SHared automation Operating models for Worldwide adoption

SHOW

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D3.1: Analysis report on legal, regulatory, institutional frameworks

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Legal Disclaimer

Executive Summary

SHOW has the potential to pave the way for the commercial operation of public transport services with automated vehicles. Currently, there are no harmonized legal frameworks in place, that enable such public transport services in real-world operation.

Nevertheless, many countries already use a national framework or exemption procedure to allow tests/trial operation of such systems. One main goal of this Deliverable is, to analyse these national frameworks and identify differences and gaps. The investigation unveiled, that national frameworks are structured very differently from country to country and the requirements and prerequisites vary a lot. Overall, gaps and barriers to bring the planned SHOW Use Cases into operation have been identified in several countries.

The Deliverable also summarises on-going efforts for harmonization of AV regulations. In many cases those efforts are restricted to individual parts of the system (e.g., vehicle) and lack a system orientated approach. We suggest handling legislation for automated public transport services with an integrated approach, including all involved aspects, like interaction with infrastructure, law on liability and commercial aspects.

This Deliverable should be seen as a starting point for further discussions and the development of recommendation for a common licensing process for public transport services with automated vehicles within the next years.

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Abbreviation List

Abbreviation	Definition
AV	Autonomous/Automated Vehicle
CAV	Connected Automated Vehicle
CCAM	Cooperative, Connected Automated Mobility
CS	Cyber Security
DSSAD	Data Storage System for Automated Driving
EDR	Event Data Recorder
FRAV	Functional Requirements for Automated and Autonomous Vehicles
FOT	Field Operational Test
GRVA	Working Party on Automated/Autonomous and Connected Vehicles
GA	Grant Agreement
KET	Key Enabling Technology
ODD	Operational Design Domain
SU	Software Updates
UC	Use Case
UNECE	United Nations Economic Commission for Europe
VMAD	Validation Method for Automated Driving

1 Introduction

1.1 Purpose and structure of the document

This document analyses all current frameworks that affect the planned SHOW demonstration activities. Since testing transport systems with automated vehicles currently relies on different national legal frameworks, the focus is on investigating the differences and identifying gaps and barriers concerning the implementation of SHOW Use Cases in the respective countries.

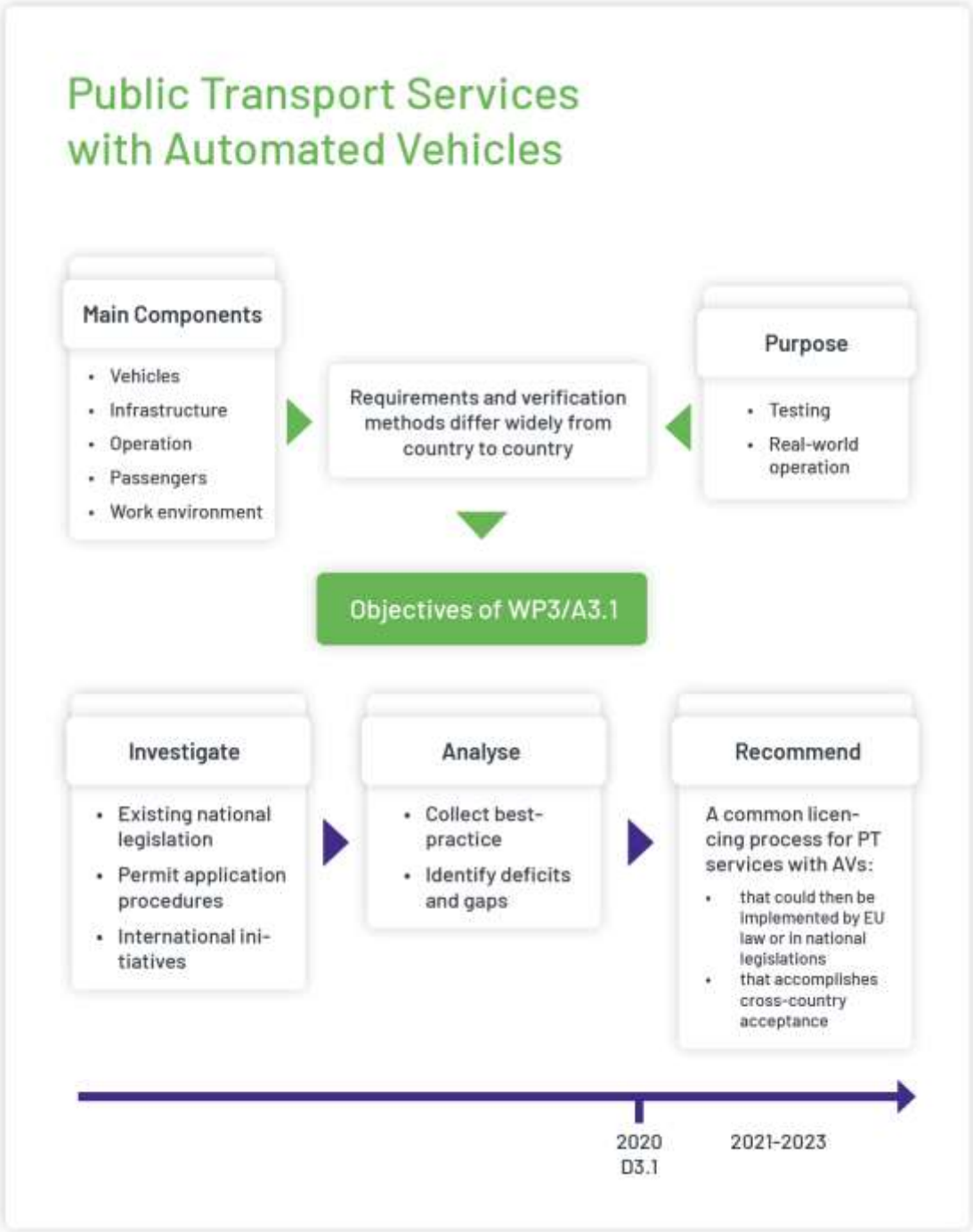


Figure 1: Key elements and objectives of WP3/A3.1

Chapter 3 gives a general introduction to legislative topics for traffic and transport and the future challenges regarding automated driving. Chapter 4 focuses on the different national frameworks for enabling transport services with AVs and identifies possible gaps and barriers in SHOW project countries. At the moment, requirements and verification methods differ widely from country to country. Chapter 5 summarises the current international efforts for harmonizing the approval of AV technology. Chapter 6 concludes the document and provides an outlook to the future steps of Activity 3.1.

1.2 Intended Audience

- All project stakeholders;
- Politicians and policy makers;
- City, traffic and transport planners;
- Potential operators;
- Law makers.

1.3 Interrelations

- Interrelations within WP3 are shown in Figure 2:

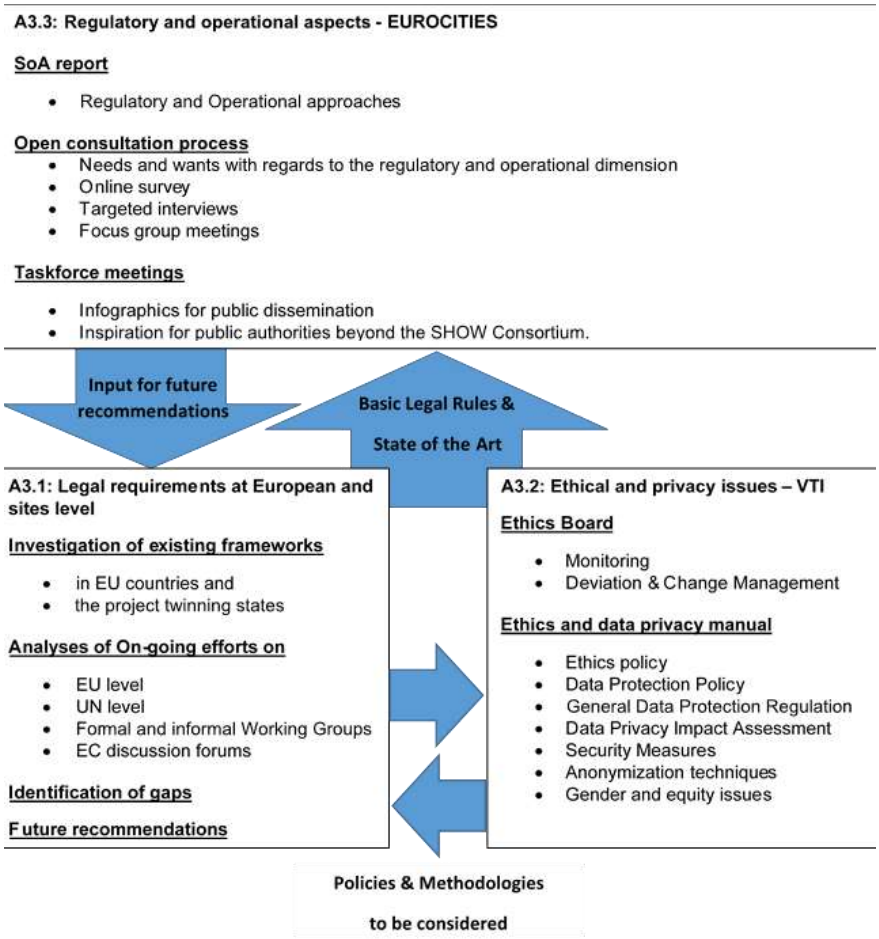


Figure 2: Interrelations within WP3.

- WP12: Accompanying permit application procedures for all sites.

2 Methodological Approach

A comprehensive literature research has been performed to give a theoretical overview on legislation for traffic and transport and discuss future challenges. The analysis of current national frameworks included research on public administration's websites, direct contact with SHOW partners in the respective countries and the results of a comprehensive survey, that was completed by at least one SHOW partner in each country. The comparison with SHOW Use cases for identifying gaps and barriers was conducted by using "D1.2: SHOW Use Cases".

The analysis also includes the results of additional surveys, that were performed before the Demo Board Meetings on 31st August 2020 and 10th December 2020. In those surveys all sites stated the progress of the permit application process.

3 Overview on legislation for traffic and transport

Traffic/transport systems are highly international, simply because this is the nature of traffic to ensure free movement of people and goods. The main objective of legislations is to ensure safety for all traffic participants. Legal requirements are currently defined in different laws (e.g. vehicle technology, behaviour in traffic, road markings and signs, etc.), which together ensure the overall safety of the system. This method – to define requirement in different laws – is globally established. Generally speaking, legislation is mainly divided into traffic rules that must be followed (including signage and road markings) and legislation for ensuring the technical and functional safety of vehicles.

Topics as Telecommunication (processes), Cyber Security (especially Software Updates Procedures), Data Collections (e.g. Big Data Management), Privacy Issues and many more are often mentioned in connection with the development of AV systems. Applicable laws (e.g. Data Protection – GDPR) have to be followed and also existing and developing norms, standards, guidelines etc. should be observed.

Examples for standards, etc. currently under development:

1. GDPR
2. Proposal for a new UN Regulation on uniform provisions concerning the approval of vehicles with regards to software update and software updates management system

One shall though be aware that a norm/standard/guideline, etc. has no legal status itself. A legislation may though refer to certain standards, norms, etc.

A norm, standard, etc. reflects in principle “current best practise” and following current best practises can contribute to minimise risks and thus “guilt”.

Anyhow, as the focus of WP 3 is on the development of a standardised permit application processes for automated public transport services with AVs, these topics are of secondary importance.

The mentioned topics (telecommunication, cyber security, etc.) are though very important for vehicle and infrastructure development (WP 7, WP 8) and the applicable approval procedures (WP 11) and should also be taken into account in WP 10 (simulations). One could also say that these topics are important with regards to product (e.g. vehicle/infrastructure) development and thus PRODUCT LIABILITY.

Reliable AV systems (= AV vehicles and physical/digital infrastructure) together with especially (for the chosen system) designed operational procedures are the most important input to be able to start the permit application processes for automated public transport services with AVs.

3.1 International treaties, conventions and working groups

Parallel to the evolution of motorized traffic, international (global) conventions (Geneva/Vienna convention) to define common rules how to behave in traffic and for common traffic signs have been developed. Within the EU/UNECE also technical requirements for vehicles have been harmonized (EU/UNECE Homologation).

As mentioned above, the Geneva (1949) and Vienna (1968) Convention on Road Traffic are the basis for law on traffic in many countries of the world. The Vienna Convention on Road Traffic currently involves 84 countries as participating parties (United Nations Treaty Collection, 2020).

It is though very important to notice and to accept that national and international traffic and transport legislation so far was based on the strict division of functional responsibilities (vehicle – infrastructure – driver (traffic participant) behaviour) and thus (national and international) rules and requirements are stated accordingly and in separate laws/legislations.

The automation of mobility (vehicles, transport systems) challenges this "historical approach" in many perspectives. Vehicles become more and more "computerized" and "robotic" which for example means that more and more sensors, controllers and software challenge the (control) legislation in order to ensure safety by suitable and effective technical control and observation regulations.

Furthermore, by introducing artificial intelligence (or at least by introducing dedicated algorithms) vehicles shall also be given the power to take over driver responsibilities. Thus, the division of responsibilities between the different functions (technology vs. traffic behaviour) more and more disappears and the need for consolidation of the so far strictly different legislations arises.

The need for consolidation of legislations has in principle been recognized by many important international stakeholder and decision makers. The need for change implies though also a suitable organization which can develop and implement the necessary changes and legal novation's **(maybe, completely new legislations are necessary, primarily focusing of the division of liability between technology and human behaviour).**

Even this need for adaption of existing "international decision organizations and procedures" has been widely recognized, it seems to be very difficult to change established organization forms or to introduce new fields of responsibilities into existing organizations.

Thus, we can today only state, that the well-established international organizations and cooperations, which continuously develop the international legislation around traffic and transport (e.g. Vienna Convention, EU/UNECE) are well aware of the challenges automated mobility has already brought up and will bring up in the future. These established cooperations and organizations are also working with the according challenges, but mainly within their established fields of responsibility (mainly vehicle technology, behaviour in traffic).

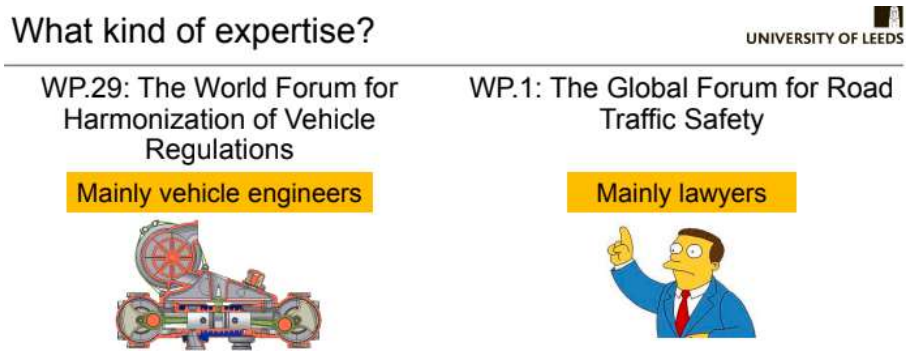


Figure 3: UNECE WP.1/WP.29 (Carsten, 2020)

Still widely missing are international cooperations, which are able to develop and realize binding international standards and regulations (legislation) for automated mobility. A first step in the "right" direction are international cooperations through

research and innovation initiatives and other informal cooperations like CCAM (Cooperative, Connected and Automated Mobility) Partnership or CCAM EU Single Platform.

Especially important to mention is the HF-IRADS group, which has a focus on human behaviour – both, inside and outside the vehicles. Important research results from this group cooperation have already been forwarded to the UNECE Working Group 1 (traffic safety) and to UNECE Working Group 29 (vehicle technology).

Figure 4: HF-IRADS group (Carsten, 2020)

3.2 Future challenges for adopting legislation

The development of automated vehicle (AV) systems fosters the need for testing such transport systems on public roads. The intention behind such tests is to learn which requirements (e.g.: on holder/driver/operator/vehicle/infrastructure) must be defined in the future legislation with regards to AV systems so that they can become a "standardised" and integrated part of the traffic/transport systems of our societies.

Today´s legislation focuses very much on "traditional" values and technologies. Focus is on the driver/operator of a vehicle because currently only humans can be hold responsible, especially when a third party is damaged. Therefore, it is usually assumed that there is always a driver/operator place in the vehicle and that the driver/operator is able to control the vehicle (or is able to overrule automated functions). Focus is on "analogue" technology, for example brakes, vehicle lighting, or other mechanical parts like engines (exhaust limits). Software is hardly covered. With the introduction of AV-systems in the traffic/transport systems not only new technologies (e.g. electronic sensors, software) enter the stage. Perhaps more important is that new functionalities are enabled which raises the issue of responsibility.

The main point of AV systems is that the driver/operator task, and thus also responsibility is delegated to technical systems. From the legal point of view this raises several questions:

- How reliable/robust are the new technologies?
- How safe is safe? What risk are we willing to accept? What does safe mean?
- Which functions/responsibilities are moving from the driver to the AV system?
- What can never be replaced by technical systems?
- How shall AV systems be controlled?
- Who will take the legal responsibility for the operation of AV systems?

- Which (risk) analyses must be undertaken to prove the safety of AV systems? Which measures (= legal requirements) must be defined to ensure traffic safety even in the future?
- Which legal status does the information exchanged within AV systems (e.g. Vehicle to Infrastructure, Vehicle to Vehicle) have (e.g. legally binding, informative…) ?
- Who is responsible in case of an accident involving AV?"

SHOW paths the way to a new form of highly automated, local (urban) public transport systems. One main characteristic of such a local public transport system is that is solely required to operate safely and reliable in a relatively small spatial area (= operation area), respectively only on certain roads in this area. This is very good prerequisite for the definition of a safe operational design domain.

3.2.1 Technical and related aspects

3.2.1.1 Vehicle Approval vs. Vehicle Use

In the context of this deliverable, the term vehicle use should be understood as the set of laws regulating the vehicle circulation in the public roads. Important matters like the traffic code, the driving license, the vehicle registration and the license exemptions are in the scope of this concept.

It does not exist a common legislation regulating the vehicle use at European scale and every state has its own national legislation with regards to this topic. The creation of a common legislative framework in this matter could be interesting from the point of view of the vehicle final user. In this way, tasks like the obtention of a vehicle license exemption or the vehicle registration, would be equally obtained in every member state.

