Consolidated draft texts for a new UN GTR and UN Regulation on Automated Driving Systems

The text below consolidates materials provided by the ADS IWG, GRVA ADS Workshops, and EDR/DSSAD IWG as of 18 June. Comments and pending proposals for amendments to the texts are shown under the "Comments" column. The purpose of this document is to facilitate discussions during the 12th ADS IWG session. Additional input is expected. These contents will be used to prepare initial draft versions of the UN GTR and UN Regulation for the 13th ADS IWG session.

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I.	Statement of technical rationale and justification			
A.	Introduction	0.	Introduction (for Information)	
		0.1.	[Where automated lane keeping features are also described in UNECE Regulation 157, the corresponding requirements should be taken into consideration, insofar as they are not already covered by this regulation.]	Shouldn't this be handled in the scope?
1.	With the rapid development of Automated Driving System (ADS) technology, ADS vehicles hold great potential to improve road safety and enhance mobility options for numerous road users. ADS are poised to significantly change the nature of road transport. They also pose many novel safety risks that must be effectively addressed by manufacturers and the international regulatory community.			

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2. The introduction of ADS presents many new, unique challenges for the development of vehicle regulation. Governments around the world are facing the problem of how to formulate effective regulatory measures. To ensure ADS safety, the safety regulators require new concepts, tools, and methodologies in addition to those historically used for previous vehicle technologies and systems.[1]		
3. WP.29 recognizes that for automated vehicles to fulfil their potential, in particular to improve road transport, they must be placed on the market in a way that reassures road users of their safety. If automated vehicles confuse users, disrupt road traffic, or otherwise perform poorly, then they will fail to improve road transport outcomes. Therefore, there is an urgent need for regulatory measures, to ensure the safety of automated vehicles that are deployed on public roads, and to promote collaboration and communication amongst those involved in their development and oversight.		

[1] ECE/TRANS/WP.29/2024/39.

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4. Technical provisions, guidance resolutions and evaluation criteria for automated vehicles will, to the best extent possible, be performance based, technology neutral, and based on state-of-the-art technology, while avoiding restricting future innovation.[2] Automated vehicle systems, operating in automated mode in their respective Operational Design Domain (ODD) shall not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable. Based on these principles, this GTR sets out a series of vehicle safety provisions to address the safe deployment of ADS equipped vehicles.[3]		
5. It is important to note that the diversity of ADS vehicle configurations and the characteristics and constraints of their ODD present challenges in establishing harmonized requirements for worldwide use. At the same time, the complexity of driving also presents challenges to the assessment of ADS performance across the diversity of ODDs.[4]		
6. This GTR aims to provide a harmonized methodology, incorporating high-level requirements that address the unique nature and safety challenges associated with ADS technology as well as a multi-pillar approach to ensure comprehensive, effective and efficient validation of ADS safety.[5]		

[2] ECE/TRANS/WP.29/2019/34/Rev.2.
[3] ECE/TRANS/WP.29/2019/34/Rev.2.
[4] GRVA-18-50.
[5] GRVA-18-50.

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7. This GTR is based on the collaborative efforts of the Informal Working Group on Automated Driving Systems (IWG ADS) and the Working Party on automated and Connected Vehicles (GRVA) workshops on Automated Driving Systems. B. Procedural background 8. In 2015, the World Forum for Harmonization of Vehicle Regulations (WP.29) established a programme under the Intelligent Transport Systems (ITS) informal working group to focus on automated driving (ITS/AD). (a) During its 174th (March 2018) session, WP.29 approved a proposal from the ITS/AD informal group for a "Reference document with definitions of Automated Driving under WP.29 and the General Principles for developing a UN Regulation on automated vehicles". (b) In March 2018, ITS/AD established a Task Force on Automated Vehicle Testing (TFAV) "to develop a regulatory testing regime that assesses a vehicle's automated systems so as to realise the potential road safety and associated benefits under real life traffic conditions". (c) TFAV established subgroups to consider AV assessment methods: (i) Physical certification tests and audit; (ii) Real-world test drive.		

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9. At the 178th session, WP29 adopted the Framework document on automated vehicles (WP.29/2019/34/Rev.2), herein referred to as the Framework document and the Terms of Reference (ToRs) (WP.29/1147/Annex VI). The Framework Document provides "guidance to WP.29 subsidiary Working Parties (GRs) by identifying key principles for the safety and security of automated vehicles of levels 3 and higher". The Framework Document allocated work on these WP.29 priorities across several informal working groups, including Functional Requirements for Automated Vehicles (FRAV) and Validation Methods for Automated Driving (VMAD). The Framework document instructed VMAD and FRAV to develop a 'new assessment/test method for automated driving' (NATM) for consideration during the 183rd (March 2021) session of WP.29.		

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10. VMAD's mandate under the ToRs was to develop assessment methods, including scenarios, to validate the safety of automated systems based on a multi-pillar approach including audit, simulation/virtual testing, test track, and real-world testing. FRAV developed functional (performance) requirements for automated vehicles. Based on the work of both groups the NATM master document, which outlines a conceptual framework for validating the safety of automated driving systems, was developed. The first version of this document was adopted at the 184th session (June 2021) of WP29 (ECE/TRANS/WP.29/1159). The second version was submitted to the 12th session (January 2022) of GRVA. [6]		
11. Building on this conceptual work, VMAD and FRAV were instructed by WP29 to undertake the development of the NATM guidelines. This document was developed to provide direction to developers and contracting parties of the 1958 and the 1998 UN vehicle regulations agreements on recommended procedures for validating the safety of ADS.[7]		

[6] ECE-TRANS-WP29-GRVA-2022-02e
[7] ECE/TRANS/WP.29/1159

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12. WP.29 further directed FRAV and VMAD to collaborate and deliver a consolidated FRAV/VMAD submission (requirements and assessment methods) for its June 2024 session. WP.29 approved the integrated FRAV/VMAD guidelines during the June 2024 session.[8]		
13. At the 191st session of the World Forum for Harmonization of Vehicle Regulations and the 68th session of the Executive Committee of the 1998 Agreement in Nov. 2023, WP.29 adopted a proposal for the regulatory approach for Automated Driving Systems (WP.29-191-30/Rev.1). This proposal included the creation of (i) a new Informal Working Group on Automated Driving Systems (IWG ADS) and (ii) Working Party on automated and Connected Vehicles (GRVA) workshops to launch and undertake the work on regulatory activities for such systems. This decision is noted in the report of the WP.29 191st session.[9] WP.29's administrative council (AC.3) approved the request for authorization of a new UN GTR on ADS in March 2024 as noted in Annex IV of the report on the 192nd session of WP.29.[10]		

[8] ECE/TRANS/WP.29/2024/39
[9] ECE/TRANS/WP.29/1175
[10] ECE/TRANS/WP.29/1177

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14. At the eighteenth session of the GRVA, the regulatory approach for Automated Driving Systems, as adopted by WP.29, was discussed. GRVA deliberated on the establishment of a bureau composed of representatives from Canada, China, the European Commission, the United Kingdom, Japan, and the United States to lead the activity. GRVA adopted the draft terms of reference for the IWG on ADS and the workshops on ADS, and submitted them to WP.29.[11]		

[11] GRVA-18-41/Rev.2 and GRVA-18-42/Rev.2.

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15. At the 192nd session of the World Forum for Harmonization of Vehicle Regulations and the 69th session of the Executive Committee of the 1998 Agreement in March 2024, WP.29 agreed that the IWG on ADS would be sponsored and led by Canada, China, European Commission, Japan, United Kingdom of Great Britain and Northern Ireland and the United States of America. WP.29 also noted that the secretariat services would be provided by the representatives of AAPC, OICA, JASIC and SAE International. The IWG on ADS was tasked with developing the technical requirements for the ADS regulation for Contracting Parties under the 1958 and 1998 Agreements. The Workshops focused on the development of the administrative requirements for the ADS regulation, as well as an interpretation document to assist in the implementation of these regulations. Two ambassadors (from Australia and the Netherlands) were tasked to align the activities of the IWG on ADS and the Workshops, and evaluate the progress of both activities.[12] During this session, WP.29 adopted an amendment to the Framework Document on automated vehicles to take into account these new activities.[13]		

[12] ECE/TRANS/WP.29/2024/38 and ECE/TRANS/WP.29/AC.3/62
[13] ECE/TRANS/WP.29/2024/33 based on informal document WP.29-191-31

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16. During the first session of the IWG on ADS the work plans and a draft structural framework referring to the ADS GTR and UNR content were explained based on specific sections, particularly “General requirements,” “Performance requirements/Test specifications,” and “Assessment/Test procedures.”[14] It was agreed to appoint “Officers of Principal Interest” (OPI) for each section, who would act as points of contact and coordinators, receiving assistance from IWG on ADS experts. During the first session of the ADS workshop OPIs were also selected to develop the text for the administrative provisions for the ADS GTR and UN Regulation.		

[14] ADS-01-03

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17. The initial objective of the IWG was transposition of the ADS guidelines (1958 and 1998 Agreement) into common regulatory provisions, focusing first on requirements and then on assessment methods/processes.[15] This text is derived from the specific provisions and annexes received from the June 2024 Functional Requirements for Automated Vehicles (FRAV) - Validation Method for Automated Driving (VMAD) Informal Working Group Integrated Document[16] under the Working Party on automated and Connected Vehicles (GRVA) and workshops for the generation of the draft UN Global Technical Regulation on ADS. The second phase involved transposing the common provisions into UN GTR and UN Regulation texts and integrating the GRVA ADS workshop outcomes into the text.		
18. The IWG also received reports on the work of other informal groups, including Automated Vehicle Categorisation (AVC), Event Data Recorders and Data Storage Systems for Automated Driving (EDR/DSSAD), Regulation Fitness for Automated Driving Systems (FADS), and the GRVA ADS WS. The IWG noted the need for consistency across all these activities with the ADS regulations.[17]		

[15] WP.29-194-ADS/Add.1
[16] ECE/TRANS/WP.29/2024/39
[17] GRVA-21-44/Add.1

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19. The text was further refined from subsequent discussions at multiple IWG on ADS sessions and GRVA workshops. This included consolidation of common provisions of the text based on the work of the IWG OPIs. The consolidated common provisions document provided a baseline document that was then separated into a draft GTR and a draft UNR.		
C. Technical background		
20. The key subject of this GTR is the ADS). The definition of ADS "means the vehicle hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis."[18] When the ADS is in operation, the DDT is "always performed in its entirety by the ADS, which means the whole of the tactical and operational functions required to operate the vehicle". [19] Section C.1 describes what the DDT consists of. Section C.2 describeq the need to demonstrate the technical competency of the ADS. Section C.3 describes the various methods used to validate the safety of the ADS.		
1. ADS performs all tactical and operational functions of driving		

[18] ECE/TRANS/WP.29/2024/39 paragraph 3.1.2. This definition is based on SAE J3016 and ISO/PAS 22736 (Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles). These standards define levels of driving automation based on the functionality of the driving automation system feature as determined by an allocation of roles in DDT and DDT fallback performance between that feature and the (human) user (if any). The term "Automated Driving System" is used specifically to describe a Level 3, 4, or 5 driving automation system.

[19] ECE/TRANS/WP.29/2024/39 paragraph 3.1.11.1.

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21. Driving consists of three categories of functions: strategic, functional and operational. The real-time tactical and operational functions required to operate a vehicle in on-road traffic are collectively known as the DDT, which does not include strategic functions. Strategic functions include activities such as determining a trip destination that do not involve vehicle dynamic control. The tactical level involves manoeuvring the vehicle in traffic during a trip, including perceiving and assessing of the driving environment, deciding and planning on a specific manoeuvre. 22. Tactical functions include but are not limited to manoeuvre planning and execution, enhancing conspicuity (lighting, signalling, gesturing, etc.), and managing interactions with other road users. Tactical functions generally occur over a period of seconds. 23. Operational functions include but are not limited to lateral vehicle motion control (steering) and longitudinal vehicle motion control (acceleration and deceleration). This operational effort involves split-second reactions, such as making micro-corrections while driving. [20]		

[20] ECE/TRANS/WP.29/2024/39 Annex 1 paragraph 6, 8, 9, 11-15.

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24. The DDT definition explains that these functions can be grouped into three interdependent categories: sensing and perception, planning and decision, and control. [21]		
25. Sensing and perception include: (a) Monitoring the driving environment via object and event detection, recognition, and classification; (b) Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle's driving environment and relevant environmental conditions; (c) Sensing the ODD boundaries, if any, of the ADS feature; (d) Positional awareness.		
26. Planning and decision include: (a) Predicting actions of other road users; (b) Response preparation; (c) Manoeuvre planning. Control includes: (a) Object and event response execution; (b) Lateral vehicle motion control; (c) Longitudinal vehicle motion control; (d) Enhancing conspicuity via lighting and signalling.		
2. ADS needs to demonstrate the competency of vehicle safety		
27. An ADS must demonstrate the competency to operate the vehicle safely, to respond to external conditions, and to manage internal failures.		
27. An ADS must demonstrate the competency to operate the vehicle safely, to respond to external conditions, and to manage internal failures.		

[21] ECE/TRANS/WP.29/2024/39 paragraph 3.1.11.1.

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28. Moreover, the ADS must be designed to ensure safe use and the safety of its users throughout the useful life of the vehicle. 29. To ensure that the safety competency is demonstrated, an ADS might be expected to be assessed via a framework for the development of traffic scenarios. 30. The framework would include nominal, critical and failure scenarios. The requirements of the rule intentionally avoid technical specifications and performance limits for specific scenarios because each traffic situation requires a response appropriate to its combination of elements, risks, and available options. 31. Defining the performance criteria in critical scenarios could be difficult. In these cases, this could be done by using appropriate safety models to enable assessment of ADS performance within the limits of the safety models. [22]		

[22] ECE/TRANS/WP.29//202439 paragraph 4.2-4.6.

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32. As a general concept, the safety level an ADS should be at least the same or greater than a competent and careful human driver. This concept is important minimizing unreasonable safety risks to the ADS vehicle user(s) and other road users[23]. The manufacturer's safety case for the ADS and its features will include a description of the design processes used to implement the safety concept, and a structured presentation demonstrating through a body of evidence that the ADS and its features have undergone sufficient safety validation to ensure an absence of unreasonable risk in the ADS's performance.[24]		
3. Validating the safety of ADS		
33. Validating the ADS's capabilities is a highly complex task which cannot be done comprehensively nor effectively through one validation methodology alone. As a result, it is necessary to adopt a multi-pillar approach for the validation of ADS.		

[23] ECE/TRANS/WP.29/2024/39 paragraph 4.8.
[24] ECE/TRANS/WP.29/2024/39 paragraph 5.3.3.

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34. These various methodologies are intended for use in combination(s) to produce an efficient, comprehensive, and coherent assessment of ADS safety performance. Each of the testing methodologies possess their own strengths and limitations, such as differing levels of environmental control, environmental fidelity, scalability, and cost, which should be considered. In some cases, the application of more than one method could be necessary to assess the capability of an ADS to cope with range of situations that can arise in real-world traffic. The use of multiple methods allows for flexibility in the composition, sequencing, and application of testing across the diversity of ADS, while avoiding unnecessary redundancies and overlaps. Figure 1 below illustrates relationships across the ADS safety requirements, ODD analysis and scenario generation, and the validation pillars.[25]		
(a) Simulation/virtual Testing		
35. It uses different types of simulation toolchains to assess the compliance of an ADS with the safety requirements on a wide range of virtual scenarios including some which would be extremely difficult if not impossible to test in real-world settings. The aspect of credibility of simulation/virtual testing is included in this topic.[26]		
(b) Track testing		

[25] ECE/TRANS/WP.29/39 paragraph 4.18.
[26] ECE/TRANS/WP.29/2022/57 IV. Paragraph 15.

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36. It uses a closed-access testing ground with various scenario elements to test the capabilities and functioning of an ADS.[27]		
(c) Real world testing		
37. It uses public roads to test and evaluate the performance of ADS related to its capacity to drive in real traffic conditions.[28]		
(d) Audit/assessment procedures		
38. They establish how manufacturers will be required to demonstrate to safety authorities using documentation, their simulation, test-track, and/or real-world testing of the capabilities of an ADS. The audit will validate that hazards and risks relevant for the system have been identified and that a consistent safety-by-design concept has been put in place. The audit will also verify that robust processes/mechanisms/strategies (i.e., safety management system) that are in place to ensure the ADS meets the relevant safety requirements throughout the vehicle lifecycle. It shall also assess the complementarity between the different pillars of the assessment and the overall scenario coverage.[29]		
(e) In-service monitoring and reporting		

[27] ECE/TRANS/WP.29/2022/57 IV. Paragraph 16.
[28] ECE/TRANS/WP.29/2022/57 IV. Paragraph 17.
[29] ECE/TRANS/WP.29/2022/57 IV. Paragraph 18.

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39. It addresses the in-service safety of the ADS after its placing on the market. It relies on the collection of fleet data in the field to assess whether the ADS continues to be safe when operated on the road. This data collection can also be used to fuel the common scenario database with new scenarios from the field and to allow the whole ADS community to learn from major ADS accidents/incidents.[30]		ADS-12-37 (OICA/CLEPA)
Figure 1. Relationships across safety requirements, ODD analysis and scenario generation, and validation pillars		
4. Common Issues and Principles		
42. The following list of issues and principles guided discussions and activities on automated vehicles within WP.29 and each of its relevant subsidiary Working Parties. The aim was to capture the shared interests and concerns of regulatory authorities, provide the general parameters for work, and to provide common definitions and guidance.		
43. The following is a list of common principles with brief descriptions and explanations. It is expected these would form the basis for further development. Except for items n) and o), all these items have been identified in ECE/TRANS/WP.29/2029/34/Rev. 2.		

[30] ECE/TRANS/WP.29/2022/57 IV. Paragraph 19.

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a) System Safety: When in the automated mode, the automated vehicle should be free of unreasonable safety risks to the driver and other road users and ensure compliance with road traffic regulations. b) Failsafe Response: The automated vehicles should be able to detect its failures or when the conditions for the [ODD] are not met anymore. In such a case the vehicle should be able to transition automatically (minimum risk manoeuvre) to a minimal risk condition. c) Human Machine Interface (HMI) /Operator information: Automated vehicle should include driver engagement monitoring in cases where drivers could be involved (e.g. takeover requests) in the driving task to assess driver awareness and readiness to perform the full driving task. The vehicle should request the driver to hand over the driving tasks in case that the driver needs to regain proper control of the vehicle. In addition, automated vehicle should allow interaction with other road users (e.g. by means of external HMI on operational status of the vehicle, etc.). d) Object Event Detection and Response (OEDR): The automated vehicles shall be able to detect and respond to object/events that may be reasonably expected in the [ODD].		

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e) Operational Design Domain (ODD)] (automated mode): Manufacturers should document the ODD available on their vehicles and the functionality of the vehicle within the prescribed ODD. The ODD should describe the specific conditions under which the automated vehicle is intended to drive in the automated mode. The ODD should include the following information at a minimum: roadway types; geographic area; speed range; environmental conditions (weather as well as day/night time); and other domain constraints.		

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f) Validation for System Safety: Manufacturers should demonstrate a robust design and validation process based on a systems-engineering approach with the goal of designing ADS free of unreasonable safety risks and ensuring compliance with road traffic regulations and the principles listed in this document. Design and validation methods should include a hazard analysis and safety risk assessment for the ADS, OEDR, as well as the overall vehicle design into which the ADS is being integrated. When applicable, the broader transport ecosystem should be included in this analysis. Design and validation methods should demonstrate the behavioural competencies an automated vehicle would be expected to perform during a normal operation, the performance during crash avoidance situations, and the performance of fall-back strategies. Test approaches may include a combination of simulation, test track, and on road testing.		

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g) Cybersecurity: The automated vehicle should be protected against cyber-attacks in accordance with established best practices for cyber vehicle physical systems. Manufacturers shall demonstrate how they incorporated vehicle cybersecurity considerations into ADSs, including all actions, changes, design choices, analyses and associated testing, and ensure that data is traceable within a robust document version control environment. h) Software Updates: Manufacturers should ensure system updates occur as needed in a safe and secured way and provide for after-market repairs and modifications as needed. i) Event data recorder (EDR) and Data Storage System for Automated Driving vehicles (DSSAD): The automated vehicles should have an ability to collect and record the necessary data related to the system status, occurrence of malfunctions, degradations or failures in a way that can be used to establish the cause of any crash and to identify the status of the automated driving system and the status of the driver. The identification of differences between EDR and DSSAD are to be determined. Additional issues not listed in the currently agreed WP.29 priorities		

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j) Vehicle maintenance and inspection: Vehicle safety of in-use vehicles should be ensured through measures such as those related to maintenance and the inspection of automated vehicles etc. Additionally, manufacturers are encouraged to have documentation available that facilitates the maintenance and repair of ADSs after a crash. Such documentation would likely identify the equipment and the processes necessary to ensure safe operation of the automated vehicle after repair.		
k) Consumer Education and Training: Manufacturers should develop, document and maintain employee, dealer, distributor, and consumer education and training programs to address the anticipated differences in the use and operation of automated vehicles from those of conventional vehicles.		
l) Crashworthiness and Compatibility: Given that a mix of automated vehicles and conventional vehicles will be operating on public roadways, automated vehicle occupants should be protected against crashes with other vehicles.		

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m) Post-crash AV behaviour: automated vehicles should be able to return to a safe state immediately after being involved in a crash. Bringing the vehicle to a safe state includes considerations such as shutting off the fuel pump, removing motive power, moving the vehicle to a safe position off the roadway, and disengaging electrical power. It is vital that the ADS have the capability to engage with an operations centre or collision notification centre.		
n) Artificial Intelligence: vehicle automation is based on a combination of hardware and software. The requirements in this regulation are based on the condition that this software does not include the use of online in-vehicle learning Artificial Intelligence. Artificial Intelligence can be used to analyse and improve ADS software in an engineering environment. By means of a software update (over the air or connected) this update can be installed in the vehicle, again without in-vehicle learning features during operation of this version.		
o) ADS vehicles shall be in conformity with regional legislation (e.g. data protection, privacy).		
D. Principles for developing the global technical regulation		

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44. The GTR provides a necessary first step to the safe deployment of ADS equipped vehicles on public roads as there are no existing global regulations nor regulations established in the Compendium of Regulations of the 1998 Agreement to support ADS deployment.		
45. Furthermore, industry has repeatedly indicated the need for regulations to be developed to support the deployment of vehicles equipped with ADS. This is necessary to prevent the fragmentation of regulatory approaches and avoid delaying the deployment of new technologies with the potential of improving road safety, promoting cleaner and greener transport, promoting social inclusion, and supporting economic growth.		
46. This GTR was developed on the principal of being performance based and technology neutral. The regulations have been developed in a manner that can be adapted to accommodate different types of vehicle certification processes.		

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47. There are several GRVA subgroups active in the field of vehicle automation (EDR/DSSAD, TF AVC, TF FADS, CS/OTA). This first GTR is based on the information currently available from these subgroups. It provides worldwide harmonised procedures to set and verify compliance with minimum requirements for the safety of ADS and vehicles equipped with ADS with the notion that future improvements of the GTR are expected as ADS technologies continue to evolve. It takes into consideration existing and new data, research, and standards proposed by the contracting parties and industry.		
E. Technical rationale and justification		
1. Application/Scope		
48. This UN GTR applies to vehicles of Category 1 and Category 2 based on the vehicle classification and definitions outlined in the 1998 Global Agreement Special Resolution No. 1 (S.R.1) with regards to their Automated Driving System.		
49. Given that high potential of the improvement for road traffic safety is expected for the vehicles equipped with ADS, this regulation will help to establish the minimum safety requirements for the manufacturers developing ADS and the adequate validation requirements for the approval authorities.		

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50. Considering the diversity of ADS vehicle configurations, use cases and the characteristics of their ODDs (e.g. highway, urban, parking), this regulation will provide generic and high-level requirements to support the harmonization for ADS regulatory development worldwide and to support the introduction of innovations, allowing the industry to use state of the art technologies. At the same time, it will offer approval authorities a way to harmonize the safety level of ADS vehicles in the market.		
51. The generic requirements framework of this regulation will also allow further development of additional requirements for specific use cases or ADS features in the future.		
2. Rationale for safety management system		
52. The safety management system (SMS) is a systematic approach of the manufacturer to manage safety that encompasses and integrates human, organisational and technical factors: (a) The human component ensures the ADS lifecycle is monitored by personnel with appropriate skills, training, and understanding to identify risks and appropriate mitigation measures.		

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(b) The organisational component procedures and methods that help to manage the identified risks, understand their relationships and interactions with other risks and mitigation measures, and help to ensure that there are no unforeseen consequences.		
(c) The technical component using appropriate tools and equipment.		
53. An adequate SMS will incorporate all three factors to monitor and improve safety and help to control the identified risks. It should also include taking measures to monitor the vehicle during the in-service operation and to take corrective remedial action when necessary.		
54. To facilitate the approval authority's audit, the manufacturer should provide certain specific documentation to demonstrate that a SMS with robust processes to manage safety risks and to ensure safety throughout the ADS lifecycle (development, production, operational, decommissioning) has been established.		
55. This UN GTR requires the manufacturer's documentation to cover relevant aspects, including safety policy, risk management, design and development, production, post-deployment, safety assurance and safety promotion.		
3. Rationale for safety case		
56. (Forthcoming)		
4. Rationale for requirements concerning performance of the dynamic driving task		

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57. As a general concept, the safety level of ADS shall be at least to the level at which a competent and careful human driver could minimize the unreasonable safety risks to the ADS vehicle user(s) and other road users.		
58. Driving involves real-time risk management under prevailing traffic scenarios which means a description of a sequence of driving situations that may occur during a given trip. Therefore, safe ADS performance of the dynamic driving task (DDT) depends upon the situations presented under each individual scenario and each scenario is associated with one or more behavioural competencies.		
59. This UN GTR establishes performance requirements for the evaluation of ADS driving behaviours under relevant traffic scenarios (nominal scenarios, critical scenarios, failure scenarios), at ODD boundaries and in fullbacks to an MRC. The manufacture shall use a process to derive behavioural competencies and scenarios that are ODD-relevant:		
60. ADS performance of the DDT under nominal scenarios. The broad objective of the ADS is to not cause traffic accidents or disrupt traffic under nominal scenarios.		
61. ADS performance of the DDT under critical scenarios. The broad objective of the ADS is to not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable under critical scenarios.		

