

BUSINESS SWEDEN



ACCELERATING CHANGE

HOW GLOBAL MEGATRENDS ARE TRANSFORMING
EUROPE'S AUTOMOTIVE INDUSTRY ECOSYSTEM

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INTRODUCTION

ADAPTING FOR A NEW FUTURE

CHANGING MARKET

The automotive industry is on the cusp of unprecedented change, but despite the challenges this is creating for global trade and the macro-economic environment, the industry is largely optimistic. While the changes ahead will be monumental, most industry players are well equipped to make the shift towards an automotive landscape that will be increasingly dominated by services, rather than products and will see more and more non-traditional players enter the value chain.

There are four key megatrends transforming both the global and European industry: decarbonisation, connectivity, autonomous vehicles and shared mobility. While each megatrend is evolving at a different pace, they are all influencing the way OEMs and suppliers interact and innovate to meet evolving needs and demands.

The new automotive landscape is emerging as a transformed sector, putting sustainability at the core of procurement and production processes while also creating a socially responsible value chain. Companies with sustainability built into their current and future operations and strategies have already begun to capitalise on the industry changes.

The industry faces complex infrastructure, regulatory and social challenges which are, and will continue to have a major impact on the velocity and adaptability of new technologies such as battery-driven vehicles, autonomous driving and shared mobility. But there is a common awareness and push to work collaboratively, across borders and industries to overcome these challenges and elevate the European automotive industry into a leading position. The industry is already leading the way in collaborative projects aimed at addressing sustainability to meet both social and regulatory expectations.

The Swedish automotive ecosystem has a long history of delivering innovation and sustainable solutions, which created a solid foundation for

tackling future challenges. Collaborative partnerships between Swedish companies and other European stakeholders are already redefining how the industry will operate in years to come. Sweden has invested substantially into knowledge and infrastructure to accommodate the R&D needs and manufacturing operations of international players. This has created an environment ready for global innovation partnerships.

ABOUT THIS REPORT

This report is based on an extensive study undertaken to gain a comprehensive view of European automotive OEMs strategies and the implications of these on the supply chain. The scope of the study covers the passenger car, light commercial vehicle and truck segments. The study was developed in the second half of 2019. This report gives Swedish companies an understanding of the new industry environment and recommendations for how to adjust to the changes, as well as giving international companies insight into the Swedish automotive landscape.

For the purpose of this report, short-, mid- and long-term time frames are defined as between 2020–2025, 2025–2030 and 2030 and beyond.

Business Sweden's study is based on personal interviews with top executives from most of the leading European automotive OEMs and OEMs groups, who, collectively account for approximately 1/3 of all vehicle sales globally and extensive consultations with leading automotive industry associations and experts across Europe.

The results from these interviews are backed up by analysis from multiple research papers of selected public and private institutions working in the field.

Erik Friberg
Head of the Automotive Europe Team
at Business Sweden



ERIK FRIBERG
Head of the
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Research participants

European OEMs and OEM groups	Automotive industry associations and experts
Volkswagen Group	European Automobile Manufacturers' Association (ACEA)
Scania (part of Volkswagen Group)	European Association of Automotive Suppliers (CLEPA)
SEAT (part of Volkswagen Group)	European Council for Automotive R&D (EUCAR)
FCA Group	Union of the Electricity Industry – Eurelectric
Daimler	Swedish Association of Automobile Manufacturers and Importers (BIL Sweden)
Groupe Renault	Scandinavian Automotive Supplier Association (FKG)
Jaguar Land Rover	MobilityXlab
Volvo Cars	CEVT in Sweden as an R&D center for Geely Group in Europe
Volvo Group	
IVECO	

EUROPE'S AUTOMOTIVE INDUSTRY IN NUMBERS (2017 AND 2018)



7%
of the EUs GDP

€84.4B
trade surplus for EU

28%
of total EU R&D spending



25%
of cars manu-
factured globally

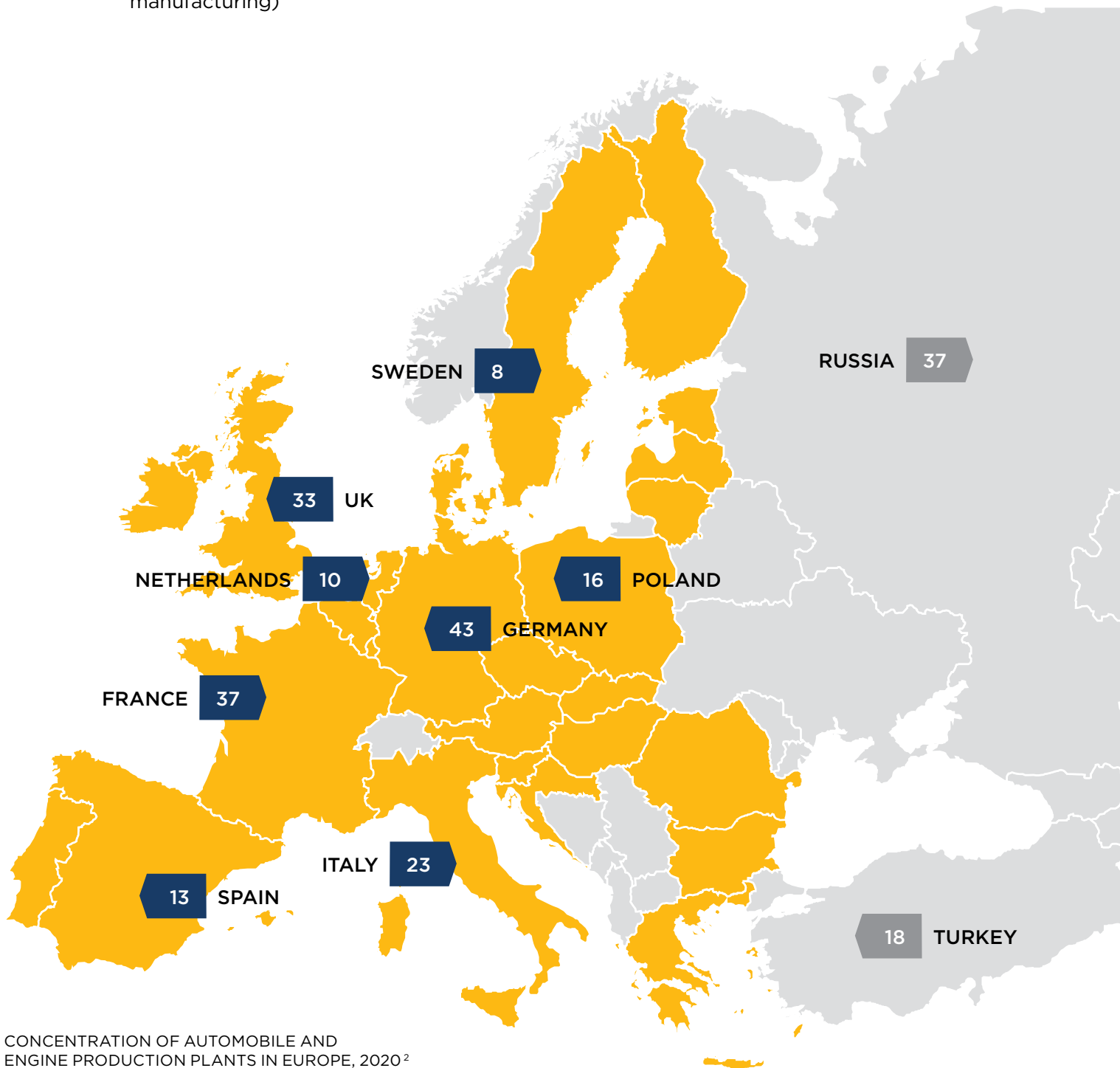
19%
of commercial vehicles
manufactured globally

19.2m
cars, vans, trucks and buses
manufactured each year



2.6m employees in direct automotive
manufacturing (8.5% of EU employment in
manufacturing)

13.8m employees
(6.1% of total EU employment)



CONCENTRATION OF AUTOMOBILE AND ENGINE PRODUCTION PLANTS IN EUROPE, 2020²

ALL EUROPEAN MANUFACTURERS	309	EU	229	NON-EU	80
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AUTOMOTIVE INDUSTRY – CORE OF EUROPEAN AND SWEDISH ECONOMIES

AUTOMOTIVE INDUSTRY KEY TO EU'S PROSPERITY

The continued development of Europe's automotive industry is critical in powering economic growth, spurring innovation and driving safe and sustainable mobility. The valuable turnover of the industry is the cornerstone of the European economy, bolstering a large supply chain on both the product and service sides. It drives upstream industries such as steel, chemicals, textiles as well as downstream industries including ICT, repair and mobility services. The automotive industry is also a crucial direct and indirect contributor to the European labour market, creating a huge number of skilled jobs¹.

The EU is one of the world's biggest vehicle producers for both European and the wider global markets, making Europe a true gateway for global exports. In both the Asian and North American markets, customers value the high quality of 'made in Europe' brands. But the industry is seen as more than high quality, it is also valued as a supplier of innovative products and solutions.

This innovation stems from automotive companies investing in European research and development, and the results are telling; in 2018, the majority of automotive global patents were awarded to EU-based industry players. This is supported at a strategic EU regulatory level as well as local levels with the European Commission offering a variety of research and funding programs aimed at preserving European technological leadership and competitiveness on the global stage.

The automotive industry has a long history of influencing European economies and with a clear link to many other industries, it has a significant multiplier effect, both during periods of growth

and downturn. The interdependency between the automotive industry's performance and the overall economic outlook cannot be underestimated, when one changes, the performance of the other is directly impacted.

This correlation has recently occurred in Germany where changes to exports of passenger cars have had a visible impact on Germany's GDP growth rate. This recent downturn in the automotive market has had a clear negative impact on the German economy which is largely dependent on vehicle production and exports. But it hasn't been restricted to Germany, there has been a visible impact on other countries' economies in the automotive value chain.

The crucial role the automotive industry plays as the engine of Europe's economy cannot be underestimated. Short- and long-term investment and innovation from traditional stakeholders and new players is crucial to meet the challenges of emerging megatrends and help Europe maintain its role in the global automotive landscape.

REGULATION AND PUBLIC AFFAIRS SHAPING INDUSTRY

Legislative developments at both the local and EU levels are considered key influences and business drivers by OEMs. Decarbonisation, particularly CO₂ reduction targets have shifted vehicle manufacturers' perspectives to meet some of the most challenging regulatory conditions while still meeting consumer price sensitivity. The EU is driving a step-change in reducing CO₂ in metropolitan areas by implementing low emission zones with the goal of improving city centre air quality. Significant future changes will include further restrictions on conventional internal combustion engines in ageing vehicles and a proposed CO₂ financial penalty structure.

However, industry and OEMs are primarily concerned by the challenge of adapting to regulations that give a short lead time. OEMs advocate for only introducing regulation that is based on facts and evidence and a robust impact assessment period. They claim that three years is the minimum time frame required to comply with new regulations, but policy makers want quicker change. OEMs believe the impact of ‘dieselgate’ and the loss of industry credibility is a key factor behind legislators demanding swift action.

The EU Commission 2019–2024 will need to agree and legally authorise legislation so development of specific vehicle functions can progress. CO₂ legislation is one key part, but connectivity and automation trends also require tailored legislation.

KEY CONSIDERATIONS FOR LEGISLATORS:



Data – New regulations are being prepared and will be agreed on in the next five years which will define data, access to data and data-sharing with third parties in the automotive industry. This would enable creation of new services and data monetisation.



Infrastructure – By as early as 2020, new regulations could be in place that govern the commitment and financing the deployment of charging infrastructure. This would spur the shift towards electrification in different vehicle segments.



Liability – Discussions are already in place that will influence automated vehicle liability legislation which is expected between 2025–2030. In this early phase, education is the primary focus with the view to inform about planned regulations.



Battery management – Battery reuse and the impact and requirements of overnight charging capacity are both areas that legislation will cover.



Homologation – Current approval of products is geared towards today’s conditions but an understanding of the scope of products required for future vehicle production needs to be established.



Building energy performance – Standardised practice of building vehicle charging points into new and renovated building projects is expected to appear in the regulatory framework.

Building of the regulatory framework is being supported by several new and existing programmes and research initiatives including Horizon and Connecting Europe Facility, which are providing valuable insight and financing into understanding both automotive and wider transport needs. The European automotive competency development programme, ‘Drives’, is identifying the short-, medium- and long-term competencies needed for the automotive industry to develop. The project will define the education curriculum for students in automotive related courses, a priority area for OEMs due to the lack of engineers with electromobility and connectivity experience.

The European Commission is consistently reducing funding for ICEV-related research and ramping up funding on projects focused on fuel cells, hydrogen and electricity. Regional cohesion funds have the potential to provide opportunities for financing the development of manufacturing facilities.

The EU is exploring the concept of Important Projects of Common European Interest (IPCEI) which will flag key initiatives and value chains with strategic EU-wide importance. This will offer exemption from state aid rule for projects that will have joint, well-coordinated actions and investments by public authorities and industries from several EU countries. Experts believe that charging infrastructure deployment projects could be within IPCEI scope, facilitating a quicker roll-out.

OEMs FOCUS ON PUBLIC AFFAIRS AGENDA

The emergence of an increasingly regulated environment, coupled with the need to collaborate in multi-stakeholder projects, is leading to many European OEMs increasing their focus on their public affairs agenda to understand where regulations are going and how it will impact on their businesses. OEMs are advocating for specific legislation to be considered at EU level with their public affairs priorities focused on:

Creating market conditions favourable for a transformation to sustainable transport

OEMs will develop their offer of electric vehicles but deployment of infrastructure, incentives and tax deductions to support the consumer uptake of electric vehicles is critical.

Retaining a skilled workforce in case of a downturn

During a recession or slow growth period, countries, companies or governments may share salary payments or introduce short working weeks which can help people retain employment status until prosperity returns.

Unified payment terms

Across Europe, company payment terms differ dramatically, with some setting 120-day payment terms which can impact finances and hit R&D investments.

Supporting the competence shift

An expectation that the EU will support the industry with programmes aimed at competency development and the anticipated European country race to implement the fastest shift.

Workforce mobility

OEMs need access to the best available competence and national legislations should enable movement and access to the best employees from outside of their countries.

