Steering the Future: An Overview of Current and Upcoming Regulations in Automated Driving

Version 0.5

Jenny Lundahl

RISE Report 2024:6
Steering the Future: An Overview of Current and Upcoming Regulations in Automated Driving

Version 0.5

Jenny Lundahl
Abstract

Steering the Future: An Overview of Current and Upcoming Regulations in Automated Driving

This report provides an overview of current and upcoming legal frameworks and instruments relevant for automated vehicles (AV) and automated driving (AD). It is the first version of this overview, which will be updated every six months as long as the project ‘Network AD regulation’ runs. Next version of the overview can be expected around June 2024. In this version, legislation as of December 2023 has been considered.

Laws and regulations play a vital role in the safe and efficient integration of AVs into our transportation system. They can ensure that we maximise the benefits of the new technology while minimising the downside risks and help to build public trust in the technology.

Vehicles are sold on an international market and much of the traffic goes across national borders. Therefore, harmonised rules are needed, at least to some extent. A regulatory development around AD is ongoing at international level and regional level within Europe, and this has already resulted in some new regulations. More will come within the next few years. Knowledge of international and EU regulations as well as ongoing and planned regulatory initiatives that affect the development and use of AVs is important for actors in the AV space to follow.

The shift towards AD is disruptive and complex, not least from a regulatory perspective. AVs need partly different requirements than previous vehicles, necessitating the development of new vehicle regulations and traffic rules. AVs must be able to interact safely with other road users (not least unprotected road users) in various traffic situations and driving conditions; anticipate and detect risks and drive with a margin of safety to prevent accidents and injuries; and follow traffic rules. (It is even likely that some traffic rules will have to be written differently than today.) ‘Vehicle regulations’ set requirements for how the vehicles should be designed and function, while ‘traffic rules’ set requirements for how road users should behave in traffic. In AD, it is the vehicle and not the driver that must follow traffic rules. This means that the AV must be designed to comply with traffic rules. This needs to be considered from a regulatory perspective. At the same time, users of AVs may need to have different traffic rules for how they should behave in relation to these vehicles. The legislator also needs to consider this.

Key words: automated driving, autonomous driving, automated vehicles, autonomous vehicles, regulatory development, regulatory landscape
# Contents

Abstract .......................................................................................................................... 2  
Contents .......................................................................................................................... 3  
Foreword .......................................................................................................................... 4  
Terminology ...................................................................................................................... 5  
1  Introduction .................................................................................................................. 9  
   1.1  Background and purpose ....................................................................................... 9  
   1.2  Methodology .......................................................................................................... 10  
   1.3  Scope and delimitations ....................................................................................... 10  
   1.4  Structure of the report ....................................................................................... 10  
2  Automated driving and automation levels ................................................................. 11  
3  Legal frameworks and instruments for automated vehicles and their use ................. 13  
   3.1  Legislation affecting automated driving is international, regional and national ... 13  
   3.2  Who decides which rules in relation to vehicles and their use? ......................... 13  
   3.3  UNECE and its working groups WP.1 and WP.29 ............................................... 16  
      3.3.1  About UNECE ............................................................................................... 16  
      3.3.2  UNECE working groups relevant for automated driving ......................... 16  
      3.3.3  UNECE activities on automated driving ..................................................... 17  
   3.4  International conventions and agreements administered by UNECE ............... 22  
      3.4.1  The 1949 and 1968 conventions on road traffic ......................................... 22  
      3.4.2  The 1958 and 1998 agreements on technical vehicle regulations ............ 23  
   3.5  EU regulations on vehicles and related topics ..................................................... 25  
      3.5.1  EU vehicle regulations ................................................................................. 25  
      3.5.2  EU rules on machinery ................................................................................. 27  
      3.5.3  The upcoming AI Act .................................................................................... 29  
      3.5.4  EU driving license rules ................................................................................. 31  
4  National legislative initiatives for automated driving ................................................. 32  
   4.1  Sweden .................................................................................................................. 32  
   4.2  Germany ............................................................................................................... 34  
   4.3  France ............................................................................................................... 34  
   4.4  United Kingdom ................................................................................................. 35
Foreword

Sweden has 17 strategic innovation programmes funded by the Swedish innovation agency Vinnova, Formas (a research council for sustainable development) and the Swedish Energy Agency. The overall task of the innovation programmes is to create conditions for sustainable solutions to global societal challenges and increased international competitiveness in their respective areas. Drive Sweden is one of these programmes. Drive Sweden comprises members from academia, industry and society and is hosted at Lindholmen Science Park. Together, the members work on challenges associated with the next generation of mobility systems for people and goods.

This report results from work done within the project ‘Network Automated Driving Regulations’. It provides an overview of current regulations and upcoming regulatory initiatives relevant to automated vehicles and automated driving. This report is the first version of the overview, and it will be updated every six months during the project. A new version can thus be expected around June 2024. The report versions will be numbered 0.5 (initial), 1.0, 2.0, 3.0 (final), where higher numbers indicate more refined versions. In this version, legislation as of December 2023 has been considered.

The project brings together industry, authorities, and research at quarterly roundtables to enable dialogue and exchange experiences and knowledge that can help support companies to move forward in the AD arena in terms of technology development, testing and implementation, as well as provide valuable insights to authorities on how the industry reasons and interprets regulations. Outcome of the project can also support a smoother collaboration among actors both internationally and within Sweden. Furthermore, the project aims to

- bring clarity to issues related to the interpretation of current and upcoming laws and regulations relevant for AVs and AD
- monitor new international and EU regulatory initiatives
- proactively influence international and Swedish legislation
- prepare for infrastructure adaptation.

The project is funded by Vinnova (grant no. 2023-01169) through Drive Sweden and by the partners. It runs from June 2023 until May 2025 under the direction of RISE Research Institutes of Sweden AB (RISE). The following entities work in the project: Trafikverket, Transportstyrelsen, Aptiv AB, Applied Autonomy AS, Mobility Sweden, Scania AB, Volvo Cars AB, Einride AB, Keolis AB (participated until November 2023), Klimator AB, Kognic AB, Nobina AB, Statens väg- och transportforskningsinstitut (VTI), Asta Zero AB (from December 2023) and Västtrafik AB (from December 2023).

The analysis and conclusions in the report reflect those of the author. This means that other parties or participants may have different views.

Gothenburg, January 2024

The author

---

1 https://www.vinnova.se/en/m/strategic-innovation-programmes/
Terminology

This section with the tables below describes the terminology (terms and definitions) used in the report. Terms described here may have different meanings in other contexts, and terms with particular meanings elsewhere, e.g. in laws, standards, etc., may not have that meaning here. Abbreviations are also indicated below.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated driving</td>
<td>Refers to when an automated vehicle is driven by its automated driving system.</td>
</tr>
</tbody>
</table>
| Automated driving system     | a) A vehicle system that uses both hardware and software to exercise dynamic control of a vehicle on a sustained basis.  
                         (Amendment to Article 1 of 1968 Vienna Convention on Road Traffic)  
                         b) The hardware and software that are collectively capable of performing the entire DDT on a sustained basis, regardless of whether it is limited to a specific operational design domain (ODD); this term is used specifically to describe a Level 3, 4, or 5 driving automation system.  
                         (The SAE J3016 standard, revised version 2021-04, [developed jointly between SAE International and ISO], equivalent to ISO/SAE DPAS 22736) |
| Automated lane keeping system| A system which is activated by the driver and which keeps the vehicle within its lane for travelling speed of 130 km/h or less by controlling the lateral and longitudinal movements of the vehicle for extended periods without the need for further driver input.  
                         (UNECE WP.29 UN Regulation No. 157) |
| Automated vehicle            | A vehicle equipped with an automated driving system.                                                                                                                                                      |
| Highly automated vehicle     | A vehicle equipped with an automated driving system. This automated driving system operates within a specific operational design domain for some or all of the journey, without the need for human intervention as a fall-back to ensure road safety.  
                         (UNECE/WP.1 Resolution on the deployment of highly and fully automated vehicles in road traffic) |
| Fully automated vehicle      | A vehicle equipped with an automated driving system. This automated driving system operates without any operational design domain limitations |
for some or all of the journey, without the need for human intervention as a fall-back to ensure road safety.

(UNECE/WP.1 Resolution on the deployment of highly and fully automated vehicles in road traffic)

| Dynamic control | This refers to carrying out all the real-time operational and tactical functions required to move the vehicle. This includes controlling the vehicle’s lateral and longitudinal motion, monitoring the road, responding to events in the road traffic, and planning and signalling for manoeuvres.

(Amendment to Article 1 of 1968 Vienna Convention on Road Traffic) |
| Dynamic driving task | a) The control and execution of all longitudinal and lateral movements of the vehicle.

(UNECE/WP.29 UN Regulation No. 157) |
| b) All of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints, and including, without limitation, the following subtasks:
1. Lateral vehicle motion control via steering (operational).
2. Longitudinal vehicle motion control via acceleration and deceleration (operational).
3. Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical).
4. Object and event response execution (operational and tactical).
5. Maneuver planning (tactical).
6. Enhancing conspicuity via lighting, sounding the horn, signaling, gesturing, etc. (tactical).

