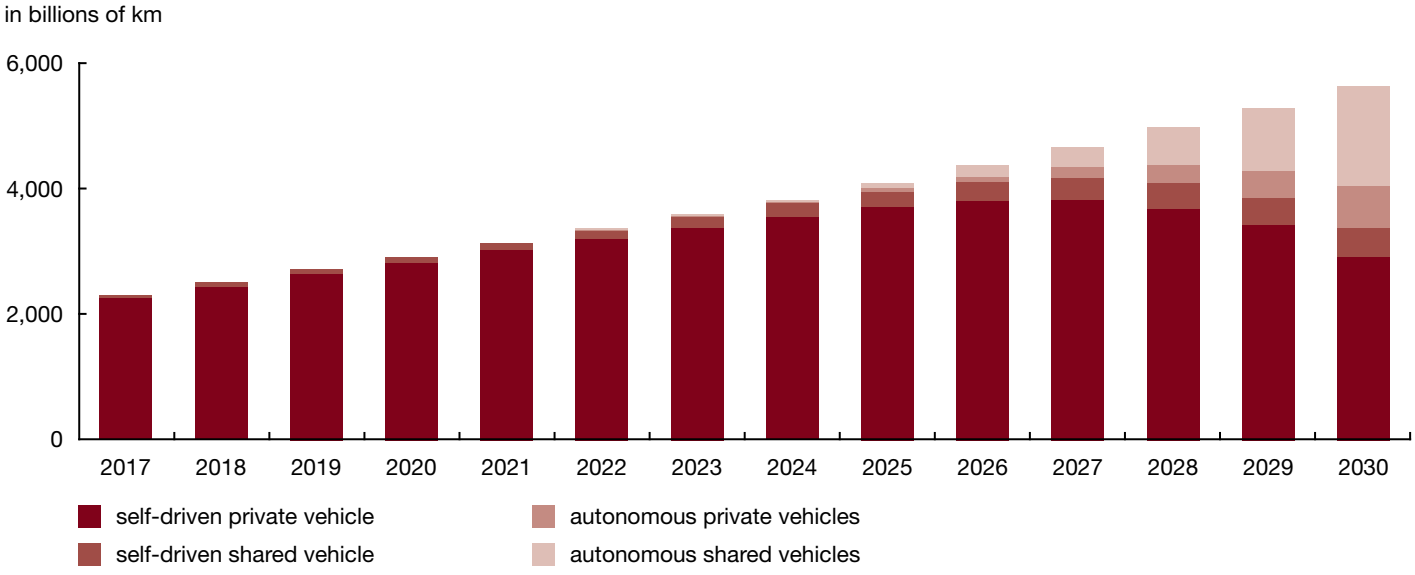


Fig. 17 China: Vehicle mileage (2017–2030)



US

Currently almost 4.7 trillion passenger vehicle kilometres are travelled in the US each year.

At an average occupancy rate of 1.3 persons per vehicle that makes a total annual mileage of 3.59 trillion passenger vehicle kilometres. The vehicle mileage could rise as high as six trillion kilometres.

China

Currently, the mileage in China is still a long way behind the levels in Europe and the USA.

Personal mileage is around 3.0 trillion kilometres. The mileage is set to increase sharply in the next few years and could well overtake the level of the US by 2030.

The intensity of vehicle use will increase

In order to calculate inventory and new car sales, however, further figures are required – namely the annual mileage of a vehicle and the mileage over the entire lifetime of the vehicle through to scrapping. These two figures give the replacement frequency for vehicles.

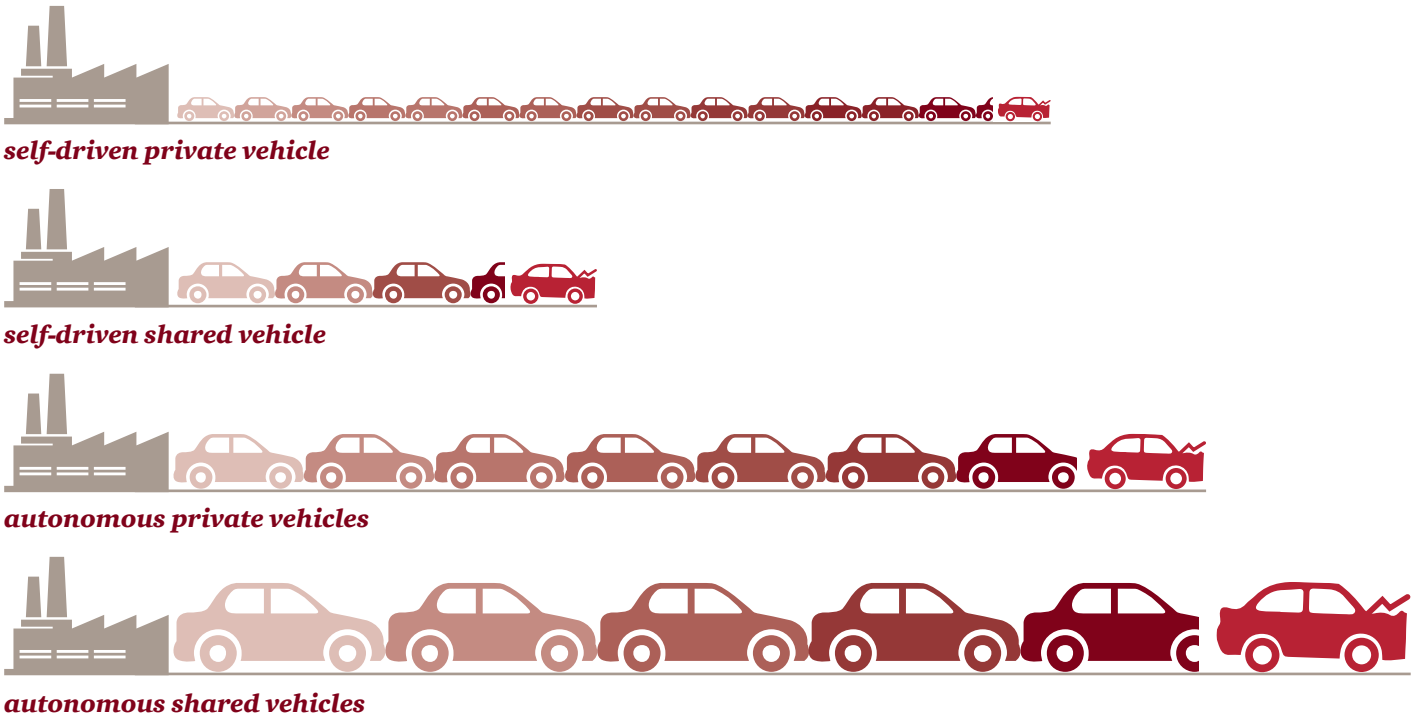
The mileage will increase for all four forms of mobility over time. The reasons for this are advancing electrification and the associated simplification of the drive train. The need for maintenance and the accident rate will reduce for the vehicles of the future. This means a reduction in the probability of malfunction during the planned mileage.

In addition to the total mileage, the annual mileage is the second relevant figure in consideration of the turnover rate. Annual mileage will vary considerably, depending on the form of mobility. Shared vehicles will be used far more than private vehicles and therefore have a higher annual mileage. If this effect is combined with the technology of autonomous vehicles, it leads to even greater usage and a further increase in the annual mileage. As well as the increased use of autonomous driving concepts, empty journeys – between individual uses – will contribute to the significant rise in mileage. Both shared and private autonomous vehicles are able to drive on demand to a certain location.