THE SWEDISH AUTOMOTIVE INDUSTRY

As the single largest export sector, representing around a fifth of total industry investments, the automotive industry is the cornerstone of the Swedish economy. As the global automotive industry transforms at a rapid pace, Swedish automotive manufacturers and suppliers are facing new challenges. Sweden's history and position as frontrunners in automotive innovation, sustainability and safety sets it up as a force to be reckoned with in a highly competitive international market. There is extensive business generated around the four OEMs consisting of a considerable network of system, component and material suppliers.

Given the industrial value of the automotive industry, Sweden's reliance on the performance and development of the industry is of extreme importance. It is unusual for a small country like Sweden to host three major vehicle OEMs³, which contribute to Sweden's elevated position on the global market⁴. Equally, Sweden's automotive sector contributes to the global stage through vehicle production but also leading in the areas of safety and renewable energy in the transport sector⁵.

Employment and turnover impact of the Swedish automotive industry:

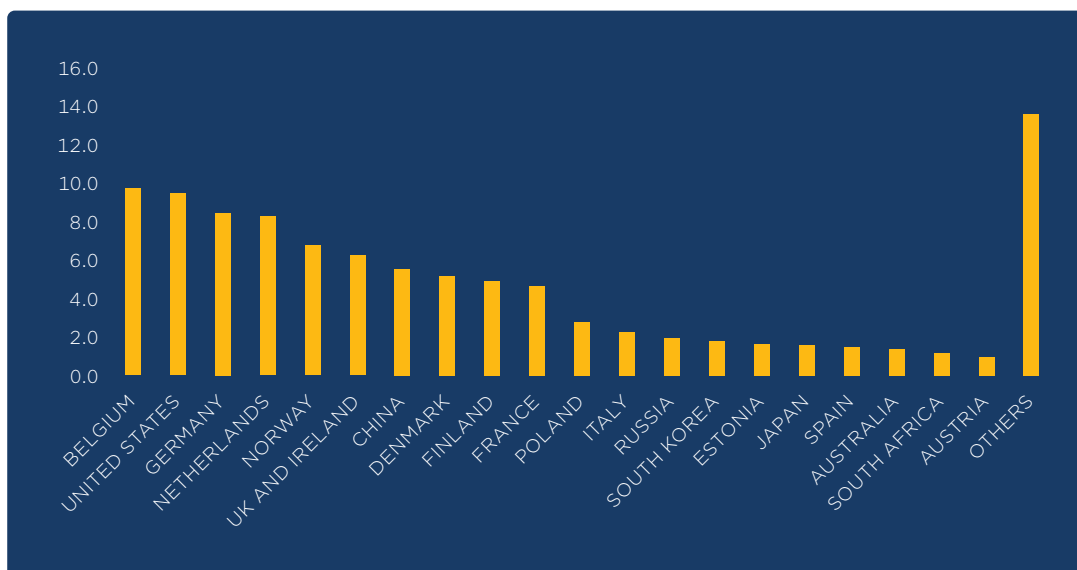
- Employs, along with suppliers, 155,000 people in Sweden.⁶ In order of most employees per segment: heavy vehicle, heavy and light vehicles, light vehicles, and construction equipment
- The Swedish automotive manufacturing sector employs 193,000 people globally, with 67,000 based in Sweden
- Has a turnover of SEK 336 billion in Sweden, in 2017. In 2019, SEK 82 billion value added (%of turnover contributing to GDP)⁷
- Contributes 13% of the value added to the entire Swedish production industry⁸

However, the contribution to the overall Swedish economy goes beyond direct employment or GDP figures. For every direct employment within the industry, a further two jobs are created within other sectors. The turnover of production of the Swedish automotive sector in total has increased

Key facts about the Swedish automotive industry export profile:

- Automotive accounted for 15% of total Swedish exports in 2018¹⁰
- 2/3 of all automotive exports go to Europe
- 86.5% of Swedish automotive exports were sold to 20 countries with the remaining 13.5% split among other countries.

SWEDISH AUTOMOTIVE EXPORT BY COUNTRY, SHARE OF TOTAL EXPORTS (%) 2014-2018¹¹



over the past five years and the added value has also risen, albeit at a slower pace to production value.

The automotive industry is a crucial export segment for Sweden, with Europe being the most substantial market. Between 2014–2018, the three largest recipient countries for Swedish automotive exports were Belgium, the United States and Germany⁹.

SWEDISH AUTOMOTIVE ECOSYSTEM

The Swedish automotive ecosystem has over 1,000 entities ranging from OEMs to Tier 3 suppliers. Suppliers are generally smaller in size than OEMs and tend to have a niche specialism rather than a broad OEM type scope¹². Tier 1 suppliers are commonly consolidated and owned by major international players while Tier 2 suppliers are facing consolidation with mostly strategic capital from both Swedish and international players¹³.

The automotive ecosystem has a wide geographical spread across Sweden but Gothenburg and Södertälje are emerging as hubs. There are clusters across the country and various collaboration opportunities between stakeholders exist through triple helix models. In practice, this can be seen with KTH and Chalmers University providing the latest research while Vinnova and Lindholmen Science Park drive innovation.

The Strategic Vehicle Research and Innovation Programme (FFI – Fordonsstrategisk Forskning och Innovation), is a partnership between the Swedish government and the automotive industry using joint funding for research, innovation and development concentrating on climate, environment and safety. FFI has R&D activities worth approximately EUR 100 million per year, half of which is government funding, and consists of relevant actors from the field. The support for this investment is based on the understanding that

road transport development and the Swedish automotive industry growth has a substantial impact on the economy.

Västra Götaland in the western part of Sweden is home to major players Volvo Group and Volvo Cars along with younger companies CEVT and NEVS. This is Sweden's top cluster and is also ranked as a three-star cluster in Europe based on size, number of employees, and economic influence¹⁴. Alone, this region employs more than 40,000 people and generates about 58 percent of exports and 20 percent of imports within the automotive sector¹⁵. In the region, automotive accounts for 10 percent of the collective GRP (gross regional product)¹⁶, and is the largest single sector in the area¹⁷.

A COMPETITIVE EDGE

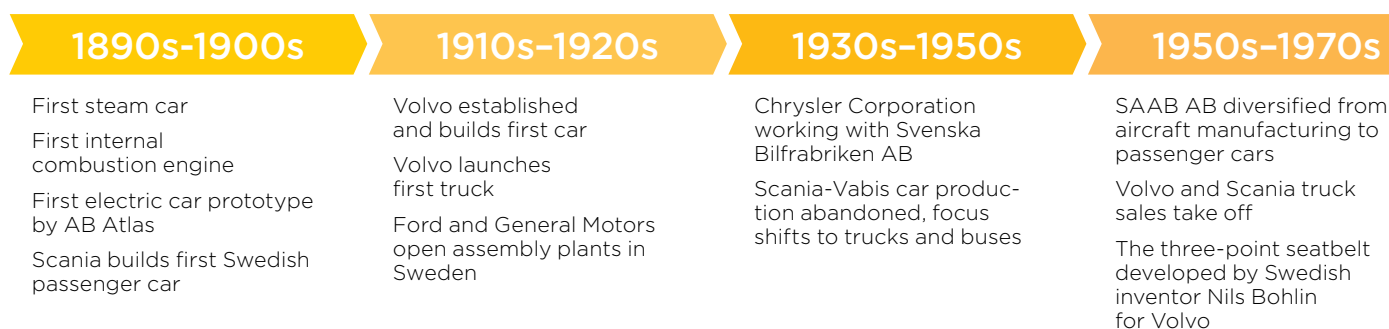
Swedish industry, and particularly the automotive sector, has a competitive edge in three areas: innovation, sustainability and safety.

Sweden consistently ranks in the top three global countries for innovation and topped the European Innovation Scoreboard in 2019, based on factors including, but not limited to, innovation-friendly environment and attractive research systems¹⁸.

The automotive industry leads the way in European innovation and registered the most patents per produced vehicle in 2016.

Sweden's position as an international tech leader makes it a strategic location for developers of ICT-based automotive applications and research leaders developing tomorrow's transport solutions. As technology revolutionises vehicles and their production, manufacturers are seeing the potential of localising production to regions with highly skilled labour and expertise in mobile communications systems, connectivity and automation²⁰.

HISTORY OF THE SWEDISH AUTOMOTIVE INDUSTRY

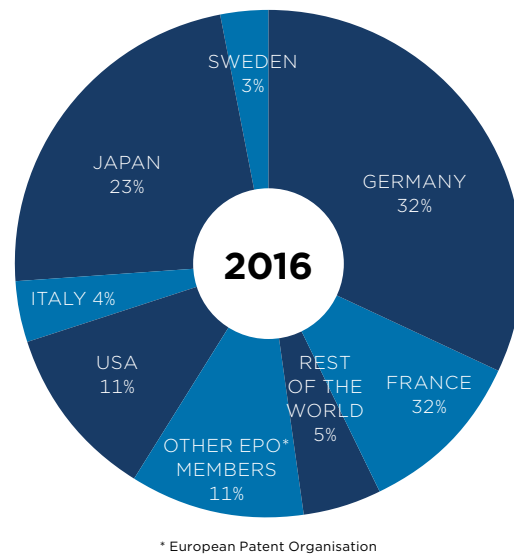


Sweden has an abundant supply of green and reliable electric energy with the lowest energy prices in Europe. Sweden is ranked second out of 157 in the UN's Sustainable Development Goals (SDG) Index²¹ and is ranked first in Europe for renewable energy use in transport. As a leader in the sector of climate friendly transportation, Sweden boasts a large share of renewable energy in the transport sector²² and is heading towards its target of a zero-carbon vehicle fleet by 2030. Sweden's strong sustainable foundation makes it the natural choice for green vehicle development. Innovation in Sweden is advancing new technologies for driverless cars, renewable fuels, electric transmissions and vehicle connectivity²³.

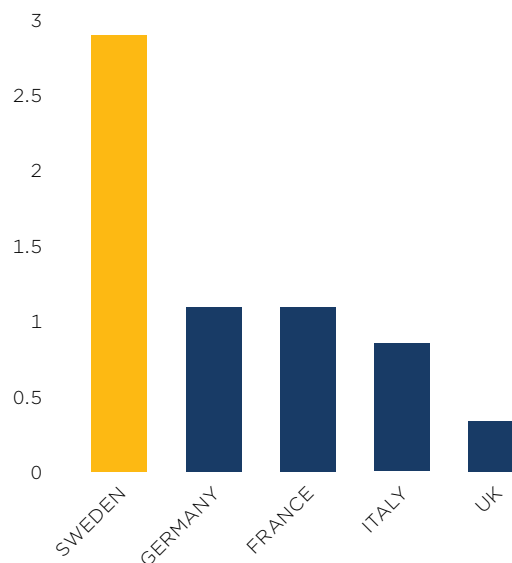
Historically, Swedish automotive manufacturing and development has had an immense impact on safety and developing safety has been a focus for the industry. Sweden is actively working towards a safer transportation environment, with collaborative projects like AstaZero owned by RISE and Chalmers, which includes partners from relevant fields in the world's first full-scale independent test environment for future road safety²⁴.

The decarbonisation, shared mobility, automation, and connectivity megatrends are shaping the future of the industry. Challenges arising from these trends include, but are not limited to, supply chain structure, the need of a shift in competence among employees, and a high-level consideration of the SDGs. The changing automotive industry landscape is forcing Swedish actors to focus on developing their future offerings. Sweden's competitive edge will play a crucial role in propelling the Swedish automotive industry towards full transformation and global relevance in an increasingly competitive environment.

SHARE OF AUTOMOTIVE PATENTS GLOBALLY PER COUNTRY, 2016¹⁹



NUMBER OF PATENTS PER VEHICLE PRODUCED, 2016¹⁹



1970s-2000s

Volvo passenger cars become popular in foreign markets
SAAB compete to scale in the international market

2000s-2010s

Sector shake-up with all major players engaged in M&A discussions
Volvo Cars sold to Zhejiang Geely Holding Group

2010s-Present

Volvo AB and Dongfeng Motor create joint venture to build heavy trucks
Scania sold to Volkswagen Group
Start-up Uniti Sweden starts development of high-tech electric city car
National Electric Vehicle Sweden (NEVS) starts electric car production
Automotive becomes Sweden's largest export industry
Automotive industry represents 1/5 of total industry investments

EUROPEAN MARKET IN A GLOBAL CONTEXT

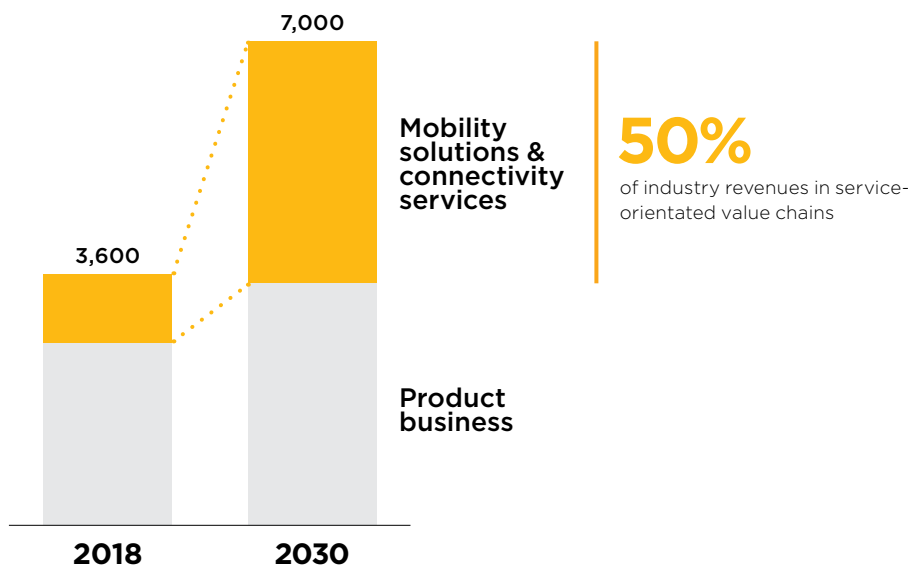
The European automotive industry is an important contributor to the global automotive ecosystem, which has in recent years experienced a significant downturn in production and sales. Around 20% of GDP slowdown and 30% of global trade decline in 2018 has been correlated to the automotive industry²⁵. Despite possible continuation of this negative trend short-term, the industry is optimistic and forecasts indicate significant increase of the global automotive revenue pool in the medium- and long-term. By 2030, industry revenues will nearly double and 50% is expected to derive from service-oriented value chains – mobility solutions and connectivity services. Car manufacturers will rely less on one-time vehicle sales but will focus on capitalising on business opportunities related to shared mobility, connectivity and aftermarket, which will rapidly grow. This creates a huge shift in OEMs perception moving more towards mobility producers from being only vehicle producers.