As mentioned before, an important task related with the vehicle use is the license exemption, to authorize the circulation in public roads of vehicles with special features normally not fulfilling one or more requirements of the traffic road laws (e.g.: long modular vehicle combination or automated driving vehicles).

With the introduction of the automated driving technologies a new differentiation has been created among the license exemptions:

Authorizations for testing AD vehicles in open traffic roads.
Authorizations for deployment.

It shall be considered that, between some countries, a mutual recognition agreement already exists for the obtention of both types of license exemptions, but in any case, it should not be considered as a common procedure valid in all the States.

The vehicle type approval, which nowadays stands only for conventional vehicles and not yet for automated vehicles, is defined as the procedure whereby an approval authority certifies that a type of vehicle, system, component or separate technical unit satisfies the relevant administrative provisions and technical requirements according to the Regulation (EU) 2018/858 which is the European framework document regulating the motor vehicle (and its trailers) type approval procedure.

In other words, it is the verification of a type of vehicle, system or component with regards to several (national, European or international) regulations. This verification is necessary as a previous condition to the vehicle registration. The regulatory acts to verify are usually related with safety (active and passive), environmental emissions or

security and they must be validated by a designated Technical Service on behalf of the National Type Approval Authority.

It is important to remark that vehicle type approval is a mandatory step prior to vehicle registration. That means that vehicles to be used in an area where registration is not mandatory (vehicles to be driven in closed areas, such as mining or construction) are not subject to type approval procedures.

As seen before, the vehicle type approval is regulated at European Union level and it was defined as a common procedure in all the Member States. However, most of the regulatory acts to be fulfilled which are included in the European Type Approval Regulation are developed in an international level, more specifically in the United Nations.

The UN body in charge of developing these type approval regulations (also legislation documents for self-certification countries) is the WP.29 World Forum for the harmonization of vehicle regulations. Important countries in the world together with Non-Governmental-Organizations representing the automotive industry are collaborating in the development of this vehicle legislation. Traditionally, European Union (and its Member States) was the main contributor to this working party. However, during the recent years, with the introduction of the automated driving technologies, countries like USA, Japan, China or Canada are contributing more actively in the UN regulatory working groups.

As mentioned before, there are no international procedures regulating the vehicle use, but in United Nations exists also a Working Party in charge of the road safety: Global Forum for Road Traffic Safety (WP.1) in parallel with the abovementioned WP.29. It can be considered WP.1 like the group in charge of the driver and the vehicle use (e.g. road safety, traffic signs…) while WP.29 is regarding the vehicle (e.g. active safety, passive safety, emissions…).

With the emergence of the automated driving technologies the work of these working parties is becoming overlapped because of the substitution of the driver by the vehicle in the driving tasks. Both working parties are working together in the preservation of the safety in those aspects where driver and vehicle may overlap their functions.

Main working lines of this joint venture are:

- Creation of a common terminology in the area of autonomous vehicles
- Definition of the driver permitted activities (others than driving) while the vehicle is in an autonomous/automated mode
- Interaction between vehicle and driver, and between vehicle and other users.

Currently one of the major works in these UNECE Working Parties is the creation of new legislation, and the adaptation of those affected documents previously created, to cover the regulatory gaps originated by the European General Safety Regulation. This work is mainly promoted by the European Commission and its Member States.

3.2.1.2 New General Safety Regulation

In December 2019, the New General Safety Regulation (Regulation (EU) 2019/2144, 2019) establishing the vehicle safety requirements was published in the official journal of the EU. The regulation comes into force 33 months after being published (July 2022) for new vehicle types.

This regulation sets out the systems that will become mandatory for all the different vehicle categories, to reduce or eliminate accidents and injuries in road transport.

In this new revision, advanced vehicle systems grow in importance due to their demonstrated effectivity in reducing fatalities. Therefore, the regulation introduces advanced safety systems that will become the basis of automated vehicles:

> *"(23) Automated vehicles have the potential to make a huge contribution to* reducing road fatalities, given that more than 90 % of road accidents are estimated to result from some level of human error. As automated vehicles will gradually take over the tasks of the driver, harmonized rules and technical requirements for automated vehicle systems, including those regarding verifiable safety assurance for decision-making by automated vehicles, should be adopted at Union level, while respecting the principle of technological neutrality, and promoted at international level in the framework of the UNE*CE's World Forum for Harmonization of Vehicle Regulations (WP.29)."*

Specifically, article 6 of the regulation defines the following advanced vehicle systems that shall be equipped on all the motor vehicle categories:

a) Intelligent speed assistance;
b) Alcohol Interlock Installation Facilitation;
c) Driver Drowsiness and Attention Warning;
d) Advanced Driver Distraction Warning;
e) Emergency Stop Signal;
f) Reversing Detection;
g) Event Data Recorder.

In addition to the systems above mentioned, these vehicles considered SAE Level 3 or higher shall also comply with technical specifications related to:

a) Systems to replace the driver's control of the vehicle, including signalling, steering, accelerating and braking;
b) Systems to provide the vehicle with real-time information on the state of the vehicle and the surrounding area;
c) Driver availability monitoring systems;
d) Event data recorders for automated vehicles;
e) Harmonized format for the exchange of data for instance for multi-brand vehicle platooning;
f) Systems to provide safety information to other road users.

And finally, also related to connectivity of automated vehicles, two new regulations regarding cybersecurity and software updates shall be developed and applied as soon as possible according to the new general safety regulation:

> *"(*26) The connectivity and automation of vehicles increase the possibility for unauthorized remote access to in-vehicle data and the illegal modification of software over the air. In order to take into account such risks, UN Regulations or other regulatory acts on cyber security should be applied *on a mandatory basis as soon as possible after their entry into force."*

These two regulations have been developed for specific groups at UN level in the framework of the WP.29, and were adopted in June 2020. The adoption of these Regulations means its early entry into force in 2021, and will change OEM's internal procedures for assessing security of their systems since the development phase.

3.2.1.3 World Forum for Harmonization of Vehicle Regulation (WP.29)

Due to the growing importance of the automated/autonomous and connected vehicles, in 2018 WP.29 started to develop a dedicated subsidiary working party called GRVA. Taking into account the main objectives reflected on the framework document for automated vehicles, different informal groups have been established in order to address the different topics. The current structure is shown in Figure 5: GRVA and subsidiary groups' structure:

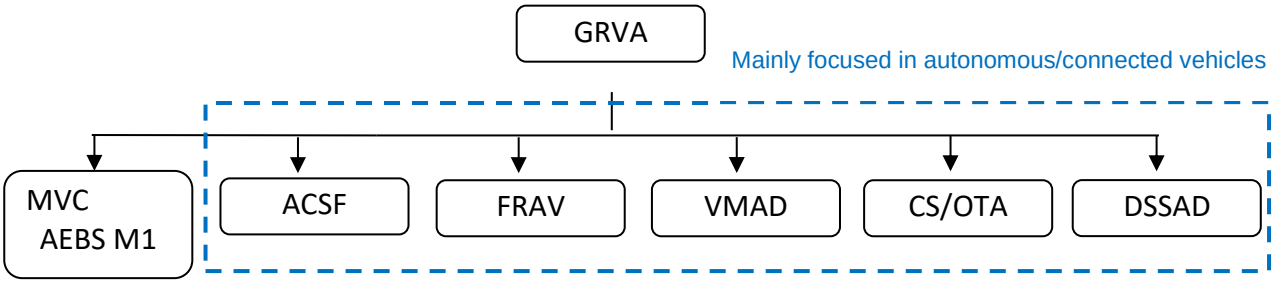


Figure 5: GRVA and subsidiary groups' structure

FRAV (Functional Requirements for Automated and Autonomous Vehicles)

This informal group is developing the functional requirements for automated/autonomous vehicles, in particular, the combination of different functions of driving: longitudinal control, lateral control, environment monitoring, minimum risk manoeuvre, transition demand, human machine interface and driver monitoring. FRAV also takes into account the failsafe response in order to validate the system safety, which is in many cases evaluated by the manufacturer during the development phase by implementing ISO 26262 for Functional Safety.

VMAD (Validation Method for Automated Driving)

VMAD objective is to develop an assessment method capable to validate the safety of automated systems based on a multi-pillar approach. This new certification approach would include audits, simulations, virtual testing, test track and real-world testing. As for conventional test methods it is not possible to evaluate all the challenges raised by automated driving, the new assessment and test method would not replace the current testing but complement it.

The group is developing a new certification approach based on the following pillars:

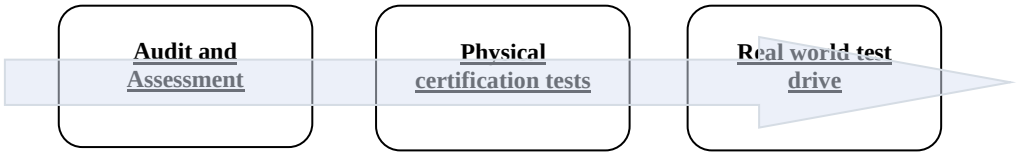


Figure 6: Multi Pillar Approach

The first step of the certification starts with the audit of the development process. Analysis of the safety concept and functional safety has been performed on complex electronic systems within the classical certifications, but currently this evaluation is growing in importance, so it is necessary to standardize it.

This first pillar is not limited to an audit, as some simulations can be used as validation of the system during the development process.

Once the initial assessment has been done, next stage would match the results obtained with proving ground tests. On proving ground, special cases can be reproduced in order to evaluate the real behaviour of the vehicle, focusing on scenarios and conditions considered as “edge conditions”.

Finally, the behaviour of the system on public roads is evaluated trying to achieve a given set of situations to fill all the common situations.

Currently the method is being developed together with the new ALKS regulation (Automated Lane Keeping System). ALKS regulation will cover systems which are activated by the driver at low speeds and keeps the vehicle within its lane by influencing the lateral movement of the vehicle and controls the longitudinal movement of the vehicle for extended periods without further driver command. It is intended for passenger cars (M1 vehicles). ALKS will be the first UN regulated system that will allow to the driver not to be in control of the vehicle.

CS/OTA (Task force on Cyber Security and Software Updates)

On top of all the new groups on the autonomous field, cybersecurity and software updates task force has evolved quickly due to its high growing importance.

Granting cybersecurity of automated/autonomous vehicles is mandatory in terms of security for road users over the lifetime of the vehicle. For that reason, the proposed regulation establishes requirements for the Cyber Security Management System of the manufacturer, so as well as for the vehicle type. Starting from 2022, manufacturers for commercial vehicles and messenger cars (categories M, N and O) will have to address cyber security for they vehicles, identifying vulnerabilities and threats in order to assure the vehicle safety. Once threats are identified, a mitigation plan will be required to reduce them. All this process will be assessed with an audit and the analysis of the documentation.

Following the same basis, it was noted that there are commonalities between cyber security and software updates. The task force considered that a new regulation covering aspects of software updates would be needed. This regulation that is also on the last stage previous to be published, sets out requirements for the manufacturer’s Software Updates Management System, as well as aspects for safe execution of all the updates.

DSSAD/EDR (Data Storage System for Automated Driving/Event Data Recorder)

This informal group is responsible of developing two proposals for new regulations on Event Data Recorder (both for conventional vehicles and autonomous) and Data Storage Systems for Automated Driving. EDR will collect data related to collisions, that will be valuable for accidents reconstructions.

DSSAD is going to collect data of the operational status of the automated/autonomous driving system and the driver during incidents.

3.2.2 Societal and ethical aspects

The natural (technical, economical, legal…) development of societies is a permanent ongoing, dynamic process. Technical development though often includes often risks; some risks are though not obvious or cannot be well defined or foreseen. Since centuries, one important function of “law” is to ensure safety (and security) for all members of a society. Therefore, certain things/actions are principally allowed or

forbidden by law. Sometimes law is very clear and logical, but sometimes it is very descriptive and hard to understand.

The development of AV systems challenges the legislation as AV technologies often need go beyond existing, well established legal rules. Thus, technical development triggers legal development. Even if law seems to be very conservative and static (e.g.: many principles of the roman law are in principal still valid in private law!) it is not. Actually, parliaments all over the world create/change/adopt legislation on a daily basis.

Nevertheless, new laws which allow new technical components, systems, functions or similar are only enacted if potential impacts on health and safety on the members of the society have been investigated and risk assessments (technical, economic, political) have been undertaken. Often new technologies need to be tested in “real life” to be able to assess its reliabilities and risks.

To enable such tests, exemptions from effective laws are required. In the field of traffic/transportation systems in principle all national legislations include mechanisms to enable such “critical” experiments in one or the other way. Either general exemptions procedures can be used or special “experimental” clauses or decrees can be defined. If test/experiments shall take place on public roads it is in general necessary to apply for a permit at the responsible authorities. Before and during the permit application process, the objectives and the characteristics of the experiment have to be explained and, in most cases, accompanied with a risk analyses and a safety concept.

4 Current national frameworks and on-going efforts for enabling transport services with automated vehicles

So far, no consensus on common rules for testing or introducing of AV systems was found. Therefore, currently national or even local legislation applies for the testing on public roads. Since testing legislation and general strategies regarding AV systems differ from country to country, it is obvious that there are significant differences how well countries are prepared for the deployment of AV systems.

(KPMG International, 2020) assesses this preparedness of different countries every year with its “Autonomous Vehicles Readiness Index”. The ranking regarding policy and regulations ranks the SHOW countries The Netherlands and Finland on place three and four, behind Singapore and United Kingdom who are ranked on the top.

To perform the ranking, KPMG uses scores for AV regulations, government-funded AV pilots, AV-focused agencies, future orientation of the government, efficiency of the legal system in challenging regulations, government readiness for change and the data-sharing environment. All these topics are weighted equally to come to the final ranking. It has to be noted, that in reality, some aspects might be more important than others.

It is evident that many countries want to encourage the development and testing of AV systems, on the other hand this national approach may generate barriers for the development and hinder the implementation of AV systems. The following chapter gives a comprehensive and up-to-date comparison of the differences in the SHOW project countries.

4.1 Comparison of current national frameworks in SHOW Mega- and Satellite Site countries

All of the involved SHOW project demonstration countries already have experience in testing automated vehicle systems. Application procedures based on national or local legislation are already available and contact points for permit applications are known. The level of development of the applicable legislation and the application procedures are different from country to country, but common prerequisites and requirements can be identified.

In general, there is the tendency to follow “early adopters” and technology leaders. This implies, that a lot of information and experience has already been transferred. Although there are a lot of common principles, also some important differences can be identified.

The following comparison is based on a comprehensive survey that was answered by at least one SHOW partner from each Mega- and Satellite Site country. This said, the presented information can be seen as a self-assessment by SHOW partners, not as a comparative analysis by the authors.

4.1.1 General Organisation

Table 1 gives an overview on the general organisational aspects for permit applications. While dedicated information is available in most countries, the accessibility of that information seems to be very different. For the majority of countries, a first point of contact is clearly defined. In many cases, permit applications are not handled by one entity, but involve several different national or even local authorities

and entities. The level of proactiveness was also graded very differently by SHOW partners as it can be seen below.

Table 1: Organization of permit applications

	Information available	Accessibility of information	First point of contact	One-stop-shop or several involved?	Authorities proactive?
France	✓	●○○	Dedicated website of interministerial comittee	One-stop-shop, but several contacted and involved	●●○
Germany	✓	○○○	Not available	Several	●●○
Austria	✓	●●○	AustriaTech	One	●●○
Sweden	✓	●●●	Swedish Transport Agency	Basically one, but e.g. also municipality could be involved	●●●
Spain	✓	●●●	DGT - General Directorate of Transit	1 authority + 1 technical service	●●●
The Netherlands	✓	●●○	Via website	One	●●○
Czech Republic	✗	○○○	Not available	Several	○○○
Denmark	✓	●●○	Road directorate	Several	●●○
Finland	✓	●●○	Traficom - Finnish Transport and Communications Agency	One	●●●
Greece	✓	●●○	Ministry of Transport	One	●●●
Italy	different answers	different answers	Not available	different answers	different answers

Note: in this table and all the following tables, the term “different answers” is used, when several SHOW partners from one country gave different answers on a binary scale (e.g. Yes/No), or ratings, that are so far apart, that it makes no sense to calculate a mean value in this context. The reasons could be, that the current framework doesn’t allow specific answers to the posed questions or that the information is not distributed well enough.

Conclusions (AV testing permit in general, not SHOW specific):

- CZ republic has no dedicated AV testing legislation yet, but AV test is possible by applying already existing laws correctly.
- The accessibility of information regarding AV testing can obviously be improved in most countries, although the first point of contact is often clearly defined.
- The “one stop shop” principle for AV testing permits is already applied in many countries, but it is not obvious that additionally necessary permits and licenses, for example for raising required infrastructure are clearly defined.
- Authorities are often very proactive.

4.1.2 Quantity and Quality

Depending on the practical experience and the development of the legislation, there may be standardised permit application process descriptions, application forms and explanatory documents available. Nevertheless, as test/experiments are rarely completely similar and assuming that technical/functional development is permanently ongoing, even in countries which already have a lot of experience, a highly standardized application processes and well-developed AV system legislation must have exemption procedures (e.g. handling of the case in an expert committee) allowing

them to issue testing permit for new testing aspects which are not covered by procedures and legislation in force.

Table 2 shows, how SHOW partners from the respective countries rate the quantity and quality of their national dedicated legislation, support information, application from sans support desk.

Looking at the results, only one county (Czech Republic) lacks all of the mentioned elements, because there is no specific framework available. The table also reveals which information is available in different languages (English in all cases).

