ACEA

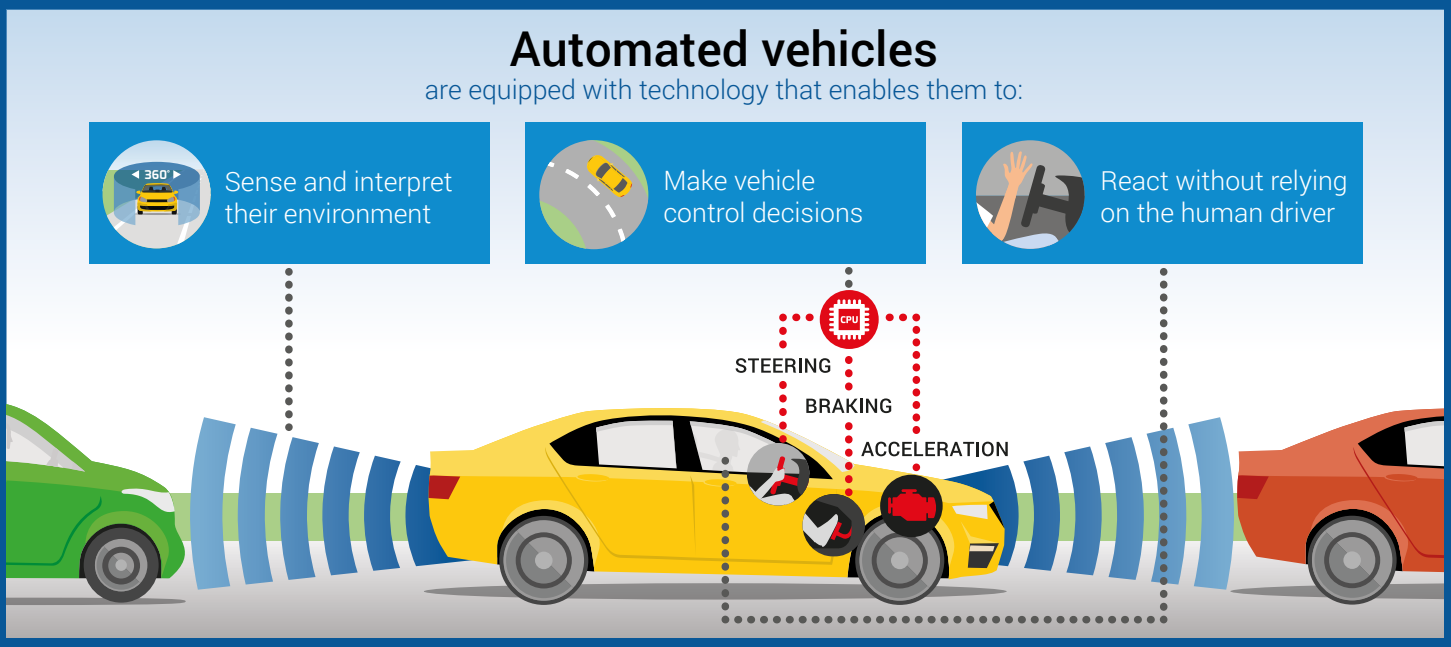
European
Automobile
Manufacturers
Association

AUTOMATED DRIVING

Roadmap for the deployment of automated driving in the European Union

WHAT IS **AUTOMATED DRIVING**?

There are different levels of automated driving, starting with technology that assists drivers in the steering, acceleration and/or braking of their motor vehicle and going up to levels that completely substitute the human driver by a system. At the highest level of automation, the vehicle is equipped with technology that makes it able to sense and interpret its environment, make vehicle control decisions, and react without relying on the human driver.



WHAT ARE **THE LEVELS** OF AUTOMATED DRIVING?

Today, there are already several systems on the market with different levels of automation. These can be considered as the building blocks towards driverless cars.

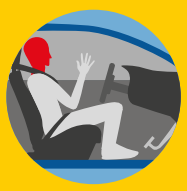
Assisted driving includes basic systems that recommend actions to drivers or give them additional sensorial perception (eg blind spot detection), while advanced active safety systems intervene automatically, faster and more reliably than a human being. Examples of the latter are autonomous emergency braking (AEB) and lane keeping assistance (LKA) systems that take over safety-critical functions in dangerous situations.