In a broader international perspective, the automotive ecosystem in Europe is unique, characterised by a dense and diverse network of global champions which is different to other key

ecosystems: the American ecosystem with data rich technology giants and wide financing possibilities, while the Chinese ecosystem is strongly supported by the government with respect to some industry trends, mostly electromobility. There are also certain challenges which are considered specific to the European context.

Internal and external factors are creating challenges that the European automotive industry must address to remain relevant globally. Industry experts and OEMs agree that cross-border and multi-stakeholder efforts are needed to address emerging megatrends. OEMs, suppliers, energy providers, research, academia, telecom operators, EU bodies, member states, local governments and others need to commit to a common understanding of European specifics, removing collaboration barriers and working together towards a greater impact to compete with the US and China. The proposed establishment of an European Mobility Valley has been cited as a way to break down competition between European stakeholders, including universities, who are competing against each other, to create more cross-border testing facilities and test labs.

GLOBAL AUTOMOTIVE REVENUE POOL EUR BN
% CREATED BY SERVICE-ORIENTATED VALUE CHAINS



EUROPEAN CONSIDERATIONS



CHALLENGING EU REGULATORY FRAMEWORK

A review of European competition policy is an area that has been flagged that could support partnerships and mergers at an earlier stage. According to OEMs, Asian competitors currently have an advantage as a direct result of strict EU competition policy which only assesses the internal perspective of the European industry landscape, and does not factor in the broader external risk. Many European OEMs believe quality and safety will give them the edge, but Chinese state-subsidised companies are slowly tapping into the market in a bid to get a bigger share.

The speed at which legislation can move and the impact this has on technology commercialisation is a concern for many OEMs. There is a contradiction in practice and theory which is a challenge for many OEMs. There is a shortening lead time to comply with regulatory change, but the decision-making process for legislative application takes a long time. In China, for example, legislation can change overnight, meaning concepts can be turned into tangible action quickly, enabling OEMs to react swiftly to market conditions and innovate accordingly. A suggested solution would be 'regulatory sandboxing', a mechanism for developing regulations that support and keep up with the fast pace of innovation. This flexible framework has worked in California, Nevada, Singapore and China.



INFRASTRUCTURE AND POWER SUPPLY

The underdeveloped charging infrastructure ecosystem and the slow ecosystem growth is a huge threat for electric vehicle uptake. Wider ecosystem thinking is needed to avoid OEM factories pressing ahead in developing products that meet CO₂ emission reduction targets but fail to get market traction because of poor infrastructure, lack of incentives and education to push consumer shift. Planning and distributing charging infrastructure to avoid saturation as well as standardised payment systems has also been lifted as a priority.

Fleet electrification will increase demand for energy production and distribution and the supply and grid across Europe must be improved to deliver. Even countries with relatively high electric infrastructure saturation like Sweden, will face challenges. Stockholm will only be able to start meeting the expected power demand by 2026–2027, a challenge given the rapid march of the decarbonisation trend.



INTERNAL INDUSTRY CHALLENGES

The automotive industry sees growing internal challenges which need to be addressed at the company level. There is an increasing workforce competency development demand, seeing the inversion of roles between hardware and software in vehicles of the future. Competencies looked for in production will shift from mechanical to software engineering, therefore, OEMs need to be able to attract employees with different types of skills than in the past. Market development related to key megatrends requires higher R&D expenditures, putting more financial pressure on automotive companies, as well as necessity of business models modification and collaboration with a variety of partners. Adapting to the new automotive landscape will be a costly transformation.



CONSUMER BEHAVIOUR

Increased sustainability efforts on the regulatory side are supported by growing societal awareness regarding the need to protect the environment. Consumers are becoming increasingly aware of the wider political and social discussions about climate change, and becoming more and more interested in sustainable transport. At the same time, electric transport is considered a premium solution due to its high prices and limited incentives for individual users, which keeps many consumers in the waiting mode for forecasted price development in the electric car segment. Additionally, concerns about insufficient availability of charging infrastructure is contributing to the low adaptation of electromobility among Europeans. Consumers are also embarking on new mobility models, with shared mobility spreading across more tech-savvy markets.



GLOBAL TRADE ENVIRONMENT

For many years, the automotive industry has been considered a global ecosystem with truly international value chains. Today, a shift from globalisation towards regionalisation is becoming more common, largely driven by trade conflicts and protectionism trends. The global automotive market could potentially be destabilised by Brexit, considering there are over 30 production plants in the UK. Electrification trend is also posing a risk for new types of dependencies to emerge – with ICEV prevalence, Europe experiences fuel dependency, while in case of electrification it shifts towards battery dependency.



AUTOMOTIVE MEGATRENDS IMPACTING OEMs AND THE SUPPLY CHAIN

Global megatrends are impacting on nearly all industries and the automotive industry is no exception. Sustainability, urbanisation and digitalisation are driving unprecedented industry-specific change in the form of decarbonisation, connectivity, automation and autonomous driving and, shared mobility.

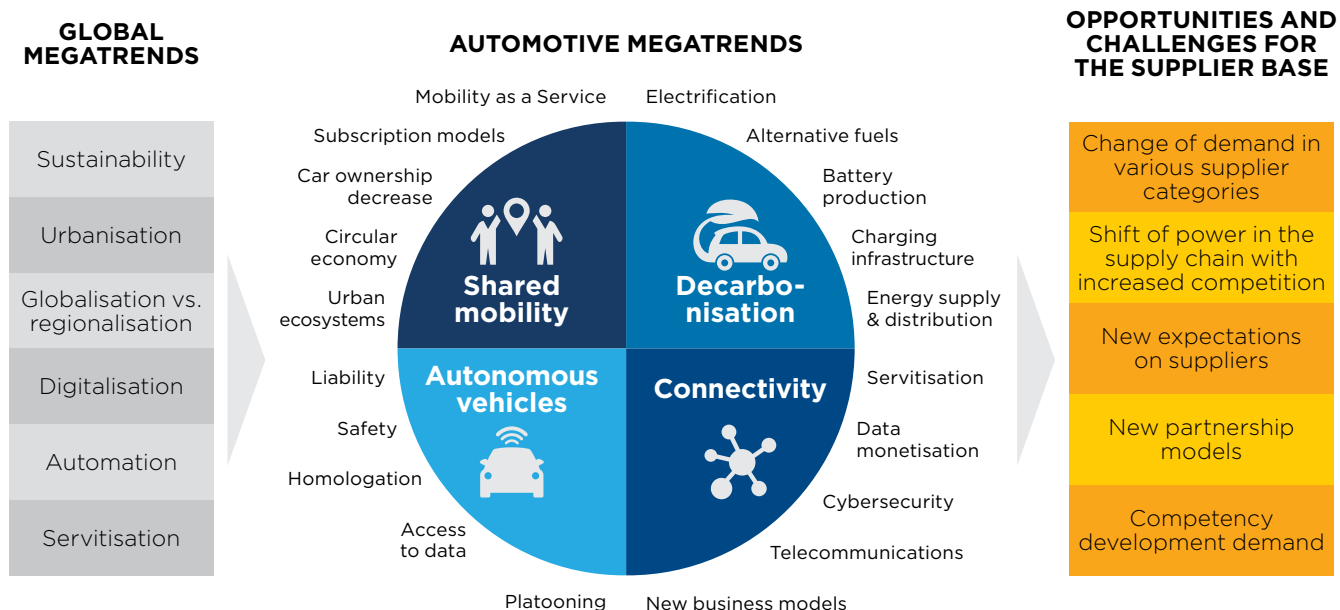
These trends do not stand in isolation but are intersecting and influencing development across the entire automotive ecosystem. The scope for change

being driven by these trends is far-reaching, creating vast opportunities but also challenges for the supplier base. New investments, business models and corporate cultures are being explored and introduced by OEMs, creating an automotive landscape that will be nearly unrecognisable in decades to come. To succeed, or indeed to survive in this evolving, redefined environment, automotive suppliers must take action and adjust.

“Key megatrends are driving significant changes in the industry right now. They are a milestone, not threats. The industry is being shifted out of its comfort zone.”

Erik Jonnaert, former Secretary General, European Automobile Manufacturers Association (ACEA);
Special Envoy Road Safety, International Organization of Motor Vehicle Manufacturers (OICA)

GLOBAL AND AUTOMOTIVE MEGATRENDS AND THEIR IMPACT ON THE SUPPLIER BASE





DECARBONISATION

The current common understanding among automotive OEMs and industry experts is that decarbonisation is the most disruptive trend and will continue to have a substantial impact on manufacturers' strategies and planned investments in the foreseeable future.

The European shift towards an automotive ecosystem which sustainably reduces and compensates emissions of CO₂ is being driven primarily by ambitious CO₂ reduction targets defined by the EU regulatory framework. The industry is under pressure given the relatively short lead times to adapt.

In April 2019, the EU decision-making bodies agreed on further reducing the average CO₂ emissions for the newly registered EU fleet. The targets are defined as a percentage decline from 2021 starting points:

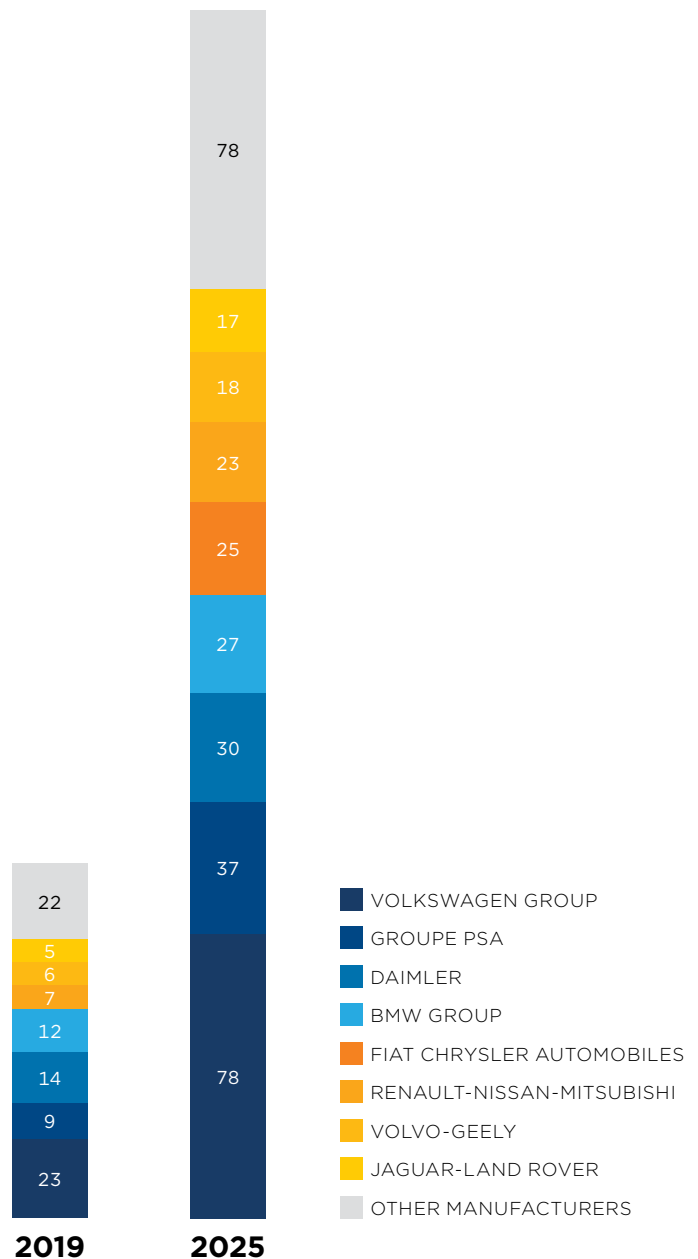
- Passenger cars by 15% in 2025 and by 37.5% in 2030;
- Vans by 15% in 2025 and by 31% by 2030.

Similar logic has been adapted for reduction targets for the heavy-duty vehicles segment, which came into force in August 2019. These are compared to the EU average for the reference period of July 2019 – June 2020²⁶:

- 15% reduction of emissions from 2025 to 2030, and then,
- 30% reduction from 2030 onwards (compared to EU average in the reference period: July 2019 – June 2020).

These targets will be reviewed regularly and depending on market adherence, may be accelerated.

While these targets are considered the most demanding in the world, they have been set to achieve international objectives from the COP21/ Paris Agreement to support transition towards a low-emission economy. Financial penalties will be applied if targets are not met which could result in manufacturers losing billions of euros. At the current rate, the penalty potential for OEMs present in the European market is estimated at over EUR



NUMBER OF ELECTRIC CAR MODELS COMING TO MARKET IN EUROPE, 2019 & 2025²⁸

“Between 2020–2025 suppliers might get their last big orders for platforms for combustion engines. Now is the time to look at portfolios and decide on a future production direction.”

Marco Philippi, Corporate Director,
Strategy Group Procurement, Volkswagen Group

30 billion²⁷. The potential financial penalties for not meeting decarbonisation targets has elevated its priority in strategy and investment plans over the other three megatrends influencing the market. Reducing CO₂ emissions is non-negotiable for all OEMs.

Meeting the current European regulatory framework of optimising emissions through decarbonisation will only be achieved by replacing combustion engines with electric. Despite their limitations, battery-driven electric solutions are today seen as the prevailing technology for the short-, medium- and long-term by approximately 50 percent of passenger car OEMs.

There are clear and bold signals that the market is recognising and reacting to the urgency of decarbonisation. Some manufacturers have decided to fully bet on electrification and exclude ICEV from their production portfolio, and the last procurements related to combustion engine platforms are set to take place between 2020–2025. The volume of electric models produced across the EU is about to rise to significantly new levels²⁸.

Combustion engines will remain relevant in the coming decades, primarily in more conservative and less developed markets but will be slowly replaced by both plug-in and mild hybrid alternatives. Although hybrid solutions are not considered as economically efficient, they are being viewed as important bridging technology for consumer acceptance of electrification. In the long-term, hydrogen-based fuel cells are the next potential technology to disrupt the market. In the short-term, perceived issues with infrastructure and storage limitations are preventing rapid commercialisation of hydrogen-based fuel cells, but the majority of European OEMs are working on R&D plans that will include it in their powertrain mix between 2030–2040.

