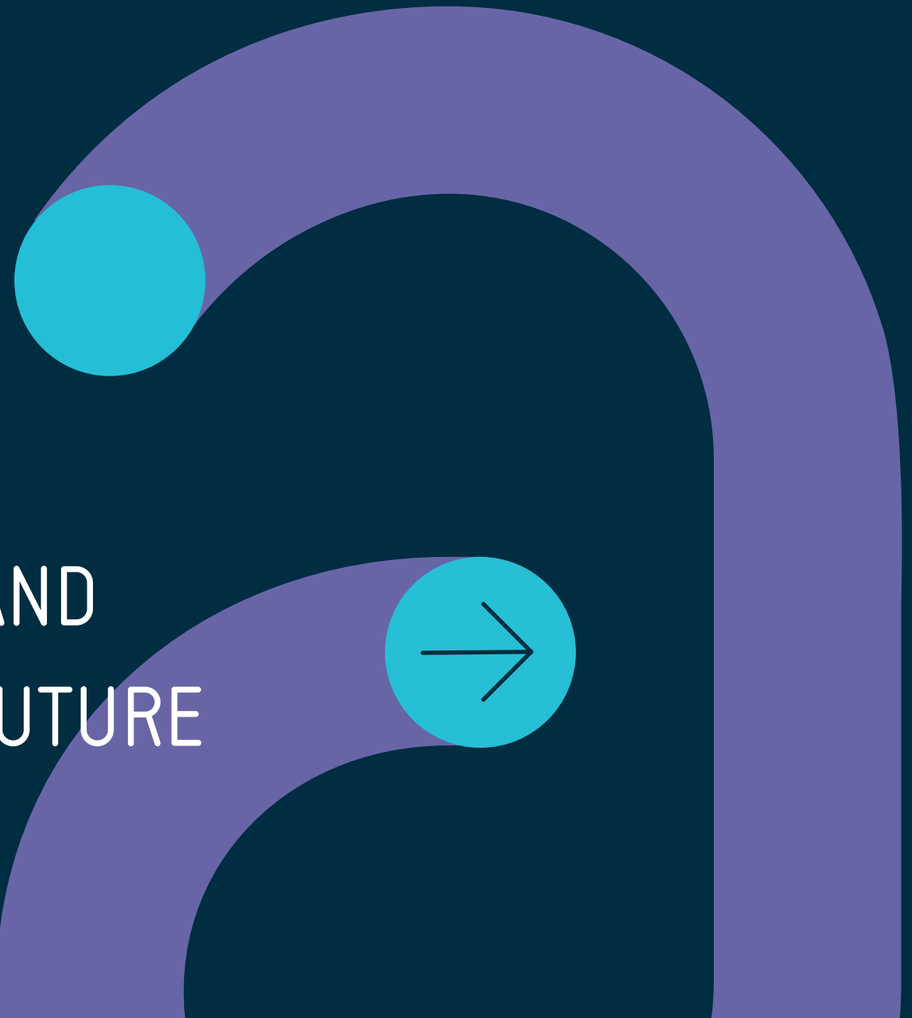
acea
DRIVING MOBILITY FOR EUROPE

AUTOMATED AND AUTONOMOUS DRIVING

STATE-OF-THE-ART AND ROADMAP FOR THE FUTURE



AUTOMATED MOBILITY: NOT JUST A VISION

The European automotive industry is progressing steadily in the development of automated vehicles, and its heavy investments are paying off. Cars that park themselves, trucks that drive on their own around freight yards: these applications are already a reality, and are shaping the future of mobility.

From lower transport costs to a smaller environmental footprint; from improved working conditions to better-served transport needs: automation will tangibly benefit European society.