Table 2: Quantity and quality of available information

	Dedicated Legislation	available in different languages	Support Information	available in different languages	Application Forms	available in different languages	Support Desk	available in different languages
France	Quantity ●●● Quality ●●○		Quantity ●○○ Quality ●○○		Quantity ●●● Quality ●●○		Quantity ●○○ Quality ●○○	
Germany	Quantity ●○○ Quality ●○○		Quantity ●○○ Quality ●○○		Quantity ○○○ Quality ○○○		Quantity ●○○ Quality ●○○	
Austria	Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes
Sweden	Quantity ●●● Quality ●●○	yes	Quantity ●●● Quality ●●○	yes	Quantity ●●● Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes
Spain	Quantity ●●● Quality ●●●	yes	Quantity ●○○ Quality ●○○		Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes
The Netherlands	Quantity ●●○ Quality ●●○		Quantity ●●● Quality no answer	yes	Quantity ●●○ Quality ●●○		Quantity ●●● Quality ●●●	yes
Czech Republic	Quantity ○○○ Quality ○○○		Quantity ○○○ Quality ○○○		Quantity ○○○ Quality ○○○		Quantity ○○○ Quality ○○○	
Denmark	Quantity ●●● Quality ●●●		Quantity ●○○ Quality ●○○		Quantity ●●● Quality ●●○		Quantity no answer Quality ●●●	
Finland	Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●○	yes	Quantity ●●○ Quality ●●●	yes	Quantity ●●● Quality ●●●	yes
Greece	Quantity ●○○ Quality ●●○		Quantity ●○○ Quality ●●●		Quantity ●○○ Quality ●●○		Quantity ●○○ Quality ●●●	
Italy	Quantity ●●○ Quality ●●●		Quantity ●○○ Quality ●○○		Quantity ●○○ Quality ●○○		Quantity ●○○ Quality ●○○	

<u>Conclusions (AV testing permit in general, not SHOW specific):</u>

- Dedicated AV testing legislation can be improved in most countries. Only few countries offer information in English.
- There seems to be a need for accompanying information, which explains the AV testing legislation and describes the connected processes and procedures.
- Dedicated application forms for AV testing are available in most countries, but even here continuous improvement is required.
- In all countries except Finland and the Netherlands the availability and the quality of support desks can be improved.

4.1.3 Permit application in detail

Table 3 gives a more specific overview on permit applications in SHOW Mega- and Satellite Site countries. As expected, some kind of risk analysis and a third-party liability insurance are mandatory in all countries.

The estimation of estimated handling time varies from 1 month in Finland to 10 months in France and Denmark. Generally speaking, handling time tends to be longer when several federal/local authorities are involved. Also, in case that independent external

experts have to be involved, handling times may be significantly longer (e.g. Denmark). On the other hand, if the applicant already knows the procedure well and already prepared all necessary documentation and certificates, handling times may get shorter.

The column on the right shows handling/processing fees, that might apply for the permit application procedure. Many countries do not make use of a handling fee at all, but in other countries those fees can cause considerable costs for the applicant.

At this point, it should also be mentioned, that besides the internal costs for the operation itself, the following costs shall be taken into account regarding permits: fees for authorities, costs for certificates, costs for insurances, cost for independent (external) quality assurance (required in some countries) and costs for data collection/reporting, that may be required by some authorities.

Table 3: Permit application in detail

	Mandatory risk analysis	Mandatory third party liability insurance	Average Handling time	Handling/processing Fee
France	✓	✓	10 months	✗
Germany	✓	✓	3 months	depends on the desired test area and vehicle
Austria	✓	✓	7 months	✗
Sweden	✓	✓	6 months	~ 135 €/hour
Spain	✓	✓	2 months	Fee according to I.4 of article 6 Ley 16/1979
The Netherlands	✓	✓	9 months	< 10 000 €
Czech Republic	✓	✓	8 months	✗
Denmark	✓	✓	10 months	✗
Finland	✓	✓	1 month	200 €
Greece	✓	✓	6 months	✗
Italy	✓	✓	4 months	✗

<u>Conclusions (AV testing permit in general, not SHOW specific):</u>

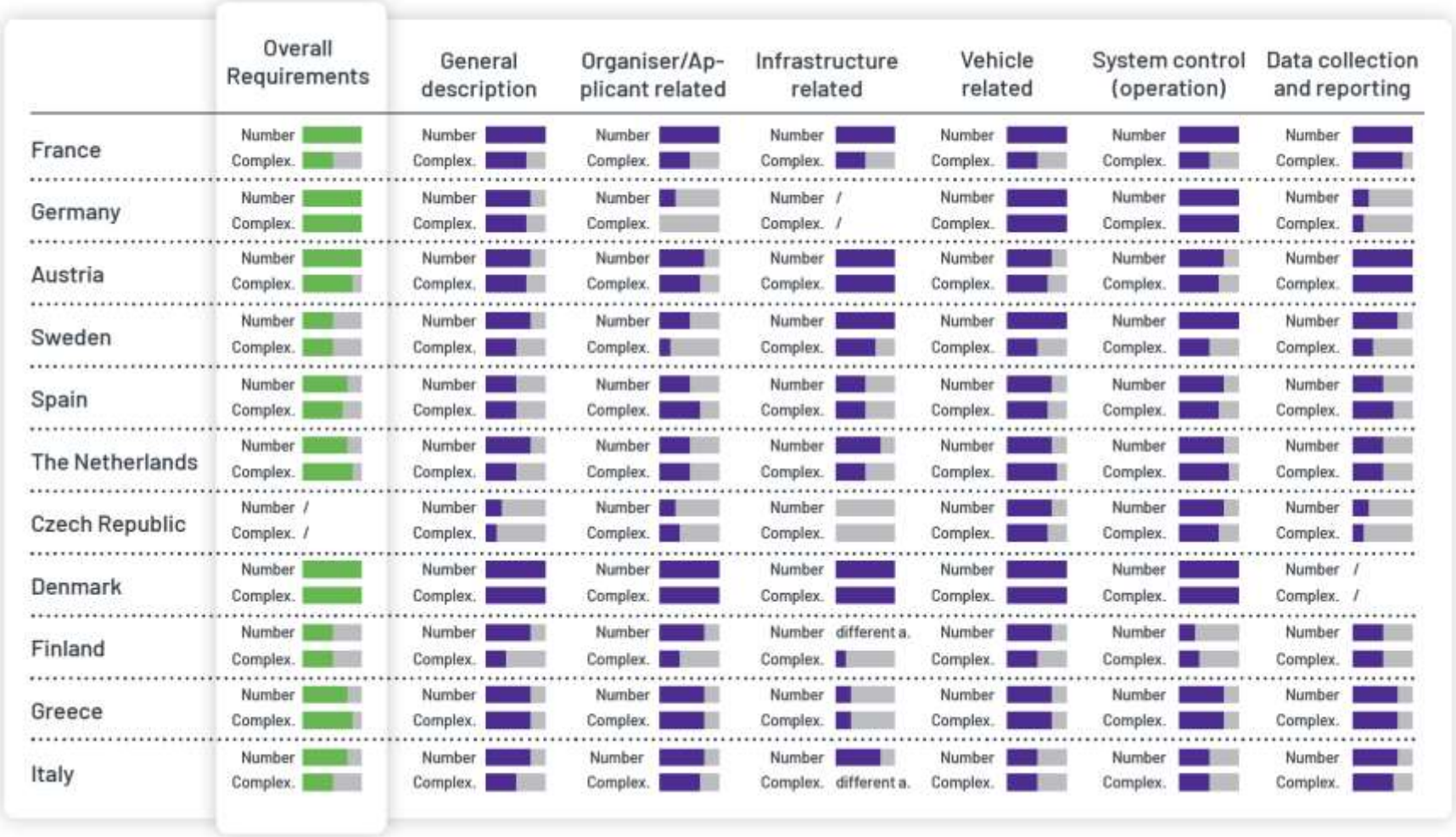
- Risk analysis are required in all countries, but no common standard could be identified. The focus, the content and the extend of risk analysis may not only vary from country to country but is also dependent on the test case.
- Insurances are required in all countries. So far no information is available if dedicated insurances for tests involving passenger are required.
- The average handling times vary a lot. The handling time is obviously very dependent on the applied test case. If test cases are “standardised by law” (as for example in Austria) or equal/similar test cases have been approved before, handling times can usually be shortened.
- If costs apply for handling of AV testing permit applications is in the first hand depending on the general administrative rules in each countries which are defined by national politics. In cannot be said that a permit application

procedure which costs (e.g. fees, taxes,…) is better or faster than a permit process where authorities do not charge anything.

4.1.4 Number and complexity of requirements

Since there are different regulatory frameworks in each country, the requirements that applicants have to fulfil – across all different aspects - differ a lot. We asked the SHOW partners in the respective countries, how many requirements there are (Number of requirements from “none” to “many”) and how complex they would rate those requirements (complexity of requirements from “simple” to “complex”). Table 4 gives very interesting insights in those differences. While some countries lack explicit requirements (Czech Republic), the number and complexity of requirements is rated very high in all aspects in other countries (e.g. Denmark). In some countries, the requirements may be significantly higher for certain aspects than they are for other aspects (e.g. Germany).

Table 4: Number and complexity of requirements



General descriptions:

Usually the authorities require a comprehensive general description of the planned test/experiment. This includes a description of the purpose and objectives of the test in most cases. Often it also includes research questions and a justification of the importance and benefits for the public. The requirements regarding general descriptions might also include the area, where tests are planned and the time periods when they will take place.

Organizer/Applicant related:

There may be certain requirements on the experience and trustworthiness of the applicant. Therefore, usually not everybody can apply for a testing permit. Often the group of admissible applicants is for example limited to research institutes, vehicle/component manufacturers, system developers or transport operators.

Infrastructure related:

Some national regulations also foresee, that requirements regarding road infrastructure are described during the permit application process. It can be assumed, that in the first-hand issues regarding physical road infrastructure (e.g. road markings, signage, traffic light) are considered important. On the other hand, applicants should also evaluate the use of digital infrastructure (e.g. C-ITS, 5G). Using additional digital infrastructure for tests may require additional permits.

Vehicle related:

In many countries, rules and regulations for testing of AV systems focus on the vehicles which shall be tested. Usually, there is no possibility for obtaining a homologated vehicle approval for the tested vehicles, therefore they are treated as prototypes. Nevertheless, all prototypes must fulfil a minimum set of environmental and safety requirements (brakes, lighting, exhaust gases…)

System control (operation)

A very important point that must be clarified during the permit process, is how the vehicles will be controlled during the test/experiment. Usually, the current national legislation for motorized vehicles on public roads implies, that a designated driver is responsible for the operation.

This is though one of the major challenges regarding the deployment of AV systems, since remote operation (supervision and/or control) will play an important role in real-world use. Currently, remote operation (supervision and/or control) is seen as a very sensitive issue – therefor national rules differ a lot. Requirements may for example include: access routines to the vehicle, training of operators and explicit rules when intervention is necessary.

Data collection and reporting

It is not unusual that the authorities set requirements regarding the observation of the test/experiment. Usually all incidents, accidents and deviations shall be reported immediately to learn from them and improve safety. Authorities also want to learn from the tests/experiments to adopt the legislation and apply the necessary measures for a safe implementation.

Potential requirements may include recording of technical data and reporting of deviations & changes, incidents, accidents. Such requirements can imply technical

measures (e.g. regular vehicle data recording, accident data recording) and organizational measures (e.g. standardised reporting duties).

In addition to the categories provided in the questionnaire, SHOW partners in France and Spain mentioned additional requirements that have to be fulfilled. In France, there is a high number of requirements for IT systems and cybersecurity, regarding safety, risk and risk mitigation strategy, regarding the transport of passengers and the routes, local authorisations and adaption of roadway and infrastructure. The French partner rates the requirements regarding risk mitigation as pretty complex.

For Spain, additional requirements regarding functional safety, specific insurance and technical approval were mentioned.

Conclusions (AV testing permit in general, not SHOW specific):

- The common goal of AV testing permit application procedures is to ensure safety for all stakeholders involved in AV testing, including third parties which are not directly involved.
- Therefore, various requirements are put on different “systems parts” (infrastructure, vehicles, operation procedures,…). Whilst some countries for example focus on technical requirements, others put special attention on other things.
- All legislations do though apply a “system view” and try to make the AV system testing safe by checking technical components in more or less detail and by checking/defining emergency procedures.
- An important part of permit applications are often pre-defined reporting duties to authorities which can be used to improve test application procedures.
- So far, the requirements are defined individually on the national level.

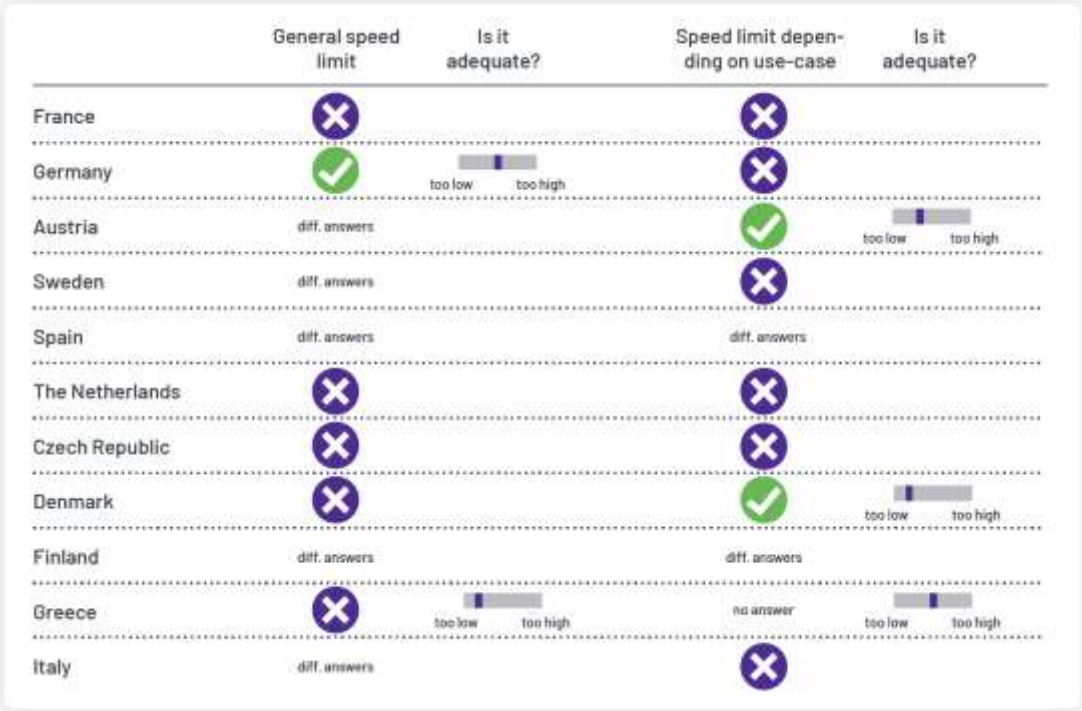
Table 5: Additionally mentioned requirements

4.1.5 Potential critical issues

Besides the use of automated vehicles, SHOW includes a number of additional aspects, for example physical and digital infrastructure, integration into traffic management systems and transport services for goods and passengers. Some of these aspects may not require separate permits, but others will. This implies, that permit procedures may take longer than expected. It may also be the case, that additional authorities have to be involved, for example if additional infrastructure has to be installed.

The following tables refer to potential critical aspects, that could be important for the realization of SHOW Use Cases and shows how the different national legislations handle the specific issues.

Table 6: Speed limits



Conclusions (AV testing permit in general, not SHOW specific):

- In general, the commonly valid speed limit for road traffic also apply for testing AV vehicles on public roads.
- Depending on the test case individually defined speed limitations may though be issued.
- In the case of “pre-defined” use cases, as for example for the Minibus test case in Austria, a speed limit is also pre-defined accordingly.
- In most countries permits/licenses are granted on an individual test case bases, thus speed limits are often defined for the applied use cases. The speed limits to be applied may depend on vehicle types, test area, traffic situation, etc.
- In test cases where passengers (third parties) are involved speeds limits are usually low to minimise risks.
- Often AV vehicles are prototypes and the availability of adequate safety equipment cannot be compared to series-production vehicles.

Table 7: Remote operation

	With physical connection, but from outside the vehicle	Wireless remote operation in line of sight	Wireless remote operation from remote location
France	✓	✓	✓
Germany	✗	✗	✗
Austria	✗	✗	✗
Sweden	✓	✓	✓
Spain	✓	✓	✓
The Netherlands	✓	✓	✓
Czech Republic	✓	✓	✓
Denmark	✓	✓	✓
Finland	diff. answers	diff. answers	diff. answers
Greece	✓	✓	✓
Italy	✓	✓	✓

Conclusions (AV testing permit in general, not SHOW specific):

- Remote operation (supervision & control) of AV vehicles is very important, because business models for AV only work if a driver/operator within the vehicle can be avoided.
- Except in Austria and Germany, AV legislation in the observed countries in principle allow “remote operation” of vehicles. This does though not automatically allow the absence of a “safety driver” on-board the vehicle (see also Table 10 – operational safety).
- Even in countries where remote operation in principle is allowed, there is though still under discussion which technical requirements shall be put on the connection between vehicle and remote operator (operation centre) and which emergency procedures shall be applied.

Table 8: Transport of goods

	Transport of goods allowed?	Goods & Passengers at the same time	Towing a trailer	Platooning allowed?	Platooning Comment
France	✓	currently not working on this use case	currently not working on this use case	✓	currently not working on this use case
Germany	✓	✓	✗	✓	
Austria	diff. answers	diff. answers	✗	diff. answers	It is allowed under special boundary conditions, like not on public roads only on proving grounds
Sweden	✓	✓	✓	✓	You need to prove it is safe enough
Spain	✓	diff. answers	✓	✓	There are a certification V2V and latency measures to assure a good comunication and response
The Netherlands	never made request	never made request	never made request	✓	Platooning is allowed with vehicles and trucks, until now not in urban settings
Czech Republic	✓	✗	never came across something like this	✗	
Denmark	✓	✓	pending approval	✓	
Finland	✓	✓	diff. answers	diff. answers	
Greece	✗	✗	✗	✗	Platooning is allowed with new permit. Also goods transfer too
Italy	diff. answers	diff. answers	diff. answers	✓	

Conclusions (AV testing permit in general, not SHOW specific):

- So far AV testing was focussing on passenger transport in many countries and the respective legislation focussed on this.
- Nevertheless, the demand for mixed passenger/small goods transport test cases increases and the legislations should be adapted accordingly.

Table 9: Vehicle technology

Conclusions (AV testing permit in general, not SHOW specific):

- The requirements for approval on vehicles to be used for AV testing vary widely from country to country
- Whilst some countries apply “self-certification” of vehicles and sometimes do not check technical details at all, other countries require that the vehicles to be tested are demonstrated to the authorities in a pre-test.
- Sometimes it is required that test vehicles have been tested on private ground or in simulations before they can be used in public traffic. It is though unclear, how the fulfilment of such requirements can be proven by the applicant.
- Software is very important for AV vehicles, but it still not very clear, how software and especially software updates are treated during the permit application process and during testing.

