

Development of automated and connected road mobility State of play, challenges and actions for the national strategy

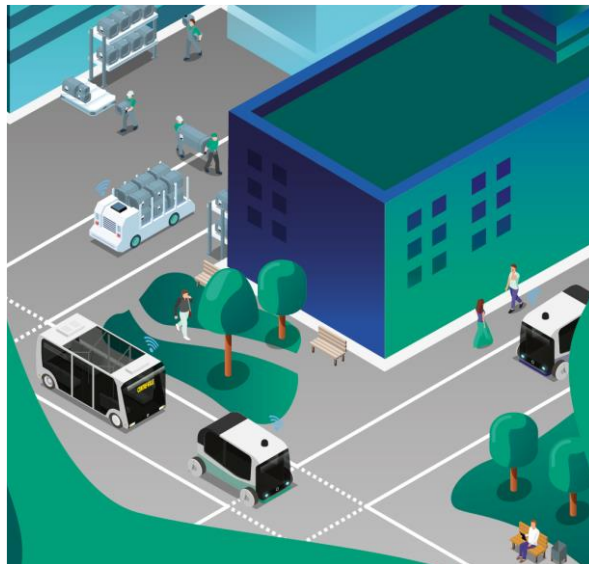


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1. Overview

As early as 2018, France adopted a strategy for the development of autonomous vehicles, updated in 2020.

This 2022 update landmarks a new stage: it explicitly takes into account **connectivity** issues, and enlarges the scope to **mobility services** made possible by automation and connectivity.

It aims to accelerate France's commitment to regulatory, technological and economic models that will make our country a **leader** in the **deployment of the most relevant and achievable use cases**.

Under the aegis of the Ministers of Ecological Transition and Territories, Economy, Interior and Overseas Territories, Transport, Industry and Digital, this strategy is being developed in close cooperation with a very thriving cross-sector private ecosystem. It is articulated with European and international work in which our country is involved in a leading position.

All of the work involved in defining and implementing this ambition is entrusted to a senior official, former minister Anne-Marie Idrac.

The public action strategy is based on four key actions:

1) Prioritize and coordinate connectivity systems and data exchange deployments.

2) Finance investment projects in industrial supply of automated road mobility, ambitious service pilots, or first commercial deployments, in particular via France 2030 and by mobilizing European credits.

3) Support volunteer local authorities and operators in the deployment of passenger services

4) Finalize the legal framework for automated freight and logistics.

Actions cover a relatively short period of time (2023-2025), in order to be able to act quickly and re-evaluate needs according to the context's evolution, notably use cases' technical and economic feasibility.

2. Context

2.1 Strategic existing framework

The strategy formulated in 2018 has laid out three principles of action - **safety, progressivity, acceptability** – that are still in effect. It has set up cross-functional working and leadership frameworks, in a public-private ecosystem. The strategy was articulated around two main axes:

- o preparing the legislative and regulatory framework for the deployment** of automation ;
- o supporting research and experimentation.**

The objectives of the December 2020 update were to:

- **intensify work on safety validation**, in support of the regulatory framework;
- **facilitate the appropriation** of the challenges of automated mobility by local actors;
- support the **deployment of service pilots**, making it possible to test the economic models and the conditions for their operation;
- **strengthen the European integration** of French work, which is a precursor.

2.2 Main progress: in line with objectives

At the end of 2022, the main progress are as follows:

General regulatory framework

- At the national level, the legislative and regulatory framework for the deployment allowing the circulation of fully automated vehicles (including without a driver on board, supervised) has been created in application of the “Loi d’orientation des mobilités” (LOM) of December 30, 2019. This framework sets out the liability regime and conditions of use for driver delegation systems in vehicles and automated road passenger transport systems (order of April 14, 2021 and decree of June 29, 2021). It has been specified by decrees relating to remote intervention, the approval and opinion of qualified organizations, and consumer information when acquiring or leasing an automated vehicle.

