FUTURE AS WE MOVE

Shaping Solutions for Mobility

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CLEPA

European Association of Automotive Suppliers
This document provides a vision of the future of mobility. It captures the diverse views of the European automotive supplier community as the industry undergoes one of the biggest transformations in its 125 year history.

Our vision outlines how European suppliers, in close cooperation with car and truck manufacturers, high-tech companies, regulators and other stakeholders, expect to shape tomorrow’s mobility landscape.

We look at strategies being deployed to reduce road casualties and limit the environmental impact of people and goods transport and we present our views on the huge potential of vehicle connectivity and automation. We also highlight what, in our view, needs to be undertaken to assure the continued competitiveness of the European supplier industry, which is both an essential part of the automotive value chain and a major European manufacturing sector that employs millions of people.

Our vision, overall, is an optimistic one with regard to the future of the industry and mobility as a whole. At the same time, we believe that more concerted efforts by all mobility stakeholders are required to successfully make the transition from the traditional automotive industry to the highly diverse and very different world of new mobility.
What will the future of mobility look like from the perspective of the European supplier community? People and goods need to move from A to B in a safe, clean and affordable manner. People’s habits will change, but even 10, 20, 30 or more years from now personal mobility will be one of the foundations of well-functioning societies and vibrant economies. And there will be many more options for individual mobility than today, whether they be car ownership, car sharing, ride hailing or a whole new range of public transportation offerings. Multi-modal and technologically diversified will be the defining characteristics of tomorrow’s mobility ecosystem.

Automotive companies, including the European automotive supplier community, are adapting to help bring about the biggest transformation of the industry in more than a hundred years. Mobility will become more electric and suppliers will adjust and provide more of the technology required for the new powertrains. Vehicles will become more highly automated and suppliers will make sensor- and artificial-intelligence-powered safety and assistance systems that are up to the challenge. And, as the auto industry moves toward new, shared business models, the supplier community will play a leading role in the development of novel concepts for this exciting new field.
Supported by new technologies, increasingly sophisticated software and much needed infrastructure improvements tomorrow’s mobility will be:

**Safer**

because advanced driver assistance systems and, further down the road, autonomous vehicles will facilitate near-accident-free driving.

**Cleaner**

with a much-reduced environmental impact from new and improved powertrains that will emit fewer pollutants. Improvements in manufacturing technologies and re-use of materials are set to make the auto industry a model of sustainability.

**Smarter and more diverse**

with new business models centering around increased multimodal mobility choices and more efficient, shared travel.
Like with all new trends, the transformation of the auto industry poses a threat to existing business processes and revenue streams. But it also presents huge opportunities for the automotive industry.

Working closely with policy makers, auto manufacturers and high-tech partners, suppliers will be in a position to forge a vibrant new industry that will benefit companies, their work forces, the overall economy and consumers.

Together, they will serve a global community and marketplace with highly diverse requirements.

Realising this vision will require a joint effort by all stakeholders in the mobility revolution and traditional cooperation will be broadened by new players and new alliances. Vehicle manufacturers and automotive suppliers won’t be able to realise their goals on their own. They will rely on national, European and global policy makers to assure a rules-based international trade framework that allows fair competition for all and helps build an environment that enables the innovation needed to meet the requirements of the new mobility world.

“Technology will be key to the evolution of current modes of mobility”

Roberto Vavassori
President, CLEPA
Our vision: Safe, Sustainable, Smart, Competitive

The following chapters will take a closer look at how the European supplier industry plans to drive the transformation of mobility in the coming years and decades.

Zero casualties
Suppliers, vehicle manufacturers and policymakers will have to work closely together to achieve the objective of zero road casualties by 2050. In the end, a combination of technology, industry-led initiatives and targeted regulatory action will contribute to making the vision reality.

Electrification and reduced environmental impact
Because demanding targets have been set to limit the environmental impact of personal mobility and transportation, the auto industry needs to respond decisively. Battery-electric vehicles will play a key role in the near- to medium-term, but other propulsion technologies such as hybrid-electric or fuel-cell will also have their place. Additionally, further improvements to the internal combustion engine as well as low and zero-carbon fuels will ensure that conventionally powered vehicles will continue to be manufactured and sold for years to come. A collaborative approach, involving industry, policy makers and society will be crucial for achieving a climate-neutral, circular economy. Work on this is being carried out on many fronts. Great progress is, for example, already being made in the eco-design of components, the remanufacturing of parts, the integration of recycled materials and the recyclability of our solutions.
Connected vehicles and autonomous mobility

Connectivity is already providing a broad range of opportunities for companies to drive progress and give consumers more choice. Vehicles that are becoming part of the Internet of Things (IoT) will allow for the development of new business models. Connected cars are one megatrend that will define the coming decades. Highly automated and autonomous driving is another, which will in the mid- to longer-term offer even more opportunities. Policies are needed that will in coming years allow automotive technology providers to offer seamless mobility solutions that may not even be imaginable today to achieve sustainability, enhance safety and lower mobility costs.

A competitive supplier industry

The European automotive supplier community will continue to lead the technology-driven transformation of mobility. Yet, this transformation will require a bold industrial policy ensuring a functioning, reliable legal framework across European borders; updated trade and competition rules; access to raw materials; a concerted effort to build an agile workforce that has the proper skills for the 21st century auto industry; and a flexible and adaptable business environment that helps foster the innovation that will assure Europe’s leading role.
The future is safe.
Zero casualties on the road in 2050
On the road to zero

If there is one area where technology can be the number one enabler, it is traffic safety. Already, cars and trucks are safer than ever before. Active and passive safety equipment such as seatbelts, airbags, ABS, ESC, blind spot detection, lane-keeping assist, emergency braking and a range of other advanced driver-assistance systems have been instrumental in reducing fatalities on the road and mitigating injuries from traffic accidents. Also contributing to this trend were the higher fitment rates of these systems, which have been driven by automaker initiatives, supplier innovations, EuroNCAP in Europe and changes in type approval legislation.