The light commercial vehicles segment is also set to follow the electrification trend with EV and hybrids expected to emerge as the leading technologies in both the short- and medium-term. But manufacturers in this segment see large potential for alternative fuels such as natural gas, biofuels

and hydrotreated vegetable oil (HVO) especially in markets with access to considerable volumes of these fuels. On the basis that OEMs in the light commercial vehicle and truck segment already have good results in reducing emissions and since these alternative fuels require less substantial infrastructural investments, they are lobbying to have alternative fuels included into the mix of EU CO₂ emission reduction technologies.

The heavy-duty truck segment is expected to be the last segment to join the electrification trend. Combustion engines will remain relevant even in the long-term, but technology developments are expected to increase the importance of hybrid, alternative fuels and battery-electric solutions.

Even though battery-driven electric solutions are the technology that many manufacturers are focusing on, there is awareness in the industry that the future automotive landscape will consist of a mix of different powertrains and there is no one-size-fits-all solution. Technologies will vary depending on:

Type of vehicle – Passenger cars present the largest potential for electrification, but with differences in potential depending on car segment. The entry level segment is expected to be difficult to electrify due to price acceptance.

Route – Uptake of electrified vehicles is expected to spread faster in urban areas than in areas where long-haul transport or distances are required.

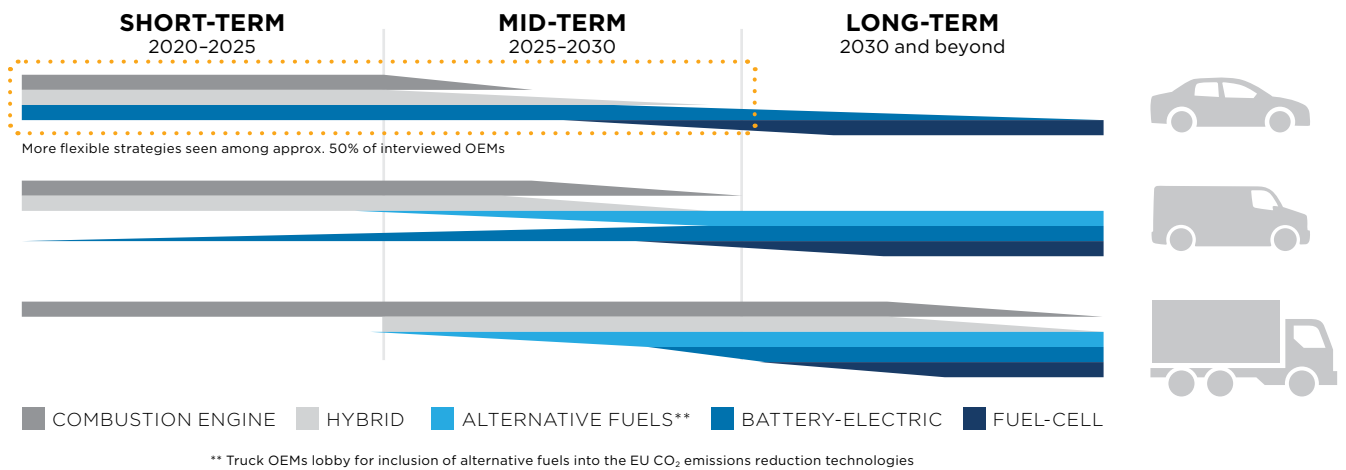
Market – Many European markets will lag behind the leaders and retain a high demand for ICEV as the uptake of electric vehicles correlates with GDP and charging infrastructure saturation.

Customer group – OEMs with several brands in their portfolio are planning to have different strategies depending on the brand. The premium car segment is expected to keep combustion engines for longer.

“Electrification will shift European dependence from fuel to battery. Batteries, along with other fuel sources like fuel cell technologies need to be developed in Europe.”

Erik Jonnaert, former Secretary General,
European Automobile Manufacturers
Association (ACEA); Special Envoy Road Safety,
International Organization of Motor Vehicle
Manufacturers (OICA)

FORECASTED TECHNOLOGY PREVALENCE, BY VEHICLE TYPE



Despite a shift in strategic development by European OEMs to increase investment in their capacity and operational footprints, reorganisation of internal structures and redesigned partnership models, electric vehicles have yet to reach consumer acceptance levels. In 2018, of all the cars sold in the EU only two percent of all cars were electrically-charged and 3.8 percent were hybrid²⁹. Electric vehicles are considered a premium product, with many consumers seeing both affordability and convenience as purchase barriers. The absence of real incentives or tax exemptions means many consumers are taking a ‘wait and see’ approach until price and sustainability factors converge. This has resulted in just six countries, all with high GDPs, responsible for over 80 percent of all electric car sales within Europe.

The high cost of electric cars can be directly attributed to batteries with around a third of the total price being battery-related. Industry experts believe that further investment is needed in battery technology developments with a shift towards solid-state batteries, which will deliver an acceptable price reduction to meet consumer acceptance.

Charging infrastructure is fundamental to both consumer convenience and practical application of electrification for both private and commercial use. As of 2019, there were only approximately 100,000 charging points in the EU and only one public charging point for electric trucks in Gothenburg. While France, Germany, the UK and the Netherlands have 76 percent of these charging points, they are not among the countries with the highest air pollution levels which is where electrification is

most needed. Standardised charging infrastructure, electricity supply and distribution grid improvement are the key challenges which OEMs and industry experts are raising at the EU level.

The European automotive industry is calling on EU institutions to adapt the regulatory framework to facilitate the fast-track roll-out of charging infrastructure and ensure member states commit to joint European goals. OEMs are running parallel projects to facilitate cross-border infrastructure deployment. Projects like IONITY, a joint venture with BMW Group, Daimler AG, Ford Motor Company, and Volkswagen Group with Audi and Porsche is working on building a high-power standardised charging network along the major European highways.

Electrification of heavy-duty long-haul transport could be facilitated by alternative charging solutions such as electric roads, currently being tested in a few European countries. Continuous charging along electrified highways, instead of charging at specific charging points, is considered by some OEMs as having huge potential for heavy transport. There are different ongoing pilot projects testing electric roads and Swedish experience in this field is significant, with three types of charging being tested:

- 1 Charging from overhead power lines in Gävle
- 2 Charging from conductive feeds in the road next to Stockholm Arlanda
- 3 Initial phase of inductive wireless charging in Gotland.

“Removing barriers to electric mobility and making the shift easy and convenient is imperative. Every consumer should have a ‘right-to-plug’, but the roll-out of public charging points must accelerate. By 2025, we need 1.2 million public charging points in Europe.”

Kristian Ruby, Secretary General, Eurelectric

Market readiness towards the decarbonisation trend



Infrastructure

Electric charging infrastructure seen as a major obstacle for market development.

Vast differences in charging infrastructure saturation between EU countries.

Unified charging payment system required.

Consumers

Alternative vehicle uptake defined by:

- GDP
- Charging infrastructure saturation (v battery capacity)
- Price v availability of subsidies

Consumer convenience not being addressed and is hindering market growth.

OEMs

Resigning from ICEV and investing intensively in electrification.

Forecasted price decrease for electric and hybrid models.

Lobbying for infrastructure deployment and initiatives to enable electrified vehicle market growth.

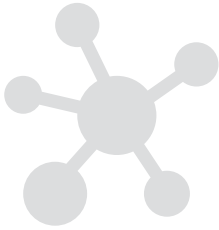
Implications for suppliers

The decarbonisation trend is primarily impacting the market outlook for the powertrain suppliers focused on ICEV as OEMs rapidly move to address tough emission regulations but also the increased focus on sustainability, consumer expectations and market development.

Electrification is also expected to lead to a major shift of manufacturing-related employment in the EU automotive industry. Electric engines only require around 50 components compared to 700 for a combustion engine, and subsequently significantly less labour. This shift is projected to remove approximately 400,000 ICEV component-specific manufacturing jobs from the EU before 2030³⁰. Conversely, electric vehicle production XEVs will create 100,000 manufacturing jobs across the EU before 2030.

European OEMs perceive the ICEV supplier base as having low readiness for decarbonisation while they perceive most of the large Tier 1 suppliers to be prepared. It is anticipated that the most technically-capable Tier 1 suppliers will gain power in the supply chain, as they become primarily responsible for manufacturing electric engines. This is a shift for OEMs who hold the power in the combustion engine manufacturing process. Autotech, software and traditional hardware suppliers are expected to be less impacted by decarbonisation.

Decarbonisation will lead to having more focus on the sustainability aspect and decreased CO₂ footprint among drivers and car owners, but at the same time, CO₂ backpack might increase in the supply chain. OEMs procurements will therefore put attention not only to price, but also to the volume of CO₂ emissions brought into the entire vehicle production value chain. Suppliers who are not compliant with this emerging demand will not be considered as potential partners.



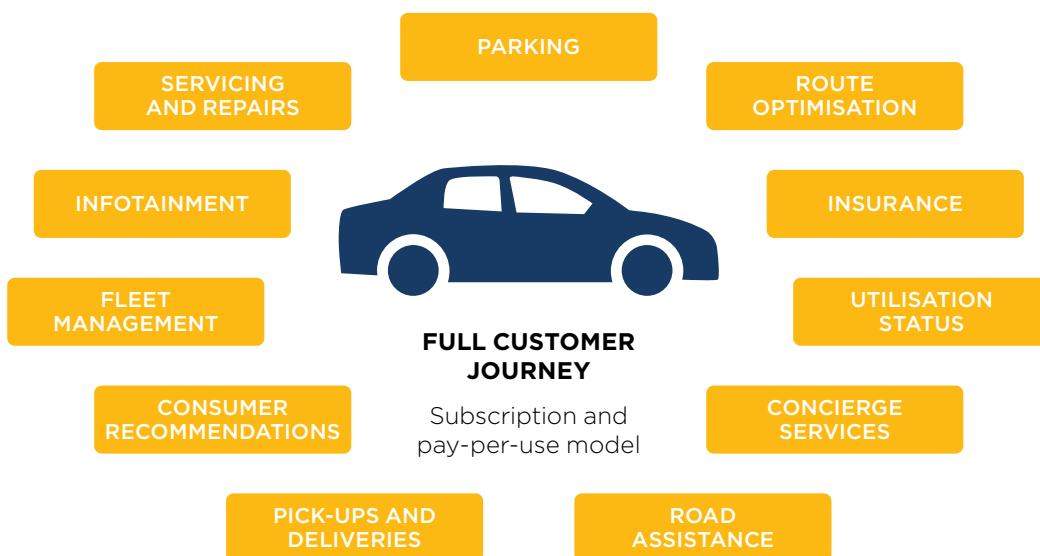
CONNECTIVITY

Digitalisation is a global trend impacting almost every industry but is a game-changer for OEMs and their supplier base. Digitalisation and connectivity require manufacturers to offer a significant pool of services on top of the one-time vehicle sale. OEMs will need to move away from being ‘car producers’ to ‘mobility producers’ with a focus on service-orientated communication to customers. The possibilities associated with digitalisation and connectivity open-up a new, full customer journey experience from basic infotainment and route optimisation to complex data-driven services such as tailor-made insurance offers or product recommendations. External connectivity can enable options including driver-tailored speed control, additional heating control or parking service payments.

Current connectivity products are considered well developed and many newly produced cars

feature a range of digital functions. Enhancing driver and traffic safety is a primary driver and EU legislation already requires all new cars and light commercial vehicles registered after 31st March 2018 to be equipped with a GPS-enabled automated eCall emergency call technology³¹. In the event of a serious accident, this technology is activated by in-vehicle sensors and reliant on connectivity modules and high-quality communications systems. While some legislation is in place, the complete regulatory framework, technology and infrastructure is lagging. Comprehensive connectivity functions require 5G which is still in pilot project phase and digitalisation across Europe is still very fragmented, far from being a high-quality cross-border network meeting the mass adoption of the connectivity trend. Manufacturers and industry experts are advocating for OEMs, stakeholders and telecom providers to co-operate at the

EXAMPLES OF CONNECTIVITY SERVICES TO BE OFFERED BY OEMs AND/OR NEW PLAYERS IN THE AUTOMOTIVE VALUE CHAIN



“Research indicates that consumers might be willing to spend an extra EUR 10–11 per month on car data based services, which can add EUR 30–35 billion to the after-market which will transform to a mobility service market. The automotive industry is opening up to more creative thinking and full customer journey solutions.”

Frank Schlehuber, Senior Consultant Market Affairs,
European Automotive Suppliers Association (CLEPA)

European level to achieve these goals.

Regulation is the biggest obstacle to developing connectivity. Currently, there is a lack of EU level regulation to govern data ownership, data access and data processing within an automotive context. OEMs and industry experts agree that achieving EU wide agreement on legislation will be a determining milestone which will propel market development and define who will take the largest market share. Currently there is no industry consensus on how data should be managed or who in the value chain should have access to it. However, these issues should be resolved in the next five years with the European Commission scheduled to work on EU data regulation with the view to implement regulation in 2025.

Currently ownership of connectivity belongs to OEMs. As installers of connectivity modules, by proxy they are responsible for the information which stays in their domain. This gives OEMs permanent communication with vehicle users and the resulting data, which has several advantages:

- 1 Information about how the product works
- 2 Information about the users, and
- 3 The access to communicate with users.

Automotive connectivity can be viewed as more than a tool to enhance driver experience, but as a holistic instrument to increase general

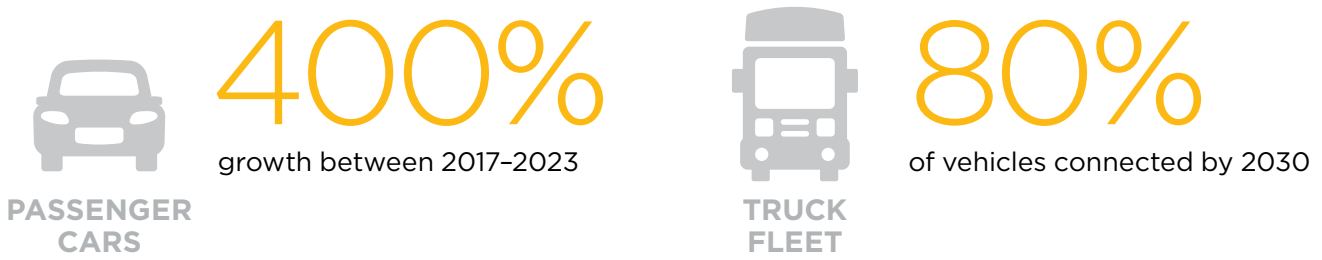
mobility efficiency. Urban and non-urban areas are increasingly struggling to manage traffic congestion and associated CO₂ emissions and solutions are needed to combat these. City data tracking people’s mobility is widely used but there is limited knowledge about the movement of goods. Connectivity is supposed to help to drive efficiencies in the movement of goods and can benefit stakeholders across the entire value chain. These include:

- Integrating different modes of transport like train, truck, ports in the mobility chain
- Improve uptime and quality of transport
- Reduce fuel consumption
- Track and understand electromobility
- Optimise data collection and improve analytical capabilities.