The combination of the annual mileage and the actual miles travelled can be used to calculate the average vehicle life expectancy and the resulting replacement frequency. These figures will be fundamentally different for shared and private vehicles. Private vehicles are currently driven for a lot longer than ten years before being taken out of the stock. Shared vehicles have a far shorter half-life period within a sharing concept. Due to the expected level of service, these vehicles must make a customer-friendly impression, both technically and visually.

The combination of higher annual mileage and lower overall mileage means that the replacement frequency will be much higher than that of privately used vehicles.

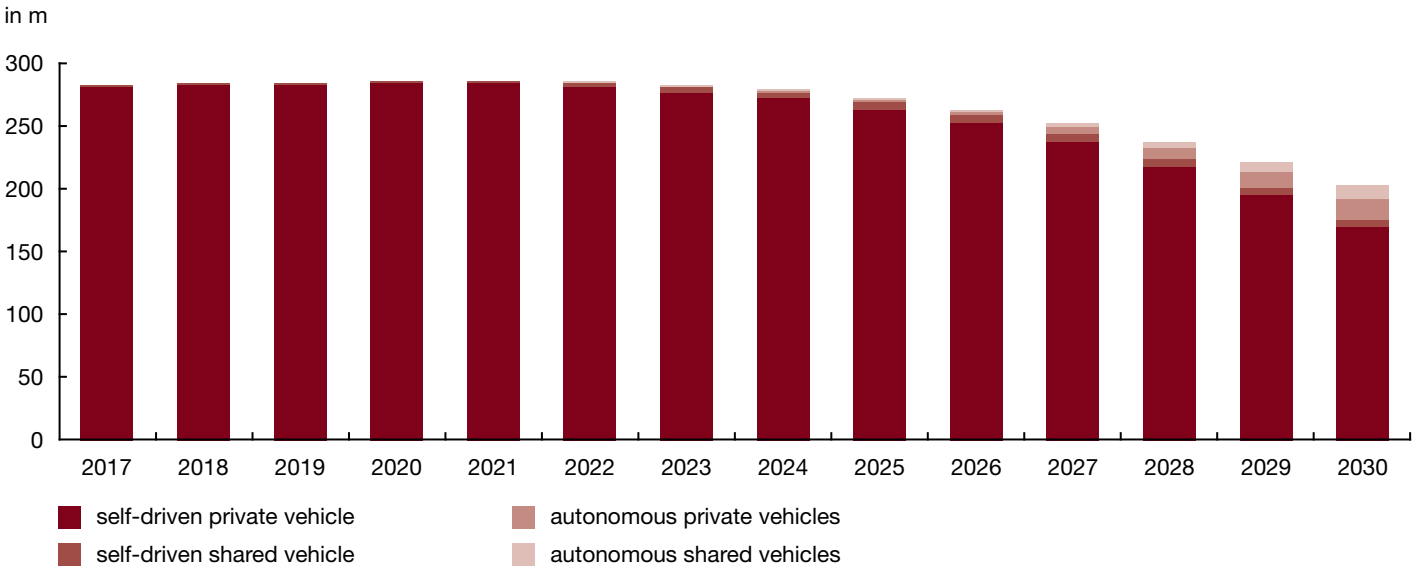
Fig. 18 Renewal quotas of conventional and future forms of mobility



The vehicle inventory will decrease
Dividing the annual personal vehicle mileage by the average annual mileage of a vehicle gives the vehicle inventory. Here, different annual mileages are expected for all forms of mobility. The inventory describes the number of vehicles that are needed to guarantee the mileage.

*In Europe the inventory is expected to drop from **280 million** to **200 million** vehicles.*

Fig. 19 Europe: Car inventory (2017–2030)



Europe

The vehicle inventory in Europe currently consists of more than 280 million vehicles, almost all of which are privately owned and used. The percentage shift towards autonomous and shared forms of mobility will mean that by 2030 the inventory could drop to just over 200 million vehicles. At the same time, the vehicles in the inventory could cover a higher mileage of over 4.2 trillion kilometres, due to the higher utilisation of autonomous and shared vehicles.

The inventory of self-driven private vehicles could drop by over 110 million to 170 million vehicles by 2030. 27 million autonomous vehicles (13% of the overall inventory) could be responsible for over 40% of personal mileage in 2030.

Fig. 20 US: Light vehicle inventory (2017–2030)

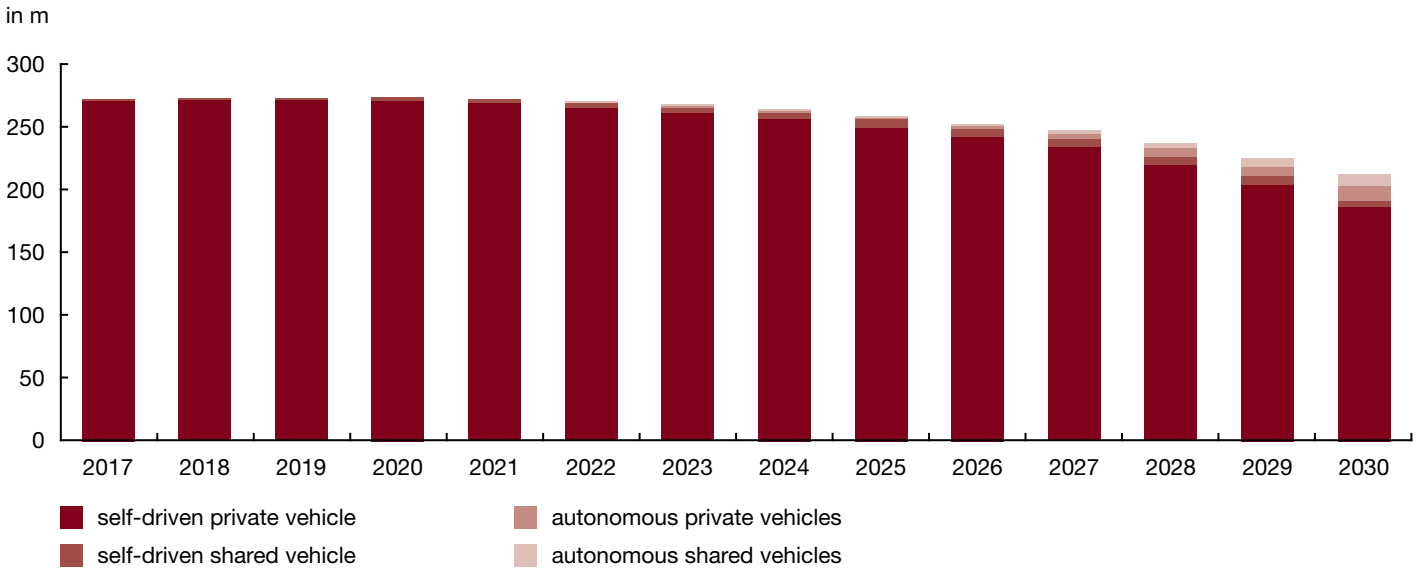
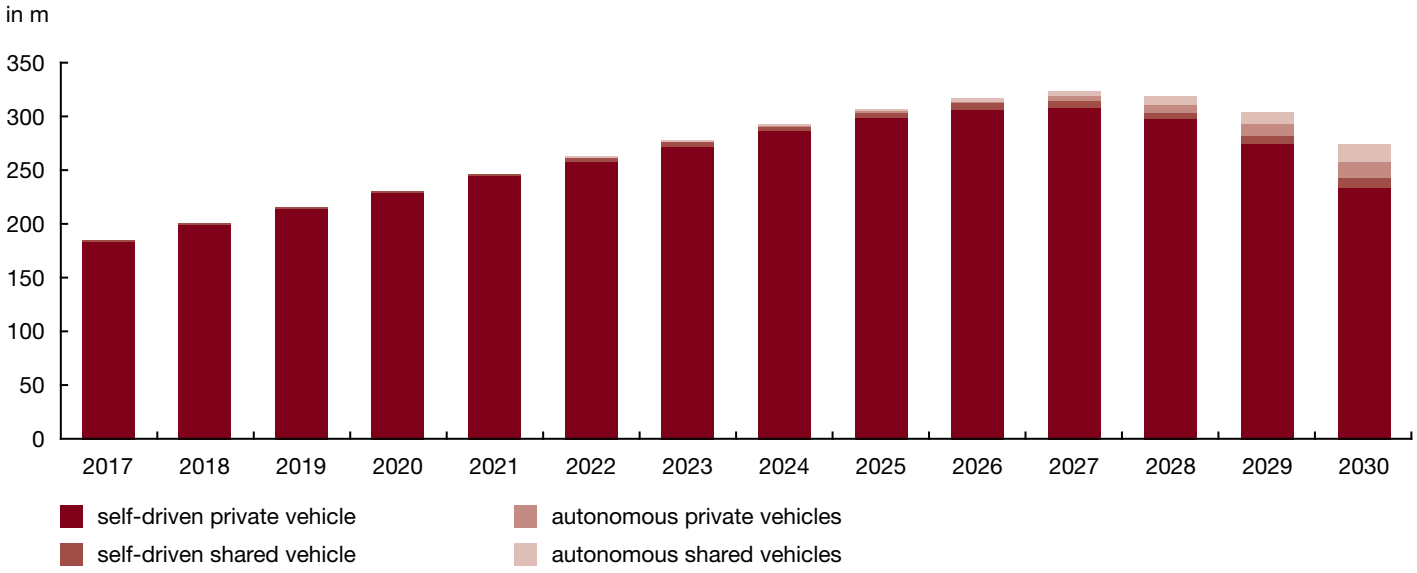