Table 10: Operational safety

	Operator must be on board or physically connected to vehicle	Operator can be in a remote location (under certain requirements)	Defined handover/ safety procedures	Defined maximum speed	Additional mentions
France	✓	✓	✓	✗	
Germany	✓	✗	✓	20 km/h	
Austria	✓	✗	diff. answers	✗	
Sweden	✗	✓	✓	depending on case	
Spain	diff. answers	diff. answers	diff. answers	✗	
The Netherlands	✓	✓	✓	✗	
Czech Republic	✓	✗	✗	✗	
Denmark	✗	✓	✓	✗	safety assessment on route before allowing for passengers
Finland	diff. answers	✓	diff. answers	✗	
Greece	✗	✓	✗	✗	
Italy	✓	✓	✗	✗	

Conclusions (AV testing permit in general, not SHOW specific):

- One very important question regarding vehicle operation is, if a safety driver on-board is required or not. In most cases a safety driver on-board is required, even if remote operation is in principle allowed (see also Table 7 – remote control).
- The definition of operational procedures is critical, especially in cases of emergency. In most countries such emergency procedures are defined and continuously improved.
- Operational safety cannot only be ensured by safety driver, also the design of the test area may play an important role.

Table 11: Traffic environment – where is testing allowed?

	On all roads with public traffic (mixed traffic)	On roads with public traffic, only in defined areas	Only on dedicated PT infrastructure (e.g. bus/tram lanes)	Other
France	✓	✗	✗	Any road environment, as long as the safety case is justified
Germany	✗	✓	✗	
Austria	✗	diff. answers	✗	only on private grounds or test areas
Sweden	diff. answers	diff. answers	✗	
Spain	diff. answers	✓	✗	Where you obtain the permission
The Netherlands	✗	✓	✗	
Czech Republic	✓	✗	✗	
Denmark	✓	✗	✗	
Finland	✓	✗	✗	
Greece	✓	✓	✓	
Italy	✗	✓	diff. answers	

Conclusions (AV testing permit in general, not SHOW specific):

- Allowing tests of AV vehicles in public traffic may lead to undesired effects on traffic flow and lead to hazardous situations.
- Where and when AV testing is allowed is mainly depending on the individual test case.

Table 12: Interaction with infrastructure

	How does your legislation handle the interaction between vehicle and infrastructure?
France	/
Germany	/
Austria	Research on this is ongoing if infrastructure is available on the private ground and the usage is defined within the use case it could be used
Sweden	„Need to communicate with road owner" „In the risk anlaysis and the site tests (where the agency is present) the safe interaction should be proven. As a general answer to several of the questions in this questionnaire: a lot depends on the specific trial case. Shuttles can be in any of the above, as long as you can prove the safety in the specific case, and have demonstrated it at a site test with agency."
Spain	„In the application, the applicant shall define the area where the vehicle is intended to be tested (including traffic signals, roads, traffic conditions...)" „Maybe try to follow an standard and certified communication„
The Netherlands	independent authority does safety assessment for target deployment location
Czech Republic	Does not handle at all.
Denmark	/
Finland	/
Greece	Does not handle at all.
Italy	The interaction is managed through specific Annexes of the Decree

Conclusions (AV testing permit in general, not SHOW specific):

- Even the term "CAV" – Connected Automated Vehicles - is widely used and can include the connection between vehicle and infrastructure, this topic is still under development.
- So far AV testing legislation is often designed for AVs which can behave like "normal" vehicles with drivers, because the "autonomous" vehicle was expected soon when the first versions of legislations was designed.
- This means that it is expected that AVs can recognise existing traffic signs, road markings, etc.. and act accordingly.
- As development of digital infrastructure (e.g. C-ITS, 5G) is behind vehicle development, applicable legislation is missing.
- The interaction between vehicle and infrastructure seems to be widely underrated in the current frameworks. Nevertheless, this topic may be of special importance for the SHOW project.

Table 13: Human-centred aspects

	Does the vehicle operator need a driving licence?	Is a dedicated training for the operator mandatory?	Are there specific requirements on operational procedures? e.g. operating manual
France	✓	✓	✓
Germany	✓	✓	✓
Austria	✓	✓	✓
Sweden	✓	✓	✓
Spain	✓	✓	✓
The Netherlands	✓	✗	✓
Czech Republic	✓	✗	✗
Denmark	✓	✓	✓
Finland	✓	✓	✗
Greece	✓	✓	✓
Italy	✓	✓	✓

Conclusions (AV testing permit in general, not SHOW specific):

- Requirements on “safety staff” (e.g. Operators, safety drivers,..) are in most countries well defined in current AV legislations
- Often safety staff has to hold appropriate driving licenses and has to undergo dedicated trainings
- In most countries operational procedures for the individual test case have to be described in dedicated documents, nevertheless there is no common European standard available.

Table 14: Reporting duties

	Is regular reporting about the test/operation mandatory?	What are the general reporting duties to authorities?	Is the use of a event data recorder mandatory?
France	✓	Regular reporting of KPIs: km travelled, weather conditions, incidents...	In France, the only current requirement is to indicate whether the vehicle is in automated or manual mode
Germany	undefined yet	There are no defined reporting duties yet	✓
Austria	✓	Focus on critical situations/ accidents and their causes	diff. answers
Sweden	✓	„end of trials = when needed" „If the trial goes beyond the what is approved in the permit. Running report to the agency about incidents, crashes. Also need to report deviations that can influence the safety. Evaluation of the trial after trial completion. For tests with a duration over 1 year, annual evaluations are required."	✗
Spain	✗		✗
The Netherlands	✓	Maintain a log book of test drives and report incidents	✗
Czech Republic	✗	In general, there are no duties since the permit is not specifically for AVs, but for testing purposes of any experimental car. There is no specific procedure for AVs in the Czech Republic.	✗
Denmark	✗		✓
Finland	✓	Reporting deviations from testing plan, dangerous situations, problems encountered etc.	diff. answers
Greece	✓	To be further examined, but there is no standardized report templates to be delivered to authorities.	✗
Italy	diff. answers	An annual report is required	✓

Conclusions (AV testing permit in general, not SHOW specific):

- In many countries “reporting duties” to authorities are defined for AV tests.
- One purpose of such reporting duties is to ensure safety. Sometimes even technical systems (e.g. event data recorder) have to be used for recording and automated reporting.
- Regular reporting to authorities can also contribute to “better” testing legislations, as authorities can learn what is critical and what not
- Often not only accidents, incident and deviations have to reported to authorities, also changes in the test set up (incl. software updates if required) have to be reported to authorities.
- Not following the requirements on reporting duties may lead to invalidity of testing permits.

4.1.6 Where SHOW partners see need of improvement

In all SHOW Mega- and Satellite Site countries, at least one SHOW partner sees need of improvement regarding the current legal framework. When asked “What could be improved?”, partners mentioned:

France: "Waiting times. Flexibility to make modifications. Streamlined process for second applications with a common baseline. Validity period for authorisations. Communication with the interministerial committee."

Germany: Nothing mentioned

Austria: *“Empowering the current first point of contact AustriaTech to act as a* responsible authority making decisions on AV testing/operating on its own, not on behalf of the legally responsible federal authority BMVIT...comparable to legally authorized car repair shops officially carrying out the § 57a KFG services for car owners ...*in order to economise AV application procedures”*

Sweden: *"The authorities are learning by doing (which is good) and thus* the process is not perfect yet. Their early experience has led the Agency in charge to introduce a first step, where you express your interest in applying. That kicks off the dialogue - it is followed by a meeting with several representatives from different parts of the Agency where you have an open exchange to familiarize both parties with expectations, what to do, how to do."

Spain: *"Less bureaucracy. Only one way to get the permits"*

The Netherlands: *"*More clear definition of safety requirements and add objective pass*/fail criteria"*

Czech Republic: *"There should be created the whole procedure."*

Denmark: *"*On top of administrative process also a political process is required - this is, time consuming.*"*

Finland: *"*More clarity / templates could help in the application proc*ess."*

Greece: *"The minimum speed of the Automated Vehicles, the context of the operation."*

Italy: Nothing mentioned

4.2 Current frameworks, gaps and barriers in SHOW Mega- and Satellite Site countries

This chapter provides an overview regarding gaps and barriers for the realisation of the planned SHOW Use Cases in all Mega- and Satellite Site countries. **Since the decision of approval is granted based on some kind of individual decision in all countries, it is hard to identify the final and definite barriers**. Nevertheless, critical aspects can be identified for several countries. This chapter also includes feedback from all sites on the progress of the permit application procedure, that we received for the Demo Board meetings on August 31st and December 10th 2020.

Additionally, in several countries on-going efforts to adopt legislation or introduce new legislation for real-world operation is identified. A separate sub-chapter "On-going efforts" is included for the respective countries.

4.2.1 France

In May 2018, the French strategic framework for the development of autonomous vehicles was published. The framework gives examples for the future use of self-driving vehicles, identifies the key issues and sets ten priority governmental actions. The former minister Anne-Marie Idrac acts as Senior Head of this National Strategy for the Development of autonomous vehicles (RÉPUBLIQUE FRANCAISE, 2018).

4.2.1.1 Current framework in France

In France, every test authorization is granted on an individual basis and several different ministries are involved. Initially, the applicant has to provide documents which explain the objectives of the test, describe the vehicles and how safety will be ensured. Authorities will raise questions, that the applicant must consider. If all involved ministries agree, the Ministry of Ecological Transition will send the dossier to the local road authority to ask for an opinion, after what the Ministry will issue a permit for the specific route.

Table 15: France - Overview

Contact Point	- Ministry of Ecological Transition – is the main contact to which the application for authorization is submitted - Ministry of domestic affairs - Ministry of Economics
Links for further information	Overview page of Ministry of Ecological Transition (in French): https://www.ecologie.gouv.fr/vehicules-autonomes Arrêté du 17 avril 2018: https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000036868691/ Application form (in French): https://www.demarches-simplifiees.fr/commencer/autorisation-experimentation-vdptc
Specific characteristics	- Authorization is granted on an individual basis (no technical restrictions beforehand) - Several Ministries involved - A questionnaire (about 90 questions) summarizing the main issues of the experiment - The authorization is granted for max. two years

Activating automated driving systems is only allowed on specified routes. In addition to the specific characteristics mentioned in Table 15, it always has to be tracked, whether the vehicle is in automated driving or manual driving mode.

Since several authorities are involved in the application process, handling times may be longer. SHOW partners also mentioned, that they would appreciate an optimized process for second/repeated applications with a common baseline. At the moment, it is necessary to submit a comprehensive application again. Also, they see room for improvement regarding the communication with the interministerial committee.

4.2.1.2 Gaps and barriers regarding realization of SHOW Use cases

The French Twin Mega Pilot consists of the sites Rennes and Rouen. The authorization process in France is very individual and SHOW partners expect no problems regarding the implementation of the planned Use Cases. Nevertheless, one challenge may be the current long handling times for the permit application process.

Rennes

In Rennes, three NAVYA and three EASYMILE shuttles will be operated at CHU Rennes (Rennes University Hospital).

Planned Use Cases according to D1.2:

- UC1.1 & 2.2: Providing a safe, acceptable and efficient mixed transport service for all the CHU users.
- UC1.3: Improving the interface between the shuttles and the vulnerable users in the CHU (including passengers with motor, visual ad cognitive problems, etc.) for overall safety.
- UC1.4: Developing a management system for combining the needs of charging and the requirement of the service via optimisation tools.
- UC1.10: Integrating the automated shuttle service into the automated transport offer in Rennes (metro).

According to Table 16: Rennes - Feedback on permit application processTable 16, SHOW partners in Rennes expect no problems regarding the technical verification of vehicles or SHOW UCs. In August they were 80% optimistic to obtain the necessary permits on time, but by December stated very low probability. The main challenge is, that the demo site is located within a hospital area.

Table 16: Rennes - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	No	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	80%	4%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	None	PT crisis and health crisis, impacting very strongly the Hospital organization (demo site is in the hospital in Rennes)

Rouen

In Rouen, Transdev i-Cristal shuttles will be used on a regular bus line in Technopole du Madrillet (science park). In addition, Renault Zoe (robotaxis) will be operated in the city centre of Rouen to offer an on-demand transport service. Also tests on a private test track in Versailles and experiments with an operational control centre will be performed.

Planned Use Cases according to D1.2:

- UC 1.1: Automated passengers mobility in Cities under normal traffic & environmental conditions;
- UC 1.2: Automated passengers mobility in Cities under complex traffic & environmental conditions;
- UC 1.3: Interfacing non automated vehicles/ travellers (VRU);
- UC 1.4: Energy sustainable automated passengers/cargo mobility in Cities;
- UC 1.5: Actual integration to city Public Transport Control Centre;
- UC 1.6: Mixed traffic flows;
- UC 1.7: Connection to Operation Centre for remote supervision;
- UC 1.10: Seamless autonomous transport chains of Automated PT, DRT, MaaS;
- UC 3.1: Self-learning Demand Response Passengers mobility;
- UC 3.4: Big data/AI based added value services for Passengers mobility.

The request for authorization was already submitted in March 2020. In August, the SHOW project partners in Rouen were 70-80% optimistic to receive permits on time. By December, they are 50% optimistic, but expect no problems regarding the technical verification or the implementation of the planned Use Cases. As mentioned above, the current main challenge may be handling times.

Table 17: Rouen - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	70-80%	50%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	Due to covid-19, French administration is running slower than usual. We received an official response explaining that our dossier will be studied in a 12 months delay. We already received a round of questions and we	The whole PT sector hit by Covid crisis

	as of August 31st	as of December 10th
	already provided the requested answers.	

4.2.1.3 On-going efforts in France

According to a strategic plan issued in May 2018, France strives to enable the road use of Level-4 automated vehicles until 2022. The plan foresees the construction of a framework between 2020-2022, "to allow the use of personally-owned self-driving cars, as well as public transport vehicles and highly-automated freight delivery vehicles." (RÉPUBLIQUE FRANCAISE, 2018).

4.2.2 Germany

A Round Table on Automated Driving was established in 2013 by the Federal Ministry of Transport and Digital Infrastructure. Bases on the recommendations of the Round Table the German "Strategy for Automated and Connected Driving – Remain a lead provider, become a lead market, introduce regular operations" was published in 2015 (ERTRAC, 2019). Since then, a number of different test sites have been put into operation.

4.2.2.1 Current framework in Germany

For testing automated driving functions, an exemption according to §70 StVZO is necessary, which is granted by the Kraftfahrt-Bundesamt. The applicant has to be the owner of the vehicle. The exemption is only granted when technical and organizational documentation, a risk analysis (including countermeasures) has been provided. Additionally, also the regional government (Bundesland) needs to approve the tests.

Table 18: Germany - Overview

Contact Point	Kraftfahrt-Bundesamt
Links for further information	StVZO: https://www.gesetze-im-internet.de/stvzo_2012 StVO: https://www.gesetze-im-internet.de/stvo_2013 StVG: https://www.gesetze-im-internet.de/stvg/
Specific characteristics	- In case the vehicle will be testing scopes (i.e. AD functionalities) which are not approved by current law, there's an exemption approval required (§70 StVZO) - Additionally, the law may require the approval of a special permit regarding the rules of the road (German "Verhaltensrecht") (StVO). - Define a data quality management system (such as a description of the software-framework for R&D work and the processes how to test and release your internal versions). It may be required that certain changes in SW have to be released by an internal quality process. - Provide documentation you have created in advance of the process to the independent testing institution and prepare a demonstration with the vehicle where you show

Contact Point	Kraftfahrt-Bundesamt
	the driving functions in different situations (and e.g. with emulated mal-functions of components).

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4.2.2.2 Gaps and barriers regarding realization of SHOW Use cases

The German Triplet Mega Pilot consists of Aachen, Braunschweig (suggested to replace Mannheim[1]) and Karlsruhe.

Aachen

In Aachen, e.GO MOOVE shuttles, a modified BMW i3, 2 arbitrary cars and regular PT buses will be operated in the area of the Campus Melaten Nord. According to D1.2, the following Use Cases will be covered:

- UC1.4: Predictive / collaborative driving manoeuvres based on V2V communication at bus stops (flowing traffic merge-out and merge-in), to reduce energy consumption through longitudinal control of multiple vehicles to avoid stationary traffic.
- UC1.1, 1.6 & 1.10: Ring feeder as on-demand service in a campus environment, based on automated people mover vehicles interfacing PT and interfacing to connected intelligent DRT/MaaS applications in Aachen (Mobility Broker and other DRT systems).

Table 19: Aachen - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority (as of August 31st)	Yes	Yes (e.Go MOOVE) No (FEV)
Probability of obtaining al necessary permits on time (M14 for pre-demo)	70-80%	30% (e.Go MOOVE) 100% (FEV)
Expected problems regarding technical verification of vehicles	Highly iterative approach with technical service expected. No clear receipt is available for L4 vehicle permits.	FEV: None e.Go MOOVE: Delay due to Corona (short shift)
Expected problems regarding permits, that may be necessary for planned SHOW UCs	Process is not perfectly clear and several vehicles included. FEV vehicle should be fine, e.GO Moove needs to report	FEV: None e.Go MOOVE: None

[1] The changes are subject to an amendment to be discussed and agreed with the EC.

	as of August 31st	as of December 10th
	status for their vehicle (e.GO Mover) separately.	
Additionally mentioned challenges	- Limited support of key suppliers due to Covid-19. - non-standardized process for getting the authorization to operate automated vehicles on public roads	e.Go MOOVE: Short shift within the company due to Corona and at key suppliers. FEV: Covid-19

As stated in Table 19, one SHOW partner already has established contact with the responsible authorities. Nevertheless, they mentioned several uncertainties and possible delays.