Over the next decade, the global automotive industry is projected to double in value and digitalisation and connectivity are recognised as the primary contributors to that growth. By 2030, it is expected that 50 percent of industry revenue will come from service-orientated value chains enabled by digitalisation and connectivity³².

Non-traditional and new players including start-ups and technology companies are set to play a pivotal role as the traditional and conservative practices and approach from yesterday are replaced by more creative thinking. As the percentage of software in vehicles increases, OEMs

PROJECTED GROWTH OF CONNECTED VEHICLES IN THE EU



“Software and services will be the main competitive and differentiating aspects between vehicle producers, while hardware platforms will be more unified.”

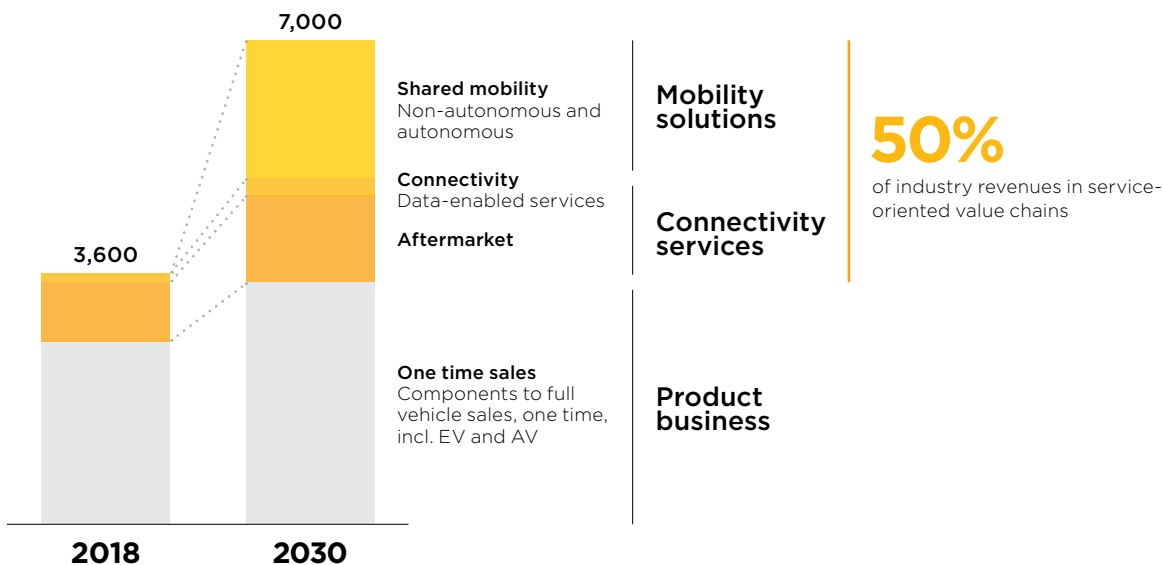
Leif Axelsson, Innovation Strategy Director, CEVT (China Euro Vehicle Technology)

realise that adapting will be the only way to survive. Industry fears have alluded to the possibility of players like Apple moving into car production, however the low-margin/high-risk nature of the industry means it is more likely that they will stay on the safer side in a supplier or partner role.

OEMs recognise that differentiation between electric engine manufacturers is very slim, so to be competitive in the automotive market, connectivity functions, seamless user experiences and design need to be prioritised. This is driving OEMs to take relevant steps to invest in software development, engage in new partnerships and adjust company culture to emerging trends. Manufacturers from both the passenger car and truck fleet sectors will both see connectivity rapidly change their segments.

For some OEMs consumer behaviours and demands are driving their approach and implementation pace. In markets like Sweden with a tech-savvy and liberal customer base, OEMs are building the majority of their future revenue streams around connectivity-enabled services, while in markets like the UK with more conservative users, a slow and gradual approach is being taken. But the front-runners are engaging with suppliers to develop cloud-based global connectivity solutions that will allow interactivity with in-vehicle and external platforms. These solutions are intended to be scalable, offer improved safety and security and provide real-time availability of services and information. The EU data regulatory framework due around 2025 is expected to speed up development in a race to monetise data.

GLOBAL AUTOMOTIVE REVENUE POOL IN EUR BN



Market readiness towards the connectivity trend



Infrastructure

Europe's digitalisation progress is fragmented with no high-quality cross-border network. Comprehensive connectivity is reliant on 5G which is in pilot phase.

Consumers

Connectivity function still a decisive factor. Concerns about personal data sharing and privacy. Consumers reluctant to pay a premium for advanced connectivity - at least in the short term.

OEMs

Connectivity products well developed and feature in newly produced cars. Service offers under-developed due to lack of infrastructure and regulatory framework.

Implications for suppliers

The trend for forming new partnerships and alliances is growing and, alongside the large number of M&A transactions taking place in the autotech field, there are opportunities for new and existing suppliers to gain and grow connectivity-related revenue streams.

As the demand for connectivity services grows, autotech companies will get the opportunity to benefit from new business opportunities and become the winners from this change. Swedish OEMs have focused their strategies on establishing new partnership models rather than intensive M&A activities. Suppliers should re-evaluate their current business and partnership models and engage in a more diversified way if they want to stay relevant in the next decade which is set to transform the industry.



AUTONOMOUS VEHICLES (AV)

Autonomous vehicles have the potential to be a societal game-changer, changing everyday life for the car consumer and improving efficiency and safety levels for truck customers. But this megatrend is also the most immature due to technological, infrastructural and societal development issues.

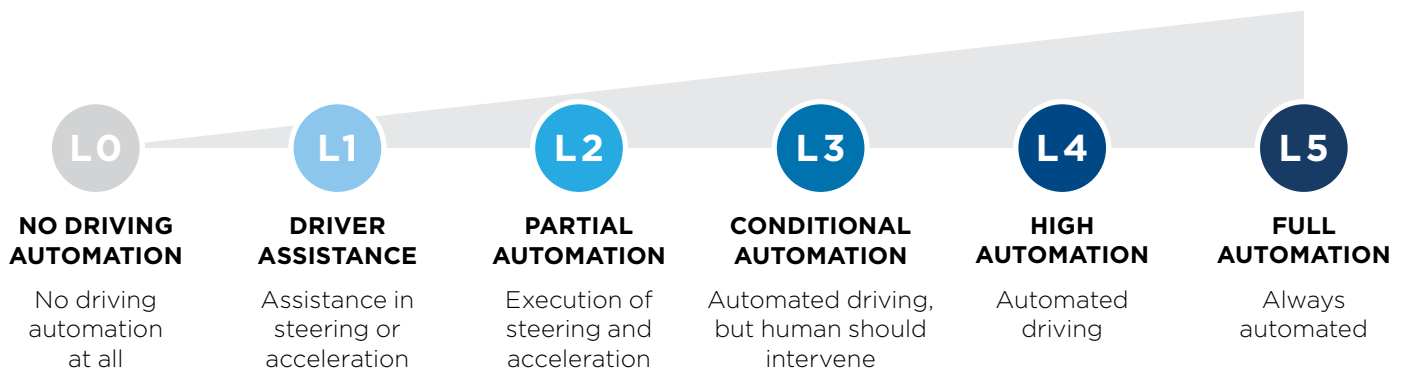
Addressing the infrastructure challenges will require data-related legislation to be implemented, infrastructure to support communication between vehicles and their surroundings and city planning to be aligned with AVs landscape. Of these issues, legislation is seen as the most important and it will need to consider:

- In early 2019, the European Commission adopted new rules to speed up the deployment of Cooperative Intelligent Transport Systems (C-ITS) on Europe's roads. This technology aims to allow vehicles, traffic signs and motorways to send standardised messages to traffic participants around them.
- In 2022, the EU plans to introduce revised general safety regulations aimed at making new safety technologies mandatory in European vehicles. This will include lane-keeping assistance and advanced emergency braking.
- Liability rules which will apply to more advanced levels of autonomous driving. These rules will need to take a common approach to applying blame in the event of an autonomous vehicle crashing.
- EUs regulatory framework for introduction of fully automated vehicles into road traffic is estimated to be in place in 2030.

Setting aside regulation immaturity, consumer acceptance is generally low, and society needs assistance to understand the implications of autonomous vehicles while not being expected to compromise safety. EU consumers' safety perceptions about autonomous vehicles dropped between 2016–2018 but this is expected to grow in line with legislative, safety and technological development. While OEMs are generally ahead in the maturity curve, there is a diverse level of interest and investment in implementing large-scale solutions until the data and liability regulations are in place.

In the passenger car segment, development of autonomous functions has been advancing but not as a major priority for manufacturers, particularly for those selling in more conservative markets. The development of autonomous functions is staggered across markets and the starting point for reaching

LEVELS OF AUTOMATION





“We take the challenges of the implementation of autonomous driving very seriously and contribute a significant, increasing amount of resources in this area. However, there is also a general understanding that it will take longer than originally expected. The last few percent needed to fulfill the promise of “no errors” still remain as the real challenge.”

Holger Prochazka, Manager Corporate Strategy, Volkswagen Group

maturity therefore varies. It is expected that the big leap to level 4+ autonomous driving will happen beyond 2030.

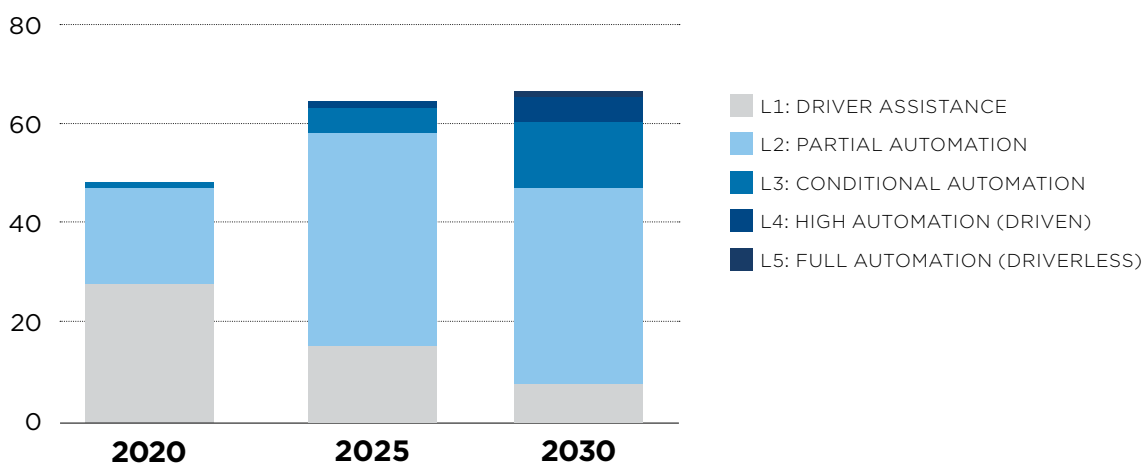
The commercial and large vehicle segment will see an overall positive impact from large-scale implementation of autonomous vehicles. In both the short- and long-term, projects and possibilities for commercial and large vehicles include:

- Autonomous trucks being tested and introduced in confined spaces in ports and mines in Sweden and around the globe.
- Autonomous minibuses providing passenger services in Norway, Sweden and France.

- The freight sector is exploring platooning trucks which would be two or more connected in convoy, controlled by automated driving support systems.

The potential for a rapid disappearance of employment for drivers within these segments has not gone unnoticed. Current figures suggest that around 4.8 million people in the EU are employed in this sector, but this will decline slowly as maturity levels increase and there will still be a need for skilled driving resources in close-maneuvring³³ conditions. However, the industry is seeing autonomous vehicles as a way of combatting the increased scarcity of drivers and the intensive associated labour costs.

GLOBAL NEW PASSENGER CAR SALES FORECASTS INDICATE UPWARD TREND FOR AUTOMATED VEHICLES (MILLIONS)³⁴



Market readiness towards the autonomous driving trend



Infrastructure

Data legislation enabling infrastructure installation some years away.

Limited infrastructure to support communication between vehicles and their surroundings.

City planning needs to be adapted to AVs landscape.

Consumers

Acceptance is low and cannot be expected to compromise on safety.

Safety perceptions have dropped between 2016-2018.

OEMs

Investment and interest in exploring AV technologies is fragmented.

Existing technology is seen as mature for confined spaces, but legal and liability considerations remain.

Implications for suppliers

The success of the current application of autonomous driving in confined spaces is proving the case for further investment in the technology which is opening up opportunities for both existing and new suppliers. While this megatrend is lagging in market-readiness, Europe is considered globally as the most prepared for autonomous vehicles.

Investments continue to rise and between 2014-2018, overall investments in autonomous driving technologies have grown six-fold, with software and AI technology taking 70 percent of the investment share and sensors including lidar, radar, cameras and GPS taking 30 percent. This intensive investment is presenting an open door to autotech and IT companies.

Larger suppliers are showing the ability to adapt to changes faster, and partnerships with OEMs are proving a successful model. Veoneer and Volvo Cars joint Zenuity project is an example of collaborative working which might prove to be a future model for success for players across the entire value chain.



SHARED MOBILITY

New shared mobility models are set to rapidly increase in the next decade and OEMs are already assessing the impact and opportunities presented by this megatrend. This trend is being propelled by shifting consumer behaviours, particularly with the declining status associated with private-car ownership, alongside government initiatives, specifically at local government level, to reduce traffic congestion in cities.

Today's figures show that only one percent of all journeys in Europe are made with shared services, but this is projected to grow significantly with current solutions as well as the introduction of autonomous driving options. The projected growth rate suggests that by 2025, more than 10 percent of US miles travelled could be done via shared concepts and by 2030 this could rise to more than one in three kilometres travelled³⁵.

Shared mobility models include:

Car-sharing – where a rider shares a car with other riders.