Fig. 21 China: Light vehicle inventory (2017–2030)



US

The various forms of mobility will lead to a possible reduction in the inventory from more than 270 million vehicles in 2017 to 212 million vehicles in 2030. Almost 7% would be given over to shared vehicles. And almost 10% of the vehicle inventory could be autonomous by 2030.

China

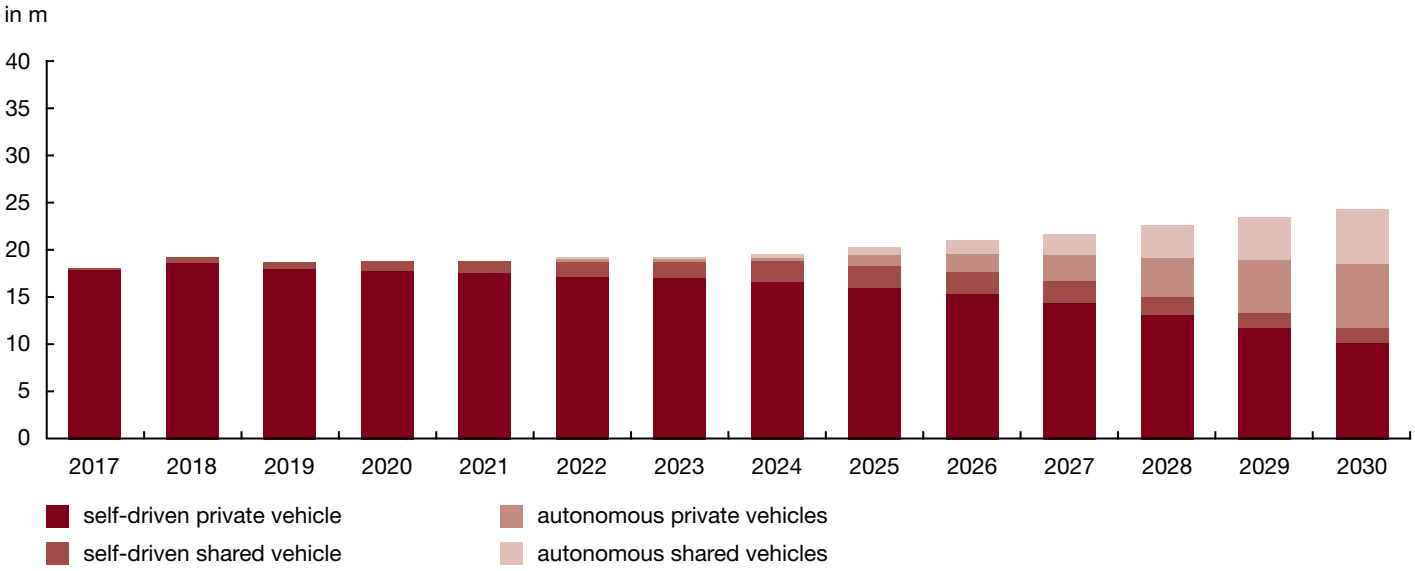
The vehicle inventory in China currently stands at around 180 million units. The strong upward trend in mileage, however, means that the inventory will decline in size later here than in Europe and the US. It could peak at more than 310 million units, before sinking again to over 276 million vehicles by 2030.

Vehicle sales will increase during the transformation of the automotive industry but could then drop

To calculate new car sales, it is necessary to know the estimated inventory, the average annual mileage and the total mileage. The latter two figures give the average time before which the vehicle must be renewed. Dividing the inventory by the renewal period gives the number of new car sales.

New car sales will increase in all the countries and regions studied. There are a number of different reasons for this. Europe and the US are slower-growing markets with mere single digit growth rates. China, on the other hand, is a strong growth market in terms of new car sales due to a growing population, rising motorisation rates and advancing urbanisation – even though new car sales are politically regulated to ensure the cities will not collapse. Alongside political and economic factors, changes in mobility behaviour will also have a major impact on future new car sales. As shown above, autonomous and shared forms of mobility have faster renewal rates, which will have a positive impact on new car sales.

Fig. 22 Europe: New sales of light vehicles (2017–2030)



Europe

New sales of cars and light vehicles could grow from today's figure of nearly 18 million to more than 24 million by 2030. As early as 2025, new car sales could include two million vehicles with Level 4 classification or higher. This figure would grow steadily to reach almost 12.5 million units by 2030. This would mean that one in every two new vehicles is already fully automated, which would complete the transition to the new normal of the "eascy" vehicle.

30% of new car sales could be fuelled by demand for sharing services at the end of the period under review, which would correspond to over 7.3 million units. We are, however, convinced that the differences in services are more likely to lead to an increase rather than a decrease in the popular vehicle types – but at heavily negotiated conditions.