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62. ADS performance of the DDT under failure scenarios. The broad objective of the ADS is to ensure the system safety and response to system failures that compromise the capability of the ADS to perform the DDT under failure scenarios.		
63. The safety case by the manufacturer demonstrates the application of the SMS to the ADS under assessment, including its design and intended uses (safety concept) and an evidence-based structured argument (safety claim, argument, evidence) that the ADS meets the safety requirements specified in this UN GTR.		
64. A complete safety case for the ADS and its features is required to be documented by the manufacturer. This includes a description of the design processes used to implement the safety concept, and a structured presentation demonstrating through a body of evidence that the ADS and its feature(s) have undergone sufficient safety validation to ensure there are no unreasonable risks in the ADS's performance.		
5. Rationale for requirements concerning ADS user interactions with the ADS		
62. The requirements for safe interactions between users and ADS vary depending on user role, system design and tasks to be performed by the user during the use of the ADS equipped vehicle, such as: (a) ADS features that allow a user to take over manual-control of the DDT;		

UN GTR	UN Regulation	Comments
(b) ADS features that do not allow a user to take manual control of the DDT.		
63. In addition to the requirements for the ADS, this UN GTR requires the manufacture to provide appropriate means in order to facilitate user understanding of the functionality and operation of the ADS. The means shall cover relevant aspects, such as operational description of the ADS features, capabilities, and limitations, instructions for the activation and deactivation of the ADS, general overview of non-driving-related activities (NDRA) allowed when an ADS feature is active where applicable, etc.		
6. Rationale for assessment of the safety case		
64. The evaluation (i.e. safety assessment) of the safety case provided by the manufacturer, including the safety of the ADS design is essential to determine the vehicle's ADS is safe by design and that the ADS has been sufficiently validated before market introduction.		
7. Rationale for In-service monitoring and reporting requirements		

UN GTR	UN Regulation	Comments
65. In addition to the pre-deployment assessment of ADS safety, the post-deployment assessment of ADS performance under the in-service monitoring and reporting (ISMR) pillar is required as well. The purpose of ISMR is to confirm the manufacturer's safety case and confirm the validation carried out by the manufacturer before market introduction as well as confirm safety during real-world operation and identify unanticipated situations that can be used to develop new or revise existing scenarios.		
66. Before the deployment of the ADS, the manufacturer should establish processes to demonstrate its capabilities to execute an effective ISMR. These processes should be documented as part of the manufacturer's SMS.		
67. The monitoring program established by the manufacturer should collect and analyse vehicle data, and data from other sources. The data analysis should be performed with sufficient frequency so that remedial action can be taken promptly and in line with reporting requirements.		
68. The reporting applies to occurrences (i.e. critical occurrence and non-critical occurrence) and safety relevant events (e.g. fallback user unavailability), which are relevant to the safety performance of ADS. The reporting, including initial notifications, short-term reports and periodic reports, will be carried out according to the requirements by the relevant authority.		

UN GTR	UN Regulation	Comments
69. This UN GTR requires the manufacturer to establish the processes for ISMR in order to contribute to the improvement of road safety by ensuring that relevant information on safety is collected, processed, and disseminated.		
8. Rationale for Virtual testing credibility assessment		Not aligned with the text: The credibility assessment is not limited to virtual testing.
70. High confidence in simulation toolchain credibility is needed so that virtual testing can be used by the manufacturer to validate the safety of their ADS on its own and in conjunction with the other testing pillars. This requires that each simulation toolchain provide an accurate representation of the real-world system where the ADS operates. Therefore, it is essential to set up a harmonized credibility framework as part of this UN GTR. The framework includes simulation toolchain management, simulation toolchain requirements, simulation toolchain verification and simulation toolchain validation.		
9. Rationale for audit of SMS		
71. The purpose of the SMS audit pillar is to allow the relevant authority to determine that the manufacturer has established robust processes to manage safety risks, manage safety throughout the ADS lifecycle, and that the manufacturer is compliant with the requirements as outlined in this UN GTR.		

UN GTR	UN Regulation	Comments
72. Given that the ISMR is also included in the SMS, the audit of the SMS should review the manufacturer's documentation to ensure the suitability of ISMR practices (processes, tools, personnel) for the ADS and evaluate the manufacturer's capability to monitor the ADS and to report any occurrences/safety relevant events during the ADS operation. Documentation should also note the manufacturer's approach/methods to verify the safety performance of the ADS and for reporting the occurrences/safety relevant events experienced by the ADS during the operation.		
73. This UN GTR specifies the requirements for the audit of SMS, including audit of the manufacturer's ISMR mechanism.		
10. Rationale for testing		Not aligned with text. The ADS regulations have credibility assessments for virtual, track, and real-world testing. Should this be folded into a "credibility assessment of manufacturer testing"?
74. The manufacturer should demonstrate that the approach to testing (virtual testing, track testing, real-world testing) and the scenario coverage/selection are suitable to validate/verify the safety case and compliance with the associated performance/functional requirements specified in this UN GTR.		
75. Regarding from the assessment aspect, there are two main parts outlined in this UN GTR. One component is for assessment of the safety case testing activities and the other is for confirmatory testing.		"Confirmatory testing" is a key component that merits a better explanation. Perhaps this section should be "Rationale for confirmatory testing"?

UN GTR	UN Regulation	Comments
F. Existing regulations, directives, and international voluntary standards		
76. The purpose of compiling this list of existing regulations and standards is to provide a comprehensive overview of the current landscape governing automated driving systems. The list categorizes these into three main sections: a) UN guidance used as a basis for the development of the GTR/UNR; b) Standards and regulations referenced in the GTR/UNR; c) Other standards and regulations identified. This compilation aims to facilitate better understanding, comparison, and alignment of ADS regulatory practices globally, reflecting the foundational work accomplished by the groups from UN and highlighting the current regulatory status of contracting parties.		
(a) The following documents reflect the technical progress made by WP.29 before starting to draft the ADS regulation, these technical documents come from informal working groups such as FRAV and VMAD, which are not only "existing regulations or technical documents", but also the basis for the preparation of this regulation, which was compiled on the basis of the conversion of the above technical documents.		
• (UN) Guidelines and Recommendations concerning Safety Requirements for Automated Driving Systems		

UN GTR	UN Regulation	Comments
• (UN) New Assessment/Test Method for Automated Driving (NATM) Guidelines for Validating Automated Driving System (ADS) • (UN) Guidelines and recommendations for ADS safety requirements, assessments and test methods to inform regulatory development (b) The following documents consist of regulations, directives, and international voluntary standards that were already in effect prior to the development of this regulation. These documents were referenced or quoted during the development process of the ADS regulation (GTR/UNR). United Nations (UN): • (UN) R157 -Automated lane keeping System International Organization for Standardization (ISO): • ISO/SAE 21434:2021 - Road Vehicles - Cybersecurity engineering • ISO/SAE PAS 22736:2021 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles		

UN GTR	UN Regulation	Comments
• ISO 26262: 2018 - Road vehicles – Functional safety – From Part1 to Part 10 • ISO 9001 - Quality management systems • ISO 31000 - Risk management • ISO 21448: 2022 - Road vehicles — Safety of the intended functionality • ISO 9241-210:2019 Ergonomics of human-system interaction Part 210: Human-centred design for interactive systems • ISO PAS 8800 : 2024- Road vehicles — Safety and artificial intelligence • ISO/TS 5083:2025 Road vehicles — Safety for automated driving systems — Design, verification and validation International Automotive Task Force (IATF): • IATF 16949 - Quality management systems (automotive)		
(c) Although not explicitly referenced in the ADS regulations, the following documents submitted by contracting parties and relevant organizations (as of September 2025) are recognized as relevant to the development and deployment of automated vehicles.		

UN GTR	UN Regulation	Comments
United Nations (UN): • (UN) R155 - Cyber security • (UN) R156 - Software updates International Organization for Standardization (ISO): • ISO 34501:2022 Road vehicles - Test scenarios for automated driving systems — Vocabulary • ISO 34502:2022 Road vehicles - Test scenarios for automated driving systems-Scenario based safety evaluation framework • ISO 34503:2023 Road Vehicles - Test scenarios for automated driving systems - Specification for operational design domain • ISO 34504:2024 Road vehicles - Test scenarios for automated driving systems - Scenario categorization • ISO/TR 21959-1:2020 Road vehicles - Human performance and state in the context of automated driving • ISO 24089:2023 - Road Vehicles - Software update engineering Society of Automotive Engineers (SAE): • SAE J3208-Taxonomy and Definitions of ADS Verification & Validation		Full “UN Regulation No.”

UN GTR	UN Regulation	Comments
• SAE J3237-Operational Safety Metrics for Verification & Validation of Automated Driving Systems (ADS) • SAE J3279-Best Practices for Applying Simulations in Driving Automation System Development • SAE 3259-Taxonomy & Definitions for ODD for Driving Automation Systems • SAE J3016-Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles Institute of Electrical and Electronics Engineers (IEEE): • IEEE 2846 2022 Assumptions for Models in Safety Related Automated Vehicle Behavior 5G Automotive Association (5GAA): • 5GAA TR T-210009 1.0 Safety Treatment in Connected and Automated Driving Functions Association for Standardization of Automation and Measuring Systems(ASAM): • ASAM OpenSCENARIO DSL V2.1.0 • ASAM OpenSCENARIO XML V1.3.1 • ASAM OpenDRIVE V1.8.1		

UN GTR	UN Regulation	Comments
• ASAM OpenODD V1.0 European Union: • (EU) Regulation 2022/1426 • (EU) Regulation 2019/2144 • (EU) ELKS Regulation 2021/646 The United Kingdom: • (UK) BSI PAS 1884 Safety operators in automated vehicle testing and trialing • Automated Vehicles Act (2024) United States of America: • NHTSA DOT HS 812 083 Advanced Test Tools for ADAS and ADS • NASA-STD-7009A - Standard for models and simulations China: • GB/T 40429-2022 Taxonomy of driving automation for vehicles • GB/T 41798-2022 Intelligent and connected vehicles—Track testing methods and requirements for automated driving functions • GB 44497-2024 Intelligent and connected vehicle—Data storage system for automated driving		Contracting Party regulations and directives come before voluntary standards. British industry standard—should be separated from UK legislation?

UN GTR	UN Regulation	Comments
• GB/T 44721-2024 Intelligent and connected vehicle—General technical requirements for automated driving system • GB/T 44719-2024 Intelligent and connected vehicle—Methods and requirements of road test for automated driving functions • GB/T 45312-2025 Intelligent and connected vehicles—Operational design condition for automated driving system France: • Ordonnance no. 2021-443 of April 14, 2021 on the criminal liability regime applicable in the event of the circulation of a vehicle with driver delegation and its conditions of use Japan: • JIS D 6805 Testing Method of the Characteristics and Functions of Automatic Guided Vehicles Germany: • Act on Autonomous Driving (Section 1a - 1l Road Traffic Act, StVG), 2021 • Ordinance on Approval and Operation of Autonomous Vehicles (AFGBV), 2022		
G. Benefits and costs		

UN GTR	UN Regulation	Comments
79. For the time being, ADS will not be mandatory for vehicles. Currently there is only one specific ADS application for which ADS regulation has been developed (ALKS/R157). Consequently, for all other ADS applications except ALKS, there is no clear regulation which helps manufacturers in developing their ADS and authorities in validating the related products and processes. This GTR is an important prerequisite to support the process of harmonization of engineering and validation requirements.		

UN GTR	UN Regulation	Comments
80. For ADS technology, the issue of responsibility attribution is one of the core challenges on its development path. Based on the authoritative platform of WP.29, formulating a comprehensive set of global technical regulations for ADS with international consensus is an important step in improving the relevant legal environment, while also clarifying the current capabilities and limitations of ADS technology. In this way, provisions can be built upon the existing technological conditions through a regulation that establishes a clear and reasonable framework for responsibility attribution. This framework establishes traceable technical parameters and system behavior logging requirements for manufacturers and software developers. In accident scenarios, the documented technical evidence provides an auditable basis for accountability determination processes, while maintaining adaptability for evolving ADS verification methodologies. The standardized technical benchmarks support alignment with legal proceedings without constituting legal judgments.		Does the highlighted text contravene the decision to use “manufacturer” only?

UN GTR	UN Regulation	Comments
81. Social trust and acceptance are key to the widespread integration of ADS technology into people's daily lives. The formulation and subsequent use of ADS regulations can play a important role in enhancing public awareness, dispelling misunderstandings, and fostering trust. These processes not only provide the public with a more comprehensive and in-depth understanding of ADS technology but also, through legal commitments and safeguards, might alleviate people's uncertainties and fears about the new technology. In the long run, this could create a positive and open social environment for realizing the grand vision of intelligent transport.		
82. At this stage of ADS development, there is no quantitative data to support a thorough cost-benefit analysis. With the accumulation of data from various deployments and testing, the GTR might help quantifying both the costs and benefits of ADS regulation. A globally harmonized regulation may potentially reduce costs and increase efficiencies for manufacturers. Such benefits may stem from streamlined production processes as well as the resources required to adapt to different regulatory regimes. For example, manufacturers may not be required to retool production facilities to comply with different regulations in different countries. With wider application of ADS, more data will become available to improve the cost/benefit analysis.		

UN GTR	UN Regulation	Comments
83. Empirical data from ADS demonstration zones and research institutions worldwide highlight the potential benefits and challenges of ADS technology across diverse traffic environments. Statistical analyses of passenger vehicles indicate that accident rates in ADS modes are consistently lower than in manual driving. A joint study spanning North America, Europe, and Asia found an average of 18.5 accidents per million kilometres in manual driving (10.2 at-fault accidents), compared to 7.1 accidents in automated driving (2.8 at-fault accidents). Notably, some leading technology providers have achieved zero at-fault accidents per million kilometres in automated mode.		
84. However, challenges to traffic efficiency persist, particularly during peak hours or in complex scenarios. Studies suggest automated vehicles may experience a 5%-15% reduction in average speed compared to human drivers, primarily due to conservative following distance decisions, suboptimal route planning, and delayed responses to dynamic environments. For example, pilot projects in multiple urban areas reported peak-hour automated vehicle speeds of 22–28 km/h, 10%-18% lower than manual driving, with travel times increasing by 8%-12% on average.		Term “complex scenario” deleted during ADS-07. Rephrase.

UN GTR	UN Regulation	Comments
85. This regulation's development, while resource-intensive, promises safety improvements. The GTR could prevent an estimated 250,000 global fatalities and reduce severe injuries through comprehensive implementation of automated driving systems (ADS). The collaborative process has enhanced knowledge-sharing between automakers, governments, and research bodies, creating transferable insights for future regulatory work—including ADAS standards. Notably, this marks the first simultaneous development of a GTR and corresponding UN Regulation (UNR) for shared safety goals, setting a new benchmark for international regulatory cooperation. Key technical elements from this GTR also demonstrate broader applicability, potentially informing updates to existing driver assistance regulations. The established framework may accelerate future rulemaking processes in evolving automotive technologies.		Source for the estimate? The GTR does not require the installation of ADS. The ADS, not the GTR, would impact road safety. The purpose of the GTR is to ensure that ADS are safe for use on public roads.

UN GTR	UN Regulation	Comments
86. At the same time, qualitative analysis remains equally important. Factors such as user acceptance, public perception, and regulatory adaptability cannot be fully captured through numbers alone. A deeper examination is required to ensure comprehensive regulation. By combining both quantitative and qualitative analyses, decision-making for future regulation development can be optimized. This regulation provides important sources for these analyses, such as In Service Monitoring and Reporting (ISMR). This ISMR element helps to balance supporting innovation with controlling the safety level. Output of ISMR can be used to further improve ADS regulation where needed.		
II. Text of the Regulation		
	0. Introduction	
1. Purpose		Workshop "contents" table does not have a "purpose" section for the UNR. Was this intentional? Omission impacts numbering throughout the UNR version.
1.1. This Global Technical Regulation (GTR) provides worldwide harmonised procedures to set and verify compliance with minimum requirements for the safety of Automated Driving Systems (ADS) and vehicles equipped with ADS.	1.1. This Regulation establishes uniform provisions concerning the approval of motor vehicles with regard to their Automated Driving Systems (ADS).	ADS IWG text: Not present in WS structure.
2. Scope	1. Scope	Different numbering

	UN GTR		UN Regulation	Comments
2.1.	This GTR applies to the Automated Driving Systems of vehicles of categories 1 and 2.	1.1.	This Regulation applies to the approval of vehicles of categories M, N[, L6, and L7] with regard to their Automated Driving Systems.	Workshop has UNR text ("This Regulation applies to the type-approval of fully automated vehicles of category M and N, with regard to their automated driving system.") but scope was assigned to the IWG. In any case, "fully automated vehicles" is not an accepted term under the WP.29 guidelines. There have been discussions on whether to include L_5 and L_6 vehicles.
		1.2.	[This Regulation does not apply to vehicles with regard to any ADS feature that has been approved pursuant to UN Regulation No. 157 as an Automated Lane Keeping System (ALKS), except with regard to the integration of the ALKS with the ADS and any interaction of the ALKS with other ADS features.]	UNR discussion to avoid "double approval" in case of an ADS that includes an ALKS feature already approved to UN R157.
3.	Definitions	2.	Definitions	Different numbering
3.1.	"*Automated Driving System (ADS)"* means the vehicle hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis.[31]			
3.2.	*"ADS vehicle"* means a vehicle equipped with an ADS.			
3.3.	*"Dynamic Driving Task (DDT)"* means the real-time operational and tactical functions required to operate the vehicle.			

[31] This definition is based on SAE J3016 and ISO/PAS 22736 (Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles). These standards define levels of driving automation based on the functionality of the driving automation system feature as determined by an allocation of roles in DDT and DDT fallback performance between that feature and the (human) user (if any). The term "Automated Driving System" is used specifically to describe a Level 3, 4, or 5 driving automation system.

	UN GTR	UN Regulation	Comments
3.3.1.	[When the ADS is in operation, the DDT is always performed in its entirety by the ADS which means the whole of the tactical and operational functions necessary to operate the vehicle (i.e., the ADS performs "the entire DDT" as stated in the definition of an "Automated Driving System" under para. 3.3.). These functions can be grouped into three interdependent categories: sensing and perception, planning and decision, and control.]		Brackets
3.3.2.	Sensing and perception include:		
	(a) Monitoring the driving environment via object and event detection, recognition, and classification,		
	(b) Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle's driving environment and relevant environmental conditions,		
	(c) Sensing the ODD boundaries, if any, of the ADS feature, [and]		Brackets
	(d) Positional awareness.		
3.3.3.	Planning and decision include:		
	(a) Predicting actions of other road users,		
	(b) Response preparation, [and]		Brackets
	(c) Manoeuvre planning.		
3.3.4.	Control includes:		
	(a) Object and event response execution,		Does this need explanation in guidance document given discussions on OEDR and "neural network" approaches to ADS perception and response?
	(b) Lateral vehicle motion control,		
	(c) Longitudinal vehicle motion control, [and]		Brackets
	(d) Enhancing conspicuity via lighting and signalling.		Explain " conspicuity" in guidance document?
3.3.5.	The DDT excludes strategic functions.		
3.4.	*"Real time"* means the actual time during which a process or event occurs.		
3.5.	*"(ADS) function"* means an ADS hardware and software capability designed to perform a specific portion of the DDT.		

	UN GTR	UN Regulation	Comments
3.5.1.	*"Operational function"* means a capability to control the real-time motion of the vehicle.[32]		
3.5.2.	*"Tactical function"* means a capability to perceive the vehicle environment and control real-time planning, decision, and execution of manoeuvres, including conspicuity of the vehicle and its motion.[33]		
3.5.3.	*"Strategic function"* means a capability to issue commands, instructions, or guidance for execution by an ADS.[34]		
3.6.	*"(ADS) feature"* means an application of an ADS designed specifically for use within an Operational Design Domain (ODD).		
3.6.1.	*"ADS feature of type 1 (ADSF-1)"* means an ADS feature which includes an ADS fallback response requiring a fallback user.		Is it possible to use a word other than "type"? "Type" has a specific legal meaning under the 1958 Agreement. Other regulations use words like "class", "category". Could the term(s) be more descriptve to avoid confusion over which type relies on a fallback user? For example, a term like "UFB" to mean "fallback to user" and "AFB" for "automated fallback to MRC" (so "UFB/AFB feature").
3.6.2.	*"ADS feature of type 2 (ADSF-2)"* means an ADS feature which does not include an ADS fallback response requiring a fallback user.		
3.7.	[*"(ADS) OFF"* means the ADS is not performing any activity.]		Would "function" be more consistent with the text than "activity"?
3.8.	[*"ADS On"* means either an ADS feature is performing the DDT or the system in in ADS Standby.]		(Sec) Not ideal to have a status that means more than one thing. ADS "ON" would mean that the ADS is monitoring its environment to determine whether to activate the "feature available" signal.
3.9.	[*"ADS Standby"* means no ADS feature is performing the DDT, however the ADS may be performing some other activity (e.g. determining whether the vehicle is in the ODD).]		Brackets (Sec) What is the ADS "standing by" for? It's actually monitoring the vehicle environment for ODD conditions.

[32] Operational functions involve executing micro-changes in steering, braking, and accelerating to maintain lane position or proper vehicle separation and immediate responsive actions to avoid crashes in critical driving situations.

[33] Examples include deciding whether to overtake a vehicle or change lanes, signalling intended manoeuvres, deciding when to initiate the manoeuvre, choosing the proper speed, and executing the manoeuvre.

[34] Examples include setting the starting point, destination, route, and way points to be used by an ADS during a trip.

	UN GTR	UN Regulation	Comments
3.10.	[*"ADS Feature Active"* means an ADS Feature is performing the DDT.]		Brackets
3.11.	[*"Activation"* means the act of changing the operational state of an ADS feature, from the state in which it is performing none of the DDT to the state in which it is performing all of the DDT.]		Brackets ADS-12-13 (China) Proposal to define as change from "available" to "active".
3.12.	["*Available"* means the operational state of an ADS feature pursuant to the ADS verification that the ODD conditions of the feature have been met and prior to activation of the feature.]		Brackets: The requirements of paragraphs 5.2.2.1.2. and 5.2.2.1.5. establish feature states as being "available" or "unavailable" to the user.
3.13.	[*"Deactivation"* ["Deactivation" means the act of changing the operational state of the ADS feature, from the state in which it is performing all of the DDT to the state in which it is performing none of the DDT. This could be a user-initiated deactivation to manual driving, a system-initiated deactivation to manual driving or the system returning to ADS Standby whilst the vehicle is stopped.]		Brackets The second sentence is a permission; it does not belong in the definition.
3.14.	[*"Data Storage System for Automated Driving (DSSAD)"* means a capability of a vehicle to monitor and enable evaluation of the performance of the ADS.]		EDR/DSSAD IWG
3.14.1.	*"(DSSAD) triggering event"* means a time-stamped data element which triggers the recording and storing of time-series data elements.		EDR/DSSAD IWG What does this mean? A data element is something a DSSAD records. How can a data element trigger the recording of itself? Time-series data elements use sampling to record a series of data points. Time-stamped data elements
3.14.2.	*"Emergency manoeuvre"* means a manoeuvre performed by the system in case of an event in which the vehicle is at imminent collision risk and has the purpose of avoiding or mitigating a collision.		EDR/DSSAD IWG "System" needs to be clarified as ADS or ADS feature. Consider for consistency with work on "critical" situation/scenario definitions. UN R157 defines this manoevre as deceleration above 5 m/s^2. Can the definition be more objective?

	UN GTR	UN Regulation	Comments
3.14.3.	*"Imminent collision risk"* means a situation or an event which leads to a collision of the vehicle with another road user or an obstacle which cannot be avoided by a braking demand lower than 5 m/s^2.		EDR/DSSAD IWG Logic. The risk is not the outcome. An emergency manoeuvre would be characterised by the high braking demand. The risk is a conflict with another road user that presents a clear and imminent danger of a collision if not mitigated (e.g., by the emergency manoeuvre).
3.14.4.	[*"Detected objects"* shall mean objects detected by the perception system of the vehicle and classified by the ADS as relevant for the purpose of performing a dynamic driving task. Objects with a negative relative velocity shall be deemed relevant.]		Brackets Wording
3.15.	*"Operational Design Domain (ODD)"* means the operating conditions under which an ADS feature is specifically designed to function.		
3.15.1.	*"ODD exit"* means: (a) the presence of one or more ODD conditions outside the limits defined for use of the ADS feature, and/or (b) the absence of one or more conditions required to fulfil the ODD conditions of the ADS feature.		
3.16.	"*Occurrence"* means a safety-relevant event involving an ADS vehicle.[35]		
3.16.1.	*"Critical Occurrence"* means an occurrence during which at least one of the following criteria is fulfilled: (a) At least one person suffers an injury that requires medical attention or dies as a result of being in the vehicle or being involved in the event, (b) The ADS vehicle, other vehicles, or stationary objects sustain physical damage that exceeds a certain threshold,		

[35] The occurrences to be reported are listed in the Annex [occurrence list annex].

	UN GTR	UN Regulation	Comments
	(c) Any vehicle involved in the event experiences a deployment of any non-reversible occupant restraint system, vulnerable road user secondary safety system, or the delta-V thresholds to be met, whichever occurs first.		Proposed "threshold" annex identifies EDR triggering as the source for the delta-V criteria. This provision should be updated and the redundant provision removed from the annex: Any vehicle involved in the event experiences: (i) the deployment of a non-reversible occupant restraint system, (ii) the deployment of a vulnerable road user secondary safety system, or (iii) the triggering of an event data recorder. "whichever comes first" should be deleted: the order of occurrences is irrelevant.
3.16.2.	*"Significant Occurrence"* means occurrences which are not "Critical Occurrences" but require to be reported on short term basis due to their relevance on safety.		
3.16.3.	"Vulnerable road user secondary safety system" means a deployable vehicle system outside the occupant compartment designed to mitigate injury consequences to vulnerable road users during a collision.		
3.17.	*"ADS user"* means a human user of an ADS vehicle.		
3.17.1.	*"Occupant"* means an ADS user located inside an ADS vehicle.		
3.17.2.	*"Driver"* means a user who performs in real time part or all of the DDT and/or DDT fallback for a particular vehicle.		ADS-11-10 (OPI-Users): Proposal to replace "user" with "occupant". (Sec) Use of "occupant" would prohibit use of "driver" with "remote". Risk of conflict with WP.1 where "remote driving" is an accepted term.
3.17.3.	*"Fallback user"* means a user designated to perform the DDT pursuant to an ADS fallback response.		ADS-11-10 (OPI-Users): Proposal to replace "user" with "occupant". (Sec) Use would prohibit a "remote fallback user".

