



## **Autonomous Vehicles to Evolve to a New Urban Experience**

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### **DELIVERABLE**

#### **D2.11 - Second report on regulatory requirements and compliance plan**



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# Acronyms

ADS	Automated Driving Systems	LIDAR	Light Detection And Ranging
AI	Artificial Intelligence	MEM	Monitoring and Evaluation Manager
API	Application Protocol Interface		General Transport
AV	Autonomous Vehicle	OCT	Directorate of the Canton of Geneva
BMM	Business Modelling Manager	ODD	Operational Domain Design
CB	Consortium Body	OEDR	Object And Event Detection And Response
CERN	European Organization for Nuclear Research	OFCOM	Federal Office of Communications
D7.1	Deliverable 7.1	PC	Project Coordinator
DC	Demonstration Coordinator	PEB	Project Executive Board
DI	The department of infrastructure	PGA	Project General Assembly
DMP	Data Management Plan	PRM	Persons with Reduced Mobility
DSES	Department of Security and Economy Traffic Police	PSA	Group PSA (PSA Peugeot Citroën)
DTU test track	Technical University of Denmark test track	PTO	Public Transportation Operator
EAB	External Advisory Board	PTO	Public Transport Operator
EC	European Commission	PTS	Public Transportation Services
EC	European Commission	QRM	Quality and Risk Manager
ECSEL	Electronic Components and Systems for European Leadership	QRMB	Quality and Risk Management Board
EM	Exploitation Manager	RN	Risk Number
EU	European Union	SA	Scientific Advisor
EUCAD	European Conference on Connected and Automated Driving	SAE Level	Society of Automotive Engineers Level (Vehicle Autonomy Level)
F2F	Face to face meeting	SAN	Cantonal Vehicle Service
FEDRO	Federal Roads Office	SDK	Software Development Kit
FEDRO	(Swiss) Federal Roads Office	SMB	Site Management Board
FOT	(Swiss) Federal Office of Transport	SoA	State of the Art
GDPR	General Data Protection Regulation	SOTIF	Safety Of The Intended Functionality
GIMS	Geneva International Motor Show	SWOT	Strengths, Weaknesses, Opportunities, and Threats.
GNSS	Global Navigation Satellite System	TM	Technical Manager
HARA	Hazard Analysis and Risk Assessment	UITP	<i>Union Internationale des Transports Publics</i>
IPR	Intellectual Property Rights	V2I	Vehicle to Infrastructure communication
IT	Information Technology	WP	Work Package
ITU	International Telecommunications Union	WPL	Work Package Leader
LA	Leading Author		

# Executive Summary

In order to identify and map regulatory and legislative requirements and procedures (concerning actual and under development policies), we have collected data, for the French, Swiss, Luxembourg and Danish situation, at national, regional and local levels on the three following aspects:

- policy decision making organization, i.e., competencies,
- laws and legal documents in the field of urban planning, transportation and mobility,
- reports, white books and national programs.

After this first step, we have interviewed actors and stakeholders of Navly projects to investigate the issues they encountered and/or still face and how they overcame any problems. We aimed at identifying potential bottle necks, expectations in terms of regulation evolutions or stakeholders' contribution.

The current document proposes a set of criteria measuring the level of obstacles or barriers (linked to regulations or policy making process) to the implementation of autonomous shuttles on open roads.

These criteria form a dashboard that helps monitoring the evolution of the barriers' level.

We applied the dashboard to the 4 first selected Avenue cities (Copenhagen, Geneva, Luxembourg and Lyon) to test its appropriateness.

The dashboard will be a barriers' evaluation tool for further Avenue replicators.



# 1 Introduction

AVENUE aims to design and carry out full-scale demonstrations of urban transport automation by deploying, for the first time worldwide, fleets of autonomous minibuses in low to medium demand areas of 4 European demonstrator cities (Geneva, Lyon, Copenhagen and Luxembourg) and 2 to 3 replicator cities. The AVENUE vision for future public transport in urban and suburban areas, is that autonomous vehicles will ensure safe, rapid, economic, sustainable and personalised transport of passengers. AVENUE introduces disruptive public transportation paradigms on the basis of on-demand, door-to-door services, aiming to set up a new model of public transportation, by revisiting the offered public transportation services, and aiming to suppress prescheduled fixed bus itineraries.

Vehicle services that substantially enhance the passenger experience as well as the overall quality and value of the service will be introduced, also targeting elderly people, people with disabilities and vulnerable users. Road behaviour, security of the autonomous vehicles and passengers' safety are central points of the AVENUE project.

At the end of the AVENUE project four year period the mission is to have demonstrated that autonomous vehicles will become the future solution for public transport. The AVENUE project will demonstrate the economic, environmental and social potential of autonomous vehicles for both companies and public commuters while assessing the vehicle road behaviour safety.

## 1.1 On-demand Mobility

Public transportation is a key element of a region's economic development and the quality of life of its citizens.

Governments around the world are defining strategies for the development of efficient public transport based on different criteria of importance to their regions, such as topography, citizens' needs, social and economic barriers, environmental concerns and historical development. However, new technologies, modes of transport and services are appearing, which seem very promising to the support of regional strategies for the development of public transport.

On-demand transport is a public transport service that only works when a reservation has been recorded and will be a relevant solution where the demand for transport is diffuse and regular transport is inefficient.

On-demand transport differs from other public transport services in that vehicles do not follow a fixed route and do not use a predefined timetable. Unlike taxis, on-demand public transport is usually also not individual. An operator or an automated system takes care of the booking, planning and organization.

It is recognized that the use and integration of on-demand autonomous vehicles has the potential to significantly improve services and provide solutions to many of the problems encountered today in the development of sustainable and efficient public transport.

## 1.2 Autonomous Vehicles

A self-driving car, referred in the AVENUE project as an **Autonomous Vehicle (AV)** is a vehicle that is capable of sensing its environment and moving safely with no human input. The choice of Autonomous

vs Automated was made in AVENUE since, in the current literature, most of the vehicle concepts have a person in the driver's seat, utilize a communication connection to the Cloud or other vehicles, and do not independently select either destinations or routes for reaching them, thus being “automated”. The automated vehicles are considered to provide assistance (at various levels) to the driver. In AVENUE there will be no driver (so no assistance will be needed), while the route and destinations will be defined autonomously (by the fleet management system). The target is to reach a system comprising of vehicles and services that independently select and optimize their destination and routes, based on the passenger demands.

In relation to the SAE levels, the AVENUE project will operate SAE Level 4 vehicles.



## SAE J3016™ LEVELS OF DRIVING AUTOMATION

		SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?		You <u>are</u> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <u>are not</u> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
		You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
		These are driver support features			These are automated driving features		
What do these features do?		These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/ acceleration support to the driver	These features provide steering AND brake/ acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
		<ul style="list-style-type: none"><li>• automatic emergency braking</li><li>• blind spot warning</li><li>• lane departure warning</li></ul>	<ul style="list-style-type: none"><li>• lane centering OR</li><li>• adaptive cruise control</li></ul>	<ul style="list-style-type: none"><li>• lane centering AND</li><li>• adaptive cruise control at the same time</li></ul>	<ul style="list-style-type: none"><li>• traffic jam chauffeur</li></ul>	<ul style="list-style-type: none"><li>• local driverless taxi</li><li>• pedals/ steering wheel may or may not be installed</li></ul>	<ul style="list-style-type: none"><li>• same as level 4, but feature can drive everywhere in all conditions</li></ul>
Example Features							

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### 1.2.1 Autonomous vehicle operation overview

We distinguish in AVENUE two levels of control of the AV: micro-navigation and macro-navigation. Micro navigation is fully integrated in the vehicle and implements the road behaviour of the vehicle, while macro-navigation is controlled by the operator running the vehicle and defines the destination and path of the vehicle, as defined the higher view of the overall fleet management.

For micro-navigation Autonomous Vehicles combine a variety of sensors to perceive their surroundings, such as 3D video, LIDAR, sonar, GNSS, odometry and other types sensors. Control software and systems, integrated in the vehicle, fusion and interpret the sensor information to identify the current position of



the vehicle, detecting obstacles in the surround environment, and choosing the most appropriate reaction of the vehicle, ranging from stopping to bypassing the obstacle, reducing its speed, making a turn etc.

For the Macro-navigation, that is the destination to reach, the Autonomous Vehicle receives the information from either the in-vehicle operator (in the current configuration with a fixed path route), or from the remote control service via a dedicated 4/5G communication channel, for a fleet-managed operation. The fleet management system takes into account all available vehicles in the services area, the passenger request, the operator policies, the street conditions (closed streets) and send route and stop information to the vehicle (route to follow and destination to reach).

## 1.2.2 Autonomous vehicle capabilities in AVENUE

The autonomous vehicles employed in AVENUE fully and autonomously manage the above defined, micro-navigation and road behaviour, in an open street environment. The vehicles are autonomously capable to recognise obstacles (and identify some of them), identify moving and stationary objects, and autonomously decide to bypass them or wait behind them, based on the defined policies. For example with small changes in its route the AVENUE shuttle is able to bypass a parked car, while it will slow down and follow behind a slowly moving car. The AVENUE vehicles are able to handle different complex road situations, like entering and exiting round-about in the presence of other fast running cars, stop in zebra crossings, communicate with infrastructure via V2I interfaces (ex. red light control).

The shuttles used in the AVENUE project technically can achieve speeds of more than 60Km/h. However this speed cannot be used in the project demonstrators for several reasons, ranging from regulatory to safety. Under current regulations the maximum authorised speed is 25 or 30 Km/h (depending on the site). In the current demonstrators the speed does not exceed 23 Km/h, with an operational speed of 14 to 18 Km/h. Another, more important reason for limiting the vehicle speed is safety for passengers and pedestrians. Due to the fact that the current LIDAR has a range of 100m and the obstacle identification is done for objects no further than 40 meters, and considering that the vehicle must safely stop in case of an obstacle on the road (which will be “seen” at less than 40 meters distance) we cannot guarantee a safe braking if the speed is more than 25 Km/h. Note that technically the vehicle can make harsh break and stop with 40 meters in high speeds (40 -50 Km/h) but then the break would too harsh putting in risk the vehicle passengers. The project is working in finding an optimal point between passenger and pedestrian safety.

## 1.3 Preamble

WP2 aims to define in detail the use cases of each demonstrator, the scenarios for each implementation phase and the value added services required for the success of the demonstrators. A human-centred design approach for the design of the use cases will be followed. The required data to be collected for the impact analysis will also be defined. Existing knowhow and best practices will be surveyed, assessed and analysed. The work of the tasks of WP2 is iterative and as the provided demonstrators and services become more sophisticated, new iterations of the work of the different tasks will be contacted.”

AVENUE will identify and map regulatory and legislative requirements and procedures (concerning actual and under development policies), as well as barriers/ obstacles for the full deployment of THE

AVENUE vision and demonstrations. The identification will focus on the city demonstrators (in depth – exhaustive analysis) and up to 10 additional cities (non-exhaustive analysis). From the latter, an in-depth analysis will be performed for those to be selected as replicators. Based on the results of the analysis a plan for regulatory compliance will be elaborated per demonstrator and replicator city.

The task T2.4 Regulatory facilitators and barriers aims to identify and map regulatory and legislative requirements and procedures (concerning actual and under development policies), as well as barriers/obstacles for the full deployment of AVENUE demonstrations and vision. Similarly, to previous tasks, the identification will focus on the city demonstrators (in depth – exhaustive analysis) and up to 10 additional cities (non-exhaustive analysis). From the latter, an in-depth analysis will be performed for those to be selected as replicators. Based on the results of the analysis a plan for regulatory compliance will be elaborated per demonstrator and replicator city.

In this Deliverable D2.11 we describe actual and under development regulatory and legislative procedures on the four demonstrators' cities on three levels policy making: the national level, the regional level and the local level. The report clarifies the impact of regulatory by providing a dashboard used to assess the level of barriers in any urban context. The dashboard is built with a couple of criteria that are indicative of the degree of legal and political leverage to the implementation of autonomous shuttles.

We applied the dashboard to the 4 first selected Avenue cities (Copenhagen, Geneva, Luxembourg and Lyon) to test its appropriateness. In the forthcoming months, the dashboard will be a barriers' evaluation tool for further Avenue replicators.

Section 2 provides a general overview on the three branches of law that may be involved in case of controversies. Section 3 proposes a dashboard to evaluate the level of city's openness to AV and how to use it. Section 4 concludes by presenting synthesis tables on the 4 AVENUE selected cities whose legal situation is largely detailed in the 4 following appendices.

## 2 - AV regulation framework

In the United States, California has passed a major milestone: allowing autonomous vehicle experiments with no operator inside. In France, the state wants to allow these tests as early as 2019. A test of size for these new systems, since historical rules will have to be unraveled, such as the Vienna Convention on Road Traffic signed and ratified in 1968 by a majority of European states. A regime to which France and Germany are subject. For a long time, the text stipulated that the driver had to remain master of his vehicle. But for two years, it allows systems of automated driving provided they can be controlled or even disabled by the driver (level 2). (Ilkova & Ilka, 2017)

### 2.1 General framework: 3 main branches of law

#### Administrative law

One of them is administrative law, which includes especially road traffic law in general (it covers, among others issues, such as certification and licensing, technical controls, road traffic rules, etc). It deals with stating technical norms as well. The most important legal challenges related to autonomous driving in the area of administrative law are following: Does autonomous driving have to require a special driving license? If so, shall it be national or international? Shall an AV driver (“user”) be required to have a driving license at all? Do there have to be any age requirements for AV users? Should autonomous driving be allowed everywhere ? Should it be mandatory on special roads or dedicated lanes? Does autonomous driving have to follow all traffic rules? If an AV violates a traffic rule, does it have to self-report to authorities? Should there be an external indicator on the vehicle when autonomous driving is engaged? (D. J. Fagnant & Kockelman, 2015)

## Civil Law

Civil law covers a wide range of legal challenges related to AVs. The most significant challenge is connected with the issue of civil liability. It includes on the one hand liability for damage and/or injury, which is further connected with insurance issues, and on the other hand, there is product liability (a specific type of liability for damage and/or injury, caused by a defective product). In this regard, an article from a German insurance journal is worth mentioning. In the article, the author outlines two possible conceptual approaches that would contribute to reach clear liability rules pertaining to AVs and clear insurance coverage. Furthermore, it would result in minimization of litigation.

The first approach is based on a compulsory motor third party liability (MPTL) insurance under the regime of strict liability by mandating AV manufacturers to contribute a portion of the insurance for each individual vehicle. However, manufacturers would be exempted from product liability for injury and damage that is covered under the compulsory MPTL insurance regime and that was caused by a product defect affecting AV functionality, unless the defect is the result of gross negligence. This approach is rather theoretical than pragmatic due to possible administration difficulties. According to the second approach, which suggests product liability to be further sharpened, the requirement of a product defect should be omitted. Instead, the manufacturer should be held liable for injury and damage caused by the way goods acted (i.e. the way of their actions and behavior; their effect; and the failure of the goods to act or to behave in a particular way, or to have a particular effect).

The main argument for this approach is the following: while AVs will be much safer than conventional cars, the technology in the product is so complex that there is an uncontrollable residual risk of malfunctioning even when the product is free from defects. Hence, the legislation should introduce an irrefutable presumption of a defect in a highly or fully automated vehicle that causes an accident, unless the manufacturer can prove that the autonomous vehicle functionality was not the cause of the accident. The MTPL regime would, in this alternative, remain identical to the first approach, except that manufacturers would not be incorporated into the MTPL system (Ilkova & Ilka, 2017).

## Criminal law

Autonomous driving-inspired legal challenges in the area of criminal law include especially the issue of criminal responsibility as well as protection against cybercrime and hackers. In general, research in this area is dealing with the following questions: What crimes may be committed in context with

autonomous vehicles? Who should be held responsible in case when using an AV a crime is committed (the owner of the vehicle; the person who is sitting in the driver's seat – if there is any kind of it; the vehicle manufacturer; the mechanic who mounted the autonomous technology to the vehicle or another entity)? The incidents may happen under various circumstances. Will the responsible subject change depending on these circumstances and if so, how? What are basic model scenarios of incidents related to the use of autonomous vehicles? How should the law react, if the criminally responsible subject is a legal entity?

As for the criminal responsibility for harm caused by an AV, according to most European states' criminal codes, the driver (or vehicle owner) may be charged with negligence even if the AV was in control (in autonomous mode). If no negligence is proved, the criminally responsible entity is the manufacturer. Since in most cases, a vehicle manufacturer is a legal entity, it is highly important to consider the issue of corporate criminal responsibility. The European Union countries do not have an identical legislation in this area. Some countries' criminal codes (including the Slovak republic's as well) are built on the idea of personal guilt. These codes would definitely need an amendment.

## 2.2 Current legal issues

The regulatory focus has been on enabling testing of autonomous vehicles and providing guidelines for the development of autonomous vehicles. Both are positive steps, however, there is a risk that without clear legislation stakeholders may opt not to follow the guidelines, leading to a discordant development. (Overy, 2017).

### Slow progress of EU legislation

Considering that it took five years from the request for a Mandate until the adoption of the 'Release 1 specifications', EU legislation may progress too slowly to be of assistance in coordinating and synchronizing development. There is considerable industry criticism that the EU is failing to move fast enough to introduce changes to vehicle safety tests and even laws regulating the high speed internet connections that connected cars rely in order to function.

### Cross-border use of connected cars

Although the International Transport System Directive focuses on creating interoperable technologies, the fact that the ITS Directive allows each Member State "to decide on the deployment of ... applications and services on its territory" may give rise to situations where car owners cannot use their vehicles outside their home jurisdiction, something which is especially important in a market such as the EU where there is considerable movement across borders exists.

### Interoperability

We already have a plethora of different platforms being developed by different suppliers for use in vehicles. Will the market need to follow the example of the mobile phone market (with which there are obvious parallels) and adopt standardised technology to ensure that connected cars can communicate seamlessly with each other and with the external environment? In the mobile phone world, standards

are negotiated among the various market players which develop the technology and technology is made available for all to license on fair, reasonable and non-discriminatory ("FRAND") terms. International standards will be particularly important, with regard to car technologies, as cars, by their nature, tend to cross geographic borders.

## 2.3 Current liability issues

### Attributing liability

It is likely that initially, in the absence of specific legislation, car owners will remain liable in the first instance for incidents caused by their autonomous vehicles. However, if an accident occurs in an autonomous vehicle as a result of an error or shortcoming in the system as opposed to resulting from carelessness on the part of the owner, in some cases it might be considered unjust to attribute the incidents to the car owner or driver. A number of complicated liability questions arise in relation to car incidents involving autonomous vehicles. For example, what if the vehicle had made a choice that the driver would never have chosen: should the driver be responsible? Who should be responsible for incidents caused by defects in the software interface between two cars or between a car and the road? The car manufacturer? The manufacturer of the software that failed to prevent the accident? Who should be held liable in the case of a cyber-attack on cars? Should the software manufacturer be strictly liable for defective software security that allowed third parties to hack into the car? Or should the owner be liable if, for example, they had failed to download software security updates? Should network providers be held liable if accidents are a result of a defect in connectivity causing the incident? (D. J. Fagnant & Kockelman, 2015)

### Attributing fault

With the increase in event data recorders (also known as insurance black boxes) in vehicles it should become easier to determine exactly what the cause of an accident was (subject to privacy implications), however, fault for the accident will still need to be attributed. A recent UK Department of Transport consultation suggests that connected car features would be treated in the same way as features such as ABS which have manufacturer liability in place.

### Responsibility for insurance

Additionally, there is the question of who should insure the vehicle. Should all relevant parties contribute to the insurance? Will car owners still be required to have third party liability insurance? Will car manufacturers be legally required to have product liability insurance? Will accidents in autonomous vehicles fall under the product liability regulations preventing any limitation on the bringing of claims against the manufacturer? Or if a network provider is liable, will telecoms liability limitations apply? In the UK, 11 major insurers, including Aviva and Direct Line, are working together to provide a framework for insuring autonomous vehicles. One option being considered is expanding compulsory insurance to cover product liability, another one is the manufacturer takes all responsibility for its products.

Some level 4 or 5 prototypes consume two to four kilowatts of electricity, the equivalent of 50 to 100 computers, making them unable to run on batteries only. The green aspect of AV could be jeopardised and stronger rules applied if LCA were to be applied or if digital pollution regulation were to be stronger.

## **Anonymity and personal data protection hardening**

“Advanced emergency braking systems, intelligent speed assistance, emergency lane-keeping systems, driver drowsiness and distraction warning, advanced driver distraction warning and reversing detection systems are safety systems that have a high potential to reduce casualty numbers considerably. In addition, some of those safety systems form the basis of technologies which will be used for the deployment of automated vehicles. Any such safety system should function without use of any kind of biometric information of drivers or passengers, including facial recognition. Therefore, harmonised rules and test procedures for the type-approval of vehicles with regard to those systems and for the type-approval of those systems as separate technical units should be established at Union level. The technological progress of those systems should be taken into account in every evaluation of the existing legislation, in order to be future proof, strictly adhering to the principle of privacy and data protection, and to support the development towards Vision Zero driving. It is also necessary to ensure that those systems can be used safely, throughout the life cycle of the vehicle.”