The total number of fatalities on European Union roads dropped 53% between 2001 and 2016, according to European Union statistics. But in recent years, the downward trend has halted. Hence, there is strong pressure to reduce casualties even further.

The European Commission notes that there have been no significant decreases in road fatalities since 2013. We believe that there is a clear roadmap for a zero-road-casualties world. It involves a combination of technology, infrastructure improvements, regulatory initiatives and other measures.

“Avoiding traffic accidents is a real megatrend”

Klaus Kimmelmann
Senior Vice President Corporate & Market Development, ZF

Road fatalities in the EU

(Source: 1)
Predicted impact of the latest EU legislation on road safety (until 2038)

- General Safety Regulation
  - 24,794 deaths
  - 140,740 serious injuries
  - +€ 15.4 bn overall net benefit

(Source: 1)

“There will be additional opportunities in areas such as new technologies, new platforms and new powertrains”

Marco Stella, CEO, DTS (Duerre Tubi Style)
Technology is a key enabler

European countries and automotive companies are committed to creating a transportation ecosystem with zero casualties by 2050. Many of the technologies underpinning this goal are in production and ever more sophisticated and effective safety systems are being developed, including promising new approaches like Human Body Models (virtual humans in a biomechanical sense) and more advanced virtual testing software and tools, as well as completely new protective technologies for driverless vehicles. But much more needs to be done and it is clear that progress on road safety requires a strong industry contribution coupled with policies that support and promote the development and deployment of safety technology both inside vehicles and in their surrounding infrastructure.

The common goals of more automation and, eventually, autonomous driving are having a huge impact on the development of new safety technology. Active and passive safety technologies must be part of an integrated approach. Sensors can warn of accidents about to occur, thereby setting off new exterior airbags that help to significantly reduce crash impact and accident rates. In-cabin monitoring technologies enable safer trips by making sure the driver is in good condition. Once partial or fully autonomous driving becomes a reality, new passenger seating positions will be enabled, which will require a reinvention of airbag and seatbelt technology.

Currently available driving-environment sensors recognise objects in the field of view of the vehicle. Tomorrow, hidden objects will also be recognised as a matter of course. Cooperative safety systems in the traffic infrastructure and on board of the vehicles could provide an even more detailed traffic map to enable collision avoidance alerts or automatic vehicle reactions. Large-scale deployment of Cooperative Intelligent Transport Systems (C-ITS) are both a precondition for such applications and an enabler of further automation and autonomous driving functions.

Stakeholders need better data on the cause and effects of accidents, ideally EU-wide and with a comparable quality level. This would support the evaluation of existing safety measures and identification of further opportunities. The practical value of this data would be greatly improved by putting in place minimum quality standards across the European Union for the gathering of such non-personal data. Data generated by new technologies such as Event Data Recorder (EDR) or Data Storage Systems for Automated Driving (DSSAD) will contribute to quality and standardisation if appropriate strategies for data sharing and data protection are in place. Access should be free for science, industry and policy making.
Spreading knowledge and awareness

Car drivers will need to be made aware of the new safety features that are being introduced, to maximise usage. In the long term, this may not matter because cars will drive themselves. But in coming decades, the industry, working closely with regulatory bodies, needs to make sure that both active and passive safety systems are used to the full to mitigate accidents. This requires more education efforts from all industry participants - including automakers and suppliers - directed at car drivers and passengers. Driving licence requirements may need to be reviewed to take into account the rapid technological changes.

In developing markets outside the EU, minimum standards for required safety systems have to be raised. While ABS (Anti-lock Braking System) is a must-have in most parts of the world, ESC (Electronic Stability Control) isn’t, and the European supplier community believes that making more of these technologies mandatory can greatly reduce the number of road accidents. Also, suppliers expect continued demand in the long-term for the use and development of traditional safety systems such as seatbelts and airbags. In fact, automated and autonomous driving is triggering a rethink and reinvention of traditional...
technologies in reaction to the change in seating positions. The European supplier industry, as the premier source of high-quality technologies, aims to continue to be a dominant provider of these kinds of systems.

The big mobility trends now transforming the industry are set to boost safety on the road. Highly automated and full autonomous cars will be designed to be safer than those driven by human drivers today. Machine learning, more sophisticated algorithms, improved sensor systems and active safety technologies in cars will see to that.

Policy makers need to actively engage with industry on safety concerns and possible solutions that can be deployed both in-vehicle and within the surrounding infrastructure to protect all road users. In the emerging traffic ecosystem, cars and trucks will coexist with pedestrians, including senior citizens, two- and three-wheelers, e-bikes and other modes of transportation that are set to gain in importance in coming years.

Facts and figures on road safety

25,100
The number of fatalities in 2018 went down 1% from 2017, but the decrease in recent years is more significant when looking at per million kilometres driven

1→5
For every person deceased, about five more suffer serious injuries

Fatalities have decreased substantially for vehicle occupants, but less progress has been made for pedestrians, cyclists, motorcyclists, and the elderly.

(Sources: 2, 3)
**Actions to help realise zero road casualties**

- **Investing in research and innovation** to deliver technology solutions which impact positively on road safety. CLEPA awards excellence in safety in its annual Innovation Awards.

- **Developing safety technologies** that are adapted to the new realities of automated and autonomous driving by integrating active and passive safety approaches.

- **Improving the human-vehicle-interface communication** to facilitate adequate use of safety solutions.

- **Raising awareness** and promoting use of safety technologies amongst road users, public authorities and other stakeholders.

- **Contributing to improving the quality** and availability of non-personal accident data across the EU to facilitate research and deployment of effective safety technology.

- **Supporting an integrated, inclusive approach to road safety** in all EU member states.

- **Promoting a standardised approach to safety requirements** and standardised testing, particularly in the framework of evolving interior configurations due to the development of autonomous modes.

- **Calling on regulators** to help bring about an integrated traffic infrastructure that benefits all stakeholders in society.
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<th><strong>Policy priorities for safer mobility</strong></th>
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- Encourage the adoption of **type approval standards** that make cars as safe as possible using technology that is available today, or is known to be emerging in the near future.