(The SAE J3016 standard, revised version 2021-04, [developed jointly between SAE International and ISO], equivalent to ISO/SAE DPAS 22736) |
| GNSS receiver (or GPS receiver etc.) | A device capable of receiving signals from global satellite navigation systems (GNSS), i.e. satellite navigation systems with global coverage (GPS, GLONASS, BeiDou, Galileo, etc.). These systems use satellites to provide geopositioning information for various applications, including vehicles. |
| Operational design domain | a) The environmental, geographic, time-of-day, traffic, infrastructure, weather and other }
<table>
<thead>
<tr>
<th>Traffic rule</th>
<th>A legal rule that determines the behavior of road users in traffic. A traffic rule originates from a traffic regulation or other legislation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition demand</td>
<td>a) An instruction from the automated driving system to the driver to take over dynamic control.</td>
</tr>
<tr>
<td></td>
<td>(UNECE/WP.1 resolution on safety considerations for activities other than driving undertaken by drivers when automated driving systems issuing transition demands exercise dynamic control)</td>
</tr>
<tr>
<td></td>
<td>b) A logical and intuitive procedure to transfer the Dynamic Driving Task (DDT) from the system (automated control) to the human driver (manual control). This request is given from the system to the human driver.</td>
</tr>
<tr>
<td></td>
<td>(UNECE/WP.29 UN Regulation No. 157)</td>
</tr>
<tr>
<td>Vehicle regulation</td>
<td>Vehicle regulations set (technical or functional) requirements for how a vehicle should be designed and function.</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>AD</td>
<td>Automated driving / autonomous driving</td>
</tr>
<tr>
<td>ADAS</td>
<td>Advanced driver assistance system</td>
</tr>
<tr>
<td>ADS</td>
<td>Automated driving system</td>
</tr>
<tr>
<td>AI</td>
<td>Artificial intelligence</td>
</tr>
<tr>
<td>ALKS</td>
<td>Automated lane keeping system</td>
</tr>
<tr>
<td>AV</td>
<td>Automated vehicle / autonomous vehicle</td>
</tr>
<tr>
<td>DDT</td>
<td>Dynamic driving task</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GNSS</td>
<td>Global navigation satellite system</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>ODD</td>
<td>Operational design domain</td>
</tr>
<tr>
<td>OTA</td>
<td>Over-the-air software update</td>
</tr>
<tr>
<td>SAE</td>
<td>SAE International, previously Society of Automotive Engineers</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
</tr>
<tr>
<td>WP.1</td>
<td>Global Forum for Road Traffic Safety (working group under UNECE)</td>
</tr>
<tr>
<td>WP.29</td>
<td>World Forum for Harmonization of Vehicle Regulations (working group under UNECE)</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Background and purpose

Automated driving (AD) has the potential to revolutionise our way of travelling and significantly improve traffic safety. At the same time, the new technology may bring new safety challenges to road traffic. It is important to address these challenges to ensure a safe and successful introduction of automated vehicles (AVs) into the transportation system. Laws and regulations play a vital role in the safe and efficient integration of AVs into our transportation system. They can also help to build public trust in the new technology while ensuring that its deployment does not compromise on safety or efficiency.

AVs will only gain wide acceptance in society if safety is guaranteed. Safety is thus an important prerequisite for further promoting the development of AD technology and its use in traffic. AD in all traffic environments will require amendments to legislation. It is important for actors in the AV space to be informed and involved in the regulatory work.

The change towards AD is disruptive and complex, not least from a regulatory perspective. AVs need partly different requirements than previous vehicles. It is thus necessary to develop new vehicle regulations and traffic rules. AVs must, among other things, be able to interact safely with other road users (not least unprotected road users) in different traffic situations and under different driving conditions; anticipate and detect risks and drive with a margin of safety to prevent accidents and injuries; and follow traffic rules. It is even likely that some traffic rules will have to be written in a different way than today.

Traffic rules are largely the same in different countries, as they are based on international conventions that Sweden and many other countries have ratified. Although many traffic rules will be the same for AD as for manual driving, some special rules may be required, e.g. rules on when a physical driver is required, but it may also be necessary to adapt certain rules that are currently aimed at physical drivers and road users in order to ensure road safety.

For example, in Article 7 of the Vienna Convention on Road Traffic it is stated that a driver, pedestrian and/or other road user must behave in a way that does not cause danger or obstruction in traffic and avoid all behavior that can cause damage to persons or to public or private property. This is a basic provision that all road users must consider in order to avoid road accidents. In Sweden, we have introduced a rule of this kind in Chapter 2, Section 1 of the road traffic ordinance ([trafikförordning [1998:1276]]). The rule calls on the road user’s common sense; he or she must have a moral and ethical sense of how he or she should behave. How do you program a computer to follow a rule that is so indefinite? It is not unlikely that more detailed traffic rules may be needed in the future.

Vehicles are sold on an international market and much of the traffic goes across national borders. Harmonised rules are therefore needed, at least to some extent. A development of regulations at international level and EU level is ongoing and has already resulted in some new regulations. More will come within the next few years.
1.2 Methodology

In the project ‘Network Automated Driving Regulations’, representatives from industry actors, authorities, and research institutes meet at quarterly roundtables to discuss and exchange experiences about current and upcoming AD regulations and their implications. The purpose is, among other things, a better understanding of current regulations and ongoing regulatory initiatives and how they affect the development and deployment of AVs, and the role of the regulations in ensuring the safety of these vehicles and acceptance from users and society at large.

When the actors are gathered around the table, knowledge transfer can take place between actors and we can also reach more knowledge together, for instance about which regulations our society needs in order to be able to integrate AVs safely into the transport system. Such collaborations can contribute to the development of policy and regulations. For instance, the outcome of discussions can lead to suggestions to the discussions at UN or EU level as well as suggestions to the Government Offices of Sweden for Swedish regulations to be on par with international and EU regulations.

In parallel with the round table discussions, we continuously follow the development of UN/EU/SE regulations relevant for AVs and AD. This we do through contact with people who actively participate in the regulatory work as well as reading the relevant documents that come out of the work.

1.3 Scope and delimitations

It is not possible to cover everything in this overview of current regulations and upcoming regulatory initiatives relevant for AD. The report is therefore subject to limitations.

In our project, the focus is mainly on UNECE and EU regulations, and the development of Swedish legislation. This report therefore describes the basis of who regulates what in terms of AVs and AD (UNECE/EU/national level), recent or ongoing regulatory initiatives in several areas that affect AVs and AD, e.g. rules on type approval requirements, traffic rules, driving license rules, etc. The overview also includes information about the regulatory work in some European countries (limited to a few).

This report is the first version of the overview, and it will be updated every six months during the project. A new version can thus be expected around June 2024. The scope of the overview may differ to some extent between different versions.

1.4 Structure of the report

The rest of the report is structured as follows:

- Chapter 2 explains what AD is and different automation levels.
- Chapter 3 describes current regulations and upcoming regulatory initiatives relevant for AVs and AD.
- Chapter 4 describes in brief a few national legislative initiatives in relation to AD (Sweden, Germany, France, and United Kingdom).
2 Automated driving and automation levels

This chapter describes what automated driving (AD) is, how automated vehicles (AVs) operate, automation levels, etc. Terms and definitions can be found in Terminology.

In a traditional vehicle that is driven by a driver, it is the driver's task to adapt the driving to the surroundings, e.g. reduce speed in bad weather conditions with poor visibility. AVs, on the other hand, must be able to adapt their driving based on their surroundings. AVs are equipped with an automated driving system (ADS) that can independently control and drive the vehicle during all or part of the journey. AD is when the vehicle is driven by the ADS. To navigate safely on the roads, AVs (more precisely the ADS) use different types of equipment such as GNSS receivers, sensors, cameras, radars, lidars, etc.

Although significant technological progress has taken place in the field of AVs, there are still challenges to overcome before they can operate universally in all areas and weather conditions. Today, AVs are typically designed to operate within specific conditions, setting the limits of where they can be used in automated mode. The specific operating conditions can relate to e.g. location, time-of-day, traffic, infrastructure, speed range, weather and other conditions that can impact the driving situation. These specific operating conditions constitute the operational design domain (ODD) in which the ADS should be able to perform the entire DDT on a sustained basis.

Since 2014, SAE International has, in its taxonomy SAE J3016, divided automated driving functions into six different automation levels from 0 to 5 (as shown in Figure 1 below). Updates of the taxonomy have so far been released approximately every two years. For the latest version, released in 2021, SAE International worked together with ISO to revise the taxonomy. Thus, the SAE J3016 standard revised version 2021-04 is equivalent to ISO/SAE DPAS 22736 (this standard will be replaced by ISO/SAE AWI TS 22736, which is under development).

The taxonomy has since 2014 been widely spread and increasingly accepted internationally. However, it has turned out to be difficult to define the exact boundaries between the automation levels and to define who should do what – the ADS vs the human – at these different levels. Thus, even after several revisions of the taxonomy there is still a lack of clarity. What makes it difficult to define this clearly enough today is that the technology is still under development and also that we still have limited experience in using this new technology. As the technology continues to evolve and we learn more about its capabilities and limitations, it will probably be easier to define what to expect from the technology and to what extent different AD functions will rely on human input or actions. So although the taxonomy can already be useful to facilitate understanding of vehicle automation and the possible role of the human in this context, it is not usually referred to directly in legislation, as is sometimes the case with international standards.