Automated driving technology is able to perform all dynamic driving tasks in specific scenarios. Think for example of an autopilot function for driving on motorways, which can be activated by the human driver to perform driving tasks, including overtaking and changing lane.

Finally, the goal of **autonomous driving** is that the vehicle can handle the full driving experience, including departure and arrival at the destination, without the need for any input from the passenger.

ASSISTED DRIVING

- The driver is at the wheel and must constantly supervise the vehicle and **intervene when necessary**.
- The system provides **steering**, **acceleration** and **braking** support.



AUTOMATED DRIVING

- The system is able to **cope with all dynamic driving tasks** within its operational design domain (ODD) without driver supervision.
- It will **transition to the driver**, offering sufficient lead time, when these conditions are not met.
- The driver may **perform non-driving related tasks**.
- The driver must be promptly **available for safe transition of control**.

AUTONOMOUS DRIVING

- The system drives the vehicle **under all conditions**.
- **No driver input is required**.
- All vehicle occupants are effectively passengers.

WHAT ARE **THE BENEFITS** OF AUTOMATED DRIVING?

Automated driving is one of the major technological advancements that is changing how we travel and transport goods – it is reshaping the future of mobility in Europe. When fully integrated in the whole transport system and accompanied by the right supporting measures, automation is expected to contribute significantly to achieving the following four social objectives:

ROAD SAFETY

Automated driving is expected to greatly reduce the risk of human error in driving, thereby making an important contribution to the EU goal of zero road fatalities by 2050.

ACCESSIBILITY AND SOCIAL INCLUSION

It will be beneficial for people with reduced mobility, such as the elderly and disabled, providing them with new mobility solutions and increased access to healthcare, work, city centres and remote locations.

EFFICIENCY AND ENVIRONMENT

It will reduce traffic congestion and increase the efficiency of our transport system, contributing to a decrease in fuel consumption and emissions (thus also addressing climate change and improving air quality).

FREEDOM AND COMFORT

Automation will increase the freedom of drivers, by allowing them to perform other activities when automated systems are active.

HOW DO WE **GET THERE**?

Before automated vehicles can become a common sight on our roads, **Europe needs to**:

- Foster **research and development** into automated driving technologies and standards.
- Review/refit, adapt and harmonise all relevant regulations to create the **right legal framework** for deployment.
- Upgrade, adapt and harmonise **physical and digital road infrastructure** to make it suitable for automated driving.
- Continue performing **large-scale and cross-border testing** of automated systems on open roads across the EU.
- Strengthen **cooperation between all stakeholders and get political support** to promote its wide-scale introduction.
- **Inform and educate the general public** as well as future drivers and passengers of automated vehicles.

Vehicle manufacturers will:

- Further develop automated driving technology and its **practical applications**.
- Provide the **necessary technical expertise** to support the regulatory process.

HOW **CONNECTIVITY** ENHANCES AUTOMATED DRIVING

Vehicle connectivity is all about the exchange of information between vehicles which are in close proximity to each other, the infrastructure around them and the wider world. It is an important enabler for many automated driving functionalities and for improving active safety features and advanced driver assistance systems (ADAS).

Connectivity also brings additional **sensorial capabilities**, notably enabling the **detection of hazardous situations** that are out of direct range of the vehicle's sensors, for example around corners or further down the road.

Crucially, connectivity provides vital **control functionalities** for certain automation applications, such as **truck platooning** (the linking of two or more trucks in convoy using connectivity technology and ADAS).

ROAD SAFETY

Automated driving holds great potential to further improve safety on our roads. Indeed, many of today's active safety technologies (which prevent accidents from happening altogether or at least actively help the driver to reduce the impact of an emergency situation) are already starting to prepare drivers and other road users for a future when vehicles will drive themselves.

HOW AUTOMATION AND CONNECTIVITY WILL FURTHER IMPROVE SAFETY

ASSISTED DRIVING

Today, we already see the introduction of partially automated vehicles, able to perform an increasing range of driving tasks in specific scenarios.

AUTOMATIC PARKING

LANE KEEPING

Including active safety systems that intervene in dangerous situations.