## **The evolution of Regulation 79 on safety**

“Over the past decades, developments in vehicle safety have contributed significantly to the overall reduction in the number of road fatalities and severe injuries. However, 25 300 people died in 2017 on Union roads, a figure that has stagnated in the last four years. Moreover, 135 000 people are seriously injured in collisions every year. The Union shall do its utmost to reduce these figures drastically aiming at the Vision Zero goal of “no fatalities”. In addition to the safety measures to protect vehicle occupants, the implementation of specific measures to prevent fatalities and injuries of vulnerable road users, such as cyclists and pedestrians, is needed to protect users outside of the vehicle. Without new initiatives on general road safety, the safety effects of the current approach will no longer be able to off-set the effects of increasing traffic volumes. Therefore, the safety performance of vehicles needs to be further improved as part of an integrated road safety approach and in order to protect vulnerable road users better.”

Automated vehicles may be able to make a huge contribution in reducing road fatalities since more than 90 per cent of road accidents are estimated to result from some level of human error. As automated vehicles will gradually be taking over tasks of the driver, harmonised rules and technical requirements for automated vehicle systems, including, in regard to verifiable safety assurance for automated vehicles decision-making, should be adopted at Union level and promoted at international level in the framework WP9<sup>1</sup> of the United Nations Economic Commission for Europe.

## **The evolution of Regulation 79 on difference between automated and fully-automated vehicle**

Advanced emergency braking or emergency lane-keeping systems might not be fully operational in some cases, in particular due to shortcomings in the road infrastructure. In those cases, the systems should

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<sup>1</sup> <https://www.unece.org/trans/main/wp29/introduction.html>

deactivate themselves and give information about the deactivation to the driver. If they do not deactivate automatically, it should be possible to switch them off manually. Such deactivation should be temporary and last for a period when the system is not fully operational only. Drivers may also need to override advanced emergency braking systems or emergency lane keeping systems, where the functioning of the system could lead to greater risk or harm. This ensures that the vehicles are at all times under the driver's control. Nevertheless, the systems could also recognise instances where the driver is incapacitated and therefore intervention by the system is needed in order to prevent the worsening of an accident.

Text proposed by the Commission Amendment (21) : “automated vehicle means a motor vehicle designed and constructed to move autonomously for extended periods of time without continuous human supervision; 'automated vehicle' means a motor vehicle designed and constructed to move autonomously for certain periods of time without continuous human supervision but on which driver intervention is still expected or required”.

### Urban planning and legal aspects for public transport organization

Experiments authorizations are provided by certification bodies and local decision-making bodies, like municipalities. But the integration in public transport, meaning common transit pass for example requires different authorizations. Depending on the city/country, this integration is limited due to the lack of mobility governance body. This body is generally made of city politicians and representative of the public transport operator (PTO). In the context of AVENUE, Geneva and Lyon have this organization. Copenhagen has this organization only since the beginning of 2019. In Luxembourg city, it is also the case, the other Luxembourg site (Contern) is not part of the mobility authority area.

## 3 – How to scan regulatory system

### 3.1 Proposition for a regulatory dashboard

The prospective issues of the autonomous vehicle, and more precisely Autonomous shuttles, have to be apprehended on several dimensions, the first being the distinction between the autonomous car and the autonomous shuttle, insofar as the uses are different, the related regulations are also different: to date, the cars are not intended to be considered as public transport, in the sense of a full integration into an urban transport network. This could obviously evolve for example with robots-taxis, in the case of on-demand transport.

Taking into account the AVENUE project, we consider the autonomous shuttle as unit of analysis. Apart from the technical progress expected and the R & D efforts of the manufacturers, the conditions of development of autonomous shuttles are twofold: regulation and political will.

The regulatory issue of the vehicle itself, falls under the European and national level for approval, levels of security, global traffic permits on roads (open road, private site ...) and more generally its use of infrastructure.

When there is a national political will, the motivation is threefold:



- Revive, support and strengthen industrial policy, in particular the automotive industry and its derivatives
- Revive, support and strengthen the country's competitiveness (in economic terms, but also in terms of attractiveness)
- Gain a pioneer position or to be in an exemplary approach.

At the local level, we find these three dimensions, but within the notion of boosting the territory in a goal of attractiveness, whether in terms of inhabitants, business location or investors. The development of competitiveness clusters is an illustration of these motivations.

The manifestation of political will involves the definition and implementation of political and financial tools and the adaptation of the regulatory apparatus. Again, there are distinctions to be made between the national and local levels.

At the national level, some states are developing programs to fund experimental or demonstration projects. The purpose of these projects is to be able to change the regulatory frameworks and to identify the obstacles and levers on which the state could intervene to favor the development of the sector (on a vision of industrial policy) or to favor new uses for the development of a carbon-free mobility, for example.

At the local level, the transport and mobility policies allow tests in situ of these vehicles, local authorizations of experimentation granted but are subject to conformity with the national regulations.

The main issues surrounding the regulatory and political aspects of the deployment of autonomous shuttles concerns the confrontation and convergence of political will at national and local levels and the distance between the different executive and legislative bodies (short circuit vs. long circuit concept and intermediaries), which also refers to the complexity of the political systems of the various states concerned by AVENUE. The development of the proposed dashboard is based on the results provided by research articles, documentary reviews and on experts' visions. The dashboard gives an evaluation of the level of openness to mobility's innovation for each city.

4 thematic and the related 8 criteria give the basis for the openness to autonomous shuttle.

Application to the 4 selected Avenue cities

In order to evaluate the level of openness, an expert basis analysis and a global documentary review have been carried out.

1. In a first step, per city, each criteria city has been evaluated on a 1 to 5 scale (1 minimum and 5 maximum)
2. In a second step, the impact of each criterion, per city has been evaluated with – and + sign (- meaning negative impact, + meaning positive impact)
3. In a third step, a relative approach has been made between the 4 cities in order to establish a referential for any city that could join the program.



Country City	Denmark Copenhagen	France Lyon	Luxembourg	Switzerland Geneva
	Score	Score	Score	Score
<b>Centrality of power at the national level</b>	1	5	4	1
<b>National industrial policy</b>	3	5	5	3
<b>Number of administrative layers</b>	1	5	1	3
<b>Local territories independency (local regulation)</b>	5	3	3	5
<b>Local policy for mobility and transport</b>	3	5	5	5
<b>Public transport governance: Integrator policy bodies at local level</b>	4	5	4	5

**Table 1 – Evaluation of each criterion per city**

Country City	Denmark Copenhagen	France Lyon	Luxembourg	Switzerland Geneva
	Impact on openness	Impact on openness	Impact on openness	Impact on openness
<b>Centrality of power at the national level</b>	--	+++	++	--
<b>National industrial policy</b>	+	+++	+++	+
<b>Number of administrative layers</b>	+++	---	+++	+
<b>Local territories independency (local regulation)</b>	+++	+	+	+++
<b>Local policy for mobility and transport</b>	+	+++	+++	+++
<b>Public transport governance : Integrator policy bodies at local level</b>	+	+	+	+

*Table 2 – Evaluation of each criterion on city's openness to AV*

Country City	Denmark Copenhagen	France Lyon	Luxembourg	Switzerland Geneva
	Score	Score	Score	Score
<b>Centrality of power at the national level</b>	-2	15	8	-2
<b>National industrial policy</b>	3	15	15	3
<b>Number of administrative layers</b>	3	-10	3	5
<b>Local territories independency (local regulation)</b>	15	3	3	15
<b>Local policy for mobility and transport</b>	3	15	15	15
<b>Public transport governance : Integrator policy bodies at local level</b>	4	5	4	5
<b>GLOBAL SCORE</b>	<b>26</b>	<b>43</b>	<b>48</b>	<b>41</b>

**Table 3 – Final evaluation of openness level per city**

The global score evaluates the propensity of a city to be open to mobility innovation.

Currently, it seems that Copenhagen is, among the 4 Avenue cities, the less ready for changes in the field of mobility.

## 3.2 Details for the criteria's evaluation

### Centrality of power at the national level

Max Weber analysis paved the way to understand advantages and limits of this kind of bureaucratic organizations. Public policies and decision-making are strongly linked to bureaucratic organization. Bureaucracy is governed by law, rationally determined and by rationally designed regulations. The specific functioning of this bureaucracy, which flourishes only with the modern state and in advanced capitalism, rests on the following elements (Weber, 1968):

- The principle of regulated administrative management;
- Explicitly separated skills and clearly distributed work;
- The principle of the hierarchy of functions and the hierarchical chain (the higher hierarchy and the subordination of the authorities are intangible);
- The principle of authenticity of acts;
- Working tools and means of production do not belong to civil servants;
- The separation between the function and the person;
- In-depth professional training for specialized functions
- The hiring of persons with recognized professional qualifications to guarantee the performance of the assignment;
- The function is filled only by full-time civil servants.

Public bureaucracies are subject to organizational and institutional constraints, which do not prevent innovation but may slow it. Hierarchy, control, centralization of coordination and incentive systems and public law govern the exchanges between the organization and its environment and internal relations. They determine the modes of integration and exploitation of new information. They print the characteristics of innovation processes, such as the multiplicity of minor innovations or the slowness of the processes of integration and diffusion of major innovations. The problem of innovation in public bureaucratic organizations can be seen in terms of arbitration between rigidity-control progressive innovation and flexibility-loss of control-rapid innovation. The more layers exist in bureaucracies, the more constraints and slowness are seen.

Any bureaucratic structure is thus designed to eliminate human arbitrariness. Such organizational principles prohibit the attribution of any innovative potential. Innovation is synonymous with creativity, personalization, learning and uncertainty, all of which are incompatible with the effectiveness of a bureaucratic structure: its depersonalization, rationalization and permanence. Bureaucracy is explicitly designed to obey, not to imagine. The function of the public servant is to apply the regulations and must behave according to precedents. He is also trained in discipline and not initiative. In this logic, the administration, faithful executor of the tutelary directives, develops only to the extent that this corresponds to a governmental will. It does not innovate but applies instantly any directive enacted by the tutelage. The established legal framework, bureaucratic rigidity and rationality, the very basis of its legitimacy, exclude any idea of taking active part in the development of innovation (Alter, 1993).

On the other hand, obedience and depersonalization exclude correlatively any idea of appropriation, retention, transformation or obstacle to a new tutelary directive. The system of authority and the prevalence of the rule preclude the staff member from taking any initiative or solving a case. Innovation is conceivable only insofar as it is known and fully realized outside the bureaucratic sphere. In this

context, the bureaucracy should even be very effective in implementing change. Weber considers the rational-legal organization as the best suited to accompany the rapid development of the economy. This is in fact based on long-term investments requiring a suitable legal and social framework. Bureaucratic rules and procedures, by their predictability, constancy and confidence, avoid arbitrary fluctuations and provide continuity that allows rational economic conduct based on calculation (Clergeau de Mascureau, 2011).

In countries like France or Germany, the existence of an old and deeply rooted administrative tradition helps to establish the idea of a specific public administration. If Weber emphasizes the organizational component, he maintains the postulate of an administration subordinate to the political power, charged with preparing and executing decisions taken outside of it. However, in countries where the state administration was formed late, there is no more reason to devote to it a privileged place, or to make a rigid distinction between the analysis of public administrations and that of private sector organizations. The study of the structure and activity of public administrations loses its specificity to be part of a global reflection on organizations. This type of study gives the bureaucracy a social and cultural depth. It becomes an actress in the public offer process and central element of the innovation process (Alter, 1993).

In AVENUE context, following experts' reviews, two criteria have been considered to analyze the impact of public policy decision-making:

- Centrality of power at the national level as a positive factor for the development of innovation, giving orientation and required actions for implementation
- Number of administrative layers (bureaucratic effect) as a negative factor for the development of innovation

## Independence of local governments

Thinking cities outside any reference to local institutions and the state is an empirically unfounded approach. Obviously, it makes analysis easier and the territories bodies of regulation, instead of states. Recent research shows very clearly the weaknesses of this approach by insisting in particular on the strong dependence of (European) cities in relation to the higher levels of government in terms of their institutional organization, the absence of metropolitan politicians who are becoming independent from the national political apparatuses or the difficulty of the metropolitan representatives to set up public-private partnerships structured at a metropolitan scale. (Jouve, 2013)

The political dimension is more complex to understand, as well as as the relationships in the multiscalar decision making bodies.

"Intergovernmental support" refers to the ability of a municipality to obtain the support of higher institutional bodies, be they inter-municipal, metropolitan, departmental, cantonal, regional, national or supranational. This resource does not appear in the typology of DA Cunha (2005) who considers cooperation between various institutional bodies as a component of the "organization" of the state system. It is true that as long as Keynesianism dominated Europe, obtaining subsidies from higher levels of government was, for the most part, the sum of simple administrative tasks for municipalities.

In France, local elected officials gave prime importance to direct links with state representatives, and the combination of mandates was an action resource in itself (Pinson, 2009). However, with the abandonment of Keynesianism, support from the state or other levels of government is no longer

guaranteed and municipalities are now competing for it (Brenner, 2004). This resource is no longer a must, but requires a real activation effort from the municipalities. Its obtaining requires the establishment of a complex political network integrating multiple public actors. This evolution refers to the increasing empowerment of local territories, hence their independency.

Our definition of "intergovernmental support" is thus relatively close to that of Savitch and Kantor (2002, p. 44) with the difference that these authors consider it primarily as a means of intervening on the market and providing "the money to local communities". Our conception of "intergovernmental support" is broader. Its activation provides municipalities with easier access to many other resources such as "political support" (a mayor who has obtained a substantial state subsidy will be more able to convince voters to re-elect him), the "consensus" (this mayor will benefit from 'better trust in the eyes of third parties', 'infrastructure' (it can influence the choice of the location of a future motorway depending on the interests of its municipality) or "expertise" (study of natal impact or research program). It impacts the structure itself, tending to organizations based on projects management instead of the traditional budget/functional management. In order to carry projects, bodies, seen as integrator for project, have emerged in various urban policy sector such as transport and mobility.

In AVENUE context, following experts reviews, two criteria have been considered to evaluate local government autonomy, both having a positive effect on the implementation:

- Local territories independency (to promote local regulation)
- Public Transport governance: integrator policy bodies at local level (to ensure general mobility policy integration)

## Transport and mobility policies

The existence of transport and mobility policies has a positive impact for the implementation of new services. In the context of public transportation, two major criteria have been chosen:

- Public service delegation: In relation with the general abandon of Keynesian approach and the role of government, in favor of a liberal economy, most of public transport services operations have been transferred to private bodies through regular calls for tender and procurements. In some cases, public bodies still keep control of the services by compliances guarantee with operators (Denmark, France, Germany, Switzerland ... ) or decided to let the market plays its role (UK). This shift towards a more liberal approach generates competition and induces competitors to fulfilling requirements, being innovative, taking into account general city goals for attractiveness in a globalized environment where competition is between local territories and not between countries anymore.
- Stability of public transport governance: this aspect is important to ensure cohesion of projects on the long term. Generally, the transport governance is comprised of elected body and technical body to actually ensure stability.

## National Industrial policy

Industrial policy becomes a competitiveness-oriented policy defined by Michael Porter (1990) as "a set of state interventions encompassing both business-environment interventions that are essential for promoting the development of the fabric of firms and improved competitiveness and direct

interventions with targeted enterprises in small but well-identified sectors, to help overcome bottlenecks and market imperfections".

Although the market is considered the best system of economic coordination by liberal economists, analyses of the process of industrial transformation show that markets alone are not enough to start and sustain the process of industrial transformation. Industrial policy plays a facilitating role in industrial modernization and economic diversification in order to achieve rapid structural change (Lin, 2015; Lin & Monga, 2010). In contemporary economies, industrial policy often translates into innovation policies that aim to improve the quality of information flows between actors and institutions, and to strengthen the innovative capacity of firms (Niosi, Bellon, Saviotti, & Crow, 2008), in particular their capacity to absorb knowledge specific to their sector of activity.

To understand the dynamics of sectorial innovation, the sectorial approach of the innovation system highlights the sectorial characteristics of knowledge, actors, networks and institutions in the innovation process (Malerba, 2009). The sectorial innovation process is embedded in an innovation system where the different actors of innovation (companies, public and private R & D centers, financial companies, administration, etc.) interact in innovation processes and maintain dynamic and systemic relationships through the flow of knowledge, finance and personnel (Laperche & Uzunidis, 2007). In this sector innovation dynamic, the role of the facilitating state is to solve the coordination problems and ensure the outsourcing of innovation activities, filling in the market failures related to the process of innovation and systemic failure, blocking interactions between actors in an innovation system (OECD, 2010).

In Copenhagen, Denmark, the centrality of power at the national level is very low which can have a very negative impact to give general directions either in terms of national policy and/or regulation to support and fasten AV deployment. In the context of Denmark, the national industrial policy is not very developed, but existing, it has a positive effect of the development of AV. Meanwhile, the number of administrative layers is limited which is extremely positive for cities/local government in terms of autonomy and possible empowerment to authorize and launch experiments and projects.

In the context of Denmark, local authorities are well empowered and this independency, in Copenhagen, for instance, has an extremely positive impact on the local deployment of projects and tests as local government can adjust more easily traffic regulation, parking policies and more generally mobility schemes. Up to now, the local policy for mobility and transport in Copenhagen exists but is limited (due to a well settled used of alternative modes such as bicycle. Hence no need for further regulations). But it has a positive effect on AV projects, allowing the integration of new modes in mobility plans. Since January 2019, Copenhagen has an integrator policy body which should have an extremely positive impact in order to integrate Autonomous shuttles in the city mobility plan, as additional means of transportation, and not only as experimental or extra project.

In Lyon, France, the centrality of power at the national level is very high which can have a very positive impact to give general directions either in terms of national policies and/or regulations to support and fasten AV deployment. In the context of France, the national industrial policy is strong which has an extremely positive effect on the development of AV. Meanwhile, the number of administrative layers is very important which can be extremely negative for cities/local government in terms of autonomy and possible empowerment to authorize and launch experiments and projects (cities may have to wait for the national law to be adapted at their local level). In the context of France, local authorities can be proactive in terms of local regulations, but depend on national for laws and schemes. Yet, there is a

current tendency to give more power to local authorities, as reflection of national government withdrawal in public services. In Lyon, the local policy for mobility and transport is very strong and extends to different cities around the inner city (Lyon Metropole). It has a highly positive effect on AV projects, allowing the integration of new modes in mobility plans. The governance body, SYTRAL, (Integrator policy body at local level) has been created in 1989 which proved to have an extremely positive impact in order to integrate Autonomous shuttles in the city mobility plan, as additional means of transportation, and not only as an experimental or extra project. The contract for the public service delegation to the PTO is renewed every 6 years: this has strong impacts on the PTO which has to comply with objectives and KPI determined by the SYTRAL.

In Luxembourg Ville, the centrality of power at the national level is high which can have a very positive impact to give general directions either in terms of national policy and/or regulation to support and fasten AV deployment. In the context of Luxembourg, the national industrial policy is strong which has an extremely positive effect on the development of AV. Meanwhile, the number of administrative layers is very low (short administrative distance between national and local government) which can be extremely positive for cities/local governments in terms of autonomy and possible empowerment to authorize and launch experiments and projects (fast decisions and implementation). In the context of Luxembourg, local authorities depend on the national government for laws and schemes and the level of independency is good to have a positive impact on AV deployment (the mobility and traffic regulation is decided at the local level).

In Luxembourg Ville, the local policy for mobility and transport is very strong). It has a highly positive effect on AV projects, allowing the integration of new modes in mobility plans. The Integrator policy bodies at local level exist for several years and has proven to have an extremely positive impact on the development of e-mobility and thus in the future to ease the integration of Autonomous shuttles in the global mobility plan, as additional means of transportation, and not only as an experimental or extra project.

Due to its particular confederation organization, Switzerland has a very low centrality of power at the “national” level, which can have a very negative impact to give general directions either in terms of national policies and/or regulations to support and fasten AV deployment. In the context of Switzerland, the national industrial policy is not very developed, but exists, it has a positive impact on the development of AV. Due to this same organization, the number of administrative layers is very important which could be negative for cities/local governments in terms of autonomy and possible empowerment to authorize and launch experiments and projects. But it is to note that these layers have been given relatively high autonomy which prevents regulation pilling for example.

It shortens the distance between cantons and cities for example. Thus it has a positive effect on the deployment of new systems. Geneva is independent and therefore can decide on its own regulations and has implemented strong mobility and transport policy. These 2 aspects have a high positive impact on the development of autonomous shuttles. This is reinforced by the existence of an integrator, allowing the long term decisions.

Details for each city and country are provided in the section Specification per city. These pages are based on official reports, PTO, municipalities websites and resources from various Databases.