- A European effort to improve the quality and **availability of non-personal accident data** from across the member states of the EU, accessible free of charge for authorities, academia and industrial research.

- Jointly with manufacturers and suppliers, **development of test methods** and evaluation procedures to assess effectiveness of safety measures.

- **Promotion of a cross-sector approach** to integrating safety solutions, benefitting all, particularly the vulnerable road users.

- **Realise the infrastructure improvements** needed for enhanced road safety, including deployment of Cooperative Intelligent Transport Systems (C-ITS).

- **Funding for research and innovation for the development of safety technologies** as well as testing, simulation, naturalistic driving and accident studies via machine learning systems of automated passenger and commercial vehicles.
The future is sustainable
Electrification and minimising environmental impact
Mitigating climate change and air pollution

The European Union strives to make its economy carbon-neutral by 2050 as part of global efforts to mitigate climate change. The automotive supplier industry supports this objective and will contribute to achieving it by delivering technology solutions to reduce and, under the right framework conditions, eliminate all vehicle emissions from passenger cars, light commercial vehicles (LCVs) and trucks.

**Electrification of the powertrain is key in the medium term** and the supplier community will play a leading role in further developing this propulsion technology. Electrification by no means implies a one-size-fits-all solution. On the contrary, the various levels of electrification enable optimum vehicle- and application-specific solutions, from small urban to long range vehicles. European suppliers lead the development of such systems, from mild to full and plug-in hybrids, with growing electric power output and reduced carbon emissions.

If the production of energy and the battery is taken into account, **plug-in hybrids compete with battery electric vehicles for the smallest carbon footprint.** By resolving the range limitation, plug-in hybrids may therefore be the bridge technology towards electric mobility. European suppliers also have a strong position in technology for full electric vehicles, for example, e-wheel drive and battery management systems. The industry aims to also lead in next-generation battery technology and expects the European Battery Initiative promoted by the European Commission as well as national strategies to support progress.

With the help of new and improved powertrain technologies, changed automotive usage models and a more efficient traffic and transportation infrastructure, the world can largely be rid of the air pollution created today at the point of use by passenger cars and commercial vehicles, specifically in urban environments. The European supplier industry supports a **technology-neutral regulatory framework** to ensure that the most efficient solutions prevail in the market. We develop technology for battery-electric propulsion, hybrid systems, fuel-cell technology, e-fuels, and other systems that will contribute to the goal of lowering mobility’s environmental impact.

"Climate action that makes business sense, together with air-quality solutions, can stabilise the social climate"

Volkmar Denner, CEO, Robert Bosch
Comparison between hybrid and all-electric powertrains

**Hybrid Electric Vehicle (HEV)**

A hybrid vehicle contains both an electric and an internal combustion engine. The battery is charged via the engine during driving and also stores braking energy at the same time.

**Plug-in Hybrid Electric Vehicle (PHEV)**

A plug-in hybrid electric vehicle can drive in full electric mode and be charged by the electricity grid. The battery also serves as storage for braking energy.

**Range Extended Electric Vehicle (REEV)**

This is a battery electric vehicle with an auxiliary power unit, known as “range extender”. This extender drives an electric generator that charges a battery supplying the vehicle’s electric motor with electricity.

**Battery Electric Vehicle (BEV)**

The vehicle is powered entirely by the battery, which is charged via the grid.

**Fuel Cell Electric Vehicle**

The vehicle uses compressed hydrogen gas as fuel to generate electric power via a highly efficient energy converter, a fuel cell. The fuel cell transforms the hydrogen directly into electricity to power an electric engine.
Diversity in mobility requires variety of powertrain options

Efficient internal combustion engines will be a feature in personal mobility and goods transportation for decades to come. Even in 2030, automotive suppliers expect that up to 75% of all new vehicles will still contain a combustion engine, including as part of a hybrid solution. Therefore, even as electric vehicles grow in importance, there will continue to be a need to increase the efficiency of the traditional powertrain. European companies are world leaders in powertrain technology and their R&D and manufacturing operations in this important field sustain a highly skilled labour force across the EU. To make traditional powertrains more efficient, regulators also should look beyond the engine and strengthen the deployment of advanced bio-based and synthetic fuels to make combustion CO\textsubscript{2}-neutral across the entire fleet.

Given the right framework conditions, which should include the supply of energy and raw materials from renewable sources, zero and low carbon fuels, such as advanced biofuels, contribute to reducing emissions. This is specifically relevant in, for example, air transport or heavy-duty vehicles, where full electrification may not be possible for all applications. Another useful characteristic of zero and low carbon fuels is that they can be used immediately across the entire vehicle fleet and not only in new vehicles. When determining the fleet-average CO\textsubscript{2} emissions of manufacturers, the emission-reduction impact of zero and low carbon fuels should be recognised. New accounting methods should be discussed when relevant regulations are reviewed and, in the area of emissions, a well-to-wheel (WtW) approach or life-cycle assessment (LCA) should be considered.

Reduction of CO\textsubscript{2} emissions of cars in the EU

1995

2021

2030

-36% (NEDC)

-37.5% (WLTP)

(Source: 4)

**“The big transformational trends are all happening in parallel, hence enormous investment is required.”**

Elmar Degenhart, CEO, Continental
Progress in pollutant emission reduction

**NOX Emissions PETROL and DIESEL**

- **Light-duty vehicles**
  - EURO I (1992): 100%
  - EURO VI (2013): 100%
  - 94% reduction for PETROL
  - 92% reduction for DIESEL

- **Heavy-duty vehicles**
  - EURO I (1992): 100%
  - EURO VI (2013): 100%
  - 95% reduction for DIESEL

PM (Particulate matter): 97% reduction for diesel

Reduction of pollutant emissions

Automotive suppliers are proud to be able to deliver the technology to further reduce pollutant emissions from vehicles and support the establishment of ambitious but realistic standards for type approval and air quality. The further development of such standards - for example of a possible future EURO 7 norm and a revision of the Air Quality Directive - should be based on sound science and realistic targets.
This decade, there will be a clear focus on battery-electric technology, which is crucial in meeting emissions targets coming into force in the coming years. In the longer term, however, a broader approach is required, including hydrogen power and other technologies that only play a marginal role today. In this context, European suppliers have long argued in favour of a well-to-wheel approach rather than a tank-to-wheel approach for CO$_2$ standards legislation. Looking at the entire lifecycle ought to level the playing field for various drivetrain technologies, as it takes into account all emissions associated with a vehicle and not just a part of it. The European Commission is currently examining the potential contribution of life-cycle analysis to the regulation on emissions, which incorporates well-to-wheel (WtW). Some suppliers are already moving to implement LCA in their business. The industry supports the work that is currently undertaken on behalf of the Commission to develop a methodology for LCA. It is expected to be considered in the context of the review of the CO$_2$ regulation (2023 for cars, 2022 for HDV) and may be used in future regulation.