	UN GTR	UN Regulation	Comments
3.17.4.	[*"Passenger"* means an occupant limited to the performance of strategic functions relative to the ADS vehicle.]		Brackets ADS-11-10 (OPI-Users): 3.5.1.3. "Passenger" means an occupant who is not a driver or designated to perform the DDT pursuant to a ADS fallback response. (Sec) This is an "non-definition": Rather than defining what a passenger is, it states what a passenger is not. The OPI proposal means that a passenger is an occupant who may not perform the DDT or DDT fallback.
3.18.	[*"DDT fallback"* means the fallback response of a user or an ADS to an ODD exit or a DDT-relevant failure.]		Brackets
3.18.1.	[*"ADS fallback response"* means a system-initiated deactivation of an ADS feature or an ADS-controlled procedure to place the vehicle in a mitigated risk condition (MRC).]		Brackets
3.18.2.	*"System-initiated deactivation of the ADS"* means a procedure by which the ADS initiates the transfer of performance of the DDT from the ADS to a vehicle fallback user.		
3.18.3.	*"User-initiated deactivation of the ADS"* means a procedure by which the user initiates the transfer of performance of the DDT from the ADS to a vehicle user.[36]		
3.18.4.	*"Suppressed"* means a condition in which a control function is limited or has limited effect until a threshold is exceeded.		ADS-12-06 (OPI): See para. 5.2.2.1.2.
3.19.	*"Remote termination"* means the act of remotely disabling one or more ADS features of one or more vehicles.		
3.20.	*"Mitigated Risk Condition (MRC)"* means a stable and stopped state of the vehicle that reduces the risk of a crash.		
3.21.	*"Other road user (ORU)"* means any entity making use of publicly accessible road infrastructure.		
3.19.1.	*"Road-safety agent"* means a human engaged in directing traffic, enforcing traffic laws, and/or responding to traffic incidents.		
3.19.2.	*"Priority vehicle"* means a vehicle [operated while making use of] [subject to] exemptions, authorizations, and/or right-of-way under traffic laws [while performing a specified function].		Brackets

[36] Where an ADSF-2 suggests that a user might optionally take control, this shall be considered a user-initiated deactivation if the user accepts the suggestion.

	UN GTR	UN Regulation	Comments
3.20.	*"Behavioural competency"* means an expected and verifiable capability of an ADS feature to operate a vehicle within the ODD of the feature.		
3.21.	*"Failure"* means the termination of an intended behaviour of an element or an item.		ADS-12-38 (OICA/CLEPA)
3.22.	*"Fault"* means an abnormal condition that can cause an element (system, component, software) or an item (system or combination of systems that implement a function of a vehicle) to fail.		ADS-12-38 (OICA/CLEPA)
3.23.	*"Functional safety"* means the absence of unreasonable risks under the occurrence of hazards caused by a malfunctioning behaviour of electric/electronic systems (safety hazards resulting from system faults).		
3.23.1.	*"Safety of the intended functionality (SOTIF)"* means the absence of unreasonable risk due to hazards resulting from functional insufficiencies of the intended functionality or reasonably foreseeable misuse.		
3.24.	*"Safety Management System (SMS)"* means a systematic approach to managing safety that encompasses and integrates organisational, human, and technical factors. (a) Human component ensuring the ADS lifecycle is monitored by personnel with appropriate skills, training, and understanding to identify risks and appropriate mitigation measures to identify risks and appropriate mitigation measures while accounting for the possibility of human errors. (b) Organisational component procedures and methods that help to manage the identified risks, understand their relationships and interactions with other risks and mitigation measures, and help to ensure that there are no unforeseen consequences. (c) Technical component using appropriate tools and equipment.		
3.25.	*"Test method"* means a structured approach to consistently derive knowledge about the performance of an ADS by means of executing tests.		
3.26.	*"Virtual testing"* means a type of testing that uses a simulation toolchain(s) to generate evidence for the manufacturer's safety case.		
3.26.1.	*"Simulation"* means the imitation of the operation of a real-world process or system over time utilizing a software implementation for some (or all) of the models, tools or test environment.		
3.26.2.	*"Simulation toolchain"* means a simulation tool or a combination of simulation tools that are used to generate evidence for the manufacturer's safety case.		Is it necessary to specify the safety case? Are toolchains limited to this use? In order to understand the definition of 'toolchain', it is necessary to understand the definition of 'tool'.

	UN GTR	UN Regulation	Comments
3.26.3.	*"Model"* means a description or representation of a system, entity, phenomenon, or process.		
3.26.4.	*"(Model) parameter"* means a numerical value inferred from real-world data and used to represent a system characteristic.		
3.26.5.	*"Stochastic model"* means a model involving or containing a random variable or variables pertaining to chance or probability.		
3.26.6.	*"Validation (of a simulation model)"* means the process of determining the degree to which a simulation model is an accurate representation of the real world from the perspective of its intended uses.		
3.26.7.	*"Verification (of a simulation model)"* means the process of determining the extent to which a simulation model or a virtual testing tool is compliant with its requirements and specifications as detailed in its conceptual models, mathematical models, or other constructs.		
3.26.8.	*"Sensor Stimulation*" means a technique whereby artificially generated signals are provided to trigger the element under testing in order to produce the result required for evaluation of the element.		
3.27.	*"Proving ground"* and *"Test track"* mean a facility closed to public traffic and designed to enable physical assessment of an ADS and/or ADS vehicle performance, e.g., via sensor stimulation and/or the use of dummy devices.		
3.28.	*"Edge Case"* means a low-probability occurrence that might arise within the ODD of an ADS and that warrants specific design attention due to the potential severity of outcomes that might result from encountering such a situation or condition.		
3.29.	*"Safety case"* means structured documentation that provides a compelling, comprehensible, and valid case that the ADS meets the relevant ADS requirements of this regulation and is free from unreasonable risks to the ADS vehicle user(s) and other road users.		
3.29.1.	[*"Argument"* means a written explanation within a safety case that captures the logical connections between a claim and the evidence for achievement of that claim.]		Brackets
3.29.2.	(*"Claim"* means a high-level assertion that the behaviour competencies of an ADS will satisfy the DDT performance requirements applicable to one or more scenarios.]		Brackets
3.29.3.	*"Evidence"* means material pertinent to demonstrating the validity of a claim such as physical test results, simulation results, analyses with supporting data, etc.		

	UN GTR	UN Regulation	Comments
3.30.	*"Safety concept"* means a description of the measures designed into the ADS so that it operates in such a way that it is free of unreasonable safety risks to the ADS vehicle user(s) and other road users in every operating condition relevant to the ODD.		ADS-12-05 (China)
3.31.	[*"(Driving) Situation"* means the entirety of the conditions surrounding a vehicle in use at a point in time that are relevant to performance of the DDT for that vehicle.]		Brackets ADS-12-23 (OPI-DDT)
3.32.	*"(Traffic) Scenario"* means a description of a sequence of driving situations that may occur during a given trip.[37]		ADS-12-23 (OPI-DDT)
3.32.1.	[*"Nominal scenario"* means any scenario that is not a critical or failure scenario.]		Brackets ADS-12-14 (China) Proposal on "nominal scenario" definition. ADS-12-23 (OPI-DDT)
3.32.2.	[*"Critical scenario"* means a traffic scenario where the operating conditions or behaviour of other road users requires a prompt action of the ADS to avoid or mitigate a collision with adverse consequences on human health or property damage.]		Brackets ADS-12-23 (OPI-DDT)
3.32.3.	*"Failure scenario"* means a traffic scenario representing a system failure that compromises the capability of the ADS to perform the entire DDT.		ADS-12-23 (OPI-DDT)
3.32.4.	*"Functional scenario"* means a basic traffic scenario describing a situation and its corresponding elements at the highest level of abstraction in natural, non-technical language.[38]		
3.32.5.	*"Logical scenario"* means a traffic scenario elaborated at a lower level of abstraction to include value ranges or probability distributions for each element of the corresponding functional scenario.[39]		
3.32.6.	*"Concrete scenario*" means a traffic scenario at a level of abstraction in which specific values have been selected for each element from the continuous ranges as may be defined in the corresponding logical scenario.		
3.33.	[*"Relevant authority"* means ….]		Brackets

[37] Scenarios include a driving manoeuvre or sequence of driving manoeuvres. Scenarios can also involve a wide range of elements, such as some or all portions of the DDT, different roadway layouts, different types of road users and objects exhibiting static or diverse dynamic behaviours, and diverse environmental conditions (among many other factors).

[38] For example, a description of the ego vehicle's actions, the interactions of the ego vehicle with other road users and objects, and other elements that compose the scenario such as environmental conditions.

[39] For example, elaborating the lane element to cover possible lane widths.

UN GTR	UN Regulation	Comments
3.34. *"Post-production phase"* means the period in which an ADS vehicle is no longer produced until the end-of-life of all ADS vehicles of the same type. The phase ends when there are no longer any operational ADS vehicles of a specific ADS type.		
3.35. *"Useful life (of an ADS vehicle)"* means the duration during which an ADS vehicle is in an operational state under which it may be driven on public roads regardless of the operational state of the ADS.		
3.36. *"Safety relevant objects"* means an object which if collided with is likely to cause non-trivial damage to the vehicle or that is likely to pose a safety risk to other road users, vehicle occupants or infrastructure.		
	3. Application for Approval	
	3.1. The application for approval of a vehicle type with regard to the ADS shall be submitted by the [vehicle] manufacturer or by their duly accredited representative.	Brackets (IWG agreed to use "manufacturer" only without any modifiers such as "vehicle" or "ADS".)
	3.2. It shall be accompanied by the documents mentioned below in triplicate:	
	3.2.1. A certificate of compliance for the SMS in accordance with this regulation.	Editorial note: The IWG has used alphabetical for "including" lists. This provision is dependent on having a provision in the Regulation for issuing a "certificate of compliance" pursuant to the audit of the SMS.
	3.2.2. A description of the vehicle type with regard to the items mentioned in paragraph [XXX], together with a documentation package as required in Annex [X] which gives access to the basic design of the ADS and the means by which it is linked to other vehicle systems or by which it directly controls output variables. The numbers and/or symbols identifying the vehicle type shall be specified.	Brackets

UN GTR		UN Regulation	Comments
	3.3.	In cases where information is shown to be covered by intellectual property rights or to constitute specific know-how of the manufacturer or of their suppliers, the manufacturer or their suppliers shall make available sufficient information to enable the checks referred to in this Regulation to be made properly. Such information shall be treated on a confidential basis.	
	3.4.	Certificate of Compliance for a Safety Management System according to paragraph [x] of this Regulation (hereinafter referred to as “Certificate of Compliance for SMS”).	Brackets
	3.4.1.	Each Contracting Party issuing type approvals pursuant to this Regulation shall appoint an Approval Authority to carry out the assessment of the manufacturer and to issue a Certificate of Compliance for the SMS.	Editorial. Align with SMS provisions drafted by the IWG (e.g., “audit” of the SMS).
	3.4.2.	An application for a Certificate of Compliance for SMS shall be submitted by the manufacturer or by their duly accredited representative.	Eidtorial: Consistent with SMS provisions?
	3.4.3.	It shall be accompanied by the undermentioned documents in triplicate, and by the following in particular: [XXX]. Documents describing the Safety Management System.	Brackets The application for approval shall be accompanied…. “undermentioned”? Can this be “following”? Alphabetical list.
	3.4.4.	A signed declaration using the model as defined in Appendix [X] to Annex [XXX].	Brackets

UN GTR		UN Regulation	Comments
	3.4.5.	In the context of the assessment, the manufacturer shall declare using the model as defined in Appendix [X] to Annex [X] and demonstrate to the satisfaction of the Approval Authority or its designated technical service that they have the necessary processes to comply with all the requirements for the SMS according to this Regulation.	Brackets Meaning of "declare using the model"? "demonstrate to the satisfaction of the Approval Authority or its designated technical service" is a requirement covered by the Regulation (i.e., that's the purpose of the SMS requirements and audit procedures).
	3.4.6.	When this assessment has been satisfactorily completed and in receipt of a signed declaration from the manufacturer according to the model as defined in Appendix [X] to Annex [X], a certificate named "Certificate of Compliance for a Safety Management System as described in Annex [X] to UN Regulation No. [xXX]" shall be granted to the manufacturer.	Brackets
	3.4.7.	The Approval Authority or its designated technical service shall use the model set out in Annex [X] to this Regulation for the Certificate of Compliance for SMS.	Brackets
	[3.4.8.	[XX The initial Certificate of Compliance for SMS issued by the Approval Authority will have a validity of maximum 3 years. The Approval authority shall perform a re-assessment within one year after granting the first ADS approval under this the certificate of compliance.]]	Brackets

UN GTR		UN Regulation	Comments
	3.4.9.	The Approval Authority which has granted the Certificate of Compliance for SMS may at any time verify that the requirements for it continue to be met. The Approval Authority shall withdraw the Certificate of Compliance for SMS if the requirements laid down in this Regulation are no longer met.	Two provisions: Separate or merge. Consistency: SMS is audited.
	3.4.10.	The manufacturer shall inform the Approval Authority or its designated technical service of any change that will affect the relevance or validity of the Certificate of Compliance for SMS. After consultation with the manufacturer, the Approval Authority or its designated technical service shall decide whether a new assessment is necessary.	Two provisions: Separate or merge.

UN GTR		UN Regulation	Comments
	3.4.11.	In due time, permitting the Approval Authority to complete its assessment before the end of the period of validity of the Certificate of Compliance for SMS, the manufacturer shall apply for a new (or for the extension of the existing) Certificate of Compliance for SMS. The Approval Authority shall, subject to a positive outcome of the assessment assessment, issue a new Certificate of Compliance or an extension of the existing Certificate of Compliance with a validity for a further period of maximum three years. The Approval Authority shall verify that the SMS continues to comply with the requirements of this Regulation. The Approval Authority shall issue a new certificate (or extend the existing certificate) in cases where changes have been brought to the attention of the Approval Authority or its designated technical service and assessment of the changes result in a positive judgement.	Garbled text. Clarify.
	3.4.12.	The expiry or withdrawal of the manufacturer's Certificate of Compliance for SMS shall be considered, with regard to the vehicle types to which the SMS concerned was relevant, as modification of approval, as referred to in this regulation, which may include the withdrawal of the approval if the conditions for granting the approval are no longer met.	Clarification. Does this mean that all approvals may be withdrawn *ex post facto* pursuant to an audit of the SMS? Meaning of "relevant"?
	3.5.	A vehicle representative of the vehicle type to be approved shall be submitted to the designated technical service responsible for conducting approval tests.	

UN GTR		UN Regulation	Comments
	3.6.	Documentation shall be made available in two parts:	
		(a) The formal documentation package for the approval, containing the material specified in Annex [x] which shall be supplied to the Approval Authority or its designated technical service at the time of submission of the type approval application. This documentation package shall be used by the Approval Authority or its designated technical service as the basic reference for the approval process. The Approval Authority or its designated technical service shall ensure that this documentation package remains available for at least [10] years counted from the time when production of the vehicle type is definitely discontinued.	Brackets
		(b) Additional material relevant to the requirements of this regulation may be retained by the manufacturer but shall be open for inspection at the time of type approval. The manufacturer shall ensure that any material made open for inspection at the time of type approval remains available for at least a period of 10 years counted from the time when production of the vehicle type is definitely discontinued.	
	4.	Approval	

UN GTR		UN Regulation	Comments
	4.1.	Approval Authorities shall grant, as appropriate, type approval with regard to Automated Driving Systems, only to such vehicle types that satisfy the requirements of this Regulation.	
	4.1.1.	The Approval Authority or the designated technical service shall verify by means of document checks and appropriate testing that the manufacturer has taken the necessary measures relevant for the vehicle type to: [Placeholder – list of fundamental aspects that the manufacturer must demonstrate to the TAA and TS; to come from the work of the 'Assessment' OPI.]	Brackets
	4.1.2.	The Approval Authority or the designated technical service shall verify by testing of a vehicle of the vehicle type that the manufacturer has implemented the measures they have documented. Tests shall be performed by the Approval Authority or the designated technical service itself, or in collaboration with the manufacturer, by sampling.	First sentence garbled. Is this provision referring to "confirmatory testing". What is meant by "sampling". How is compliance with the sampling requirement determined?
	4.1.3.	The Approval Authority or designated technical service shall refuse to grant the type approval where the manufacturer has not fulfilled one or more of the requirements of this regulation.	Do technical services grant type approvals under this Regulation?

UN GTR		UN Regulation	Comments
	4.1.4	The assessing Approval Authority shall also refuse to grant the type approval where the Approval Authority or designated technical service has not received sufficient information from the manufacturer to assess the Automated Driving System of the vehicle type.	Why “assessing Approval Authority”? Isn’t this saying that the TAA or TS may refuse to consider a vehicle for approval if the manufacturer has not provided the required information?
	4.2.	Notice of approval or of extension or refusal of approval of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement which apply this Regulation, by means of a form conforming to the model in Annex [X] to this Regulation.	Communication form in Annex 1
	4.3.	Approval Authorities shall not grant any type approval without verifying that the manufacturer has put in place satisfactory arrangements and procedures to properly manage all aspects required by this Regulation.	Is this redundant? The Regulation specifies extensive manufacturer (organisational) requirements with compliance assessments to verify what is stipulated here.
	4.3.1.	The Approval Authority and its designated technical services shall ensure, in addition to the criteria laid down in Schedule 2 of the 1958 Agreement that they have:	Presumably, “they” means the manufacturer, not the TAA and TS, and the approval authority ensures that the designated technical services have the competencies? The requirement to comply with Schedule 2 is missing.
		(a) Competent personnel with appropriate skills and specific knowledge of functional safety, safety of the intended functionality, modelling & simulation, and human factors.	Misplaced and redundant. The SMS and credibility assessments extensively cover these requirements.
		(b) Implemented procedures for the uniform evaluation according to this Regulation.	Misplaced and redundant. The “testing environments” and “safety case” cover this provision.

UN GTR		UN Regulation	Comments
	4.4.	For the purpose of paragraph [SMS] of this Regulation, the manufacturer shall ensure that the safety management aspects covered by this Regulation are implemented.	Brackets
	[4.5.	Approvals covering ADS features which can be activated in the territory of other Contracting Parties]	Brackets
	4.5.1.	Before granting an approval according to this UN Regulation, the granting Approval Authority shall contact the Approval Authorities of the respective Contracting Parties in whose territory any feature of the Automated Driving System can be activated, in accordance with Paragraph 1 of Schedule 6 to the 1958 Agreement. The following information shall be provided as a minimum:	Reconsider. Schedule 6 concerns "Procedures for resolving interpretation issues in relation to the application of UN Regulations and granting approvals pursuant to these UN Regulations". Paragraph 1 states, "When an application for UN type approval requires the approval authority to make a significant interpretation on the application of the UN Regulation…" The issue here does not concern interpretation of the ADS regulation. The provision concerns the outcome of the assessment and requires consultation with other TAA prior to granting any approval.
		(a) … (b) … *	No information.
		[Notwithstanding the period specified in Schedule 6 to the 1958 Agreement, a period of [x days] shall be allowed for replies from the other approval authorities.]	Brackets Orphan Reconsider. This provision proposes to supersede the 1958 Agreement with regard to the required period that must be allowed for replies to a notification by a TAA.

UN GTR		UN Regulation	Comments
	4.5.2.	Following the review in accordance with paragraph 4.5.1, in accordance with Article 10 of the 1958 Agreement, the receiving Approval Authority may give notice to the granting Approval Authority using the model given in Appendix [x] that the Contracting Party concerned disagrees with the interpretation or application of this UN Regulation *.	Paragraph 4.5.1. does not specify a "review". Meaning of "receiving approval authority"? Where is the "model given in Appendix [x]"?
	4.5.2.1.	[In this case, the granting Approval Authority shall ensure that the territory of the Contracting Party concerned is excluded from the ODD of the ADS feature(s) concerned and shall not include that Contracting Party in Appendix [x] to Annex 1.]	Brackets Logic and wording: This provision does not seem quite right. The Authority would need to tell the manufacturer that the vehicle cannot be approved for use in the territory of the CP. The manufacturer would then need to demonstrate that the ADS will not make the feature(s) available in the territory of the CP. The ODD is primarily concerned with the functional capabilities of an ADS feature. The only ODD attribute concerned here would be geographic. SAE J3016 (para. 8.8) discusses legal jurisdictions and note that a prohibition on use in one country does not change the underlying functional capabilities (i.e., an L5 is still an L5 even if legally prohibited from operating in a country). More precise wording would reduce the risk of confusion over the meaning and application of ODD.
	4.5.2.2.	[If the requirements of paragraph 4.5.2.1. are not fulfilled, in accordance with Article 4 of the 1958 Agreement, the Contracting Party concerned may prohibit the sale and use of such wheeled vehicles in their territory until the dispute is resolved and shall inform the secretariat of the Administrative Committee of this situation.]	Brackets

UN GTR		UN Regulation	Comments
	4.5.3.	[In the case that the granting Approval Authority disagrees with the reasons given by the receiving Approval Authority in the notification according to paragraph 4.5.2, this dispute shall be settled in accordance with Article 10 and Schedule 6 of the 1958 Agreement. The Contracting Parties shall also inform the relevant subsidiary Working Party of the World Forum for Harmonization of Vehicle Regulations (WP.29) of the diverging interpretations within the meaning of Schedule 6 to the 1958 Agreement. The relevant subsidiary Working Party shall support the settlement of the diverging views and may consult with WP.29 on this if needed.]	Brackets
	4.5.4.	[In the case that the territory of an additional Contracting Party is added as part of the extension of a type approval, the requirements of paragraphs 4.5.1 to 4.5.3 shall apply *mutatis mutandis* with respect to that Contracting Party and its Approval Authority.]	Brackets
	4.5.5.	[In the case of modifications to a vehicle type resulting in extension of an approval which covers territory of other Contracting Parties, the granting Approval Authority shall consider whether these changes constitute new significant interpretations. If so, the Approval Authorities of the relevant Contracting Parties shall be consulted in accordance with Paragraph 1 of Schedule 6 to the 1958 Agreement. In the case of any dispute, the provisions of paragraphs 4.5.2 and 4.5.3 shall apply.]	Brackets

UN GTR		UN Regulation	Comments
	4.5.6.	[Each Approval Authority shall, within 14 days after granting or extending a type approval pursuant to this Regulation, upload the type approval together with the supplementing documentation (including all related test reports) in English language to the secure internet database "DETA", established by the United Nations Economic Commission for Europe.]	Brackets
	4.6.	There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark consisting of:	
	4.6.1.	A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval(footnote),	Change to alphabetical.
	4.6.2.	The number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in paragraph 4.6.1. above, and	Change to alphabetical
	4.6.3.	An additional symbol consisting of the roman numerals for the type(s) of ADS feature present in the ADS which has been approved.	Change to alphabetical “present in the ADS”? Use of roman numerals intentional? ADS feature types use arabic, not roman numerals, in the definitions.

UN GTR		UN Regulation		Comments
		4.7.	If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.6.1. above need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.6.1. above.	
		4.8.	The approval mark shall be clearly legible and be indelible.	“clearly” legible is redundant: legible means “clear enough to read”.
		4.9.	The approval mark shall be placed close to or on the vehicle or bodywork data plate affixed by the manufacturer.	
		4.10.	Annex [2] to this Regulation gives examples of arrangements of approval marks.	Brackets
4.	General requirements			General requirements omitted from the Workshop UNR. Was this intentional? This section will be prepared by the leadership to describe the overall regulation. The current draft is subject to change based on the evolution of the requirements and assessments chapters.
4.1.	This Global Technical Regulation establishes: (a) Performance requirements for ADS and ADS vehicles, (b) Requirements for manufacturer design, development, validation, and monitoring of ADS and ADS vehicles, and			

UN GTR	UN Regulation	Comments
(c) Assessment procedures and criteria to verify compliance with the above requirements.		
4.2. The Regulation aims to ensure that ADS vehicles will be safe for use on public roads.		
4.3. ADS requirements		
4.3.1. This Regulation contains provisions concerning:		
(a) ADS performance of the Dynamic Driving Task (paragraph 5.1.),		
(b) The safety of interactions between ADS and their users (paragraph 5.2.), and		
(c) For data-recording systems, cyber security, software management, and other areas relevant to the safe deployment of ADS on public roads (para. 5.3.).		
4.3.2. The DDT performance requirements establish a framework for the evaluation of the ADS capabilities:		
(a) Under nominal scenarios		
(b) Under critical scenarios		
(c) Under failure scenarios		
(d) At Operational Design Domain (ODD) boundaries		
(e) In fallbacks to a Mitigated Risk Condition (MRC).		

	UN GTR	UN Regulation	Comments
4.3.2.1.	The requirements under nominal scenarios concern the functional capabilities of the ADS to perform the entire DDT necessary to operate the vehicle within the ODD of its features.		
4.3.2.2.	The requirements under critical scenarios concern the behavioural capabilities of the ADS to mitigate the risks and consequences of conflicts with other road users.		
4.3.2.2.1.	The requirements for DDT performance under nominal scenarios continue to apply under critical scenarios as far as is reasonably practicable given the specific circumstances.		
4.3.2.3.	The requirements under failure scenarios concern the capabilities of the ADS to detect and manage failures that compromise its ability to perform the DDT.		
4.3.2.4.	The requirements for DDT performance at ODD boundaries concern….		To be completed after review of the requirements.
4.3.2.5.	The requirements for performance of fallbacks to a Mitigated Risk Condition concern the ADS capabilities to bring the vehicle to a safe stop.		To be completed after review of the requirements.