### 3.3 Prospective dashboard 2022-Work in progress

In the following months a prospective Dashboard will be implemented based on annual upgrades made available by regular scanning of regulatory changes.

An observatory is being set up to monitor the evolution of regulation and decision-making processes in urban mobility policies.

#### Focus on the French context: a new law on mobility

On September 5<sup>th</sup> 2019, a new law on mobility was presented by the French government to the French parliament whose members should discuss its application during fall.

The following figures depict the French situation:

- Transport is responsible for 30% of greenhouse gas emissions.
- 1 inhabitant out of 4 refused a job at least once because he/she had no commuting solution.
- On 80 % of the French territory, inhabitants are proposed no collective transport for daily commuting, they must drive a car or being driven by someone's car,
- Transport represents an average of 18% of a household budget at first position for all expenses before food and housing.
- 7 French residents out of 10 commute with a car every day.

In order to improve the mobility for all residents, the French government has decided to deeply transform the mobility system, starting with the rail system in 2018, it targets in 2019 daily and short motilities, with a clear openness to innovation in product and services.

€13,4 billion are targeted to investment to implement new motilities and help everyone to commute.

The French government wants to imply all stakeholders in the mobility plan, mainly companies and territorial authorities should be largely involved.

Alternative solutions to personal vehicles should be deployed on 100% of the French territory by local authorities by means of autonomous shuttles, shared mobility, on-demand mobility, ... all supported by digital technologies.

The French government launched a call for project; for example, €500 million are planned to finance new projects within local authorities in order to propose new motilities to citizens. Daily home-to-work mobility should become mandatory in the social negotiations framework and discussed between unions and the firm's management. Mobility costs for the employees should be partly financed by the companies as it is the case for lunch costs by means of luncheon voucher, companies may have to provide mobility vouchers up to 400€ per year. In 2020 the government will start to give a 200€ mobility voucher for each civil servant.

The law also aims at improving mobility for disabled people like free mobility specific services for assistants, autonomous shuttles are expected to expand from 2020 onwards for urban mobility. A legal framework for free-floating is about to help transactions between delivery platforms, taxis and drivers.

The French Government works for the implementation of a more sustainable mobility; vehicles running with carbon energy should be fully forbidden for 2040, inducing a decrease of 37;5% of the greenhouse gas emissions by 2050.

In the meantime, charging infrastructures for EV are going to be 5 times more numerous in 2022, investment costs being reduced by half.

As yet 23 cities have reduced or forbidden the circulation for polluting vehicles, implementing low emission zones for a less polluted urban area. The evolution of the French law on mobility is being closely watched.

## 4 Conclusion and Synthesis tables

In order to identify and map regulatory and legislative requirements and procedures (concerning actual and under development policies), we collected data, for 3 countries and selected cities i.e. France and more specifically the Lyon Metropole, Switzerland and Denmark. The data collection targeted the following issues:

- Which are the policy decision making organizations, i.e., competencies
- On which laws and legal documents are urban planning, transportation mapping and mobility policies based
- Which reports, white books and national programs are published to describe regulations and public transport policies
- Which experiments are being (or have been) conducted with autonomous vehicles

The four questions have been considered for 3 levels: national, regional and local levels.

The four following tables give a synthetic view of the legal context in the 3 analysed countries: France, Switzerland and Denmark.

## 4.1 TABLE 1 - Mobility and transport framework

		Denmark	France	Switzerland
1.1	Which organization has responsibilities to implement urban transport policies (like a travel master plan)?		Metropolis / city	Department of Infrastructure
1.2	Which organization has responsibilities to implement regional transport policies (like an inter-urban travel plan or rail development)?	Rail is the state Busses are ordered by the municipalities	Department/Region	Department of Infrastructure
1.3	Which organization has responsibilities to implement national transport policies (like rail development or national mobility programs) ?	Ministry of Transport, Building and Housing	Ministry for the Ecological and Inclusive Transition	Federal Department of the Environment, Transport, Energy and Communications (DETEC)
1.4	Is there any national or local urban development planning or “clean air act” with mobility aspects?	Copenhagen 2025 Climate plan	Regional scheme of intermodality Urban Travel Plans 7 plans at different levels have to be compatible	Very low scale Green Village initiatives and national Anti-pollution standards for vehicles.
1.5	What are the current regulatory documents in terms of mobility and parking within your city?	In general: the Road Traffic Act For parking specifically: FÆL §§ 28-31 <a href="https://www.retsinformation.dk/Forms/R0710.aspx?id=185819">https://www.retsinformation.dk/Forms/R0710.aspx?id=185819</a>	The transit network development projects or action ideas are described in the Urban Transit Plan (UTP). The Transport Code provides that the UTP aims to ensure various sustainable mobility measures	Better availability of public transport and fewer parking spaces for normal vehicles.
1.6	Which entities are responsible for mobility and parking regulations within your city?	The Municipality of Copenhagen (Københavns Kommune) is responsible for publicly owned streets and parking areas.	Lyon Metropole Police department SYTRAL for applications	Department of Infrastructure

## 4.2 TABLE 2 - Experiment status for AV in the selected country

		Denmark	France	Switzerland
2.1	Which authorization(s) to carry out experiments on vehicles equipped with driving delegation functions are required (national level and/or local level)?	<p>In July 2017 a new law was passed (unanimously vote from Parliament), which makes it possible to apply to conduct Trial/Project pilots with “Autonomous motorized vehicles”.</p> <p>The law is called: L120 Motion on law on changing the Road Traffic Act - Authorization to form rules and give permission to conduct Trial/Project pilots with Autonomous motorized vehicles”.</p> <p>In general, we have to obtain two types of overall approval on the national level: Vehicle approval and Over all approval of each project.</p>	<p>The authorization document clearly indicates on which sections the vehicle can be driven in automatic mode and which automated driving functions can be activated. For this purpose, the vehicle must be equipped with a device that records when the vehicle has driven in automatic mode. Holders of experiment authorizations must regularly submit reports to the relevant ministries on the experiments carried out. In France, the validity of road test authorizations is limited to a maximum of two years, with the option of renewal.</p>	<p>National (Federal) and local (Cantonal)</p>
2.2	Who gives these authorizations? (National and /or local level)	<p>Transport, Building and Housing Committee</p> <p>Ministry of Transport, Building and Housing</p> <p>The Danish Road Directorate</p>	<p>Ministry of Transport</p>	<p>Federal Office of Transport</p> <p>Homologation of a Shuttle and only for a specific track</p>
2.3	Is there a specific legal status for the experiment?	<p>Each project ends up getting its own legal act, to ensure that the legal liability is ensured correctly.</p>	<p>The legislative and regulatory framework for the experiments, resulting from the 2015 Energy Transition Law, was updated in March 2018.</p>	<p>Shuttles have to comply with the same (technical) regulations as any other vehicle, they cannot load or unload passengers outside predefined bus stops an Operator needs to be present in the Shuttle</p> <p>Max speed 25 km/h</p>

## 4.3 TABLE 3 - Current barriers and expected evolution

		Denmark	France	Switzerland
3.1	Is there any on-going thinking to have evolutions on driving rules and the liability aspects (when accidents occur)?	The law L120 will be reviewed in 1 year (July 2020) - and will so far be enacted until 2023.	The civil liability regime resulting from the "Badinter" Law and the insurance framework based on an insurance obligation covering this liability seem to be able to handle, without modification to this effect, automation cases, including total automation. Established in the interests of the victims and guaranteeing them certain and rapid compensation, the current legislation does not constitute a barrier on the development of automated vehicles.	Authorities have no or very limited experience with autonomous driving and do not own their own test environment. Hence, we, more or less, show them what is possible and which barriers we have to overcome, upon which they can prepare new rules. Swiss government is very open-minded for technological development
3.2	Is there any on-going thinking with regard to a driving license evolution (at the national level)?	No	The conditions for the issuing of driving licenses fall within the competence of the European Union and, more specifically, the provisions contained in Directive 2006/126 / EC of the Council and the European Parliament of 20 December 2006 on driving licenses. It is the European Commission, in particular DG MOVE, its Road Safety Unit, which have to work on the issue.	The operators comply with the national standard driving license and are allowed to drive the shuttle on the open road (a predefined and homologated track) after a specialized course from the constructor of the vehicle.
3.3	What about the evolution of technical regulations and homologation of automated vehicles or what are the current procedures if they already exist?	Current situation for homologation of AV's: Danish Road Safety and Transport Agency approves each vehicle separately. Currently this means that AV are approved into a regular category called M2: large person car.	the existing national framework, in particular the third book ("The Vehicle") of the Traffic Code and its implementing decrees, will have to be reviewed in order to ensure the adequacy between the new technical prescriptions published in Geneva and made compulsory by Brussels, and those already present in the traffic Code, whether in terms of the technical provisions of the vehicles, their receipt and homologation, their registration and their technical inspection, and should be adapted accordingly	Homologation of a autonomous vehicle used for public transport is the same as a normal bus used for the same service.
3.4	Is there already a specific automated public transport framework (in comparison with the regular public transport framework allowing companies to transport people on the behalf of public authorities)?	The L120 law states that you do not have to have a regular PTO to conduct project pilots with AV's where you are doing public transportation	The dynamic development of automated public transport leads French decision-makers to consider two strategic orientations at the national level to support the market: The development of a regulatory framework laying down the safety requirements of the "shuttle" type vehicle (9 to 16 seats, including at least 4 seats), as well as the traffic conditions of these vehicles when they are automated. The development of a reference system for evaluating the safety of shuttle routes, when these routes are fixed, based on an analysis of the critical situations of automated shuttle traffic in urban areas and on experiments. These two elements will make it possible to set up a system of homologation of the vehicles concerned and a system of validation of the routes and conditions of circulation of the vehicles	No

## 4.4 TABLE 4 - On-going national programs on automated vehicles

		Denmark	France	Switzerland
4.1	Is there any on-going national program on automated vehicles or plans?	The new law is right now the program, you could say - it has dedicated resources in the different Authoritative teams dealing with the applications for pilot projects with AV's.	France-Germany-Luxembourg project On May 14, 2018, the French State adopted the National autonomous Vehicle Development Strategy. The 10 priority actions define aim to "build the framework, by 2020 to 2022, to allow the circulation of private cars, public transport vehicles and highly automated goods in France. the traffic code, the rules of responsibility or the training can be adapted	Only by private initiatives, either by Transport Operators and private companies
4.2	if yes, can you please give some details (objectives, resources, leadership, deadlines, ...) ?		The EVRA (expérimentation véhicule routier autonome) call aims to support experimental projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics. These projects will contribute to the development of methodologies for validation of safety and to the improvement of knowledge on uses and acceptability. It is managed by ADEME (French energy and environment national agency). It was launched on June 8th 2018 and will be closed one November 29th.	Sion, Fribourg, Zug, Schaffhausen, Bern and Geneva. These are all low scale projects that deploy one line last mile services.
4.3	if no, can you please explain the barriers that hinder experimentations?			The technology is still in its infancy, not suited to replace a normal bus yet and very expensive. The Avenue project works with the "follow a virtual line" Shuttle technology, which is not very technologically advanced but less expensive and especially less complicated.

# Appendix 1

## Legal context in Copenhagen

### Mobility and transport Danish framework

More and better public transport is an essential element of a greener transport system in Denmark. Public transport should be an attractive everyday alternative to the car. Accessibility and flexibility are central issues in order to make public transport more attractive.

Public funds have been invested in projects on public transport solutions. Among these are projects that improve the accessibility of train stations and projects that integrate the use of mobile phones in planning and purchasing public transport services.

Public funds are also invested in public transport solutions for the larger cities such as Aarhus and Odense, e.g. light rails that will make public transport even more attractive. With the planned congestion charging zone in Copenhagen, more funds will be available for improving public transport, as the revenues from the congestion zone will be invested in improving and expanding the public transport sector.

The public transport system needs to be expanded and become more efficient, in order to better connect cities and provinces across Denmark. More terminals, more passenger stops and increased utilization of IT are just some of the actions, which contribute to a more efficient and environmentally friendly public transport system. Given the central role played by large-scale public investments, it would be easy to assume that Greater Copenhagen's sustainable transportation regime was made possible by a central state that was both strong and electorally dominated by the left.

The reality, however, is more complicated. Periodic state weakness has been crucial in producing not just positive change but also minimizing negative change in sustainable transportation in Greater Copenhagen. Most notably, the region's transit-oriented development model, the so-called Finger Plan, was developed and championed by non-state actors and became a reality, in the absence of state legislation, as a result of the influence of non-state actors. Private actors also played an important role in influencing the content of Denmark's national roads policy. This helped contribute to a comparative underinvestment in the motorway system in the capital region, which in turn later facilitated the expansion of non-car-based modes of transportation.

#### Mobility program

This ITS Action Plan outlines the themes and focus areas that Copenhagen will be working with within Intelligent Transport Systems (ITS) up to and including 2016. These initiatives aim to ensure that the municipality meets the service goals set out in the Traffic Management Plan, which was approved by the Technical and Environmental Committee on 22 September, 2014. In addition, the initiative will further the municipality's overall objectives as set out in section 1.2.

In the period 2013-2014, the administration implemented a number of pilot projects as well as a public private innovation partnership (PPI) for ITS. In these, the administration, in collaboration with universities and private companies, has developed and tested new ITS solutions for the benefit of





citizens and users. Lessons learned from these projects, as well as user feedback, have been decisive for the choice of themes and focus areas in this action plan.

As part of the "CPH 2025 Climate Plan - A green, smart and carbon neutral city", Copenhagen has set an ambitious goal to become carbon neutral by 2025. The ITS programme is one action in the Climate Plan and is expected to contribute to a reduction in CO<sub>2</sub> emissions of 25,000 tons per year by 2025. In 2010, transport contributed with 380,000 tonnes CO<sub>2</sub>. This goal requires investments in ITS continuing until 2025.

So, the purpose of the ITS programme is to support the goals within green mobility and improve flow, enabling road users to reach their destination more easily, through smarter and greener traffic management for all modes of traffic. Persuading people to go by bike instead of taking their car is one of the most effective methods for reducing CO<sub>2</sub> emissions. So, amongst many other things, the ITS programme deals with how to make cycling and public transport more efficient and attractive.

#### The Danish Infrastructure Commission

The Danish Infrastructure Commission was appointed in November 2006 following a government decision. The terms of reference for the work of the commission state that "the overall objective is for Denmark to maintain and develop its position as one of the countries in the world with the best transport systems, despite the fact that growing traffic volumes are increasing the requirements in the long term". On this background, the commission has been given the following main tasks:

- To analyze and assess the key challenges and development potential for the infrastructure and national traffic investments until 2030.
- To identify and assess the strategic options and priorities and to put forward suggestions to strengthen the basis for the national investment decisions in the transport area. Furthermore, the commission was given the task of analysing and assessing proposals for strategies for handling a number of selected issues. These include the issue of cost-effective organisation and management of construction projects, the handling of preservation, climate and environmental concerns, the opportunity for better utilisation of the infrastructure by means of modern IT, and the significance of the long-term physical planning.

### The Ministry of Transport, Building, and Housing

The main responsibility of the Ministry of Transport, Building, and Housing lies within the following areas: Transport: roads, vehicles, railways, rapid transit systems (e.g. the Copenhagen metro), fixed links, harbours, ferry operations, aviation, airports and postal services. Building: national office buildings, building regulation, and regulation of the construction sector. Housing: social housing, housing regulation, and urban renewal.

A new PT initiative from the Government, publish on 20th September 2018

The Danish government has just published a suggestion on how to develop better conditions for passengers and private solutions in public transport. The initiatives are put forward in a bill later this year.

Some of the main points are: Digitalization in the field of transport has enabled digital mobility services to make it easier to access the entire journey. The trip could be planned, booked and paid in one single app.

With the new initiative, public transport offers are therefore required to share transport data with the private sector. At the same time, private operators must be able to resell tickets for public transport. This allows new markets to arise in the area of mobility.

Rejseplanen (journey planner) and Rejsekortet (electronic ticket system) must work more actively with the private sector, which must be linked to a larger extent on the Travel Plan (rejseplanen) across the country. And then the features of the two products must be assembled into one mobility service under one company with one joint board that will future-proof and strengthen the travel plan and travel card's offer to the travelers.

The Danish Road Directorate (vejdirektoratet)

The Road Directorate is responsible for the state road network, consisting of highways, a number of mainland roads and many of the country's bridges - a total of approximately 3,800 km of road. The state road network is only approx. five percent of the total public road network of almost 75,000 km, but almost half of all traffic in Denmark is being settled on state roads. To ensure a comprehensive and well-planned infrastructure, the Road Directorate collaborates with a large number of authorities and the road sector and municipalities.

The Road Directorate's work consists primarily of three elements:

- Planning
- Construction and operation
- Traffic development and management

### **Danish road safety agency (Færdselsstyrelsen)**

The Danish Transport Agency is part of the Ministry of Transport, Building and Housing, the Ministry of Transport, Building and Housing. The Danish Transport Agency regulates and supervises within the traffic area.

The Agency consists of approx. 70 employees, divided into 9 professional teams. The Agency is responsible for regulation and supervision in the field of traffic, including contributing to the drafting of regulations and guidelines, the administration of traffic laws and the handling of general questions about the individual areas of responsibility.

The Agency is working closely with the Danish National Police, Police, Road Directorate and Transport Organizations.

The Danish road safety agency, receives the application for a test with autonomous vehicles:

An application for tests with autonomous motor vehicles is sent to the Road Directorate. Upon receipt, the Road Directorate examines whether the required documents are attached. Then the application material is forwarded to the authorities to process the application.

Task force for AVs

Experiments with AVs require handling of several authorities. There is therefore, a Task Force set up to make the application procedure so smooth and consistent as possible for the applicant.

The task force consists of four permanent members:

- The Danish Transport Agency

- The Danish national Police
- Director of Public Prosecution
- The Road Directorate

In addition to the permanent members, other relevant authorities may, for example, Ministry of Justice, municipalities or the Ministry of Transport, Building and Housing, will be involved in the processing of the application. The involvement of other relevant authorities depends on the scope, nature, geography, etc. Then Task Force members begin processing the application based on their subject areas.

The examination of the application will be based on the assessor's assessment of the trial. As a matter of principle, the professional handling process will consist of investigating all relevant safety issues have been uncovered. Likewise, the test's impact and requirements are investigated the traffic and other physical conditions. The processing of the application is in dialogue with the applicant.

## Specific context in Copenhagen

The government of the City of Copenhagen consists of its supreme body, the City Council, followed by seven standing committees.

The City of Copenhagen has an intermediate government system with a divided administrative management. In an intermediate government system, the Lord Mayor as well as the chairmen of the standing committees (mayors) are born members of the Finance Committee – with the Lord Mayor as chairman of the Committee.

In a system of divided administrative management, the Lord Mayor and the chairmen of the standing committees (the mayors) share responsibility for the senior management of the City: Each of them is head of the administration in charge of the tasks falling under their various committees. Also, under this type of government, the committees can make final decisions within their area, which reduces the number of cases that must be submitted to the City Council.

Furthermore, the committees are elected by proportional representation, which implies that a simple majority cannot take all the seats in a committee. Since the committees are not merely advisory bodies, this ensures that minorities are heard in the administration of the City's tasks.

The City Council (Borgerrepræsentationen)

The City Council is Copenhagen's supreme political authority. It has 55 members who are elected for a term of four years. The City Council sets up the frameworks of the committees' tasks. The Lord Mayor is chairman of the City Council and sets the agenda for the meetings of the City Council, convenes the meetings and chairs the discussions. Members of the public and the press may attend the meetings, unless confidential matters are on the agenda. The agendas for the meetings are available on the City's website at [www.kk.dk](http://www.kk.dk). After the meetings, a record of resolutions is prepared which is also available on the City's website.

The committees are in charge of the day-to-day management of tasks falling within each their special area. Overall decisions are made by the City Council. Each of the six standing committees has 11 members, including the mayor of the relevant administration, who is chairman of the committee. The Finance Committee has 13 members. In addition to the Lord Mayor, who is chairman of the Committee, the six mayors of the standing committees and six members of the City Council are also members of the Finance Committee.

The City of Copenhagen has seven administrations. Each administration works with the tasks related to its committee. The administration is responsible for operating and developing the city for the benefit of citizens, users and businesses.

The Technical and Environmental administration is responsible for the City's environmental and climate activities, development of the traffic area, development of new urban areas and for a number of authoritative functions. In addition, the Technical and Environmental administration is in charge of the City's green areas. The activities portfolio covers operation and construction activities in relation to roads and parks, parking facilities, operation of cemeteries and cleaning services. Also, the administration is in charge of the implementation of strategic plans, such as the CPH 2025 Climate Plan and policies for vulnerable urban areas.

Core services: Local development planning and architecture, environment, traffic, parking, parks and recreational areas, urban renewal, neighborhood improvement, cleaning and maintenance of outdoor areas, construction cases, cemeteries.