➤ **France thus has the most complete legal framework in the G7 countries for the circulation of vehicles with driver delegation, up to the level of automation without a driver on board.**

- At the European level, the approval of fully automated vehicles has been defined by the regulation of August 5, 2022, which allows a good articulation with the national framework of safety demonstration of systems deployed on specific routes or areas.
- At the international level, an amendment to the Vienna Convention on Road Traffic, defining automated driving systems, entered into force in July 2022. A group of experts, under the French vice-presidency, has been created to develop a new legal instrument on automated driving, intended to complement the pre-existing Conventions on road traffic.

Safety demonstration

- At the national level, various guidelines have been published on safety demonstration methods (use of driving scenarios, application of the "globally at least equivalent" principle in safety, reference safety levels, connectivity requirements, description of fields of use).
- At the European level, France, which has actively participated in the work of drafting the vehicle type-approval regulation, has proposed that guides to ensure uniformity of practice in Europe supplement the regulation. The Commission's work program has largely taken up the approaches proposed by France on safety demonstration methods and tools.

Support to innovation

An overview of innovation support levers.

- *Technological building blocks*: the Orientation Committee for Automotive and Mobility Research (CORAM), set up in May 2020 (budget of €250M in 2022), supports structuring projects by start-ups and companies in the field.

- *Artificial intelligence applications*: the Confiance.ai program, with a budget of €45 million (2021-2024), aims to create a platform of software tools for integrating AI into critical products or services; the PRISSMA program, with a budget of €5 million (2019-2023), aims to create a platform for validating the safety of the AI component of autonomous transport systems

- *Experiments*: the EVRA program (2019), with a budget of €42 million, has supported 16 experiments with autonomous vehicles in various operational design domains (private vehicles, public transport, logistics; urban and rural environments) ;

- *Service pilots*: the France 2030 "road mobility" program has a budget of €200 million (2021-2023)

- *Logistics automation*: France 2030's Logistics 4.0 program has a budget of €90 million (2021-2022)

At the European level, the Horizon Europe research program (2021-2027) includes a specific program on automated, connected and cooperative mobility (CCAM), to which the EU is contributing around €500M, for an estimated total budget of €1Bn. Other European programs indirectly contribute to the support of automated and connected mobility solutions: Digital Europe (use of digital technologies, supercomputing, artificial intelligence, cybersecurity); 5G corridors.

Stakeholder animation

At the national level, public-private cooperation has underpinned the development and monitoring of the strategy since its inception, relying on various technical working groups between administrations and industries, notably concerning safety, use cases for passengers, freight transport and logistics, and vehicle-infrastructure connectivity issues.

Exchanges with local authorities have been set up, in particular with those involved in experimentation or pilot projects. Experimentation consortiums have set up bodies to produce evaluation elements from the projects and share them with public actors.

Finally, a national seminar has been set up to monitor ethical and acceptability issues

At the European level, the Commission set up a platform on automated, connected and cooperative driving (CCAM) in 2019, which gave rise to the CCAM partnership designed to guide European innovation policy, in which France is a stakeholder.

Focus on acceptability

The national seminar on acceptability and societal aspects of the automated vehicle set up in 2018 brings together representatives of parliamentary assemblies, local authorities, economic players, associations and research. The seminar meets every six months and reports on national, local and international acceptability studies. It has carried out a number of reviews of the work done on safety, environmental impacts and data. It also discussed the conclusions of the report of the Digital Ethics Council of April 2021, highlighting the need for transparency in the regulatory framework for demonstrating safety.

At the European level, the September 2020 research report on ethical issues highlights the need to assess the benefits of automated driving, clarify liability rules, and ensure the explicability and safety demonstration of automated systems.