	UN GTR	UN Regulation	Comments
4.3.2.6.	As a general concept, these requirements aim to ensure that the safety level of each ADS shall be at least to the level of a competent and careful human driver.		Suggest replacing first “safety level” with “DDT performance”.
4.3.3.	Safety of interactions between ADS and their user(s)		ADS-12-05 (China)
4.3.3.1.	[Something interesting goes here.]		Overview of the provisions to be added.
4.3.4.	Other requirements revelvant to safe deployment of ADS on public roads		
4.3.4.1.	Data Storage Systems for Automated Driving		
4.3.4.1.1.	The Regulation requires ADS vehicles to be equipped with a Data Storage System for Automated Driving (DSSAD).		
4.3.4.1.2.	DSSAD provide a data-recording and storage capability for monitoring the safety-relevant performance of the ADS vehicle.		
4.3.4.1.3.	DSSAD support the monitoring and evaluation of ADS post-deployment safety performance.		
4.3.4.2.	[Cyber security management]		
4.3.4.3.	[Software updates management]		
4.4.	Manufacturer requirements		
4.4.1.	This Regulation establishes requirements for: (a) The Safety Management System of the manufacturer,		

UN GTR	UN Regulation	Comments
(b) The testing environments used by the manufacturer to generate evidence to support the ADS safety case, (c) The techincal documentation of the ADS safety concept and the claims, arguments, and evidence used to validate the concept, (d) The requisite capabilities for monitoring and reporting on ADS post-deployment safety performance.		
4.4.1. Safety Management System		
4.4.1.1. This Regulation requires the manufacturer to document its processes for ensuring that the ADS is free of unreasonable safety risks.		
4.4.1.2. The Regulation establishes requirements for managing safety throughout the useful life of the ADS vehicle, including the following stages: (a) Development, (b) Production, (c) Operation, and (d) Decommissioning.		

UN GTR	UN Regulation	Comments
4.4.1.3. The Regulation requires these processes, collectively known as the Safety Management System (SMS), to address safety risks associated with organisational, human, and technical factors.[40] (a) Organisational factors concern procedures and methods to manage identified risks, understand their relationships and interactions with other risks and mitigation measures, and reduce the risk of unforeseen consequences.[41] (b) Human factors concern the roles of personnel, their skills, training, and understanding to identify risks and mitigation measures, and processes to control for the possibility of human error. [42] (c) Technical factors concern the tools and equipment used to identify risks and evaluate mitigation measures.[43]		

[40] Based on ADS-05-13: “The SMS shall manage and improve safety by considering organizational, human and technical risk factors.”
[41] ADS-05-13: “Organisational component procedures and methods that help to manage the identified risks, understand their relationships and interactions with other risks and mitigation measures, and help to ensure that there are no unforeseen consequences”
[42] ADS-05-13: “Human component ensuring the ADS lifecycle is monitored by personnel with appropriate skills, training, and understanding to identify risks and appropriate mitigation measures while accounting for the possibility of human errors”
[43] ADS-05-13: “Technical component using appropriate tools and equipment.”

UN GTR	UN Regulation	Comments
4.4.1.4. The Regulation requires the manufacturer's documentation to cover the following aspects:[44] (a) Safety policy (paragraph 6.1.1.) (b) Risk management (paragraph 6.1.2.) (c) Design and development (paragraph 6.1.3.) (d) Production (paragraph 6.1.4.) (e) Post-deployment (paragraph 6.1.5) (f) Safety assurance (paragraph 6.1.6.) (g) Safety promotion (paragraph 6.1.7.).		
4.4.2. Test environments		
4.4.3. Safety case		
4.4.3.1. The Regulation requires the manufacturer to produce a safety case for the ADS and its feature(s) in a manner that demonstrates the application of the SMS to the ADS under assessment, including the following aspects:		

[44] These are the section headings in ADS-05-13. The word "process" has been dropped as unnecessary (and possibly misleading since these management aspects can involve many processes, not just one). Cross-references are added to guide the reader to the corresponding sections.

UN GTR	UN Regulation	Comments
(a) The safety concept, which describes the hazard identification and mitigation measures designed into the ADS to meet the requirements of this regulation and achieve the goal of avoidance of unreasonable risk with regard to SOTIF and functional safety,		
(b) Information and documentation necessary to describe the ADS covered by the safety case, including the intended use, the operating environment, the interactions with humans, sub-systems and components, control strategies,		
(c) Structured claims, argumentation, and evidence (including validation tests) that affirm and demonstrate that the ADS meets the requirements in Section 5 and is free from unreasonable risks to the ADS vehicle user(s) and other road users,		ADS-12-05 (China)
(d) Demonstration of credibility and suitability of test tools used in generating evidence, and		

	UN GTR	UN Regulation	Comments
	(e) Explanation of the processes for reinforcing ADS safety throughout the life of the ADS.		Is “reinforcing” the right word? The ADS is deemed safe pursuant to its assessment prior to deployment. Perhaps “maintaining” or a similar word would be more apt? The concept is that the ADS is safe but given the complexity and dynamics of its operating environment, updates might be warranted to maintain the desired levels of safety.
4.4.4.	Post-deployment safety		
4.4.4.1.	The Regulation requires manufacturers to perform in-service monitoring and reporting (ISMR) on the safety performance of their ADS in use.		
4.4.4.2.	The Regulation requires the manufacturer to put in place a fleet-monitoring mechanism to collect information from the ADS vehicles in accordance with the requirements listed in under paragraph 6.1.5.:		ADS-12-37 (OICA/CLEPA) From the DSSAD? Bias: Assumes that the manufacturer does not already have a monitoring program.
	(a) To confirm the safety case and confirm the validation carried out by the manufacturer before market introduction,	(a) To confirm the safety case and confirm the validation carried out by the manufacturer before the granting of the approval.	ADS IWG text indicates intention to include “general requirements” in the UNR (in contrast with the ADS WS omission).
	(b) To enable the identification of unreasonable risks related to the use of an ADS on public roads and the evaluation of its safety performance during real-world operation,		

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	(c) To enable the identification of unanticipated situations, hazards, and risks that lead to unexpected behaviour of the ADS. This information shall be assessed by the manufacturer and where appropriate be used to develop new or revise existing scenarios derived from ISMR activities.		Verbosity and context: To enable analysis of situations, hazards, and risks that resulted in unexpected ADS behaviour(s), (d) To support the development of traffic scenarios for assessment of ADS capabilities and behaviours.
4.4.4.3.	The Regulation requires the manufacturer to have mechanisms for receiving and analysing safety-relevant feedback and reports from other sources, in accordance with the requirements listed in 6.1, to complement the data collected from ADS vehicles.		More detail than necessary. Para. 6.1.5. stipulates what the manufacturer must be set up to collect. Provision can be simplified: The Regulation also requires the manufacturer to collect and analyse safety-relevant information from other sources (paragraph 6.1.5.7.).
4.4.4.4.	ISMR reports indicating that the ADS poses an unreasonable safety risk will trigger actions to address non-conformities in accordance with the applicable law.		“unreasonable risk to safety” is not the same thing as “non-conformities”: ISMR reports indicating that an ADS presents an unreasonable risk to safety are expected to trigger remedial processes in accordance with the applicable laws.
4.4.4.5.	These requirements are without prejudice to applicable laws governing: (a) Access to data, (b) availability of data, (c) Data privacy, (d) Data protection, (e) Provision of data to other authorities.		ADS-12-08 (OPI ISMR)

	UN GTR	UN Regulation	Comments
4.5.	Compliance assessments		
4.4.1.	Audit of the Safety Management System		
4.4.2.	ADS Testing Credibility Assessments		
4.4.3.	Assessment of the Safety Case for the ADS		
4.4.4.	Post-deployment Safety		
TBD			Any additional items such as annexes?
5.	ADS Requirements		
5.1.	Performance of the DDT		
5.1.1.	The ADS shall be capable of performing the entire DDT within the ODD of its feature(s).		Clarity: …the entire DDT necessary to operate the vehicle within the ODD…
	[The manufacturer shall use a process to derive behavioural competencies and scenarios that are ODD-relevant. The methodology used in Annex [x] can be used or alternative methods providing they are equally comprehensive.]		This is a process requirement (not an ADS performance requirement) that should be covered under the SMS. Also note that the SMS audit provisions refer to evaluation of the manufacturer's methods for analysing an ODD. ADS-09-23 provided a draft annex on ODD analysis and scenario generation. ADS-08-19 proposed text for reflecting the aims of the annex in minimum requirements for an ODD analysis.
5.1.2.	ADS Performance of the DDT under Nominal Traffic Scenarios		
5.1.2.1.	The driving behaviour of the ADS shall not cause a collision.[45]		
5.1.2.2.	The ADS shall adapt its speed in line with safety risks.		The ADS shall adapt the speed of the vehicle in line with safety risks.
5.1.2.3.	The ADS shall maintain appropriate distances from other road users by controlling the longitudinal and lateral motion of the vehicle.		

[45] It is acknowledged that establishing causation can be complex, and not always possible. However, where it is established that the behaviour of an ADS caused a collision, this is a non-compliance with this requirement.

	UN GTR	UN Regulation	Comments
5.1.2.4.	The ADS shall avoid unreasonable disruption to the flow of traffic in line with safety risks.		
5.1.2.5.	The ADS shall adapt its driving behaviour in line with safety risks.		ADS-12-15 (China)
5.1.2.5.1	This shall include the anticipation of risks in the driving environment to reduce the likelihood of encountering a critical scenario.		
5.1.2.6.	The ADS shall detect and respond to objects and events relevant to its performance of the DDT.		
5.1.2.7.	The ADS shall detect and respond to priority vehicles in accordance with the applicable traffic law(s).		
5.1.2.8.	The ADS shall comply with traffic rules in accordance with application of relevant law within the area of operation.		
5.1.2.9.	The ADS shall interact safely with other road users.		
5.1.2.10.	The ADS shall avoid collisions with safety-relevant objects.		
5.1.2.11.	The ADS shall signal its operational status if required by applicable laws.		
5.1.2.12.	Pursuant to a passenger request under para. 5.2.4.1., the ADS shall bring the vehicle to a safe stop.[46]		
5.1.2.13.	The ADS shall have strategies in place to appropriately detect and respond to instructions from road safety agents.		
5.1.3.	ADS Performance of the DDT under Critical Traffic Scenarios		
5.1.3.1.	The requirements for DDT performance under nominal scenarios shall continue to apply during critical scenarios as far as is reasonably practicable under the specific circumstances with the aim of minimising overall safety risks.		
5.1.3.2.	When a collision cannot be avoided, the ADS shall aim to mitigate its severity.		In the case of an unavoidable collision, the ADS driving behaviour shall aim to mitigate the severity of the collision.
5.1.3.3.	In the event of a collision involving the ADS vehicle, if required to stop by applicable law, the ADS shall stop or fall back to an MRC as appropriate. During this process the user may initiate deactivation of the ADS if the design of the ADS allows.		ADS-12-16 (China)
5.1.3.2.1.	The ADS shall not resume travel unless:		

[46] Para. 5.2.4.1.: “The ADS shall provide the passenger(s) with means to request to stop the vehicle.”

	UN GTR	UN Regulation	Comments
	(a) The safe operational state of the ADS vehicle has been verified, and		
	(b) It is permissible under the applicable laws.		
5.1.3.2.2.	Notwithstanding para. 5.1.3.2.1.(a), if the collision occurred while an ADS feature of type 2 was active, when directed by a road safety agent, the ADS shall move the vehicle unless the ADS determines that the manoeuvre poses an unreasonable safety risk or is not technically possible due to damage. Alternatively, the safety case shall describe how the road safety agent's instructions will be complied with in such circumstances.		
5.1.4.	ADS Performance of the DDT under Failure Scenarios		
5.1.4.1.	The requirements for DDT performance under nominal scenarios shall continue to apply during failure scenarios as far as is reasonably practicable under the specific circumstances with the aim of minimising overall safety risks.		
5.1.4.2.	[The ADS shall detect faults, malfunctions, and abnormalities that compromise its capability to perform the DDT within the ODD.]		Brackets. Note: This requirement was directly linked to the outcome of SMS analyses to identify failure risks. The intent was to require an ADS to be able to detect faults that might compromise the ability of the ADS to perform the DDT. The list of faults (and assessment of their severity) are an outcome of the SMS risk analyses. The ADS shall detect faults, malfunctions, and abnormalities that compromise its capability to perform the DDT within the ODD pursuant to the requirements under paragraph 6.1.2. of this Regulation.
5.1.4.3.	In response to a fault, the ADS shall either:		
	(a) Execute a fallback response and prohibit activation of the impacted feature(s) if the fault prevents the ADS from performing the DDT in accordance with the requirements under paragraph 5.1., or		
	(b) Adapt its performance of the DDT in accordance with the severity of the fault provided the resulting performance complies with the requirements of under paragraph 5.1.		
5.1.4.4.1.	Remote termination for an ADS performing the DDT shall be capable of triggering an ADS fallback response.		

	UN GTR	UN Regulation	Comments
5.1.4.4.2.	Remote termination of an ADS or ADS feature(s) shall render it unable to be activated by a user until such time as the remote termination is rescinded.		
5.1.5.	ADS Performance of the DDT at ODD Boundaries		
5.1.5.1.	The ADS shall recognise the conditions and boundaries of the ODD of its feature(s).		
5.1.5.2.	The ADS shall be able to determine when the conditions are met for activation of each feature.		
5.1.5.3.	The ADS shall prevent activation of a feature unless the ODD conditions of the feature are met.		
5.1.5.4.	The ADS shall execute a fallback response when one or more ODD conditions of the feature in use are no longer met.		
5.1.5.4.1.	For ADS Features of type 2, under a nominal scenario this fallback response shall be to [aim to] bring the ADS vehicle to a stop in a location which is safe and complies with traffic rules (e.g. a parking space).		ADS-12-34 (OPI-DDT)
5.1.5.5.	The ADS shall be able to anticipate and safely respond to foreseeable exits from the ODD of each feature.		
5.1.6.	Fallbacks to a Mitigated Risk Condition		
5.1.6.1.	For ADS features of type 2, the ADS fallback response shall be to place the vehicle in an MRC. During the fallback to MRC the user may initiate deactivation of the ADS if the design of the ADS allows.		ADS-12-34 (OPI-DDT) Confusing. If driverless, the fallback is always to an MRC. This adds that any user may deactivate the ADS. Deactivation only applies to features. Unlimited user deactivations sounds unsafe—what's to prevent error and abuse? Why would the user initiate deactivation when the ADS is already doing this via the MRC fallback?
5.1.6.2.	For ADS features of type 1, if it has not been possible to complete a system-initiated deactivation procedure, the ADS shall execute a fallback to an MRC. During the fallback to MRC the user may initiate deactivation of the ADS.		ADS-12-34 (OPI-DDT) Why is this provision so vague? A type 1 feature falls back to the user. If the user response is inadequate, the feature falls back to an MRC. A user may interrupt a fallback to an MRC by correcting their response (or lack thereof). Why use vague "deactivation" instead of clear wording?

	UN GTR	UN Regulation	Comments
5.1.6.3.	Upon completion of an ADS fallback to an MRC, a user may be permitted to assume control of the vehicle.		
5.2.	Interactions between the ADS and its User(s)		
5.2.1.	General requirements		
5.2.1.1.	Safety-relevant information and signals shall be:		
	(a) Noticeable by the target user(s) under all operating conditions,		ADS-12-05 (China) ADS-12-06 (OPI)
	(b) Comprehensible and unambiguous, and		ADS-12-06 (OPI)
	(c) Multi-modal (e.g., optical, auditory, haptic) if needed.		ADS-12-06 (OPI)
5.2.1.2.	The ADS shall signal its intention to place the vehicle in an MRC to the ADS user(s).		
5.2.1.3.	The ADS user shall be permitted to override ADS operation of doors in the event of emergency.		ADS-12-06 (OPI) ?? The ADS shall allow the user to override its operation of doors in the event of an emergency. OR The user shall be able to override the ADS operation of doors in the event of an emergency. ?? (Wording raises question of who or what permits the user to override the ADS).
5.2.2.	ADS features that permit a user to perform the DDT.		ADS-12-06 (OPI)
5.2.2.1	General requirements		
5.2.2.1.1	The ADS shall be designed to prevent misuse and errors in operation by the user.		
5.2.2.1.2.	[While an ADS feature is active:]		ADS-12-06 (OPI): **See for discussion of stakeholder positions.** ADS-12-11 (China) Suggest restructuring for clarity (these are distinct requirements and permissions)
	(a) The controls related to manual performance of the DDT shall be disabled, suppressed, or by other means made unavailable:		5.2.2.1.2. Controls related to manual performance of the DDT shall be disabled, suppressed, or by other means made unavailable to the user(s) while an ADS feature is active.

UN GTR	UN Regulation	Comments
	(i) In the case these controls are suppressed, the ADS shall have strategies in place to avoid ambiguous states of control, or unintentional effect on the DDT.	This wording indicates that "suppression" is a permission ("may", not "shall"). What is the difference between "disable", "suppress", and "make unavailable"? 5.2.2.1.2.1. If controls are suppressed, the ADS shall have strategies to avoid ambiguous states of control or unintended effects on feature performance of the DDT.
	(ii) When a user overcomes a suppression threshold a user-initiated deactivation procedure shall commence and must follow the requirements of 5.2.2.3.	5.2.2.1.2.2. User inputs that exceed the threshold of the suppressed controls shall initiate a feature deactivation procedure pursuant to paragraph 5.2.2.3. of this Regulation.
	(b) Devices for indirect vision, tell-tales, and non-ADS-related warnings may be disabled, suppressed, or by other means made unavailable, and	5.2.2.1.3. Devices for indirect vision, tell-tales, and non-ADS-related warnings may be disabled, suppressed, or by other means made unavailable to the user(s) while a feature is active.
	(c) In the case of an ADS feature of Type 2 direct view to the outside environment may be reduced or compromised.	5.2.2.1.4. User fields of view may be reduced or compromised while an ADS feature of Type 2 is active.
5.2.2.1.3.	The vehicle controls dedicated to the ADS shall be clearly identified and distinguishable to accommodate only the appropriate interactions.[47]	
5.2.2.1.4.	While an ADS feature is active, it shall inform the user of:	
	(a) ADS status information,	
	(b) The role of the fallback user in the case of a Type 1 feature, and	ADS-12-06 (OPI)
	(c) Adapted performance of the DDT consequent to some failure of the ADS.	
5.2.2.1.5.	The ADS shall indicate the availability of a feature for activation.	

[47] Through size, form, location, colour, type, action, spacing and/or control shape. The provision aims to promote correct use and is not intended to prohibit multifunction controls.

	UN GTR	UN Regulation	Comments
5.2.2.1.6.	While active, a Type 1 feature shall:		ADS-12-06 (OPI)
	(a) Continuously assess whether the fallback user is available to assume the role of driver. A fallback user is considered available when the user is at least awake and correctly seated in such a way as to enable the fallback user to take control of the DDT at the end of the deactivation procedure.		ADS-12-06 (OPI)
	(b) Provide effective procedures for re-engaging the fallback user who has been detected not to be available.		
	(c) Trigger a fallback to an MRC where it has not been possible, feasible and/or safe to re-engage the fallback user.		
	(d) In a nominal scenario, indicate the beginning of a system-initiated deactivation procedure in a manner so the fallback user has sufficient time to perceive the need to take over and be able to safely respond at the end of the deactivation procedure in order to support the fallback user re-engaging to the driving task.		ADS-12-06 (OPI) (Sec) "Situation", not "scenario". Why is this wording so dense? What does "respond at the end of the deactivation procedure" mean? The procedure has ended; what kind of response could there be? Is this requiring notifications to provide sufficient time for completion of the deactivation process?
5.2.2.2.	ADS feature activation		
5.2.2.2.1.	The ADS shall ensure a safe ADS feature activation.		
5.2.2.2.2.	[The ADS shall provide immediate feedback to indicate success or failure when the user attempts to enable an ADS feature.]		ADS-12-07 (China): The ADS shall provide timely feedback to indicate success or failure when the ADS user attempts to activate an ADS feature.
5.2.2.2.3.	The feature activation procedure (e.g., sequence of actions and states) shall take into account relevant recommendations or standards.		ADS-12-06 (OPI)
5.2.2.2.4.	Upon activation of an ADS feature of Type 1, the ADS shall immediately and explicitly inform the fallback user of the consequent expectations on them to be ready to respond to a request to resume the DDT.		ADS-12-06 (OPI)
5.2.2.3.	ADS feature deactivation to manual driving		

	UN GTR	UN Regulation	Comments
5.2.2.3.1	A suggestion from a Type 2 feature that a user might optionally take control shall be considered a user-initiated deactivation if the user accepts the suggestion.		What is the intent of this provision? It permits a feature that is not designed to fall back to a user to request a user to take over performance of the DDT. The "deactivation procedure" for a fallback and a takeover is the same: the ADS determines that the "transfer of control" is safe and deactivates the feature in use. Why would a feature not designed to hand control to a user suggest that a user to take control? The provision then states that if the user responds and the ADS completes the deactivation, then the deactivation is deemed "user-initiated". Why is this made so complicated? Why wouldn't we simply say that an ADS can issue, say, "notifications" and "warnings". A notification provides information that a user may act upon (e.g., "ODD exit in two kilometers—prepare to assume control"). A warning has consequences (e.g., "ODD exit imminent—Assume control or the vehicle will be placed in an MRC"). The provision can then be, "A user response to a notification shall be considered a user-initiated deactivation of the ADS feature."
5.2.2.3.2.	Following the user requesting deactivation of the ADS feature, the ADS shall follow a deactivation procedure to safely transfer control of the DDT to the user.		How will compliance with this requirement be determined? Why is this "user requesting" not a "user-initiated deactivation"? Using "transfer control". How does "user requesting deactivation" fall under "ADS feature deactivation"? Isn't that a "user-initiated deactivation"?

	UN GTR	UN Regulation	Comments
5.2.2.3.3.	The ADS shall respond when the user requests to initiate a system deactivation procedure. The ADS shall only initiate the system deactivation procedure if the ADS verifies that the user is in position to assume the role of the driver.		Two distinct requirements. Respond how? The ADS is the system. Activations refer to the feature, not the system. Is there consistent language available for describing the fallback user being ready to participate in and complete the deactivation process? Is a "request to initiate" different from "initiate"? What criteria fulfill being "in a postion to"? Does this link to the safety concept?
5.2.2.3.4.	ADS feature deactivation may be delayed if it is assessed by the ADS that the situation is unsuitable or unsafe for the subsequent mode of vehicle operation. In this case, the user shall be informed of this circumstance.		Multiple and ambigous requirements. The ADS may delay the deactivation of a feature: Presumably, this case only applies to a user-initiated deactivation? Presumably, the user has initiated (or is the preferred term "requested"?) deactivation of a feature. The ADS is permitted to delay the deactivation of the feature (a) if the ADS determines that the deactivation would be "unsuitable" (what constitutes this?) or unsafe, and (b) if the ADS notifies the user (the fallback user?).
5.2.2.3.5.	The ADS feature shall remain active until the system deactivation procedure has been completed or the ADS vehicle reaches a minimal risk condition.		ADS-12-06 (OPI) Careful about wording: a fallback to an MRC might be triggered by the inability of a feature to continue performing the DDT. Technically, a fallback is a response to the incapacity to continue performing the DDT (i.e., the "fallback" is the "Plan B" when something prevents the ADS from performing the DDT).
5.2.2.3.6.	The deactivation procedure (e.g., sequence of actions and states) shall take into account relevant recommendations or standards.		ADS-12-06 (OPI) Can we define "deactivation procedure so we don't need the "e.g." (which are not examples, so not really "exempli gratia").

	UN GTR	UN Regulation	Comments
5.2.2.3.7.	The ADS shall assess if the user is suitably engaged to resume the DDT before completion of the deactivation procedure. A user is considered suitably engaged to resume the DDT when they are at least in contact with the steering control and their gaze or head posture (if gaze monitoring is momentarily unavailable) has been primarily directed to a driving task relevant area long enough to be able to resume the DDT safely.		ADS-12-06 (OPI)
5.2.2.3.9.	At the completion of the deactivation procedure, control shall be returned to the driver without any continuous lateral or longitudinal control assistance active [unless there is a deliberate action by the user in or [immediately preceding/during] the deactivation procedure and the assistance system is able to monitor the driver potential disengagement from the driving task].		ADS-12-06 (OPI)
5.2.2.3.9.	If applicable, during the deactivation procedure, controls related to manual performance of the DDT, direct view to the outside environment, devices for indirect vision, indicators, warnings, and tell-tales shall be set to an appropriate state for manual driving.		ADS-12-06 (OPI) ADS-12-10 (China) Proposal to delete “if applicable”.
5.2.3.	ADS features that do not permit a user to perform the DDT		
5.2.3.1.	The ADS shall provide the passenger(s) with means to request to stop the vehicle.		?? The ADS vehicle shall be equipped with means to… ??
5.2.3.2.	The ADS vehicle shall provide safety-related information to the passengers.		
5.2.3.3.	The ADS shall attempt to mitigate the safety risks if such risks to passengers (e.g., safety belts not fastened, passengers not seated) arise while an ADS feature is active.		ADS-12-06 (OPI) Oprhan: needs to be clarified.
5.2.3.4.	Controls provided for manual driving (e.g., steering, service brake, parking brake, accelerator, lighting) shall be designed to prevent any effect on the DDT whilst the ADS is performing the DDT, or reasonable safeguards shall be put in place to prevent access to controls.		Rephrase for consistency: “controls related to manual performance of the DDT” “ADS feature active”, “disabled, suppressed, or by other means made unavailable”
5.2.4.	Information provision to users who can perform the role of the driver		
5.2.4.1.	Means shall be provided that facilitates user understanding of the functionality and operation of the system.		
5.2.4.1.1.	A description of the ADS features and their capabilities and limitations shall be provided.		ADS-12-06 (OPI) Can this be linked to similar requirements under safety case?
5.2.4.1.2.	Instructions for the activation and deactivation of the ADS feature(s) shall be provided, with clear explanations of the distinctions between user-initiated deactivation and system-initiated deactivation where applicable.		ADS-12-06 (OPI)

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5.2.4.1.3	A description of the transitions of user roles and the procedure for those transitions, for example, reversion to manual driving following deactivation of the ADS feature shall be provided.			Back to using "transitions" again. The user provisions strongly suggest a need to define "deactivation process" in terms of the transitions.
5.2.4.1.4	Any expectations on the fallback user to be ready to resume the DDT upon request shall be explained.			
5.2.4.1.5	A general overview of non-driving-related activities (NDRA) allowed when an ADS feature is active shall be provided.			
5.2.4.1.6	Information related to the ADS feature(s)' signals shall be provided, covering e.g.:			What does "covering e.g." mean?
	(a) Visual tell-tales, icons			Under UN R121, "tell-tale" by definition is an optical signal. "Icons" is not a recognised term.
	(b) Acoustic signals			UN Regulations use "audible" in reference to these kinds of user signals.
	(c) Haptic signals.			
5.2.4.1.7	Information on possible changes in the performance of the DDT by the ADS features following a failure of the ADS shall be provided.			
5.2.4.1.8	Information on how the ADS feature responds to inputs by the user into controls provided for manual driving (e.g., steering, service brake, parking brake, accelerator, lighting), if they are available, shall be provided.			
5.2.4.1.9.	Information on any additional safety precautions in using an ADS feature to be taken by the user shall be provided, such as that owners or drivers should check the condition of tyres and lights.			ADS-12-06 (OPI)
5.2.4.1.	For the ADS users who can perform the role of the driver, means shall be provided that facilitates user understanding of the functionality and operation of the system.			
5.3.	Other ADS Requirements			ADS-12-26 (OPI-SA)
5.3.1.	Data Storage Systems for Automated Driving			
5.3.1.1.	Each ADS vehicle shall be equipped with a DSSAD capable of monitoring the safety performance of the ADS in accordance with the provisions of this Regulation.	5.3.1.1.	The ADS vehicle type shall be equipped with a DSSAD capable of monitoring the safety performance of the ADS in accordance with the provisions of this Regulation.	