STEERING

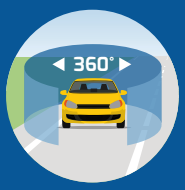
BRAKING

AUTOMATED DRIVING

These vehicles have the ability to navigate without permanent supervision from the driver.

NO DRIVER INPUT NEEDED DURING NORMAL OPERATION

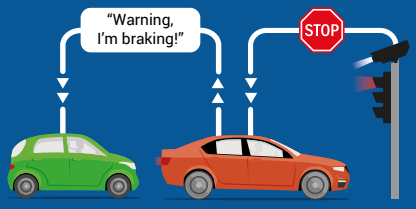
HIGHLY RELIABLE PERCEPTION OF ENVIRONMENT



Reduces the risk of human error in driving, which is still a major contributing factor in most accidents.

CONNECTIVITY

Exchanging safety-critical information between vehicles and infrastructure makes it possible to reduce the number of accidents and casualties.



Using this information it is possible to:

IMPOSE VARIABLE SPEED LIMITS

OPEN OR CLOSE TRAFFIC LANES

HELP AVERT ACCIDENTS

FLAG HAZARDS ON THE ROAD AHEAD

RESEARCH AND DEVELOPMENT

The European automotive sector spends €57.4 billion on research and development per year, making it the EU's number one investor in R&D, responsible for 28% of total spending. Automation is one of the most important drivers of innovation in the auto industry, making it is a decisive factor in the future viability of the sector in Europe. Indeed, research and pre-deployment projects focussing on automated driving give a strong boost to the technological competitiveness of auto manufacturers, helping the industry to maintain its position as an engine for growth and jobs.

4 KEY FOCUS AREAS

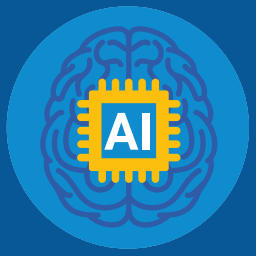
SECURITY

It is essential to guarantee safe, secure and trusted communication between vehicles and the digital infrastructure.

USER ADOPTION

The success of automated driving depends on user adoption as well as acceptance by society at large, including other road users.

ARTIFICIAL INTELLIGENCE



AI enables safe autonomous driving in a complex traffic environment. It also plays a major role in intelligent mobility services.

TESTING

Large-scale testing and validation of automated driving systems on open roads is vital to furthering their development and deployment.

SHAPING TOMORROW'S MOBILITY AND TRANSPORT

NEW APPROACH TO VEHICLES

Automated driving is a paradigm shift that will change the way we experience road travel and transport. As automation further develops in the future, the driver will gradually be able to enjoy new activities within the system's intended use, such as reading, working or using an electronic device.

Eventually, as vehicles become fully autonomous, the driver will no longer be required as a fallback. Drivers and passengers will thus progressively gain the freedom to enjoy new services offered to them. This will provide room for further innovation in terms of mobility and entertainment.

INTEGRATED MOBILITY

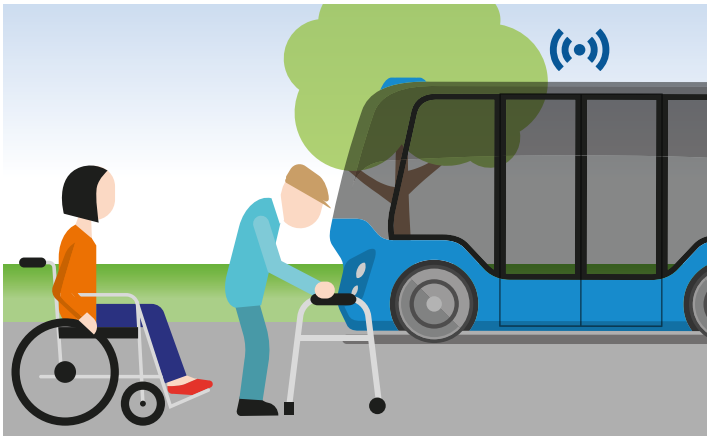
Automation makes a positive contribution to sustainable transport by offering new mobility solutions that can be integrated into a single 'Mobility as a Service' (MaaS) ecosystem.