According to SAE J3016, AD starts at level 3. But at this level vehicles and drivers are still interdependent. The technology has the capacity to drive by its own, but the driver needs to take over in certain situations/journeys, when the ADS requests this. The ADS
should be able to decide on its own when this is needed; the driver should not have to monitor this, just be receptive and available for a request to take control (so-called transition demand). At level 4, the ADS should be able to deal with more by itself, but even at this level the ADS needs some human input or actions in some cases. At level 5, the ADS should be able to independently handle every type of journey that a physical driver can handle (i.e. all different driving environments and traffic situations).

Level 2 are advanced driver assistance systems that assist the driver but are not built to handle driving on their own. A driver is needed who constantly monitors and corrects the driving when necessary. This technology can from a user perspective be difficult to distinguish from automated driving as the experience may be that the vehicle is driving by itself. This can lead to an overconfidence in the technology, which can be very dangerous. There are discussions in some countries about how manufacturers should be allowed to market such vehicles, to reduce the risk of consumers being misled about the technology’s capabilities.

AD has often been defined as when the vehicle is driven by an ADS that performs the entire DDT on a sustained basis even if the ADS may need human assistance in some situations while operating within its ODD. For example, an ADS may be designed to issue a request to intervene to a human in charge when it encounters certain events or conditions. However, it should be mentioned that there is a recent discussion in some countries about not calling it AD if a human needs to be brought into the loop under any time of the DDT within the ODD. In that case, the question is how to define AD instead and in which future we can expect to see AVs with that capability. There are experts who say that we will never, at least not in the foreseeable future, see AVs that do not under any circumstances need to bring a human into the loop. Only time will tell.

**Levels of driving automation according to SAE International/ISO**

<table>
<thead>
<tr>
<th>Level 0: No Driving Automation</th>
<th>Level 1: Driver Assistance</th>
<th>Level 2: Partial Driving Automation</th>
<th>Level 3: Conditional Driving Automation</th>
<th>Level 4: High Driving Automation</th>
<th>Level 5: Full Driving Automation</th>
</tr>
</thead>
</table>

Automated driving: level 3–5

Figure 1: Levels of driving automation according to SAE International/ISO. The levels apply to the driving automation feature(s) that are engaged in any given instance of on-road operation of an equipped vehicle. As such, although a given vehicle may be equipped with a driving automation system that is capable of delivering multiple driving automation features that perform at different levels, the level of driving automation exhibited in any given instance is determined by the feature(s) that are engaged.
3 Legal frameworks and instruments for automated vehicles and their use

This chapter summarises in brief the decision-making entities, working groups, legal frameworks, international conventions, agreements, and rules on technical requirements related to AVs and their use.

3.1 Legislation affecting automated driving is international, regional and national

Rules about vehicles and their use are decided at different levels – at global, regional (EU) and national levels:

- **Global level:** international conventions and agreements, and UN regulations based on those legal instruments, and global policy documents such as UN resolutions or UN framework documents.
- **EU level:** EU regulations and EU directives regarding technical specifications for type approval, driving license rules, product safety and product liability, traffic insurance, etc.
- **National level:** national vehicle regulations not covered by UN or EU regulations, national/local traffic rules, national driving license rules (based on international conventions and EU rules), national rules on product liability (based on EU rules), criminal liability, national rules on traffic insurance (based on EU rules), rules for trial operations with AVs, etc.

3.2 Who decides which rules in relation to vehicles and their use?

As mentioned in the previous section, rules about vehicles and their use are decided at different levels – at global, regional (EU) and national levels.

The EU and the EU member states have shared authority in terms of regulation in the field of transport (Article 4.2 g of the Treaty on the Functioning of the European Union, "TFEU"). (Note that changes to current EU regulations can only be made by the EU legislator.) In addition to this, the EU as well as individual EU countries are contracting parties to international agreements on vehicle regulations that UNECE administers. Individual EU countries (but not the EU itself) are also convention countries to the international road traffic conventions (with traffic rules) that are administered by UNECE.

**Vehicle regulations**, which set technical requirements for vehicles and their equipment, are determined primarily at international level by the UNECE and at regional level by the EU. Both the UNECE and the EU have already adopted some vehicle regulations for AVs and their equipment. The EU is a contracting party to both the 1958 and 1998 agreements on technical vehicle regulations administered by the UNECE. The
EU adopts the UN vehicle regulations annexed to the agreements. However, the EU can decide on vehicle regulations not covered by the UN vehicle regulations. Individual EU countries can also decide on vehicle regulations not covered by either UN or EU vehicle regulations.

Most of our Swedish traffic rules originate from international conventions on road traffic which are administered by UNECE: the 1949 Geneva Convention on Road Traffic and the 1968 Vienna Convention on Road Traffic. The EU is not a contracting party to these conventions. However, most EU countries are contracting parties to the conventions.

Driving license rules are essentially harmonised at EU level (and are in turn based on basic driving license rules in the Vienna convention).

Product liability rules and product safety rules are mainly developed at EU level (e.g. Directive 2001/95/EC on general product safety and Directive 85/374/EEC concerning liability for defective products, which is currently undergoing revision and will likely be replaced by a new directive soon).

Criminal law traditionally belongs to the national level (but as in other areas of law, national criminal law can be subject to international influence and for certain phenomena there are international criminal law conventions).

Rules on liability for traffic damage and traffic insurance: Our Swedish legislation on liability and compensation for damages as a result of motor vehicle traffic and rules on compulsory traffic insurance were issued in 1975 (trafikskadelag [1975:1410] and the associated trafikförsäkringsförordning [1976:359]), but this legislation has later been adapted to EU directives. EU law in this area has gradually developed through several directives. Directive 2009/103/EC currently applies, which was amended by the new directive [EU] 2021/2118 on 24 November 2021.

The figures below provide an overview of the legal and regulatory landscape for vehicles and their use with a division into different pieces of legislation at different levels (UN/EU/SE levels).

---

Figure 2: The figure illustrates the legal and regulatory landscape for vehicles with a division into different pieces of legislation at different levels (UN/EU/SE levels). There are many alternative ways that could illustrate this. The illustration is also not exhaustive in terms of the various legislation that affects how vehicles must be designed and equipped. (See Figure 3 below for legislation governing the vehicle user and owner.)

Figure 3: This figure illustrates legislation that governs the user or the owner of a vehicle (e.g. traffic rules that govern the behavior of road users in traffic, requirements for drivers, etc.) with a division into different pieces of legislation at different levels (UN/EU/SE levels). There are many alternative ways that could illustrate this. The illustration is also not exhaustive in terms of applicable legislation. (See Figure 2 above for legislation governing how vehicles must be designed and equipped.)
3.3 UNECE and its working groups WP.1 and WP.29

3.3.1 About UNECE

At global level, the United Nations Economic Commission for Europe (UNECE) plays a crucial role in shaping the future of AD.

The UNECE was established in 1947 by the United Nations Economic and Social Council (ECOSOC). It is one of five regional commissions of the United Nations. UNECE’s primary goal is to promote pan-European economic integration. It includes 56 member states in Europe, North America, and Asia, but all interested UN member states may participate in the work of UNECE. The UNECE facilitates greater economic integration and cooperation among its member countries and promotes sustainable development and economic prosperity through policy dialogue, negotiation of international legal instruments, development of regulations and norms, exchange and application of best practices, as well as economic and technical expertise.

3.3.2 UNECE working groups relevant for automated driving

In UNECE, under Inland Transport Committee (the UN platform for inland transport to help efficiently address global and regional needs in inland transport), there are several working groups of which the most important for AD are:

- Global Forum for Road Traffic Safety (WP.1)
- World Forum for Harmonization of Vehicle Regulations (WP.29)

WP.1 is the working group for road safety that develops the traffic rules and WP.29 is the working group that develops rules about vehicles and systems, so-called vehicle regulations. The development of vehicles and vehicle systems means that the rules must also develop over time.

Under these working groups there are dedicated subsidiary working groups or expert groups:

- Under WP.1:
  - Group of Experts on Road Signs and Signals
  - Group of Experts on drafting a new legal instrument on the use of automated vehicles in traffic
- Under WP.29:
  - GRE Lighting and Light-Signalling
  - GRVA Automated/Autonomous and Connected Vehicles
  - GRBP Noise and Tyres
  - GRPE Pollution and Energy
  - GRSP Passive Safety

Working Party on Automated/Autonomous and Connected Vehicles (GRVA) is the main working party preparing draft regulations, guidance documents, and interpretation
documents for adoption by the parent body WP.29. GRVA deals with safety provisions related to the dynamics of vehicles (braking, steering), ADAS, ADS, and cyber security provisions. The group supervises around 8 informal work groups (IWGs) and tasks forces.

IWGs under GRVA work on specific aspects of AVs:

- IWG on Functional Requirements for Automated and Autonomous Vehicles (FRAV)
- IWG on Validation Methods for Automated Driving (VMAD)
- IWG on Event Data Recorder (EDR) / Data Storage Systems for Automated Driving (DSSAD)
- IWG on Advanced Emergency Braking Systems (AEBS)
- IWG on Automatically Commanded Steering Function (ACSF)
- IWG on International Whole Vehicle Type Approval (IWVTA)
- IWG on Database for Exchange of Type Approval documentation (DETA)
- IWG on Cyber Security and Over-The-Air Software Updates (CS/OTA).