Braunschweig

3 different prototype vehicles (upgraded passenger cars) will be used to connect the main station in the city centre to the airport/DLR facilities. The Demo will also include platooning on one part of the 10km long route- The following Use Cases will be covered:

- *UC 1.1 & 1.6: Automated vehicle with on-demand stops: DRT with fixed stops and including the possibility of a few virtual stops on the route.*
- *UC 1.8: Platooning in urban environment demo: Platooning showing logical coupling of vehicles, to be conducted with 2-3 vehicles on parts of the route, focusing e.g. on signalized intersections.*

According to Table 20, SHOW partners state a very high probability that permits will be in place on time and see no additional challenges at all.

Table 20: Braunschweig - Feedback on permit application process

	as of August 31st	as of December 10th
Established contact with authority	Not available (new site)	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	Not available (new site)	97%
Expected problems regarding technical verification of vehicles	Not available (new site)	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	Not available (new site)	None

	as of August 31st	as of December 10th
Additionally mentioned challenges	Not available (new site)	None

Karlsruhe

In Karlsruhe, a EasyMile Shuttle and an Audi Q5 passenger car will be operated in the restricted area of Markensen Kaserne and a residential area to cover the following Use Cases:

- UC1.1: Restricted area Markensen Kaserne.
- UC1.2: Driving in (peri-) urban areas.
- UC1.3: Co-existence with VRUs on the street.
- UC1.6: Driving in (peri-) urban areas with mixed traffic flow.
- UC1.7: Demonstration of Connection to Operation Centre for remote supervision and decision aid in restricted or in (peri-) urban areas.
- UC1.9: Demonstration of Cargo platooning in restricted or in (peri) urban areas.
- UC2.1: Demonstration of automated mixed spatial mobility in restricted or in (peri-) urban areas.
- UC2.2: Demonstration of automated temporal mobility in restricted or in (peri-) urban areas.

Table 21: Karlsruhe - Feedback on permit application process

	as of August 31st	as of December 10th
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	80%	50%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	New Route => new Challenges	None
Additionally mentioned challenges	None	None

According to Table 21, SHOW partners in Karlsruhe have no concerns regarding the technical verification of vehicles. They only mentioned that they will use a new route, which brings new challenges.

4.2.2.3 On-going efforts in Germany

Currently, there is a draft law being discussed, that will enable real-world operation of autonomous vehicles within designated operational areas. The draft is currently reviewed by different stakeholder groups.

4.2.3 Austria

Austrian efforts in the field of automated mobility are accompanied by the "Austrian Action Programme on Automated Mobility" (BMVIT, 2018). The "Contact Point Automated Mobility" was established at AustriaTech as a first point of contact in legal and technological issues, for national test environments as well as national and international stakeholders who want to test according to the Austrian Automated Driving Regulation.

This first regulatory framework for automated driving – "AutomatFahrV" - was introduced in 2016 and was amended in March 2019. This amendment added a separate chapter for systems in series production, along the already existing chapter for test applications.

4.2.3.1 Current framework in Austria

Regarding test applications, the current framework includes three different test cases: "Autonomous Minibus", "Motorway Pilot with Automatic Lane Changing" and "Autonomous Military Vehicle". If all requirements of "AutomatFahrV" are met by the applicant, the ministry issues a test certificate for testing on public roads. The process also includes a council of experts, that regularly meets to discuss incoming requests.

Table 22: Austria - Overview

Contact Point	- AustriaTech: contact point automated mobility (responsible for coordination between applicant and BMK) automatisierung@austriatech.at - BMK - Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology
Links for further information	English translations of Austrian Edict for automated driving, Code of Practice, Application forms and more information available on: https://www.austriatech.at/en/testantraege-kontaktstelle/
Specific characteristics	Specific test case "Autonomous Minibus": - includes category M1, M2 and M3 vehicles - passengers may only be located in passenger seats - no commercial passenger transport allowed - at least 1.000 test kilometres necessary - maximum speed of 20 km/h - accident data recording system mandatory

If test applicants want to conduct test cases, that are not covered by the current edict, AustriaTech uses standardized questionnaires to collect these requests and communicate them to the ministry. Those inquiries are then used to evaluate the need for amendment.

In summary, access to testing is relatively easy in Austria, if the planned test case is covered by the current regulatory framework. In case some parameters of the test case are not covered by the current regulatory framework, it may be hard to estimate the time and effort that is necessary for amendments.

4.2.3.2 Gaps and barriers regarding realization of SHOW Use cases

The Austrian Triplet Mega Pilot includes the cities of Graz, Salzburg in Vienna. Unfortunately, no demonstration will take place in Vienna. Efforts for finding an alternative site within Austria are on-going. Therefore, the following chapter only includes the gaps and barriers that were identified for the realization of SHOW UCs in Graz and Salzburg.

Graz

In Graz two L4 vehicles (upgraded passenger cars) will operate between a public transport terminal and a shopping centre. The planned Use Cases are:

- **UC1.2/1.3/3.4:** Automated shuttle service at public transport terminal

Although upgraded passenger cars will be used in Graz, under the current national legislation the planned SHOW UCs are covered by the test case “Autonomous Minibus”. Nevertheless, AustriaTech collected questionnaires to communicate the need for amendment to the ministry, for example to allow slightly higher speeds or the transport of small goods.

It is currently difficult to estimate when these amendments will happen. In any case, since all other requirements of the test case “Autonomous Minibus” are met, it will be possible to operate the vehicles with a maximum speed of 20 km/h to transport passengers.

Table 23: Graz - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	50%	50%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	None	None

Salzburg

In Salzburg, two L4 shuttles (probably EasyMile) will be operated as a first & last mile feeder and be connected to a C-ITS enabled bus line (non-automated) to the city center. According to D1.2, the following Use Cases are planned in Salzburg:

- **UC1.2/1.3/1.5/1.6/3.1:**
  Automated passenger mobility under complex traffic & environmental conditions in peri-urban areas serving as a first & last mile transport supported by a C-ITS enabled bus corridor connecting the peri-urban area to the city centre.

In Salzburg, all planned UCs are covered by current regulatory framework. Permits have already been granted to SRFG for the vehicle and route, that will also be used in SHOW, and probably just have to be prolonged.

Table 24 shows the feedback for the Demo Board Meetings. One mentioned challenge is related to the current restrictions on the number of passengers due to Covid-19. Hopefully, this issue will not affect the SHOW Demonstration Period. Additionally, due to the steep gradient of the route, operations in winter might not be safe enough to obtain a permit.

Table 24: Salzburg - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	100%	90%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	Due to Covid-19: passenger capacity of the shuttle is limited to 3 passenger (not the same household) + safety operator / 4 passenger (same household) + safety operator.	- Funding for autonomous shuttles - Recruitment and funding of safety operators for the scheduled operations - Integration of the services into a digital mobility service (MaaS app) - Weather related restrictions (snow, ice on the road) may apply, meaning no test permit for the winter months

Vienna

Due to organisational reasons, no SHOW demonstration will take place in Vienna. AustriaTech, as the Austrian Triplet Mega Pilot coordinator and the project coordinators are currently trying to implement an alternative site in Austria.

4.2.3.3 On-going efforts in Austria

Currently the AutomatFahrV is under revision. Beyond others, the planned amendment was also initiated to cover the speed of 30 km/h and goods transport in certain cases. We expect it to enter in force on time for SHOW.

As an addition to the current regulatory framework, the introduction of controlled test and experimentation spaces (sandboxes) is currently being evaluated. The main purpose is to accelerate research and deployment of innovative new systems with new transport technologies in public spaces. The evaluation should explain the specific limits for Austria on controlled experimentation spaces under administrative and constitutional law, as well as their technical feasibility.

4.2.4 Sweden

Swedish entities and research organisations (e.g. Trafikverket, RI.SE, VTI) are involved in numerous projects and pilots on automated driving since several years. To support the development of efficient, connected and automated transport systems, the government-founded and funded (partially) platform DriveSweden was established. It already consists of about 150 partners and underlines Sweden's leading role in creating the mobility system of the future.

4.2.4.1 Current framework in Sweden

In 2017 trial operation with self-driving vehicles was enabled by "Ordinance (2017:309)". A permit from the Swedish Transport Agency may only be granted, if the applicant shows that traffic safety can be ensured and the trail doesn't cause any significant disruption or inconvenience to the surroundings. Furthermore, a physical driver has to be present inside or outside the vehicle.

The information document by the (Swedish Transport Agency, 2019) also mentions, that additional permits, e.g. for public transport of passengers, may be necessary. All activities of the Swedish Transport Agency are mainly financed by fees (hourly rate), that the applicant has to pay.

Table 25: Sweden - Overview

Contact Point	Swedish Transport Agency vag@transportstyrelsen.se
Links for further information	Information page of Swedish Transport Agency (in English): https://www.transportstyrelsen.se/en/road/Vehicles/self-driving-vehicles/ Edict coming into effect on 1.1.2021: https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-2017309-om-forsoksverksamhet-med_sfs-2017-309

Specific characteristics	- Handling costs (approximately 140 € per hour) - Driver can be located outside the vehicle - If software changes occur, a new verification has to be done

In Sweden, every applicant has to prove individually and in great detail that the trial will be safe. It is important to have a red tread in the application. A common way to organize an application is:

Vehicle (ADS + DDT) + Environment (ODD) => Risk analysis => Risk minimization

Vehicle (ADS + DDT): A detailed technical description of the vehicle has to be provided, including a list of exceptions you need from the Vehicle Act i.e. if your vehicle don´t have a steering wheel you need an exception. To get an exception you need to prove that your vehicle is safe. You also need to describe Dynamic Driving Task (DDT) and Automated Driving System (ADS) and their limitations. DDT is about vehicle movements (acceleration, brake, turn left etc.) and ADS is the autonomous technique itself. DDT combined with ADS shall ensure that the vehicle complies with traffic regulations. You also need to do a Factory Acceptant Test (FAT).

Environment (ODD): ODD stands for Operational Driving Domain. You need to provide a detailed description of the environment within the vehicle will operate and a description of traffic rules within the testing area. It is also important to talk to the road owner at an early stage (maybe the road owner is thinking about a road construction). The road owner also knows about traffic accidents in the area and can give you advice about road safety.

Risk analysis: How does Vehicle and Environment fit together? An example: The description of the vehicle´s ADS shows that the vehicle cannot handle roundabouts and the description of the environment shows a roundabout. Ergo you have a risk. How will you as a test operator solve this problem? You need to make an assessment of how serious the risk is. Under what circumstances are you prepared to take a risk? Why? For example: you can grade the risk 1-5 (the likelihood of the risk occurring and how serious is the risk). My vehicle cannot handle roundabout, so I grade that a (5). If my vehicle cannot handle roundabout the risk of someone being injured is very high (5). I am not willing to accept a 5 + 5 risk and need to do something about it. Another example: the probability of a meteorite to hit the test site is (1), but if a meteorite hit the test site everyone will be injured (5). I am willing to accept a 1 + 5 risk in my test.

Risk minimization: You need to prove that your trial is safe enough. For example: to handle the risk that your vehicle cannot handle roundabouts you will switch to manual driving. But switching to manual driving will raise new safety issues i.e. how can the interaction between human and machine be safe enough?

Developing a Safety case is a way to work with risk minimization. In the safety case you can show how training of drivers/operators are done, how information about safety is distributed within the test group/to the agency, how you will act if an accident occurs, who is responsible for what etc.

Additionally, one or more of the following standards may be referred to:

- Threat Analysis and Risk Assessment in Automotive Cyber Security (TARA);
- Hazard and Risk Analysis for the automated system (HARA) (ISO 26262);
- Safety of the Intended Functionality (SOTIF) (ISO 21448:2019).

Site Acceptance Test (SAT): A pre-permit test is needed. It is a one-day test with the Swedish Transport Agency to check everything before getting the real permit.

Exchange of information: You need to provide information to the Swedish Transport Agency when you are no longer within the range of the permit and if an accident/incident occurs, you also need to give an annual report if your test goes on for more than a year and when your test ends.

4.2.4.2 Gaps and barriers regarding realization of SHOW Use cases

The Swedish Twin Mega Pilot includes the cities of Kista and Linköping. Both sites include the implementation of a control tower.

Kista

In Kista, three different types of vehicles will be operated at Kista Science City. According to D1.2, the following Use Cases will be covered:

- UC1.1 First/last mile PT in Kista;
- *UC1.2 First/last mile PT in Kista under complex environmental conditions;*
- *UC1.3 Control Tower connecting to other travellers in Kista;*
- *UC1.6 First/last mile PT in Kista in mixed traffic;*
- *UC1.7 Assistance of driverless vehicle by Control Tower;*
- *UC3.4 Autonomous driving functions at bus stop.*

According to Table 26, SHOW partners are very optimistic to obtain all necessary permits on time for Kista. They also mentioned, that Site Acceptance Tests may be more difficult to handle now, since they are conducted by shooting a movie of the test during the Covid-19 pandemic. Normally they are performed as a one-day test by the Transport Agency.

Table 26: Kista - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	93%	92%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	Site acceptance tests in Sweden these Corona days are made by shooting a movie, this could sometimes be difficult to evaluate for the authorities.	Only financial

Linköping

In Linköping three different L4 vehicles will be operated at the Campus and in Vallastaden. The planned Use Cases include:

- UC1.1: First & Last mile public transportation in normal traffic;
- UC1.3: First & Last mile public transportation at shared space with VRU;
- UC1.6: First & Last mile public transportation in mixed traffic;
- UC1.7: Elin operational Dashboard;
- UC3.4: On-demand stop signal at bus stops;
- UC3.1: Route optimization based on passenger counting;
- UC3.2: Personalized route (on & off) suggestions.

As stated in the table, SHOW partners expect no specific problems regarding the permit application process for Linköping. They already have parts of the permission, and just have to wait for the finalisation of the route.

Table 27: Linköping - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	80%	0%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	No specific	No major, we got the permission for the area and for the vehicles. We will apply for the specific route permission in March. We are waiting for a finalisation of a pedestrian/cycle path.

4.2.4.3 On-going efforts in Sweden

Both Swedish Sites include the implementation of a control tower, but different opinions on the topic of remote operation could be identified. Remote operation of vehicles is in principal allowed, but discussions regarding legal details, especially about liability and technical reliability of “over-the-air” remote solutions are ongoing. Aspects, that are currently being discussed include e.g. “prioritization” of remote control signal in the mobile data network and fall-back procedures in the case the connection to the vehicle is lost.

By 01.01.2021 a new edict will come into effect, that will be applicable for one year. Changes include for example the use of different terms (e.g. “automated” instead of “self-driving”) and several other aspects, that will for example enable driverless tests with vehicles that aren’t amenable to the EU driver’s licence Directive (“motorredskap” - engineering/working vehicles).

4.2.5 Spain

In Spain, the Dirección General de Tráfico (DGT) acts as the central point for promoting legislation regarding traffic, vehicles, drivers and mobility. It also is responsible for traffic management and enforcement and the coordination of research on road safety (DGT, 2016).

4.2.5.1 Current framework in Spain

With “INSTRUCTION 15/V-113”, tests and trials with automated vehicles on public roads were enabled in 2015. It sets very specific requirements for the certification of systems, that the applicant wants to test. The final decision of granting of refusing the authorization is made by DGT and must include the type of trial, the specific route and all other conditions for the test.

Table 28: Spain - Overview

Contact Point	Dirección General de Tráfico, DGT: sgmovilidad@dgt.es movilidad.vehiculos@dgt.es
Links for further information	Instruction 15/V-113 in English: http://www.dgt.es/Galerias/seguridad-vial/normativa-legislacion/otras-normas/modificaciones/2017/15.V-113-Authorization-to-conduct-tests-or-research-trials-of-automated-vehicles-on-roads-open-to-general-traffic._EN.PDF
Specific characteristics	- Costs for application procedure - Vehicle authorizations issued by the competent authorities in European Union member states with equivalent procedures shall also be accepted. - Driver with valid driving license: responsible for the driving and handling of the vehicle if requested even if not physically present in the cabin. - Once granted, this license lasts two years and is valid for the territory under vigilance of DGT. - Any driving out of the defined test zones shall be carried out in non-automated mode.

Instruction 15/V-113 also includes specific requirements for vehicle inspection, checks of dynamic driving functionality, override of automated driving, lateral and longitudinal control, traffic sign recognition etc. Compared to many regulatory frameworks in other countries, the requirements are very specific.

As mentioned in Table 28, one other significant part of the Spanish legislation, is the possibility for mutual recognition with other EU Member States. According to chapter 3. d) of Instruction 15/V-113, the applicant shall submit previously obtained certification

from competent authorities of other EU member states that uses an equivalent prior control procedure.

In general, SHOW partners in Spain mentioned that they would appreciate a less bureaucratic process to obtain the necessary permits. To adapt the regulatory framework to new technologies and systems, the DGT is currently working on an update of Instruction 15/V-113.

4.2.5.2 Gaps and barriers regarding realization of SHOW Use cases

In Spain, SHOW demonstrations will take place at two different sites in Madrid (Carabanchel and Villaverde). A variety of vehicles, including Gulliver Shuttles, a 12m Irizar i2eBus and a Renault Twizy will be used.

Use Cases according to D1.2:

- UC1.1: Automate*d passengers' mobility in Villaverde around Nave ar*ea (normal traffic & environmental conditions).
- *UC1.2: Automated passengers' mobility in Villaverde around Bajo Cruce* (subway station) (complex traffic & environmental conditions).
- UC1.3: Reliable and safe VRU interfacing at Villaverde Bajo Cruce (subway station).
- UC1.6: Villaverde open traffic conditions.
- UC1.7: Shuttle teleoperation at Carabanchel depot.
- UC1.8: Cooperative V2V platooning for electric bus and passenger car.
- UC1.10: SAE L3-4 Villaverde passenger mobility.
- UC3.3: Shuttle and electric bus automated docking at Carabanchel depot.
- UC3.5: SAE L3-4 automated Depot management, at Carabanchel.

Table 29: Madrid - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes (EMT) No (DATIK)
Probability of obtaining al necessary permits on time (M14 for pre-demo)	25%	15% (EMT) 99% (DATIK)
Expected problems regarding technical verification of vehicles	The Gulliver (EMT vehicles) must be instrumented (the tenders are on-going).	None (EMT) None (DATIK)
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None (EMT) None (DATIK)
Additionally mentioned challenges	- Covid - The permit associated to level 3 and 4 are challenging, nevertheless, there is	Due to the COViD 19 pandemic, we are suffering delays (EMT)

	as of August 31st	as of December 10th
	a 'prototype plate' possibility.	