Ride-hailing – where riders hire a personal driver to drive them to their destination.

Light transport options – small vehicles such as electric scooters used for short journeys.

Shared mobility was put on the OEMs' agenda just few years ago but has not yet proven as disruptive as decarbonisation. However, it is anticipated by those manufacturers who have placed electrification at the centre of their strategies, that shared mobility will help drive consumer interest and demand for electric vehicles. Many sharing concepts involve electric solutions, and it is thought that as consumers become more familiar with the use of electric mobility, this will help drive approval and uptake of electric cars.

Even though the shared mobility market is on the rise, there are two distinct and differing approaches being taken among OEMs to address the shift in demand.

On one side, OEMs who believe that shared mobility, alongside connectivity-based services, will represent most of their revenue growth are investing in dedicated shared-mobility subsidiaries and / or engaging in new collaboration models.

On the other side, there are OEMs that consider themselves too small to make all the relevant investments to meet each megatrend or do not believe shared mobility presents the right answers to future urban challenges. This group is taking a cautious and selective approach and monitoring market opportunities, often together with partners.

NEW MOBILITY MODELS



CAR OWNERSHIP



CAR SHARING
e.g. Car2Go

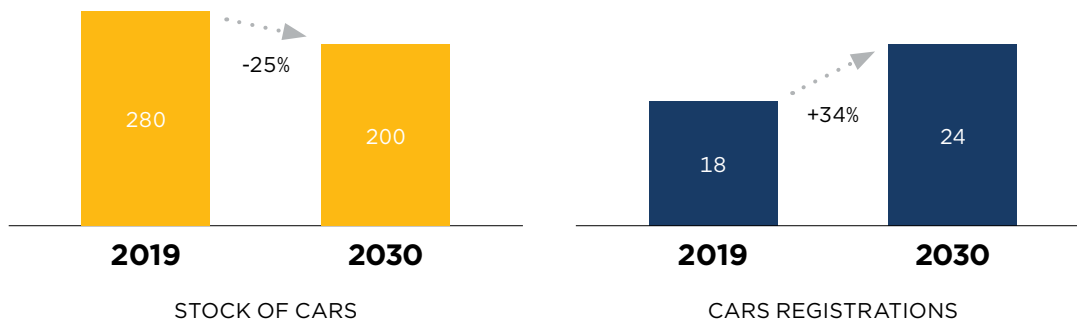


RIDE-HAILING
e.g. Careem



LIGHT TRANSPORT VEHICLE SHARING
e.g. Lime

STOCK OF CARS VS. NUMBER OF CARS REGISTRATIONS IN EUROPE (MILLION UNITS)



Changing mobility patterns will ultimately contribute to a decline in car ownership, however this trend does not define the whole market picture. Shared cars will still contribute to the overall pool of car registrations which is set to increase by 34 percent by 2030 despite vehicle stock dropping by 25 percent. Shared cars will also be subject to heavy use, similar to taxis and potentially have a shorter life span.

OEMs are exploring new business models to address changing mobility needs but with different intensity levels and forms. Some of the leading examples are:

Launch of new brands within OEMs groups

- Volvo Car Corporation and M (Swedish smart car sharing company)
- Groupe Renault and Renault M.A.I.

Investments in carsharing operators and new mobility service programmes

- Daimler and Car2Go

Joint ventures for large scale carsharing operations in major cities

- BMW and Daimler.

LINDHOLMEN INTEGRATED MOBILITY ARENA (LIMA), LINDHOLMEN SCIENCE PARK, GOTHENBURG

LIMA is a pilot shared mobility project involving over 1,000 people working at Lindholmen Science Park. Participants have access to a variety of transport modes including:

- Public transport
- Bike sharing
- E-scooter sharing
- Taxis, and
- A fleet of shared cars via shared private or company cars and a public car-pool.

The objective of the project is to simplify business trips to see if this will promote behaviour change and acceptance of shared mobility solutions, ultimately with the view of creating a more sustainable and less congested city.

“For Volkswagen, it has always been important – and even more so today and in the future – to pursue a balanced approach towards mobility. That means that we always place our customers and their need for mobility – both individual and shared - in the center of our focus.”

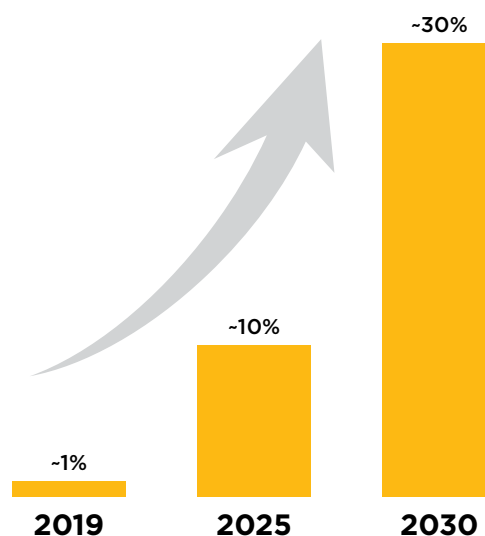
Holger Prochazka, Manager Corporate Strategy,
Volkswagen Group

It is widely acknowledged that there will not be an instant en masse shift to shared mobility, but a gradual shift from cities to regions to markets. Equally, it is expected that different forms of shared mobility will be more popular in different parts of Europe, particularly defined by weather conditions and consumer preferences. Logically, car-sharing and ride-hailing is anticipated to prevail in northern Europe, while in southern Europe the focus will be on light transport vehicles.

Across Europe, local consumer and market conditions will define the specifics of shared mobility and the intensity of uptake. Sweden is emerging as a testbed for solutions and has high potential to lead the way in shared mobility solutions. This is being driven by several factors:

- 1 Local manufacturers are committed to promoting shared mobility among their customers
- 2 Government incentives which are making car ownership cost-ineffective
- 3 High awareness of environmental issues across the social spectrum
- 4 Low social value associated with car ownership.

EUROPE: PROJECTED INCREASE IN SHARED MOBILITY USING AUTONOMOUS AND SELF-DRIVEN VEHICLES



“As urban areas grow and become increasingly crowded, we believe people will re-think their mobility demands – car accessibility will win over ownership. Volvo Cars Mobility will aim to give 24/7 on demand car access. So, our customers can “stream a car like music”, and have convenient access to a car when they need it through smart and sustainable car sharing.”

Pär Jacobson, Head of Global Procurement Strategy & Business Office, Volvo Cars

Market readiness towards the shared mobility trend



Infrastructure

Cities using electrified car-sharing fleets to reduce traffic, congestion and air pollution.

Co-operation between local governments and car-sharing providers for improved car parking and lane sharing options.

Consumers

Urban-dwelling consumers most likely to show interest in shared mobility.

Private car ownership status in decline, but not in conservative markets.

Supply, reliability and cost to be developed to ensure positive user experience.

OEMs

Investing in car-sharing operators and new mobility service.

Joint ventures for large-scale car sharing operations in major cities.

Implications for suppliers

Shared mobility services will have a limited impact on the overall supply chain but will accelerate the shift from ICEV to electrified vehicles and at the same time improving consumer acceptance of new technologies.

As OEMs move towards more direct client relations through the provision of car-sharing services, suppliers will see an increase in their direct interactions with customers. New support segments will be developed which will have the potential to impact on aftermarket and services. Shared mobility will see car utilisation intensify, driving the demand for spare parts as well as the overall stock of cars, both bringing orders for suppliers.

OPPORTUNITIES AND CHALLENGES FOR THE EUROPEAN SUPPLIER BASE

SHIFTING DEMAND ACROSS SUPPLIER CATEGORIES

The disruption of the automotive industry through decarbonisation and connectivity is sending shockwaves across the entire supply chain, changing demand and forcing suppliers to adapt to survive.

As combustion engine production is being phased out, the traditional hardware suppliers of ICE vehicles are becoming increasingly disadvantaged and this is expected to lead to consolidation and loss of smaller players who are unable to transform. Coupled with low margins and cost pressure from global suppliers like China, a huge impact on the suppliers' bottom lines will see many companies need to change their product portfolio, develop new partnership models and optimise internal structures.

However, the magnitude of these changes will largely depend on the direction decarbonisation

will take. If the transition to electric takes a significant amount of time, hybrid technology will maintain demand for ICE components. However, when regulatory requirements and roll-out plans take hold, full electrification is inevitable alongside the substantial decline of combustion technology.

Disruption will lead to increasing demand for components driving technology and most of these supply categories show growth projections of up to 15 times their current volume. New, non-traditional suppliers are expected to dominate this area, shaking up the current power structures and gaining significant share in the supply chain. These suppliers will have more power with cross-market selling opportunities into the consumer market where the margins are more lucrative. Collaboration will define success and the lead taken by Northvolt, Umicore and BMW in partnership-working will eventually be seen as standard.

“Infotainment and sensors will become more important in the supply chain. Disadvantaged are producers of exhaust systems, fuel systems, brakes, etc. We can expect more consolidation on components level.”

Mattias Bergman, CEO, BIL Sweden

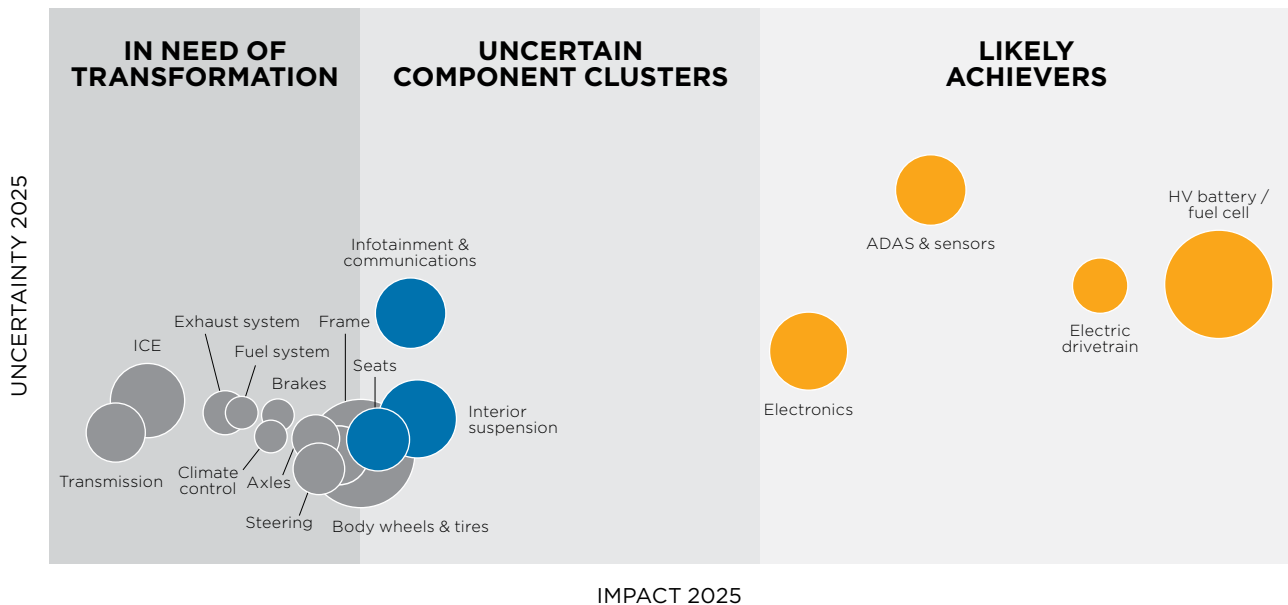
Some suppliers will need to review their tactical approach, creating strategies that enable them to monitor and adjust to market uncertainty. For example, interior component suppliers may keep their status quo, but should prepare for the impact of autonomous driving and shared mobility, and any future technology and regulatory developments.

Differentiation will be driven by comfort, autonomy and add-on services which means new technologies will have the power to influence supplier business models. Mechanical parts and engine performance will become commodities in the short- to medium-term, while integrated software solutions will offer a unique driving experience.

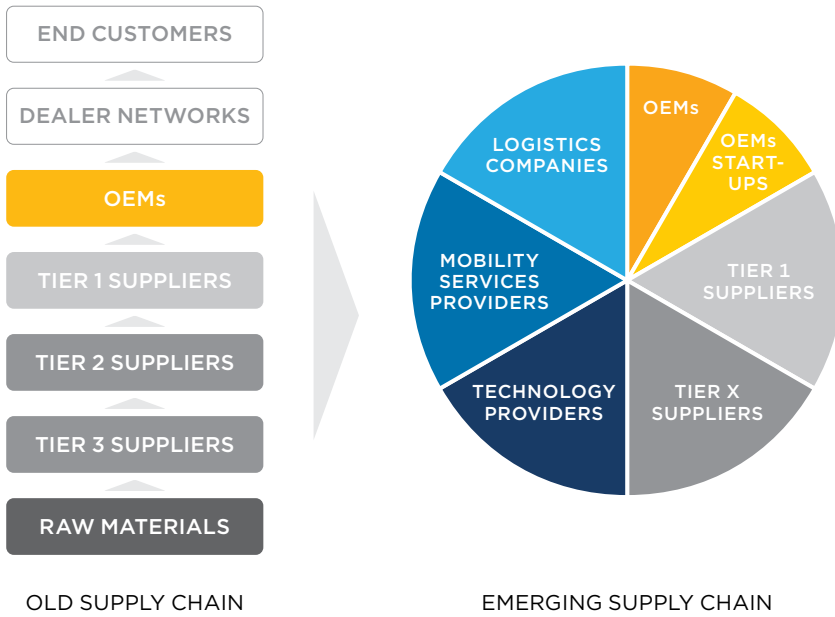
Disruptive technologies driving new supplier segments:

- Electric drivetrains
- HV batteries
- Advanced driver assistance systems
- Sensors, cameras and laser technologies
- Filters
- Emission cleaning technologies

IMPACT VS UNCERTAINTY OF MATERIAL COST VOLUME DEVELOPMENTS (2016-2025)³⁶



EXPECTED SHIFT OF POWER IN THE AUTOMOTIVE SUPPLY CHAIN



SHIFT OF POWER IN THE SUPPLY CHAIN

The current pyramid supply chain with OEMs occupying the most powerful position with a few tiers of suppliers delivering on their requirements is on course for major disruption. The supply chain is expected to become a complex constellation, developing into a value network with new players carving out their share in an evolving market with emerging business opportunities. It will become increasingly difficult to differentiate between OEMs and suppliers as they battle for elements within the value supply chain.