3.3.3 UNECE activities on automated driving

As already mentioned, WP.1 administers international conventions on road traffic that were drafted at a time when automated vehicles were not yet thought of. The Inland Transport Committee (ITC) of UNECE, at its annual meetings, has regularly highlighted the importance of WP.1 developing new institutional strategies on the issue of more advanced vehicle automation vis-à-vis the driver’s role, and scaling up and accelerating legislative initiatives and other automated, connected and automated vehicle initiatives aimed at improving road safety; to enable the future safe coexistence of automated and traditionally driven vehicles on roads; and their interaction with other road users and infrastructure, environmental protection, energy efficiency and traffic management.

WP.1 adopted in 2018 a resolution on the introduction of highly or fully automated vehicles in road traffic (see section 3.3.3.1). In addition, WP.1 adopted in 2022 a resolution on safety considerations regarding non-driver activities when a vehicle is driven in an automated manner (see section 3.3.3.2). These resolutions complement the Geneva and Vienna conventions and provide guidance for the convention countries on the safe introduction of such vehicles into traffic.

WP.1 has also adopted amendments to the Vienna convention to enable the use of automated driving systems. Previously there was a requirement for a physical driver who controls the vehicle according to Article 8, but through new definitions in Article 1 and a new Article 34 bis, the requirement of a physical driver can now be waived if the vehicle meets technical requirements and national traffic regulations.

In order to strengthen global harmonisation, WP.1 has begun a work to develop a new ‘Legal instrument on the use of Automated Vehicles in traffic’ (LIAV), which is expected to complement the Geneva and Vienna conventions. The legal instrument should specifically aim to ensure road safety, in particular the safety of vulnerable road users. A Group of Experts (GoE on LIAV or LIAV GE) has been established to propose a draft of the new legal instrument, and one of their tasks is to identify traffic safety challenges
related to the use of AVs, as the new legal instrument should address them. The new legal instrument will affect both international traffic (enabling) and countries’ national traffic regulations.

WP.29 has also adopted rules on uniform requirements for certain automated driving functions (Regulation No. 157 on ALKS), and for cyber security and software updates (Regulations No. 155 and 156). The harmonisation of technical provisions and/or guidance and resolutions for automated/autonomous vehicles is conducted within the contexts of both the 1958 Agreement and 1998 Agreement (find out more about these agreements in section 3.4.2). GRVA under WP.29 is working on various topics related to AVs, such as functional requirements for AVs, validating ADS, a new assessment/test method, cyber security and OTA-issues, etc. Within GRVA a regulatory approach for ADS is now being developed. The aim is to deliver a UN regulation for ADS to WP.29 by June 2026 and also a UN Global Technical Regulation for ADS with the same delivery date to WP.29. The informal document WP.29-191-30/Rev.1 proposes the creation of a new organisational structure to work on this – that the text of the regulation should be developed by one common group (Informal Working Group on ADS – IWG on ADS).

Further work with regard to AVs and AD is ongoing in both WP.1 and WP.29.

A list of relevant presentations and documents linked to UNECE activities on AD can be found on on their official website on this topic: Automated driving | UNECE.

Summary of WP.1 activities and outcomes relevant for AD:

- Amendments to the 1968 Vienna convention on road traffic in 2021.
- A resolution on the deployment of highly and fully automated vehicles in road traffic (non-binding guidelines) adopted in 2018.
- A resolution on safety considerations for activities other than driving undertaken by drivers when automated driving systems issuing transition demands exercise dynamic control (SAE level 3) adopted in 2022.
- Ongoing: drafting a new legal instrument for safe use of AVs (with the aim to complement the Geneva and Vienna conventions on road traffic).

Summary of WP.29 activities and outcomes relevant for AVs:

- WP.29 Framework Document on Automated Vehicles (FDAV) (there are also outcomes under FDAV, e.g. documents on functional requirements for AVs, a new assessment test method, etc.).
- UN regulations (rules on technical requirements):
  - UN Regulation No. 79 (on technologies supporting the driver regarding lane keeping and lane changes on motorways)
  - UN Regulation No. 155 Cyber security
  - UN Regulation No. 156 Software updates
  - UN Regulation No. 157 Automated Lane Keeping Systems (ALKS)
  - UN Regulation No. 160 Event Data Recorder (EDR).
- Ongoing:
  - EDR performance elements for AD and also a regulation on Data Storage System for Automated Driving (DSSAD)
Regulations covering 'level 4' of automation (new regulations can be expected to build on UN Regulation No. 157, ALKS).

New Assessment/Test Method for Automated Driving.

3.3.3.1 WP.1 Resolution on the deployment of highly and fully automated vehicles in road traffic

This WP.1 resolution, adopted in 2018, provides guidance on the deployment of highly and fully automated vehicles in road traffic. The resolution, which is non-binding, is intended to guide contracting parties to the Geneva and Vienna conventions on road traffic, with respect to the safe deployment of highly and fully automated vehicles in road traffic.

The resolution recognises the continuous progress of automotive and digital technologies, which could improve road safety, including through the deployment of highly and fully automated vehicles in road traffic. It also recognises the potential for innovative safety technologies to improve social well-being by preventing motor vehicle accidents.

The resolution provides complementary recommendations supporting the road safety principles of the 1949 and 1968 conventions on road traffic to facilitate the safe, global deployment of highly and fully automated vehicles in road traffic. It takes into consideration the role of human beings in the context of these vehicles, and it offers recommendations at a global level to achieve a safe interaction between highly and fully automated vehicles and all road users. It is supposed to evolve as technology develops and as experience and evidence accumulate regarding the use of highly and fully automated vehicles in road traffic.

3.3.3.2 WP.1 Resolution on safety considerations for activities other than driving

This resolution on safety considerations regarding non-driver activities when a vehicle is driven in an automated manner was adopted by WP.1 in September 2022. It was submitted by several countries, including Canada, Finland, France, Germany, Japan, Luxembourg, Netherlands, Sweden, and the United Kingdom.

The resolution applies to vehicles equipped with automated driving systems that issue transition demands with the expectation for the human driver to intervene in response to the transition demands issued by the systems. The resolution does not explicitly mention the level of automation, but since it is applicable to systems where the human driver is expected to take over control when a transition demand is issued this typically means level 3 automation (as defined jointly by SAE International and ISO).

The resolution provides guidelines for drivers when automated driving systems are in control. It advises drivers to refrain from performing activities other than driving if those activities impede the take-over of dynamic control when a transition demand is issued. It also advises drivers to refrain from interfering with automated driving systems in a way that could compromise the safe functioning of the systems and road safety in general.
3.3.3.3 WP.29 Framework document for AVs

WP.29 adopted a (revised) Framework Document for Automated/Autonomous Vehicles (FDAV) in 2019. The Framework document’s primary purpose is to provide guidance to WP.29 and its subsidiary Working Parties (GRs) by identifying key principles for the safety and security of automated/autonomous vehicles of levels 3 and higher. The framework document also defines the work priorities for WP.29 and indicates the deliverables, timelines and working arrangements for those certain work products related to those priorities.

WP.29 recognises that AVs must be placed on the market in a way that reassures road users of their safety. WP.29 seeks to avoid poor performance of AVs by creating the framework to help deliver safe and secure AVs, and to promote collaboration and communication amongst those involved in their development and oversight.

The document defines a safety vision, key safety elements, and provides guidance to the working parties of WP.29 as well as a program of work priorities and activities. The level of safety to be ensured by AVs implies that ‘an automated/autonomous vehicle shall not cause any non-tolerable risk’, meaning that automated/autonomous vehicle systems, under their automated mode ([ODD/OD]), shall not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable. Based on this principle, the framework sets out a series of vehicle safety topics to be considered to ensure safety.

The framework establishes that the technical provisions for AVs shall be performance-based and technology neutral, based on the current state-of-the-art while avoiding restricting future innovation. They shall take into account existing standards/guidelines of the contracting parties and in standardisation bodies as well as previous work and reference documents agreed in the UNECE.

The document is supposed to be reviewed and updated once a year, if necessary. The basis document has been revised twice (in 2019 and 2020) and the table with the detailed work priorities has also been updated twice (in 2021 and 2023).

3.3.3.4 UN Regulation No. 157 on ALKS

The UN Regulation No. 157 on automated lane keeping systems (ALKS) was adopted in June 2020 (in force since January 2021) as the first international type approval requirements for AD functions. It is a UN Regulation annexed to the 1958 agreement (explained above in section 3.4.2).

This regulation sets requirements for automated lane keeping systems. Such AD functions correspond to SAE level 3 automation, but the scope of this particular type approval regulation is (currently) limited to certain road conditions: highway like roads, where pedestrians and cyclists are prohibited, and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions. Initially, the function was also only allowed to be used at speeds up to 60 km/h, but after an

---

7 SAE level 3 'condition automation' is the step from assisted driving to automated driving. It is when the vehicle is capable of driving itself in certain scenarios, but a human driver must be ready to intervene as and when required.
amendment to the regulation it now allows the function to be used at speeds up to 130 km/h. At first the regulation only applied to cars and vans, but it was later extended to heavy vehicles as well (trucks, buses, coaches). Previously it was not allowed to change lanes, but later an amendment was adopted so that lane changes will be allowed. In summary, this regulation has undergone several important changes since it was introduced. We can therefore expect more updates to come, as WP.29 is continuously working on the issue.