Table 29, in August partners from Madrid only saw 25% probability to obtain the necessary permits by M14. The main reason for this might be, that tenders for the instrumentation of the Gulliver vehicles were not completed yet. They also mentioned that permits are a challenge, but a suitable solution will be found. It has to be mentioned, that the situation seems to be varying for the different sites in Madrid. Partners also mention delays due to the COVID-19 pandemic.

4.2.6 The Netherlands

In 2017, the Netherlands Institute for Transport Policy Analysis published a strategic document, describing the Paths to a self-driving future (KiM, 2017). The country can be described as a first mover in preparing itself for automated transport. Various tests already took place in different traffic environments. The outcomes of those test will also be used to continuously adapt the legislation.

4.2.6.1 Current framework in The Netherlands

Since July, 1st 2019 a new "Experimental Law on self-driving vehicles" is in place. It also allows experiments with the driver outside the vehicle but also imposes strict conditions. Testing automated vehicles on public roads has already been possible since 2015, but the new Experimental Law enabled tests with remote drivers for the first time (Government of the Netherlands, 2019).

Table 30: The Netherlands - Overview

Contact Point	The Netherlands Vehicle Authority, RDW ontheffingen@rdw.nl
Links for further information	RDW, Connected automated vehicles: https://www.rdw.nl/over-rdw/information-in-english/about-rdw/connected-automated-vehicle
Specific characteristics	- The application processing time is approximately three to six months. - Understanding the 'tailored work and flexibility' factors are important in CAD test applications. - Driver can be located outside the vehicle

With the new framework, the Minister of Infrastructure and Water management is the responsible entity to issue the permit. Before a test can be approved, the applications are assessed by RDW (vehicle authority), the police, road authorities and the Dutch Institute of Road Safety Research.

According to SHOW partners, obtaining permits may imply serious costs (<10.000€). Additionally, they would desire a clearer definition of safety requirements and objective pass/fail criteria.

4.2.6.2 Gaps and barriers regarding realization of SHOW Use cases

Brainport/Eindhoven

At Brainport/Eindhoven passenger vehicles (TNO car labs) and a bus will be operated in peri-urban and urban scenarios to fulfil the following Use Cases:

- UC1.1: Intersection crossing at normal operational speed;
- UC1.3: Safety for VRU at intersections;
- UC1.8: Vehicle relocation for automated mobility using platooning.

Table 31: Brainport/Eindhoven - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	No	No
Probability of obtaining al necessary permits on time (M14 for pre-demo)	99% (no need for permit during development phase)	99%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	None	None

Partners in the Netherlands do not expect any problems in obtaining necessary permits, but it must be considered that tests are only permitted on specific road sections within a limited time frame. It may even be necessary to close the specific road section for all other traffic for that time frame.

4.2.7 Czech Republic

In the Czech Republic, no trials for the transport of passengers with AVs have taken place so far and there is no dedicated framework that enables operation on public roads. Recently, the Ministry of Transport has established an Ethics Committee, that will assess all issues related with the operation of automated vehicles in the Czech Republic.

4.2.7.1 Current framework in Czech Republic

As of now, there is the possibility for car producers or technical services to conduct "field-tests". To apply for a field-test permission, the applicant has to possess a homologations certificate or a confirmation that he has applied for homologation. This framework is mainly intended to be used for vehicle development by OEMs and not for testing AVs to transport passengers.

Table 32: Czech Republic - Overview

Contact Point	Ministerstvo dopravy (Ministry of transport) Road Vehicles - Operation Section
Links for further information	Law on traffic: https://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=361/2000&typeLaw=zakon&what=Cislo_zakona_smlouvy Recently established Ethics Committee: https://www.mdcr.cz/Media/Media-a-tiskove-zpravy/Provozem-automatizovanych-a-autonomnich-vozidel-se
Specific characteristics	- Applicant possess a homologation certificate (or confirmation that subject has applied for homologation) - Have a quality control system and fulfil standards of it - Report any changes of conditions on which a permission was issued to the Ministry of Transport

4.2.7.2 Gaps and barriers regarding realization of SHOW Use cases

In Brno a Hyundai i40 Robotaxi, a EasyMile EZ10 shuttle and probably a RoboCargo delivery platform will be used. The planned UCs also include remote operation over longer distance.

Planned Use Cases:

- UC1.2: Lower speed shuttle service.
- UC1.3: Lower speed shuttle service, interfacing VRUs.
- UC1.6: Lower speed shuttle service serving students, commuters, tourists, operating at mixed lanes.
- UC 1.7: Traffic centre controlled remote automated driving over long distance (up to 200 km).

Table 33: Brno - Feedback on permit application process

	as of August 31st	as of December 10th
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	40%	35%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	The AV technology in the Czech Republic is new and there is no previous experience of governmental bodies with AVs used for transporting people. Their inspection and investigation of the whole thing might be therefore very thorough and time consuming.	None
Additionally mentioned challenges	Provider of one vehicle not very responsive in the matter of providing us with the necessary technical documentation to begin a certification/homologation procedure here.	The issue with EasyMile hasn't been fully resolved yet. The final agreement is still moving to the future.

As mentioned in Table 33, due to the lack of a dedicated framework and no previous experience, it may be hard to estimate the time and effort that is required to obtain the necessary permits. Nevertheless, contact to the responsible authority has been established early on, to find a suitable solution. Another challenge is to provide the technical documentation about the vehicles, that Czech authorities require.

4.2.8 Denmark

4.2.8.1 Current framework in Denmark

A task force has been set up to handle experiments with AVs within Denmark. It consists of the Danish Transport Agency, the Danish national Police, the Director of Public Prosecution and the Road Directorate. Also additional authorities may be involved, if necessary (Bonnardel, 2019).

On July, 1st 2017, an amendment of the Danish traffic law entered into force and enabled testing auf automated vehicles on public roads.

Table 34: Denmark - Overview

Contact Point	Vejdirektoratet (Road Directorate): https://www.vejdirektoratet.dk/kontakt
Links for further information	Amendment of Road Traffic Act for tests with automated vehicles: https://www.retsinformation.dk/eli/lta/2017/696
Specific characteristics	- Complex permit application process, many stakeholders and authorities involved, ending with a final decision of the Danish parliament - Plan for information of other road users are very important - Third party assessor required

The Danish permit application process is very special, since it also involves a political process which may be time consuming. Additionally, also a third-party assessor is required which may imply additional costs.

At this point, it is also important to mention, that SHOW partners in Denmark rated the number of requirements and the complexity to fulfil all requirements of the legal framework as very high.

4.2.8.2 Gaps and barriers regarding realization of SHOW Use cases

Copenhagen

In Copenhagen, it is planned to use 3 shuttles and two medium sized buses in Lautrup business area to fulfil the following Use Cases:

- *UC1.1: "Feeder service to Multi Modal PT Hub"*;
- *UC1.2: "Driving in heavy traffic and intersections"*;
- UC *1.3: "Presence of vulnerable road users in intersections" / "Presence of vulnerable road users in AVs driving SAE4 without a safety driver on board"*;
- *UC1.4: "Operator neutral intelligent planning"*;
- *UC1.5: "Integration to local TMC"*;
- *UC1.6: "Operation in mi*xed traffic on smaller private roads & large public road*s"*;
- *UC1.7: "AV Supervision center"*;
- *UC3.1: "Shift between route and DRT mode"*;
- *UC3.2: "Real time planning and information to passengers"*;
- *UC3.4: "Automated service at bus stop"*.

Table 35: Copenhagen - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	0%	2%

	as of August 31st	as of December 10th
Expected problems regarding technical verification of vehicles	Depending on the choice of vehicles that will be part of the test	in previous national tests, the vehicle verification process has lasted up to 14 months. We are expecting the verification for the SHOW demo site vehicles to be significantly quicker, but last up to 6 months.
Expected problems regarding permits, that may be necessary for planned SHOW UCs	Not problems but there are always risks. We keep a table of identified risks and keep track of how we mitigate them.	None
Additionally mentioned challenges	1. This fall (2020) we are conducting a public tender to select 1-2 AV bus operators. Thus we actually do not know which operators and vehicles we will be deploying. 2. Vehicle homologation could be a challenge. In Denmark EZ-10 and Arma are the only two AV buses approved to drive on public roads. We aim at having a 8-m AV bus in our test site, which means a new homologation process. 3. Permit approval includes also a political process in the Danish Parliament. This is out of our control but we have at least good contacts with relevant authorities. 4. Time plan is very tight and interconnected so if one thing get delayed it will have an immediate knock-on effect on the rest of the plan.	Real risk of difficulties in regard to the mapping, due to travel restriction caused by Covid-19.

As shown in Table 35, permits will not be in place in the foreseen time frame. The reason is, that the Danish SHOW partners will conduct a public tender to find an AV bus operator and the appropriate vehicles. Therefor the permit application process cannot be started yet. The public tender will be concluded in March 2021.

Additionally, the permit application process may be very time consuming, since it involves many stakeholders and a third-party assessor is required.

4.2.9 Finland

In 2016, the Finnish Road Transport Automation Road Map and Action Plan for 2016-2020 was published, that also focusses on testing activities. Finnish stakeholders also emphasize on testing automated driving in harsh arctic conditions in the north of the country (ERTRAC, 2019).

4.2.9.1 Current framework in Finland

Finland can be seen as one of the "forerunners" regarding the support of the development automated mobility. Also, Finland has one of the most liberal "testing" legislations. Traffic safety is though out most important and is thus insured through an individual evaluation of test applications which have to include detailed descriptions how traffic safety can be ensured during the test of automated transport systems.

Table 36: Finland - Overview

Contact Point	Finnish Transport and Communications Agency (Traficom) - single window for AV testing: automatedvehicles@trafi.fi
Links for further information	Test plate certificate form: https://www.traficom.fi/en/services/test-plate-certificate
Specific characteristics	- Very liberal legislation - Traffic safety is very important - Individual evaluation of test applications

The permit application process is handled by Traficom in a one stop shop. According to Finnish SHOW partners, handling times are very short compared to other countries (1 month). What they also noted, is that more clarity or dedicated templates could help in the application process. Also the information that is required is increasing continuously.

4.2.9.2 Gaps and barriers regarding realization of SHOW Use cases

Tampere

In Tampere, Sensible 4 shuttles buses will be operated in the residential area Hervanta, covering the following Use Cases:

- UC1.1: Hervanta smooth;
- UC1.3: Hervanta complex;
- UC1.4: Hervanta sustainable;
- UC1.7: Hervanta remote;
- UC3.1: Hervanta DRT.

Table 37: Tampere - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes

	as of August 31st	as of December 10th
Probability of obtaining al necessary permits on time (M14 for pre-demo)	90%	95%
Expected problems regarding technical verification of vehicles	None	None
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	Covid-19 and related challenges in funding.	Due to Covid-19 the funding possibilities by the City of Tampere are limited. It will also be hard to get the originally planned vehicles to Tampere and therefore alternative ones may be used.

According to Table 37, SHOW partners see no problems in obtaining all necessary permits on time. The Hervanta Demo also includes the link to a remote control centre. It has been mentioned, that even the direct remote control of driving functions will be tested there. At this point it should be mentioned, that Finnish SHOW partners gave different answers on the topic of remote operation in the questionnaire on legal frameworks. It should be clarified, if the planned activities with the remote control centre can take place as planned.

4.2.10 Greece

In 2015, a first framework, to allow testing of fully automated driverless vehicles on public roads, was created. On November, 10th 2015 the CityMobil2 demonstration started in the city of Trikala. Automated driving was recognized as an important element for the future public transport planning (ERTRAC, 2019).

4.2.10.1 Current framework in Greece

For a previous project (CityMobil2), the Greek Ministry of Transport, Infrastructure and Networks established a special framework to enable the operation of autonomous buses. In this context, operation only is allowed in a bus lane that is dedicated to the autonomous vehicle (CAD Knowledge Base, 2020d). Also during the currently running demonstrations of FABULOS project in Lamia, a dedicated bus lane is used for the operation of the Auve Tech shuttle.

Table 38: Greece - Overview

Contact Point	Greek Ministry of Transport, Infrastructure and Networks https://www.yme.gr

Links for further information	/
Specific characteristics	- Tests have to be supervised by a public Research or Educational institute - For previous projects testing was only allowed in dedicated bus lanes

Besides the Ministry, also the local municipality and the local road traffic police has to approve the test. In addition, tests have to be supervised by a public research or educational institute.

4.2.10.2 Gaps and barriers regarding realization of SHOW Use cases

Trikala

In Trikala two iDriverPlus shuttles, 2 upgraded BMW i3 and one FURBOT will be used to cover a number of passenger and cargo Use Cases, as listed below.

Planned Use Cases:

- UC1.1a: Autonomous shuttles operation in real urban mixed-traffic environment connecting City Centre with central Intercity Bus Station.
- UC1.1b: Autonomous cargo vehicle operation in real urban pedestrian city-centre environment.
- UC1.2a: Autonomous shuttles operation in real urban mixed and complex traffic environments involving intersections and roundabout connecting City Centre with central Intercity Bus Station.
- UC1.2b: Autonomous cargo vehicle operation and parking in real urban pedestrian city-centre environment.
- UC1.3a: Autonomous shuttles operation in real urban mixed and complex traffic environments involving pedestrian crossings and VRUs connecting City Centre with central Intercity Bus Station.
- UC1.3b: Autonomous cargo vehicle operation, smooth braking and immobilisation in real urban pedestrian city-centre environment.
- UC1.5: Integration of the remote control centre of UC1.7 in a TMC nucleus for the city.
- UC1.6: This is combined with 1.2., as part of the routes will be performed in mixed lanes, with other vehicles.
- UC1.7: Autonomous shuttles and cargo vehicle remote monitoring and emergency braking for immobilization mechanism via the connection with the remote control center.
- UC1.8: Platooning of two passenger cars.
- UC1.10: Autonomous shuttles fixed route and DRT operation in real urban mixed traffic environment connecting City Centre with central Intercity Bus Station. Use of 2 autonomous cars for last mile operation, using local Maas Service.

Table 39: Trikala - Feedback on permit application process

	as of August 31st	as of December 10th
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	72%	70%
Expected problems regarding technical verification of vehicles	Logistics use case and the homologation of the vehicle, we are working on this.	The logistics vehicle is a prototype so we are expecting problems regarding the official process required for technical verification and homologation.
Expected problems regarding permits, that may be necessary for planned SHOW UCs		
Additionally mentioned challenges	Delays due to Covid-19	None

As shown in Table 39, SHOW partners identified some critical issues, but are still optimistic to obtain permits on time.

It is important to note, that the planned SHOW Use Cases in Trikala include transport of cargo and the operation in mixed and complex traffic environments. Until now, there was no dedicated legal framework for this kind of operation in Greece. Nevertheless, SHOW partners stated a high probability that permits will be available on time.

4.2.11 Italy

4.2.11.1 Current framework in Italy

In Italy, the common procedure is, that a local authority sends an inquiry to the Ministry of Transport for the certification of a new transport system. This includes the description of technical standards and a risk assessment. If all requirements are met, a commission of national experts issues a temporary certification for trials without passengers. If the trials without passengers are successful, a permit to run the service, transporting passengers, might be issued (CAD Knowledge Base, 2020c).

Table 40: Italy - Overview

Contact Point	Ministero delle Infrastrutture e dei Trasporti
Links for further information	Road Code: https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:1992-04-30;285 DECRETO 28 febbraio 2018:

	https://www.gazzettaufficiale.it/atto/serie_generale/caricaDettaglioAtto/originario?atto.dataPubblicazioneGazzetta=2018-04-18&atto.codiceRedazionale=18A02619&elenco30giorni=false
Specific characteristics	- Handled as certification for new transport system by Ministry of Transport - Current decree focuses on road transport infrastructure

It has to be noted, that SHOW partners in Italy partially gave different or opposing answers on the questionnaire about legal frameworks. The reason might be, that the procedure is not standardized and requirements and possibilities may be different from case to case.

4.2.11.2 Gaps and barriers regarding realization of SHOW Use cases

Turin

In Turin, one Navya shuttle and one tele-operated car will be passing through the city traffic in mixed traffic to connect to the campus/hospital area.

Planned Use Cases:

- *UC1.2: "*Door-to-door transport of hospital patients in mixed traffic on public *roads"*
- *UC1.3: "Presence of vulnerable road user on smart crossing equipped with C-*ITS capabil*ities "*
- *UC1.5: "Traffic light priority to autonomous shuttle"*
- *UC1.7: "Tele-*operated vehicle *towards the hospital"*
- *UC1.10: "Link between the railway station and the hospital"*

The city of Turin is involved in finding the suitable routes to operate the vehicles, respectively some routes have already been identified as suitable. According to the procedure described before, it should be the city who sends an inquiry to the Ministry of Transport for the certification of a new transport system.

SHOW partners mentioned uncertainties regarding the tele-operated car and regarding delays due to the COVID-19 situation.

Table 41: Turin - Feedback on permit application process

	as of August 31st	**as of December 10th**
Established contact with authority	Yes	Yes
Probability of obtaining al necessary permits on time (M14 for pre-demo)	80%	25%
Expected problems regarding technical verification of vehicles	Still some uncertainties about the retrofitted vehicle	COVID19 restrictions maybe will not allow to go to ISPRA site

	as of August 31st	as of December 10th
Expected problems regarding permits, that may be necessary for planned SHOW UCs	None	None
Additionally mentioned challenges	Some delays in the contacts with the Municipality and the hospital due firstly to the Covid19 emergency and then to the summer break. Still some uncertainties about the retrofitted vehicle.	

4.2.11.3 On-going efforts in Italy

The current decree (DM70 2018) mainly focuses on the Road Transport Infrastructures. However, the new decree (DM71 202X) will also focus on autonomous/intelligent vehicles. DM71 is under final approval by the Italian State Council. It extends the possibilities of DM70 as for types of vehicle (now transport means) to be included in the experiments.

4.3 Twinning countries

In SHOW, twinning and international collaborations are planned with several countries, among others Japan, Australia, China, US, and Singapore. In this section, we review regulations worldwide with a focus on these countries.