Fig. 23 US: New sales of light vehicles (2017–2030)

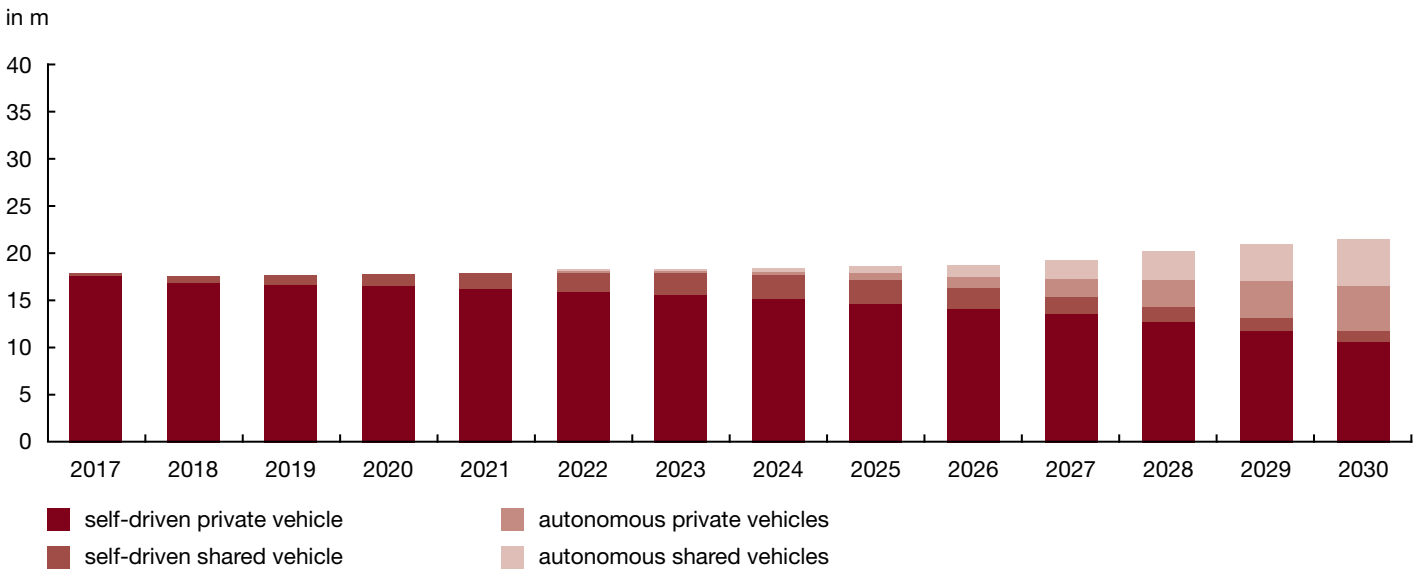
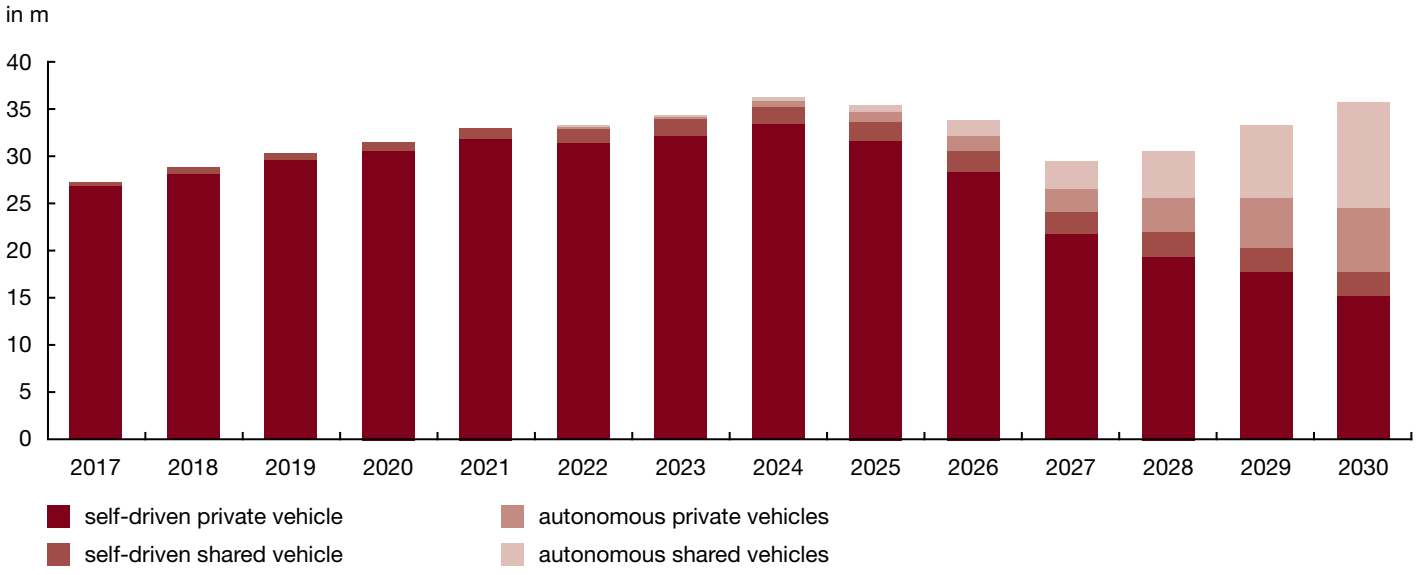


Fig. 24 China: New sales of light vehicles (2017–2030)



US

In order to cover the mobility demand, new car sales will grow from around 18 million to 21.6 million units. New car sales will continue to climb steadily and may not even have reached their peak by 2030.

Almost every second vehicle in the year 2030 could be at least automation Level 4.

China

New car sales could exceed 38 million, making this country the prototype for the transformation of the automotive industry. The strong upward trend in mileage means that the vehicle inventory will decline in size later in China than in Europe and the US. In combination with the strong increase in shared forms of mobility, there will also be a slump in new car sales. However, this will only be of a short duration due to the rapid replacement rate of shared vehicles.

The Robotaxi scenario

In a scenario that assumes that 100% of all mileage is covered in Robotaxis, new car sales could sink even further. This is because of the striking reduction in the inventory, which would not be compensated for by the increased replacement frequency of autonomous shared vehicles.