Transports system with bus

DOT - Public Transport - is a collaboration between DSB, Metro and Movia, which aims to make it easy to be a passenger in public transport. Through DOT, DSB, Metro and Movia coordinate their passenger-oriented activities, including ticket sales, customer service, lost property management, travel regulations, traffic information, marketing and communication, etc.

The strengthened co-operation on the companies' passenger-directed activities shall ensure coherence and integration across modes of transport, products and services, and will contribute to continuing to make public transport an attractive choice for passengers. DOT is not an operating organization and is therefore not intended to be responsible for the conduct of public transport. Responsibility for operation, security and personnel etc. is still best handled in the individual transport companies.

The transport strategy contains five strategic benchmarks that make up DOT's focus areas up to 2020. These strategic benchmarks must support the objective of making it easier to be a passenger in public transport.

The transports strategy's benchmarks are:

- Easier product offering and fewer sales channels
- Good shifting options and correspondence
- Effective and relevant traffic information
- Uniform communication and marketing, as well
- Efficient operation that gives customers confidence and consolidates DOT.

DOT is organized as a partnership (I / S) which is owned by equal shares of DSB, Movia and Metroselskabet. DOT conducts ongoing activities that improve the conditions for passengers in public transport. The focus is on both new activities and ongoing improvements to existing initiatives.

Many of DOT's initiatives are visible to the passengers in the public space, while other activities are carried out internally in the traffic companies and indirectly passengers benefit, for example in the form of improved coordination across the companies, which enables more accurate and relevant traffic information : such as establishing the website [dinooffentligetransport.dk](http://dinooffentligetransport.dk), which provides a common entrance to public transport on Zealand, where passengers can find information and answers, search for transport options and much more; establishing a DOT Facebook page which also constitutes a common interface for public transport, where users have the opportunity to ask questions about the total public transport, Set up signs and screens at traffic hubs that make it easier for passengers to switch between bus, train and metro.

Metroselskabet was founded on 26 October 2007 under the provisions of the Act regarding Metroselskabet I/S and Arealudviklingsselskabet I/S. Metroselskabet, owned by the State and the municipalities of Copenhagen and Frederiksberg, has the overall responsibility for the operations of the Metro and to establish the City Ring. Following a public tender Metro Service A/S is operating and maintaining the existing Metro, presently up to 2019.

Metro Service A/S is responsible for operation and maintenance of the metro. We ensure that the metro runs on time 24 hours a day, and that travelling on the metro is a positive experience for our passengers. The operation and maintenance of the Metro is handled by Metro Service A/S

Metro Service A/S is a privately owned company run by a senior management team consisting of CEO Claudio Cassarino, Maintenance manager Jimmy Jensen, Operations manager Lars Toft Krag, Betriebsleiter and S, Q and E Manager Nicola De Negri, HR manager Thuri Didriksen and Finance manager Klaus Aakilde. Metro Service was founded in 1998. The company is a joint venture between Italian ATM (Azienda Trasporti Milanesi) and AnsaldoSTS.

## Prospective 2020

### More space on the roads

The metropolitan area contains some of the road sections in Denmark where there are the greatest capacity challenges. In 2010, motorists in the metropolitan area experienced a delay of approx. DKK 29 million hours, corresponded to a socio-economic loss due to congestion of approx. 8.5 billion - and the figure is increasing: Over the past 10 years, traffic on the motorway network has increased by 32 per cent. There is therefore a need for the infrastructure to be expanded in line with the increasing need, so that citizens and businesses experience an efficient infrastructure, where it is easy and safe to transport around the capital.

The greatest accessibility and capacity problems on the road network are centered on the ring connections - Motor ring 3, Ring 4, the cross connections and the Amager motorway. For the citizens this means increased transport time, for example to and from work, and for the companies it becomes more expensive to transport goods, their employees spend time in line on the roads, and this has an impact on the companies' competitiveness. The challenges in the ring connections must be resolved before or at the same time as the expansion corridors are expanded. The Government will therefore prepare a basis for decision and EIA studies for a large number of projects on the ring roads in the metropolitan area. The studies include, among other things, increased capacity on Motor Ring 3, extension of Ring 4 and expansion of the capacity of the connections between these. Based on the investigations, a decision can be made to initiate the projects so that the capacity on the congested roads can be increased.

### Increased public transport capacity

In these years, significant investments are made in the capital area's collective infrastructure, among other things. Metro city ring which opens in 2019, and in 2020 follows Nordhavnsafgreningen and in 2024 Sydhavnsafgreningen. The light rail along Ring 3 from Lyngby to Ishøj is connected to the S-train network in 2025, and close connection and flexibility is created between train, S-train, light rail and buses across the capital. Glostrup Station will become a hub between the S-train and the light rail, and the station can therefore possibly be expanded in the future with a view to easier access to the airport outside Copenhagen Central Station. The number of incidents in the public transport in the metropolitan area is expected to be stagnant in the longer term - though close to the metro, where Cityringen will

provide completely new opportunities for public transport, and it is thus expected that the number of passengers in the metro will increase by almost 50 per cent. up to 2030.

The pressure will especially be massive on the Kongens Nytorv - Christianshavn section across the harbor. With an increasing population and a greater need for mobility, the requirements for public transport will also increase. In order to counter increased congestion, the public transport system must therefore offer efficient and flexible solutions, which at the same time contain the digital and technological development, where private and part-economic transport services are coupled to the public, and the boundaries between modes of transport are blurred. With the simplified public transport concept from September 2018, it becomes easier to be a passenger in public transport. The outline is to promote the development of digital, smart mobility services that link travel planning, payment, ticketing and traffic information across public and private modes. With digital mobility services, cross-functional and across public, sharing, and private modes of transport, citizens' freedom of choice is enhanced, making it easier to go all the way from door to door on their journey. For sparsely populated areas, digital mobility services can help increase citizens' mobility offerings, but especially in the densely populated areas, mobility services will benefit. In the metropolitan area, digital mobility services will contribute to a more coherent transport system for travelers and lead to more efficient mobility

Within the framework of the Lynetteholmen principle agreement, the Government will expand the metro to include the new district. In the principle agreement, it has been agreed that a preliminary study of metro services of the area will be carried out in the first instance. The feasibility study maps among other things net construction costs for an extension of the Nordhavn Metro under the Kronløbet and further as a highway with stations at Lynetteholmen. It is also examined whether the capacity of the existing lines can be increased, eg by extending the trains.

The Government will restructure the S-trains for automatic operation to increase the efficiency and capacity of the S-train network. The conversion to automatic operation will involve relevant private competencies in a Public Private Partnership (PPP). S trains play a central role for infrastructure in the capital. The Government will work to ensure that the capital becomes a test and experimental area for the development of new business models within the area of mobility by implementing an open data challenge that is made possible by the simplified public transport concept.

### **New organization of public transport in the capital**

Today, the tasks of public transport in the metropolitan area are divided among a number of different players. This gives a fragmented approach to the development of transport services. Therefore, the Government will establish a new, common and strong transport organization - The Capital of Public Transport (HOT) - which aims to increase the use of public transport and ensure that the transport service appears efficient and attractive. The new transport organization must ensure a better coherence between the various public transport modes and at the same time open the public transport for the cooperation with private and part-economic modes of transport that can support integrated door-to-door journeys. bus, metro, light rail, private railways and S-trains, for example, both route planning and departure times. At the same time, the transport organization must handle all customer-oriented activities across the modes of transport, including the sale of tickets, travel information, complaints and lost property. The capital's public transport is established as a joint transport organization by the state and the 34 municipalities in the metropolitan area.

	local bus traffic	regional bus traffic	metro	light rail Ring 3	Private railways	S-train
Ordering and financing	Communes	Regions	The State, Communes of Frederiksberg & Copenhagen	Region & 11 communes	Regions	The State
Procurement & planning	Movia (Danish bus company)	Movia	The metro company	The metro company	Movia	DSB (Danish state railways)
Ticket sales	Movia	Movia	The metro company	The metro company	Movia	DSB
Operator	Private bus operators	Private bus operators	Metro Service A/S	Metro Service A/S	Local train A/S	DSB

**Table 1 : Public Transport in the capital up to January 2019**



## Appendix 2

# Legal context in Lyon - France

### Mobility and transport framework

The law Maptam (modernisation de l'action publique territoriale et d'affirmation des métropoles ) has brought many changes in the skills/competences of the different levels of communities in the areas of environment, energy and transport. It also introduces new responsibilities for organizing mobility, among others.

#### Organizing authority for mobility

Due to the adoption of the law of modernization of territorial public action and affirmation of metropolises (MAPTAM- modernisation de l'action publique territoriale et d'affirmation des métropoles) on the 27th of January 2014, the former urban transport organizing authority (AOTU - autorité organisatrice des transports urbains) has become the organizing authority for mobility. (AOM - autorité organisatrice de la mobilité) (art.52).

Its territorial jurisdiction corresponds to the perimeter of the intercommunality which exercises mobility competence. Some communities exercise this competence compulsorily - metropolitan areas, urban communities and agglomeration communities -. According to the wishes of their members, the communities of communes can choose not to acquire this competence or exercise it in whole or in part. It is related to the implementation of « sustainable mobility » and « territory development ». The modalities of the joint action of the communities and their groupings for the exercise of these competences are debated by the territorial conference of the public action (CTAP- conférence territoriale de l'action publique), under the aegis of the president of the regional council (art.4). CTAPs can be organized into specialized thematic commissions involving all relevant stakeholders. For example, the thematic commission of a CTAP in charge of transport "are able to associate all the authorities organizing transport to its work, even if they are not members of the CTAP".

According to the last adopted laws, the mobility competence exercised by the AOM includes:

- The organization of regular urban and non-urban public transport services;
- The development of non-motorized travel modes and shared uses of motorized vehicles;
- Urban travel master plans - mandatory only for AOMs with more than 100,000 inhabitants;
- The development of public and private decision support tools that have an impact on mobility practices - mandatory only for AOMs with more than 100,000 inhabitants;
- The establishment of a "mobility account" showing the different mobility practices in the agglomeration and in its urban area, the costs for the user and the community - mandatory only for AOMs with more than 100,000 inhabitants;
- The setup of an information service for users - mandatory only for AOMs with more than 100,000 inhabitants;
- The establishment of a mobility advice service.
- On-demand transport setup ;
- Reducing urban congestion and pollution by setting up public goods and urban logistics service;
- The organization of the car-sharing activity



- Incentives and actions plans for car sharing ;
- Bike-rental public service implementation

Regarding large French urban areas, the text provides for the creation of 14 metropolises, 3 of which have a special status (Grand Paris, Lyon and Aix-Marseille-Provence). From January 1st 2015, the "regular" cities, namely the Lille, Strasbourg, Toulouse, Bordeaux, Nice, Nantes, Grenoble, Rennes and Rouen communities - and under certain conditions Montpellier and Brest - lead "a project of development and economic, ecological, educational, cultural and social development of their territory in order to improve its cohesion and competitiveness and to contribute to a sustainable development and solidarity of the regional territory "(Article 43). To do this, the scope of the powers devolved to the metropolis, instead of the communal block, is particularly vast, particularly in terms of development of port or airport areas and the metropolitan area: Scot ("schema de cohérence territoriale, PLU-plan local d'urbanisme", mobility, roads, signaling, passenger shelters, parks and parking areas, urban travel master plan, public spaces dedicated to all modes of urban travel, governance and development of stations etc. On this last point, it was important not to interfere with the dual role of organizing authority for regional express transport ("TER") and leading regional intermodality.

With regard to the environment, the text also broadens the powers transferred by the municipalities through automatic divestiture: water and sanitation, management of aquatic environments, flood prevention, household and similar waste management, pollution control and pollution control. air, noise pollution, contribution to the energy transition - pending the draft law related to this, which will clarify competences on this subject -, support for actions to control energy demand, climate-energy plan territorial, concession of the public distribution of electricity and gas, management of heat networks, load infrastructures of electric or hybrid vehicles or management of beaches granted by the State.

In terms of community space development, the compulsory jurisdiction of urban communities for parking lots is extended to parking areas (section 71). The text also complements the competences devolved to urban communities, by adding a recognized competence to metropolises, entrusting them with "the contribution to the energy transition", the management of energy networks (heat, electricity and gas networks conceded) as well as the creation and maintenance of charging infrastructures for electric vehicles. It should be noted that for the exercise of the jurisdiction of the granting authority of the public electricity distribution, the urban community is substituted for the member communes composing it within the electricity Syndicat. Finally, the text specifies that urban communities are consulted "in the development, revision and modification of planning schemes and documents relating to planning, economic development and innovation, higher education and of research, transport and environment, the list of which is fixed by decree in Council of State ".

The department was transport authority until January 1st 2017 for intercity transport and remained until September 1st 2017 for school transport. Considering the terms of the law on the new territorial organization of the Republic (NOTRe- nouvelle organisation territoriale de la République - August 7th 2015), the transport competence of the departments are carried out by the regions. The department is competent for the organization of these transports on its perimeter outside the territorial jurisdictions of the AOM. Its main role is on the social level, for example, "contribution to the reduction of energy poverty".

Region is the organizing authority for collective transport of regional interest. Its competences are both for road and rail transport.

The Region Rail competence has been given to regions in the frame of the law solidarity and urban renewal (SRU- solidarité et renouvellement urbain - december 13th 2000). Since january 1st 2002, the regions are therefore responsible for organizing and financing regional passenger rail services and road services as a substitute for them. In the respect of a coherent and unique rail system of which the State remains the guarantor and the SNCF the operator, the regions can fix the tariffs of the rail services in the respect of the principles of the national tariff system of the SNCF.

In addition to road transport as a substitute for rail services, the regions are the organizing authorities for interurban transport and inter-urban school transport - instead of departments.

With the adoption of the MAPTAM law, the legislator has made the region the leader in intermodality and complementarity between modes of transport. As such, the regional level is now responsible for coordinating its action AOMs' and to define general rules on intermodality between public transport and mobility services within the framework of the regional planning, sustainable development and territorial equality plan (SRADDET – “schéma régional d'aménagement, de développement durable et d'égalité des territoires”).

The region and the department must establish projects of "territorial agreements of concerted exercise of a competence" in each of the fields for which they are designated leaders. It is only a faculty for the local block. These agreements provide for the delegation of possible powers, the creation of unified services and the terms of financial coordination and the duration of the agreement, which may not exceed six years.

Note on parking regulation: Decriminalization of pay parking on streets allows the municipal council or the deliberative body of the intercommunal body or the “syndicat mixte” with urban transport competencies to set a parking fee and the price of the post-parking fee to replace the fine (sections 63 and 64). It is a measure that would allow communities to better manage traffic flows and, consequently, sustainable mobility policies. The provisions introduced affirm the domanial nature of the parking fee that motorists must pay, either by immediate payment or later via the payment of a post-parking fee. In this case, the package will be capped at the maximum amount of the parking fee due for a day. Modulations of the parking fee are provided based on the duration of parking, the area occupied by the vehicle, its impact on air pollution, as well as specific pricing for certain categories of users, including residents. The product of the post-parking packages is allocated "to operations to improve public transport or environmentally friendly and traffic". If the community that established the levy has jurisdiction over streets, part of this revenue may also be used to finance road operations. Note, in the case of the metropolis of Lyon, the municipalities return the proceeds of post-parking packages to the metropolis, after deduction of the costs related to the implementation of these packages.

#### Planning documents

The law (art. 6) establishes a regional scheme of intermodality, intended to promote coordination between transport authorities with regard to the provision of services, user information, pricing and ticketing. Developed by the region, in consultation with the departments and the authorities organizing the mobility, the draft scheme must be approved by the regional prefect, before being approved by the regional council after favorable advice from the general councils of departments "representing at least half of the regional population and the deliberative bodies of the majority of the authorities organizing urban mobility representing at least half of the population of the urban transport perimeters of the region ". Urban Travel Plans (UDP) should be compatible with the regional scheme of intermodality.

## Lyon metropole

The metropolitan poles system - created by the Local Government Reform Act of December 16th 2010 and currently 16 in number - is considerably enlarged (MAPTAM - Article 77). The text gives them in particular a general competence, replacing the limitative list of competences, since their actions are now intended to "promote a model of planning, sustainable development and territorial solidarity". The departments and regions concerned can join.

Note on parking policy: the president of Lyon Metropole exercise the traffic police on all the roads of public domain (art.26). On the other hand, the parking police reports to mayors. However, a consultation with the president of the metropolitan council by the mayor is planned prior to the enactment of a parking regulatory act.

The MAPTAM law thus gives the new Métropole de Lyon a unique status in France. It results from the merger of the current skills of Grand Lyon and Rhône Département in the territory of the metropolis. The Urban Community and the Rhône Department disappeared on January 1st 2015 in this area. A new Rhone Department has been created in the remaining territory.

The territory of the metropolis is that of the former Urban Community of Lyon (59 municipalities). The capital of the metropolis is set in Lyon.

The creation of a single territorial unit in place of the former Communauté urbaine and the Département du Rhône constitutes a major institutional advance enabled by the high degree of intermunicipal integration of this territory. With a clause of general competence, the Métropole de Lyon regulates all matters of metropolitan interest by deliberation.

It sets the direction of the metropolis medium and long-term travel policy on jurisdiction of the mobility authority (SYTRAL). The transit network development projects or action ideas are described even those that will remain to be studied more precisely before their implementation.

The Transport Code provides that the UTP aims to ensure

- the sustainable balance between the need for mobility and access, on the one hand, and the protection of the environment and health, on the other hand, strengthening social and urban cohesion, improving the safety of all trips, the decrease in car traffic,
- the development of public transport and the means of transport that consume the least energy and are the least polluting,
- the improvement of the use of the main road network in the agglomeration,
- the organization of parking on roads and in public parking lots,
- the organization of the conditions of supply of the agglomeration necessary for the commercial and artisanal activities,
- the improvement of the transport of the personnel of the companies and the public authorities,
- the organization of integrated pricing and ticketing for all trips,
- the design of charging infrastructures to promote the use of electric vehicles or plug-in hybrids.

As part of its "Smart Metropolis" strategy, the Lyon Metropole's president has set the goal of inventing the city of tomorrow to improve people's daily lives: mobility is a priority of this strategy. To build relevant alternatives and facilitate urban travel on its territory, the Lyon Metropole associates public and private partners, in order to:

- improve the performance of public transport
- Smooth and reduce car traffic
- promote modal shift (from individual transport to public transport)
- contribute to changing behaviour

- offer users new services.

In this context, the Métropole de Lyon is involved in the development, coordination and experimentation of innovative projects such as NAVLYA 50/50 joint venture Navya and Keolis, Optimod or Opticities.

## Experiment status for Autonomous vehicle

In France, the applicant must, (vehicle covered by type approval or not), file an application for authorization. The file must contain, in particular, a technical description of the experimental vehicle, the request for experimentation and the opinions of the infrastructure manager, the competent authority for the traffic police, and the transport authority when the vehicle is intended for public transport of passengers. The authorization document clearly indicates on which sections the vehicle can be driven in automatic mode and which automated driving functions can be activated. For this purpose, the vehicle must be equipped with a device that records when the vehicle has driven in automatic mode. Holders of experiment authorizations must regularly submit reports to the relevant ministries on the experiments carried out. In France, the validity of road test authorizations is limited to a maximum of two years, with the option of renewal. In France, Germany and Luxembourg, vehicle tests with driving delegation functions are carried out with a driver on board who must be ready to take control of the vehicle at any time. With Bill 2018-211, the driver can be outside the vehicle. The delegated driving systems must be designed in such a way that the driver can deactivate or disable them at any time.

The legislative and regulatory framework for the experiments, resulting from the 2015 Energy Transition Law, was updated in March 2018.

This order is made of four articles. The circulation for experimental purposes of a vehicle with partial or total delegation of driving on a lane open to public traffic is subject to the issue of an authorization to ensure the safety of the conduct of the experiment. The authorization is granted by the Minister in charge of transport after the opinion of the Minister of the Interior, if necessary after the opinion of the road manager, the competent authority for the police and the organizing authority of the transport concerned. The conditions are detailed into the following decree.

The purpose of this decree is the determination of the conditions of issue and the conditions for the implementation of the authorization for driving for experimental purposes of vehicles with driving delegation. This is made of 20 articles that can be summarized as follow.

The vehicles concerned by the authorization can circulate on lanes open to public traffic under cover of a provisional title of specific circulation which is added to the number of those currently envisaged by the article R. 322-3 of traffic regulation.

For vehicles used for the public transport of persons or goods, the decree makes adaptations of Articles R. 3113-10 and R. 3211-12 of the Transport Code. These adaptations make it possible to simplify the registration in carriers' registers (of persons or goods) of companies wishing to experiment with a transport service consisting solely of vehicles with driving delegation. For this, it requires a formal agreement from the AOM (Sytral here) to become a public transport service. This entails in particular a transfer of responsibilities towards the operator (and no longer towards the persons coming on board the vehicle as "guinea pigs")

The authorization is a prerequisite for the circulation for the purpose of experimenting with a driving delegation vehicle. These experiments relate to one or more of the following cases:

- technical tests and development;
- performance evaluations in the situation of the use for which the vehicle with driving permission is intended;

- public demonstrations, especially during eventual events.