2.3 Recent evolution of context and challenges

The main changes in context to be taken into account at the end of 2022 appear to be the following:

- A. **Societal demands for mobility:** mobility of people and goods is a strong socio-economic expectation in all territories. Environmental footprint of mobility, while largely determined by the evolution of motorization, also depends on modal choices and the ability to optimize supply: pooling of transport, adaptation of capacities to demand, facilitation of load breaks, optimization of the use of roads and public space, cost control, etc. The ideas of inclusive and shared mobility are also gaining ground. In all these areas, digitalization and automation can provide their part of solutions. This is particularly the case with high quality services that complement traditional public transport.
- B. **A return to reasonable prospects for the development of vehicle automation**, based on an analysis of achievable operational design domains, both in the technological sense and in terms of usage. At the same time, the rapid **development of driver assistance systems** (ADAS¹) is contributing to

¹ Driving assistance systems are not, strictly speaking, part of automated driving systems.

the gradual integration of pre-automation technologies and to the increasing appropriation of these functions by the public, in particular for the benefit of road safety and driving comfort.

C. The growing importance of data-related issues:

- **The progressive development of the legal framework on data access** combines European and national regulations and addresses two main areas:
 - **Data exchanges between public and private actors for road information, operation and safety:** the European directive on intelligent transport (2010) aims to facilitate data exchanges between road operators and service providers; current developments are broadening the scope of the data concerned, including those produced directly by vehicles; at the national level, the order of April 14, 2021 sets out the principles of access to vehicle data for public actors (operator and intervention services, organizing authorities).
 - **Access to vehicle data between private economic actors for the provision of commercial services to users:** the Commission has planned an initiative in the course of 2023, which could lead to a regulation.
- Connectivity needs are diversifying:
 - The accumulation of automated vehicle experiments and the importance of routes in the safety of systems have revealed growing connectivity needs related to various issues of safety, operation, maintenance and updating of on-board systems, supervision, or user information. **Connectivity is thus a facilitator of automation**, thanks to the integration of infrastructure and vehicle design;
 - Independently of automation, **the need for connectivity for driver information and on-board functions** continues to grow, as does the **development of other mobility services**.
 - Overall, the convergence of themes related to automation, those related to road information, and flow management tends to **make connectivity multifunctional**, opening up questions of standardization and regulation.
- The **question of technologies mix (ITS-G5; LTE-V2X; 5G; satellite) is raised**, in order to clarify investment strategies, knowing that some stakeholders have already made technological choices and investments.
- In this context, and in order to clarify both safety and deployment issues, **a hierarchy of road connectivity use cases** and the qualification of the corresponding data must now be carried out.

D. The maturation of automated freight transport and logistics use cases, with three main areas of use identified: closed sites² / last mile logistics / long distance transport), within which use cases are diversifying, in terms of customers, goods transported, or manoeuvres.

Beyond closed sites for which the regulatory framework exists (EU Machinery Directive), traffic on public roads could develop, requiring regulatory framework as part of the strategy, with probably forms of "hybrid" traffic environments (transport between two closed sites, from hub to hub, deliveries in mixed spaces such as parking lots, shopping areas or traffic-calmed areas); certain standardisation issues could appear and inter-modality will have to be taken into account.

² Most of the logistic automation concerns the warehouses, and does not require the elaboration of a specific regulation, whose need concerns the traffic on the public road.

3. 2022-2025 strategy

3.1 Expectations from the ecosystem

Various collective work tools were mobilized in the second half of 2022 to build the strategy update with all stakeholders. Three main points emerged from these consultations:

A. The need to extend and deepen the strategy on the basis of what has been achieved

While greening is the priority objective for all, this does not exclude the pursuit of commitments on automation, especially since it can be considered as a source of opportunities for policies to decarbonize mobility. It also raises the stakes for the development of our technologies, including internationally.

The continuation and expansion of experience sharing, evaluation processes, and public-private coordination dynamics are desired for the implementation of a new stage of the strategy.