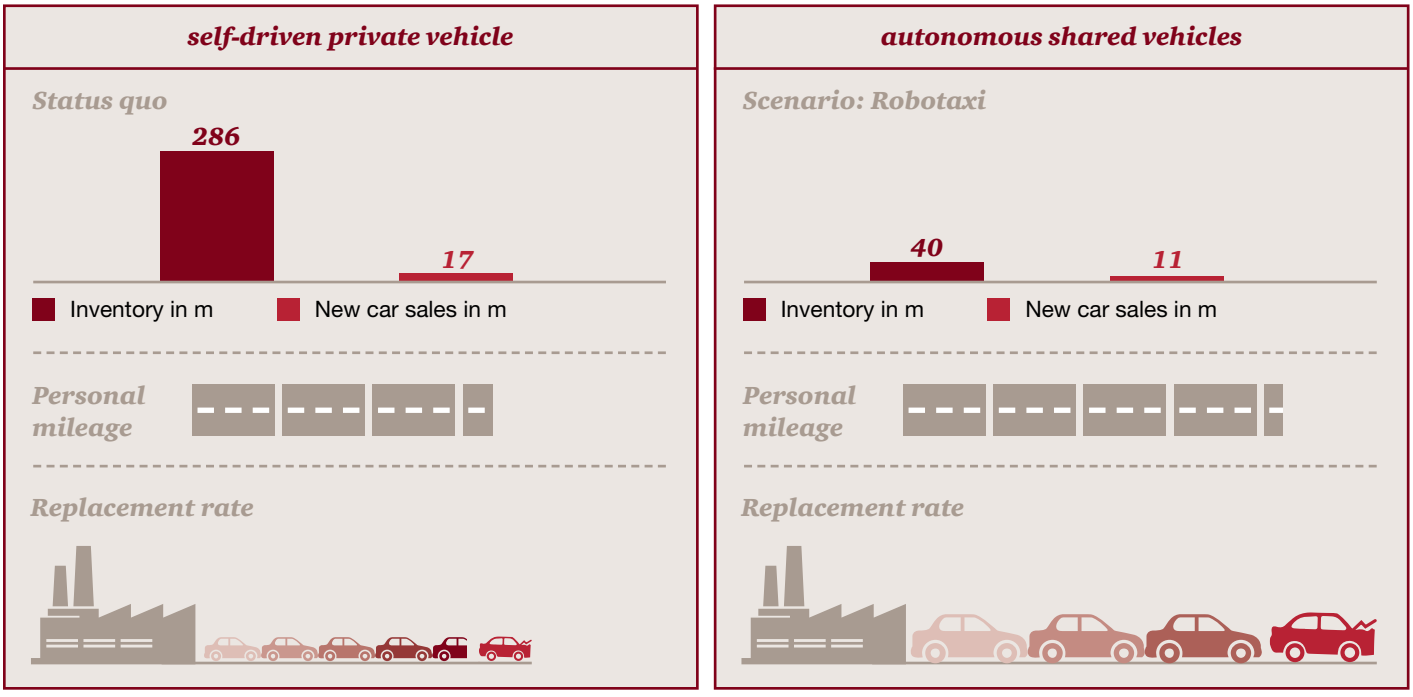
Key factors influencing this situation include the trend in mileage, the pooling factor and the mileage of future vehicles through to scrapping. In a pure Robotaxi scenario, these factors are subject to major changes, as there will be significant differences between urban and rural areas. PwC Autofacts calculates, however, that in such a scenario only 14% of the existing inventory will be required to satisfy the increasing mileage. This could result in a reduction of new car sales by up to 50%, as the change in inventory would carry greater weight than the shorter replacement rate.

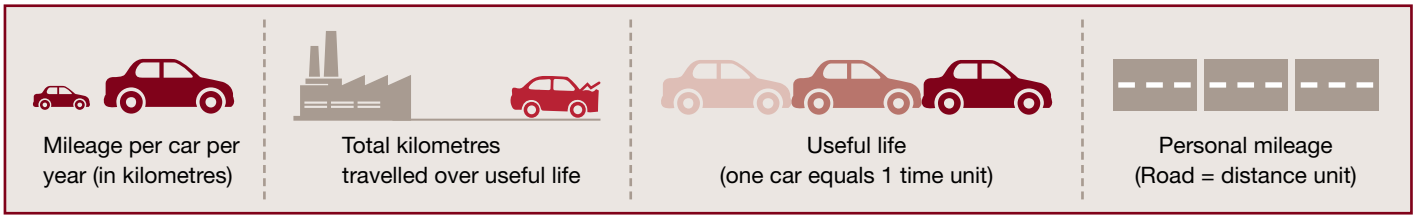
The actual manifestation will, however, depend on the aforementioned variables – both the distribution of the mobility demand within individual days or as a result of annual seasonal variations. Regular demand peaks could make it sensible to have a larger vehicle inventory available and thereby limit the theoretical decline in that inventory.

Likewise, we will need to wait and see how the technical lifetime mileage of these vehicles will develop. The current assumption of a strong increase considerably reduces the inventory turnover rate.

Fig. 25 Changes in market structure in a purely Robotaxi scenario

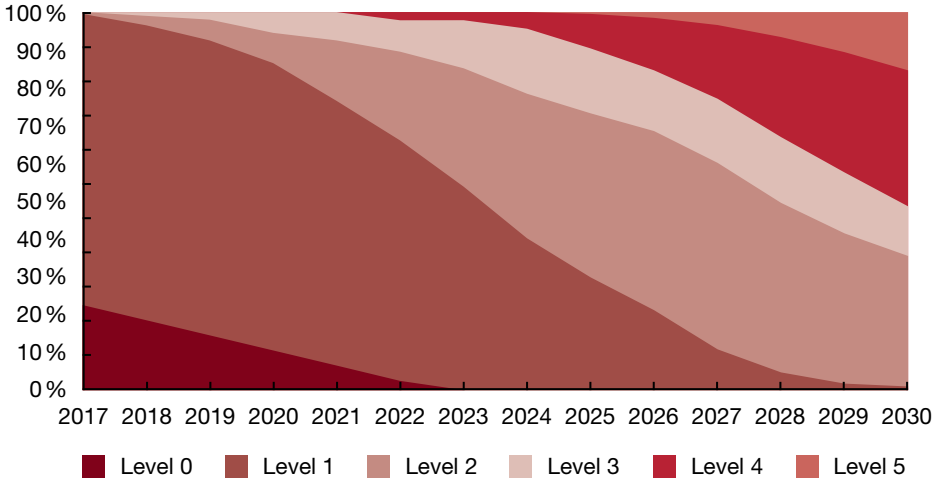
What does a world of shared, autonomous Robotaxis look like?





Automation and electrification are mutually supportive.
As explained above, the "eascy" model shows that most vehicles with Level 4 or Level 5 autonomy will be electric vehicles. The ongoing adaption of autonomous vehicles will enlarge the area of application of electric vehicles. This will result in a shift from a politically expedient facility to a customer-oriented demand. As a first step, autonomous vehicles will service the primary use case of sharing services. The requirements for shared forms of urban mobility are ideal areas of application for autonomous and electrified vehicles, as they ensure low-emission, user-friendly transport.

Fig. 26 Europe: Development of automation levels (2017–2030)



Europe

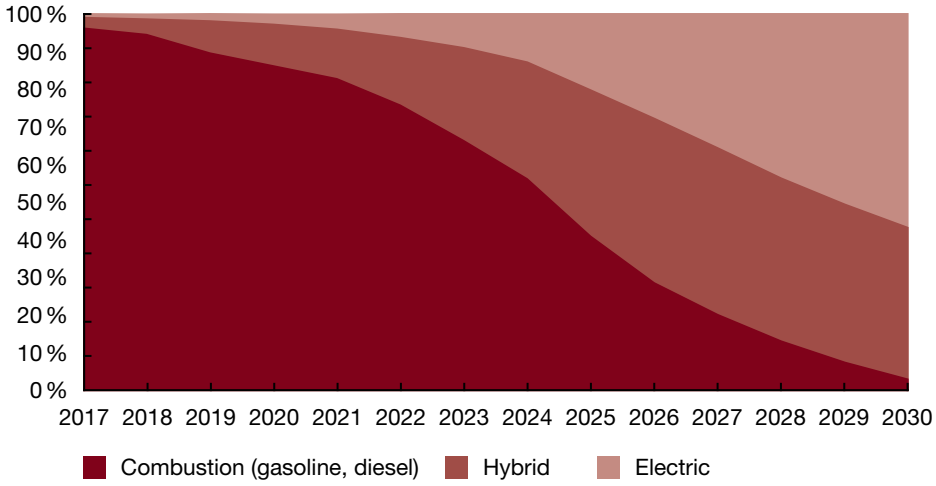
Vehicles in Europe are currently classified predominantly as Level 0 or Level 1. There are some vehicles at Level 2, such as the Mercedes E-Class with its "Intelligent Drive," and some with Level 3, such as the new Audi A8.