The sections on which the vehicle is authorized to operate in driving delegation as well as the driving delegation functions that can be activated on these sections are specified in the authorization.

The authorization may relate to a vehicle engaged in the performance of a service for the transport of persons or goods. In the case of an experiment of a vehicle intended for the public transport of persons or for the transport of goods, this transport is carried out on the route defined in the authorization. Any experimentation of a vehicle with a driving delegation intended for the public transport of persons entails a trial period without the execution of this transport.

The vehicles with driving delegation circulating within the framework of an authorization of experimentation are equipped with a recording device making it possible to identify the phases of delegation of pipe.

The applicant guarantees that his financial and technical capacities are adapted to the purpose of the experiment. The authorization specifies the start date and the duration during which the experiment is authorized. The maximum duration of the authorization is two years and may be extended by renewal of the authorization depending on the evaluation of the experiment.

## **The current barriers and expected evolution**

The traffic conditions on the public roads of the vehicles concerned must guarantee a level of road safety at least equivalent to comparable vehicles without driving authorization systems. This will necessitate adaptations to the rules of the road and the definition of a liability regime specifying the respective tasks and responsibilities of the driver, the automated system, possibly including supervision, infrastructure managers or operators and vehicle and equipment manufacturers. Adaptations will have to be consistent with the evolution of international conventions on driving.

### **Liability**

In the field of civil liability, Law No 85-677 of 5 July 1985 on improving the situation of victims of road traffic accidents and speeding up compensation procedures, known as the Badinter Law, establishes fault-free liability system allowing a certain and rapid compensation of the victims (bodily injury or material damage). The driver is not defined; it is the owner of the vehicle who is presumed guardian. This exclusive liability regime is coupled with an insurance plan, based on an insurance obligation covering this civil liability (Articles L. 211-1 et seq. Of the Insurance Code). This national system, particularly protective, guarantees the victims to be compensated by the insurer of the vehicle involved (except in the case of inexcusable or intentional fault), who can subsequently bring an action against the author of the damage. Existing legislation ensures, in all circumstances, the creditworthiness of the person who caused the damage.

This dual regime seems to be applicable to automated vehicles, even without any driver on board. The absence of driver or control by a driver is thus indifferent, both for the application of the liability regime and for the obligation of civil liability insurance. Compensation for victims would remain based on the notion of involvement of the automated vehicle, regardless of the existence of a driver or his fault. After compensation, a case-by-case examination would establish all the responsibilities (manufacturer, equipment supplier, software supplier, other vehicles, infrastructures, etc.). This would include resolving the issue of a possible defect or possible failure of the product, ie the automated system, and therefore the responsibility of the manufacturer, the designer of the equipment, or from the software vendor or any other person involved in this automation.

With regard to the criminal liability of the driver and as the functions of automation of driving tasks develop in the vehicles, it is important to distinguish between two situations:

- Cases where the driver must always remain in control of the vehicle using certain automated driving functions, and must be able to regain control at any time, no reform appears necessary;
- cases (future for fully automated vehicles) where the driver can not monitor the road in any way.
- The civil liability regime resulting from the "Badinter" Law and the insurance framework based on an insurance obligation covering this liability seem to be able to handle, without modification to this effect, automation cases, including total automation. Established in the interests of the victims and guaranteeing them certain and rapid compensation, the current legislation does not constitute a barrier on the development of automated vehicles.
- In terms of criminal responsibility, it is necessary to consider:
- If it is necessary to provide, by way of derogation from existing laws or regulations, specific rules in the traffic regulation Code for vehicles capable of driving without drivers (providing for the non-applicability of any article of the traffic regulation).
- How to deal with highly automated systems in which may appear long periods of time during which the "driver" will rely on the system, and which will raise the question of responsibility, especially in terms of recovery, to reconcile the fact that the driver is in any case responsible criminally while he trusts the system almost all the time.

## French government proposition

With a view to enabling the deployment of highly automated vehicles by 2020 to 2022, the liability regime will be adapted according to changes in the respective roles of the driver and the automated system for the corresponding use cases. These adaptations will be proposed, along with the corresponding changes in the traffic regulation Code, within the framework of the working group led by the Ministry of the Interior, including the Ministries of Justice, Transport and Industry. In the immediate future, in order to allow the development of experiments that derogate from the provisions of the traffic Code, the Mobility Orientation Law will propose a framework of responsibility adapted to the specificity of the experiments, and in particular to the commitment of the person in charge of the experiment, holder of the authorization, to ensure its safety. Judicial magistrates, judicial experts and judicial police officers will be made aware of the liability issues that will be generated by the development and introduction of autonomous vehicles.

### Driving licence

The conditions for the issue of driving licenses fall within the competence of the European Union and, more specifically, the provisions contained in Directive 2006/126 / EC of the Council and the European Parliament of 20 December 2006 on driving licenses. It is the European Commission, in particular DG MOVE, its Road Safety Unit, which must work on the issue.

"This is a key point in our discussions with Xavier Delage at the Ministry. Currently, Navya shuttle operators must hold a D (+ FCO / FIMO) license. On the Autonom Cabs however, less than 9 passengers, so normally a license B will be sufficient. We (with the other operators RATP and TD) asked that the shuttle operators could hold only a license B. We await their returns." Clément Aubourg, Keolis, November 2018

### Evolution of vehicle technical regulation and homologation

In the context of the work on the evolution of the technical regulation of vehicles within the UNECE in Geneva, it is currently Regulation 79 (see box below) relating only to vehicle steering equipment which deals with the main issues of automation. Until 2017, this regulation allowed the automatic control of



the steering control by the vehicle only up to 10 km / h. This requirement was sufficient to certify automatic parking systems, but did not allow the homologation of the projects of the manufacturers aiming to direct the vehicle automatically on fast lanes or in situations of corks, and eventually in all situations.

The work undertaken in UNECE WP29 leads to a sequential approach to the increasingly high degrees of automation, classified into 5 categories:

A	maneuvers <10km / h, including remote controlled parking (example park assist)
B	keeping in the lane
B1	assistance, the driver must keep his hands on the steering wheel (ie. lane keeping assist)
B2	delegation, the driver can let go of the steering wheel (example: lane guidance)
C	lane change initiated by the driver
D	lane change initiated by the system validated by the driver
E	B2 + automatic lane change

In addition to the management regulation R79, it is important to include the evolution of international technical regulations in a new framework that makes it possible to move from a "module" approach (eg lateral-direction, braking-acceleration, field of vision) to a "system" approach and to take into account in particular:

- the need to distinguish the different types of use cases in the approach, including automation levels and areas of use or traffic conditions;
- the need to take into account the learning nature of these systems;
- the need to progressively extend technical regulations to the challenges of vehicle connectivity.

In terms of approval, based on the 'horizontal rule' approach, each type of vehicle with a set of automated features may be approved by a receiving authority, on the basis of a service report, which will have carried out all the necessary verifications adapted to all the embedded functionalities (documentary verification, simulation tests, physical tests, conformity assessment open and systemic). The process of issuing the European homologation of the vehicle will be done according to the principles established by European directives or framework regulations, for all non-automated aspects of the vehicle (seat belts, lighting, glazing, ...), by incorporating the certification dedicated to the automated features above.

Finally, the existing national framework, in particular the third book ("The Vehicle") of the Traffic Code and its implementing decrees, will have to be reviewed in order to ensure the adequacy between the new technical prescriptions published in Geneva and made compulsory by Brussels, and those already present in the traffic Code, whether in terms of the technical provisions of the vehicles, their receipt and homologation, their registration and their technical inspection, and should be adapted accordingly.

On May 14, 2018, the French State adopted the National Autonomous Vehicle Development Strategy. The 10 priority actions defined aim to "build the framework, by 2020 to 2022, to allow the circulation of private cars, public transport vehicles and highly automated goods in France. the traffic code, the rules of responsibility or the training can be adapted ",as quoted into the report from former minister Anne-Marie IDRAC.

Experiments will also take place in Île-de-France from 2019, said the president of the Île-de-France region, Valérie Pécresse. These will take place on the A1, A6, A4 and A10 on emergency stop strips transformed into connected and dedicated traffic lanes. These infrastructures will be financed by the region with 100 million euros. In the prospect, "an automated service to the sites of the Olympic Games in 2024, to compensate for some delays in the railway," hopes the elected. These autonomous buses or collective taxis - the project has not yet been precisely stopped - will serve the Charles de Gaulle airport, Orly or Marne-la-Vallée.

At the national level, category 3 autonomous vehicles (the driver may give up complete control of the vehicle but must be able to take it back in a given time) may be authorized in 2020, those in category 4 (full autonomous driving on certain portions route) in 2022, according to the schedule presented by Anne-Marie Idrac, commissioned by the government to establish this strategic plan. Level 5, where the vehicle can drive alone in all circumstances and make critical decisions, is not up to date. The Pact Law, as mentioned before, whose entry into force is expected in 2019, will include a component on the experimentation of autonomous vehicles without an attentive driver, said the Minister of Transport Elisabeth Borne, which will make possible the experiment in Ile-de-France. The law of orientation of the mobilities aims at creating a perennial legal framework by 2022. Since the end of 2014, 54 registration authorizations for autonomous vehicle trials have been issued in France, including 26 for private cars.

## **Automated public transport framework**

The dynamics of innovation in the automated public transport sector suggest that it is necessary to anticipate the transition from an experimental logic to the development of services. It is likely that, in an incremental logic and learning, shuttle use cases first develop on relatively secure circulating environments (as has been observed until then in research and experimentation projects), to gradually move from "almost-dedicated sites" to less secure routes (mixed flows and crossroads, change of lanes for avoidance), to possibly go towards non-fixed routes. The services identified in the framework of the NFI (Nouvelle France Industrielle) suggest that the "size" of the vehicle, as it is currently known (about 12 people), will have to diversify as well as the nature of the routes (dedicated sites / open sites), to cover a wider spectrum, ranging from autonomous shared vehicles for the most atomized applications, to capacity buses. The automation levels targeted are higher than what is targeted for the particular vehicle, targeting now levels 4 and 5.

The regulatory work on automation carried out at UNECE does not address the challenges of developing automated public transport, which appears fast in relatively secure areas of employment.

The dynamic development of automated public transport leads French decision-makers to consider two strategic orientations at the national level to support the market

The development of a regulatory framework laying down the safety requirements of the "shuttle" type vehicle (9 to 16 seats, including at least 4 seats), as well as the traffic conditions of these vehicles when they are automated (this category of vehicle is different from categories M2 or M3 intended for the transport of persons and subject to international regulation and European homologation).

The development of a reference system for evaluating the safety of shuttle routes, when these routes are fixed, based on an analysis of the critical situations of automated shuttle traffic in urban areas and on experiments. These two elements will make it possible to set up a system of homologation of the vehicles concerned, and a system of validation of the routes and conditions of circulation of the vehicles.

### **3.2.5 On-going programs**

France-Germany-Luxemburg project



France initiated cooperation with Germany in 2016, extended to Luxembourg in 2017 which resulted in the identification of a transboundary site. The content of the expectations of the public authorities has been defined. On this basis, a call for expressions of interest was launched on 11 May 2018 following the meeting of the French and German ministers. The following text is directly taken from the document “Franco-German-Luxemburgish cooperation on automated and connected driving Concept for the Cross-border Digital Test Bed”, co-signed by Bundesministerium für Verkehr und digitale Infrastruktur, Ministère de la transition écologique et solidaire et le gouvernement du Grand-Duché du Luxembourg on the 8th of May 2018.

“On September 29th, 2016, the Governments of Germany and France launched the "Franco-German Initiative on Electric and Digital Mobility". The objective of the initiative is to enhance cooperation between the two countries in order to progress innovations in the spheres of electric mobility and automated and connected driving. By launching this initiative, the two countries are affirming their joint commitment to a sustainable European transport policy that is fit for the future. In the field of automated and connected driving, the Franco-German initiative provides for cooperation on the following points:

- Assessment of challenges of the use of automated and connected vehicles, with a focus on safety and traffic management impacts, as well as interactions with the infrastructure and other vehicles or road users;
- Assessment of medium-term impacts of automated and connected driving on mobility and the environment;
- Identification of the need for joint experimental or pilot projects;
- Exchange of experiences regarding driving skills and training needs.

In connection with these points an agreement was reached on the establishment of a cross-border “Franco-German Digital Test Bed” for automated and connected driving on 8 February 2017. The test bed serves to promote the deployment and trialling of technologies for automated and connected driving in cross-border operations and in real life conditions. The interaction between motorway, rural and urban traffic is to be future-proofed across national borders. In particular, the following objectives should be emphasized:

The test bed is to provide a technologically neutral offer to industry and academia for testing innovative technologies.

A joint exchange of experience based on experiments results of industry and academia especially regarding juridical and technical issues encountered during the cross-border testing of automated and connected driving technologies is to be established.

On this basis the impacts and potentialities of the technologies regarding concrete use-cases are analysed and assessed. The lessons learned will be submitted jointly to European and international institutions for discussion.

On 14 September 2017, Luxembourg joined the cooperation, and additional objectives were added to the trilateral cooperation:

- Support the development of innovating and tailored mobility services, for example towards rural zones;
- Aim at developing a joint large scale pilot project in the cross-border regions;
- Pay a particular attention to acceptability and ethical issues;
- Support common and proactive initiatives in European and international institutions.”

**Thematic Key areas**

- Continuous compatibility of automated driving perception functions
- Link between automation and connection, including Intelligent Transport Systems (ITS) and cross-border mobility services
- Impact and effects of automated and connected driving
- Data access and use

**Experimentation of the Autonomous Road Vehicle**

The EVRA (expérimentation véhicule routier autonome) call aims to support experimental projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics. These projects will contribute to the development of methodologies for validation of safety and to the improvement of knowledge on uses and acceptability. It is managed by ADEME (French energy and environment national agency). It was launched on June 8th 2018 and will be closed on November 29th. On May 14, 2018, the State adopted the National autonomous Vehicle Development Strategy. This call aims to select one or more projects that register and participate in Priority Action 5 of this strategy, entitled "Structuring a National Program of experimentation ". It follows the "call for interest" opened on February 23, 2018, which was intended to allow actors to gather around common projects. Projects that meet this call involve several "call for interest" winners, working in particular on the development of automated vehicles or on the development of mobility or transport services for goods using these vehicles

The choice of public authorities is to select a limited number of projects, of sufficient critical size, having the best governance between the project partners, but also with the other projects and the public authorities, in order to exploit as much as possible the synergies between the cases of use and the pooling of skills necessary for experimentation.

The projects deal with one or more of the application areas defined as part of the "Nouvelle France Industrielle" stand-alone vehicle roadmap:

- Particular vehicle ;
- Collective and shared transport system;
- Freight transport system.
- Only consortium projects labeled in the call for interest are eligible.

**French Mobility program: prototypes to launch projects**

French Mobility is a community open to all mobility stakeholders: transport companies, start-ups, local authorities, incubators, investment funds, training organizations, associations. In a process of co-construction, the community members are called upon to participate in the creation of an environment conducive to the development of new mobility, for persons and goods, by proposing concrete and operational solutions that meet the needs of project leaders.

The French Mobility initiative is an operational complement to the Mobility Orientation Law, which aims to modernize the legislative framework for mobility, and is anchored in the Government's actions for innovation. It participates in the promotion of French innovation carried by numerous institutional players and relies on existing approaches (French Tech, France experimentation Investment plan for the future ...) for the benefit of its members.

The French Mobility action plan, announced at the European Mobility Fair 2018, includes 7 main measures over two years (French Mobility Facilitator within the Ministry of Transport; French Mobility

collaborative platform; Appropriation of the innovative purchase; Creation of an innovation and mobility culture; Orient funding in support of innovation in mobility; Engineering support for low density territories; Highlighting French Mobility as THE unifying brand of mobility innovation). Six multidisciplinary groups (State, local authorities, companies, start-ups, associations, etc.) are already working on prototypes for its implementation.

These prototypes include ways to improve and develop solutions that meet everyone's needs.

The group "financing of innovation and public procurement" aims to remove the financial and legal obstacles to the setting up of experiments and innovative solutions by the public authorities. Short and medium-term actions are proposed to facilitate the path of the innovative candidate, reconciling innovation and public order and, in the longer term, encouraging the financing of experiments and large-scale deployment.

The purpose of the "Deployment" working group is to allow the transition from successful experimentation to a generalized and sustainable service, in a priority area: the link between the peripheries and the agglomerations. To accelerate large-scale deployment and integrate innovations with existing solutions, the prototype plans to integrate the deployment of innovative solutions by making it possible, as of 2019 and for a period of 3 years, to amend the 400 service delegation contracts. In order to define measures to better position France as a territory of excellence for the automotive industry and its associated services, the Prime Minister required a report on October 29, 2018.

This mission is part of the continuation of the strategic automotive contract signed on May 22, 2018 between the State and the Strategic Steering Committee (CSF Automobile). The FSB will be responsible for monitoring the implementation of the measures adopted by the Government.

It also relies on all the work done in the framework of the preparation of the law of orientation of the mobilities and the strategy for the development of autonomous vehicles led by Anne-Marie Idrac. We will only present measures related to autonomous vehicles. One of the major measures is to deploy by 2021 full-scale on-demand transportation services. The goal is to make France the most advanced country in Europe in terms of boosting the autonomous vehicle.

To develop autonomous vehicles, France has both startups and innovative companies on sensors, vision, geo-positioning, cyber-security, intelligent processors and simulation but also recognized institutes of artificial intelligence ( INRIA, SystemX, LAAS, CEA-LIST ...). Two of France's four interdisciplinary Institutes of Artificial Intelligence (3IA) focus on transportation applications.

The French strategy published in May 2018, in line with the strategy of the European Commission, is articulated around three objectives: security, progressivity, acceptability. This strategy was conceived and implemented in cooperation between private and public actors, under the authority of Mrs. Anne-Marie Idrac, former minister, appointed High Authority to the autonomous vehicle in November 2017.

A round table on acceptability was launched to closely monitor citizen perceptions on the basis of surveys and forums. Acceptability is indeed a prerequisite for the development of automated vehicles.

Experimentation remains a key step in moving from concepts to uses, to advance technologies while preserving safety. Since 2015, 68 experimental authorizations have been granted, nearly half of which for public transport services. These experiments represented more than 200 000 km of driving in very different traffic conditions. Thousands of people were transported without injury. A new national program of experiments supported by the public authorities was launched in June 2018 (EVRA project: Experimentation of the Autonomous Road Vehicle with 40 million euros of public support).

## Appendix 3

# Legal context in Luxembourg

### Mobility and transport framework

For the transport of people, it is to promote public transport, multi-mobility and electric mobility.

Here are some key figures concerning the current transport situation in Luxembourg and the Greater Region:

- > 20,000 passengers take the tram every day;
- 6,000 passengers use the Pfaffenthal-Kirchberg funicular every working day, totaling 1.5 million passengers in one year since the inauguration of 10 December 2017;
- 2,200 RGTR buses less every day in Luxembourg City, as soon as Luxexpo's full 16 km tram line ends at La Cloche d'Or;
- 35 people killed on the roads in 2018;
- 3.8 billion euros will be invested until 2023 in rail infrastructure;
- 150 electric charging stations (= 300 charging points) currently available to the public;
- 600 km of cycle paths;
- 3,600,000 air passengers in 2017;
- 938,000 tons of air cargo transport in 2017.

250,000 free car seats enter the city of Luxembourg each morning, which equates to an occupancy rate of 1.16 persons per car for residents and 1.22 persons per car for cross-border workers.

#### Vehicles fleet

- 285,000 bicycles used (MDDI, TNS Ilres 2017)
- 245,000 diesel cars (STATEC, 2019)
- 163,000 gasoline cars (STATEC, 2019)
- 4,900 gasoline / electric hybrid plug-in cars (STATEC, 2019)
- 1,360 electric cars (STATEC, 2019)
- 2,042 buses (STATEC, 2019)
- 259 passenger cars (27,190 seats) (STATEC, 2017)
- 9 trams (Luxtram, 2017)

#### Infrastructures

- Highways: 165 km
- National Roads: 839 km
- Paths recovered: 1.891 km
- Other roads: 5,900 km
- Main tracks: 451 km
- National Cycling Network: 611 km
- Tram network in service: 5.2 km

The specific character of the socio-economic situation of the Grand Duchy of Luxembourg, namely a very strong economic and demographic growth, accompanied by a considerable increase in the number of jobs, induces an increasing need for travel and therefore increased needs in terms of mobility.

The massive spread of the car as a preferred mode of travel due in particular to its availability and speed has led, with the constant growth of travel in recent years, a saturation and congestion of transport networks, especially during rush hour .

The current situation with regard to mobility is characterized by a continuous deterioration of the traffic situation. However, ensuring good accessibility both internally and externally to the country is a fundamental element in order to remain competitive from an economic point of view.