“In the area of emissions, we need to not just look at tailpipe emissions, but take a ‘well-to-wheel’ approach. We also need to look at the entire lifecycle of the automotive products from manufacturing all the way to recycling”

Olivier Rabiller, President and CEO, Garrett
Joining efforts to enable rapid electrification

The European Union has adopted the most ambitious targets for carbon emissions from vehicles worldwide. Numbers vary depending on the strategies chosen by manufacturers, but we assume that by 2030 a share of 40% of the vehicle fleet will need to be plug-in hybrid or fully electric in order to meet the fleet-average CO$_2$ target.

The rate of growth in electric-vehicles sales varies from country to country and depends on factors that are outside the control of the automotive industry. These include consumer confidence, the need for a better charging infrastructure and the current inability of the electricity grid to transmit sufficient amounts of renewable energy. Also, in the absence of higher electric-vehicle sales volumes, these cars continue to be expensive compared with traditionally powered vehicles. Hence, the total cost of personal mobility is likely to increase and there is a need for policy makers to consider a stronger contribution to the goal of realising the transformation towards electric mobility.

The review of the CO$_2$ standards for cars and vans in 2023 and for heavy-duty vehicles (HDVs) in 2022 should be seen as an opportunity to critically review the development of Europe’s charging infrastructure, the relatively low EV sales and the cost to consumers of electric mobility. The review provides a good opportunity to make some key decisions on ways to support the mobility transformation. Stepped up efforts to upgrade Europe’s EV charging infrastructure would be one important step. The reviews of the Alternative Fuel Infrastructure Directive and the Directive on Energy Efficient Buildings are opportunities to support the deployment of such an improved charging infrastructure.
Global CO\textsubscript{2} emissions overview

Global anthropogenic emissions

- **Other** 73.4%
- **Transport** 26.6%
  - **Marine** 10.7%
  - **Road** 74.4%
  - **Aviation** 11.6%
  - **Other** 11.6%

(Source: 7)

Light-weighting and advanced materials: key areas for innovation

Light-weighting can be used across the vehicle

- **Weight** -10%
- **Fuel economy** 6-8%
- **Energy efficiency**

Light-weight technology should be considered a full part of the integral low emission mobility strategy, and many automotive suppliers innovate and invest substantially in this field. Light-weighting has the potential to reduce CO\textsubscript{2} emissions in significant quantities. Each 10% reduction in vehicle weight, will generate a 6-8% improvement in fuel economy and energy efficiency.

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Ambitious European CO₂ targets for 2030

-37.5%  -31%

Emissions reduction

To make this possible by 2030, 40-50% of Europe's vehicle fleet will have to be

1. Plug-in hybrid (PHEV)
2. Fully Electric (BEV)

2018 → 2030

Electric car share

How to facilitate this?

- Consumer confidence in the technology
- Battery charging infrastructure
- Increase the sales in the mass market

"Energy efficiency is the point where climate action and profitability intersect"

Volkmar Denner, CEO, Robert Bosch
Automotive suppliers acknowledge their responsibility to deliver products that are sustainable from cradle to grave and they extend this sustainability goal to their manufacturing operations.

As many raw materials are finite, sustainable resource use is key. Further innovation will be crucial to protecting the environment in general and in combination with our industry’s insight about depletion of resources. **Today already, more than 85% of the weight of vehicles that reach the end of their lifecycle is reused or recycled on average across the EU**. The auto industry has, thus, achieved the target set out in the End of Life Vehicles Directive. It is performing better in this respect than many other consumer goods sectors.

Recycled steel, glass and plastic have been used in the automotive supply chain for years. It is important that recycled materials fulfil the same criteria for safety and quality as virgin material. **A rigid legal obligation on the use of recycled material, e.g. plastic, may contradict such requirements and should be avoided.**

In the upcoming review of the End-of-Life Vehicles Directive it will be important to ensure consistency in the regulatory framework, and to avoid overlap between regulations on the recycling of vehicles and other goods, such as electronic devices or batteries.

**Rемanufacturing of parts and components has been around for decades and contributes to the circular economy** by restoring the functionality of an existing part in standardised industrial processes with the same warranty as a new part. Work continues on the harmonisation of definitions and legal standards in markets across the world but more progress is needed to support industrial remanufacturing.

The **REACH regulation** defines the framework for the use of chemical substances. **Legal certainty and transparency** in the further development of REACH is crucial for businesses to adapt long-term planning and production accordingly.

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**Raw materials and circular economy**

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**Life Cycle Assessment (LCA) of a vehicle**

- Raw materials
- Manufacturing
- Energy / fuel production
- End of Life & Recycling
- Vehicle use & maintenance
**Actions on the road to zero carbon emissions**

The European supplier community is developing a technology approach for the life of the vehicle and is aware that it needs to deploy different technologies for different mobility segments:

1. **Continuing to improve emission-reduction technologies.**
2. **Investing heavily in alternative drivetrains,** including hybrid drives, electric motors, battery and battery management technology and fuel-cell.
3. **Working to introduce energy-efficient multi-modal** and autonomous mobility concepts such as robo-taxis, shared people carriers, etc.
4. **Collaborating with automakers and city, regional, national and supra-national regulatory bodies** to develop a more efficient traffic and transportation infrastructure.
5. **Seeking ways to improve supply chain and resource efficiencies and better methods to reuse and recycle materials** as well as remanufacturing of parts and components.
6. **Researching and deploying new forming and joining technologies, and innovative materials,** including lightweighting and biobased materials.
7. **Collaborating with energy and utility providers** to help connect transportation to more efficient fuel and greener power options.
Policy priorities for sustainable mobility

Promoting a regulatory framework that rewards efficiency and emissions reduction in a technology-neutral framework, e.g. well-to-wheel approach and life cycle analysis.