B. Integrating technological opportunities into the range of mobility solutions for travelers

From that point on, support for local authorities and passenger transport service operators becomes a priority: local authorities have expressed a need for information and experience sharing on both regulatory and political aspects (operational design domains and adaptation to territories, acceptability, project management, etc.) as well as on financial support for the deployment of the first services.

Focus on shared mobility services

Identified use cases: new services (feeder services to mass transit, staggered or occasional schedules, service to sparsely populated or closed areas) or improvement of existing services (e.g., Bus Rapid Transit - BRT).

A reasonable target in 2030: 100 to 500 new services.

Challenges:

- acceptability, quality of service, operating models and business transformation,
- the choice and development of routes from the point of view of both the value of the services and safety
- the development of remote intervention for driverless vehicles, interoperability between types of vehicles, and the need for user interaction with off-vehicle operating personnel.

C. The need to industrialize vehicle and service offerings, to move from experimentation to deployment

Needs to support innovation are diversifying and extending to industrialization and commercialization, and require the implementation of appropriate mechanisms, beyond those already in place within the framework of France 2030. The evolution of support tools will have to integrate a dimension of national and European sovereignty, which is becoming more and more important as technologies mature.

Diversification of innovation support issues

The new challenges concern in particular:

- The industrialization of key components (sensors, software, human-system interfaces);
- The automation of higher capacity and faster vehicles;
- Supervision tools;
- Connectivity capabilities; Cybersecurity;
- Databases and their processing;
- Performance improvement in a system logic;
- Validation tools;
- Deployment of the necessary infrastructure, including trackside connectivity equipment;
- Service pilots in expanded and more varied operational design domains;
- Risk sharing for the first commercial launches of automated transport systems.

3.2 Priority actions

Given the achievements and expectations presented above, it appears that public action should, in the coming years, focus on four priority actions:

1) Prioritize and coordinate connectivity systems and data exchange deployments

This involves defining common priorities for connectivity use cases among all stakeholders, with regard to road safety and operations issues, and economic benefits. This action will have to pay particular attention to the needs of connectivity and on-board intelligence for automated public or shared transport, in order to accelerate their deployment

2) Finance investment projects in industrial supply of automated road mobility, ambitious service pilots, or first commercial deployments, in particular via France 2030 and by mobilizing European credits

The objective is to extend the measures put in place as part of France 2030, in order to finance the development and industrialization of automated and connected vehicles and their components, as well as the first commercial deployments of passenger transportation services based on these vehicles.

3) Supporting volunteer local authorities and operators in the deployment of passenger services

The objective is to make the regulatory framework a deployment facilitator for local authorities, transport operators and site managers. The preferred tool will be a resource center to share experiences and guide the design and evaluation of deployment projects and the application of the safety demonstration framework.

The 2030 target is for 100 to 500 services without an onboard operator, i.e. several thousand vehicles
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4) Finalize the legal framework for automated freight and logistics.