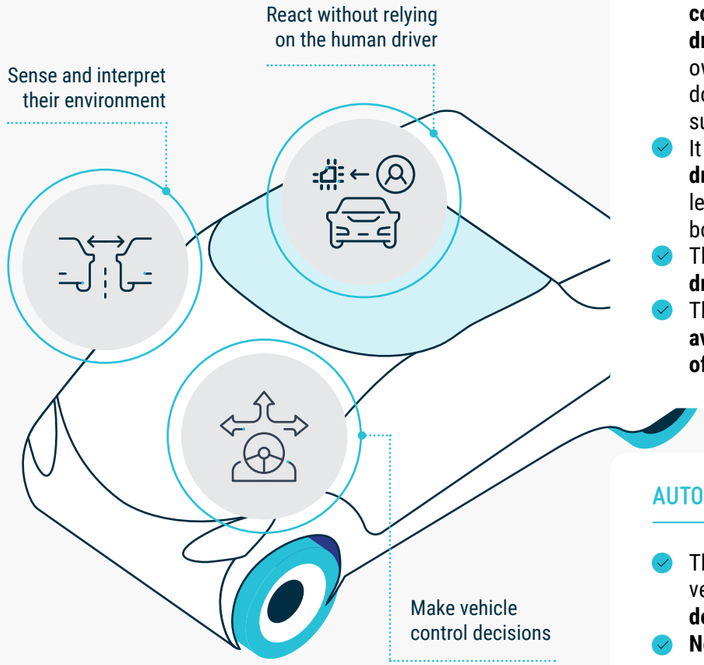
Supporting R&D in automation will enable European firms to develop the know-how to be competitive in one of the defining fields of the future of transport. It will also encourage the pursuit of high-quality connectivity, which is important to the operation of services based on automation. Europe cannot afford to miss the 'digital train'. This roadmap aims to help European policy makers usher in an era of better, more efficient mobility.

WHAT ARE THE LEVELS OF AUTOMATED DRIVING?

There are already several systems on the market with different levels of automation. These can be considered as the building blocks of self-driving cars.

- **Assisted driving** includes basic systems that recommend actions to drivers or give them additional sensorial perception (eg blind spot detection).
- **Advanced active safety systems** intervene automatically, faster, and more reliably than a human being. A well-known example is automated emergency braking (AEB) systems that take over safety-critical functions in dangerous situations.
- **Automated driving** technology can 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 like overtaking or changing lanes.
- Finally, **autonomous driving**'s goal is to enable the vehicle to handle the full driving experience, from departure to arrival at the destination, without the need for any input from the passenger.

AUTOMATED VEHICLES ARE EQUIPPED WITH TECHNOLOGY THAT ENABLES THEM TO:



AUTOMATED DRIVING

- The system is able to **cope with all dynamic driving tasks** within its own operational design domain (ODD) without driver supervision
- It will **transition to the driver**, offering sufficient lead time, when reaching the boundaries of its ODD
- 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 in **its operational domain**
- **No driver input is required**

WHAT ARE THE USES OF AUTOMATED DRIVING TECHNOLOGY?

Automated vehicles are already on our roads — and manufacturers are working to deploy them in roles where they have the strongest immediate impact.

Here are use cases for vehicle automation that exist today or that will soon become reality.

HUB-TO-HUB FREIGHT TRANSPORT

Highly automated heavy trucks carry freight over medium and long distances, linking warehouses to distribution centres. The routing and scheduling of these vehicles can be planned for maximum efficiency. For instance by avoiding peak traffic hours, adjusting travel speeds, and reaching much higher overall usage rates. This translates into lower costs and a reduced environmental impact. The absence of user errors also reduces repair costs. Autonomous trucks are key to reinventing logistics structures in Europe.

PASSENGER SERVICES

In cases where passenger transport is considered impractical or economically unfeasible, automated vehicles can nonetheless provide crucial mobility services. People with disabilities and the elderly in particular stand to benefit.

On traffic routes where demand fluctuates, automated vehicles can operate on request around the clock and remain on standby indefinitely until summoned, reducing wasteful trips while preserving service quality and capacity. In densely populated areas, the higher occupancy rates of automated vehicles can translate into less traffic overall.