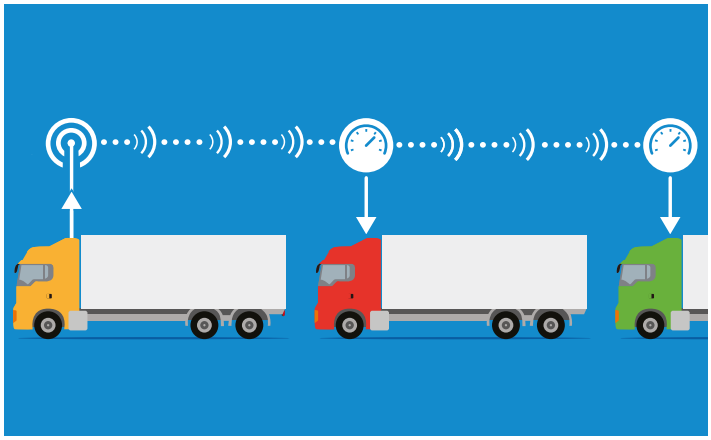
This will allow cities and regions to build a transport offer combining high-capacity public and private transport with individual mobility solutions that respond to diverse and changing customer needs. Integrated mobility will help deliver important societal goals such as accessibility, inclusion and sustainability.

ENHANCED ACCESS TO MOBILITY

Automated vehicles will increase the availability of passenger transport services while reducing their cost. This is especially valid in areas with low and dispersed demand, such as rural areas and suburbs, where the availability of professional drivers is typically low, or bus routes may have disappeared due to public spending cuts.

Furthermore, automation will offer access to mobility to people who are traditionally deprived of it, such as those with limited mobility and the elderly, who may be unable to drive themselves.