	UN GTR	UN Regulation	Comments
5.3.2.	[Requirements specific to cyber security of ADS installed on vehicles]		Brackets. Handling of cyber security
5.3.3.	The manufacturer shall include a robust process in the SMS to ensure that post-deployment software updates are properly validated and distributed and downloading is confirmed.		
5.3.4.	The ADS shall be designed to protect against unauthorized access to and modification of the ADS features and functions. The measures ensuring protection from unauthorized access shall be provided in alignment with engineering best practices.		
5.3.5	The ADS shall provide an interface for the purposes of maintenance and repair by authorized persons.		
5.3.5.1.	For vehicles without manual driving controls, suitable means shall be made available, where necessary (e.g. special controls, test modes, ADS functions) to enable the performance of the physical checks required for mandated inspections of other vehicle systems in the jurisdiction of operation (e.g. Periodical Technical Inspection, safety standards inspection etc.).		ADS-09-27 (EC/UK)
5.3.6	The ADS shall receive and appropriately manage all signals received from other vehicle systems. A list of these signals and how they are managed shall be included in the manufacturer's safety case.		Cross-reference to specific safety-case paragraph.
5.3.7	[While a Type 2 feature is active], the ADS shall manage relevant non-DDT-related tasks (which would otherwise be performed by a driver) in accordance with the manufacturer's safety case. Alternatively, where the ADS does not perform such necessary tasks, the safety case shall describe how these tasks are performed.		Brackets.
6.	Manufacturer Requirements		
6.1.	Safety Management Systems		
6.1.1.	Safety Policy		
6.1.1.x.	[The manufacturer shall establish, implement and document a Safety Management System (SMS).]		(Sec) Bias: The manufacturer may already have established an SMS.
6.1.1.1.	[The safety policy shall outline the aims and objectives that the manufacturer uses to achieve the desired safety outcomes.]		ADS-09-28/Rev.1 (UK): "The manufacturer shall establish, implement and document a safety policy. The safety policy shall outline the aims and objectives…." Brackets
6.1.1.2.	The manufacturer shall provide evidence that its safety policy implements the following aspects: (a) Safety policies and principles (e.g., ISO 21434, para. 5.4.1 and ISO 9001 Automotive 5.2.),		

	UN GTR	UN Regulation	Comments
	(b) Organization safety objectives [and the process for creating safety performance indicators used in the safety case],		ADS-09-28/Rev.1 (UK): delete text in brackets.
	(c) SMS structure, taking into account regulation, standards, best practice guidance and the use-case of the vehicle and mapping its organization structure, processes, and work products onto the SMS,		ADS-12-37 (OICA/CLEPA)
	(d) Safety culture (e.g., ISO 26262-2, para. 5.4.2),		
	(e) Safety governance including management commitment (e.g., ISO 21434, para. 5.4.1 and ISO 9001 Automotive 5.1) and roles and responsibilities (e.g., ISO 26262-2, para. 6.4.2, this relates to the organizational and project dependent activities),		ADS-09-28/Rev.1 (UK): "management commitment …, clear lines of accountability, and roles …"
	(f) Effective communications within the organization on safety issues (e.g., ISO 26262-2, para. 5.4.2.3),		ADS-12-24 (EC/JRC/OPI): Proposal to move under safety promotion section.
	(g) Information sharing outside of the organization (e.g., ISO 21434, para. 5.4.5 and ISO 9001, but from a safety perspective), [and]		Brackets ADS-12-24 (EC/JRC/OPI): Proposal to move under safety promotion section.
	(h) Quality Management System (e.g., IATF 16949 or ISO 9001 to support safety engineering, including change management, configuration management, requirement management, tool management etc.		
6.1.2.	Risk Management		
6.1.2.1.	The SMS shall include a management process to identify, assess, and mitigate organisational, human, and technical risks.		
6.1.2.1.1.	The SMS shall show the link between the overall risk management process, the mitigations, and the resulting operational risks.		The SMS description shall show….
6.1.2.2.	The manufacturer shall document its risk-management processes and activities with consideration of relevant standards and best practices, including:		
	(a) Risk identification (e.g., ISO 31000 para. 6.2),		
	(b) Risk analysis (e.g., ISO 31000 para. 6.3),		
	(c) Risk evaluation (e.g., ISO 31000 para. 6.4),		
	(d) Risk treatment (e.g., ISO 31000 para. 6.5),		
	(e) Processes for keeping the risk assessments up to date,		

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	(f) Review of safety performance of the organisation and effectiveness of safety risk controls.		
6.1.2.3.	The risk-management processes shall include Failure Mode and Effect Analysis (FMEA), Fault Tree Analysis (FTA), System-Theoretic Process Analysis (STPA) or a similar process appropriate to SOTIF and/or functional safety.		ADS-12-24 (EC/JRC/OPI): Move to "design and development" Is this an "and/or" (given the decision to clarify and require both functional safety and the safety of the intended function per 3.23)? The process shall include…similar analytical process designed to ensure functional safety and safety of the intended function (SOTIF).
6.1.2.4.	The manufacturer shall demonstrate its use of a top down (from possible hazard to design) and a bottom-up approach (from design to possible hazards) in its identification of hazards.		ADS-12-17 (China) ADS-12-24 (EC/JRC/OPI): Move to safety case (para. 6.3.2.1.1. in this document)
6.1.2.5.	Operational Design Domain Analysis		ADS-08-19 (Sec): Robust ODD analysis is the foundation of the Regulation. The credibility of the testing and the safety case depend upon the quality of the ODD analysis. Post-deployment safety requires a baseline ODD analysis to determine whether an occurrence can be traced to an omission (i.e., absence of scenarios corresponding to the occurrence in the original testing and approval).
6.1.2.5.1.	The manufacturer shall describe its processes for: (a) Identification and characterisation of ODD objects relevant to performance of the DDT, (b) Definition of ODD conditions and boundaries (if any) of each ADS feature, and (c) Determination of reasonably foreseeable conditions under which ODD objects might be encountered, (d) Identification and characterisation of risks of conflicts or crashes within an ODD, (e) Determination of the functional capabilities necessary to operate a vehicle within an ODD, (f) Determination of ADS behavioural competencies across these nominal and critical scenarios. (g) Generation of nominal scenarios sufficient to assess the functional capabilities of an ADS feature to perform the entire DDT necessary to operate a vehicle within an ODD		FRAV developed guidance on ODD analysis and scenario generation to provide criteria for evaluating whether the scope of testing conducted to validate an ADS was sufficient to reach a determination that the ADS is free from unreasonable risks to safety. The SMS should include verification that the manufacturer understands the importance of ODD analysis, especially with processes to translate the analysis into comprehensive testing of the ADS functional and behavioural capabilities.

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	(h) Generation of critical scenarios sufficient to assess the behavioural competencies of an ADS feature to manage conflicts with other road users, and		
	(i) Generation of failure scenarios sufficient to assess the behavioural competencies of an ADS feature to safely manage failures identified pursuant to paragraph 6.1.2.3. above.		
6.1.5.2.2.	Annex 5 provides guidance on methodologies that can be applied to satisfy the requirements of paragraph 6.1.2.5.1. above.	6.1.5.2.2. Annex 7 provides guidance on methodologies that can be applied to satisfy the requirements of paragraph 6.1.2.5.1. above.	
6.1.3.	ADS Design and Development		ADS-12-24 (EC/JRC/OPI): "Management of ADS design and development", reposition after risk management, safety assurance, and safety promotion (i.e., para. becomes 6.1.5).
6.1.3.1.	This documentation shall include risk management, requirements management, requirements' implementation, testing, failure tracking, remedial actions, and release management [including the following aspects:]		ADS-12-28/Rev.1 (UK): "The SMS shall include evidence of the deployment of the safety policy in the Design and Development phase, including the following…" Brackets
	(a) Roles and responsibilities of the people involved during the design and development phase,		
	(b) Qualifications and experience of persons responsible for making decisions that affect safety,		
	(c) Coordination of roles, responsibilities and information transfer between design and production activities.		
6.1.3.2.	The manufacturer shall document its processes and activities to ensure the robustness of the design and development phase, including the following aspects:		ADS-09-28/Rev.1 (UK) "implement"
	(a) A general description of how the organization performs all the design and development activities,		
	(b) Vehicle/system development, integration, and implementation, including:		ADS-12-24 (EC/JRC/OPI-SMS)
	(i) Requirements management (e.g., requirement capture and validation),		ADS-12-24 (EC/JRC/OPI-SMS)
	(ii) Validation strategies, including but not limited to:		ADS-12-24 (EC/JRC/OPI-SMS)
	a. Assessment of the physical testing environment,		ADS-12-24 (EC/JRC/OPI-SMS)
	b. Credibility assessment for virtual tool chain,		ADS-12-24 (EC/JRC/OPI-SMS)

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	c. System integration,	ADS-12-24 (EC/JRC/OPI-SMS)
	d. Software,	ADS-12-24 (EC/JRC/OPI-SMS)
	e. Hardware.	ADS-12-24 (EC/JRC/OPI-SMS)
	(iii) Management of functional safety (e.g., ISO 26262) and SOTIF (e.g., ISO 21448), including the ongoing evaluation and update of risk assessments and interactions,	ADS-12-24 (EC/JRC/OPI-SMS)
	(iv) Management of human factors, including human-centred design processes (e.g., ISO 9241-210).	ADS-12-24 (EC/JRC/OPI-SMS)
	(c) Design and change management, including but not limited to:	ADS-12-24 (EC/JRC/OPI-SMS)
	(i) Major design decisions,	
	(ii) ADS design modifications,	
	(iii) Changes in key personnel responsible for making decisions that affect safety,	
	(iv) Tools and thresholds adopted for ADS safety verification.	
6.1.3.3.	The manufacturer shall include effective communication channels between the departments and third-party organizations responsible for functional safety, SOTIF, cybersecurity, and any other relevant disciplines related to the achievement of vehicle safety. These processes and activities shall be documented considering relevant standards and best practice.	ADS-09-29/Rev.1 (UK): “include” ADS-12-24 (EC/JRC/OPI-SMS)
6.1.3.4.	The SMS shall include a process for creating safety performance indicators used in the safety case.	ADS-09-28/Rev.1 (UK)
6.1.4.	Production management	ADS-12-24 (EC/JRC/OPI): “Management of production”.
6.1.4.1.	The manufacturer shall establish and document the production process in the SMS. The manufacturer shall document its processes and activities to ensure the robustness of the production phase, including:	ADS-12-24 (EC/JRC/OPI-SMS)
	(a) Quality Management System accreditation (e.g., IATF 16949 or ISO 9001), [and]	Brackets
	(b) A description of the way in which the manufacturer performs all the production functions including management of working conditions, working environment, equipment and tools.	

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6.1.4.2	The manufacturer shall establish and document their distributed production processes and activities in the SMS. The processes and activities shall include: a) Liaison between the manufacturer and all other organisations (e.g. suppliers, partners or subcontractors) involved in the supply chain.		Bias: "shall establish". The manufacturer shall document any distributed production processes…. Verbosity: "…including liaison between the manufacturer and other organisations…involved in the supply chain. Is the e.g. necessary? Does anyone not understand the meaning of "supply chain"?
6.1.5.	Post-deployment safety		ADS-12-24 (EC/JRC/OPI): "Management of Post-deployment Safety"
6.1.5.1.	The manufacturer shall establish processes to demonstrate its capabilities to execute an effective ISMR and to take corrective remedial action when necessary.		ADS-09-28/Rev.1 (UK): The SMS shall establish processes to execute… ADS-12-24 (EC/JRC/OPI-SMS) Bias: "shall establish" The manufacturer shall describe its processes and capabilities to… Meaning: "processes to demonstrate"?
6.1.5.2.	The processes for ISMR shall demonstrate the capabilities:		The description shall cover the processes and capabilities:
	(a) To monitor ADS operations,		
	(b) To confirm the compliance with the defined safety case and compliance to the performance requirements,		
	(c) To identify safety risks related to ADS performance that need to be addressed in the frame of the SMS activities, including instances of non-compliance with ADS safety requirements,		
	(d) To manage potential safety-relevant gaps during the in-service operation and to provide the information that allows the ADS to be updated according to the appropriate manufacturer processes,		
	(e) To support the development of new or revise existing scenarios,		
	(f) To perform event investigation,		
	(g) To report occurrences to the relevant authority when they occur,		
	(h) To share learnings derived from occurrence analysis, [and]		Brackets "learnings" → "knowledge"

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	(i) To contribute to the continuous improvement of automotive safety.		ADS-12-18 (China) “automotive”→”ADS vehicle” ADS-12-39 (OICA/CLEPA)
6.1.5.3.	The process for ISMR shall demonstrate the capabilities for handling the reports received from other sources, including distinguishing false reports from actual events and conducting thorough investigations when necessary.		
6.1.5.4.	The manufacturer shall demonstrate the capabilities to monitor the performance of all its in-service ADS vehicles.		
6.1.5.5.	The manufacturer shall demonstrate the capabilities collect and analyse vehicle data and data from other sources to achieve the ISMR objectives.		
6.1.5.5.1.	The manufacturer shall have:		
	(a) A data acquisition strategy,		
	(b) A data retention strategy, and		
	(c) Data access, security, and protection policies		
6.1.5.5.2.	The data acquisition strategy shall ensure a representative collection of data to monitor the ADS in service performance.		
6.1.5.5.3.	The data retention strategy shall ensure that:		
	(a) Data related to a detected safety issue is retained until any necessary corrective action and review processes are complete, and		
	(b) The retention of the data for longer-term trend analysis (i.e. subset of the collected data).		
6.1.5.5.4.	The data access, security and protection policies shall ensure that information access is allowed only to authorized persons and contains safeguards to ensure the security and protection of the data in accordance with the data-protection laws of the relevant jurisdiction.		
6.1.5.5.5.	The manufacturer shall achieve the following objectives from the monitoring activity:		
	(a) Verify the safety performance (i.e., Safety Performance Indicators) and confirm the in-service safety level of the system (i.e. metrics and thresholds),		
	(b) Identify areas of operational risk,		
	(c) Identify when the ADS prevents incidents/accidents (e.g., MRC fallbacks, collision avoidance, emergency manoeuvres),		

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	(d) Characterise and analyse occurrences,		
	(e) Discover trends that suggest the emergence of unacceptable risks,		
	(f) Ensure that remedial actions are put in place when an unacceptable risk is discovered or predicted by trends,		
	(g) Confirm the effectiveness of any remedial action, [and]		Brackets
	(h) Enable the development of new or the revision existing scenarios derived from ISMR activities.		
6.1.5.5.6.	The manufacturer shall perform a data analysis with sufficient frequency so that remedial action can be taken promptly and in line with reporting requirements listed under paragraph 6.4.		Check cross reference to 6.4.
6.1.5.5.7.	The analysis techniques shall include at least the following:		
	(a) Routine measurements: a selection of parameters shall be collected to characterize the performance of ADS and to allow a comparative analysis. These measurements shall aim at identifying and monitoring emerging trends and tendencies before the trigger levels associated with exceedances are reached.		
	(b) Exceedance detection: a set of safety performance indicators shall be selected to cover the main areas of interest for the ADS operation with aim at searching for deviations from safety performance and limits. They shall be continuously reviewed to reflect the current operations.		
	(c) Occurrence analysis: It shall be possible to characterize and investigate all the occurrences listed in the 6.4.9 using the recorded data.		
	(d) Statistics: Data series shall be collected to support the analysis process with additional information. These data shall provide information to generate rates and trends.		
6.1.5.6.	The manufacturer shall have a mechanisms in place for receiving and analysing safety-relevant feedback and reports from other sources to extract safety-relevant information and to review the safety monitoring data.		“feedback and reports as available” for clarity? Unnecessary verbosity: The manufacturer shall have means to receive and analyse safety-relevant data from sources other than the [DSSAD]. The following subparagraph explains the kinds of data. “to extract…” is obvious from the requirement to “analyse” and the extensive specifications for what should be reported (i.e., what the analysis is looking for).

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6.1.5.6.1.	The feedback and reports from other sources shall include at least:		
	(a) ADS-related vehicle maintenance and inspection feedback,		"periodical technical inspections"?
	(b) Enforcers (including the police) and other authorities' reports, and		"enforcers" is not appropriate wording: law enforcement, highway authorities, first responders, crash investogators, road-safety authorities, traffic-safety authorities are possible options.
	(c) Service operator, customer, public and dealer feedback.		
6.1.5.7.	The manufacturer shall evaluate the results from the monitoring activity to assess:		
	(a) In-service safety performance,		
	(b) The adequacy of the metrics and thresholds, and		
	(c) The outcome of remedial actions.		
6.1.6.	Safety Assurance		ADS-12-24 (EC/JRC/OPI): Proposal to move section after 6.2.1. (risk management)
6.1.6.1.	The manufacturer shall demonstrate that periodic independent internal audits and external audits are carried out to ensure that the processes established for the Safety Management System are implemented consistently.		
6.1.6.2.	The manufacturer shall put in place suitable arrangements (e.g., contractual arrangements, clear interfaces, quality management system) with any organization involved in the development, manufacturing, or in-use deployment of its vehicles (e.g., contracted suppliers, service providers, or manufacturers' sub-organizations)		ADS-12-37 (OICA/CLEPA) Bias: "put in place": The manufacturer shall demonstrate that … Subjectivity: "suitable" should be deleted. (6.1.6.2.1. addresses the scope of the arrangements).
6.1.6.2.1.	The manufacturer shall document its processes and activities, including the following aspects:		
	(a) Organizational policy for supply chain,		
	(b) Incorporation of risks originating from supply chain,		
	(c) Evaluation of supplier SMS capability and corresponding audits,		
	(d) Processes to establish contracts, agreements for ensuring safety across the phases of development, production, and post-production,		

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	(e) Processes for distributed safety activities, [and]		Brackets
	(f) The manufacturer shall have processes for providing safety-relevant information to relevant parties as needed, enabling them to meet their legal obligations.		
6.1.6.3.	SMS documentation shall be regularly updated in line with any relevant changes to the SMS processes. Gap analysis shall be used when auditing and updating the SMS, examining the current safety culture before formulating new and more appropriate SMS processes to ensure issues are adequately resolved.		More than one requirement.
6.1.6.4.	The manufacturer shall have processes for:		Are these processes subsidiary to 6.1.6.3. (i.e., are they about "regularly updating the SMS")?
	(a) Assuring that all practices and activities documented as part of the SMS are followed,		
	(b) Assuring that an independent check of compliance with the applicable requirements is performed. (i.e., not from person creating the compliance data), [and]		Brackets
	(c) Assuring the continued evaluation of the Safety Management System so that it remains effective.		
6.1.6.5.	The manufacturer shall define appropriate Key Performance Indicators (KPI) to measure the effectiveness of the Safety Management System throughout the ADS lifecycle (development, production, operation and decommissioning).		
6.1.7.	Safety Promotion		ADS-09-28/Rev.1 (UK): Proposal to add "SMS training plans" ADS-12-24 (EC/JRC/OPI): Proposal to move with "safety assurance" section to position after 6.2.1 (risk management).
6.1.7.1.	The SMS shall be subject to a process of continual improvement (e.g. "Plan, Do, Check, Act" as described in ISO 9001). Any changes to SMS documentation should be communicated as required to the relevant authority.		
6.2.	Test Environments		
6.2.1.	Virtual Testing		ADS-12-20 (OPI)
6.2.1.1.	The manufacturer shall describe the intended use(s) of virtual testing and its role in the overall testing strategy.		
6.2.1.2.	The manufacturer shall demonstrate that each simulation toolchain is suitable to use for virtual testing by showing that they fulfil the requirements laid down in the present section.		ADS-12-20 (OPI)

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6.2.1.2.1.	In performing this assessment the manufacturer shall take into account the results of the criticality analysis as described in 6.2.1.9. to produce evidence to support the safety case [and for the assessment of ADS compliance with functional/user requirements].		Brackets ADS-12-20 (OPI) Is "the assessment" done by the manufacturer or by the approval authority?
6.2.1.3.	Data Management		ADS-12-20 (OPI)
6.2.1.3.1.	The manufacturer shall manage the data used to develop, verify, validate and update the simulation toolchain(s) throughout its lifetime. The manufacturer shall consider the completeness, accuracy and consistency of this data.		
6.2.1.3.2.	The manufacturer shall maintain a record of the data used in the validation of the toolchain(s).		
6.2.1.3.3.	The manufacturer shall describe the measures taken to ensure the quality and integrity of data or tools integrated into the simulation toolchain(s) from organisations that are not under the control of the manufacturer.		ADS-12-20 (OPI)
6.2.1.3.4.	Management of input data and simulation toolchain(s) parameters		ADS-12-19 (China) ADS-12-20 (OPI)
6.2.1.3.4.1.	The manufacturer shall document the input data used to develop, verify, and validate the simulation toolchain(s).		ADS-12-20 (OPI)
6.2.1.3.4.2.	The documentation shall note important quality characteristics of the input data.		ADS-12-20 (OPI)
6.2.1.3.4.3.	The documentation shall show that the input data covers the intended ADS functionalities that the virtual testing aims to assess.		ADS-12-20 (OPI)
6.2.1.3.4.4.	The documentation shall describe the calibration procedures used to fit parameters associated with the simulation toolchain(s);		ADS-12-20 (OPI)
6.2.1.3.4.5.	The documentation shall explain the reasons for any changes to the data or parameters that occur when a new version of a simulation toolchain(s) is released.		ADS-12-20 (OPI)
6.2.1.3.5.	The manufacturer shall quantify the uncertainty in the simulation toolchain(s) and its outputs that occur because of the quality of the data (e.g. data coverage, signal to noise ratio, and sensors' uncertainty/bias/sampling rate).		
6.2.1.3.6.	Management of output data		ADS-12-20 (OPI)
6.2.1.3.6.1.	The manufacturer shall record the output data from the simulation toolchain(s) used for its validation.		ADS-12-20 (OPI)
6.2.1.3.6.2.	Each output record shall be traceable to the input data that produced the output.		ADS-12-20 (OPI)

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6.2.1.3.6.3.	The manufacturer shall conduct statistical analysis of the output data and note any important quality characteristics deduced from this analysis.		ADS-12-20 (OPI)
6.2.1.3.6.4.	The manufacturer shall show that the quality of the output data is sufficient to:		ADS-12-20 (OPI)
	(a) Validate the simulation toolchain(s) and its components,		ADS-12-20 (OPI)
	(b) Allow consistency/sanity check of the simulation toolchain(s) and its components, and		ADS-12-20 (OPI)
	(c) Produce evidence to support the ADS safety case.		ADS-12-20 (OPI)
6.2.1.3.6.5.	In the case of output data generated by stochastic models, the manufacturer shall:		ADS-12-20 (OPI) ADS-12-21 (China)
	(a) characterize the variance in the simulation toolchain(s)'s output[, and]		Brackets
	(b) ensure the possibility of a deterministic re-execution of the simulation toolchain(s).		
6.2.1.4.	Competency of Personnel		
6.2.1.4.1.	The manufacturer shall document and provide the rationale for their confidence in the competency of:		
	(a) the personnel that developed the simulation toolchain(s) and its components		
	(b) the personnel that assessed the simulation toolchain(s) and its components[, and]		Brackets
	(c) the personnel that used the simulation toolchain(s) to perform the testing with the purpose of validating the system.		
6.2.1.4.2.	The manufacturer shall have processes and procedures that identify and maintain the skills, knowledge, and experience needed to develop, assess and use the simulation toolchain(s). The following processes shall be established, maintained and documented:		ADS-12-20 (OPI)
	(a) Process to identify and evaluate the necessary competencies that are required to perform the modelling and simulation activities identified by the manufacturer[, and]		ADS-12-20 (OPI)
	(b) process for training personnel to be competent to perform the modelling and simulation activities.		ADS-12-20 (OPI)
6.2.1.4.3.	The manufacturer shall maintain records of the personnel involved in the development, assessment and use of the simulation toolchain(s) showing they have received the necessary training and have been deemed competent to perform the requested modelling and simulation activities		ADS-12-20 (OPI)

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6.2.1.4.4.	The manufacturer shall set up suitable arrangements with third-party organisations linked to the simulation toolchain(s), to ensure that the competency of third-party personnel is adequate to perform the tasks assigned to those personnel.		ADS-12-20 (OPI)
6.2.1.4.5.	The arrangements with third-party organizations shall be aligned with the SMS provisions reported in paragraphs 6.1.3.3. and 6.1.6.3. of this Regulation.		ADS-12-20 (OPI)
6.2.1.5.	Release Management		ADS-12-20 (OPI)
6.2.1.5.1.	The manufacturer shall manage and support the simulation toolchain(s) used for virtual testing throughout the lifecycle of the simulation toolchain(s).		
6.2.1.5.1.1.	This management and support shall also continue until the end of the post-production phase of the ADS.		
6.2.1.5.2.	The manufacturer shall manage and document the simulation toolchain(s) release management process. The simulation toolchain(s) release management activity shall include: (a) A description of the modifications associated with each toolchain(s) release, (b) A record of any associated software (e.g., specific software product, designations and version) and hardware arrangements (e.g., XiL configuration)[, and] (c) A record of the internal review activities that supported the toolchain(s) acceptance and release.		
6.2.1.6.	Description of the Simulation Toolchain		
6.2.1.6.1.	The manufacturer shall describe the simulation toolchain(s) and identify its scope of applicability, its limitations, assumptions and the sources of uncertainty that can affect results.		
6.2.1.6.2.	The manufacturer shall provide a description of the simulation toolchain(s) and its components.		
6.2.1.6.3.	The manufacturer shall provide a description of the approach adopted in the simulation toolchain(s) validation.		
6.2.1.6.4.	The manufacturer shall provide a description of the acceptance tests and criteria that will be used to determine that the simulation toolchain(s) can be used to produce the evidence needed to support the ADS safety case.		ADS-12-20 (OPI)
6.2.1.7.	Simulation Toolchain Assumptions, Known Limitations, and Uncertainty Quantification		
6.2.1.7.1.	The manufacturer shall describe the modelling assumptions and considerations that guided the design of the toolchain(s).		