We assume an expansion of assisted (Level 1) through to partially automated (Level 2) vehicles. Automation (Level 3), on the other hand, will play a comparatively minor role, as the focus in the coming years is already on fully automated vehicles (Level 4), in order to satisfy the area of application for sharing services.

In the future, autonomous and shared vehicles will create an important use case for electric vehicles.

*In **2030** the majority of vehicles will be classified as **Level 2** and **Level 4**.*

Fig. 27 Development of drive systems (New car sales 2017–2030)



Europe

PwC Autofacts views regulation as a further factor in electrification. To quantify the dimension "electrified," we therefore chose an existing model, which puts the focus on the development of and compliance with CO_2 target values (see the article in the German Automotive Industry Association's economic barometer: "With electrification and combustion engines on our way to the future of mobility").

In addition to political and legal regulations, the interactions between electrification, automation and shared concepts could have a positive effect on the electrification of new car sales and the vehicle inventory. Depending on the penetration of autonomous and shared vehicles, the percentage of combustion vehicles among new car sales in Europe could drop to less than 5% by 2030. More than one in every two new vehicles could in the meantime be supplied with purely electrical drive. The importance of hybrid vehicles will rise consistently over the period under review, and by 2030 could make up more than 40% of all new car sales in Europe.

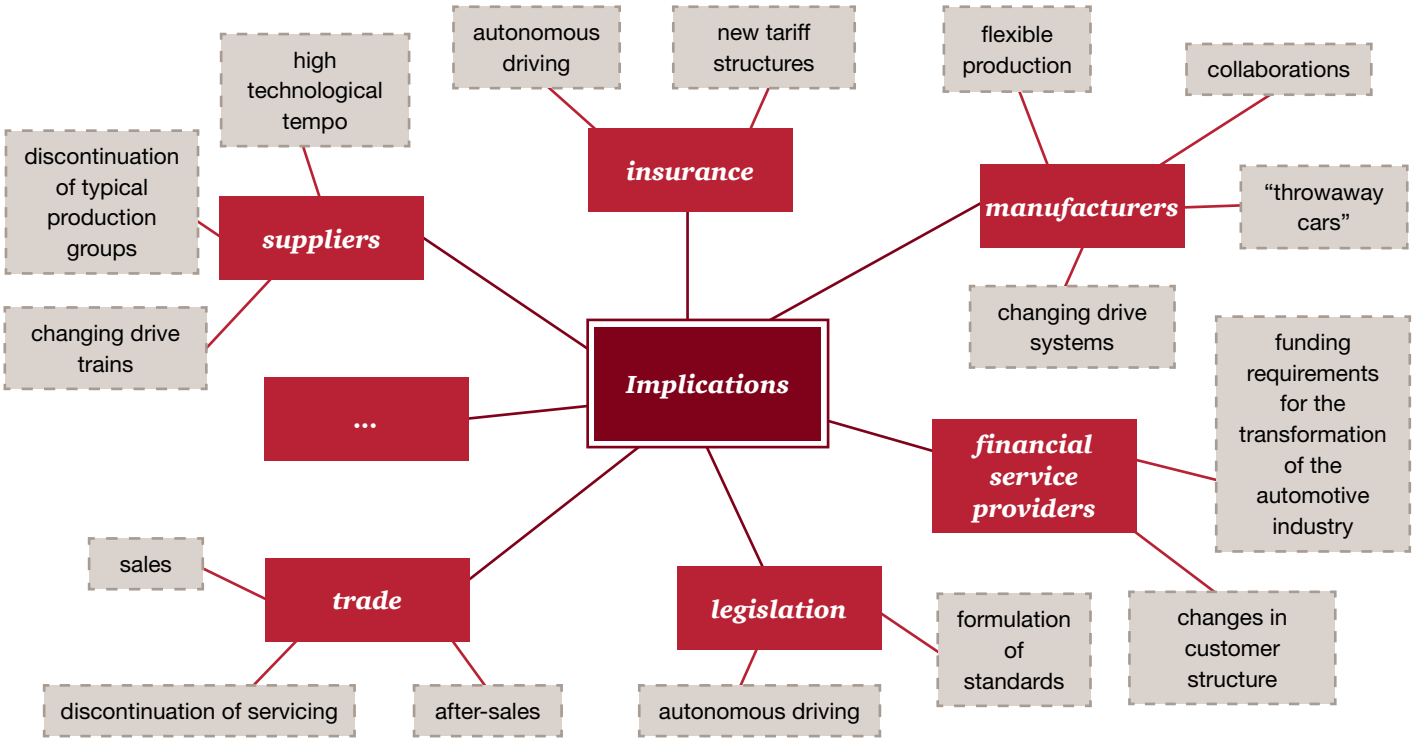
***Over 95%** of new car sales are expected to be partially electrified in 2030.*

5 What effects will this have on the automotive value chain?

Five of the top 20 companies with the highest R&D investment are manufacturers, but they do not feature among the 10 most innovative enterprises.

The comprehensive and rapid reorganisation of the automotive sector, as we predicted, will have far-reaching consequences for the entire industry and its value chains. Elementary structures and attitudes will have to change fast in order to cope with the developments by 2030 and beyond. If they want to remain successful, both the manufacturers and the suppliers will have to offer customer-oriented innovations. This report could form the basis for deriving the strategic and conceptual implications for manufacturers, suppliers, the automotive trade, as well as insurance companies and other financial service providers. The initial focus of our study is the classic automotive industry.

Fig. 28 Effects on the industry



Development budgets need to be redistributed fast

As mentioned above, only one automotive company [9] – Tesla – appears in the world's 10 most innovative companies. However, it is not a matter of the size but rather the type of the investments that counts. In order to rise to the challenges posed by the restructuring of the automotive industry, manufacturers and suppliers need to redistribute their budgets quickly and in a targeted manner. Research and development needs to focus on software and services – but also on manufacturing feasibility and the modularisation of vehicles. The software needs to enhance the performance of the products, while the services need to offer the customer additional functionality and improved user-friendliness – which in turn must be able to be flexibly integrated into the hardware.

Fig. 29 The 10 most innovative companies

2016 Rank	▲▼	2015 Rank	Company	Geography	Industry	R&D Spend ($billion)
1	▶	1	Apple	United States	Computing and electronics	8.1
2	▶	2	Alphabet	United States	Software and internet	12.3
3	▲	6	3M	United States	Industrials	1.8
4	▼	**3**	**Tesla Motors**	**United States**	**Automotive**	**0.7**
5	▶	5	Amazon	United States	Software and internet	12.5
6	▼	4	Samsung	South Korea	Computing and electronics	12.7
7	▲	NA	Facebook	United States	Software and internet	4.8
8	▶	8	Microsoft	United States	Software and internet	12.0
9	▼	7	General Electric	United States	Industrials	4.2
10	▲	9	IBM	United States	Computing and electronics	5.2

Source: PwC Strategy& Global Innovation 1000 Study.

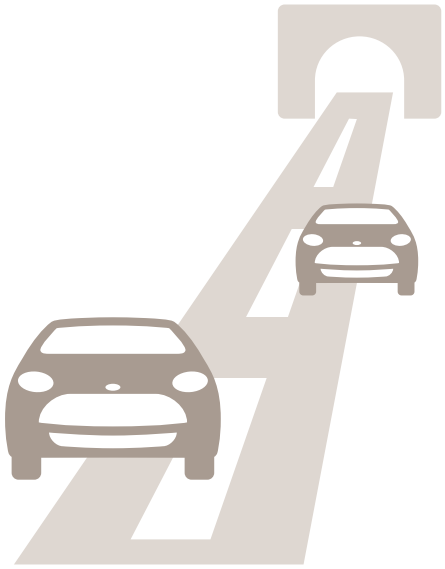
What must be done?