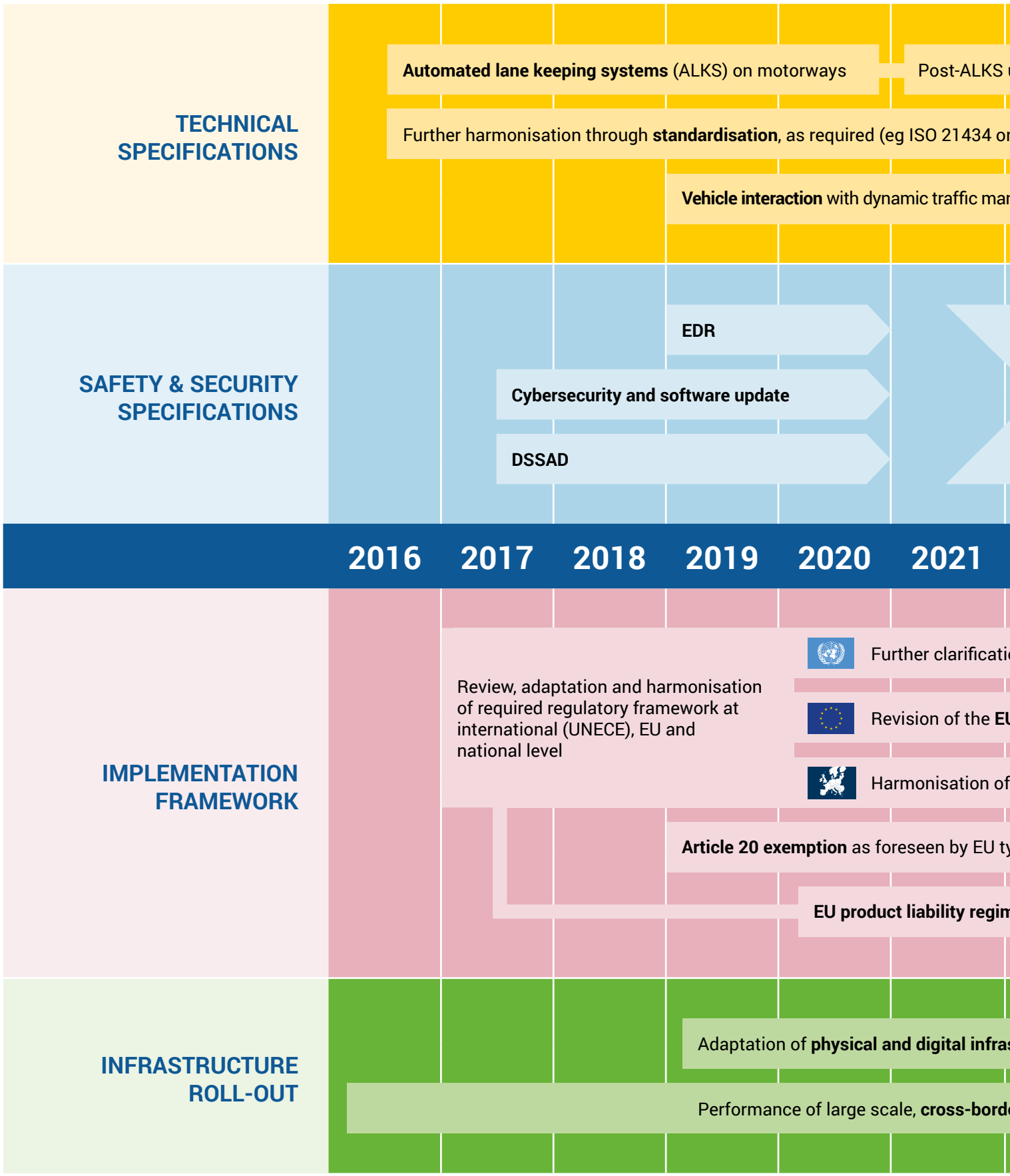


FREIGHT TRANSPORT

Automated driving, in combination with connectivity, is also revolutionising the transport of goods. Today, with platooning, trucks can be linked together into a convoy through connectivity technology and ADAS. The driver in the truck at the head of the platoon acts as the leader. The following trucks react and adapt to changes in the leader's movement, with little to no action required from the drivers.

Tomorrow's trucks will be autonomous, transporting goods all over Europe without the need for drivers, providing shippers with a competitive advantage as well as reinventing the logistics structures of today.

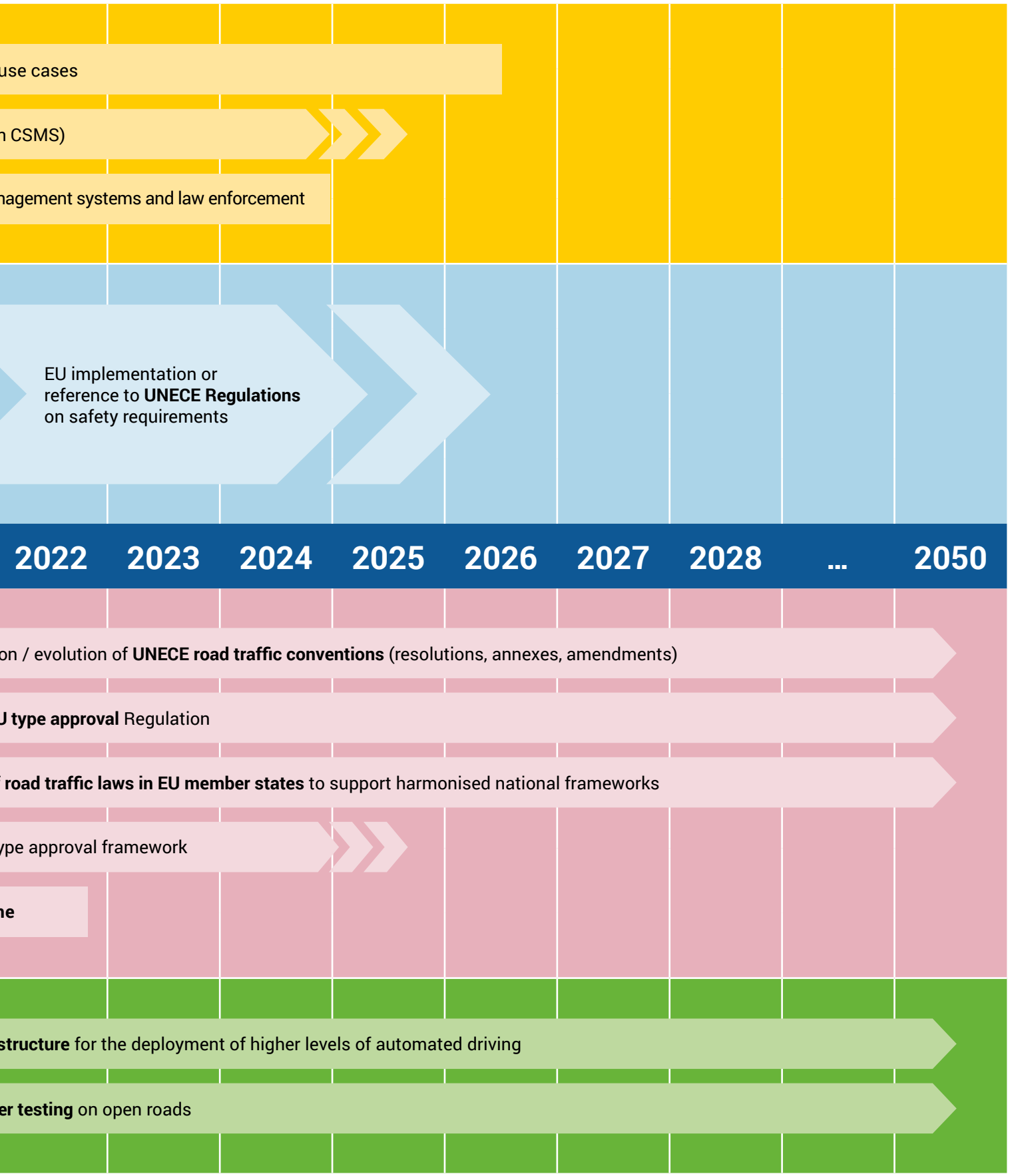
STEPS TOWARDS THE DEPLOYMENT OF AUTOMATED DR