Adopting incentives aimed at rapidly creating demand for electrified and electric vehicles as well as the necessary charging infrastructure, e.g. in the Directives on Alternative Fuel Infrastructure, Energy Efficient Buildings and Renewable Energy Directive.

Promoting solutions for a secure hydrogen distribution infrastructure.

Reducing national and regional divergences for electric mobility: charging infrastructure, standardisation of charging infrastructure, price differences etc.

Developing standards for emissions of vehicles and air quality which are ambitious but realistic and based on sound scientific evidence.

Ensure a reliable and transparent regulatory framework on remanufacturing, resource use and recycling that does not interfere with requirements on material quality and safety.
THE FUTURE IS SMART
Connected vehicles and autonomous mobility
Mobility reinvented

Connectivity, higher levels of vehicle automation and the move toward near or full autonomous driving are megatrends that are transforming mobility. Although linked, these megatrends develop independently from each other. Connected cars and rising levels of vehicle automation will play a key role in creating a transportation infrastructure that is sustainable and can handle the requirements of an increasingly urbanised world. In an ecosystem where more people make better use of shared or personally owned electric vehicles, pressures on the infrastructure will ease and environmental impact will be reduced. Moreover, shared mobility and MaaS (Mobility as a Service) will open up new transportation possibilities for elderly and disabled people.

Connected and automated vehicles generate data, which holds great potential for the auto industry. Under the right framework conditions, the availability of automotive data will allow the development of new business models that help finance the innovation that will assure continued European leadership in the global mobility market. Connected mobility – and, eventually, highly automated and driverless cars – will be instrumental in making transportation safer and more sustainable.

The auto industry is working with telecommunications companies and regulators to make sure that vehicles have the ability to communicate; that standards are implemented for V2V (Vehicle to Vehicle) and V2X (Vehicle to Everything); that the appropriate infrastructure is created; and that vehicle connectivity can be assured at all times. Also, European suppliers are keen to develop a common European standard that enables the free flow of data that makes these data available to all market participants in a fair and balanced way. In this context, cyber security is critical, but should not limit market access.

“As we prepare for a future of electric, shared, autonomous and connected urban mobility in cities, I see the car as a key enabler of the smart and sustainable city of tomorrow”

Jacques Aschenbroich, Chairman of the Board and CEO, Valeo
With autonomous driving, the closer you get to implementation, the more you have to face the reality that there are lots of hurdles that need to be overcome.

Patrick Koller, CEO, Faurecia
Platooning technology, example of transport automation

Trucks communicate directly with each other by using connectivity technology and automated driving support systems. Platooning vehicles autonomously adapt the distance, speed and direction and adjust to the vehicle in front.

Benefits of truck platooning

- **Emission reduction**: Up to -15% CO₂
- **Road capacity optimisation**: Less congestion
- **Safety improvement**: 90% of road accidents are caused by human error

**Social value**

**Business value**

- Lower fuel consumption
- Fleet use optimisation
- Improved driver efficiency

Platooning technology contributes to make road transport safer, cleaner and more efficient

(Source: 8)
Software in focus

In the near term, European suppliers will continue to develop connected technologies, focusing on adding value to the personal mobility experience and making transportation smarter, cleaner and safer. Longer term, this progress could help make highly automated and fully autonomous cars a reality.

European suppliers are committed to providing the core technologies that will drive the trend. As the smart mobility ecosystem takes shape, software will play an even bigger role than today in facilitating the safe and efficient interplay between vehicles and the infrastructure. We are investing heavily in software capabilities to meet these growing requirements. Artificial intelligence and machine learning will be key enablers, but the supplier industry is also working on many other technologies. Research and innovation funding, for example in the Horizon Europe programme, is important to defend European leadership, and budgets need to compete with those in regions such as the USA, China, Korea and Japan.

There has been an impressive technology leap in autonomous-driving systems in the past three years and increasingly autonomous vehicles are being successfully tested on public roads in many countries.
Driving automation levels for vehicles

**0. NO AUTOMATION**
The driver constantly performs all aspects of the dynamic driving task. No systems intervene - only those that warn the driver.

**1. DRIVER ASSISTANCE**
The system can take over either steering or acceleration/deceleration. The driver must continuously carry out the rest.

**2. PARTIAL AUTOMATION**
The driver does not have to monitor the system at all times; must always be in position to resume control.

**3. CONDITIONAL AUTOMATION**
The system takes over both steering and acceleration/deceleration in a defined use case. It is capable of recognizing its limits and notifying the driver.

**4. HIGH AUTOMATION**
The driver can hand over the entire driving task to the system in a defined use case.

**5. FULL AUTOMATION**
System can take over the entire dynamic driving task in all use cases.

(Source: 10)
A concerted effort

The next steps on the road to driverless mobility will require even more intensive and broader collaboration than in the past. Advanced driverless technology needs to be embedded in a regulatory framework, more testing of systems has to be conducted, trials have to be scaled up, and, equally important, public acceptance of future driverless cars and trucks needs to be increased. Suppliers are working closely with automakers to develop the vehicles that will be at the centre of tomorrow’s traffic ecosystem.

With the first steps towards automated mobility already behind us, a regulatory system is now required that ensures that vehicles are placed on the market in a way that reassures authorities and road users of their safety. Developing type approval rules is an international effort to create similar regulation for a global market. Particularly safety performance evaluation is important to ensure automated vehicles are safe and contribute to road safety. Automotive suppliers contribute to this initiative at the UNECE in Geneva and work closely with EU institutions to facilitate alignment of rules.