YARD OPERATIONS

Commercial vehicles operating in confined areas away from public roads – like harbours, airports, mines, freight hubs, and bus depots – allow for earlier adoption of self-driving technology. Indeed, the technical implementation of high-level automation is easier in environments where traffic is tightly controlled and the required infrastructure can be fully deployed. The more predictable and controllable nature of these areas enables vehicle manufacturers to gain valuable experience with automation.

AUTOMATED VALET PARKING

Occupants can disembark at the entrance of a parking facility and order their car to park itself automatically. Automated valet parking systems not only save time, but also enhance safety by reducing the number of pedestrians on mixed-usage roadways. In addition, when connected to parking infrastructure, these systems can reduce energy consumption by directing vehicles to free spaces. They can enable more vehicles to fit into parking facilities by allowing the design of tighter spaces that do not leave room for occupants to access their cars.

LAST MILE DELIVERY

In recent years, we have seen an unprecedented rise in demand for delivery services due to the increased popularity of online shopping. Automated last mile delivery can alleviate the strain that this shift in consumer habits has put on the road network and businesses. Vehicles without a driver compartment also have a smaller footprint or higher capacity, and offer a solution to an industry facing severe driver shortages.

PRIVATE VEHICLES ON HIGHWAYS

From assisted driving to automation to autonomous operation: the natural evolution of automated driving through these development stages leads to more extensive self-driving capabilities that eventually reach private passenger vehicles. As each development stage lasts around a decade, making full automation accessible to the general public will take time. It is nonetheless a worthwhile goal, as it holds great potential to contribute to improved traffic flow, increased passenger comfort, and road safety.

WHAT ARE THE BENEFITS OF AUTOMATED MOBILITY?

Automated mobility is one of the major technological advances 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 social objectives.

INNOVATION CAPABILITIES

Cutting-edge research and engineering lead to the creation and retention of know-how in Europe, making it possible to attract a highly skilled workforce from the EU and the rest of the world. They also create better connections between academia and industry. Research funding has a multiplier effect too as it leads to enhanced industrial and technological capabilities.

SUSTAINABILITY

Automation translates into optimal vehicle usage, which leads to less congestion. For instance, commercial vehicles that carry cargo around the clock enable transport operators to use roads when traffic is lighter, and to lower speeds when possible. Automated passenger services, such as ride pooling, lead to more users per vehicle, and therefore use less roadway overall.

ROAD SAFETY AND COMFORT

The promise of convenient and comfortable mobility will draw more users to automated mobility, reducing the risk of human error in driving. Automated systems are quicker to react than a human being and are always vigilant: they do not experience fatigue, drowsiness, or distraction.

COMPETITIVENESS

Europe is competing with overseas industrial strategies that rely either on ease of access to private capital or on high investment in public infrastructure. Automated mobility provides Europe with an opportunity to take advantage of the good cooperation between the public and private sectors, and to strike a unique balance between intelligent infrastructure and intelligent vehicles.

WORKFORCE AND SKILLS

Today's shortage of commercial vehicle drivers is linked to an increased demand for transport. Automation can be part of the solution. If vehicles can drive themselves under certain conditions, human drivers can be allocated to where they are needed most. Drivers can in turn benefit from better working conditions and less time away from home.

ACCESSIBILITY AND INCLUSION

Automation will provide those with reduced mobility, such as the elderly and people with disabilities, with new mobility solutions that give better access to healthcare and to work, both in city centres and more remote locations.

5 RECOMMENDATIONS FOR DEPLOYING AUTOMATED VEHICLES ON EUROPE'S ROADS

1

INNOVATION CAPABILITIES

- Foster R&D in automated driving technologies and standards.
- Simplify national and cross-border pre-deployment testing of automated systems on open roads across the EU by creating European testing permits.

2

ROAD SAFETY AND COMFORT

- Upgrade, adapt, and harmonise digital infrastructure to make it suitable for automated driving.
- Establish European minimum standards for high-quality physical road infrastructure.
- Update and harmonise road traffic rules to allow for high-level automation.
- Cooperate with the industry on guidelines on remote vehicle supervision.
- Grant access to public traffic data.