OEMs

The trend towards electrification will not change primary engine production from being in the Tier 1 OEM domain, but unlike the combustion engine, no OEMs will have the capacity to build electric powertrain, so the significance and strategic importance for Tier 1 suppliers across the entire value chain will be elevated. This means OEMs are searching for unique selling points and trading elements beyond the basic engine, and how they can add new values for their customers. This will see OEMs shift from ‘vehicle producers’ to ‘mobility producers’, providing an opportunity to move beyond just selling products to offering permanent services. New OEMs like Tesla and Einride are becoming front-runners in electromobility and autonomous vehicles and their rapid technological developments and non-traditional business models place them in prime position to accelerate faster than existing manufacturers.

Tier 1 suppliers

Tier 1 suppliers have the potential to take over from traditional OEMs as they will hold the primary responsibility for manufacturing electric engines, the core component of produced vehicles. Alongside their increasing technical development and production capacity, they can become OEMs and it is expected that the largest suppliers will be able to take responsibility for production and assembly of entire vehicles. In Austria, Magna are operating as a contract manufacturer, setting a precedent with their production of electric Jaguars.

Tier X suppliers

Tier X suppliers will enjoy more visibility in the value chain with an increased demand for transparency as there becomes a greater focus on sustainability and quality of modules, components and raw material production. More power will also go to specialised producers of niche components and technologies who have a clear focus on electrification, connectivity or automation as OEMs compete to work with them.

Technology providers

Despite an increasingly important role in the automotive value chain, Tier 1 suppliers must also keep adapting and innovating, particularly around digitalisation. As more players come into the market, OEMs will have a bigger pool of technology and partners to choose from, posing a threat to those Tier 1 suppliers who have not advanced their offering. Technology providers, both existing digital giants and start-ups are expected to become key partners for automotive companies. As the

“The need for transport will continue to grow. To help customers take on this demand in a sustainable way will be key. There is also a big potential in improving efficiency in logistics systems, which means a new business landscape is emerging. Europe must ensure that it’s industry has the right conditions to remain competitive as we take on these challenges.”

Per Utterbäck, Senior Vice President Group Strategy, Volvo AB

percentage of software in a car increases, so too will the demand for a continued competitive technological edge. The circular demand means all players in the value chain will need to keep adapting and developing. The risk of technology companies directly competing in vehicle production is slim, they will be more likely to remain as suppliers who buy and sell their platforms to any OEM. WAYMO is already leading the way with this tactic which means they avoid competing with themselves and keep their risk low.

Mobility service providers

A supply chain is emerging consisting of providers of mobility services, which are increasingly expected to have direct interactions with OEMs. There are already partnerships between OEMs and mobility service providers like Uber and Lyft which are paving the way for future collaborations. Industry experts predict that OEMs will act as suppliers to this sector with large money flows going in the direction of shared mobility providers.

Logistics companies

The global e-commerce megatrend and logistics required to deliver on changing customer behaviour and expectations are set to become a major disruptive force for the automotive industry. Urban freight logistics are being redefined by the boom of e-commerce which is driving next- or same-day delivery. Shippers and logistics providers are searching for solutions that meet consumer demands, and support business growth while meeting increasing regulations to minimise congestion and air pollution. While large vehicles are still needed for long-haul and regional transport, they are being replaced with smaller ones that can manage the ‘last-mile’ movements which are more frequent and occur in urban areas. This hub and spoke delivery model will be largely facilitated by electrification and connectivity and for last-mile deliveries, automation optimisation will play a pivotal role.

This change will see the boundaries between logistics companies and OEMs blur. In some cases, logistics companies will produce their own electric vehicles fleets, like DHL have chosen to do, or OEMs will create their own logistics companies, setting up as direct competition to their own customer base. If OEMs are unable to meet the demand for new vehicle production, the shift in power between segments will continue while also providing opportunities for other players to gain technology competence and production

capacity for manufacturing. IKEA is already setting standards and demanding that all transport involved in their operations be electric. If OEMs cannot meet this demand, they will inevitably look to developing their own solutions.

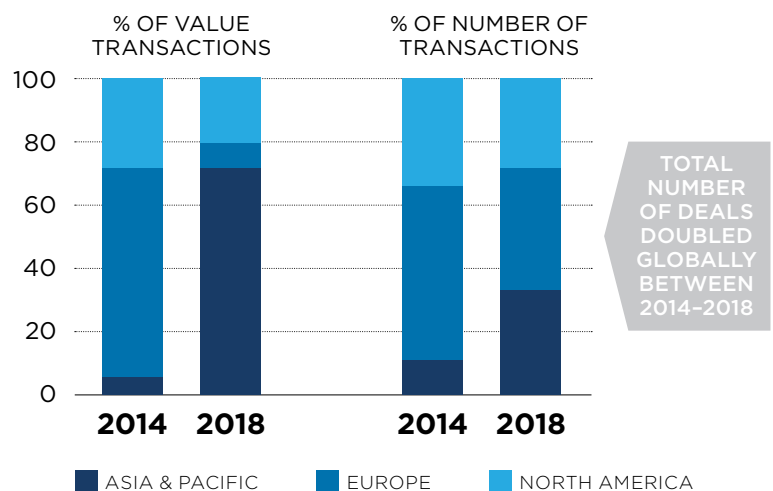
Start-ups and new players

OEMs and industry experts agree that the future value chain will be comprised of different players; traditional roles and players will be revised, and new actors will enter the mix. What cannot be predicted is where the centre of gravity will be, or if a centre will exist at all. But what is more realistic is that hierarchies’ dependencies will evolve into a collaborate value chain with challenges and opportunities for all stakeholders.

NEW PARTNERSHIP MODELS

The industry transformation is challenging for all stakeholders and partnerships are quickly becoming accepted as the most effective solution to overcome and succeed in a changing market. Collaborations will grow in both numbers and intensity between automotive actors and beyond, with non-industry players. The historical approach of individual manufacturing is being replaced by co-operation, often with competitors, to facilitate holistic and cross-border thinking and innovation. OEMs agree that while it might be difficult to allow competitors access to their business, in the face of ongoing intense connectivity developments, it is essential for the industry to move forward.

AUTOTECH M&A TRANSACTIONS BY GEOGRAPHY, 2014 AND 2018



Currently, partnerships between OEMs are mostly among car manufacturers or suppliers of relevant infrastructure, but not with competitors. Volkswagen and Ford are collaborating on electrification and autonomy and BMW and Daimler on automated driving, while heavy industry is partnering with suppliers of charging infrastructure. Sharing technology R&D expenditure has been a substantial motivating factor for partnerships and collaboration and is being viewed as the future of the industry while M&A will begin to ramp up.

Industry consolidation

Automotive megatrends are driving industry consolidation at both the OEM and supplier level with major mergers already impacting the market. In October 2019, Fiat Chrysler Automobiles and Groupe PSA announced their plans to merge to create the world's fourth largest auto-maker, which seems to sit in contradiction to OEMs' belief that co-operation between independent companies will still be the default in the European automotive landscape. But as the industry evolves, and some suppliers fail to adapt, it is expected that strong consolidation will occur, and some smaller suppliers will disappear. The first wave of supplier bankruptcies has occurred in Germany, the impact of only a small volume drop, but demonstrating the huge impact it can have on suppliers' financials. This pattern will see large suppliers grow and small suppliers become obsolete.

While European OEMs are seemingly prioritising partnership models, M&A activities in the autotech field have doubled in the past five years³⁷. Globally, Europe leads in terms of transaction numbers but APAC accounts for +70% in terms of deal value. Only five years ago, Europe led in both

transaction numbers and deal value but because of the failure of some investments and start-ups to reach their potential, European OEMs could be now be taking a more cautious approach and making broader, but smaller investments to lower the risk threshold.

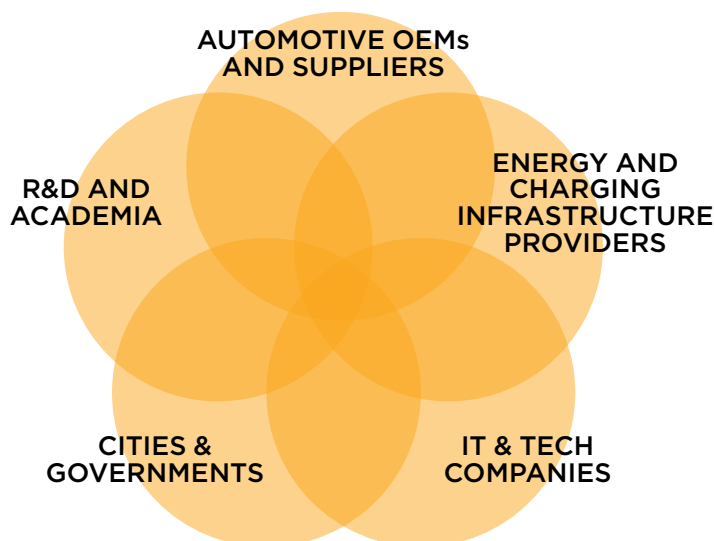
Partnerships beyond automotive industry

New partnership models go beyond the automotive industry as decarbonisation and connectivity push co-operation between and across sectors. Energy and charging infrastructure providers are now partners while autonomous driving and shared mobility are partnering with IT and technology companies. These partnerships are leading to co-operation models that feature: licence and royalties-based transactions, profit and revenue sharing in contracts, and considerations about responsibility splits in partnerships.

The future automotive ecosystem will also include non-corporate players like local municipalities, governments, R&D and academia, coming together with OEMs to build and deliver on their public affairs agenda to meet the global trend of creating sustainable cities with sustainable transport. Vehicle manufacturers have both the ability to provide low- and zero-emission public transport and promote electrification in individual car traffic, making them the natural partners for authorities who aim to reduce CO₂ emissions, noise pollution and traffic congestion in cities.

Automotive megatrends are putting huge pressure on technology development which will only be met by increased R&D and collaboration with industry, OEMs and academia. But to build and manage global research and innovation networks, OEMs must work in close collaboration with

NEW PARTNERSHIP MODELS IN THE AUTOMOTIVE AND NON-AUTOMOTIVE INDUSTRY



More cross-border cooperation

Harmonisation of charging infrastructure and payment systems across Europe

Partnerships between OEMs

Necessary for developments especially in connectivity field

Partnerships between OEMs and suppliers

Inversion of power between OEMs and suppliers

More engagements with R&D and academia

Increasing importance of test labs and test beds for new technology developments

Partnerships with cities and national governments

Driving B2G agenda regarding e.g. charging infrastructure, shared mobility, incentives and emissions

Consolidation of the industry, M&A activities

Mostly expected among suppliers

NEW EXPECTATIONS ON SUPPLIERS



SUSTAINABILITY



REGIONALISATION



NEW COLLABORATION
MODELS

“Sustainability is key for the future. Suppliers need to keep on investing not only in technology, but also into sustainability aspects of manufacturing and sourcing.”

Anders Wihlborg, Procurement Director HV Batteries, Volvo Cars

universities on a global scale to foster partnerships with public and private entities. Initiatives should aim at improving technological competence but work towards shifting the workforce from a traditional mechanical engineering to the digital era.

In a bid to commercialise technology, partnerships between academia and R&D are becoming increasingly common. Science and technology parks are becoming home to test labs and test beds, and creating environments where automotive and non-automotive players, start-ups and industry giants, are accelerating knowledge transfer and bringing technologies to the market. MobilityX-lab, hosted by Lindholmen Science Park in Gothenburg gives young companies the opportunity to accelerate their ideas through mentorship and access to competence, networks, tools and insights from leading subject matter experts. MobilityX-Lab was founded by leading Swedish firms CEVT, Ericsson, Volvo Cars, Volvo Group, Veoneer, and Zenuity and is setting a new standard of working with start-ups and innovators to develop mobility solutions for the future.

NEW EXPECTATIONS ON SUPPLIERS

Within the industry's current disruptive environment, and driven by the regionalisation trend, suppliers are expected to focus on sustainability and new collaboration models.

Sustainability is becoming a key requirement in the procurement process with suppliers risking business if they fail to meet standards. At the financial sector level, banks and hedge funds are expected to only release funds once sustainability requirements are met. While for automotive components, a 'CO₂ backpack' will be incorporated into future

procurement and become the primary qualification while price will become secondary. Many OEMs track CO₂ impact in some product categories or parts of the supply chain like battery source and logistics but in the next five to 10 years, this will become standard. There will also be an expectation for improved transparency across the entire supply chain with OEMs requiring information on the origin of raw materials, sources of raw electricity production, labour conditions and business ethics. This will be applied to all contracts within the value chain, not just the traditional Tier 1 level.

The previous dominance of globalisation as a driver for the automotive industry is being challenged by a turbulent trade environment and many OEMs are regionalising their procurement models which is resulting in a change in relation with suppliers. Prior to 2017, most OEMs had global sourcing strategies which allowed suppliers to produce for a global market from the best economically positioned locations. OEMs now want to buy from fewer partners, but they also want them to be global actors with production close to their factories. This enables an OEM to secure economy of scale and transform to a regional procurement model. With this approach, the smart factories concept has positively transformed the European production landscape creating localised supply chains.

The classic supply chain is being replaced by emerging, new collaboration models which will support the unification of platforms and integration of functions. Fewer platforms will be needed as OEMs shift away from hardware and focus on connectivity services and services. Suppliers of selected product categories will become partners and increase their power in relationship to OEMs.



KEY TAKEAWAYS FOR A NEW FUTURE



Suppliers are expected to adjust to the new industry reality with a specific focus on performance improvement.

SUSTAINABILITY NOT NEGOTIABLE

Decarbonisation and compliance with emission targets and regulations will see many powertrain suppliers become obsolete along with 400,000 jobs related to ICEV-specific components within the EU by 2030. Sustainability is emerging as the primary focus for procurement, overtaking price as the defining factor.

NEW BUSINESS MODELS SHIFTING FOCUS

The inter-related streams of connectivity, digitalisation and automation will collectively become the power segment of the new automotive industry. Non-traditional players will enter and dominate the market in a shift from product to service delivery models. Suppliers will need to collaborate and innovate in partnerships to survive. New car concepts will require suppliers to create different product portfolios with increasing importance on new solutions to bolster the EV range. As OEMs are moving into more direct client relations, suppliers might be required to have direct interactions with customers.

DEVELOPING AND ATTRACTING A TALENTED WORKFORCE

Smaller players with limited brand recognition or undesirable locations will struggle to attract the level of talent required to remain competitive. In a bid to create a tailored workforce, non-core competencies will be outsourced while geographic footprints will be adjusted and remapped.