- Redistribution of investment towards more R&D in the areas of software and services.

[9] Strategy& (a PwC network business) (2016): Global Innovation 1000 Study, https://www.strategyand.pwc.com/innovation1000.

The decision about long-term survival will be made in the years from 2020 to 2025

The transition to the "eascy" world will be far from easy for the automotive industry. Traditional manufacturers and suppliers will be extremely vulnerable in the years ahead. They will have to battle against falling margins while at the same time making far greater investments in electro-mobility and new, customer-oriented innovations. The combustion engine, which was for decades at the heart of the German automobile industry in particular, will become obsolete. At the same time, more and more new competitors will force their way onto the market, which will make life difficult for the old timers. All these trends are likely to come to a head between 2020 and 2025 – which means that these are the decisive years for manufacturers and their suppliers.



What must be done?

- Building capabilities for the development of customer-oriented products.
- Investment in the electrical future to counter simultaneously falling margins for combustion engines.

***Five of the top 20** companies with the highest development investment are manufacturers.*

What effects will this have on the automotive value chain?

__Manufacturers__ must find a way to continue to invest in the future despite falling margins.

It's not just about cars – but also about mobility

Manufacturers and suppliers who continue to focus solely on the production and sale of automobiles will find it especially hard to manage the restructuring of the automotive sector. In the age of "eascy" it is no longer just the product but the mobility services that will be at the heart of the business model. This is the only way companies can continue to meet the changing expectations of their customers. It will be essential to link the "hardware" (i.e. the vehicle) with the "software" (i.e. the services).

Manufacturers, in particular, will have to make the fundamental decision about whether they wish to continue as a fleet or service provider. For some the right pathway could involve a strong focus on one of these two sectors while others may want to try their chances in diversification. Despite the huge challenges, some of the trends should give rise to optimism: Entering the field of mobility services could potentially open up access to new sources of income for manufacturers; but at the same time there will be increased pressure on the core business of the production and sale of cars.

Further information about the financial effects of the restructuring of the automotive industry can be found in the PwC 2017 study *Strategy& Digital Auto Report*[10]. This looks in detail at the effects of a "Roboconomy" and offers additional information on the digitisation of vehicles, the impact of the change in focus to mobility, profit shifting within the industry and the success factors of manufacturers.

What must be done?

- Business models need to be adjusted: Focus on mobility services instead of product.
- Clear and intuitive mobility offering by linking hardware with software.
- Review business purpose: Manufacturers as fleet, service or product provider?

[10] Strategy& (a PwC network business) (2017): Digital Auto Report, https://www.strategyand.pwc.com/.

Travel in the fifth dimension

The question about the future of the automobile is the question about the future of mobility. Instead of only focusing on the buyers of new vehicles, the future automotive value chain will include and integrate all mobility users. We hope that this study will make a constructive contribution to current and future discussions and thus help to support the development of forward-looking strategies today and tomorrow.

The "eascy" model and its implications have already provided us with a deeper understanding of the dynamics of the restructuring of the automotive industry. Further studies and modelling building on this foundation are certainly possible and could answer any further questions that may arise. Our arguments already use terms such as pooling factor, infrastructure efficiency, inventory coefficient and autonomy levels, which were only familiar to us as individual aspects at the start of the process. We are convinced that these key terms will determine future discussions and strategy planning, as they form a completely new model of automotive value chain – from manufacturers through to operators.

However, this does not mean that there will be no cars or car factories in the future – quite the opposite, as we have already shown: Our model gives a strong indication that the number of new car sales will rise noticeably each year, but at the same time the vehicle inventory will decline dramatically. Suppliers and car manufacturers will need to adjust to much shorter development cycles and improved recycling methods. New sales models will compete and converge with new operating models, autonomous driving algorithms will communicate with central transport systems, and electricity suppliers will attract new customers by advertising traction current and battery capacity. Traditional brands will expand their areas of business, new brands and competitors will attack traditional automobile companies. We have not explored many of the operational issues around restructuring here. For that, we refer to the series of PwC studies that look at other aspects in greater detail.

The model of our Western society is based on a division of labour. This cannot function, however, without trust in a common set of values and without the mobility of people, goods, capital and services. When we think about mobility, we always think about our civilization in general. Such a fundamental change to our current civilization demands changes in mobility and the primary energies that supply our society. Here at PwC, we are working intensely on combining the transformation in mobility with the move towards renewable energy and we are convinced that both challenges will make the fastest progress if they have a joint, integrated solution. We are looking forward to researching this route together and taking a bold step with you into the future.

Manufacturers and suppliers have to rethink their business model, focus attention on the user and offer "eascy" mobility solutions.

Methods: Market model

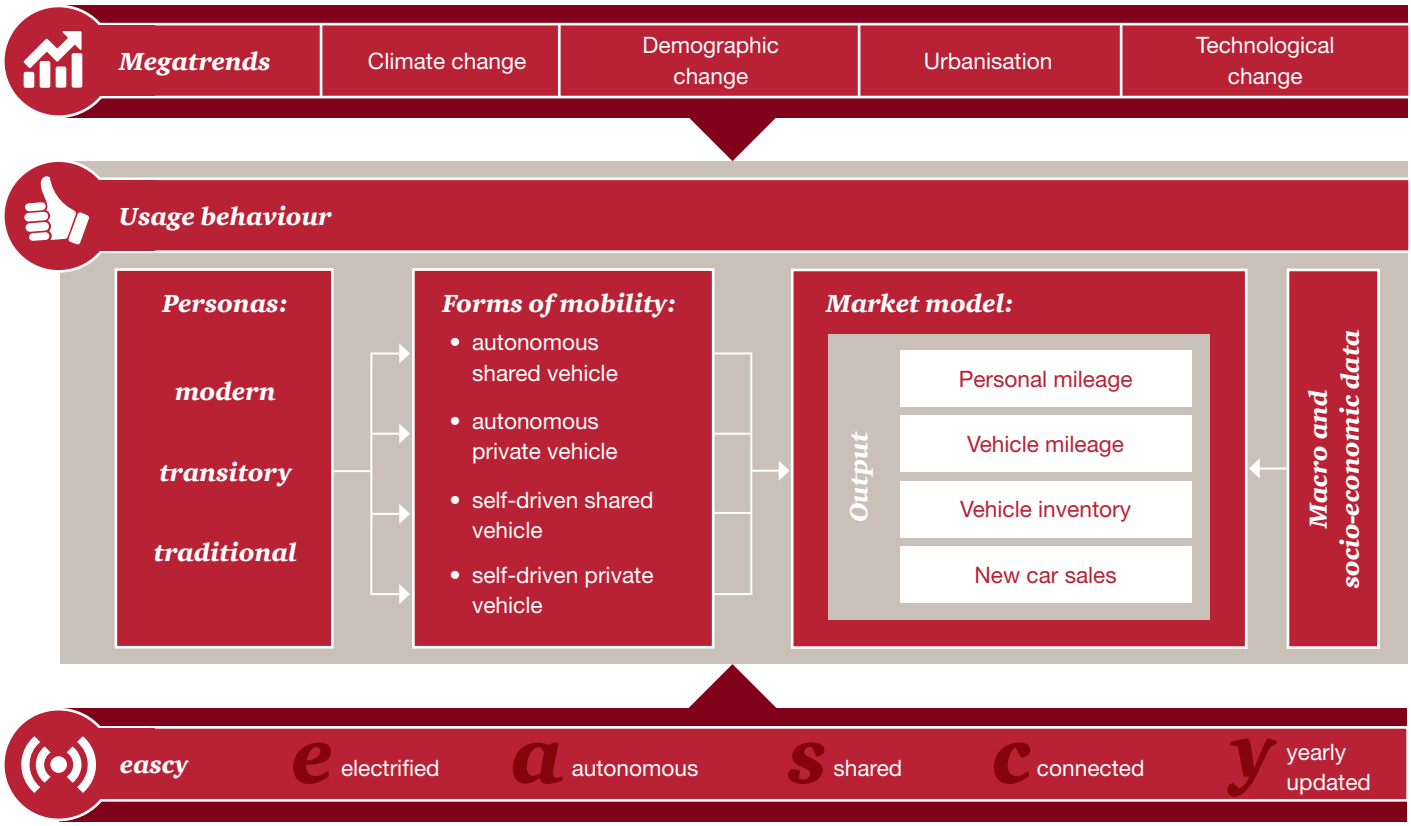
The findings contained in this study are based on a mathematical model developed by PwC Autofacts in order to quantify for the first time the effects of the five dimensions of "eascy." As described, over time vehicle sales and vehicle inventory will no longer be critical target figures.