ALKS allows the driver to hand over the DDT to the system (freeing him/her to do other things until alerted otherwise). Once activated, the ALKS is in primary control of the vehicle. However, the driver must be in a position to respond to a transition demand from the system. The driver should be able to take back control within a defined period of time if prompted to do so by the system. The regulation specifies how the dynamic driving task shall be safely handed back from the system to the driver, including the capability for the vehicle to come to a stop in case the driver does not respond appropriately.

On-board displays used by the driver for activities other than driving shall be automatically suspended as soon as the system issues a transition demand.

The regulation requires a driver availability recognition system, which control both the driver’s presence and availability to take back control of the vehicle.

It also sets requirements for the use of a ‘black box’ (Data Storage System for Automated Driving, DSSAD) and the retrievability of data in the event of a crash.

It also sets requirements for cyber security and software updates in compliance with the UN regulations UN R155 and UN R156.

3.3.3.5 UN Regulations No. 155 and 156 on cyber security and software updates

Simultaneously with the adoption of the new regulation on ALKS in June 2020, WP.29 adopted two other regulations: UN Regulations No. 155 and 156 which deal with cyber security requirements and software updates respectively.

The UNECE’s press release in relation to the adoption of these regulations in 2020 stated that cars today contain up to 150 electronic control units and approximately 100 million lines of software code, which is expected to be 300 million lines of software code by the year 2030, and with this comes significant cyber security risks as hackers may attempt to get access to electronic systems and data, which poses a threat to both vehicle safety and consumer privacy. The UN regulations on cyber security and software updates will help to manage these risks. The regulations came into force in January 2021.

Within the EU, the UN regulation No. 155 is mandatory for all new vehicle types from July 2022 and mandatory for all new vehicles manufactured from July 2024.

UN Regulation No. 156 deals with software updates and software update management. This regulation covers requirements for vehicle and component software updates, but also for a Software Update Management System (SUMS). The regulation ensures that software updates (with or without hardware changes/upgrades) can be performed at any point of time during the lifetime of the vehicles.
3.4 International conventions and agreements administered by UNECE

Technical requirements for vehicles and international traffic rules are agreed by member states of the UN in the framework of the UN conventions and agreements administered by the UNECE:

- The 1949 Geneva Convention on Road Traffic (admin by WP.1)
- The 1968 Vienna Convention on Road Traffic (admin by WP.1)
- The 1968 Convention on Road Signs and Signals (admin by WP.1)
- The 1958 and 1998 agreements on technical vehicle regulations (both admin by WP.29)
- The 1997 agreement on periodical technical inspection of vehicles (admin by WP.29)
- The 1957 agreement on transport of dangerous goods (admin by WP.15).

3.4.1 The 1949 and 1968 conventions on road traffic

The Vienna and Geneva conventions on road traffic contain basic rules for road traffic, drivers, vehicles, driving licenses and road signs and signals. The purpose is to facilitate international road traffic and increase traffic safety. A country that has acceded to the conventions undertakes to ensure that the national road traffic legislation complies in all essential respects with the rules of the conventions. Most of our Swedish traffic rules, driver’s license rules, road signs and signals originate from these conventions. Sweden is a contracting party to both conventions.

The Geneva Convention on Road Traffic of 1949 was signed on 19 September 1949 and came into effect on 26 March 1952. The convention promotes the development and safety of international road traffic by establishing certain uniform rules among the contracting parties. It addresses minimum mechanical and safety equipment needed to be on board and defines an identification mark to identify the origin of the vehicle. It further emphasises that every contracting party should recognise the domestic driving permits issued by other contracting parties.

The Vienna Convention on Road Traffic of 1968 was signed in Vienna on 8 November 1968 and came into effect on 21 May 1977. It aims to facilitate international road traffic and increase road safety through the adoption of uniform traffic rules. It contains provisions on the rules of the road, the conditions for the admission of motor vehicles and trailers to international traffic, the drivers of motor vehicles in international traffic, and conditions for the admission of cycles and mopeds to international traffic. Between the signatory countries the Vienna convention replaces the previous Geneva convention (Article 48 of the Vienna convention). Most European countries have ratified the Vienna convention (but how the convention is interpreted in terms of AD differs between countries).

These conventions were drafted at a time when automated driving systems that could replace the driver’s tasks were not yet envisaged. In 2016, amendments were made to the convention to allow ADAS. In 2021, further amendments were made to enable AD. The
amendment means that an ADS can drive a vehicle instead of a human. Previously, the convention stated that ‘Every driver shall at all times be able to control his vehicle’.

The EU itself is not as a contracting party to these conventions, but most EU countries are contracting parties.

It should also be mentioned that there are legal instruments on road signs and signals. To the 1949 Geneva Convention on Road Traffic there is a Protocol on Road Signs and Signals of 19 September 1949. The 1968 Vienna Convention on Road Traffic addresses the topic of road signs and signals to some extent, but there is also a specific convention dedicated to this topic – the Convention on Road Signs and Signals, which was also signed in Vienna on 8 November 1968, and entered into force on 6 June 1978. This convention is about standardising the signing system for road traffic (road signs, traffic lights, and road markings) in use internationally. The convention revised and substantially extended the earlier Protocol on Road Signs and Signals. It recognises that international uniformity of road signs, signals, symbols, and road markings is necessary in order to facilitate international road traffic and to increase road safety.

Over the years there have also been several European agreements that supplement the conventions.

3.4.2 The 1958 and 1998 agreements on technical vehicle regulations

There are essentially two different systems for vehicle approval before vehicles are placed on the market: type approval and self-certification. These different systems/regimes govern the vehicle approval processes. UNECE administers two international agreements that regulate these systems. The 1958 agreement regulates the type approval system and the 1998 agreement regulates the self-certification regime.

Type approval vs self certification:

- **Type approval:** The type approval system is used for instance in EU countries. The type approval authority evaluates the vehicle and certifies that it is safe. (The remaining risk level for the assessed vehicle is considered acceptable for its entry into service. Still, the manufacturer’s responsibility for the overall vehicle safety remains throughout the vehicle’s service life.) A type approval proves that a vehicle (or component, system or device) type meets the applicable technical requirements. When a type approval is obtained the automaker can bring out the new model.

- **Self certification:** The self certification regime is used in e.g. the United States. The vehicle manufacturer certifies that the vehicle is safe (self certification). (This basically means that it is the automaker who decides if the vehicle is safe, i.e. that it meets the vehicle standards.) The role of the authorities is to act when it does not work, through sanctions or claims for damages, etc.

1958 agreement and annexed UN(ECE) regulations:

- This is an agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on
wheeled vehicles, and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions.

- This enables governments (the contracting parties) to grant and accept type approvals issued in accordance with UN regulations.
- There are 167 UN regulations adopted so far.
- 57 contracting parties, e.g. EU, Sweden, France, Germany, United Kingdom and Japan (not United States and Canada).

1998 agreement and global technical regulations:

- This is an agreement concerning establishing of global technical regulations (GTRs) for wheeled vehicles, equipment, and parts which can be fitted and/or be used on wheeled vehicles.
- GTRs provide a way to establish test procedures and performance requirements for use outside of type approval systems, e.g. under self certification regimes.
- There are 23 GTRs adopted so far.
- 36 contracting parties, e.g. EU, Sweden, France, Germany, United Kingdom, Japan, United States and Canada.

In Sweden, there are regulations on the approval of vehicles (type approval and individual approval) in the Vehicle Act (fordonslagen 2002:574) and the associated ordinance (fordonsförordningen 2009:211). The Swedish Transport Agency (Transportstyrelsen) is the authority responsible for approval of vehicles in Sweden. The Swedish Transport Agency is authorised to issue and, where appropriate, revoke certificates of approval.

A type approval can be in accordance with EU legislation (EU type approval), in accordance with UN(ECE)-regulations (ECE type approval) or as national type approval. A type approval can thus be international or national. An ECE type approval is only for parts of a vehicle and not for the whole vehicle. Each part has its own regulations and must be adopted by the convention country in order to apply nationally. There are currently more than 160 UN regulations. The EU and Sweden have not adopted all these UN regulations. EU type approval can refer to parts or to a whole vehicle. However, some parts in the EU type approved vehicle may be ECE type approved. EU member states recognise a type approval granted by another member state. Thus, a vehicle that is EU type approved in one EU country can be sold in all EU countries.

UNECE/WP.29 has already developed some vehicle regulations in relation to automated and connected vehicles (see sections 3.3.3.4 and 3.3.3.5). Work is also ongoing to develop and deliver a UN Regulation for ADS as well as a UN Global Technical Regulation for ADS within the next few years.
3.5 EU regulations on vehicles and related topics

3.5.1 EU vehicle regulations

EU type approvals are to an increasing extent regulated by EU regulations instead of EU directives in order for the application of the rules to be as direct and harmonised as possible between EU countries. On 4 July 2018, a new framework regulation entered into force within the EU regarding the approval and market control of vehicles – Regulation (EU) 2018/858. It applies from September 2020 and replaces the previous framework directive 2007/46.

On 5 January 2020, a new regulation – Regulation (EU) 2019/2144 – came into force. This is the so-called General Safety Regulation (GSR) which amends Regulation (EU) 2018/858 and updates the EU type-approval requirements with the aim to ensure the general safety of vehicles and the protection of vulnerable road users. The GSR thus sets minimum safety standards for motor vehicles and their trailers in the EU. It applies to new vehicle types from 6 July 2022, and to all new vehicles from 7 July 2024. It sets requirements for some advanced vehicle systems (e.g. intelligent speed assistance, driver drowsiness and attention warning, event data recorder, etc.) that must be present in all motor vehicle categories and also specific requirements relating to certain motor vehicle categories. The GSR also contains rules for type approval of AVs in the EU. However, it is currently limited to small series of a maximum of 1,500 vehicles per model and year. The GSR mandates the EC to adopt more detailed rules for the type approval of AVs.