Furthermore, an agreement on the use of specific communication technologies for V2V and V2X and further close consultations between all stakeholders on a framework for vehicle data sharing is required. Rules governing liability also need further intensive discussion. A kind of “digital single market for mobility” in Europe would go a long way toward creating a traffic ecosystem that can reap the full benefits from autonomous driving.

“Mobility will become much more diverse. I wouldn’t call it a revolution, but rather an accelerated evolution”

Olivier Rabiller, President and CEO, Garrett

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Data are the gateway to new services

Automated and connected vehicles will generate large amounts of data, which hold an enormous potential to create new services and products, revolutionise existing business models and lead to the development of new ones. Whilst certain traditional jobs may become redundant through automation, we believe in the opportunities for growth and employment in this innovative economy. Suppliers are already developing successful new services and applications, for example, new concepts for shared, automated and connected mobility, as well as new repair and maintenance offerings in the automotive aftermarket which increase choice and reduce cost for consumers.

For the success of new services, especially in the independent repair and aftermarket, it is crucial that access to vehicle data and a direct link to the vehicle and the driver are available. Vehicle manufacturers and digital platforms currently have privileged access to car data. They also are in a position to propose services directly to drivers and passengers through in-car infotainment systems.
Actions to support connected and autonomous mobility

Setting standards to V2V (Vehicle to Vehicle) and V2X (Vehicle to Everything) connectivity.

Testing driverless technology in real-world environments.

Launching multi-purpose autonomous test vehicles.

Helping regulatory bodies and EU and national governments to set priorities that further this transformation.

Collaborating across sectors to include telecommunications companies to improve connectivity.
Policy priorities for smart mobility

Create an *internationally harmonised type approval system* at UNECE level that ensures automated and autonomous vehicles are safe.

Enable road testing by giving clear and consistent *guidelines to manufacturers* seeking exemptions.

Assure European R&I *funding*, for example in Horizon Europe, with a focus on key new technologies such as artificial intelligence, machine learning, and smart sensors.

Use IPCEI (Important Projects of Common European Interest) to support developing a European value chain for automated mobility.

Ensure free and non-discriminatory access to data created by vehicles for a competitive market for new products and services.

Large scale deployment of Cooperative Intelligent Transport Systems (C-ITS) infrastructure as well as making data available and ensure interoperability of data to create “readable roads”.

Consistent rules on cyber security, data protection and liability issues around highly automated and, eventually, fully autonomous vehicles.

Initiate and support trust-building measures and communication campaigns to create societal acceptance for connected and autonomous driving.
THE FUTURE IS COMPETITIVE
European supplier leadership
Harnessing the power of innovation

Automotive suppliers, in their more than 100-year history, have been champions in adapting to new product- and marketing opportunities. And they are, once again, doing so today. European suppliers see a broader role for themselves as the mobility industry evolves. They are focusing on electric-powertrain technology, investing in core software expertise, developing data-based services and working with all stakeholders to realise the mobility business models that will define tomorrow’s transportation ecosystem. Mobility as a service (MaaS) is a big new growth area.

The European automotive supplier community is committed to leading the technology-driven transformation of mobility, even as new players from the high-tech, IT, internet and communications industries are entering the market, eager to play a role in the mobility business. European suppliers are forging alliances with these new market entrants, but they are also making sure they are offering the key technologies their automotive customers need going forward. Building on more than a century of providing high-quality core components and systems to the automotive sector, European suppliers will enable the fundamental changes that will be coming to the global mobility industry while supporting European employment and livelihoods for citizens.

As global competition intensifies, the European supplier industry is investing more in R&D and developing the new expertise required to meet changing customer requirements. Important core expertise will cover areas such as software, artificial intelligence, connectivity, data analytics, electric and alternative powertrains, safety and battery cell technology. But next to these new automotive areas, traditional mechanical, electronics and general engineering skills will continue to support European suppliers’ leading role in the mobility business.

“In many respects, Europe continues to be the main source of innovation in the automotive industry. But we have to accelerate the growth of the new technologies that will keep our region competitive”
Alberto Bombassei, Founder and Chairman, Brembo
European leadership in patent applications for self-driving vehicle technology

As car manufacturers shift focus and investments to other parts of the business, there will likely be an even more active role for suppliers in the value chain.

Marco Stella, CEO, DTS (DuerrTubi Style)

(Source: 11)
“One of the biggest changes for automotive suppliers is that our emerging business models involve a wide spectrum of players in the mobility ecosystem, ranging from our traditional consumers – the car manufacturers – to new mobility players and cities.”

Jacques Aschenbroich, Chairman of the Board and CEO, Valeo

(Source: 12)
European suppliers also have a strong commitment to the automotive aftermarket, which sustains a massive number of vehicles on the road today with spare parts and components. Key to the successful functioning of the aftermarket will be the unrestricted and standardised access to vehicle data for suppliers and repairers. Such access will not only ensure competition and lower cost for consumers, but it will also open up possibilities to develop new products and services. Already, aftermarket suppliers are boosting their IT capabilities, while developing new advanced diagnostics tools, maintenance software products and on-demand services that meet changing customer needs and generate new revenue.

(Source: 13)

The European automotive industry had more than 9000 patents granted in 2018 by the European Patent Office, with an increase of nearly 6% from the previous year. (Source: 13)

EU R&D Investment by sector in 2018

- 30.5% Health industry
- 22.4% Others
- 14.1% ICT producers
- 7.1% ICT Services
- 5.6% Industrials
- 4.4% Aerospace & Defense
- 2.7% Chemicals

The automotive sector is the EU’s number one investor in R&D, responsible for more than 30% of total spending.

(Source: 14)
Regulatory framework more essential than ever

A functioning, reliable and innovation-friendly legal framework across European borders will be a prerequisite for continued success in a world increasingly characterised by global competition. European supplier companies can only be leaders in their field when their home market operates with as few internal barriers as possible. Moreover, an industrial policy for the EU should put more emphasis on the target of increasing manufacturing to 20% of the overall economy. With the European auto industry operating in a global market, EU policy makers need to be ready to mitigate factors that negatively impact European competitiveness.