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6.2.1.7.2.	The manufacturer shall provide information on:		
	(a) Assumptions made during the development of each simulation toolchain and its components and the limitations that these place on its scope and applicability[, and]		
	(b) The rationale for choices made about the level of fidelity of each simulation toolchain and its components.		
6.2.1.7.3.	The manufacturer shall provide justification that the tolerances associated with the simulation toolchain(s) are appropriate and meet the acceptance tests and criteria.		
6.2.1.7.4.	The manufacturer shall provide details of the sources of uncertainty in each simulation toolchain and its components and the assessment of their impact on the results.		
6.2.1.8.	Simulation Toolchain Scope		
6.2.1.8.1.	The manufacturer shall document the scope of each simulation toolchain and identify its limitations.		
6.2.1.8.1.1.	The scope shall refer to the ODD and identify any limitations about its applicability to the ODD.		
6.2.1.8.2.	The manufacturer shall demonstrate how each simulation toolchain imitates the relevant physical phenomena and meets the necessary level of accuracy.		
6.2.1.8.3.	The manufacturer shall provide sufficient evidence to justify the claim that the simulation toolchain(s) can be used within the defined scope.		ADS-12-20 (OPI) Is this a requirement for the safety case? Should “claim” be replaced to avoid confusion with the safety case? Is there a requirement to make this claim?
6.2.1.8.4.	The manufacturer shall provide a list of tests used for validation and the corresponding parameters and any known limitations.		
6.2.1.9.	Simulation Toolchain Criticality Analysis		
6.2.1.9.1.	The manufacturer shall review the error estimates of the simulation toolchain(s) to assess their criticality and the effect these would have on the manufacturer's claims about their safety case.		Given 6.2.1.2.1., should this requirement be moved and/or merged?
6.2.1.10.	Simulation Toolchain Verification		
6.2.1.10.1.	The manufacturer shall demonstrate that the simulation toolchain(s) will not exhibit unrealistic behaviour for valid inputs which have not been explicitly tested.		
6.2.1.11.	Simulation Toolchain Code Verification		

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6.2.1.11.1.	The manufacturer shall document the execution of proper code verification techniques used in evaluating each simulation toolchain and its components (e.g., static/dynamic code verification, convergence analysis and comparison with exact solutions if applicable).		
6.2.1.11.2.	The manufacturer shall provide evidence that the input parameter space was sufficiently explored to identify if there are any parameter combinations for which the simulation toolchain(s) shows unstable or unrealistic behaviour.		
6.2.1.11.3.	The manufacturer shall undertake sanity and consistency checking procedures and provide information on the results to show that the simulation toolchain(s) is robust.		ADS-12-20 (OPI)
6.2.1.12.	Simulation Toolchain Calculation Verification		
6.2.1.12.1.	The manufacturer shall document numerical error estimates (e.g., discretization error, rounding error, iterative procedures, and convergence).		
6.2.1.12.2	The manufacturer shall review the analysis and demonstrate that the numerical errors are understood and sufficiently bounded to allow the simulation toolchain(s) to be used for virtual testing.		
6.2.1.13.	Simulation Toolchain Sensitivity Analysis		
6.2.1.13.1.	The manufacturer shall provide documentation demonstrating that the input data and parameters that most critically influence the toolchain outputs have been identified by means of appropriate sensitivity analysis techniques.		
6.2.1.13.2.	The manufacturer shall demonstrate that robust calibration procedures have been adopted for assigning appropriate value(s) to all the simulation parameters while ensuring that special attention is taken for the most critical parameters. This is to ensure that the simulation toolchain can be used to emulate the relevant real-world system.		
6.2.1.13.3.	The manufacturer shall demonstrate that sensitivity analysis has been used to identify the critical input data and parameters that need particular attention in order to characterize the uncertainty of the overall simulation toolchain outputs.		
6.2.1.14.	Simulation Toolchain Validation		
6.2.1.14.1.	The manufacturer shall perform a validation analysis, based on quantitative metrics, to determine the degree to which each simulation toolchain is an accurate representation of the real-world system.		
6.2.1.14.2.	The manufacturer shall provide evidence that the simulation toolchain(s) results are consistent and correlated with the results of the physical tests.		

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6.2.1.14.3.	The validation shall be performed on a sufficiently representative set of tests in order to substantiate the claims that the simulation toolchain(s) is suitable and can be used within its scope.		
6.2.1.14.4.	The manufacturer shall define the measures of performance (metrics) that will be used when comparing between the results of physical tests and the output of the simulation toolchain(s).		
6.2.1.14.5.	The manufacturer shall use appropriate statistical techniques when comparing the results of physical tests and the corresponding output of the simulation toolchain and its components.		
6.2.1.14.6.	The manufacturer shall specify acceptance tests and criteria during the development of each simulation toolchain and its components and demonstrate that they have been achieved.		
6.2.1.14.7.	The manufacturer shall define the methodology and tests used for each simulation toolchain validation.		
6.2.1.14.7.1.	It should be clear whether the full ODD is within scope of the toolchain(s) or only part of it.		
6.2.1.14.7.2.	The validation strategy may consist of one or more of the following:		
	(a) subsystem model validation e.g. environment models, sensor models, and vehicle models,		
	(b) vehicle system model validation (vehicle dynamics model together with the environment model),		
	(c) sensor system validation (sensor model together with the environment model)[, and]		Brackets
	(d) integrated system validation (sensor model together with the environment model with influences form vehicle model).		
6.2.1.14.8.	The manufacturer shall demonstrate that the accuracy criteria defined during each simulation toolchain development have been met.		
6.2.1.14.9.	The manufacturer shall provide evidence that the processes related to the validation activity have been followed.		
6.2.1.14.10.	The manufacturer shall document their uncertainty characterization analysis and provide information about how the simulation toolchain(s) should be used and any safety margins that should be applied when it is used for virtual testing.		
6.2.1.14.11.	The manufacturer shall demonstrate it has techniques to estimate each simulation toolchain's critical inputs and that they have been applied and the results documented.		ADS-12-20 (OPI) Please clarify: what does it mean to "estimate the toolchain's critical inputs"?

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6.2.1.14.12.	The manufacturer shall demonstrate that they have characterised the critical parameters used in each simulation toolchain and its components and where appropriate have identified these as distributions with confidence intervals.		
6.2.1.14.13.	The manufacturer shall demonstrate that they have achieved a proper characterisation of the uncertainty of the results of each simulation toolchain and its components because of any assumptions therein.		ADS-12-20 (OPI) Please clarify: Is this requiring explanations of assumptions inherent in the modeling?
6.2.1.14.14.	The manufacturer shall demonstrate that they have differentiated between the aleatory and epistemic[48] uncertainties associated with each simulation toolchain.		
6.2.2.	Track Testing		ADS-12-20 (OPI)
6.2.2.1.	The manufacturer shall demonstrate that the track testing facilities environment and capabilities are suitable to conduct testing and gather evidence to support the safety case. In particular the manufacturer shall demonstrate that:		ADS-12-20 (OPI)
	(a) The track-testing facilities include static and dynamic elements representative of the ODD [and the expected operating conditions and are relevant to the tests being performed], [and]		ADS-12-20 (OPI)
	(b) The equipment used during track testing undergoes periodic inspection, maintenance and calibrations to ensure that the measurements are characterized by sufficient accuracy and precision.		ADS-12-20 (OPI)
6.2.2.2.	[Placeholder for a paragraph related to the assessment of accreditations]		ADS-12-20 (OPI)
6.2.3.	Real-world testing		ADS-12-20 (OPI)
6.2.3.1.	The manufacturer shall demonstrate that the real-world testing facilities (public roads), environment and capabilities are suitable to conduct testing and gather evidence to support the safety case. In particular the manufacturer shall demonstrate that:		ADS-12-20 (OPI)
	(a) The selected test routes hold a sufficient probability for the ADS to encounter scenarios that involve a large number of other road users, unlikely road infrastructure, or abnormal geographic/environmental conditions[, and]		ADS-12-20 (OPI)
	(b) The equipment used during real-world testing undergoes periodic inspection, maintenance and calibrations to ensure that the measurements are characterized by sufficient accuracy and precision.		ADS-12-20 (OPI)

[48] "Aleatory Uncertainty" means the portion of uncertainty deriving from a random process that cannot be reduced, while "Epistemic Uncertainty" means the portion of uncertainty deriving from a lack of knowledge about a process that can be reduced via observations.

	UN GTR	UN Regulation	Comments
6.3.	Safety Case for the ADS		
6.3.1.	[System Description]		ADS-12-09 (OPI) The ADS is the system. Why are we using "system" when "ADS" is available ("ADS description")?
6.3.1.1.	The manufacturer shall provide a system description.		ADS-12-09 (OPI) The ADS is the system. This provision is too vague.
6.3.1.2.	The system description shall describe the type of use(s) for which the ADS is intended, such as personal car ownership, urban taxi fleet, goods transportation, highway use, etc.		ADS-12-09 (OPI) Reconsider. "type" of uses associated with type of vehicle is problematic. Vehicle uses fall under traffic laws and registration requirements. If the approval is for a vehicle declared as "A", then this raises questions about whether the vehicle can be registered for another use (e.g., a taxi purchased for personal use). Provision raises questions.
6.3.1.2.1.	This shall include a description of each ADS feature configuration including ADS functions applicable to that specific feature, the intended uses and limitations on the use of the feature which gives a simple explanation of its operational characteristics.		ADS-12-09 (OPI SA) Reconsider. This provision misapplies the ADS guidelines. FRAV intentionally avoided this kind of attention to "functions" because these capabilities are multi-layered, multi-faceted, and complex to define. The capability of a feature to perform the DDT necessary to operate the vehicle within the DDT is demonstrated by testing under scenarios, not documentation. Paragraph 6.3.1.4. below covers the hardware and software to perform functions; however, expecting to then document how all the functional capabilities apply to each of the features is excessive and unnecessary.

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6.3.1.3.	The system description shall describe how the Operational Design Domain has been defined for each ADS feature and explain the boundaries of each of the conditions in which the feature is designed to operate. This shall include at least the following:		ADS-12-09 (OPI) ADS-12-12 (OPI) The processes used to analyse the ODD need to be described and approved under the SMS with reference to Annex on ODD analysis and scenario generation. The manufacturer shall describe the ODD of each ADS feature pursuant to the outcomes of the processes described under paragraph 6.1.x.
	(a) Intended area of operation (i.e. Jurisdictions, geographic limitations, etc.) (b) Roadway characteristics (i.e. road type, road conditions, speed limit, etc.) (c) Environmental conditions (i.e. Weather, illumination, etc.) (d) Dynamic elements (i.e. kinds of other road users, etc.)		Delete. The scope and content of the manufacturer's processes for ODD analysis should be approved under the SMS audit. The description of the ADS should include descriptions of the features including the outcomes of the ODD analysis. Given the complexity of ODD analysis, this short list does not add value. However, the FRAV requirement for ODD conditions to be described in verifiable and/or measurable terms has been omiited.
6.3.1.4.	The system description shall include outlines of the following elements of the ADS and their relationships to other vehicle systems:		ADS-12-09 (OPI SA) Inconsistent with the regulation: A function is an ADS hardware and software capability designed to perform a specific portion of the DDT. In terms of describing a function, hardware and software are indivisible. Ambiguous: What are "relationships to other vehicle systems"? The manufacturer shall describe the ADS functions, including their hardware and software. The manufacturer shall note inputs and outputs between the ADS functions and other vehicle systems.
	(a) Hardware components and their functions[, and]		ADS-12-09 (OPI)

UN GTR	UN Regulation	Comments
	(b) Software components and their functions.	ADS-12-09 (OPI)
6.3.1.4.1	The outlines shall include block diagrams and/or schematics.	ADS-12-09 (OPI)
6.3.1.4.1.1.	The hardware components outline shall include a schematic of the ADS illustrating the equipment distribution.	ADS-12-09 (OPI)
6.3.1.4.1.2.	The outlines shall integrate the hardware identification markings of the ADS components in its diagrams and/or schematics and, a table shall be provided to link the hardware identification to the software identification.	ADS-12-09 (OPI)
6.3.1.4.1.3.	A single hardware identification marking shall be used for functions that are combined within a single component (e.g. control unit or single computer) but are shown in multiple blocks in a block diagram.	ADS-12-09 (OPI)
6.3.1.4.1.4.	[The table in 6.3.1.4.1.2 shall be kept up to date with software and hardware updates.]	ADS-12-09 (OPI)
6.3.1.4.2.	The outlines shall include the components/functions of the ADS and other vehicle systems that are relevant to meeting the requirements of this regulation.	ADS-12-09 (OPI)
6.3.1.4.2.1.	The outlines shall show interconnections between the components/functions of the ADS and those components/functions and other systems via:	ADS-12-09 (OPI)
	(a) A circuit diagram for the electrical transmission links,	
	(b) A piping diagram for pneumatic and/or hydraulic transmission equipment, and	
	(c) A simplified diagrammatic layout for mechanical linkages.	
6.3.1.4.2.2.	There shall be a clear correspondence between transmission links in the hardware and software components outline, schematics and/or diagrams and the signals carried between components and systems of the corresponding functions outline, schematics and/or diagrams.	ADS-12-09 (OPI)
6.3.1.4.2.3	Priorities of signals on multiplexed data paths shall be stated wherever priority can be an issue affecting performance or safety.	ADS-12-09 (OPI)
6.3.1.4.3.	The outlines shall include how the following functions and aspects are addressed:	ADS-12-04 (China): Ref. ADS-10-05, 6.3.1.1.2. ADS-12-09 (OPI)
	(a) Sensing and perception of events and objects,	ADS-12-09 (OPI)
	(b) Decision-making and planning,	ADS-12-09 (OPI)

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	(c) Remote supervision and remote monitoring by a remote supervision centre (if applicable),		
	(d) Information display/user interface,		
	(e) The data storage system (e.g., Date Storage System for Automated Driving), and		
	(f) Redundancies of components and/or connections.		
6.3.1.4.4.	The hardware components outline shall provide information regarding the installation options that will be employed for the individual components that comprise the sensing system.		ADS-12-09 (OPI)
6.3.1.4.4.1.	These options shall include, but are not limited to, the location of the component in/on the vehicle, the material(s) surrounding the component, the dimensioning and geometry of the material surrounding the component, and the surface finish of the materials surrounding the component, once installed in the vehicle.		ADS-12-09 (OPI)
6.3.1.4.4.2.	The information shall also include installation specifications that are critical to the ADS's performance such as tolerances on installation angle.		ADS-12-09 (OPI)
6.3.1.4.4.3.	Any changes to the individual components of the sensing system, or the installation options, shall be updated in the documentation.		ADS-12-09 (OPI SA)
6.3.1.5.	A list of all inputs relevant to/for the ADS , including those from sensors, shall be provided and the working range of these defined, along with a description of how each variable is linked to the control functions of the ADS and potential impacts on system behaviour. This shall include the nominal range, and coverage area of each sensor.		ADS-12-09 (OPI SA)
6.3.1.6.	A list of all of the ADS outputs shall be provided and an explanation given, in each case, of whether the output directly controls the vehicle or is processed via another vehicle system. The range of control exercised on each variable shall be defined as well as the nominal capabilities of control actuators.		ADS-12-09 (OPI SA)
6.3.1.7.	The system description shall describe how the ADS detects and responds to approaching and crossing of ODD boundaries.		ADS-12-09 (OPI SA)
6.3.1.8.	The system description shall document:		ADS-12-09 (OPI SA)
	(a) The conditions that must be present to permit activation of the feature,		
	(b) The conditions that trigger a fallback response,		
	(c) The conditions that must be present to permit deactivation of the feature, and		
	(d) The conditions which may prompt the user to voluntarily take back control, if applicable.		

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6.3.1.9.	The system description shall indicate the categories of other road users with whom the ADS is designed to interact (e.g., pedestrians, cyclists, etc).		ADS-12-09 (OPI)
6.3.1.10.	The system description shall identify the ADS users with whom it is designed to interact and describe the nature of their interaction with the ADS.		ADS-12-09 (OPI)
6.3.1.11.	If the ADS can request a remote intervention, the system description shall describe the nature and process for such interaction.		ADS-12-09 (OPI)
6.3.1.12.	The system description shall describe the methods of activating, overriding, or deactivating the ADS feature by any or all of: the ADS user (where relevant), remote intervention (where relevant), passengers (where relevant) or other road users (where relevant).		ADS-12-09 (OPI)
6.3.1.13.	The system description shall describe the range of end states constituting a mitigated risk condition that can be achieved by the ADS feature. This shall include:		ADS-12-09 (OPI) What are “end states”? The failure scenarios are designed to enable demonstration of the ADS competencies to manage failures. The possible MRC are tied to the characteristics of the ODD. The behaviours of the ADS across the failure scenarios essentially constitute a set of claims for ADS failure management. Describing “end states” does not seem consistent with the ADS guidelines/regulation.
	(a) The conditions which may trigger an attempt to reach a mitigated risk condition,		ADS-12-09 (OPI) Not a permission: The conditions that trigger an ADS fallback to a mitigated risk condition.
	(b) The processes by which the ADS feature attempts to reach a mitigated risk condition, and		ADS-12-09 (OPI) Already demonstrated under the failure scenario testing.
	(c) The evaluation of risk related to mitigated risk condition end states.		ADS-12-09 (OPI) Outcome of failure scenario testing: misplaced as a “system description”.

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6.3.1.14.	The system description shall describe how the ADS feature responds to failure situations, including:		ADS-12-09 (OPI) ADS-12-30 (China) Same concerns as preceding paragraph: the overall approach is to have claims concerning behavioural competencies (including failure management) with scenario-based and ODD-specific testing to provide the evidence supporting the claims. The wording here is not consistent with the process of ODD and failure-risk analysis generating credible scenario-based testing to generate evidence that the ADS competencies ensure safe management of failures.
	(a) Fallback (or fail safe) operation using a partial system,		ADS-12-09 (OPI)
	(b) Redundancy using separate systems,		ADS-12-09 (OPI)
	(c) A list of the potential faults identifiable by the diagnostic system(s) of the ADS feature,		ADS-12-09 (OPI)
	(d) Removal of some or all automated driving function(s),		ADS-12-09 (OPI)
	(e) Failure of a vehicle system or component other than the ADS that precludes the ADS from performing the DDT.		ADS-12-09 (OPI)
6.3.1.14.1.	If a partial performance mode of operation is used under certain fault conditions (e.g. in case of severe failures), The system description shall describe:		ADS-12-09 (OPI)
	(a) the conditions for activation of that mode (e.g. type of failure),		
	(b) the resulting ADS feature behaviour and capabilities (e.g. achievement of a minimal risk condition immediately), and		
	(c) the warning strategy to the user/remote supervision centre (if applicable).		
6.3.1.15.2.	If a second (backup) means to realize the performance of the dynamic driving task is used, the system description shall describe:		ADS-12-09 (OPI)
	(a) the principles of the change-over mechanism,		
	(b) the logic and level of redundancy and any built-in backup checking features,		
	(c) the resulting limits of backup effectiveness.		

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6.3.1.15.3.	If the chosen response to a system failure entails the removal of an ADS function, the system description shall describe how it is done in compliance with the relevant provisions of this regulation. It shall also describe how all the corresponding output control signals associated with this function are inhibited.			ADS-12-09 (OPI)
6.3.1.12.	Data Storage System for Automated Driving			New section from EDR/DSSAD IWG
6.3.1.12.1.	In accordance with Annex 7, the manufacturer shall describe the DSSAD installed on the ADS vehicles, including:	6.3.1.12.1.	In accordance with Annex 9, the manufacturer shall describe the DSSAD installed on the ADS vehicle type, including:	EDR/DSSAD IWG
	(a) Capability to record time-stamped data,			EDR/DSSAD IWG
	(b) Capability to record time-series data,			EDR/DSSAD IWG
	(c) List of recordable data elements,			EDR/DSSAD IWG
	(d) Means for enabling access to stored data, and			EDR/DSSAD IWG
	(e) Means for protecting data against unauthorized access and manipulation.			EDR/DSSAD IWG
6.3.1.12.2.	Data elements listed in Annex 7 that are not relevant to monitoring the safety performance of the ADS may be omitted from the list of recordable data elements under paragraph 6.3.1.12.(c) above.	6.3.1.12.2.	Data elements listed in Annex 9 that are not relevant to monitoring the safety performance of the ADS may be omitted from the list of recordable data elements under paragraph 6.3.1.12.(c) above.	EDR/DSSAD IWG
6.3.1.12.3.	[The manufacturer shall justify the omission of data elements listed in Annex 7.]	6.3.1.12.3.	[The manufacturer shall justify the omission of data elements listed in Annex 9.]	EDR/DSSAD IWG
6.3.2.	Safety Concept			
6.3.2.0.	The manufacturer shall document the safety concept of the ADS.	*6.3.2.0.*	The manufacturer shall provide the safety concept of the ADS to the approval authority or its designated technical service.	Secy: Open with generic statement on providing the safety concept so the text can then follow with neutral “the safety concept shall…” pattern.