In addition, there are the issues of environmental impact, health, economic potential and social cohesion, while respecting an integrative approach. Moreover, the link between territorial development and mobility, respectively transport, is no longer established, since only dense and compact urbanization allows efficient and attractive functioning of active mobility (walking, cycling) and public transport. Thus, the Luxembourg government recommends mixed assignments and a more dense development that brings people closer to their place of work and the services they need for their daily lives. The car could then become a choice more than a necessity. Therefore, to imagine the mobility of tomorrow, implies a different conception of our territories, and more particularly of our cities, but also of our ways of life.

Indeed, by analyzing the daily movements, it was found that in 2009, only 13% of these trips were made on foot or by bike. Active mobility, currently considered as a mode of travel largely devoted to leisure, will in the future have to be considered, in view of its many advantages, as a mode of transport in its own right and it will be a question of to develop considerably. This is all the more necessary as half of the country's daily motorized journeys are within the same region and 40% of daily journeys are less than 3 km.

In addition to active mobility, Luxembourg accounts for no less than 1.66 million motorized journeys per day (including individual motorized transport and public transport).

Two-thirds of these daily motorized trips are made during rush hours in the morning and late afternoon, resulting in, at these specific times, an obvious overload of major road and rail routes. It is important to note that the road and rail loads are found at the same critical points, namely the capital's entrance gates and the main roads connecting the capital's agglomeration to other parts of the country and to neighboring countries.

In addition, the Central Station, the only train-bus interchange in the City of Luxembourg, is overwhelmed by the huge influx of passengers arriving by train, most of whom are rushing to public transport by bus serving the city of Luxembourg. City Center and Kirchberg. Buses, for their part, are hampered during the daily peaks on certain roads or they use the same lanes as individual traffic and find themselves stuck in the same way as motorists, thus accumulating significant delays. In addition, since most of the regional and local bus lines today cross the central axis (avenue de la Liberté / Boulevard Royal), it is regularly saturated with buses during rush hours.

## Organization of mobility and actors in charge

### The State

The state sets the legal framework. It guides the evolution of mobility through spatial planning, the choice of investments in transport infrastructure and the provision of public transport.

- Spatial planning and mobility planning in favor of sustainable mobility
- Providing public transport
- Financial incentives consistent with the objectives of mobility

- Transport infrastructure and public buildings favoring alternative modes of transport
- Different shift hours to avoid rush hours (administrations, high schools, etc.)

Mobility and public works Ministry - mobility and transport department

The responsibilities of the Ministry of Mobility and Public Works for Mobility / Transport are:

1. General Transport Policy: Definition, Design and Guidance by Needs Inventory, Prioritization, Implementation of Resources and Expenditure Control - General Coordination of Work - Government Protection Service
2. Railways: Rail transport of persons and goods - Rail infrastructure and international rail connections - Rail Fund - International Rail Connections Fund - Rail Regulation - Railways Administration
3. Mobility planning: Strategy, coordination and mobility planning - Concepts and projects - Alternative mobilities - Development of transport networks (rail, tram, bus, road and soft mobility) and intermodality - Tramway / Luxtram - Cross-border mobility - Mobility mobility unit - Mobility observatory - Traffic model cell - Transport decarbonisation - Intelligent transport systems - Mobility plans (municipalities, business parks, public buildings, etc.)
4. Road traffic: Driver's license and driver training - Vehicle registration and technical inspection - Regulation and road safety - Taxi management
5. Road transport: Regulation concerning international road transport - Authorizations for the international carriage of passengers and goods by road - Road traffic control
6. Public transport services: Coordination of the different modes of transport performing a public service - Determination of the supply - Transport Community / Central Office of Mobility - Authorizations for international passenger transport - Pricing - Specialized transport service on behalf of children or young people with specific educational needs to the Competence Centers, people attending centers for the physically handicapped and multi-handicapped as well as employees with disabilities and young people in need of professional integration - Adapto Service
7. Inland navigation: Regulation - Exploitation of the canalized Moselle - Merttert Harbor - River Navigation Service - Fleet Management - Management of the public river domain
8. Combined transport - Multimodal policy - Logistics - Intermodal terminals - Administration of Technical Investigations
9. Regulation - Airport - Navigation and Air Transportation - Aviation Safety and Security - Civil Aviation Directorate - Air Navigation Administration - Development of Airport Activities – Luxairport

In summary, it has to coordinate:

- Global strategy for sustainable mobility
- Cross-border mobility strategies with our neighboring countries
- Regional or local mobility concepts
- Follow-up of Major Projects and Major Transport Policy Initiatives
- Planning for strategic mobility projects
- Tram in the City of Luxembourg
- Exchange centers
- Public transport networks

The Ministry of Mobility and Public Works - Department of Mobility and Transport is responsible for road safety on public roads. Through preventive and repressive measures (extension of the probationary period, point permit, administrative measures ...) the Department of Mobility and Transport guarantees the respect of traffic rules and prevents traffic accidents.

The Ministry of Mobility and Public Works - Department of Mobility and Transport can work on traffic laws.

For example, regarding the legal situation of bicycle traffic and foot traffic, several actors are involved, namely:

- Ministry of Mobility and Public Works - Department of Mobility and Transport;
- the Ministry of Mobility and Public Works - Department of Public Works through the State Roads and Bridges Administration (National Bicycle Route Network);
- the Ministry of Energy and Spatial Planning - Department of Spatial Planning;
- Ministry of Environment, Climate and Sustainable Development - Department of the Environment;
- the Ministry of Economy and the Directorate General of Tourism;
- the Ministry of Internal Security and the Grand Ducal Police;
- the Ministry of Health;
- the municipal administrations.

The State is the organizing authority of public transport. The functions of the state as organizing authority are:

- Planning ;
- Organizational And Financial Management;
- Control ;
- The Negotiation Of Public Service Contracts;
- The Pricing Policy.

Collaboration between the State and the municipalities is done through the State Circulation Commission.

Are subject to prior authorization from the Ministry of Mobility and Public Works:

- Mobility Concepts For Pedestrians And Cyclists;
- The Introduction Of A Zone 30 On The Territory Of The Communes;
- An Integrated Mobility Concept;
- The General Development Plan.

Examples of measures to promote active mobility in Luxembourg municipalities

- Creation Of A Network Of Pedestrian Paths And Bike Paths In Bascharage;
- Creation Of A Network Of Cycle Paths In Mamer, Mersch And Esch / Alzette;
- Introduction In The Municipal Area Of Zones 30 In Sanem, Schifflange, Lorentzweiler;
- Area Reserved For Pedestrians And Cyclists in the center of the City of Differdange.

Verkéiersverbond



The Verkéiersverbond is a cooperation body bringing together representatives of the State, municipalities, users and operators. This is a public institution with missions:

- Promotion of public transport;
- The development of alternative forms of mobility;
- Conducting surveys, counts and needs analyzes;
- The establishment of statistics;
- The conclusion of agreements with the State;
- The right of passengers: defense of the interests of passengers or passengers in several areas of public transport;
- Management of a mobility center;

The Transport Community is also the competent authority for passenger rights and administrative penalties in the sense of EU regulation n° 181/2011.

Public transport must cover travel needs in the territory of the Grand Duchy of Luxembourg and relations between the Grand Duchy and cross-border regions. These transports include:

- regular services;
- occasional services;
- specific services.

#### Mobility center / Mobilitéitszentral

It is a contact body for the public whose missions are:

- To provide information and advice on public transport;
- To propose alternative modes of movement to the individual car;
- To receive suggestions, complaints and questions regarding public transport.

The Verkéiersverbond (Transport community) is a public body while the Mobilitéitszentral (Mobility Centre) is the contact body for general public.

#### Operators of Regular public transport services

Regular services shall be deemed to be the public transport of persons regularly or periodically, on a specified route, between two points or in circuit, even if they only serve the localities forming the points of departure and arrival, and accessible to anyone upon presentation of a ticket.

Specialized regular services are the public transport of persons who, while presenting the general characteristics of regular services, are reserved for specific categories of passengers.

Regular public transport services can be bus lines in the Grand Duchy, thus national services, but can also be cross-border lines with our neighboring countries, or coach lines to foreign destinations within the European Union and beyond.

They include regular services and specialized regular services as well as occasional public and specific services. All public transport services, ie establishment, modifications and deletion, must be authorized by the Minister responsible for transport.

Regular services that affect not only the Grand Duchy of Luxembourg but also countries of the European Union are subject to European regulations. For services that even go outside the European Union there are agreements or rules established between each country concerned.

Regular public transport services are:

- the service of the General Regime of Road Transport (RGTR);
- the bus service of the City of Luxembourg (AVL);
- the bus service of the Luxembourg Railways;
- the bus service of the Union for Intercommunal Transport in the Canton of Esch-sur-Alzette;



- cross-border bus services.

Transport offers, such as Late Night Bus Night Services, which operate according to scheduled and pre-arranged schedules, are also national scheduled public transport services.

The RGTR (“Régime Général des Transports Routiers”) est one of the 5 public transport operators in the Grand Duchy of Luxembourg and operates the regional bus lines.

RGTR lines are operated by more than 30 private bus companies on the basis of public transport concession contracts.

The RGTR lines are regional lines and serve all the municipalities of the country. There are also cross-border RGTR bus lines, linking localities in the 3 neighboring countries with Luxembourg's urban centers. The RGTR network also covers school transportation to secondary schools.

## Forthcoming Projects

The strategic goal for 2025 is to reduce congestion during peak hours while carrying 20% more people than in 2017. This overall objective is broken down into four specific targets, in addition to other objectives in relation with mobility such as road safety, inclusion, air quality, decarbonisation, land use planning and the Third Industrial Revolution.

The global strategy for sustainable mobility relies on the rail network at the national level as the backbone of the public transport network.

Existing projects or planning exchange nodes, such as peripheral stations, Park & Ride car parks and bus lanes, will enable the mobility chains to be put into practice and to unclog the centers. of great affluence.

At the level of the City of Luxembourg and its suburbs, the goal is to unclog the 2 main gateways to the capital (Central Station and Hamilius).

To do this, new exchange hubs will be created. They will allow a better distribution of flows at the entrance and inside the capital and will be linked together by tram.

They will also allow trans-train-bus or bus-bus transfers to access peri-urban areas which constitute important employment centers.

At the national level, the objectives are:

- modernize the railways and develop the railways;
- improve cross-border connections;
- to fight against road insecurity;
- consolidate the Luxembourg airport;
- modernize and expand the port of Mertert. Telematics

The Verkéiersverbond has a leading role in the organization of public transport. This public institution is responsible for issuing proposals for the improvement of planning, services and systems in public transport. The improvement of schedules and connections requires a database to be perfected by joining the "M-Kaart" pricing system with a national bus tracking system.

The Verkéiersverbond is responsible for piloting the national telematics project in the public transport mLive.

This project is essential for the proper functioning of multimodality and fundamental in the individual planning of mobility chains. Before moving, the citizen inquires about his transport possibilities. The information that comes out of mLive allows to plan a part of journey: real time schedules before journey

on the site [www.mobiliteit.lu](http://www.mobiliteit.lu), on the mobile application [mobiliteit.lu](http://mobiliteit.lu), on the dynamic displays on different bus stops and in the Mobilityitszentral of Verkéiersverbond.

The Verkéiersverbond has equipped 1140 buses with on-board computers and screens that provide real-time timetables for public transport. On these screens, the customer will see the next stops, the connections that will be possible and the time that will take his trip to this or that stop. The names of the stops will be announced to the passengers. Real-time information will of course also be available on the [mobiliteit.lu](http://mobiliteit.lu) mobile application on smartphones.

#### Road safety

The fight against road safety focuses on reducing the number of accidents, alternating preventive and repressive measures. The installation of automatic speed cameras at places deemed dangerous is a concrete project in the making. Extending the accident analysis component, including safety and signaling audits, in order to draw useful lessons, will provide the relevant data to improve road safety in a targeted manner.

Training is a complementary track that is not neglected. Driver's license learning will be reviewed to improve safety and to develop environmentally responsible driving while reducing failure rates. The commissioning of a specific training center for bus and truck drivers is a complementary project in progress. The concept of the technical inspection of self-propelled vehicles will be subject to review.

Where appropriate, Luxembourg will - in the continuity of the current measures of the "Eurovignette" group - evaluate means of taxation of heavy goods vehicles for the use of certain road infrastructures in order to work to decongest in particular, and a modal rebalancing in general.

#### Tramway extension

On October 13, 2017, the Minister of Sustainable Development and Infrastructure François Bausch presented the two extensions of the new tramway network. By 2021, they will be able to serve on the one hand the neighborhoods of Bonnevoie, Howald, Ban de Gasperich, Cloche d'Or and on the other hand the sector of Héienhaff and Senningerberg as well as the airport. These extensions will link in this way the trading centers of Héienhaff, Bonnevoie, Howald and Cloche d'Or. The design of these extensions is carried out in close coordination with the Roads Authority (PCH), which is responsible for the project management of the adjacent road projects.

The total cost for the construction of the extensions is estimated at 214,000,000 euros (excl. VAT) financed by the state, ie 114,900,000 euros (excl. VAT) for the route between the Central Station and the Golden Bell and 99,100 euros. 000, - euros excluding VAT for the route between the International Fair Circuit and the Findel Airport. 12 trains will complete the fleet of 21 trains that will run between Luxexpo and Central Station. The current Storage and Maintenance Center facilities are already planned to accommodate and maintain the trains needed to operate the 16 km line without additional investments. At rush hour, the tram will then serve every 3 minutes each of the stations between Lycée Bonnevoie and Luxexpo. Beyond that, towards Cloche d'Or and Findel, the crossing frequency will be 6 minutes.

#### Individual Transport

Alongside the public transport offer, other means of individual travel such as carsharing and carpooling have recently emerged.

Admittedly, individual transport offers a great deal of freedom and meets a fundamental need for mobility, constituting a precondition for the functioning of an economy. But changing and challenging our habits, even if only from time to time, to take the path of alternatives as stated in the Modu 2.0 sustainable mobility strategy, will achieve the goal of mobility together.

## Perspectives

The planning bases developed or being developed are:

- the strategy for sustainable mobility "Modu 2.0";
- the Transport Sector Master Plan (TSP);
- cross-border mobility strategies with our neighboring countries (SMOT);
- studies and concepts of regional or local mobility.

The 2003 spatial planning program and the integrated concept of transport and spatial planning, better known by its German acronym IVL ("Integratives Verkehrs - und Landesentwicklungskonzept") presented in 2004 define territorial strategies in terms of spatial planning with a view to ensuring a balanced and integrative territorial development that reconciles socio-economic development and urbanization with that of mobility.

The strategy for sustainable mobility "Modu 2.0 - Mobilität zusammen erreichen" presented in May 2018 (an update of the "MoDu" strategy of April 2012) shows an integrative approach of different measures to meet the challenges of mobility and concretises projects based on new thinking in order to reduce budget costs, while maintaining the principle of giving priority to projects related to public transport.

The Transport Sector Master Plan (PST in French), which refers to the spatial planning program as an orientation framework, but also to the "Modu 2.0" strategy, makes it possible to present the various projects and measures of the strategy. "Modu 2.0" and allows, in addition, to give a regulatory framework to these projects and measures.

### Transport Sector Master Plan

The Transport Sector Master Plan (PST) provides a regulatory framework for the Modu 2.0 projects and measures. Referring to the land-use planning program as an orientation framework, and therefore also to the Modu 2.0 strategy, the PST makes it possible to present the various projects and measures of the Modu 2.0 strategy, mainly:

- the reservation of corridors for railway and road infrastructure projects;
- the implementation of a consistent management of parking spaces;
- promoting active mobility.

With housing, the problem of motorized individual traffic is probably the one that most impacts the lives of residents and cross-border commuters as it causes increasing congestion on the roads. At the country level, the increase in road traffic remains significant. At the same time, the number of travelers using the train has increased by 60% in 10 years (2005-2016).

In a context of growth in the demand for mobility, changing the modal split towards public transport and active mobility is a double effort to be made. The results of the "Luxmobil" survey show that in 2017, the proportion of individual motorized traffic was still 69%, compared to 17% for public transport and 14% for active mobility. The country seems to be crossing the "peak car", a ceiling reached in terms of use of the car.

Nevertheless, to cope with the very strong growth of the Grand Duchy in economic and demographic matters, which is accompanied by a geographically very unbalanced increase in the number of jobs, it is necessary to superimpose corridors and areas intended to accommodate all means of transport as well as to aim for a very significant increase in the number of journeys made by sustainable means of transport.

With this in mind, the Transport Sector Master Plan (TSP), which is strategically and conceptually integrated within the framework defined by the global strategy for sustainable mobility (MoDu 2.0),

automatically overlays corridors and areas designed to accommodate the transport infrastructure projects in question. The PST is complementary to the MoDu 2.0 strategy since it allows: to list the different transport infrastructure projects; to give them a regulatory framework, which will integrate them into the various general development plans (MAPs) of the municipalities and will reduce preventively the potential conflicts between transport planning and other functions that consume soil. The PST is actively seeking the creation of synergies between the potentialities of a sustainable spatial planning with a densification of functions in certain parts of the national territory (Nordstad, Agglolux and Agglosud) and those of the future transport system.

It has also been ensured that the planning provided for by the TSP is consistent with that of the other sectoral "housing", "landscape" and "economic activity area" sectoral plans developed in parallel. In the context of these projects, the TSP also designates: infrastructures that can be declared of public utility; corridors and superimposed areas as shown graphically; the order of priority of transport infrastructure projects.

In this context, the PST superimposes corridors and areas for infrastructure projects if the technical level of the studies allows it. Since the TSP is superimposed on the PAG, the municipalities are obliged to keep the corridors free of all buildings and, where appropriate, to provide for areas of railway and road stations or overlapping "corridors and reserved areas" for infrastructure projects.

Thus, the PST is intended primarily for municipalities and not for individuals. In total, the TSP includes 81 transport infrastructure projects, including:

- 46 projects benefit from corridors or reserved areas, detailed at 1: 2500 scale;
- 42 projects benefit from a priority infrastructure status of public utility;
- 40 projects are ranked in order of priority 1;
- 24 projects are ranked in order of priority 2;
- 17 projects are ranked in order of priority 3.

The TSP distinguishes four broad categories of transport infrastructure projects, namely:

- public transit infrastructure projects;
- infrastructure projects for individual motorized traffic;
- park & ride parking projects and trade hubs;
- national cycling routes projects.

#### Modu 2.0 – Strategy for a sustainable mobility

The updated version of the Modu 2.0 Sustainable Mobility Strategy was presented on May 29, 2018 by the Minister of Sustainable Development and Infrastructure. While the fundamentals of the 2012 MoDu Strategy remain strong (multimodality and strengthening of public transport and active modes), Modu 2.0 highlights the progress made since 2012, provides current figures, sets targets for horizon 2025, integrates recent technological progress, ensures coherence with new global and national strategies (Paris Climate Agreement, Third Industrial Revolution), expands the strategy of a mobility toolbox and addresses more explicitly to the four mobility actors: citizens, municipalities, employers and the state. Indeed, one of the main messages of "Modu 2.0 - Mobility zesammen erreechen" is as follows: while the state continues to catch up with infrastructure, the other three mobility actors (citizens, employers and municipalities) can implement a number of concrete measures that will make mobility more enjoyable, more efficient and more economical, even in the short and medium term.

Modu 2.0 is complementary to the draft Transport Sector Plan as submitted by the Government on 27 April 2018.

The update of the "Modu 2.0" sustainable mobility strategy, approved by the Council of Government on May 23, 2018, was presented to the general public on May 29, 2018 by the Minister of Sustainable Development and Infrastructure.

While the core principles of the 2012 "MoDu" strategy remain strong (multimodality and the reinforcement of public transport and active modes), the "Modu 2.0" strategy:

- highlights the progress made since 2012;
- provides current figures;
- set targets for the 2025 horizon;
- incorporates recent technological advances.

The document "Modu 2.0 - Mobility zesummen erreechen" is organized in five parts:

1. Mobility figures as shown by the 2017 Luxmobil household survey, various recent mobility surveys and the ongoing study on costs and benefits in the land transport sector in Grand Duchy;
2. the 2025 targets for modal shares, peak hour car occupancy rates and transit service quality.
3. a mobility toolkit detailing some 50 concrete measures that the four mobility actors (citizens, employers and schools, municipalities, the state) can implement, if they wish;
4. a summary of the main land transport projects that have been implemented since 2012 or are underway or planned;
5. An illustration of the planning method by which Luxembourg can move from catch-up to anticipation by developing, like Switzerland, for the 2035 horizon a concept of sustainable mobility that is coherent with growth scenarios and the country's financial means.

#### Challenges and projects of the bus network

- Provide a high-performance bus network that meets the needs of the population and connects the different modes of transportation with each other;
- Deal with the traffic situation on the roads;
- Ensure accessibility by taking into account rolling stock, infrastructure (stops, platforms, trade hubs, P + R, etc.) and the quality of information.