Fair and open markets as well as rules-based competition are the main drivers of a competitive industry. The automotive industry organises highly efficient global value and supply chains. Manufacturers and suppliers depend on a rules-based, fair, international trading system. The WTO, which provides a global trading framework as well as the tools to deal with disputes, should be strengthened and developed further to deal with the challenges of today and tomorrow. In this context, rules on subsidies, state-owned enterprises and intellectual property protection should be reinforced and, where necessary, strengthened.

Automotive suppliers support the multilateral and bilateral trade agenda of the European Commission. We recommend further facilitating international trade by dismantling tariffs and reducing barriers to access to third country markets via fair and ambitious trade agreements with important markets such as India, Mercosur and ASEAN. The current state of trade relations with the USA and the potential risk of a departure of the UK from the EU single market are a cause of great concern. Especially with regard to recent developments in world trade, the EU should leverage its strong economic position.
Global competition

China, the world’s biggest vehicle market, in particular requires a coordinated approach by all stakeholders in the European automotive industry. For European components and systems makers, China is a high-potential market and many suppliers are already well established there. For many, moreover, it is one of the biggest markets for their products. But the country’s growing auto industry is also a competitive challenge as Chinese companies internationalise and capitalise on their strength in a home market where they are heavily favoured by national regulations. The European Union needs to push for free and fair trade and reciprocity in all regulatory fields, while at the same time making sure that European companies are supported in the global market.

If European companies are going to maintain their innovation power, they must have steady and secure access to the raw materials and intermediate products they need, regardless of the provenance of these materials. EU policy should support this unfettered access to avoid supply chain disruptions that could, for example, result from the current trade dispute between China and the US. At the same time, European policy makers should support R&D efforts to develop alternative technology solutions that can reduce dependence on materials whose supply outlook is uncertain.

Global technical harmonisation is a key factor in strengthening the competitiveness of a traditionally highly export-intensive EU automotive industry. Development costs can be reduced, and duplicate administrative procedures can be avoided by establishing common technical requirements, such as those under the UNECE framework, and in particular through the introduction of mutual recognition of international whole vehicle type approval (IWVTA). Automotive suppliers contribute to defining such global standard, and call on the EU institutions to ensure alignment of regulations in this area.
Efforts are underway to build an agile work force in Europe that has the proper skills for tomorrow’s auto industry, but more work needs to be done in this area. There is a global competition for people with 21st century automotive technology skills and European suppliers need to be in a position to win that race. To do so, the industry is working with regulators, policy makers, think tanks, universities and other stakeholders to make sure students can acquire those skills, workers can be retrained and people with essential expertise can be recruited from anywhere in the world. European suppliers also support vocational training and lifelong learning programs developed in strong cooperation with universities and other institutions of higher education. But more efforts need to be made to assure the availability of experts with the relevant skillsets.

“The industry is going through the most radical transformation ever seen in the automotive industry”
Elmar Degenhart
CEO, Continental
Promoting entrepreneurial spirit

To retain and expand the leadership role of Europe’s supplier industry, the region also needs to have a flexible and adaptable business environment that helps foster innovation. Europe-wide policies need to take into account the large role played in the automotive supply chain by small- and medium-size companies (SMEs). In addition, start-ups play a crucial role in cementing the industry’s leading position and further improvements in the cultural and business climate are needed to encourage young entrepreneurs to commit to automotive technology innovation. High-tech clusters in many parts of the world are competing for technology leadership and Europe must aim for a top ranking in this competition. Industrial companies must work with governments to forge cultural change and support innovation in many different ways.

European suppliers are committed to maintaining and raising the competitiveness of the automotive industry. To do so, they are investing heavily in research and are fostering innovation, with the aim of maintaining competitiveness through quality and excellence. Public support and funding for research and innovation projects, for example in the framework of the Horizon Europe programme, has an important role to play in the competition with other world regions, such as the USA, China, Japan and Korea but requires equally strong budgets as well as unbureaucratic, technology neutral procedures.

“My vision is that Europe should lead the world in sustainability, skilled employment and innovation for the good of our citizens and the entire world”

Alberto Bombassei, Founder and Chairman, Brembo
To assure the competitiveness of the European supplier industry and automotive manufacturing across the region, several strategic initiatives need to be undertaken and supported by the European Union.

**Support European competitiveness** through comprehensive industrial policy, reconfirming the commitment to industrial manufacturing.

**Supply of raw materials and substances**, as well as transformed materials, must be assured in Europe to allow production of advanced innovations.

**Provide a reliable legal framework** for rolling out the new mobility ecosystem and industrial manufacturing in the EU.

**Strengthen the multilateral approach to fair and rules-based international trade and open competition**, dismantle tariffs and barriers to market access, and defend this approach against protectionism and unfair competition.

**Achieve systematic and global training of employees** in relevant ‘new’ skills and a mobile workforce.

**Contribute to harmonising technical requirements** across the European Union and worldwide.

**Ensure funding for research and innovation** which supports strategic objectives of sustainability, safety, connectivity and automation.
European suppliers: automotive excellence in the past, present and future

Today, like yesterday, European automotive suppliers are an integral part of what makes the region’s auto industry competitive. Focus may be shifting from vehicles to mobility, from combustion engines to electric motors, and from mechanical systems to software, but the European supplier community continues to develop the innovation that underpins the success of the industry.

European suppliers have played this key role for as long as cars and trucks have been produced. From the start of the last century, they have been instrumental in developing the systems that made cars and trucks more reliable, more efficient, safer and more fun to drive.

The history of the auto industry is defined by supplier innovations that propelled mobility to the next level. Spark plugs, ABS, ESP, seatbelts, high-performance tires, exhaust aftertreatment, new forming and joining technologies, turbochargers, common-rail diesel, LED lights, adaptive cruise control. The list is long and, for all these technologies, auto manufacturers relied heavily on suppliers to provide the core innovations.