3

COMPETITIVENESS

- Update Europe's type-approval scheme to remove the current restrictions on the number of automated vehicle registrations.
- Expand the number of automated vehicle applications allowed in Europe as the world moves towards application-independent regulations, such as those discussed at the UN.
- Support the adoption and harmonisation of national operation, licensing, and traffic regulation to adopt pan-European rules on passenger transport and licensing.
- Foster harmonisation of legislation on a global scale. Progress in mobility should not be limited to some individual EU member states. Early legal certainty will also help reduce vehicle complexity, support technological development, and help manufacturers scale deployment to a global level.
- Create a European funding scheme for automated passenger and freight services.

4

WORKFORCE AND SKILLS

- Adapt labour regulations for commercial vehicle drivers and operators.

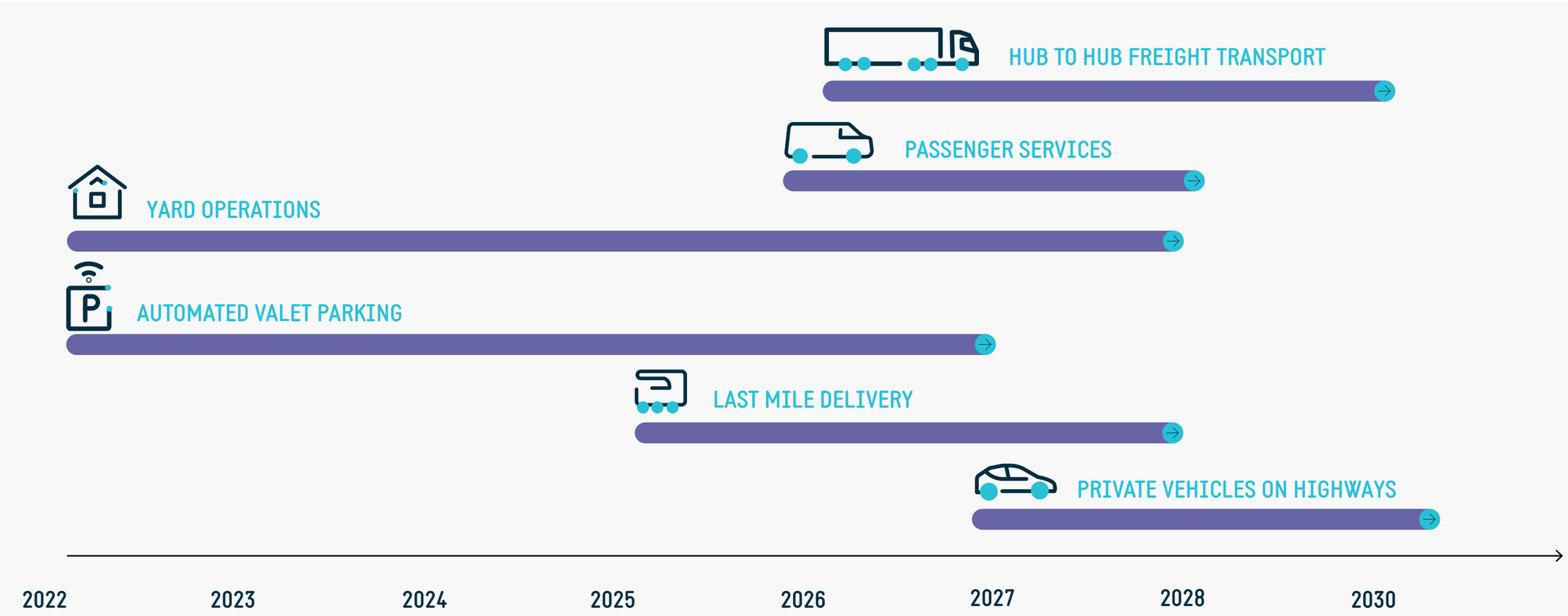
5

ACCESSIBILITY AND INCLUSION

- Inform and establish a dialogue with the general public, and future drivers and passengers of automated vehicles.

ROADMAP

Commercial operation for each use case will start within the indicated time range.



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