There is no harmonised regulatory framework applicable Worldwide. In Europe, the regulatory framework is defined by EU directives, regulations and standards. However, in other countries it is common to find other frameworks such as the self-certification scheme or their own specific regulatory framework. In some cases, their own specific regulatory framework uses the **United Nations Economic Commission of Europe (UNECE)** regulation requirements as a base (CAD Knowledge Base, 2020b).

The **World Forum for Harmonization of Vehicle Regulations**, hosted by UNECE, is the intergovernmental platform that defines the technical requirements applied by the automotive sector worldwide. In order to accelerate progress, the World Forum created a dedicated **Working Party on Autonomous and Connected Vehicles (GRVA)** in 2018. Countries from all over the world (including USA, all European countries, China, Japan, Korea, Australia and South Africa) participate in the work of GRVA, mobilizing expertise from key industries including the automotive, IT, telecoms and insurance sectors, together with civil society (UNECE, 2020).

The information in the following chapters has been mainly retrieved from the Knowledge Base on Connected and Automated Driving (CAD Knowledge Base, 2020a), developed within the EU-project ARCADE (GA No. 824251).

4.3.1 Japan

<u>Testing infrastructure and Procedure Description</u>

Testing of automated driving systems on public roads, may happen according to:

- the Guidelines for Public Road Testing of Automated Driving Systems (National Police Agency, May 2016);
- another procedure not complying with the Guidelines, always with preliminary advice of the police.

The basic conditions for running these tests are as follows:

- the test vehicle complies with the Safety Regulations for Road Vehicles (Ministry of Transport Ordinance nr 67 of 1951);
- the driver is seated in the driver's seat and ensures safety, he always has to be able to operate the vehicle all by himself;
- the vehicle is driven in compliance with the rules of the Road Traffic Act.

Prior to testing on public roads, sufficient driving testing should be conducted at test facilities. Testing on public roads should start in a road environment with few unpredicted situations. Implementing entities should check in advance the traffic environment of the public road they plan to use. A second person aboard in the test vehicle is necessary to monitor the automated driving systems. The test driver needs the drivers' license required for the used test vehicle. The test driver keeps all legal driver responsibilities. He or she is not obliged to hold the steering wheel but is required to monitor the surrounding traffic.

The actors that plan or implement public road testing, are called the "implementing entities". They should take adequate measures to ensure safety and make a Public Road Testing Plan. Furthermore, the implementing entities are responsible for

- the required qualities of the test driver;
- an appropriate cybersecurity when testing on public roads;
- the recording of various data about the driving and the condition of the vehicle.

With regard to testing infrastructure, public roads, as defined in article 2(1)-1 of the Road Traffic Act (= law Nr 105 of 1960) and private testing facilities can be used. The automated driving system used in public road testing, has to be able to be operated by the test driver.

Table 42: Japan - Overview

Organisation(s) in charge	- FOT (National Police Agency) https://www.npa.go.jp/english/ - Ministry of Land, Infrastructure, Transport and Tourism https://www.mlit.go.jp/en/
Links for further information	• National Police Agency: Guidelines for Public Road Testing of Automated Driving Systems (May 2016). Link here. • National Police Agency: Criteria for the permission for use of roads for public road testing of Driving Automation Systems with Remote Control Technology (June 2017). Link here.

4.3.2 Australia

In November 2016, Australian transport ministers agreed to a phased reform program so that conditionally automated vehicles can operate safely and legally on our roads before 2020, and highly and fully automated vehicles since 2020.

Testing infrastructure and procedure description

First, the applicant will need to decide whether to apply under the Test and Evaluation Vehicles option using Regulation 18; or the Discretionary Approval option using Regulation 11.

Following guidelines are described on the website of the Department of Infrastructure, Transport, Regional Development and Communications from the Australian Government dedicated to the Testing of Automated Vehicles (Department of Infrastructure, Transport, Regional Development and Communications of the Australian Government, 2020a).

Vehicle trials

Approvals under Regulation 11 or Regulation 18 are not intended to be for the large-scale commercial deployment of automated vehicles into the Australian market and so the number of vehicles of any make and model should be restricted to a minimum number necessary for the evaluation/research program.

It is expected that a typical trial would involve no more than 1–3 vehicles of a type, although the number of vehicles required to trial a particular use case may necessitate a larger number (such as trials for compatibility with infrastructure and/or the impact on transport systems and passenger services). It is also expected that at least part of the research gathered will ultimately be used towards certifying a vehicle that fully complies with Australia's national vehicle standards, the Australian Design Rules (ADRs) applicable to the relevant category of vehicle (Department of Infrastructure, Transport, Regional Development and Communications of the Australian Government, 2020b).

Road use

Where a vehicle is intended to be used on public roads (defined by most road transport agencies as “roads and road related areas”), the applicant is strongly advised to provide written support from the road transport agency in the jurisdiction where the vehicle deployment is intended.

Table 43: Australia - Overview

Organisations in charge	- Australian Government. Department of Infrastructure, Transport, Cities and Regional Development - NTC (National Transport Commission). https://www.ntc.gov.au/about-ntc/
Links for further information	• Information about the importation of vehicles: https://www.infrastructure.gov.au/vehicles/imports/import_options/av.aspx • Automated vehicle trial guidelines (May 2017): Develop national guidelines governing conditions for trials of automated vehicles. http://www.ntc.gov.au/Media/Reports/(00F4B0A0-55E9-17E7-BF15-D70F4725A938).pdf

4.3.3 China

As translated documents from Chinese official bodies were difficult to be found during our literature review, we refer for this section to the work of an online legal media platform called Conventus Law for Asia Pacific, which summarizes the situation of getting approval for automated vehicles in China.

> China - National Administrative Rules Of Road Testing Of Self-driving Vehicles Promulgated (Conventus Law, 2018)
>
> "Since December 2017, various guidances, implementation rules and other documents relating to the road testing of ICVs ("Local Rules") have been successively issued in locations including Beijing, Shanghai, Chongqing. In addition, road testing facilities for ICVs have been built in Shanghai, Chongqing, Beijing, Zhejiang, Changchun (Jilin), Wuhan (Hubei), Wuxi (Jiangsu) and elsewhere. The legislative and practical insights acquired during the testing processes addressed in these Local Rules have provided a solid foundation for the issuance of nationwide unified administrative rules relating to ICVs.
>
> On April 12, 2018, the Ministry of Industry and Information Technology, the Ministry of Public Security and the Ministry of Transportation jointly issued the Administrative Rules of Road Testing of Intelligent Connected Vehicles (for Trial Implementation) (the "Administrative Rules"), which subsequently came into force on May 1, 2018. The Administrative Rules are the first national level regulatory document on road testing of ICVs. By standardizing and unifying the Local Rules, the Administrative Rules serve to accelerate the development of road testing processes for ICVs in China.
>
> The Administrative Rules set out the requirements and conditions for test vehicles, test applicants and test drivers, and include a number of requirements for the management of tests so as to ensure safety during the road testing of ICVs. More information under https://www.conventuslaw.com/report/china-national-administrative-rules-of-road/"

Table 44: China - Overview

Organisation (s) in charge	- MIIT (Ministry of Industry and Information Technology): http://english.www.gov.cn/state_council/2014/08/23/content_281474983035940.htm - MPS (Ministry of Public Security): http://english.www.gov.cn/state_council/2014/09/09/content_281474986284154.htm - MOT (Ministry of Transport): http://english.www.gov.cn/state_council/2014/09/09/content_281474986284076.htm

4.3.4 United States of America

There is no harmonized regulatory framework for testing in public roads across all the States. Some States though have issued through their Governor executive orders related to autonomous vehicles, e.g. in Arizona, the Executive Order 2018-04 (State of Arizona, 2018) defines any necessary steps to support the testing and operation of self-driving vehicles on public roads within Arizona or the Bill 1298 (State of California,

2012) in California, which established the first procedures for testing self-driving cars in the state. Other laws lay out the rights of law enforcement to seize improperly licensed self-driving cars, the ability of local municipalities to charge specific taxes on driverless taxi services, and other factors relating to self-driving cars.

Table 45: United States - Overview

Organisation(s) in charge	- US Department of Transportation - NHTSA: National Highway Traffic Safety Administration - Each respective Federal State
Links for further information	• Safely Ensuring Lives Future Deployment and Research In Vehicle Evolution Act or the SELF DRIVE Act https://www.congress.gov/bill/115th-congress/house-bill/3388 • American Vision for Safer Transportation through Advancement of Revolutionary Technologies Act or the AV START Act https://www.congress.gov/bill/115th-congress/senate-bill/1885

4.3.5 Singapore

Enterprise Singapore has published a set of provisional national standards to guide the industry in the development and deployment of fully autonomous vehicles (AVs): the Technical Reference 68 (Enterprise Singapore, 2019). Known as TR 68, it promotes the safe deployment of fully autonomous vehicles in Singapore. TR 68 was developed over the past year under the review of the Singapore Standards Council's (SSC's) Manufacturing Standards Committee.

An industry-led effort, four working groups comprising representatives from the AV industry, research institutions, institutes of higher learning and government agencies developed standards covering four key areas of AV deployment:

1. vehicle behaviour,
2. vehicle functional safety,
3. cybersecurity, and
4. data formats.

Overseas experts were also consulted during the development process. These efforts were supported by the SSC, Land Transport Authority, and Singapore Manufacturing Federation-Standards Development Organisation (SMF-SDO).

As a provisional standard, TR 68 will continue to undergo refinement as AV technology matures, with feedback from the industry. The feedback gathered will be used to review TR 68 as it is eventually expanded to cover other aspects of AV development and deployment (Land Transport Authority et al., 2019).

5 International efforts for harmonizing the approval of AV technology

5.1 Approval of automated vehicle technology

5.1.1 Guidelines on the exemption procedure for EU approval of Automated Vehicles

In 2018, the European Commission released a communication on connected and automated mobility. This communication addressed the new opportunities for Europe related to driverless vehicles (European Commission, 2018).

With the communication, the commission proposes harmonized approach towards this technology and sets out an agenda to get it. The agenda provides a common vision and identifies action points for developing and deploying key technologies, services and infrastructure. It is important to remark, that it also looks for obtaining a legal and policy framework prepared for supporting the development of safe connected and automated mobility.

Initially, the Commission identified the use cases that will be relevant until 2030, but not limited to, and remaining open to all the possibilities. The use cases were:

- Passenger cars and trucks able to handle specific situations on the motorway, and some low-speed situations in cities.
- Public transport, for vehicles able to handle specific and limited number of situations at low speed. For these vehicles it is expected to need human supervision.

In order to allow the innovation, the communication states that the Commission should work on the development of a new approach for certifying the safety of automated vehicles.

Currently, new technologies not considered in EU rules, can be validated under EU vehicle approval framework, through an exemption granted on basis of a national safety assessment. To ensure the mutual recognition between Member States and the harmonization of the safety assessments, the Commission decided that would be necessary to create a Guidelines on it.

First of all, it is necessary to understand how non regulated technologies can be approved under current EU framework.

Included in the new EU vehicle approval framework of 2018 (Regulation (EU) 2018/858, 2018), there is a chapter that directly address new technologies or new concepts. Article 39 defines an exemption procedure for these concepts that are incompatible with the regulatory acts that are mandatory for the different vehicle categories.

The procedure defines that the Approval Authority grants that the following conditions are met:

a) the reasons why the new technologies or new concepts make the vehicle, systems, components or separate technical unit are incompatible with one or more of the existing regulatory acts.
b) The description of the safety and environmental implications of the new technologies or new concepts and the measures taken into account in order to ensure at least an equivalent level of safety and environmental protection to that provided by the requirements in respect of which an exemption is sought.

c) Test descriptions and results presented providing that b) is met.

Once granted for the Approval Authority and the Commission, other Member States may accept or not the provisional exemption within their territory. Additionally, the Commission shall take the necessary steps to adapt the current regulatory acts concerned to the latest technological developments.

Thus, given the instructions of the Commission communication regarding the need of creating a common Guidelines, and the requirements defined by the exemption procedure, on February 2019 the EC published the final document of “Guidelines on the exemption procedure for the EU approval of automated vehicles” (European Commission, 2019).

The guidelines provide rules for EU countries to follow in their ad-hoc safety assessments, ensuring coordination in the approval of autonomous technologies. In order to assess the safety requirements, at least the following items shall be described and evaluated:

1. System performance in the automated driving mode.
2. Driver/operator/passenger interaction.
3. Transition of the driving tasks.
4. Minimum risk manoeuvre.
5. Installation of event data recorders.
6. Cybersecurity.
7. Safety assessment and tests.
8. Information provision to automated vehicle users.

The validity of the approval can be limited in time or in registration numbers, and if the necessary steps to adapt the regulatory acts are not done, the validity may be extended with another Commission decision.

License exemptions and the exemption procedure, are two processes that clearly related for AD. Most probably, during the procedure for obtaining the exemption, it will be necessary to apply for a license exemption to the relevant Member State.

The main reason is that part of the safety assessment and tests used for the validation of the system in the Guidelines, should be performed in open road tests, hence exemptions for testing a non-type approved system in real world would be needed through a license exemption (according to the relevant state).

5.1.2 Cooperative, connected and automated mobility Partnership (CCAM)

Highly automated vehicles are starting to have a huge uptake worldwide, for this reason, in Europe the Cooperative Connected and Automated Mobility (CCAM) Partnership has been created, leaded by ERTRAC and with the support of the European Commission (DG MOVE & DG RTD) and of the main association of the transport sector. In this section, an overview of the partnership is done, considering the main document of the partnership (CCAM Partnership, 2020).

The CCAM Partnership aims to harmonise European R&D efforts to accelerate the implementation of innovative CCAM technologies and services. By bringing together the actors of the cross-sectorial value chain, the Partnership aims to exploit the full benefits of new mobility solutions, working on a shared and long-term R&I agenda.

Considering that mobility is changing, new ways to travel are taking part in people’s daily basis, such as carsharing or motosharing, among others, which will end being operated by a full autonomous fleet. This new mobility models, need to be well

integrated into the transport system, and this happens by connecting the vehicles with infrastructure, with the service operator, etc. These new mobility models will enable less congestion in cities, more adaptability of the cities (i.e. the streets do not need to be always 1-way or 2-way, as an example, they can change from east-west, to west-east depending on the time of the day).

The main impacts of the CCAM will be to reduce the number of road fatalities and accidents caused by human error, reducing transport emissions and congestion, ensuring inclusive mobility and goods, and strengthen competitiveness of European industries by having a technological leadership.

The CCAM Partnership is divided in 7 working areas (or clusters):

- Cluster 1: Large-scale demonstration Its main objective is to ensure that the results of all clusters are capitalised and implemented in:

    - Pilots: They comprise different operational domains, and various environmental and road conditions to validate the safe system functioning.
    - Field Operational Tests (FOTs): They will be used to gather information on user interaction and acceptance, providing data on transport efficiency, road infrastructure utilization, energy consumption and road safety.
    - Living Labs: They will support user-interaction and analysis of public acceptance with CCAM in real operation. In a Living Lab, stakeholders have the opportunity to innovate, test and improve new mobility and logistics solutions. An interesting feature that a Living Lab offers to stakeholders is the possibility to test automated mobility solutions fully integrated with public transport.

- Cluster 2: In-vehicle technologies Its main objective is the development of on-board highly automated technologies, such as those to perceive the environment, take decisions, provide protection in case of traffic, among others. Those technologies are essential in highly automated vehicles to guarantee the safe operation of the automated vehicle, enabling safe interaction with other road users and providing protection in case of emergency, considering passive safety but also the vehicle decision making.

- Cluster 3: Validation Its main objective is to provide procedures, methodologies and tools which are needed for validating, verifying & rating CCAM systems. New validation methods are needed in highly automated vehicles, considering that traditional methods would require a huge amount of time and work without having an optimal solution.

  This cluster also aims to optimize the on-board experience, such as per comfort, well-being and privacy & security; responding to the needs of all users.

- Cluster 4: Integrating the vehicle in the transport system Its main objective is to define a future effective and efficient Mobility System, in which Connected Automated Vehicles (CAVs) are part of it. This means, that the vehicle presents a need to interact with infrastructures (both physical and digital).

- Cluster 5: Key enabling technologies (KETs) Its main objective is to focus on the enabling technologies which are key for large scale deployment of

CCAM. These KETs comprise data availability, data storage and data sharing, as well as, Artificial Intelligence (AI) linked to user acceptance and self-learning.

Additionally, Cluster 5 will define the basis for validation and tools for artificial intelligence within CCAM, as well as providing a harmonised approach for data sharing.

- Cluster 6: Social aspects and user acceptance. Its main objective is to be a bridge between the other clusters and the society, with users having a central role, considering that for CCAM to have a successful implementation it is needed a wide acceptance by society. This acceptance comes from gaining trust among most users and the whole society, considering that it implies the use of highly automated vehicles.

  In addition, cluster 6 aims to develop a socio-economic and environmental impact analysis of CCAM, assessing among others, the impact on accessibility, driver and mobility behaviour and emissions.

- Cluster 7: Research coordination Its main objective is to develop harmonised approaches and European frameworks for the assessment of impacts of CCAM technologies and systems, testing on public roads and sharing of transport, traffic and test data.

  Additionally, the EU-wide Knowledge Base (CAD Knowledge Base, 2020a), that will publish and disseminate R&I outcomes from the execution of activities in the previous clusters, will be built and maintained.

The interaction between the different cluster is shown in Figure 7.

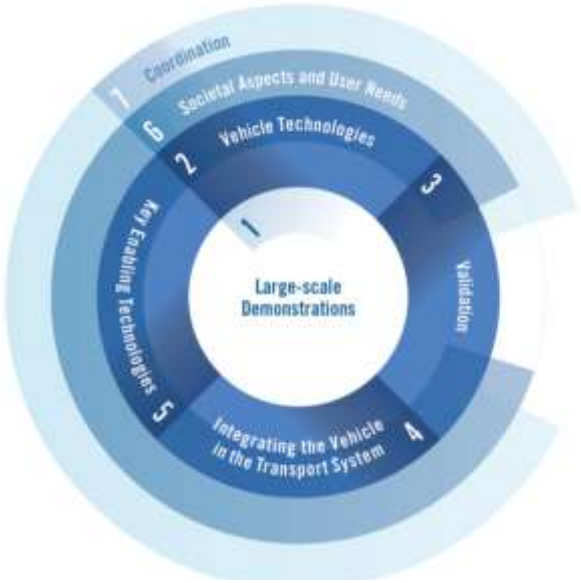

Figure 7: CCAM Partnership Clusters interaction

As mentioned earlier in this section, the main outcomes of this partnership will be the reduction of road fatalities and accidents, transport emissions and congestion reduction, ensuring inclusive mobility and goods, and strengthen competitiveness of European industries by having a technological leadership in cooperative, connected and automated mobility.