“European automotive manufacturers are among the most demanding customers globally, so European suppliers provide high levels of quality and more technology”

Patrick Koller, CEO, Faurecia
Automotive innovations where European suppliers have played an important role:

<table>
<thead>
<tr>
<th>Spark plugs</th>
<th>ABS</th>
<th>ESP</th>
<th>Seatbelts</th>
<th>Gasoline direct injection</th>
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<tr>
<td>Radial tires</td>
<td>Exhaust aftertreatment</td>
<td>Turbochargers</td>
<td>Common-rail diesel</td>
<td>LED lights</td>
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<td>Adaptive cruise control</td>
<td>Platform strategy</td>
<td>Airbags</td>
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An average car is made of 30,000 parts and CLEPA members cover all of them
Components and systems from automotive suppliers consistently represent around 75% of the value of a car and this ratio is expected to remain stable in the future. Suppliers, many of whom are evolving from component makers to full-system providers, will continue to develop and introduce technologies to make cars safer, to lower CO₂ emissions and to improve the ride. At the same time, as new technologies make their way into cars and trucks, they are investing heavily in areas such as electrification, connectivity and artificial intelligence, which will be crucial in tomorrow’s mobility sector.

The European supplier community includes some of the biggest tier 1 parts and systems makers, but it is also characterised by its variety. Some suppliers are true global multinationals, while others are highly specialised niche players. The backbone of the industry is the thousands of small and medium-sized companies that provide essential components and systems for the vehicle industry. And the supplier community plays a dual role in catering both to the new-car market and the aftermarket, where vehicles need to be serviced, repaired and kept up-to-date.

“Intelligence and innovation is more important than scale, hence we need to continue in Europe to improve the quality of our products and services”

Roberto Vavassori, President, CLEPA
Policy priorities for safer mobility

Zero casualties on the road in 2050

- Encourage the adoption of type approval standards that make cars as safe as possible using technology that is available today, or is known to be emerging in the near future.
- A European effort to improve the quality and availability of non-personal accident data from across the member states of the EU, accessible free of charge for authorities, academia and industrial research.
- Jointly with manufacturers and suppliers, development of test methods and evaluation procedures to assess effectiveness of safety measures.
- Promotion of cross-sector approach to integrating safety solutions, benefitting all, particularly the vulnerable road users.
- Realise the infrastructure improvements needed for enhanced road safety, including deployment of Cooperative Intelligent Transport Systems (C-ITS).
- Funding for research and innovation for the development of safety technologies as well as testing, simulation, naturalistic driving and accident studies via machine learning systems of level 4 automated passenger and commercial vehicles.
Policy priorities for sustainable mobility

Electrification and minimising environmental impact

Promoting a regulatory framework that **rewards efficiency** and emissions reduction in a technology-neutral framework, e.g. well-to-wheel approach and life cycle analysis.

**Regulation and incentives** aimed at rapidly creating demand for electrified and electric vehicles as well as the necessary charging infrastructure, e.g. in the Directives on Alternative Fuel Infrastructure, Energy Efficient Buildings and Renewable Energy Directive.

Start evaluating solutions for a **secure hydrogen distribution** infrastructure.

Reducing national and regional **divergences** for electric mobility: charging infrastructure, deployment of e-fuels, price differences etc.

**Developing standards for emissions of vehicles** and air quality which are ambitious but realistic and based on sound scientific evidence.

Ensure a reliable and transparent **regulatory framework** on remanufacturing, resource use and recycling that does not interfere with requirements on material quality and safety.
**Policy priorities for smart mobility**

**Connectivity and autonomous driving**

Create an **internationally harmonised type approval system** at UNECE level that ensures automated and autonomous vehicles are safe.

Enable road testing by giving clear and consistent **guidelines to manufacturers** seeking exemptions.

Assure European R&I **funding**, for example in Horizon Europe, with a focus on key new technologies such as artificial intelligence, machine learning, and smart sensors.

Ensure free and non-discriminatory access to data created by vehicles for a competitive market for new products and services.

Large scale deployment of **Cooperative Intelligent Transport Systems (C-ITS)** infrastructure as well as making data available and ensure interoperability of data to create “readable roads”.

Consistent rules on cyber security, data protection and liability issues around highly automated and, eventually, fully autonomous vehicles.

Use **IPCEI** to support developing a European value chain for automated mobility.

Initiate and support **trust-building measures** and communication campaigns to create societal acceptance for connected and autonomous driving.
Policy priorities for a competitive automotive industry

European supplier leadership

Support European competitiveness through comprehensive industrial policy, reconfirming the commitment to industrial manufacturing.

Supply of raw materials and substances, as well as transformed materials, must be assured in Europe to allow production of advanced innovations.

Provide a reliable legal framework for rolling out the new mobility ecosystem and industrial manufacturing in the EU.

Strengthen the multilateral approach to fair and rules-based international trade and open competition, dismantle tariffs and barriers to market access, and defend this approach against protectionism and unfair competition.

Achieve systematic and global training of employees in relevant “new” skills and a mobile workforce.

Contribute to harmonising technical requirements across the European Union and worldwide.

Ensure funding for research and innovation which supports strategic objectives of sustainability, safety, connectivity and automation.
CLEPA appreciates the collaboration from all the contributors to this report, that includes the CEOs and management of the top global and European automotive suppliers.

**Sources**

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European suppliers at a glance:

Annual sales: 600 billion EUR

Annual investment in R&D: 25 billion EUR

Annual trade volume: 65 billion EUR

European employment in the automotive supplier industry: 5 million

Number of patents registered each year: 9,000
What is CLEPA?

CLEPA, the European Association of Automotive Suppliers, represents over 3,000 companies supplying state-of-the-art components and innovative technology for safe, smart and sustainable mobility, investing over 25 billion euros yearly in research and development. Automotive suppliers in Europe employ overall nearly five million people across the continent.

CLEPA brings together over 120 global suppliers of car parts, systems and modules and more than 20 national trade associations and European sector associations.

CLEPA is the voice of the EU automotive supplier industry linking the sector to policy makers.