	UN GTR	UN Regulation	Comments
6.3.2.1.	The manufacturer shall document its safety concept which shall include the risks identified according to the SMS processes in 6.1.2 relevant to the ADS and shall include how those risks have been reduced, mitigated or accepted.		ADS-12-09 (OPI) The safety concept shall describe the risks identified and mitigations implemented pursuant to application of the processes documented under paragraph 6.1.2. of this Regulation.
6.3.2.1.1	The safety concept shall demonstrate the manufacturer's use of processes with top down (from possible hazard to design) and bottom-up approaches (from design to possible hazards) in its identification of hazards.		ADS-12-09 (OPI) ADS-12-24 (EC/JRC/OPI-SMS)
6.3.2.2.	The safety concept shall describe how the ADS features detect, identify, and respond to hazards, including the following:		ADS-12-09 (OPI)
	(a) Detection and identification of hazards,		
	(b) Design provisions for SOTIF and functional safety (e.g. redundancies),		
	(c) An analysis which shows how the ADS will behave (e.g. control strategies) to mitigate or avoid hazards which can have a bearing on the safety of the ADS vehicle user(s) and other road users, and		ADS-12-05 (China)
	(d) An analysis that shows how unknown hazardous scenarios will be managed.		
6.3.2.3.	The safety concept shall describe the process the ADS uses to determine if a collision with an object would cause non-trivial damage		ADS-12-09 (OPI)
6.3.2.4.	The safety concept shall describe the ADS's strategy for determining if the ADS vehicle has collided with a safety-relevant object.		ADS-12-09 (OPI)
6.3.2.5.	The safety concept shall describe measures taken to assure the cybersecurity of the ADS and the analysis performed to identify and disposition likely security threats. Where UN R 155 applies, the manufacturer shall describe how the ADS meets the requirements of that regulation.		ADS-12-09 (OPI) Wording needs refinement. Ensure language acceptable across GTR and various CP situations under UNR.
6.3.2.6.	[Software updates & Safety Case updates as per 6.1.5.2]		Brackets, content? 6.1.5.2. → ISMR
6.3.2.7.	The safety concept shall describe how software updates are validated and confirmed. Where UN R 156 applies, the manufacturer shall describe how the ADS meets the requirements of that regulation. in accordance with SMS section [6.1.5.9.]		Ensure language acceptable across GTR and various CP situations under UNR. No para. 6.1.5.9.
6.3.2.8.	The safety concept shall describe how the ADS determines the presence/absence of the conditions stated under paragraph 6.3.1.3. of this Regulation and any linked/dependent conditions (e.g. reduced speed in icy weather).		ADS-12-09 (OPI)

	UN GTR	UN Regulation	Comments
6.3.2.9.	The safety concept shall describe the conditions that the automated driving system is reasonably likely to encounter on its trip(s), including, but not limited to, environmental and geographical conditions, and/or the presence or absence of certain traffic or roadway characteristics, and explain how those expected conditions compare to the ODD of the ADS as described in 6.3.1.3.		ADS-12-09 (OPI) Redunandant. The description of the ODD is exactly what is described here (redundant). The scope concerns ADS features. Wording.
6.3.2.10.	The safety concept shall describe the measures or strategies implemented to:		ADS-12-09 (OPI)
	(a) prevent or mitigate abuse/misuse and errors by occupants that could affect safe performance of the DDT (e.g. occupants attempting to access driving controls),		ADS-12-09 (OPI) ADS-12-22
	(b) Prevent, mitigate or deter harm to occupants caused by external sources (e.g. unauthorised persons attempting to access a vehicle with occupants), [and]		Brackets ADS-12-09 (OPI)
	(c) Prevent, mitigate or deter abuse/misuse of the vehicle or its systems from external sources. (e.g. Objects placed on vehicles during operation, attempts to damage a vehicle).		ADS-12-09 (OPI) ADS-12-22 (China)
6.3.2.11.	The safety concept shall describe strategies to limit sudden ODD exits and frequent activation/deactivation situations.		ADS-12-09 (OPI)
6.3.2.12	The safety concept shall include the list of safety risks considered in relation to 5.2.3.3 and a description of how they are managed for all passengers, while an ADS feature is active.		ADS-12-09 (OPI)
6.3.2.13	The safety concept shall describe the strategies in place to avoid operating the vehicle when the general working condition of the vehicle is not satisfactory (e.g. condition of tyres, brakes, lighting, status of external loads, steering, etc.). These strategies may include technological solutions, regular inspections at a vehicle depot/garage, inspections by a driver prior to an ADS feature being activated or other relevant solutions.		ADS-12-09 (OPI)
6.3.2.14.	[Placeholder for behavioural competencies text pending completion of assessment portion by testing OPI in 7.3.2]		Content? ADS-12-09 (OPI)
6.3.2.15.	[Placeholder for scenario generation pending completion of assessment portion by testing OPI in 7.3.2]		Content? ADS-12-09 (OPI)
6.3.2.16.	The safety concept shall include the following information:		ADS-12-09 (OPI) This provision mixes ODD analytical processes (SMS) with the outcomes of the processes as applied to the ADS under assessment (i.e., the description of the ODD of each ADS feature).
	(a) Verification and validation plans including metrics and targets:		ADS-12-09 (OPI)

	UN GTR	UN Regulation	Comments
	(i) An explanation how scenarios are selected as part of verification and validation to provide reasonable coverage of the ODD and its boundaries,		ADS-12-09 (OPI) This management process should have been covered in the SMS audit
	(ii) Methodology, metrics and targets used to determine reasonable ODD coverage,		ADS-12-09 (OPI) This management process should have been covered in the SMS audit
	(iii) Any analysis comparing the performance of an ADS feature to that of a manually driven vehicle of comparable category (e.g. category M1 or category 1-1) in situations within the ODD of the feature and,		ADS-12-09 (OPI)
	(iv) Identification of any metrics or targets resulting from the analysis in (iii).		ADS-12-09 (OPI)
	(b) Scoring/evaluation methodology to obtain metrics,		ADS-12-09 (OPI)
	(c) Justification of the chosen acceptance criteria for metrics, and		ADS-12-09 (OPI)
	(d) Verification and validation results including evidence that the targets have been met (i.e. metrics meet acceptance criteria)		ADS-12-09 (OPI)
6.3.3.	Claims, Arguments, and Evidence		
6.3.3.1.	The safety case shall include a series of claims for each of which there must be at least one supporting argument.		ADS-12-09 (OPI)
6.3.3.1.1.	Each argument shall be supported by at least one piece of evidence.		“one piece of evidence”: Would it not be clearer to state that each argument shall be supported by evidence (with change in “evidence” definition)? Each argument shall be supported by results from testing pertinent to the argument.
6.3.3.1.2.	Each claim, argument and evidence shall be uniquely labelled but may be used more than once (i.e. a piece of evidence may support more than one argument).		
6.3.3.2.	The claims, arguments and evidence shall be understandable, logical, correct and robust and shall demonstrate that:		Long series of subjective adjectives that are addressed by requirements elsewhere (the text states what the claims, etc. must contain which is the criteria from determining “robust”, etc. Remove adjectives.
	(a) the ADS is free of unreasonable risk to ADS user(s) and other road users and		

	UN GTR	UN Regulation	Comments
	(b) the ADS meets applicable requirements of this regulation in each of following areas:		
	(i) DDT requirements (5.1)		
	(ii) User Interactions (5.2), except for the user information requirements of 5.2.5.		Discuss the exception. Are not the "information requirements" integral to ensuring an ADS free of unreasonable risks? Does something need to be corrected?
	(iii) Other Requirements (5.3)		
6.3.3.3.	The following summary information shall be provided with regards to the claims, arguments and evidence:		ADS-12-09 (OPI)
	(a) A summary identifying the relationships between claims and their supporting argument and evidence, and		
	(b) A summary identifying each regulatory requirement noted above and the claims that demonstrate the requirement is met.		
6.3.3.4.	The claims, arguments and evidence shall describe how the SMS processes (section 6.1) have been applied to manage ADS safety throughout the lifecycle of the system.		ADS-12-09 (OPI)
6.3.3.5.	Relevant assumptions made in relation to claims, arguments and evidence shall be stated.		ADS-12-09 (OPI)
6.3.3.6.	The claims, arguments and evidence shall demonstrate that the approach to testing is suitable for the demonstration of the safety case and the compliance with performance/functional requirements.		ADS-12-09 (OPI) ADS-12-20 (OPI-Test): Ref. 6.3.2.6. alternative proposal
6.3.3.7.	There shall be at least one claim for each goal or regulatory requirement.		ADS-12-09 (OPI) This does not make sense. The ADS requirements were designed to be holistic. Safe speed and safe distance are maintained simultaneously. It makes no sense to suggest that compliance with traffic laws could be demonstrated by an example with one law. Claims should connect with scenarios, performance of manoeuvres, demonstrated behavioural competencies, etc. that formed the framework of the ADS guidelines.

	UN GTR	UN Regulation	Comments
6.3.3.7.1.	Multiple sub-claims for a claim may be created, where a broader claim may not be sufficient or where additional justification is warranted as long as said sub-claims are sequenced logically and their relationships are included in the summary documents.		ADS-12-09 (OPI)
6.3.3.8.	Each argument supporting a claim shall provide contextual information and supporting information that explains how a claim is met based on an appropriate set of evidence.		ADS-12-09 (OPI)
6.3.3.9.	Evidence supporting argumentation shall consist of test results or analysis (e.g. system layout and schematics, photographs, required documentation etc.) as appropriate.		ADS-12-09 (OPI)
6.3.3.9.1	The test environment used to generate evidence shall meet the requirements of 6.2.1 for virtual tests, 6.2.2. for track tests, and 6.2.3 for real-world tests.		ADS-12-09 (OPI) ADS-12-20 (OPI-Test): split of physical into track and real-world
6.3.3.9.2.	Testing results may be provided individually or on aggregate and shall include appropriate acceptance criteria.		ADS-12-09 (OPI)
6.3.3.9.3.	Each test shall include enough information or be recorded in such a way that it may be reproduced upon request (e.g. same software/hardware versions, same tool versions, same scenario, same parameters etc.).		ADS-12-09 (OPI)
6.3.3.9.3.1.	The manufacturer shall facilitate access and execution of the necessary tools and analysis software upon request by the authority for the purpose of reproducing this evidence as part of the approval process or during compliance verification.		ADS-12-09 (OPI)
6.3.4	Manufacturer's Review of its Safety Case		ADS-12-09 (OPI)
6.3.4.1.	As part of the manufacturer's demonstration of compliance to 6.1.6, the manufacturer shall review its safety case prior to certification/approval and is encouraged do so during the development process.		ADS-12-09 (OPI)
6.3.4.2.	The reviewer(s) shall be independent, meaning that they are free from conditions that would threaten their ability to review the Safety Case without bias.		ADS-12-09 (OPI)
6.3.4.4.	The reviewer(s) may be internal or external to the manufacturer.		ADS-12-09 (OPI)
6.3.4.5.	The review shall be documented, available for inspection and include: (a) Qualifications of the reviewer/ review team, (b) Date/period of review, version of: the safety case, tools and ADS reviewed, (c) Methods used to review the Safety Case, (d) Listing of any evidence repeated/reproduced, and		ADS-12-09 (OPI)

	UN GTR	UN Regulation	Comments
	(e) Identified gaps, questions or areas of lower confidence or unknowns		
6.3.4.6.	Following each review, and after a time of the manufacturer's choice but before assessment of compliance, the manufacturer shall include in their review documentation the steps taken to remediate or improve upon any findings (e.g. release notes).		ADS-12-09 (OPI)
6.4.	Post-deployment Safety		
6.4.1.	[The manufacturer shall provide reports on the in-service safety performance of its ADS vehicles to enable:]		Brackets ADS-12-08 (OPI ISMR/Secy)
	(a) [Monitoring implementation of the SMS processes required under paragraphs 6.1.5. and 6.1.6. of this Regulation,]		Brackets ADS-12-08 (OPI ISMR/Secy)
	(b) [[Monitoring of ADS performance for consistency with the claims evidenced in the safety case of the ADS under paragraph 6.3.2. of this Regulation, and]		Brackets ADS-12-08 (OPI ISMR/Secy)
	(c) [Identification of safety concerns in need of remedy,]		Brackets ADS-12-08 (OPI ISMR/Secy)
6.4.1.1.	The manufacturer shall carry out the reporting as required by the relevant authority in accordance with the laws of the Contracting Party or Parties with jurisdiction over the reporting, including but not necessarily limited to laws governing:		ADS-12-08 (OPI ISMR/Secy)
	(a) Data access		
	(b) Data privacy, and		
	(c) Data protection.		
6.4.1.2.	The reporting by the manufacturer shall be based upon information known to the manufacturer.		
6.4.1.3.	The reporting shall include:		
	(a) Initial notifications,		
	(b) Short-term reports,		
	(c) Periodic reports.		
6.4.1.4.	The manufacturer shall provide the supporting data underpinning the report by means of an agreed data exchange mechanism upon request by the relevant authority.		

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6.4.1.5.	The manufacturer shall provide the relevant authority with a description of the data processing (for example: filtering and conditioning) procedure and agree on the steps undertaken to deliver the data supporting the report.			Delete. The processing is already covered under 6.1.5. Paragraph 6.4.1.1. already stipulates reporting "as required by the relevant authority" which covers how the authority wants the reports transmitted.
6.4.1.6.	The manufacturer shall report the occurrences listed in Annex 1.	6.4.1.6.	The manufacturer shall report the occurrences listed in Annex 3.	
6.4.1.7.	The manufacturer shall report occurrences when at least one of the following is fulfilled: (a) An ADS feature was active when the ADS vehicle was involved in the occurrence, or (b) An ADS feature was active up to 30 seconds prior to the ADS vehicle experiencing the occurrence.			
6.4.2.	Initial notifications			
6.4.2.1.	The manufacturer shall notify the relevant authority of a critical occurrence without unreasonable delay in accordance with the applicable laws after becoming aware of it.			ADS-12-xx (Secretary)
6.4.2.2.	The initial notification may be limited to high-level data (e.g., location, time, type of accident).			
6.4.3.	Short-term reporting			
6.4.3.1.	The manufacturer shall provide short-term reports for the significant and critical occurrences listed in Annex 1.	6.4.12.1.	The manufacturer shall provide short-term reports for the significant and critical occurrences listed in Annex 3.	Does the short-term reporting include the reporting of safety concerns in need of remedy? The periodic reporting below refers to following up on identified risks and how they have been addressed. Is this process of safety issue identification and resolution part of the short/periodic reporting or should it be a separate parallel process?
6.4.3.2.	The manufacturer shall issue each short-term report within 30 days from its knowledge of the occurrence.			
6.4.3.3.	The manufacturer shall report the occurrences in accordance with the template provided in Annex 2.	6.4.12.3.	The manufacturer shall report the occurrences in accordance with the template provided in Annex 4.	
6.4.4.	Periodic reporting			

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6.4.4.1.	The manufacturer shall provide periodic reports for the occurrences listed in Annex 1.	6.4.4.1.	The manufacturer shall provide periodic reports for the occurrences listed in Annex 3.	ADS-12-08 (OPI ISMR/Secy) Periodic reporting is not limited to occurrences (see item (c) in the following paragraph. Should the reporting of occurrences be mixed with reporting of safety concerns and their remediation?
6.4.4.2.	The periodic report shall provide evidence of the in-service ADS safety performance. In particular, it shall demonstrate that:			Wording: the reporting cannot be required to demonstrate the items; the reporting consists of facts that enable determinations on whether (a) and (b) are true. The periodic report
	(a) The ADS fulfils the performance requirements as evaluated in the test methods and/or declared in the safety case,			
	(b) No inconsistencies have been detected compared to the ADS safety performance declared prior to market introduction, [and]			Brackets Revise to align with safety case and remove potential conflict under systems that address the vehicle at the time of production rather than market introduction. The report shall include any
	(c) Any newly discovered significant ADS safety performance issues that pose an unreasonable risk to safety have been adequately addressed and how this was achieved, including how they were addressed.			Periodic reporting is annual. Presumably, the issues being followed up on are not “new”. They have already been reported: The status of actions to remedy outstanding ADS safety performance issues that pose an unreasonable risk to safety, if any.
6.4.4.3.	The manufacturer shall submit periodic reporting regularly, at least every year, in the form of aggregated data (e.g., per hour of operation and distance driven) for ADS-vehicle type and related to ADS operation.			
6.4.4.4.	The manufacturer shall provide the periodic report in accordance with the template provided in Annex 3.	6.4.4.4.	The manufacturer shall provide the periodic report in accordance with the template provided in Annex 5.	ADS-12-08 (OPI ISMR/Secy)
6.5.	Other Manufacturer Requirements			
6.5.1	The manufacturer shall make available the extent, timing and frequency of maintenance operations necessary for safe ADS performance to the vehicle owner or operator			ADS-12-26 (OPI-SA)

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7.	Compliance Assessments		
7.1.	Audit of the Safety Management System		This section should be reviewed for alignment with the requirements and to ensure criteria for determining compliance. Are the outcomes of the audit to be documented (i.e., an equivalent of a test report providing outcomes of testing)?
7.1.1.	Objectives of the SMS audit		ADS-12-24 (EC/JRC/OPI-SMS): Delete and renumber subsequent provisions.
7.1.1.1.	The documentation of the manufacturer's safety management system shall be audited for compliance with the requirements under paragraph 6.1.		
7.1.1.2.	The audit of the manufacturer's safety management system shall provide confirmatory evidence on the robustness of the manufacturer's processes [to manage safety risks and to ensure safety] throughout the ADS lifecycle (development, production, operation and decommissioning).		ADS-09-28/Rev.1 (UK): delete bracketed text. ADS-12-24 (EC/JRC/OPI-SMS) The audit is an objective assessment of compliance with the requirements. We cannot require the audit to provide confirmatory evidence. The audit can only verify whether the SMS provides evidence.
7.1.1.3.	The auditor shall evaluate the robustness of the manufacturer's processes to monitor the safety management system activities (KPIs) and to take appropriate (corrective or preventive) action to address any issue.		
7.1.1.4.	The audit of the safety management system shall be conducted by auditors with the technical and administrative knowledge necessary for such purposes. This competence shall be demonstrated by appropriate qualifications or other equivalent training records.		Out of place: This provision establishes requirements for SMS auditors.
7.1.2.	The auditor shall verify that the manufacturer has used suitable and documented processes to derive behavioural competencies and scenarios that are ODD-relevant and are relevant to the ADS safety case.		ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.2.1.	The auditor shall verify that the manufacturer's approach and processes to identify and generate scenarios: (a) Covers the necessary nominal, critical and failure scenarios,		ADS-12-24 (EC/JRC/OPI-SMS): Delete This provision needs alignment with the ODD analysis annex and provisions in the requirements for an SMS.

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	(b) Takes into account data driven, knowledge driven and stochastic approaches to systematically identify hazardous events and other occurrences used to develop scenarios,			
	(c) Properly maps and characterises the behaviour of all the elements included in the scenarios.			
7.1.2.2.	The auditor shall verify that the manufacturer has used sampling techniques when selecting parameters to be used in creating logical and concrete scenarios used as evidence supporting the ADS safety case to avoid the ADS being optimized for a set of known test cases.			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.	The auditor shall verify that the manufacturer has suitable processes, resources and competent personnel in place for the testing that has been undertaken to demonstrate the ADS safety case.			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.1.	The auditor shall verify that the manufacturer has suitable processes and competent personnel to assess the behavioural competencies demonstrated by the ADS under each scenario against requirements for performance of the Dynamic Driving Task (DDT).			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.2.	The auditor verify that the manufacturer has suitable processes and competent personnel to assess the capability of the ADS to ensure the safety of users and their use of ADS vehicles.			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.3.	The auditor shall verify that the manufacturer has suitable processes in place to identify the set of scenarios to be tested via track-testing.			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.4.	The auditor shall verify that the manufacturer has suitable processes in place to identify test routes that capture predictable aspects of the ODD (e.g., road types and geometries), elements found in the related nominal scenarios (e.g., other road users, signs, and signals), and typical dynamic conditions (e.g., high/low traffic densities). The test routes shall also enable verification of nominal requirements for the safety of user interactions, including prior to, at the time of, and after entering and exiting the ODD of an ADS feature.			ADS-12-24 (EC/JRC/OPI-SMS): Delete
7.1.3.	Review of the Safety Policy			ADS-12-24 (EC/JRC/OPI-SMS) “Assessment” rather than “Review”?
7.1.3.1.	The audit shall verify that the safety policy covers the following aspects:	7.1.3.1.	The approval authority or its designated technical service shall verify that the safety policy covers the following aspects:	ADS-12-24 (EC/JRC/OPI-SMS)
	(a) Definition of the principles and objectives upon which the SMS is built, operated and maintained.			ADS-12-24 (EC/JRC/OPI-SMS)
	(b) General recognition of the inherent risks of ADS-related activities throughout their life cycle, including the risks of the parties involved.			ADS-12-24 (EC/JRC/OPI-SMS) Meaning? What are the “ADS-related activities”? How do they have life cycles? What risks to what parties?

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	(c) Organisational structure, the safety-governance elements, and their appropriateness for the needs of the organisation.			ADS-12-24 (EC/JRC/OPI-SMS) ?"needs of the manufacturer"?
	(d) Evidence on the commitment towards the safety.			ADS-12-24 (EC/JRC/OPI-SMS) Meaning? Demonstrate commitment to meeting (a)?
	(e) Description of the means/approaches to engage people within the organization in the culture of safety.			ADS-12-24 (EC/JRC/OPI-SMS) Choose: "means", "approaches", "means and approaches", "means or approaches"
7.1.4.	Review of the Risk Management			ADS-12-24 (EC/JRC/OPI-SMS) Assessment?
7.1.4.1.	The audit shall verify that the manufacturer's risk-management processes cover the following aspects:	7.1.4.1.	The approval authority or its designated technical service shall verify that the manufacturer's risk-management proesses cover the following aspects:	ADS-12-24 (EC/JRC/OPI-SMS)
	(a) Reactive and proactive practices for risk management are in place,			ADS-12-24 (EC/JRC/OPI-SMS)
	(b) Risk management activity is not limited to the ADS itself but includes risk arising from organization/people which can affect the SMS effectiveness or ADS's Safety			ADS-12-24 (EC/JRC/OPI-SMS)
	(c) Risk management activity includes risks from third parties			ADS-12-24 (EC/JRC/OPI-SMS)
	(d) Risk management activity covers and is performed over the entire lifecycle			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.5.	Review of the Safety Assurance			
7.1.5.1.	The audit shall verify that the manufacturer's safety-assurance processes cover the following aspects:	7.1.5.1.	The approvel authority or its designated technical service shall verify that the manufacturer's safety-assurance processes cover the following aspects:	ADS-12-24 (EC/JRC/OPI-SMS)
	(a) Periodic independent internal audits and external audits			ADS-12-24 (EC/JRC/OPI-SMS)
	(b) Processes for the management of the supply chain and any other involved organization which can affect the safety of the ADS			ADS-12-24 (EC/JRC/OPI-SMS)
	(c) Change management processes are in place			ADS-12-24 (EC/JRC/OPI-SMS)
	(d) Processes for corrective actions to maintain an acceptable level of safety are in place			ADS-12-24 (EC/JRC/OPI-SMS)
	(e) The corrective action applies to the ADS as well as SMS			ADS-12-24 (EC/JRC/OPI-SMS)

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	(f) Monitoring practices to measure overall safety performance are in place.			ADS-12-24 (EC/JRC/OPI-SMS)
	(g) The monitoring practices/processes apply to the ADS as well as to the SMS			ADS-12-24 (EC/JRC/OPI-SMS)
	(h) Independent functions for carrying out the compliance assessment and audit are in place			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.6.	Review of the Safety Promotion			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.6.1	The Auditor shall ensure that the following aspects are covered:			ADS-12-24 (EC/JRC/OPI-SMS)
	(a) There is an appropriate level of competence of the personnel to perform their duties.			ADS-12-24 (EC/JRC/OPI-SMS)
	(b) The competence is promoted through training			ADS-12-24 (EC/JRC/OPI-SMS)
	(c) Means for internal and external safety communications are in place			ADS-12-24 (EC/JRC/OPI-SMS)
	(d) Process for continuous improvement.			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.7.	Review of Design and Development			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.7.1.	The audit shall verify that the manufacturer's design and development processes cover the following apsects:	7.1.7.1.	The approval authority or its designated technical service shall verify that the manufacturer's design and development processes cover the following apsects:	ADS-12-24 (EC/JRC/OPI-SMS)
	(a) Processes for the management of the design and development phase, and			
	(b) Evidence of the embodiment of the safety policy, risk management, safety assurance and safety promotion aspects in the design and development.			
7.1.8.	Review of Production processes			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.8.1.	The audit shall verify that the manufacturer's processes for the management of ADS production cover the following aspects:	7.1.8.1.	The approval authority or its designated technical service shall verify that the manufacturer's processes for the management of ADS production cover the following aspects:	ADS-12-24 (EC/JRC/OPI-SMS)
7.1.9.	Review post-deployment processes			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.9.1.	The audit shall verify that the manufacturer's post-deployment safety processes cover the following aspects:	7.1.9.1.	The approval authority or its designated technical service shall verify that the manufacturer's post-deployment safety processes cover the following aspects:	ADS-12-24 (EC/JRC/OPI-SMS)

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	(a) Processes for the management of Post deployment Phase			ADS-12-24 (EC/JRC/OPI-SMS)
	(b) Evidence of the embodiment of the safety policy, risk management, safety assurance and safety promotion aspects in Post deployment Phase			ADS-12-24 (EC/JRC/OPI-SMS)
7.1.4.	Pre-Deployment Assessment of In-Service Monitoring and Reporting			ADS-12-24 (EC/JRC/OPI-SMS): renumber to 7.1.9.2. and rename “audit of the ISMR”
7.1.4.1.	The manufacture’s documentation shall be reviewed to verify the suitability of ISMR practices for the ADS.	7.1.4.1.	The approval authority or its designated technical service shall review the manufacturer’s documentation to ensure the suitability of ISMR practices for the ADS.	
7.1.4.2.	The documentation review shall provide evidence that:			The assessment verifies compliance; this provision may not require the review to provide evidence of compliance. The elements of the review need to refer back to specific requirements under para. 6.1.
	(a) the processes for ISMR are suitable for the ADS,			
	(b) the tools used for ISMR are suitable for the ADS, [and]			
	(c) the personnel for ISMR have an adequate level of competence.			
7.1.4.3.	The manufacturer’s capability to monitor the ADS shall be evaluated for compliance with the requirements under paragraphs 6.1.5.1. through 6.1.5.8.	7.1.4.3.	The approval authority or its designated technical service shall verify the manufacturer’s capability to monitor the ADS in accordance with the requirements under paragraphs 6.1.5.1. through 6.1.5.8.	Cross-references. In the case of type approval, the capability would be “verified” rather than “evaluated” (i.e., “evaluate for compliance” = “verify”).
7.1.4.4.	The manufacturer’s approach/methods shall be evaluated:	7.1.4.4.	The approval authority or its designated technical service shall evaluate the manufacturer’s approach/methods:	Choose “approach” or “method” or another word. This seems to be a sub-element of the preceding monitoring provision. The audit (approval authority or its designated technical service) shall verify the manufacturer’s capabilities to:
	(a) To verify the safety performance of the ADS during the operation, and			Link to requirement(s) under 6.1.?
	(b) To ensure the effectiveness of their safety risk controls.			Link to requirement(s) under 6.1.?

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7.1.4.5.	The audit shall verify and evaluate that the manufacturer has a mechanism in place:	7.1.4.5.	The approval authority or its designated technical service shall verify and evaluate that the manufacturer has a mechanism in place:	
	(a) To collect data from the vehicle and to receive data other sources, [and]			Brackets
	(b) To utilize all relevant data feeding sources in order to assess the ADS safety risks, evaluate its safety performance, and, in time, take appropriate actions and check their effectiveness.			
7.1.4.6.	The documentation review shall provide evidence that, at least:			The audit may not be required to provide evidence (the audit can only verify whether the evidence has been provided). Wording might be: The audit shall verify that the documentation covers:
	(a) Responsibilities and timelines are defined to ensure that the monitoring is applied and effective,			Responsibilities and timelines to ensure the effectiveness of the monitoring activities,
	(b) Methods for data collection and analysis are adequate to ensure monitoring objectives are fulfilled,			Methods for data collection and analysis to ensure fulfilment of the monitoring objectives,
	(c) ADS safety performance will be verified in reference to the safety performance indicators and safety performance targets as indicated in the safety case,			Verification of performance against the safety performance indicators and targets indicated in the safety case,
	(d) The risks are managed and controlled based on the information coming from the monitoring activities,			Management and control of risks based on information generated by the monitoring activities,
	(e) The monitoring takes into account feedback and information received from sources other than the ADS vehicle data, [and]			Brackets Inclusion of information from sources other than the ADS vehicle data, Should “ADS vehicle data” be replaced by “DSSAD” since this is the capability required for monitoring ADS performance?
	(f) The effectiveness of the monitoring activity will be regularly reviewed.			Regular periodic reviews of the monitoring activities’ effectiveness.

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7.1.4.7.	The manufacturer's capability to report the occurrences listed in Annex 1 shall be verified.	7.1.4.7.	The approval authority or its designated technical service shall verify the manufacturer's capability to report the occurrences listed in Annex 3.	
7.1.4.8.	The manufacturer's approach/methods for reporting the occurrences experienced by the ADS during the operation and for assessing the cause of such events shall be evaluated.	7.1.4.8.	The approcal authority or its designated technical service shall evaluate the manufacturer approach/methods for reporting the occurrences experienced by the ADS during the operation and for assessing the cause of such events.	Choose "approach", "method", or another word.
7.1.4.9.	Use of the reporting templates in Annex 4 and Annex 5 by the manufacturer shall be verified.	7.1.4.9.	The approval authority or its designated technical service shall verify that the manufacturer utilizes the reporting templates provided in Annex 4 and Annex 5.	What is the provision asking for? "Use" and "utilize" are not identical. "Use" implies "as is or as intended". "Utilize" implies the application of something, including modification. "Utilize" implies that the manufacturer has applied the template to establish its own reporting form suited to meeting reporting requirements specific to its situation. "Use" can be interpreted either as verifying use of the templates exactly as they are in the annexes or verifying adaptation of the templates to manufacturer's "use case". "Utilize" would imply evaluating rather than verifying.
7.1.4.10.	The data, metrics, and other information that the manufacturer intends to use for the characterisation of the occurrences shall be evaluated for adequacy.	7.1.4.10.	The approval authority or its designated technical service shall evaluate the adequacy of the information that the manufacturer intends to use for the characterisation of the occurrences (e.g. data elements and metrics).	Any criteria for determining "adequacy"? The occurrences listed in Annex 1/Annex 3?
7.2.	Assessment of the Test Environments			
7.2.1.	Appraisal of the physical testing facilities and environment			Replace "appraisal": it unnecessarily introduces a new word that might raise uncertainty over "assessment"".