PRICING AND INVESTMENT STRUGGLES WILL REDEFINE PLAYERS

Major OEMs have issued performance improvement programmes to advance technology and workforce skills. OEMs also have high capital requirements to finance R&D expenses or potential fines for exceeding emission limits. Low manufacturing volumes with small client bases and often a limited global presence will force change for many. Operational practices will be changed by digitalisation and automation to maximise performance while industry 4.0 solutions will also require substantial investments. Suppliers in high risk domains will see creditors take a more cautious approach with long-term commitments while equity investors will be difficult to find.

Setting up a holistic performance excellence or improvement programme for overhead, operations and R&D will support long-term sustainability and development while efficiency programmes will free up cash in the short- to mid-term term.

SHORT-TERM DECLINE FOR LONG-TERM TRANSFORMATION

A possible short- to mid-term economic downturn is predicted as the transformation process gains traction and shifting power structures and roles take hold. An expected higher car utilisation ratio driven by shared mobility concepts and autonomous driving will see strong growth in the long-term. Securing flexible, long-term funding and sufficient equity ratio will counteract the short-term uncertainty while actively considering merger and disposal options will help secure partnerships that will deliver long-term growth.

OPPORTUNITIES WILL DRIVE GLOBAL CHANGE

Electrification, connectivity, autonomous driving and shared mobility are transforming the automotive industry at a rapid pace across global, regional and local levels. These megatrends, alongside emissions compliance, increasing competition from Asia and a shift in focus from product to service delivery are widely recognised across the industry as key drivers for change. To remain competitive and relevant, OEMs and suppliers need to keep up to speed on R&D and team up with the right partners.

The global industry is expected to double by 2030, recovering from the recent slowdown with growth driven primarily by service-orientated businesses in the areas of connectivity, shared mobility and after-market services. Internal and external factors are challenging the dense and diverse network of global champions that make up Europe's unique ecosystem. At both the product and service levels there is an insufficient regulatory framework and a lack of relevant infrastructure to enable transformation into electromobility and growing development of connectivity functions.

The current turbulent global trade environment is a compounding challenge while consumer's increasing demand for sustainable solutions but low-level adaption to electromobility is a contradiction that the industry has not yet resolved. The entire value chain is facing extraordinary pressure to develop workforce competency, increase demand for R&D investments to keep up with market development and change business models towards new collaborative partnerships.

MEGATRENDS DRIVE GROWTH

Suppliers should see the four megatrends as both challenges and opportunities; as drivers for an industry shift that will change demand in supplier categories, shift power in the supply chain, increase competition, set new expectations on transparency and sustainability, and offer new partnership models and competency development.

While electrification is emerging as one of the key solutions of the future, there are a number of transition solutions and technologies including hybrid, alternative fuels and, ultimately, fuel cell technology which OEMs are betting on in the short-to long-term. While fuel cell technology

is currently not proven competitive, many OEMs prefer to keep their technology strategies flexible by introducing a mix of powertrains in their product portfolio. However, combustion engines will still be relevant, particularly for those car OEMs with a strong SUV and premium vehicle presence, as well as in the light commercial vehicle and truck segments. Many industry players believe that EU regulatory framework is forcing electrification, and 50% of OEMs are strategically diversified.

Traditional and small powertrain suppliers focusing on manufacturing fuel systems, brakes, transmission and exhaust systems within the ICEV segment will need to adjust their product strategies or risk becoming irrelevant and obsolete. OEMs perceive the ICEV supplier base as ill-prepared for the demand changes. Urgent transformation actions such as product portfolio change and new partnerships are critical for mid- to long-term sustainability.

On the flipside, demand for new technologies such as electric drivetrains and batteries is set for short-term growth of more than 1,000 per cent. Technology suppliers in this segment are on course to take market share and play a significant role in the future supply chain of what will be a very competitive environment. This power shift will see Tier 1 suppliers responsible for electric engine manufacturing take over from major OEMs traditional capabilities.

Connectivity-related products and services are expected to shape the future and deliver growth for the automotive industry. Service-orientated value chains enabled by digitalisation and connectivity are set to account for 50% of industry revenue. New companies, both technology giants and start-ups will enter the automotive market and will open up collaboration opportunities within the supply chain. New monetisation models will be tested with licence and royalties-based transactions, profit and revenue sharing in contracts, subscription-based and pay-per-use based services all presenting opportunities.

ECOSYSTEM TRANSFORMATION

Responsibility splits in new partnership models will need to be considered by all stakeholders, while market players will be able to capitalise on sales of services after relevant EU data legislation comes into force around 2025.

It is expected that hardware platforms will become more unified while software and services will emerge as the main competitive and differentiating aspects for vehicle producers. The percentage of software to hardware will be inverted with software and electronics components also set to increase their share of vehicle value. Despite early projections that technology providers could compete to produce entire vehicles, it is more likely that they will play an increasingly bigger role in the supply chain with partnerships and most probably not step into the traditional OEMs role.

The entire automotive value chain will be dramatically transformed with traditional OEMs positioning themselves towards customers as mobility providers, rather than vehicle producers.

After electrification, autonomous driving is predicted as the next big industry milestone, with high automation expected beyond 2030. Most OEMs have expressed an interest in autonomous driving technologies but have not prioritised them, citing the slow pace of development for a European regulatory framework as a barrier. Truck manufacturers are ahead of the curve having already introduced automated functions in protected, industrial areas. Passenger car manufacturers are developing in markets with more conducive regulations for new products and homologation, while lower interest in autonomy is naturally found in markets with more conservative consumers.

Up until two to three years ago, globalisation was the key driver behind supply chain developments, but most recently, OEMs have embarked on regional sourcing strategies to combat the turbulent trade environment, benefit from positive cost impact of production automation in Europe, have closer ecosystems for sustainability reasons and highlight an increasing preference to work with fewer global partners with the proximity to their manufacturing plants.

Electrification will decrease CO₂ footprint at the driver and car owner user level but will increase in the supply chain. Therefore, the sustainability aspect will gain weight in procurement processes with CO₂ backpack considered the key qualification criteria, followed by price. This change requires more transparency and sustainability action in the supply chain, starting with original raw material down to business ethics on the supplier side.



APPROACHES FOR SUSTAINABLE BUSINESS GROWTH



CULTURAL AWARENESS

Informal business practices
Accepted social norms
Local process



SUSTAINABILITY

Environmental strategy
Sustainable economic growth
Social and community



LEGAL COMPLIANCE

Local, regional or national laws
Trade agreements or tariffs
Tax regulations

Every market has unique characteristics that influence business operations, growth opportunities and long-term viability.

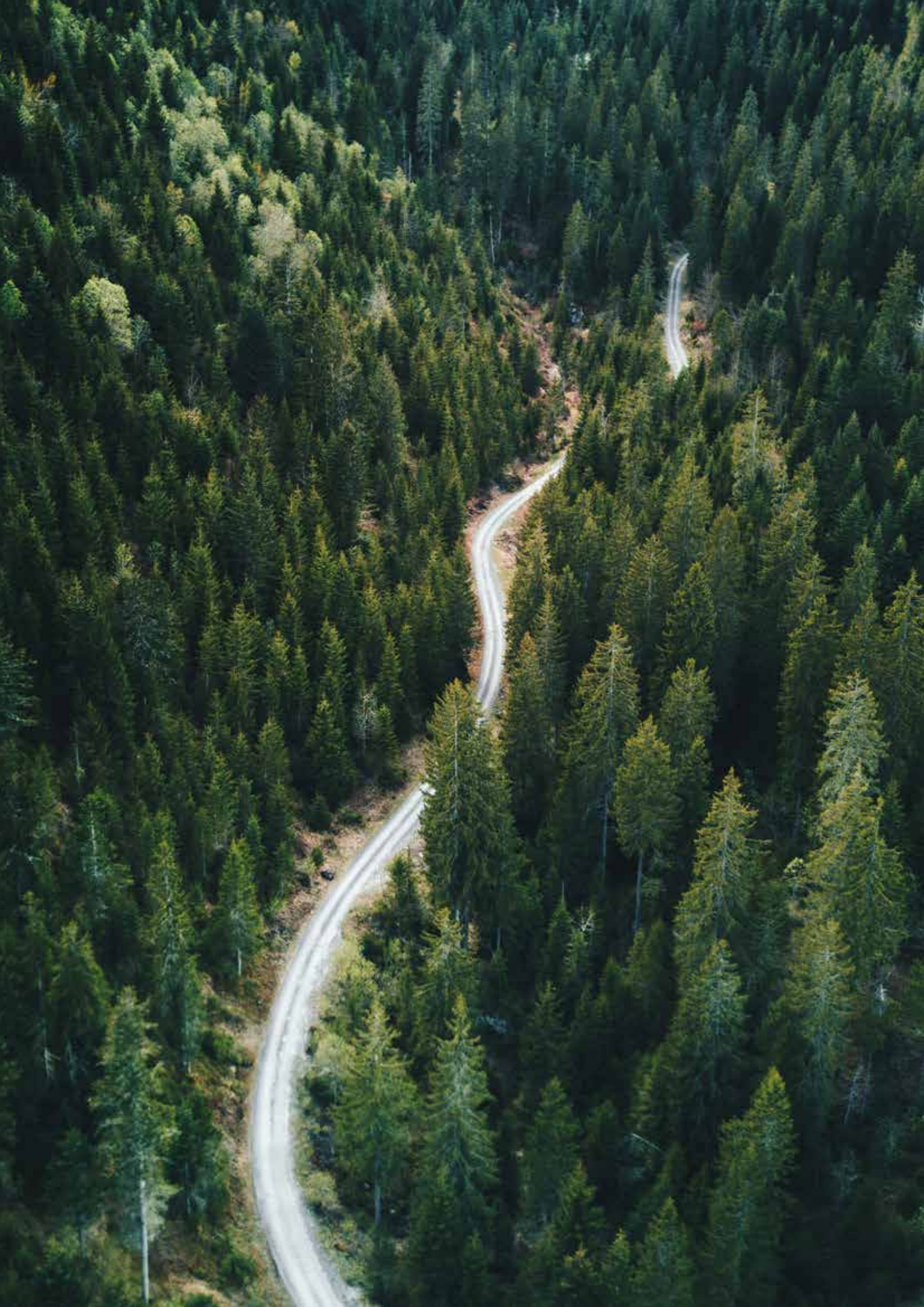
Before you change your market approach, it is advisable to have a strategy in place to manage both macro and micro market related issues. This strategy should address all or a combination of, sustainability, legal compliance and cultural awareness. As outlined in this report, at industry and country level, sustainable business practices are being adopted and enforced across the environment, economic and social spheres.

To reduce the risks of business malpractice and ensure you continue to meet international and Swedish standards and maintain economic stability, it is important to have a region-specific and industry-specific sustainability strategy.

A tailored sustainability strategy must address economic, human rights and labour condition requirements and how your company aims to work with suppliers to address these. It should also outline how you plan to meet and exceed environmental sustainability in accordance with applicable global and regional legislation.

Each market has unique legislative processes for the automotive sector value chain. A complete analysis of your legal responsibilities and the implications of these should be conducted before entering or expanding in a market.

Conducting business across Europe is defined by different cultural practices. Building relationships with potential key stakeholders is important but unlike many emerging markets, is not a defining feature.

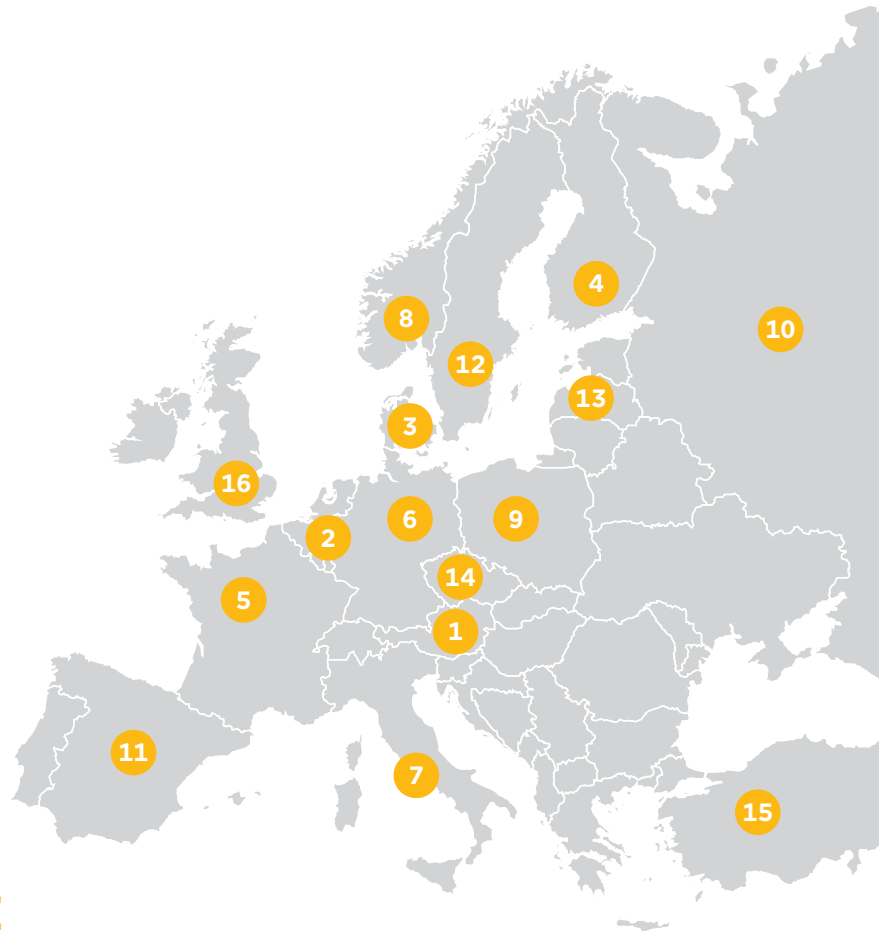


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Business Sweden has been working within the automotive industry for decades, bringing together traditional and new suppliers across the Swedish and European ecosystem and facilitating innovation and collaboration. Business Sweden has helped Swedish, European and global brands succeed in the global market, providing insights and connections that support long-term growth. Over the years we have built strong expertise and forged relationships with public officials and decision-makers across the business spectrum. We help you grow in industries that are growing.



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