#### Mobility planning

Mobility planning is carried out within the Department of Mobility and Transport of the Ministry of Mobility and Public Works (MMTP). This planning mainly involves the chain of design, development and evaluation of by working closely with the public authorities responsible for the implementation of transport policy at the level of the different modes of transport. It thus ensures an important coordination role within the MMTP. More concretely, it is about:

- the development of the "Modu 2.0" strategy as a strategic mobility document;
- the development and monitoring of new concepts and initiatives in public transport and alternative mobility at cross-border, national and regional levels;
- the planning of mobility projects of strategic importance such as the tramway and the interchange centers.

The government has put in place various initiatives to encourage the transfer of a significant portion of road transport to other modes:

- incentives (valid from 01.01.2019)

- tax measures;
- national aids;
- international aid.

For the transport of people, it is to promote public transport, multi-mobility and electric mobility.

For the transport of goods, it is a question of transferring a part of the long-distance freight towards modes of transport that the road.

National measures and European programs enable businesses and citizens to find different forms of support in order to change their modes of transport.

New incentives for ZER/low emission vehicles (from 2019.01.01)

In the interest of a rapid decarbonization of transport and the promotion of electromobility, the government has decided to introduce a zero or low emission vehicle bonus scheme, valid from 1 January 2019 (subject to the entry into force of the definitive provisions at the end of the regulatory procedure).

In fact, in order to further promote electromobility, the government program plans to "replace the current model of tax incentives with a new model of targeted subsidies".

Thus, different bonuses can be requested by an eco-responsible driver from the Environment Administration:

- € 5,000 bonus for a new 100% electric or hydrogen fuel cell vehicle: car and van;
- Incentive of 2,500 euros for a new vehicle of the plug-in hybrid type ( $\leq 50$  g  $\text{CO}_2$  / km) following: car and van;
- Incentive up to 500 euros for a new vehicle 100% electric following: quadricycle, motorcycle, light motorcycle (125  $\text{cm}^3$ ) and moped (scooter and pedelec45);
- Incentive up to 300 euros for a next cycle nine: bike and pedelec25.
- The government has introduced a series of measures for sustainable mobility. As part of the tax reform, valid for fiscal years 2017 and 2018:
- A tax deduction for sustainable mobility private vehicles zero emission;
- The reassessment of the flat-rate benefit for official vehicles according to their pollution effect in relation to their contribution to the greenhouse effect ( $\text{CO}_2$  emissions) and to air pollution (particulate and  $\text{NO}_x$  emissions).
- In this incentive rather than repressive approach, the 100% electric vehicle, the bike and the pedelec25 are the big winners. A tax deduction or a re-evaluation of the benefit in kind for the eco-responsible driver is put in place. Thus, 300 euros are possible as tax deduction for a purchase of a bike or pedelec25.

The government has also introduced a new zero or low emission vehicle bonus scheme, valid from 1 January 2019 (subject to the entry into force of the final provisions following the regulatory procedure).

Electric mobility

Electric mobility is the movement either plug-in hybrid car, or 100% electric car or electric bike (pedelec). "Chargy" public charging stations form the infrastructure and common operator network for the deployment of public infrastructure related to electric mobility.

The network of public charging stations for electric cars and hybrid plug-in cars in the Grand Duchy of Luxembourg has been operational since 2 June 2017 under the Chargy name.

In early 2019, 277 Chargy and "Chargy OK" 1 terminals are operational and accessible to the public, including 203 terminals installed on public roads, 43 terminals on the P + R and 31 "Chargy OK" terminals with private customers.



By 2020, a total of 800 kiosks will be installed across the country: 400 kiosks on public car parks - including car-pool parking - municipalities and 400 kiosks on P + R relay car parks allowing easy access to public transport. Each terminal has two accelerated charging points (adjustable between 3.7 kW and 22 kW depending on the type of car), Chargy will ultimately have 1,600 parking spaces dedicated to electric mobility.

All charging stations in the network are equipped with a uniform means of payment by means of the Chargy mKaartelle multi-function smart card, which has the same functionalities as a "Verkeiersverbond" mobility card.

The Chargy network is not limited to the 800 public terminals but is designed so that it can integrate all other terminals compatible with the platform. These terminals will then be labeled "Chargy OK" and may be operated in the same way as public terminals.

The "Rifkin" study, which outlines a new economic model for Luxembourg by 2050, proposes several strategic measures for the mobility component. Some of these measures, such as limiting the need for mobility, development of a Mobility-as-a-Service solution and the shift to a car fleet composed exclusively of zero-emission vehicles, are already in the process of being implemented. Other recommendations are futuristic at first sight, such as speeding up the transition to self-driving vehicles and launching an autonomous public transport system that will offer flexible and on-demand solutions. On the occasion of the Luxembourg Sustainability Forum 2016, the Ministry of the Economy, the Chamber of Commerce and IMS Luxembourg presented the strategic study of the "Third Industrial Revolution".

Conducted in a participatory approach and in collaboration with Jeremy Rifkin and his team of experts, the result of the process is a comprehensive and detailed study considering the socio-economic characteristics of the country and proposing concrete actions and tools, including included a range of strategic measures and projects, to prepare the country, its society and its economy to begin the process of the "Third Industrial Revolution".

In total more than 300 people from all socio-economic sectors were actively involved for one year by participating in nine working groups that focused on the challenges of energy, mobility, construction, food, industry, finance, "Smart economy", the circular economy and the "prosumer & social model".

## MaaS

The Mobility-as-a-Service solution is made possible by combining and managing all transport service offerings and all travel needs on the same digital platform. Based on the current platform "mobiliteit.lu", this unique entry point on mobility must be supported by a robust real-time and predictive multimodal data management system capable of providing users with tailor-made transport solutions. according to individual needs. The goal is to enable users to enjoy an integrated, on-demand travel experience. This system, represented by "mobiliteit.lu", will constitute a key piece of the Internet of Mobility. The information provided will cover all means of public transport but also the availability of Park and Ride (P + R) for private car transport, availability of bicycles and electric bikes, walking times, carpooling options. Will be offered booking and payment services for users as well as a dynamic pricing of parking according to peak or off-peak hours. In the long run, this could also serve as a platform where people can share their own cars and generate revenue. This single-entry system is a response to the proliferation of sharing platforms that are an integral part of new mobility solutions. It should be set up in cooperation with all stakeholders of private and public transport and neighboring countries in a "Greater Region"

approach that will ultimately unify standardization, regulation, ticketing systems, reservations and services. throughout the European Union.

Accelerating the transition to vehicles without conductor

“The automation of public transport is an essential component of the creation of an Automated Transport and Logistics Internet for the Grand Duchy of Luxembourg. Autonomous public transport will reduce both the fixed and the incremental costs of providing transit services and help extend services to low demand areas and off-peak hours. This innovation marks the conjunction of electric mobility, automated, connected and shared” (Luxemburg Government, 2017). Luxembourg intends to position itself as the first country to offer an automated public transport system in the European Union. The launch of an autonomous public transport system (Personal and Collective Rapid Transit System), offering flexible, on-demand and on-demand door-to-door solutions, is therefore strongly recommended with, in the start-up phase, pilot projects in certain areas.

The automation of public transport is an essential component of the build out of an automated Transportation and Logistics Internet for the Grand Duchy of Luxembourg. Autonomous public transport will reduce both the fixed and marginal costs of providing public transportation and helping expand services to low-demand areas and during off-peak times. This innovation marks the conjunction of electric, automated, connected and shared mobility. Automated public transport is already technically viable and exists in select urban areas around the world. Given Luxembourg’s dense commuter traffic, the country should be a first-adopter in introducing automated public transport across its transport corridors. The launch of an autonomous public transport system (a.k.a. rapid Personal and Group Transit System), offering flexible on-demand and ultimately door-to-door mobility solutions is therefore highly recommended with pilot demonstrations in selected areas commencing as soon as the technology warrants.

Luxembourg should be a major player in the new transport system. The automated system, operating like a horizontal elevator, brings a high level of flexibility to the transport sector. A specified network can combine on-demand personal rapid transit (up to 6 passengers), group rapid transit (shuttle for 20 to 25 passengers) and freight rapid transit. One of the major benefits of this technology is that it can address the need for on-demand transport and door-to-door services. To be consistent with the sustainable mobility strategy, the fleets should be fully electric.

Expected results are:

- Reduced number of individual vehicles in city centers (this system will contribute to increase share of public transport: a shift in modal split; public transport to reach 40% by 2050)
- Road safety expected to improve significantly –
- A solution that can be optimized for last-mile delivery with a combination of passengers and goods transports (a flexible platform to develop urban reverse logistics through 2- flow optimization and packing stations).

The creation of a cluster for autonomous transport will prepare the Grand Duchy for the advent of self-driving autonomous vehicles. Passenger cars, taxis, or even trucks that can reposition themselves are a revolutionary innovation. However, they require level 5 automation and will take longer to appear than autonomous public transport. The "Smart Mobility" working group dedicated to smart mobility and bringing together public and private stakeholders (MEC, MDDI, R & D, LuxInnovation, Cluster for Logistics), should address different aspects of automation: economic (eg the economy of sharing), legal (eg data protection issues related to autonomous driving), technological (vehicles are all connected to each other, infrastructure and cloud via the Internet), as well as automotive cyber security .



Updating the regulations to include autonomous vehicles is essential. Laws and regulations must be adapted to allow autonomous technology for smaller shuttles in selected areas over the next ten years to accommodate larger, faster vehicles that are free to operate in a variety of geographies. The working group's reflections should also include the promising role of automation in logistics, such as examining regional possibilities for platooning. Finally, the potential of drones should be fully explored. Luxembourg could be a laboratory for drone technologies.

Beside rail solutions, freight transport can also benefit significantly from automation, very likely earlier than personal cars. Moreover, freight vehicles tend to travel on specialized corridors, from fewer origins and to fewer destinations. This solution – that can be designed at the regional level – makes it easier to implement “equipped corridors” where freight vehicles can travel in platoons, or take advantage of a high level of automation, enhanced by efficient V2V and V2I communication. Drones will increasingly be used to deliver goods in the coming years. However, potential safety concerns will likely limit payloads to below 50 kg. The potential of drones should be fully explored and Luxembourg could be a testbed for drone technologies. A priority could be given to remote locations, before expanding their use. Given Luxembourg’s commanding presence in the satellite sector and its strong economic support to developing countries, new opportunities should be explored for utilizing drones in emergency relief missions.

The future Luxembourg Automotive Campus will host the research and innovation activities of several companies in the automotive sector. Common infrastructures will be set up, such as testing laboratories, research facilities, meeting rooms, dining areas and exhibition areas. The test track site provides opportunities to test and validate prototypes in the field of logistics and to handle realistic traffic scenarios. This project will pave the way for research and development in the economic (for example the sharing economy), technological (cars are interconnected) and cyber-security for the successful implementation of autonomous driving and a network “vehicles” and “vehicles and infrastructures”. Beyond that, the campus will also foster entrepreneurship by hosting innovative automotive start-ups.

#### Cybersecurity Competence Center

The future Cybersecurity Competence Center (C3) of SECURITYMADEIN.LU aims to make cybersecurity tangible and accessible to all stakeholders (citizens, start-ups, SMEs and other public or private organizations). The center acts as a catalyst for the cybersecurity community by building skills and sharing expertise, fostering and creating synergies among key players, and encouraging smart and flexible regulation. C3 was conceived as a public-private partnership to monitor potential threats, cybersecurity skills and know-how, as well as training and testing infrastructures. It will increase Luxembourg's competitive advantage and help secure the emerging ecosystem in areas such as the Internet of Things (IoT), space technologies, FinTech and autonomous driving. Building on successes such as CASES and CIRCL, C3 will offer three important infrastructures: Threat Intelligence, Training and Tests.

Foster and focus applied research in the key areas of smart city, smart energy, smart space, autonomous driving, High Performance Computing, Big Data enabled applications, and FinTech. The University of Luxembourg, LIST and other applied research stakeholders are on the right path but not yet sufficiently focused, staffed and funded to foster knowhow transfer from academia to business and society through Dual-Use oriented applied research projects. The motto should be “quality, focus and excellence over quantity.” Luxembourg should explore other best practices including a comparison with ETH Zurich, Fraunhofer SIT, IBM Research, the National University of Singapore and EPFL (Ecole Polytechnique Federale Lausanne).

This innovation cluster will shape tomorrow's safe and intelligent mobility through researching and testing self-driving vehicles. For this purpose, realistic traffic scenarios will be addressed in a test field infrastructure in Luxembourg. The project will also pave the way for economic (e.g. the Sharing Economy), legal (e.g. data protection issues of autonomous driving), technological (each car is interconnected to each other, and Internet-connected to the cloud), and cybersecurity (automotive cyber security) R&D to successfully usher in autonomous driving, car-to-car, and car-to-infrastructure networking. The project will be linked to E-services such as car registration and taxation services through the E-Luxembourg portal. "Luxembourg is centrally located in the automotive heart of Europe. At the crossroads between Germany, France and Belgium, it offers 'just-in-time' access to the major European car manufacturers and assembly plants. It is an ideal location for component suppliers with a multi-customer base to deliver their products easily and directly."<sup>294</sup> Recently, the Grand Duchy has opened an Automotive Campus: "This industrial site is dedicated to research and innovation in the automotive sector."

#### LUX-TIR IoT Test-Bed.

The TIR paradigm is based on the build out of IoT networks to interconnect people, cars, buildings, and cities with digital infrastructure to collect Big Data that can be processed to provide analytical information for strategic decision making. To date, IoT networks have been developed vertically with proprietary technologies. An institutional LUX-TIR IoT test-bed initiative would boost the development of open-source IoT technologies, positioning Luxembourg at the forefront of this crucial element of the smart-economy architecture. This should be done in conjunction with the seven lighthouse initiatives that have already been kickstarted in Luxembourg: High Power Computing (HPC); Big Data enabled applications; autonomous driving; smart city; smart space; smart energy; and FinTech. Some of these initiatives have been described in the Important Project of Common European Interest (IPCEI) document which establishes these projects as a top priority for the Luxembourg Government. The LUX-TIR IoT test-bed project aims at the development of a Luxembourg-wide wireless sensor network for IoT applications. Several applications can be addressed. For example, in the automotive sector, the IoT test-bed would aim at the collection of information from all cars transiting into the Luxembourg territory, to extract distributed information about traffic and pollution, and drive the decisions for corrective measures. Incentives should be given to those who participate in the LUX-TIR IoT test-bed initiatives, for example as discounts on tolls or insurance (which can be dynamically based on usage, routes, times schedule, and so on). It would be reasonable to define the scope of the LUX-TIR IoT test-bed project within the first quarter of 2017, for a start up in the second quarter of 2017.

## Public Policy

Consideration should be given to the establishment of a dedicated taskforce to expedite the AV transition for Luxembourg. The creation of a cluster for autonomous transportation will prepare the Grand Duchy for the advent of autonomous vehicles. The dedicated taskforce "smart mobility," gathering public and private stakeholders (MEC, MDDI, R&D, LuxInnovation, Cluster for Logistics), will address various aspects of automation. In this context, the future Luxembourg Automotive Campus is a strong asset and will house research and innovation activities of several companies within the automotive sector. The taskforce should focus on the following areas: - Attract companies for testing of connected and automated driving technologies in crossborder corridors - Conduct pilot studies on dedicated sites (e.g. Belval Automotive Campus) - Explore regional truck platooning projects and drone technologies opportunities - Cooperate with other countries (i.e. BeNeLux) on larger proof of concept -

Study the ethical issues around the automation of transport, including privacy, data security, open access, etc.

Implement a pilot test and regulations

The uptake of autonomous vehicles will require some transition time. The city authorities are key stakeholders in the transition to automated vehicles. Initially, a negotiation will be necessary to implement potential restrictions to normal traffic in order to set up experimental projects for automated vehicles on specific corridors.

On September 29th, 2016, the Governments of Germany and France launched the "Franco-German Initiative on Electric and Digital Mobility". The objective of the initiative is to enhance cooperation between the two countries in order to progress innovations in the spheres of electric mobility and automated and connected driving. By launching this initiative, the two countries are affirming their joint commitment to a sustainable European transport policy that is fit for the future. In the field of automated and connected driving, the Franco-German initiative provides for cooperation on the following points:

- Assessment of challenges of the use of automated and connected vehicles, with a focus on safety and traffic management impacts, as well as interactions with the infrastructure and other vehicles or road users;
- Assessment of medium-term impacts of automated and connected driving on mobility and the environment;
- Identification of the need for joint experimental or pilot projects;
- Exchange of experiences regarding driving skills and training needs.

In connection with these points an agreement was reached on the establishment of a cross-border "Franco-German Digital Test Bed" for automated and connected driving on 8 February 2017. The test bed serves to promote the deployment and trialing of technologies for automated and connected driving in cross-border operations and in real life conditions. The interaction between motorway, rural and urban traffic is to be future-proofed across national borders. In particular, the following objectives should be emphasized:

The test bed is to provide a technologically neutral offer to industry and academia for testing innovative technologies. A joint exchange of experience based on experiments results of industry and academia especially regarding juridical and technical issues encountered during the cross-border testing of automated and connected driving technologies is to be established.

On this basis the impacts and potentialities of the technologies regarding concrete use-cases are analyzed and assessed. The lessons learned will be submitted jointly to European and international institutions for discussion.

On 14 September 2017, Luxembourg joined the cooperation, and additional objectives were added to the trilateral cooperation:

- Support the development of innovating and tailored mobility services, for example towards rural zones;
- Aim at developing a joint large scale pilot project in the cross-border regions;
- Pay a particular attention to acceptability and ethical issues;
- Support common and proactive initiatives in European and international institutions.

Four thematic key areas have been distinguished

1. Continuous compatibility of automated driving perception functions

2. Link between automation and connection, including Intelligent Transport Systems (ITS) and cross-border mobility services
3. Impact and effects of automated and connected driving
4. Data access and use.

## Appendix 4

# Legal context in Switzerland

### Mobility and transport framework

In Switzerland, control and direction of transport at the federal level is the responsibility of the Federal Department of the Environment, Transport, Energy and Communication through four different offices, namely the Federal Office for Civil Aviation (FOCA), responsible for aeronautical policy and surveillance of Swiss civil aviation, the Federal Office of Roads (FEDRO), responsible for road infrastructure and individual traffic for national roads and main roads, the Federal Office of Transport (FOT), responsible for public transport (railways, cable transport, buses or boats) and rail freight traffic and the Federal Office for Spatial Development (ARE), responsible for strategies and the coordination of the decisive projects of territorial organization, transport coordination and sustainable development.

By virtue of the principle of subsidiarity of the federalism in force in the country, the cantons exercise, in the field of transport as in all the others, all the rights which are not delegated to the Confederation. Over time, delegated rights became increasingly important, centralizing power within the Confederation. For example, in the field of road traffic, the ownership of motorways passed from the cantonal hands to the federal hands in 2007, while the national roads did the same from 1 January 2008 as part of the project reform of the financial equalization and division of labor between the Confederation and the cantons (RPT project)

Public transport in Switzerland is spread over several modes of transport: alongside trains, trams and buses, there are boats and cableways that are also under the competence of the OFT. On this page and its derived pages, you will find the information by mode of transport, as well as the information on the offers of freight traffic carried by these modes of transport, including road freight traffic, whose legal framework conditions also apply. of the competence of the OFT.

OFT and the cantons jointly order the bus and tram offers (as well as the rail offer) in regional traffic, while local traffic is controlled and financed by the cantons and cities.

As the approval authority, the OFT also plays an important role in national and international bus line traffic. The OFT grants the necessary authorizations or licenses to companies engaged in the road transport of passengers. He is responsible for the technical approval of buses and trams and he also approves the extensions and transformations of the trolleybus infrastructure.

The same rules apply to trams and railways in various fields. These include the admission of drivers of motor vehicles as well as authorizations to use the rail network and operate vehicles

The local traffic includes the lines which serve for the capillary service of localities. It is excluded from federal benefits. In accordance with art. 3 OITRV, the local traffic includes lines serving the localities, ie when the stops are, as a general rule, less than 1.5 km from the nearest junction with the public transport network. and that the distance between stops is short.

### Agglomeration Traffic Program and Urbanization

Through the Program for Agglomeration Trafficking (PTA), the Confederation contributes to the financing of transport projects in towns and cities. Federal contributions go to agglomerations whose

agglomeration projects effectively coordinate the development of transport and that of urbanization. Agglomeration projects are therefore an important pillar of the Confederation's agglomeration policy and sustainable spatial development of Switzerland.

Transport systems and urban development are closely linked: new transport offers boost urban growth and, conversely, urban development generates additional traffic and therefore increased demand for infrastructure. Through the PTA, the Confederation encourages coherent planning of transport and urbanization in agglomerations and thus promotes, beyond the communal, cantonal and national boundaries, urban development within the built environment and an extension of the supply of transport where the need is really felt.