Uniform procedures and technical specifications for the type approval of the automated driving system (ADS) of fully automated vehicles in the EU was adopted by the EC on 5 August 2022 in the Comission implementing regulation (EU) 2022/1426 on type

---

8 EU directives and EU regulations are both types of legislation used by the EU, but they work in different ways. EU regulations become directly applicable in the same way at the same time in all EU countries, while EU directives must be implemented in national law in each country and the countries usually have some flexibility in how they implement the rules if they achieve the intended outcome. An EU regulation thus is a binding legislative act that must be applied in its entirety across the EU and each member state must ensure their domestic laws do not conflict with the regulation. However, certain national regulations that supplement the EU regulation are sometimes needed, for example to designate which authority should have a certain task.


approval of ADS of fully automated vehicles\textsuperscript{11}. As explained in the preamble of the regulation, the approval of ADS of AVs (not fully automated) should not be covered by the implementing regulation, as it is intended to cover them with a reference to UN regulation No. 157 on ALKS).

The EU definitions of fully automated and automated vehicles can be found in Articles 3.21–22 of the GSR:

- A ‘fully automated vehicle’ means a motor vehicle that has been designed and constructed to move autonomously without any driver supervision (Article 3.22 GSR).
- An ‘automated vehicle’ means a motor vehicle designed and constructed to move autonomously for certain periods of time without continuous driver supervision but in respect of which driver intervention is still expected or required (article 3.21 GSR).

Subject to the provisions of Regulation (EU) 2018/858 and any relevant EU legislation, the implementing regulation is without prejudice to the right of Member States to regulate the circulation and the safety of operation of fully automated vehicles in traffic and the safety of operation of those vehicles in local transport services. This is explained in the preamble.

The scope of the type approval in accordance with the implementation regulation is limited to the following use cases:

a) Fully automated vehicles (incl. dual mode vehicles) designed and constructed for the carriage of passengers or carriage of goods on a predefined area.

b) ‘Hub to hub’: fully AVs (incl. dual mode vehicles) designed and constructed for the carriage of passengers or carriage of goods on a predefined route with fixed start and end points of a journey/trip.

c) ‘Automated valet parking’: dual mode vehicles with a fully automated driving mode for parking applications within predefined parking facilities.

This scope of the regulation is to be reviewed regularly to add more use cases if needed (stated in the preamble).

For the whole-vehicle type-approval of fully automated vehicles, the type-approval of their ADS under the implementing regulation should be complemented with the requirements set out in Annex II, Part I, Appendix 1 of Regulation (EU) 2018/858. As next stage, the EC will continue the work to further develop and adopt by July 2024 requirements for the EU whole-vehicle type-approval of fully automated vehicles produced in unlimited series (stated in the preamble). It should also be mentioned that the current EC type approval for AVs does not cover all motor vehicle categories. Put

\textsuperscript{11} Commission implementing regulation (EU) 2022/1426 of 5 August 2022 laying down rules for the application of Regulation (EU) 2019/2144 of the European Parliament and of the Council as regards uniform procedures and technical specifications for the type-approval of the automated driving system (ADS) of fully automated vehicles.
simplistically, it covers cars and trucks but not buses. As of this writing we do not know which motor vehicle categories the upcoming type approval regulation in July 2024 will cover.

3.5.2 EU rules on machinery

A motor vehicle is basically a machine. It is equipped with several parts, an engine, and a control unit. Yet, the term ‘machinery’ encompasses a wider spectrum. While all motor vehicles can be considered machines, not all machines are vehicles. For example, a washing machine is a machine but not a vehicle.

In terms of regulation, a distinction is made between vehicles and machines. The Machinery Directive does not apply to motor vehicles and their trailers covered by type approval, with the exception of machinery fitted to those vehicles. However, the application of the regulations can depend on the specific use case and location of the product. This will be explained in more detail below.

Vehicle regulations generally applies to motor vehicles and their trailers intended to be driven on public roads. The regulations set requirements for the safety and environmental performance of such road vehicles. The relevant regulations for AVs have been described in previous sections of this report.

The Machinery Directive is an EU directive concerning machinery and certain parts of machinery. The directive aims at harmonising the health and safety requirements to guarantee a high level of protection for EU workers and citizens, while ensuring the free circulation of machinery on the EU market. The directive applies to machinery products that are placed on the market for the first time.

A ‘machine’ is a composite unit that has at least one moving part and is powered by one or more energy sources. A machine can have a motor with its own energy source, for example energy from a battery; be connected to one or more external energy sources such as electricity or compressed air; use mechanical energy that comes from other equipment; be powered by natural energy sources such as wind or hydropower. A machine is not a composite unit operated by direct power from a human or animal and which ceases to function as soon as the power ceases, such as hand-operated lawnmowers, hand-operated drills, or hand-drawn carts.

Vehicles can be categorised in different ways for different purposes. For example, vehicles are divided into different categories for type approval purposes. In EU type approval, the main categories of vehicles are category M (vehicles carrying passengers), category N (vehicles carrying goods), category L (2- and 3-wheel vehicles and quadricycles), category T (agricultural and forestry tractors and their trailers), and category O (consists of trailers). In this classification, a passenger car belongs to category M1, and a bus belongs to category M2 or M3, depending on the weight. Vehicles can also be divided into different categories for driving license purposes. In Sweden, for example, the categories range from AM (for mopeds) to DE, each with specific age requirements and entitlements. For example, a passenger car falls under category B, and a heavy bus falls under category D. So vehicles can be categorised for different regulatory purposes and the categories may not directly correspond to each other.


Means of transport are, in general, excluded from the scope of the Machinery Directive, but machinery mounted on means of transport are subject to the Machinery Directive (Art. 1.2). Examples of machinery mounted on means of transport include, for example, loader cranes, tail lifts, tipper bodies, vehicle or trailer-mounted compressors, vehicle-mounted compaction systems, vehicle-mounted concrete mixers, skip loaders, powered winches, tippers, telescopic lifting arms and vehicle-mounted mobile elevating work platforms. Where such machinery is mounted on motor vehicles, trailers or tractors that are excluded from the scope of the Machinery Directive, the requirements of the Machinery Directive do not apply to the vehicle, trailer, or tractor itself. However, the requirements of the Machinery Directive apply both to the mounted machinery and to all aspects of the interface between the machinery and the chassis on which it is mounted which may affect the safe travel and operation of the machinery. Machinery mounted on means of transport is therefore distinguished from self-propelled mobile machinery such as, for example, self-propelled construction machinery or self-propelled agricultural machinery, which is subject to the Machinery Directive in its entirety.\textsuperscript{15}

If a truck has a lift to help load and unload heavy items, the type approval regulations would apply to the truck as a whole, ensuring that the vehicle meets all relevant safety and environmental requirements, but the Machinery Directive would apply to the lift, ensuring that it meets essential health and safety requirements.

However, the application of the regulations (the vehicle regulations vs the Machinery Directive) can depend on specific circumstances – the specific use case and location of the vehicle/machine.

It has been discussed that it would be easier to start the market introduction of AVs in enclosed areas than on the roads, since there are fewer rules that the vehicle needs to consider, and the environment is less complex. Traffic legislation in Sweden distinguishes between road/off-road and enclosed/non-enclosed areas (roads). Within an enclosed area, many traffic rules do not apply that would otherwise apply out on the road. There is also a difference concerning who shall determine whether a vehicle is safe to use. For vehicles to be used on the road, it is the Swedish Transport Agency, as the type-approval authority, that decides whether a vehicle is safe to use. This also applies to AD since the Swedish Transport Agency can grant permission for trial operations with AVs. Within enclosed areas, there is no authority that grants approval for the use of a vehicle/machine, rather, it is the manufacturer/employer who determines whether the vehicle/machine meets the safety requirements and ensures this. This can be accomplished by means of CE marking in accordance with the Machinery Directive. The employer also has an obligation to ensure that the work environment is safe for the employees, which is supervised by the Swedish Work Environment Authority (Arbetsmiljöverket). Within enclosed areas there is therefore no authority that grants permission for the use of an AV, but the onus is on the manufacturer/employer to decide if it is safe to use. However, in the event of a workplace accident, the Swedish Work Environment Authority will investigate the accident.

Researchers have described a case where a bus on a regular basis is driven in both manual mode on public roads and in autonomous mode within an enclosed area (a bus depot).

The bus would be type-approved for manual traffic with a driver (SAE levels 0–2), but not approved for automated road operation (SAE levels 4–5). During the span of a single day, the bus will therefore alternate between the regulations for enclosed (fenced depot) and non-enclosed (road) areas, between being autonomous and not autonomous. The bus was previously a legal ‘static whole’ but will now instead be tested based on two regulations depending on the environment it is in at any given time and the level of autonomy. This is a completely new situation: that a bus is ‘dynamically divisible’ from a regulatory perspective, which has significance in terms of who shall decide whether the vehicle is safe to use in a certain environment. The conclusion of the researchers was that, in order to be considered safe in autonomous mode within the depot, the bus should be self-certified by means of CE marking according to the Machinery Directive.  