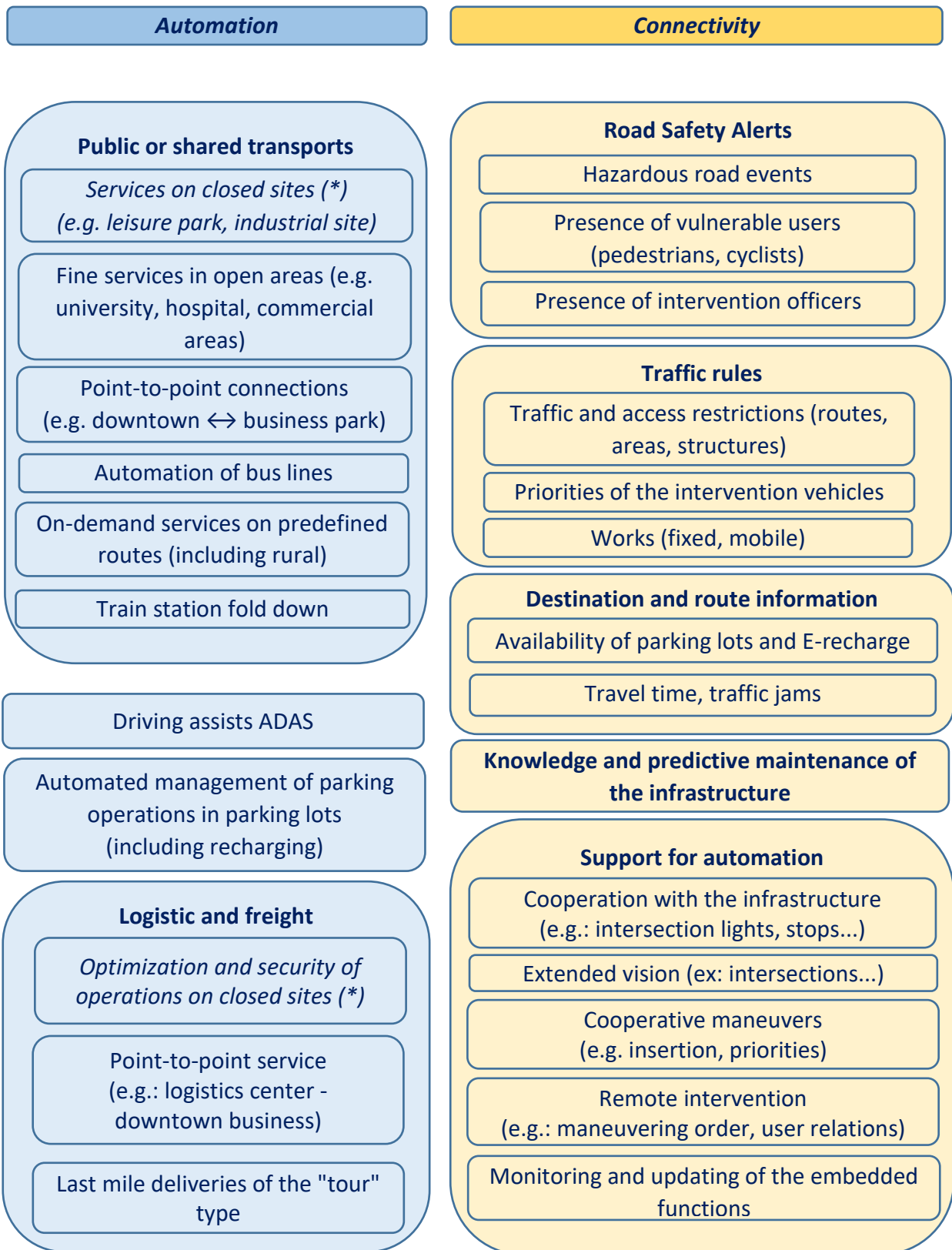
The objective is to enable the development of use cases by creating the necessary framework for traffic on open roads, in addition to the existing framework that already allows operations on closed sites.

3.3 Support and animation actions

The following actions are intended to support these priority actions:

- **Deployment perspectives**
 - Assessment of experiments
 - Development factors for 2030
 - Skills and training needs
- **Regulations**
 - Safety demonstration methods and tools (including remote intervention and connectivity)
 - Specification of a base of safety demonstration scenarios
 - Participation in EU and UN work on regulation and safety demonstration
 - Specific requirements for valet parking uses cases
- **Connectivity and data**
 - Common priorities for connectivity use cases
 - Functional needs of connectivity use cases
 - Territorial coverage issues and relevance of different technologies
 - Data specifications for the application of national and European regulations
 - Secure architecture for data exchange
- **Animation**
 - Coordination and monitoring procedures will be extended and strengthened, with local authorities and connectivity and logistics players being more closely involved in groups designed to prepare and support the regulations (particularly via safety standards) and in work on acceptability and societal aspects.

3. Annex: use cases examples



(*): these use cases do not require the regulatory framework specifically dedicated to the circulation of automated vehicles on public roads, the framework mentioned in this document.