The PTA enables cities and agglomerations to meet the major challenges posed by increasing traffic and urbanization. Thanks to a clear planning framework and PTA co-financing, the projects carried out have the best effects in the long term. More than 80% of the agglomerations have been able, with the support of the PTA, to increase the efficiency of their transport networks over the past ten years. The PTA has thus proved to be one of the most successful instruments of Swiss transport policy. Its long-term financing was ensured by the "yes" of the people and the cantons to the creation of the fund for national roads and agglomeration traffic during the February 2017 vote.

Already at the end of 2006, the Confederation co-financed particularly urgent transport projects in agglomerations using the PTA. Since 2007, agglomerations have been submitting agglomeration projects every four years, which are examined and, where appropriate, co-financed. The first and second generation projects are already in the implementation phase, while the third generation projects will start in 2019.

In the field of transport, DETEC is committed to sustainable development. The latter also includes the development of new ideas for promising forms and mobility offers.

With the Service Center for Innovative and Sustainable Mobility, the Confederation contributed to this development from 2006 to 2015. In 2016, the Coordination Office for Sustainable Mobility (COMO/KOMO) took over the tasks of the Service Center.: The SwissEnergy program was initiated by the Federal Council with the aim of promoting energy efficiency and renewable energies.

To this end, it raises awareness in Switzerland about energy issues, encourages innovative projects and supports training as well as continuing education for professionals. The program is thus making a significant contribution to allowing new products to enter the market, gain a foothold and gain visibility. Renewable energy or efficient use of energy: SwitzerlandEnergie advises and informs interested parties.

### **Long-term strategy for autonomous mobility.**

"The Confederation is open to new technologies. We consider that automation is part of the general technical development. But it's the ETFs and the industry that are leadership position in this area. We support pilot projects. As a supervisory authority, we focus on security. We were contacted by different parties, but there is no concrete plan nowadays. There is a lot of discussion about it, but I'm not sure about that lead to important projects. The basic service in Switzerland is provided by transport services ordered and financed jointly by the Confederation and the cantons. This principle remains the backbone of public transport throughout the national territory even if the entrepreneurial incentives are reinforced, the control processes optimized and the offer complemented here and there by autonomous vehicles". M. Füglistaler, Director of the Office

Coordination Office for Sustainable Mobility COMO

The pilot project is to develop an offer concept for stand-alone shuttles as first-to-last-mile solution providers in train stations and to be tested in a multi-phase pilot company (running at request, coordinated with the TP schedule, connection to car sharing).

#### Autonomous shuttle in ZUG

At the push of a button, order the bus and get off wherever you want? This is the vision of a pilot project in the city of Zug, which was presented today. From the summer of 2017, two automated shuttle buses will drive through the city center. The project, supported by the Sustainable Mobility Coordination Unit (KOMO) \* under the Energy Switzerland program, integrates self-driving buses into an existing transport and mobility system. Compared to previous projects, such as "SmartShuttle" in Sion, the shuttle buses operate in regular urban traffic and ensure connection to trains at the station. Zug wants to reduce long-term traffic in the city center.

The two self-propelled electric shuttle buses transport up to eight passengers free of charge from the station to the Zug technology cluster. In the second phase of the project, passengers can board at any location within the project area. Various applications are tested. For example, as part of a car sharing offer or in the network of existing public transport. The complexity in terms of route guidance and supply is continuously increasing.

Participants include the SBB, Mobility Carsharing, Zugerland Verkehrsbetriebe, the city of Zug and the Zug Technology Cluster. The project partners contribute their specific and broad know-how in order to find innovative solutions together.

The project has a long-term and sustainable perspective. Self-driving vehicles have the potential to radically change the mobility system and bring great potential for a more efficient and cost-effective overall transport system. Automated driving involves both opportunities and risks, as a recent Federal Council report shows. Therefore, the project will be analyzed in order to avoid possible negative effects on energy consumption or the environment.

KOMO is supported by the six federal offices ARE, ASTRA, FOEN, BAG, BAV and BFE. KOMO serves as a central point of contact and coordination for innovative mobility projects as well as a knowledge platform. There are two submission deadlines for projects each year: April 30 and October 31.

## Diversity of the activities in the field of AV

In terms of clarifying key aspects of automated driving, Switzerland relies heavily on international developments in this area. It is therefore necessary to monitor them closely and take timely measures to make use of the new opportunities that will result.

The Confederation has already undertaken to fulfil many of the tasks involved. As part of the research on roads, FEDRO has launched a research program on automated driving. Through this program, the Confederation intends to fill the gaps in the knowledge of this field and allow research organizations to seize this theme oriented towards the future.

The inaugural project, which has already started, aims to define the scope and modalities of the entire program. The Confederation also kicked off an EPFZ research project on the analysis of the effects of automated vehicles on the Swiss transport system and on the other hand on acceptance of new potential offers.

The knowledge gained from this research is immediately integrated into the Confederation's activities in the field of "smart mobility". Finally, the Federal Institute of Metrology (METAS), which has extensive experience in measuring data and data security, is currently strengthening its skills in the field of automated vehicles and data security.



FEDRO has long been represented in the specialized technical bodies of the EU, where it participates in the development of international guidelines and standards for automated driving. Switzerland also maintains regular international contacts in the field of traffic law.

These examples of cooperation ensure the rapid integration of international developments in the corresponding activities in Switzerland.

the Confederation commits itself - alongside specialized associations, universities and cantonal bodies - in its-ch, the Swiss telematics transport platform. its-ch promotes the launch in Switzerland of products and services related to transport telematics, as well as the networking of relevant stakeholders from scientific circles, industry and administration. Intelligent mobility is one of the priorities around which its-ch organizes regular events

FEDRO has also launched, in collaboration with the TCS Mobility Academy, a web platform dedicated to automated driving. The purpose of this platform is to gather national and international knowledge in this field and to make it available to interested circles.

By encouraging the creation and operation of knowledge exchange platforms and organizing specialized events, governments support sector stakeholders in carrying out their tasks and facilitate networking.

As part of the development of its mobility model, DETEC is currently defining, among other things, the principles that will determine the importance of new technological opportunities in Switzerland related to mobility. as well as the principles that will govern its management. Mobility models and infrastructure programs will then be reviewed in the light of this model and, if necessary, adapted.

Various elements of the "Digital Switzerland" strategy are being developed - led by the Federal Office of Communications (OFCOM) - as part of the action plan based on this strategy. The action plan includes an overview of the data policy of the Confederation, the creation of a national data infrastructure, and an IT-based intermodal and interconnected traffic management (including (c) for automated driving) and to examine issues of cybersecurity and data security.

Without these elements, it will not be possible to develop automated driving.

In addition to the action plan measures are the activities of the industry, which is currently developing and standardizing Next Generation Communication Technology (5G).

This could play an important role in the interconnection of automated vehicles.

FEDRO has for several years been responsible for the "Swiss System Architecture" project, which aims to harmonize and standardize equipment for the operation and safety of national roads on a technical level. One of the permanent tasks resulting from this project is to continually modernize the equipment in place to bring it into line with the latest state of the art. This work is a prerequisite for the connection of automated vehicles with the infrastructure in Switzerland.

Moreover, as soon as the technical standards of communication between vehicles and infrastructure are sufficiently stable at the international level, it will be necessary to define and apply the measures that may be necessary to comply with them in our country.

Finally, it will also be necessary to define the tasks of the public authorities in connection with the implementation and operation of the data systems that will be required to automate the traffic.

These tasks can range from simple provision of data to active participation in the design, implementation and operation of these digital infrastructures.

Road Traffic Legislation

The legal framework for automated driving and the use of other opportunities in the digital world in the field of mobility will need to be created. The first step is to make possible the development of



predictable automated driving in the short and medium term in Switzerland, as well as its harmonization with international developments.

FEDRO has already developed a model governing the changes to the traffic rules and the conditions for admission of vehicles and drivers to be carried out.

The adaptations of the relevant legal bases are being prepared. They aim to make legally possible technological developments necessary to achieve, in Switzerland, level 4 of automated driving.

#### Other legislation

The need to legislate in areas other than road traffic, such as data protection, cybersecurity, data system operation or government influence on traffic, must still be determined.

The necessary legislative work will have to be coordinated with the activities foreseen in the "Digital Switzerland" strategy action plan.

In addition, depending on the positions that society and the political world will take on the effects of the technological developments needed to automate mobility, various other regulatory measures will have to be adopted. These measures will have to be identified, then addressed to the competent services so that they specify the contents and, finally, subject to the process of political decision.

In addition, the Confederation provides services in the areas below.

- Allow and monitor pilot tests: The Confederation is actively working to make pilot tests possible in relation to automated vehicles. DETEC has already issued the first test approvals and more will follow. The lessons learned from the pilot tests are gradually integrated into the work of the Confederation.
- Coordinate and steer the works in progress: in early 2016, FEDRO set up a small group called "Intelligent Mobility". This interdisciplinary working group is responsible for developing ideas for applying intelligent mobility, coordinating activities in this field and implementing the adopted subprogrammes. One of these subprogrammes is the creation and operation of a data platform, on which FEDRO will make all traffic data available to interested users.
- Ensure the smooth flow of traffic on national roads: FEDRO has been working hard for several years to ensure the smooth flow of traffic on national roads. These include, in particular, the continuous improvement of the provision of real-time information on the state of the traffic, the installation on national roads of equipment suitable for influencing the traffic, the realization of installations making it possible to put the band emergency stop temporarily at the disposal of general traffic, or the implementation of extension projects as part of the bottleneck elimination program.
- Implement the mobility pricing model: FEDRO and the Federal Office of Transport (FOT) are currently working to implement the report on mobility pricing adopted by the Federal Council. The goal is to deepen the conceptual reflections it contains and accumulate experience in the application of this instrument. In the medium and long term, mobility pricing could help to counteract the undesirable developments that automated driving might present.
- Ensure financing: the current financing of road traffic is essentially based on the mineral oil tax. However, if only because of the (partial) electrification of the fleet that is on the horizon, this funding is expected to find a new base in the relatively near future. In addition, since advances in automation are likely to accelerate this electrification, the need for action could be even more pressing. The levy on electric vehicles provided for in the draft fund for national roads and agglomeration traffic (FORTA) is a first step towards a new form of financing. However, because it is independent of the kilometers, this fee can only be a transitional solution. It is also uncertain

whether the gradual automation of road traffic will require investment and, if so, how important it will be. If this is true, the corresponding financial resources should be available in due course.

## Context and legal framework in Geneva

Regional Actors: Métropole Lémanique, Grand Genève

Agglomeration projects are an important pillar of the Confederation's agglomeration policy and sustainable territorial development in Switzerland.

The Agglomeration Project is a planning instrument designed to improve urban transport systems and to coordinate the development of transport and urbanization, beyond the municipal and sometimes even cantonal or national boundaries. For this purpose, the organizations responsible for a project determine what the future development of the agglomeration - or "big picture" - should look like, and develop strategies and measures accordingly. Through the Agglomeration Project, the responsible organization submits a request for a federal contribution for its transport infrastructure to the Federal Office for Spatial Development (ARE).

Around the two urban centers of Geneva and Lausanne, the two cantons form a community of interest and one of the most dynamic economic poles of Europe with an increase in the number of jobs and inhabitants well above average for ten years.

Indeed, 15% of the Swiss population lives in its territory and between 2005 and 2015, the PUB increased by 23%.

This is why the Geneva and Vaud governments signed an agreement on 9th November 2011 for the development and promotion of the Lemanic Metropolis. The two cantons thus tighten their collaboration and lay the foundations of a metropolitan organization. Their goal is to strengthen the region's national weight and economic competitiveness, while maintaining a high quality of life.

The objectives of the Lemanic Metropolis focus on four priority areas: mobility, hosting of sports federations and international organizations, promotion of the center of excellence in the field of health as well as training and research.

A dynamic cross-border conurbation, Greater Geneva has nearly a million inhabitants between Bellegarde-sur-Valserine, Annemasse, Meyrin, Nyon, Bonneville, Thonon-les-Bains and Geneva. For their movements, their housing, their work, their leisure or their consumption, the inhabitants go beyond the logic of border.

The Cross-Border Cooperation Group (GLCT), composed of 24 members representing all the territories involved, ensures the governance of Greater Geneva. Its role is to manage cross-border issues in three broad areas: mobility, planning and environment.

It must also carry out, organize and manage the launching of the studies and steps necessary for the realization of the Franco-Valdo-Geneva Agglomeration Project and its deepening. Swiss and French elected officials are represented in a balanced way.

Canton and communes share ownership of the public domain and have shared competences. Each owner is responsible for the layout and maintenance of the domain that belongs to him. The Geneva area has 1816 km of roads, of which 15% (260 km) belong to the canton and 83% to the municipalities (and 2% are national highways).

Department of the Environment, Transport and Agriculture (DETA) is working to streamline daily traffic, for all modes of transport, while building the railway agglomeration and the road network of tomorrow, essential elements to absorb the population growth in the region. These missions are led by 3 Directorates General: the Directorate General for Transport (DGT), the Directorate-General for Vehicles (DGV) and the Directorate-General for Civil Engineering (DGGC).

In addition, the State of Geneva has all the powers to regulate traffic and parking. On the one hand, it is therefore necessary to pre-notify the draft building permit applications submitted by municipalities on their public domain when work is envisaged. On the other hand, it allows measures requiring traffic regulations or the modification of markings.

The municipalities, owners of most of the road network located on the territory of the canton, have the obligation to develop and maintain their public domain to ensure the safety and comfort of all users. As such, to meet the demand for travel and maintain existing facilities, it is their responsibility to plan the implementation of infrastructure in their area, with the validation of the Canton.

Associations active in mobility are key partners in planning the infrastructure and facilities available to the population. DETA favors dialogue and consultation with these actors, who have extensive experience in the field.

#### TPG

Public Transport Geneva (TPG) is a régie and an autonomous establishment under cantonal public law, composed as follows.

The tpg board of directors brings together sixteen political representatives and three staff representatives who sit at least ten times a year. It establishes the strategy of the company, draws up and negotiates the service contract with the State, appoints the directors, validates the social and budgetary orientations. The office is organized around five members of the board, including the president and the vice-president. This restricted college constitutes the various files submitted to the decision of the administrators and can be seized for particular themes. The boards of the board of directors bring together four or five members of the board who study in depth specific files: human resources, finance, infrastructure, network, etc. At the end of their review, the commissions issue notices to the board of directors. The board of directors entrusts management with the implementation of the strategy and the implementation of the decisions taken. Composition of the Board of Directors appointed for the period from 1.12.2018 to 31.11.2023.

**GENERAL DIRECTION:** ensures that the company is on the right track. The mission of the executive management is to realize the strategic visions of the board of directors and the issues of the service contract, while taking into account the company's own pace and the possibilities of each area of activity. The general direction is therefore at the center of all the legal, social, economic and organizational pressures that are exerted on the structure. Its role is to balance them by a careful weighing of interests, by the creative search for solutions alongside the directors of the fields of activity and by the necessary exchanges with the board of directors and the State. The general management plays an important role in the image of the tpg as it embodies and carries the visions and perspectives of the company, both internally and externally. Three transversal units are directly attached to the general management.

Geneva public transport is organized into seven major groups of activities led by domain managers. In their area of expertise, they are responsible for developing and applying on a daily basis the processes that enable the achievement of the objectives of the service contract, the respect of the company's commitments and the maintenance of the quality of the service. offer. The area directors and senior management meet weekly to coordinate their efforts.

Whether for practical or legal reasons, the tpg have created two separate companies, one dealing with display advertising on vehicles, the other operating in the French border area.

TP Publicité SA: Established in 1998, this company supports all aspects of advertising on tpg vehicles. From the reservation of spaces to the creation of new media, for example inside trams, TP Publicité SA

takes care of everything! In addition to respecting specific ethical principles and valuing the fleet's vehicles, this subsidiary participates in the overall financing of the GPT.

TPG France Sàrl: Originally created for legal reasons - vehicle registrations in France to carry out cabotage in cross-border areas - TPG France now has other uses. Since 2002, this company has owned 49% of public transport in the Greater Marseille area (TP2A) in partnership with Ratp Développement (51%). The TP2A operates - and since 2004 within unireso - the network TAC (Collective annemassien transport), which is itself in direct connection with the Geneva network.

## Organisation and planification

The main mission of the Federal Council is to govern. It constantly analyzes the political situation, sets the objectives and the means of the activity of the State and represents the Confederation. Under the Constitution, the cantons are sovereign. The Federal Council is responsible for the relations between the Confederation and the cantons and collaborates with them.

The Federal Department of the Environment, Transport, Energy and Communications (DETEC) deals with infrastructure (traffic routes, electricity and communication networks) as well as the environment.

DETEC's 2016 strategy defines the main challenges and objectives for 2030 and describes the measures to be implemented by 2019. It specifies in particular that, at the level of the Confederation and if possible in cooperation with the cantons, it is necessary to deepen the global vision of transport by coordinating road, rail and air transport as well as soft mobility more efficiently.

### Cantonal legislative authority

The Grand Council votes the laws that govern the canton. The 100 deputies debate, amend and adopt the proposed texts, either by themselves or by the Council of State. In the area of mobility, for example, the work of the Transport Subcommittee to develop a counter-proposal to Initiative 154, which proposed that public transport should always be a priority, led to the Law for Coherent and Sustainable Mobility. balanced. The text, resulting from an inter-party consensus, was applauded by nearly 68% of Genevans in 2016.

The State Council is the Government of the Republic and Canton of Geneva. Its tasks include implementing the laws passed by the Parliament (Grand Council), conducting the canton's foreign policy and ensuring public order and security. The Department of the Environment, Transport and Agriculture (DETA) deals with mobility issues.

Aware of the ecological issues and the need to support the change of behavior of road users in their consumption of mobility, DETA creates the framework conditions allowing the development of innovative means of transport, in partnership with the private sector.

Beyond technique, the roles of traditional mobility actors are changing with the emergence of new private actors with strong influence and very reactive capacity.

It is therefore necessary to rethink the nature of the links between the public and private sectors. While it is essential to develop in the public sector a capacity to perceive and understand opportunities related to the private sector, public authorities remain guarantors of fundamental principles for life in society. Private and public actors have a shared interest in knowing mutually the mobilizable resources they possess for the implementation of efficient actions of a public policy.

In a laboratory logic of new mobilities, the Department of the Environment, Transport and Agriculture (DETA) will address these developments through local examples of partnerships to implement innovations in transport:

With regard to transport, DETA is working to make traffic more fluid on a daily basis, and for all modes of transport, while building the railway agglomeration and the road network of tomorrow, essential elements to absorb the demographic growth that the region is experiencing.

#### Municipalities

Municipalities have decision-making power over certain local issues; in other cases, they execute the decisions of the canton or the Confederation. Their areas of expertise include, but are not limited to, security, education, health and transportation. In the latter case, they are responsible for maintaining and improving their road network.

### **Law for a coherent and balanced mobility**

Submitted to the cantonal popular vote on June 5th, 2016, this law for a coherent and balanced mobility was supported by nearly 68% of the population. Through the pages of this file, you will be able to know more about the process of elaboration of the law as well as the measures which will allow its progressive application.

In September 2014, the Department of Environment, Transport and Agriculture (DETA) organized the "States General of Transport". This broad consultation aimed to develop an understanding to apply the principle of free choice of the mode of transport inscribed in the Geneva Constitution. On this occasion, some 12'000 people were able to express themselves on how they conceived the future in terms of mobility.

A large majority favored a differentiated prioritization of modes of transport at the hyper-center, in urban centers and in the periphery.

As a result of this, a bill was tabled, debated and amended to finally be proposed and voted in the Grand Council by a large majority under the name of "Law for a coherent and balanced mobility".

Less than a year after its entry into force, the DETA publishes this catalog which gathers the measures envisaged for its implementation for the next five years. In total, a hundred measures that aim to improve the travel of all modes of transport in accordance with the principles of the law. Some of them are the prerogatives of the state or the communes, the work of consultation at the origin of the law will therefore continue for its implementation. With the municipalities of course, but also with the mobility associations and the professionals of the road and the local residents.

100 measures and 6 principles

The 100 measures presented in this plan are intended to cover all the aspects covered by the law for a coherent and balanced mobility. They are organized around six principles. The measures collected under the medium belt theme aim to implement a homogeneous and legible medium belt, hosting unwanted transit traffic in the hyper-center and urban centers and provide access to different sectors and neighborhoods in the heart of the city. The measures attached to the Multimodal Penetrants are intended to ensure an effective and efficient link between the cantonal boundaries and the average belt for all modes of transport. The measures contained in the Urban Centers concretely make it possible to implement the priority of soft modes and public transport while relying on the development of the average belt and the penetrating ones to reduce the traffic of transit circulating there

As for the Hyper-Center, it also brings together measures aimed at developing the priority for soft modes and public transport by measures focusing mainly on pedestrianization and the pacification of spaces. The measures proposed under the theme Securing local crossings on primary or secondary networks have the main objective, outside the zones defined by the law, of securing and fluidizing axes undergoing significant pendular traffic. Finally, mobility and innovation services offer as many new

opportunities to get around, particularly by reducing the pressure of the number of vehicles on the networks, by favoring the sharing of vehicles rather than their possession.

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