Recently, a new machinery regulation has been decided by the EU. After a several-year process to revise the Machinery Directive, the EU decided on the new machinery regulation on 22 May 2023. The regulation contains product requirements for machinery and related products and is aimed at manufacturers, distributors, and importers. The regulation harmonises the essential health and safety requirements for machinery in the EU, promotes the free movement of machinery, and ensures a high level of safety for workers and citizens. The new machinery regulation applies to means of transport by road that are not yet covered by a specific Union legal act (except in respect of risks that might arise from circulation on public roads). This means that vehicles that are not subject to EU type approval under Regulation (EU) 167/2013, Regulation (EU) 168/2013 or approval under Regulation (EU) 2018/858 are covered by the machinery regulation.

The new machine regulation aims to better fit with the technological advances made in the last decade and is intended to give a new boost to the machinery sector. For instance, it considers artificial intelligence (AI) by setting requirements for machines that have fully or partially self-developing behavior and that use machine learning methods. The manufacturer must engage a third party (notified body) who assesses whether such machines comply with the requirements. However, it is the manufacturer who ensures that a machine maintains its safety throughout its lifetime. Furthermore, requirements are placed on cyber security in machines. Also, the requirements for autonomous and remotely controlled mobile machines are also clearer than before.

3.5.3 The upcoming AI Act

Artificial intelligence (AI) is a significant enabler for AD, aiding in various aspects from data collection and analysis to decision-making and efficiency improvement. Many complex tasks that AVs have to deal with to achieve high levels of automation can be addressed by using AI. Without AI, the vehicle’s ADS must be programmed in advance on how to handle a particular situation. The problem is that many different situations can arise in road traffic. The ADS may be programmed to handle 100,000 situations, but if situation 100,001 occurs, the ADS cannot resolve the problem.

---

At regional level within Europe, the EU is now about to regulate through hard law some of the principles of AI. The upcoming AI Act\textsuperscript{18} will create a legal framework for AI in the EU. This means that the EU will soon decide what an AI system is and what requirements it must meet before it can be placed on the market in Europe. The proposed AI Act is still being negotiated, but within a few years we will likely have an EU regulation that defines what counts as an AI system and which risk category it belongs to with accompanying requirements. The aim is to promote a European development and use of AI that respects the Union’s values and rules on fundamental rights.

The proposed AI Act assigns applications of AI to different risk categories. AI systems that create an unacceptable risk are banned. High-risk applications are subject to specific legal requirements. Applications not explicitly banned or listed as high-risk are largely left unregulated.

The AI Act is a horizontal legal framework, which means that its requirements should apply across all sectors. However, the horizontal nature of the proposal requires full consistency with existing EU legislation applicable to sectors where high-risk AI systems are already used or likely to be used in the near future.

As regards high-risk AI systems which are safety components of products, the proposal will be integrated into the existing sectoral safety legislation to ensure consistency, avoid duplications, and minimise additional burdens. As regards high-risk AI systems related to products covered by the New Legislative Framework (NLF) legislation (e.g. machinery, medical devices, toys), the requirements for AI systems set out in the proposal will be checked as part of the existing conformity assessment procedures under the relevant NLF legislation. The applicability of the requirements of the AI Act should thus not affect the specific logic, methodology, or general structure of conformity assessment under the relevant specific NLF legislation. This approach is reflected in the interplay between the proposed AI Act and the new Machinery Regulation. While safety risks of AI systems ensuring safety functions in machinery are addressed by the requirements of the AI Act, certain specific requirements in the Machinery Regulation will ensure the safe integration of the AI system into the overall machinery, so as not to compromise the safety of the machinery as a whole.

As regards high-risk AI systems related to products covered by relevant Old Approach legislation (e.g. aviation, cars), the proposed AI Act would not directly apply. However, the ex-ante essential requirements for high-risk AI systems set out in the proposal will have to be considered when adopting relevant implementing or delegated legislation under those acts. This means that even if the proposed AI Act does not directly cover AVs and their AI systems, despite its cross-sectoral approach, several of the requirements will likely also apply to AVs by being integrated into regulations for the type approval of motor vehicles in the future. So, while vehicles are initially exempt from the proposed AI Act, some of its requirements will still apply to vehicles via other regulations.

The proposed AI Act’s definition of AI is quite broad, and is focused on its outputs and objectives, rather than its underlying technology or algorithms. It is rather close to the OECD’s definition of AI. The proposed definition of AI system means software that is developed with one or more of the techniques and approaches listed in Annex 1 of the

\textsuperscript{18} Proposal for a Regulation laying down harmonised rules on AI (AI Act) (COM(2021) 206 final.}
proposal and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with. Annex 1 of the proposal lays out a list of techniques and approaches that are used today to develop AI. Accordingly, the notion of ‘AI system’ would refer to a range of software-based technologies that encompasses ‘machine learning’, ‘logic and knowledge-based’ systems, and ‘statistical’ approaches. The definition covers AI systems on a stand-alone basis or as part of a product. Since the legislation is meant to be ‘future-proof’ and also cover upcoming AI, the EC will progressively supplement the list with new approaches and technologies for AI systems through the adoption of delegated acts.

In addition to the AI Act, the EC has also proposed a directive, the AI Liability Directive\(^19\), to establish uniform rules for certain aspects of non-contractual civil liability for damage caused with the involvement of AI systems. The proposal aims to address the specific difficulties of proof linked with AI and ensures that justified claims are not hindered. It creates a rebuttable ‘presumption of causality’, easing the burden of proof for victims to establish damage caused by an AI system. So the AI Act and the AI Liability Directive are two separate, but related pieces of legislation proposed by the EC. While the AI Act focuses on the prevention of harm caused by AI (i.e. ensuring AI is developed safely), the AI Liability Directive focuses on providing redress following harm caused by AI.

### 3.5.4 EU driving license rules

Our Swedish driving license rules are largely based on EU’s driving license directive(s). The EU’s driving license rules have been progressively introduced through three directives in 1980, 1991, and 2006. The EU rules are in turn based on the provisions on driving licenses in the 1968 Vienna Convention on Road Traffic.

Among other things, the current EU directive from 2006\(^20\) regulates different requirements for different driving licence categories, i.e. which driving licenses are required for a driver to drive certain motorised vehicles.

In March 2023, the EC published a proposal\(^21\) for a revised driver’s license directive which will replace the current directive from 2006. The revised directive contains new test rules that will prepare future drivers for, among other things, automated driving. The rules establish requirements in terms of knowledge, skills, and behaviour. According to the proposed requirements, drivers of all power driven vehicles must have sufficient knowledge on the usage of ADAS and of other automation aspects of a vehicle. However, there is nothing in the proposal that suggests anything other than that a physical driver will still be required in relation to a motorised vehicle also when it is driven in an automated manner.

---


4 National legislative initiatives for automated driving

Around the world, many countries are currently reviewing and adapting their national legislation to prepare for the introduction of AVs on public roads. This chapter provides some examples of such national legislative initiatives.

4.1 Sweden

In Sweden, legislation on trial operations with AVs was introduced in 2017. A permit from the Swedish Transport Agency (Transportstyrelsen) is required to conduct trial operations with AVs. A basic condition for obtaining a permit is that the applicant can prove that the trial operation will be conducted in a traffic-safe manner. This is done by showing that all safety risks associated with the test have been considered. The AD functions must be described and shown to be safe for those inside of the vehicle as well as those in the surroundings. To show that risks and control strategies have been analysed and set at a minimum level, a safety plan, a system and trial definition, and a risk analysis has to be submitted. Trial operations with AVs is regulated in the Regulation on experimental activities with automated vehicles (förordning [2017:309] om försöksverksamhet med automatiserade fordon). In the Swedish Transport Agency’s regulations and general advice on permission to conduct trials with automated vehicles (TSFS 2021:4, last amended by TSFS 2022:82) there are further provisions.

Going beyond tests, Sweden has, like many other countries, begun to rewrite the legislation for a wider adaptation of AD. In 2015, the Swedish government decided to appoint an inquiry to develop a legal framework to enable AD on Swedish roads. In 2016, the inquiry proposed legislation for test operations (see the report SOU 2016:2822). This legislation was introduced in 2017, as already mentioned. Later, in 2018, the inquiry also proposed legislation for the deployment of AD (up to level 5 automation) (see the report SOU 2018:1623). After a referral process of the inquiry’s proposal, the government decided to investigate the liability issues further, instead of submitting the proposal to the parliament. The Government Offices then presented a slightly adjusted proposal in 2021 (see the report Ds 2021:2824). This report was also sent out for consideration to relevant bodies. Since then, the Government Offices has been preparing the proposals.

About the proposal (from 2021):

- The proposed liability regime is quite similar to the liability regimes adopted in Germany and France and the proposed liability regime in the United Kingdom.