5.1.3 Upcoming Regulations for systems related to Autonomous/Connected vehicles

In 2019, the WP.29 adopted and published a framework document (ECE/TRANS/WP.29, 2019), which primary purpose is to provide guidance to the subsidiary working parties (GRs) by identifying key principles for the safety and security of automated/autonomous vehicles. All these key principles are the different topics that will be necessary to regulate in order to ensure a certain level of safety, meaning that AV should not cause any traffic accident that is foreseeable. The following list includes the principles that will be the basis of the further development:

1. System safety.
2. Failsafe response.
3. Human Machine Interface (HMI)
4. Object Event Detection and Response (OEDR)
5. Operational Design Domain (ODD).
6. Validation for System Safety.
7. Cybersecurity.
8. Software Updates.
9. Event Data Recorder.

The following table shows the current work at UN level related to automated/autonomous vehicles, the relevant GR group, and the issues above mentioned that are addressed on it:

Table 46: On-going work on UN level

TITLE	GROUP	KEY ASPECTS
Functional Requirements for automated/autonomous vehicles	**GRVA**	**1. System Safety** **2. Failsafe Response** **3. HMI** **4. OEDR**
New assessment / Test Method	**GRVA**	**4. OEDR** **6. Validation for System Safety**
Cybersecurity and Software Updates	**GRVA**	**7. Cybersecurity.** **8. Software Updates.**
Data Storage Systems for Automated Driving Vehicles	**GRVA with collaboration of GRSG**	**9. Event Data Recorder.**
Event Data Recorder	**GRSG**	**9. Event Data Recorder.**

The WP.29 and the European Commission are developing the first regulatory acts and requirements that will conform the basis for the approval of connected and automated vehicles. These are the most important oncoming regulations within this area:

Table 47: Development of regulatory acts

		Topic	Regulatory act	Application
UN REGULATION	GRSG	Blind Spot Information System	UN R152	6 July 2022
	GRVA	ALKS	UN R157	---
		CS	UN R155	6 July 2022
		OTA	UN R156	6 July 2022
		DSSAD	TBD	7 Jan 2026
EU REGULATION	--	Exception procedure	EU Guideline	In force
	General Safety Regulati	Intelligent speed assistance	TBD	6 July 2022
		Event data recorder	TBD	7 Jan 2026

		Driver Drowsiness Attention Warning	TBD	6 July 2022
		Platooning	TBD	6 July 2022
		Emergency Stop Signal	TBD	6 July 2022
		Reversing Detection	TBD	6 July 2022

5.2 Defining operational environments

Usually, public transport systems with AVs are operated in a very specific area. Thus, the systems only have to meet the requirements to safely operate in the designated area. Therefor the solution for the introduction of reliable and safe transport services with AVs, might be systems that are designed for very specific and limited Operational Design Domains (ODDs).

SAE International (2020) recently published a document together with the Automated Vehicle Safety Consortium, that describes Best Practice for describing such Operational Design Domains. It includes a step by step approach for the description and a comprehensive lexicon for the description of weather-related environmental conditions, road surface conditions, the roadway infrastructure in general, additional operational constraints, other road users, non-static roadside objects and the connectivity.

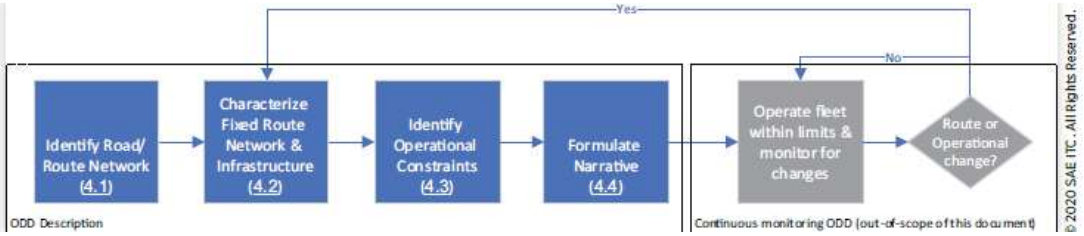

Figure 8: ODD Conceptual Framework Description (SAE International, 2020)

As shown in Figure 8 , the step by step approach for the description of the ODD starts with the identification of the road/route network. In the next step, that specific road/route network has to be characterized. The characterization includes all elements, that are relevant for the operation of the Automated Driving Systems (ADS).

As a next step, Operational Constraints should be identified. This includes testing of the ADS on the road/route networks that was defined and characterized before. When the constraints were identified, a narrative can be formulated. In this step, the route characteristics and the operational constraints are compared and then described as permissive or non-permissive elements.

5.3 Societal and ethical aspects

The societal and ethical aspects of automated mobility are manifold.

In connection with fully automated vehicles the dilemma “whom to kill” (the old or the young person, the mother or the single,…) when an accident becomes unavoidable is widely known and willingly discussed. The basis for this discussion is though the assumption that the vehicle is fully automated, has taken over decision responsibilities from humans, is operated in the “real world” and thus (in most cases) is not supported

by any kind of infrastructure which contributes to avoid such situation or which is at least able to allay the negative impact of such in accidents.

In the case of automated public transport services which are provided by using relatively small (light) vehicles and which are furthermore in most case indispensably supported by normal and digital infrastructure (including information transfer to third parties) and which have to follow well developed operational procedures and which have to successfully complete a comprehensive safety orientated licensing process the chance of such in principal seldom accidents is widely minimized.

Perhaps more important – at least with regards to automated public transport services – are discussions about societal parameters like trust, reliability, affordability, etc.... But of course, even here safety is the main requirements which has to be guaranteed in a trustworthy manner before other aspects can be discussed.

The potential of automated mobility is huge. One big hope is that traffic safety can be increased – nevertheless even automated mobility will never be able to guarantee that the vision zero will be reality, but it can contribute to less fatalities, if used correctly.

Automation can also enable new public transport systems and thus contribute to reduce climate change, because less individual vehicles must be used.

Anyhow, the complete society (decision makers, passengers, third parties) must have trust in the new automated mobility and accept it as a new, reliable, part of daily life. Only then, the demand for automated mobility will arise and it will become efficient and thus widely affordable.

There any many more societal and ethical aspects which have to be considered when introducing automated mobility in societies. Example:

How will automated mobility change the working world. Will it steal my job (says the bus driver), will it improve the quality of my job and thus make me more satisfied (say the same bus driver which is now supported by automated systems) or will it create a new job for me (say the remote operator)?

In any case, to be able to create trust it is important to enable understanding between man and machine. Humans must for example be able to recognize automated mobility and they must know how to operate it and how to act and react correctly.

Therefore, it is very important to investigate around the internal and external interface between man and machine.

Last but not least politicians and other decisions maker have also to investigate if new rules for behaviour in traffic (for machines & humans) are necessary to enable the introduction of automated mobility. If the answer is yes, such rules must be defined, and if required made obligatory via novated or new laws. The society must be informed and trained accordingly.

6 Conclusions

The main goal of SHOW is to **path the way into reality for automated public transport services** which are based on automated vehicles (e.g. shuttles, robotaxis, pods, etc.) and their supporting infrastructure and operational procedures (dedicated automated public transport system) in urban and peri-urban contexts.

The purpose of this deliverable D3.1 was to investigate the currently available legal prerequisites (e.g. legislation, permit procedures), which could be important to reach this goal, and to analyse existing gaps which could hinder or at least delay reaching this goal in the project, based on the use cases foreseen in the SHOW demonstration projects.

Focus was therefore put on a **system orientated approach** (e.g.: vehicle, infrastructure, operational procedures), not (only) on technical details as for example regarding type approval or homologation of vehicles.

Starting point for the legal investigation have been the (international) legislations and procedures for testing automated vehicles on roads with public traffic which today are very broad, as they want to encourage the development and implementation of automated vehicles in the "common" traffic/transport system as a whole. Therefore, technical "safety" aspects of vehicles are often seen as more important than supporting infrastructure or operational procedures. Dedicated rules and regulations which focus on "automated public transport services" can hardly be found in current legislation and permit procedures.

Since "perfect" automated vehicles, which are suitable for public transport services in general traffic conditions (e.g. everywhere and at any time) are still far away and perhaps will never be available, it is necessary to put on the "system (ODD) orientated" glasses if we want to become automated public transport a reality soon.

Status of permit applications of SHOW Sites

Most current national frameworks use different approaches and give different possibilities for applicants that wish to test AV systems. Since the decision often is made on an individual basis and requirements are not always transparent, it is hard to estimate the time required for approval. Additionally, some sites face challenges and delays due to the Covid-19 pandemic.

Next steps

Taking the investigated and analysed (international) legislations and procedures for testing automated vehicles on roads with public traffic as a starting point, **we have to develop "dedicated legislations and permit procedures" for automated public transport services** which do not only contain realistic "ODD" requirements (including requirements on vehicles, supporting infrastructure, operational procedures,…) but also clarify issues like **liability** (who is responsible in the end) and **commercial aspects** (who shall be allowed to offer automated public transport services).

Highest possible safety must always be guaranteed for all stakeholders and third parties, but also other aspects like affordability and reliability have to be considered.

Only if we succeed to describe suitable legal rules and procedures, which make automated public transport systems safe and reliable, we can win the trust of the intended user groups. Only if a sufficient number of users are satisfied they will become regular users; thus automated public transport systems will also become affordable.

Deliverable D3.1 shall be considered as (discussion) basis for the future development of recommendations for **"dedicated legislations and permit procedures" for automated public transport services.**

Within the already ongoing and forthcoming SHOW activities A3.1 and A3.3, important stakeholders (e.g. political decision makers, strategic traffic and transport planners, potential operators) will be contacted and invited to expert workshops.

Thus, it can be ensured, that the opinions and requirements of the stakeholders which can put automated transport systems into reality are affiliated and well understood.

In this way, also national specifics and limitations can be identified and taken account and we will be able to define appropriate recommendations (e.g. "parts which are valid worldwide" & "national features") suitable for a (worldwide) majority.

The planned activities and future recommendations for "dedicated legislations and permit procedures" for automated public transport services will be documented and described in the upcoming deliverable D3.3: Recommendations for Adapting Regulatory and Operational Strategies for CCAV deployment at Local and Regional Level in M30.

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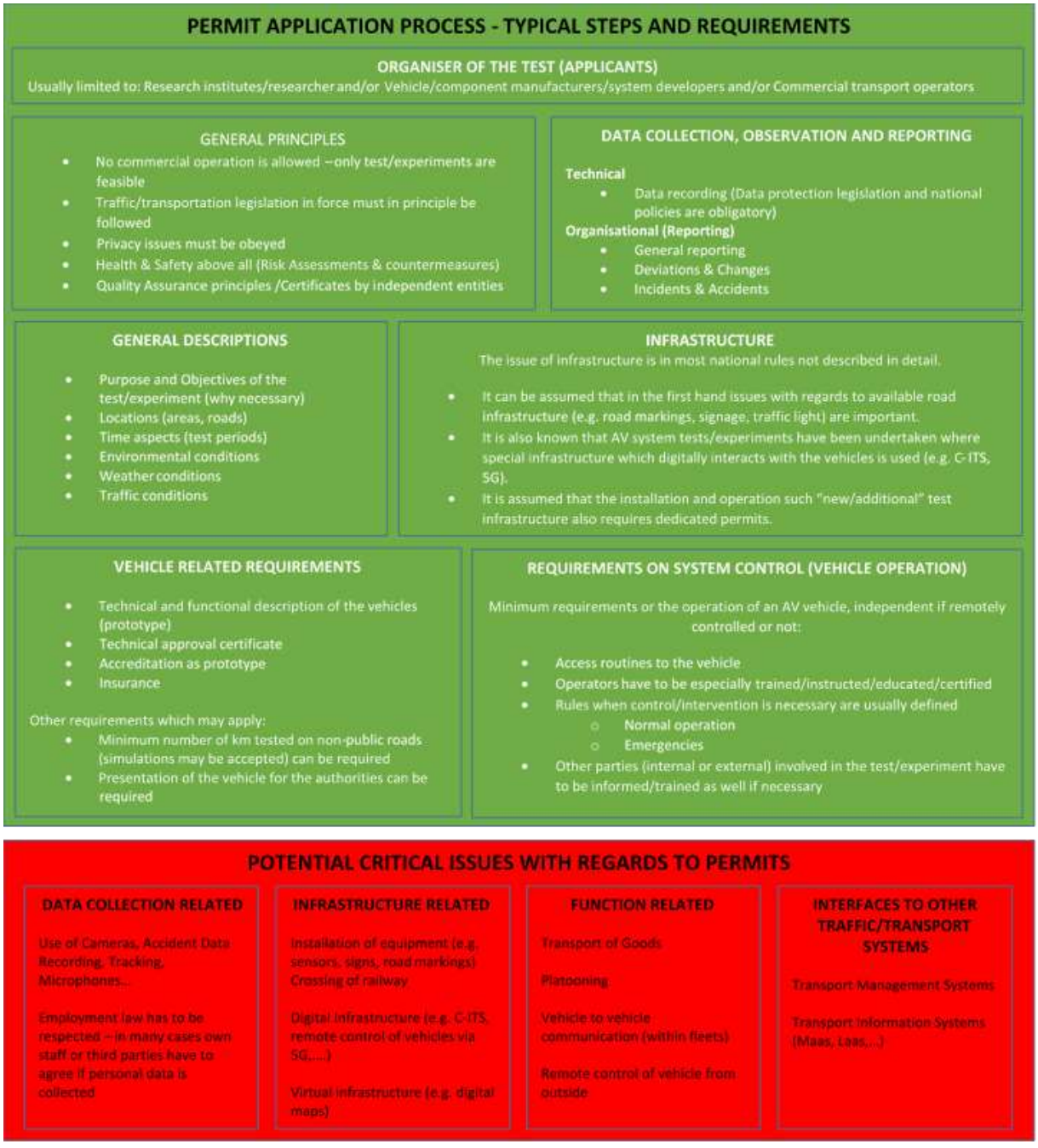
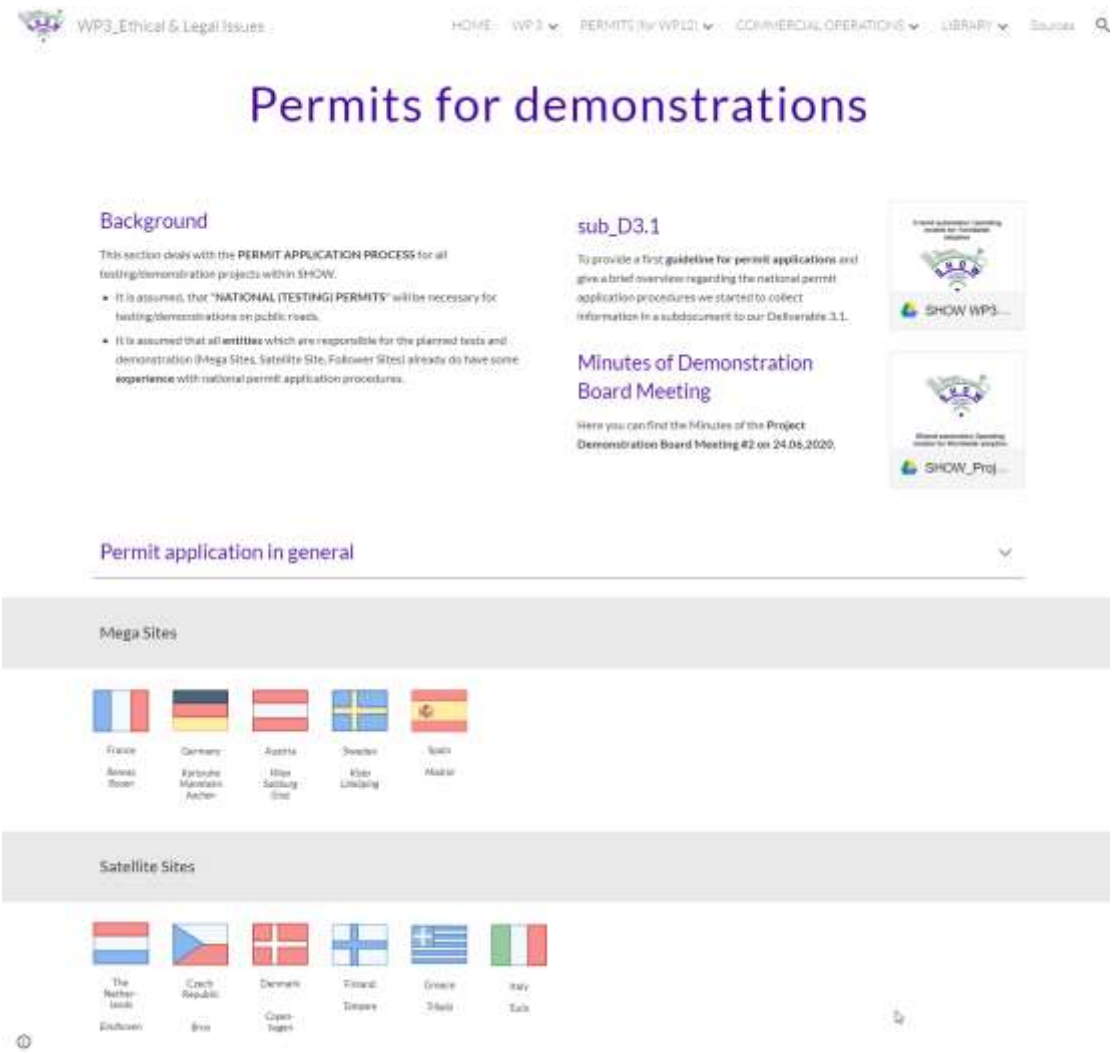
Annex 1

Within our “Guideline for permit applications”, a one-page figure was provided to all SHOW sites, to come to a common understanding of typically important topics:



Information also was provided on a dedicated internal website:



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