It is therefore all the more important to know how these figures could change in the future. The starting point of the model is the user ("persona"), who will use forms of mobility in a certain way. Based on the modelling of usage behaviour, it is possible to work out personal mileage and vehicle mileage. These are the most important intermediate stages to calculating target figures.

We are happy to provide you with the individual evaluations and analyses of each of the countries and regions mentioned as well as individual industry sectors. Alternatively, we would be delighted to share our findings with you in a more detailed conversation.

"eascy" puts the focus on the mobility requirements of the customer, not the technical product itself.

Market model of the transformation of the automotive industry



Our expertise guiding you on your way into the automotive future

Felix Kuhnert
Partner, Global and German Automotive Industry Leader
Phone: +49 711 25034 3309
felix.kuhnert@pwc.com

Ray Telang
US Automotive Leader
Phone: +1 313 394 6738
ramesh.d.telang@pwc.co m

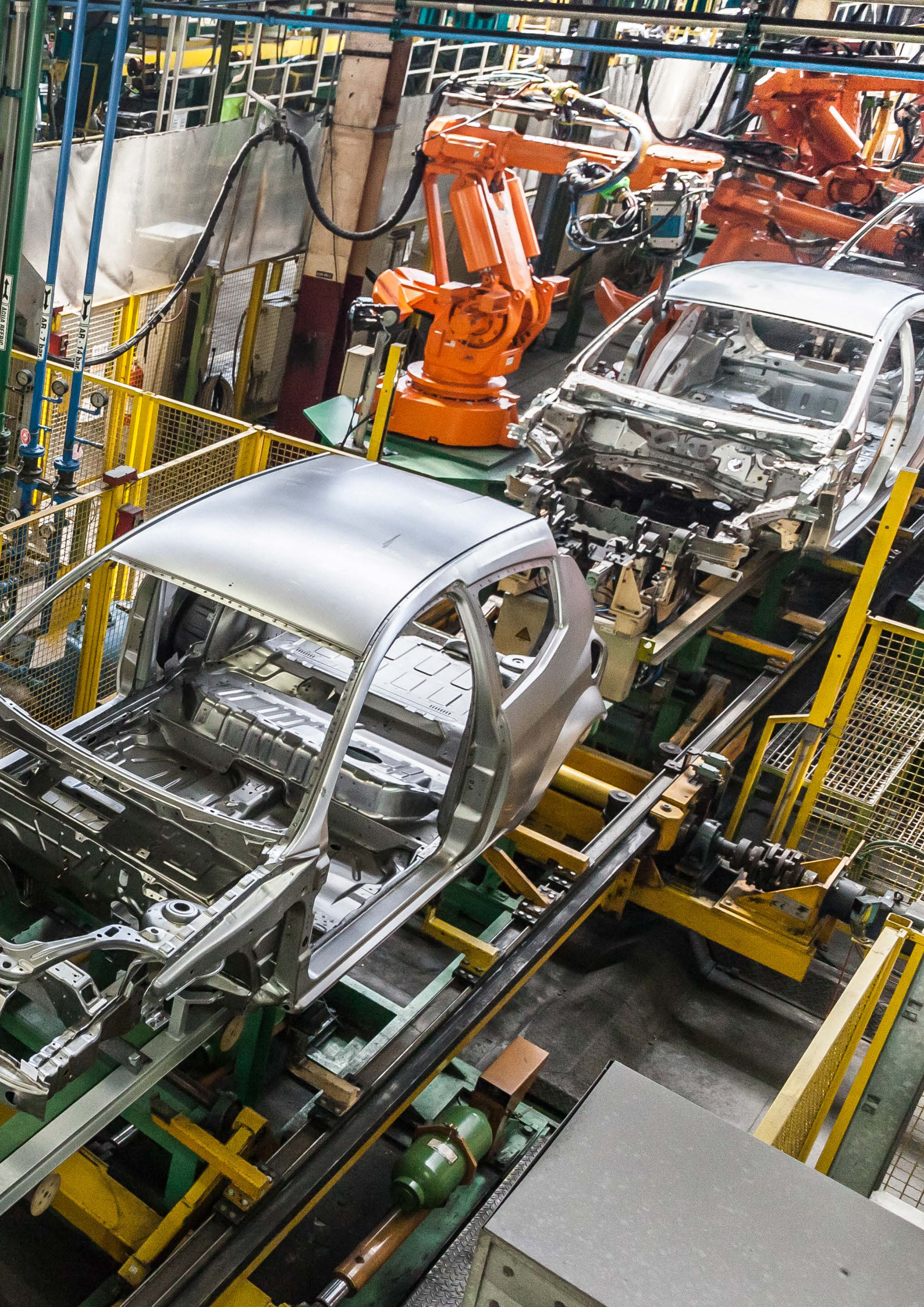
Wilson Liu
China Automotive Industry Leader
Phone: +86 (20) 3819 2278
w.liu@cn.pwc.com

Christoph Stürmer
Global Lead Analyst,
PwC Autofacts
Phone: +49 69 9585 6269
christoph.stuermer@pwc.com

About us

Every day, our clients face multiple challenges, want to implement new ideas and seek advice. They expect us to provide them with comprehensive support and to develop practical solutions with the greatest possible benefits. That is why for every client – whether they are global players, family businesses or public sector authorities – we bring out the entire arsenal of our skills: Experience, industry knowledge, specialist expertise, quality assurance, innovative spirit and the resources of our expert network across 158 countries. We are especially committed to fostering a close collaboration with our clients, as the better we know and understand them, the more specific support we can provide.

PwC. More than 10,300 dedicated people serving the Automotive industry in 21 locations. 1.9 billion Euro total output. Leading auditing, assurance, tax and consulting company around the world.


AGUA REFRIG
AR - 7 bar
AR - 14 bar

www.pwc.com/auto

Five trends transforming the Automotive Industry

Published by PricewaterhouseCoopers GmbH Wirtschaftsprüfungsgesellschaft

By Felix Kuhnert, Christoph Stürmer and Alex Koster

45 pages, 29 illustrations, soft cover