---

24 Ministry of Rural Affairs and Infrastructure (Landsbygds- och infrastrukturdepartementet, previously Infrastrukturdepartementet): Ansvarsfrågan vid automatiserad körning samt nya regler i syfte att främja en ökad användning av geostaket, Ds 2021:28.
In the proposal, a new driver role – ‘förare i beredskap’ (‘driver in readiness’) – is introduced. This is a new driver role with fewer but other tasks. According to the proposal, the driver in readiness should not be responsible for how the ADS performs the DDT, but he/she must take control if the ADS so requests. Failure to do so may result in criminal liability. The driver in readiness is defined as the person who activates the ADS or takes over the task for a vehicle where the system is already active. The task remains a responsibility until the ADS is deactivated or the task is taken over by another person. The driver in readiness may engage in activities other than monitoring the driving, if the activity does not prevent him or her from responding to a request from the ADS to take control. In conditional automated driving (level 3 automation as defined by SAE), it is not permitted to use a hand-held mobile phone (this does not apply to higher levels of automation – level 4 and 5 as defined by SAE). The driver in readiness remains responsible for tasks that an ADS cannot (yet) perform, including ensuring that children have the correct safety equipment, that the vehicle is properly loaded and that certain measures are taken after an accident.

The owner of the vehicle should be responsible for traffic insurance of the vehicle and also for ensuring that traffic rules are complied with during AD. In the event of traffic offenses, a penalty fee is charged by the owner, unless the offense is due to error/malfunction of the ADS beyond the owner’s control. According to the motivation of the proposal, it was not reasonable to place the responsibility on the owner if the error that caused the AV not to follow the traffic rules was due to how the ADS was programmed by the manufacturer. However, ‘beyond the owner’s control’ excludes cases due to, for example, the owner failing to update the software of the ADS or manipulating it.

Manufacturers, system developers, etc. are responsible for the vehicles being safe (vehicle safety and product safety) and have a financial responsibility for damages that result from a safety defect (in accordance with e.g. product liability, contractual law, etc.). Manufacturers are also responsible for the storing of certain data about the AD.

In October 2023, the Government Offices of Sweden sent out a new report on automated driving, Promemoria Automatiserad köring, for considerations to relevant bodies. Referral responses must be submitted no later than 19 January 2024. In the report, new rules are proposed with the aim to clarify that AVs that are type-approved according to the EC’s implementing regulation (EU) 2022/1426 (see section 3.5.1) may only be driven where it is specifically permitted and that road authorities, i.e. Trafikverket (the Swedish Transport Administration) and municipalities where applicable, should be mandated to regulate such places. The new rules are proposed to enter into force on 1 July 2024. What should happen to previous proposals, e.g. the proposed liability regime in either SOU 2018:16 or Ds 2021:28, is not mentioned in this new report. Instead, it is stated in this report that the current traffic and liability rules should apply. However, the government

---

Note that ’driver in readiness’ is not an official translation of the term ‘förare i beredskap’ in the proposal. There is no official translation of the proposed term förare i beredskap.
might return to the question of a changed liability regime later. This issue has often been a very important issue to solve in various countries’ legislative work around AD.

4.2 Germany

Germany was early in adapting its legislation to prepare for AD. Already in 2017, amendments were made to establish what rights and obligations a driver has when using AD functions. Provided that such functions meet certain requirements, a driver should be able to trust these functions, and when such functions are in operation, the driver may engage in other things than monitoring the driving. However, the driver is still obliged to take control when the ADS demands it, or when he/she realises due to obvious circumstances or should realise that the ADS can no longer be used.

In 2021, new rules were also introduced to enable AD at level 4 in defined operating areas on public roads. This allows companies to deploy robotaxis and driverless delivery services on public roads. A technical supervisor (‘Technische Aufsicht’) is necessary. This is a natural person who can deactivate the ADS and enable driving maneuvers from outside the vehicle. The defined operating area must be approved by the competent state authority. The manufacturer must submit a certification that the vehicle complies with the technical requirements. The German Federal Motor Transport Authority will check whether the vehicle meets the technical requirements. When the rules were introduced, there were no harmonised vehicle regulation covering level 4 automation, which is why Germany set its own technical requirements that would serve as an interim solution in the meantime.

4.3 France

France allows trial operations with AVs but has also adopted legislation for deployment of AVs.

The French trial operation authorisation process involves an application to the Ministry of Ecological Transition (Direction Générale de l’Energie et du Climat, DGEC), a questionnaire with about 90 questions summarising the main issues of the test.

In 2021, France introduced legislation to allow for more permanent operations of AVs on public roads. It sets definitions and general safety provisions for these systems, as well as requirements for the driver or the person in charge of remote intervention. It covers automation levels up to fully automated systems, provided the supervision of a person in charge of remote intervention and deployed on predefined paths/zones. Remote intervention is allowed for highly or fully automated vehicles, not for partially automated vehicles, and only upon system validation, safety demonstration and after an opinion of an approved notified body.

The provisions differ depending on the automation level:

- Partially automated vehicles: An on-board driver must be able to respond to a transition demand, respond to law enforcement orders and facilitate the passage of priority vehicles. Remote intervention is not allowed.
• Highly automated vehicles: The on-board driver must be able to respond to any request to take over, respond to law enforcement orders and facilitate the passage of priority vehicles. Remote intervention is allowed only if the system is validated by the service organiser, after safety demonstration and opinion of an approved qualified body. A remote operator can intervene in accordance with the system’s conditions of use.

• Fully automated vehicles: On-board driver is not applicable. Remote intervention is allowed on the same terms as for highly automated vehicles.

The obligations of various actors and the liability regime are as follows:

• Driver: The rules discharge the driver of his/her criminal liability when the ADS operates in accordance with its conditions of use. When the ADS is active it performs the DDT. However, the driver must be ready to respond to a transition demand, follow summonses and instructions from law enforcement forces, facilitate the passage of vehicles of general interest and give way to priority vehicles of general interest.

• Vehicle manufacturer/agent: When the ADS is active, the vehicle manufacturer or its agent may be criminally liable for life-threatening infractions and may also bear the pecuniary liability for traffic fines in most cases.

4.4 United Kingdom

The UK government has been working on regulating AVs for several years to ensure their safe deployment on public roads. The Automated Vehicles Bill 2023 is expected to set the legal framework for the safe deployment of AVs in UK. The bill will implement the recommendations of the 4-year review of regulation for AVs carried out jointly by the Law Commission of England and Wales and the Scottish Law Commission (the Law Commissions).

The Law Commissions’ review of the law relating to AVs involved 3 rounds of consultation in 2018–2021, involving over 350 meetings with individuals and organisations, and analysis of over 400 written responses. The Law Commissions published their report ‘Automated Vehicles: joint report with 75 recommendations’ in January 2022. The government’s response to the recommendations was published in ‘Connected and Automated Mobility 2025: Realising the benefits of self-driving vehicles in the UK’ (CAM 2025) in August 2022. Based on the Law Commissions’ recommendations, CAM 2025 committed to set out a legal and safety framework to provide clarity of responsibility for AVs and to put in place new safety requirements.

As recommended by the Law Commissions, CAM 2025 identifies new legal entities responsible for the safety of ADS and creates a new legal status for a driver who has handed control of a vehicle to an ADS. It also sets out details of a new safety framework for AVs on UK roads.

If the AV is capable of operating without a driver in the vehicle, it will require a licensed operator to oversee the journey. If the service carries passengers, it will require an
automated passenger services permit for automated passenger services or a licence under existing schemes.

An in-use regulatory scheme will hold those responsible for automated driving systems to account while the systems are in use, and new sanctions and penalties will apply if they fail in their duty. No-blame investigations by inspectors of AV incidents will make recommendations to inform and shape the ongoing safe development and deployment of AVs.

Authorisation for use of AD will determine if vehicles are capable of safely and lawfully driving themselves without the need for a human to exercise control or monitor the road. The authorisation is to identify each self-driving ‘feature’ within the vehicle and decide whether it meets the self-driving test. Authorisation must specify whether it is a ‘user-in-charge’ or ‘no user-in-charge’ feature, how the feature is engaged or disengaged, and the locations and circumstances in which the feature meets the self-driving test.

The political intention is that vehicles with authorised user-in-charge features still requires a human (the ‘user-in-charge’) to be able to respond to requests from the vehicle and to hold at all times driver responsibilities other than those relating to exerting control of the vehicle and monitoring the road environment, but when the ADS is engaged the human is not required to monitor the road and should not bear responsibility for the behavior of the vehicle on the road. Responsibility for the manner of driving rests with the authorised self-divining entity (ASDE); this entity is responsible for the vehicle’s behaviour. The user-in-charge shall in principle have immunity from road traffic offenses relating to how the vehicle behaves on the road (there are exceptions, however).

In addition to the Law Commission’s recommendations, the bill will make information about traffic regulation orders (TROs) available digitally and in a common format for use in AVs and other systems that facilitate driving vehicles on a road. The data includes e.g. speed limits, road closures and restrictions, location and times of use of bus lanes and parking bays. The proposal for digital TROs was consulted on in 2022.
Through our international collaboration programmes with academia, industry, and the public sector, we ensure the competitiveness of the Swedish business community on an international level and contribute to a sustainable society. Our 2,800 employees support and promote all manner of innovative processes, and our roughly 100 testbeds and demonstration facilities are instrumental in developing the future-proofing of products, technologies, and services. RISE Research Institutes of Sweden is fully owned by the Swedish state.

I internationell samverkan med akademi, näringsliv och offentlig sektor bidrar vi till ett konkurrenskraftigt näringsliv och ett hållbart samhälle. RISE 2 800 medarbetare driver och stöder alla typer av innovationsprocesser. Vi erbjuder ett 100-tal test- och demonstrationsmiljöer för framtidssäkra produkter, tekniker och tjänster. RISE Research Institutes of Sweden ägs av svenska staten.