LIST OF ABBREVIATIONS

- ALKS = Automated lane keeping systems
- CAD = Connected and automated driving
- CSMS = Cyber security management systems
- DSSAD = Data storage system for automated driving
- EDR = Event data recorder
- GRSG = UNECE Working Party on General Safety
- GSR = EU General Safety Regulation

IVING IN THE EUROPEAN UNION



RIGHT LEGAL FRAMEWORK FOR AUTOMATED DRIVING

In order to enable the deployment of automated vehicles on Europe's roads in the near future, it is **essential to set the right legal framework at the international, EU and national level**.

To that end, ACEA recommends that the following legal framework is put in place.

UN **EU** **National**

TECHNICAL REGULATIONS / FUNCTIONALITIES

- **Framework Regulation on automated / autonomous vehicles** – New regulation
- **ALKS motorway** – New regulation
- **Advanced Emergency Braking Systems (AEBS)** R131 (commercial vehicles); New regulation (cars)
- **Braking** – R13; R13H
- **Driver monitoring** – Part of ALKS
- **Minimal risk manoeuvre** – Part of ALKS

CYBERSECURITY

- **Cyber Security Management System (CSMS)** New regulation (2020)
- **Cybersecurity for CAD** – New delegated act (GSR, based on UNECE Cybersecurity Regulation)

SOFTWARE UPDATE

- **Software over-the-air update** New regulation (2020)

LIABILITY AND ACCIDENT RECONSTRUCTION

- **DSSAD** – New regulation (WP 29 Informal Group)
- **EDR** – New delegated act (GSR, based on UN GRSG EDR)

MUTUAL RECOGNITION

- **Art 20 Exemption Procedure Guidelines** (2019)

DRIVER

- **Driving licences** – New regulation (WP 1 Informal Group)
- **Human Machine Interface (HMI)** – Part of ALKS

TRAFFIC RULES

- **Evolution of the Geneva and Vienna Conventions**
- **Harmonisation of national road traffic laws**

ROAD INFRASTRUCTURE

- **Road signs** (harmonised under UNECE WP1) Regulation (EC) 1071/2009
- **Vehicle interface** with dynamic traffic management and law enforcement – New regulation or standard
- **Road Infrastructure Safety Management (RISM) Directive** – Directive 2008/96/EC
- **Road signs** – National laws on road signs to be updated

ROAD WORTHINESS

- **Periodic technical inspection** Directive 45/2014/EU, possible future harmonisation within the 97 Agreement

SOCIAL LEGISLATION

- **Driving time** – Regulation (EU) 561/2006
- **Tachograph** – Regulation (EU) 165/2014

ACEA European Automobile Manufacturers Association

ACEA represents the 15 major Europe-based car, van, truck and bus manufacturers

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