	UN GTR		UN Regulation	Comments
7.2.1.1.	The test track(s), proving ground(s), and/or public roads used to conduct testing of the ADS under paragraphs 6.2.x (track) and 6.2.y. (real-world) shall be assessed for compliance with the following items:	7.2.1.1.	The approval authority or its designated technical service shall assess the physical test environments used to conduct testing of the ADS under paragraphs 6.2.x (track) and 6.2.y. (real-world) to verify that:	Revised from "the assessor shall…" Confirm cross-references to the corresponding test environments requirements sections. (original text: "The assessor shall appraise the physical testing (proving ground and/or public road) facilities and environment for their suitability to conduct the testing and gather evidence to support the safety case. In particular the assessor shall verify that:")
	(a) The physical testing facilities used by the manufacturer includes static and dynamic elements representative of the ODD and the expected operating conditions and as relevant to the tests being performed,			Changed from numerical to alpha list. Shorten "physical testing facilities" and similar phrases to "the test environments" for brevity (the heading is already clear that the section concerns "physical" environments.
	(b) The facilities and capabilities are suitable to assess the aspects of the safety case under test,			Cross reference to safety case provision(s)?
	(c) The facilities have all the relevant equipment and accreditations;			Remove "all" (no prescribed list)—check for 6.2. provisions on documenting the equipement and accreditations necessary to ensure credible test outcomes.
	(d) The equipment undergoes periodic calibrations to ensure that the measurements are characterized by sufficient accuracy and precision.			Check for 6.2. provisions setting this requirement and evidence (cross-reference) and consider whether linked to any SMS management provisions.

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7.2.1.2.	Selected tests may be reproduced as part of conducting the assessment pursuant to paragraph 7.2.1.1 above.	7.2.1.2.	The approval authority or its designated technical service may request the manufacturer to reproduce selected tests pursuant to paragraph 7.2.1.1. above.	Revised for "the assessor may…" (original test: "The assessor may request to witness the execution of some of the physical tests performed by the manufacturer to verify their suitability to conduct the testing and gather evidence to support the safety case as well as to verify that the manufacturer is following the agreed processes for doing the physical testing.") The "purposes" clause is problematic since there is no provision requiring "agreement" over the processes used by the manufacturer. The purpose of 7.2. is to check whether the testing is acceptable. The "purposes" clause is unnecessary given that this provision is part of 7.2.1. on assessing the physical test environments. Check this provision against "confirmatory testing"—this provision is similar to, but not exactly the same, as an authority or service reproducing tests conducted by the manufacturer.
7.2.2.	Appraisal of the credibility framework developed by the manufacturer for virtual testing			Replace "appraisal": it unnecessarily introduces a new word that might raise uncertainty over "assessment'". "Credibility framework" is not defined in the text, so it is uncertain what is being assessed. It would be simpler to call this subsection "Assessment of the virtual testing environment(s)".

	UN GTR		UN Regulation	Comments
7.2.2.1.	Each simulation toolchain used by the manufacturer to support the ADS safety case shall be assessed for compliance with the requirements under paragraph 6.2.1. of this Regulation.	7.2.2.1.	The approval authority or its designated technical service shall verify that each simulation toolchain used by the manufacturer to support the ADS safety case complies with the requirements under paragraph 6.2.1. of this Regulation.	Revised for "the assessor shall…." (original text: "The assessor shall verify that the simulation toolchain(s) used by the manufacturer in the assessment of the safety case is suitable for conducting virtual tests and in compliance with requirements listed in 6.2.1. and sub-paragraphs.") Virtual testing is used to "support" not "assess" the safety case. "used to generate evidence under parapgraph 6.3.x (claims, arguments, evidence subsection)" would be more precise.
7.2.2.2.	Each simulation toolchain shall be assessed for compliance with the processes documented by the manufacturer to fulfill the requirements under paragraph 6.2.1. of this Regulation.	7.2.2.2.	The approval authority or its designated technical service shall assess each simulation toolchain for compliance with the processes documented by the manufacturer to fulfill the requirements under paragraph 6.2.1. of this Regulation.	Revised for "the assessor shall…" (original text: " "The assessor shall review the manufacturer's credibility framework to determine whether the simulation toolchain(s) is suitable to undertake virtual testing." "credibility framework" seems to be a code word for the manufacturer's processes for meeting the requirements of section 6.2.
7.2.2.3.	The documentation and evidence supporting the manufacturer's claims about the capability of the simulation toolchain(s), including its scope, shall be reviewed to confirm that the tooichain can be used to perform virtual testing as part of the ADS assessment.	7.2.2.3.	The approval authority or its designated technical service shall review the documentation and evidence supporting the manufacturer's claims concerning the capabilities of each simulation toolchain, including its scope, to perform virtual testing as part of the ADS assessment.	Revised for "the assessor shall…" What exactly is this provision asking for? What is the "capability of the toolchain", the "scope of the toolchain"? What does it mean for a simulation toolchain "to perform virtual testing"? What is the "ADS assessment" (vis-à-vis the safety case)? Can this provision be linked to one or more requirements (i.e., are there provisions requiring "claims and evidence" for the credibility of the toolchains)?

	UN GTR		UN Regulation	Comments
7.2.2.4.	Additional physical or virtual tests may be requested or carried out as part of this assessment of the manufacturer's virtual testing.	7.2.2.4.	The approval authority or its designated technical service may request or carry out additional physical or virtual tests as part of this assessment of the manufacturer's virtual testing.	Revised for "the assessor shall…" (original text: "The assessor shall audit the information provided by the manufacturer and may request or carry out additional physical or virtual tests. The results of these additional tests shall be reviewed and any concerns or discrepancies shall be raised and reviewed with the manufacturer.") What is the intent of this provision? Isn't the "information" reviewed under 7.2.2.3.? It seems to include "audit", "request additional tests", "carry out additional tests" and includes virtual and physical tests when this subsection only concerns virtual. Then it adds a provision about discrepancies presumably between the reported outcomes and the "additional tests" outcomes. If the tests are "additional", are there constraints or can any test be performed? What is the basline for identifying "discrepancies"? Where is the "information provided by the manufacturer" listed (i.e., the requirements)? Check against "confirmatory testing" (which is the TAA/TS reproducing manufacturer tests). Replace "audit" to avoid confusion with SMS audit.
7.2.2.4.1.	Concerns or discrepancies in the results of these additional tests compared against the information provided by the manufacturer shall be explained.	7.2.2.4.1.	Concerns or discrepancies regarding the results of additional tests compared against the information provided by the manufacturer shall be reviewed with the manufacturer.	
7.2.3.4.2.	If the concerns or discrepancies identified under the preceding paragraph cannot be readily explained, the manufacturer shall undertake further study to determine the reason(s) for the concerns or discrepancies.	7.2.3.4.2.	If the manufacturer cannot explain the concerns or discrepancies identified under preceding paragraph, the approval authority or its designated technical service shall require the manufacturer to undertake further study to determine the reason(s) for the concerns or discrepancies.	Revised for "the assessor shall…" (original text: "If the results do not sufficiently replicate those of the manufacturer or raise other concerns and the manufacturer cannot provide an explanation for the discrepancies then the assessor shall inform the manufacturer that they need to undertake their own review to identify the reasons.").

	UN GTR		UN Regulation	Comments
7.2.3.4.3.	The manufacturer shall document the outcomes of the study conducted pursuant to the preceding paragraph, including any corrective actions undertaken to resolce the concerns or discrepancies.	7.2.3.4.3.	The manufacturer may submit the outcomes of its study pursuant to the preceding paragraph, including any corrective actions undertaken to resolve the concerns or discrepancies.	Revised for "the assessor shall…" (original text: "The manufacturer can resubmit once they have identified and resolved the issue and updated the information. The manufacture shall explain the issue and its extent. The assessor shall conduct a further review that will include an assessment of the additional information supplied by the manufacturer.")
7.2.3.4.4.	The outcomes of the study and corrective actions, if any, shall be assessed.	7.2.3.4.4.	Purusant to a submission under the preceding paragraph, the approval authority or its designated technical service shall assess the additional information provided by the manufacturer.	The original text contains two provisions: one for the manufacturer study and a second for the response to the study.
7.2.3.5.	The assessor may request to witness the generation of some of the virtual testing results to verify the evidence indicated in the previous points.	7.2.3.5.	The approval authority or its designated technical service may request the manufacturer to conduct selected virtual tests.	Revised for "the assessor shall…" (original text: "The assessor may request to witness the generation of some of the virtual testing results to verify the evidence indicated in the previous points."). **Questionable provision!** The ADS guidelines require witnessing randomised virtual testing to check for training bias and produce data for comparison against a selected concrete-layer track test.
7.3.	Assessment of the Safety Case Content			
7.3.1.	The safety case shall be assessed by an assessor, or team of assessors meeting 7.3.6 and 7.3.7 in order to determine if the Safety Case is complete and robust.			Delete. This is a requirement to meet another requirement. It is unnecessary.

	UN GTR		UN Regulation	Comments
7.3.2.	Additional supporting documentation, reproduction of evidence, or confirmatory tests may be requested.	7.3.2.	[The approval authority or its designated technical service may: (a) Request the manufacturer to provide supporting documentation, (b) Request the manufacturer to assist in reproducing evidence, or (c) Subject the ADS to confirmatory tests.]	Revised for "the assessor shall…" (original text: "The assessor may request that the manufacturer provide supporting documentation, assist in repeating/reproducing evidence or subject the ADS to confirmatory tests the assessor deems necessary for this task." What is "this task"? "deems necessary" is superfluous unless there is a require for the "assessor" to justify its requests. Alpha list to correct grammatical logic. "and", "and/or".
7.3.3.	The ADS safety case shall be assessed to verify compliance with the following critiera:	7.3.3.	The approval authority or its designated technical service shall verify the ADS safety case for compliance with the following criteria:	Revised for "the assessor shall…" (original text: "The assessor shall review the manufacturer's safety case for completeness ensuring that at least the following criteria have been met:").
	(a) The manufacturer's safety concept is consistent and complete,			"the safety case for the ADS is…"
	(b) Each requirement in the regulation has been addressed by one or more claims pursuant to paragraph 6.3.3.8. of this Regulation,			
	(c) The cumulation of claims would yield a system absent of unreasonable risk pursuant to paragraphs [6.3.1.30, 6.3.1.31] and 6.3.3.2. of this Regulation,			Confirm cross-referenced paragraphs. 6.3.1.30 and 31 do not exist.
	(d) Each claim is supported by one or more arguments pursuant to paragraph 6.3.3.1. of this Regulation,			
	(e) Each argument is supported by a non-zero set of evidence pursuant to paragraph 6.3.3.1.1. of this Regulation,			
	(f) The manufacturer has documented metrics and acceptance criteria related to their claims pursuant to paragraphs [6.3.1.30 and 6.3.1.31.]			Documentation of metrics and acceptance criteria have been moved.
	(g) backwards and forward traceability from requirements to evidence as per 6.3.2.3			"traceability" requirements appear to have been removed.

	UN GTR		UN Regulation	Comments
7.3.4.	The manufacturer's safety case shall be reviewed for robustness with verification that at least the following criteria have been met:	7.3.4.	The approval authority or its designated technical service shall review the manufacturer's safety case for robustness and verify that at least the following criteria have been met:	ADS-12-27 (OPI-SA) "Assessor" language edited by secretary and adapted for GTR and UNR application.
	(a) Testing evidence and the tools by which they are obtained achieve an acceptable level of credibility and demonstrate stability of performance when subjected to variations as per 7.2,			ADS-12-27 (OPI-SA)
	(b) Testing evidence provided can be repeated and reproduced with consistency of safety objectives as per 7.3.9, [and]			ADS-12-27 (OPI-SA)
	(c) The testing evidence demonstrated by the manufacturer provides reasonable coverage of foreseeable operating conditions and events in the intended area of operation, including conditions consistent with the ODD of the ADS and conditions that may involve ODD exit.			ADS-12-27 (OPI-SA)
7.3.5.	A report of the assessment under paragraph 7.3. shall be prepared.	7.3.5.	The approval authority or its designated technical service shall prepare a report of its assessment.	Revised for "the assesor shall…" (original text: "7.3.1.5. The assessor shall prepare a report of its assessment in such a manner that allows traceability, e.g. versions of documents inspected are coded and listed in the records of the Assessor. The report shall include any identified discrepancies/gaps and remediations undertaken by the manufacturer.").
7.3.5.1.	The report shall ensure traceability across versions of documents such as through coding and indexing in the records of the assessment.			
7.3.5.2.	The report shall include the records on the identification and correction of discrepancies or gaps.			Is this referring to omissions or other concerns with the safety case as provided by the manufacturer? "discrepancies" is used under 7.2. for differences in test outcomes.
7.3.6.	The assessment purusuant to paragraph 7.3. of this Regulation shall be conducted by personnel competent in:	7.3.6.	The approval authority or its designated technical service shall ensure that the assessment pursuant to paragraph 7.3. of this Regulation is conducted by personnel competent in:	Revised for application to UNR with qualifications moved to common alphabetical list. This provision does not address the ADS or its safety case; the provision establishes requirements for "assessors" (which are covered outside of UN Regulations).

	UN GTR		UN Regulation	Comments
	(a) Functional safety (e.g., ISO 26262), (b) SOTIF (e.g., ISO 21448), (c) Human factors considerations, and (d) Cyber Security (e.g., UN R155, ISO/SAE 21434).			
7.3.6.1.	The competencies of the personnel who conduct the assessment shall be demonstrated by documenting their qualifications or other equivalent training records.	7.3.6.1.	The approval authority or its designated technical service shall demonstrate the competencies of its personnel by documenting their qualifications or other equivalent training records.	Does this mean that the assessment/approval reports shall include the information on the people who conducted the assessment (i.e., the personnel records are part of the "approval package")?
7.3.7.	The conditions under which the assessment is conducted shall be free of:	7.3.7.	The approval authority or its designated technical service shall be independent and external with repect to the manufacturer in accordance with Schedule 2 part 1.4 of the 1958 agreement.	Revised to addess use of "assessors" (original: "The assessors shall be free from conditions that would threaten their ability to assess the Safety Case without bias including:") Why is this necessary? It repeats what is already covered by national rules of procedure and Schedule 2 of the 1958 Agreement. "threaten" is a bit dramatic.
	(a) Financial incentives linked to the approval of the Safety Case (excludes incentives for the work undertaken to assess the Safety Case) (b) Participation in the development of the Safety Case via creation of evidence, analyses, test tools or other material (c) Potential of reprisals for not approving the Safety Case			Meaning of parenthetical remark uncertain.
7.3.8.	[Assessment of the DSSAD]			EDR/DSSAD IWG inputs

	UN GTR		UN Regulation	Comments
7.3.8.1	[The documentation furnished under paragraph 6.3.1.12. shall be verified for consistency with the provisions of Annex 7.]	7.3.8.1	[The documentation furnished under paragraph 6.3.1.12. shall be verified for consistency with the provisions of Annex 9.]	
7.3.8.2.	[The omission of data elements listed in Annex 7 shall be evaluated to ensure a reasonable, objective basis for their exclusion.]	7.3.8.2.	[The omission of data elements listed in Annex 9 shall be evaluated to ensure a reasonable, objective basis for their exclusion.]	
7.4.	Post-Deployment Safety Assessment			
7.4.1.	The assessment shall review confirmatory evidence produced by that the information provided by the manufacturer during the ADS operations (e.g. Notification, short term and periodic reports) is in compliance with and assess that it is in accordance with capabilities described in the manufacturer's SMS [ref. 7.4.1.7-7.4.1.10].	7.4.1.	The approval authority or its designated technical service shall receive information provided by the manufacturer and assess that it is in accordance with the manufacturer's SMS [ref. 7.4.1.7-7.4.1.10].	"confirmatory evidence" might be confusing given the importance of "comfirmatory testing" in the approval process. Notifications, short-term reports, and the periodic reporting shall be assessed for compliance with the reporting requirements under para. 6.4. Notifications, short-term reports, and the periodic reporting shall be evaluated for consistency with the audit of the SMS (certificate of compliance?).
7.4.2.	The information provided by the manufacturer on the ADS operations (e.g. Notification, short term and periodic reports) shall be reviewed:	7.4.2.	The approval authority or its designated technical service shall review the information provided by the manufacturer on the ADS operations (e.g. Notification, short term and periodic reports):	This is a requirement for the authority to review the reports provided by the manufacturer. The provisions seems aimed at setting criteria for determining whether the reporting is satisfactory, but the phrasing seems off-target (e.g., what does it mean "to review the information to receive confirmatory evidence…"?).
	(a) To receive confirmatory evidence on the safety case and on the Safety Management System,			
	(b) To receive information on the ADS safety level and assess whether the ADS continues to be safe when operated on the road,			
	(c) If applicable, to verify that this information, is used to develop new scenarios or variations of existing scenarios included in the Safety case' evidence, [and]			Brackets

	UN GTR		UN Regulation	Comments
	(d) To ensure the effectiveness of the implemented corrective actions.			
7.4.3.	The Assessor shall review the manufacturer's data processing (for example: filtering and conditioning) procedure during occurrence investigation and agree on the steps undertaken to deliver the data supporting the report.	7.4.3.	The approval authority or its designated technical service shall review the manufacturer's data processing (for example: filtering and conditioning) procedure during occurrence investigation and agree on the steps undertaken to deliver the data supporting the report.	Can this provision be rephrased to enable neutral wording under the GTR? The provision requires "agreement" which suggests a compliance assessment. Are there criteria for what "steps" are acceptable?
7.4.4.	The confidentiality of sensitive and business confidential information reported in accordance with the short-term template shall be assured.	7.4.4.	The approval authority or its designated technical service shall ensure the confidentiality of sensitive and business confidential reported information in the short-term template.	Somewhat garbled UNR wording. Sets a requirement imposed on authorities—is this "canononical" for UNR? Are there any provisions under the accreditation of TAA/TS covering the handling of confidential materials?
7.4.5.	The Assessor, where necessary, may verify the information provided and, if needed, the assessor may require further investigations and evidence, including test, before closing the occurrence.	7.4.5.	The approval authority or its designated technical service, where necessary, may verify the information provided and, if needed, the approval authority or its designated technical service may require further investigations and evidence, including test, before closing the occurrence.	Consider refinements. The "occurrence" is what happened, so "closing the occurrence" seems intended to address closing an investigation or inquiry. Where necessary, additional verification, testing and/or evidence may be required to enable completion of an investigation of an occurrence.
Annexes				
		Annex 1.	Communication	
		Annex 2.	Examples of arrangements of approval marks	

Annex 1. List of Reportable Occurrences by Reporting Type

Annex 3. List of Reportable Occurrences by Reporting Type

The following table lists the occurrences to be reported by the manufacturer in accordance with para. 6.4. of this Regulation. The table indicates the reporting type(s) that apply to each occurrence.

Occurrences	Reporting Type		
	Notification	Short-term	Periodic
1. **Critical occurrences**[1]	X	X	X
2. **Significant occurrences**			
ADS operation outside its ODD		X	X
ADS failure to achieve a minimal risk condition when necessary		X	X
Failure to meet the ADS requirements as per the Section 5 of this regulation		X	X
Performance issues constituting an unreasonable risk to safety		X	X
3. **Other occurrences**[2]			
Uncompleted system-initiated deactivation process to manual driving			X
Communication issues affecting the safety of the ADS			X
Cybersecurity issues affecting the safety of the ADS			X
System failures that compromises the capability of the ADS to perform the entire DDT			X
Maintenance or repair issues affecting the ADS's intended functionality [3]			X
Unauthorized modifications to ADS that could affect the intended functionality			X
Manoeuvres performed to reach MRC			X
[Emergency Manoeuvre]			X
Active ADS feature required remote interaction to navigate a driving situation [4]			X

Fallback user unavailability [5]			X
Prevention of takeover under unsafe conditions[6]			X

[1] If such an occurrence also belongs to one of the remaining sub-categories listed in the occurrence table, the following provisions apply:

- Short-term report: there is no need to double-report such occurrence also as part of one of the remaining categories listed in the table.
- Periodic reporting: the occurrence should be double reported both as part of critical occurrence and as occurrence belonging to one of the remaining categories listed in the table. However, the report shall specifically note this aspect.

[2] The Occurrences of this category could be also reported as critical or significant occurrences. In this case, the periodic report shall specifically note this aspect.

[3] This occurrence captures systematic problems due to a maintenance/repair/service action discovered during the ADS operations.

[4] This occurrence captures events in which the ADS will require a support for “tactical functions” to cope with very specific situations, while the ADS continues to perform the entire dynamic driving task.

[5] At aggregate level, this information can provide useful information on the validity of the HMI concept and on the need to provide more effective procedures for keeping the fall-back user available.

[6] It is acknowledged that there is no obligation to implement such design solution. However, such information can provide useful information to evaluate the safety benefit of implementing such solution.

Annex 2.	In-Service Reporting Template: Short-term Reporting	Annex 4.	In-Service Reporting Template: Short-term Reporting	
Annex 3.	In-Service Reporting Template: Periodic Reporting	Annex 5.	In-Service Reporting Template: Periodic Reporting	See ADS-12-32 (JRC) and ADS-12-33 (clean version): Proposals to explain general requirements for using the short and periodic templates plus amendments to the contents.

Annex 4.	Definition of Thresholds for Critical Occurrences	Annex 6.	Definition of Thresholds for Critical Occurrences	Thresholds for Determination of Critical Occurrences
1.	General			
1.1.	This annex defines thresholds for the reporting of critical occurrences as defined under paragraph 3.16.1.			Cross reference.
1.2.	The timing for the notification of such occurrences starts from the manufacturer's knowledge that the occurrence exceeded the threshold for critical occurrence.			ADS-12-35 (Secretary)
1.3.	The manufacturer shall exert all reasonable efforts to gather the relevant evidence supporting the critical occurrence identification without delays or limitations.			
2.	Injury level threshold			Redundancy: Injury threshold
2.1.	The injury level threshold for a critical occurrence aims at promoting the reporting of collisions resulting in a fatality or any person requiring medical attention due to the injury, regardless of whether the person killed or injured was an occupant of the subject vehicle.			Confusing to mix injury criteria with the fatality criteria. The injury threshold for a critical occurrence aims to facilitate the reporting of collisions resulting in serious injuries.
2.2.	The threshold is triggered by the attendance in the area of the collision of an ambulance.			Subject-verb: Thresholds are not triggered. An occurrence shall be deemed critical if:
2.3.	The manufacturer shall classify the occurrence as critical if they reasonably believe that there may be an injury requiring medical attention to any person even if an ambulance has not been detected.			(a) The manufacturer has reason to believe that the event resulted in an injury requiring medical attention, (b) The incident was attended by an ambulance.

2.4.	The manufacturer is expected to fulfil these criteria through one of the following approaches:	The criteria are for the determination of "critical"; they are not criteria for manufacturer performance. The manufacturer is expected to make such injury determinations through one of the following approaches:
	(a) ADS strategies in place to appropriately detect such situations provided that the ADS vehicle is still capable of performing audio/visual sensing capabilities, following the collision or via remote visual check (if applicable);	Verbosity: ADS perception of the post-crash environment,
	(b) Processes to receive and analyse information from other sources;	
	(c) Combination of (a) and (b).	
3.	Physical damage threshold	
3.1.	The physical damage triggering condition for critical occurrence aims at promoting the reporting of collisions that, despite not causing any significant injury or fatality to people, are deemed critical because of the extent of the damages produced on vehicles or stationary objects.	Verbosity: The physical damage threshold for a critical occurrence aims to facilitate the reporting of serious collisions that do not result in injuries or death.
3.2.	The concept of "physical damage" is here intended as:	The level of physical damage shall be based on one of the following:
	(a) Tow-away, e.g., damage that restricts/prevents regular operation of a vehicle involved in the collision as part of the reported occurrence;	(a) Tow-away damage
	(b) Importance-based, e.g., a damage that affects the safe state of the ADS, critical road infrastructure asset and other vehicles/road users;	(b) Importance
3.3.	The manufacturer is expected to fulfil this criterion through one of the following approaches:	The criteria apply to threshold determination, not manufacturer performance. The manufacturer is expected to make such damage determinations through one of the following approaches:
	(a) ADS strategies in place to appropriately detect such situations provided that the ADS vehicle is still capable of performing audio/visual sensing capabilities, following the collision or via remote visual check (if applicable);	Verbosity: ADS perception of the post-crash environment,
	(b) Processes to receive and analyse information from other sources;	
	(c) Combination of (a) and (b).	

3.4.	Tow-away damage threshold	Out of place: tow-away threshold is a subset of physical damage per 3.2. This section should be moved and renumbered from 3.2.1.
3.4.1.	The tow-away threshold is triggered when the damage occurred to a vehicle involved in the collision is such that the same can no longer be operated either manually or in automated mode requiring specialized equipment for traffic restoration.	
3.5.	Importance-based damage threshold	Out of place: importance threshold is a subset of physical damage per 3.2. This section should be moved and renumbered from 3.2.2.
3.5.1.	Importance-based damage thresholds consider the type of the item which was damaged to take into account their relevance and health status.	
3.5.2.	The importance-based threshold shall be deemed exceeded when one of the following conditions occurs:	
	(a) Collision with priority vehicles,	
	(b) Collision rendering traffic lights and/or other safety-relevant road signage no longer operational/visible,	
	(c) Collision affecting infrastructure communication/connectivity support system,	
	(d) Collision damaging or rendering a roadway segment impassable,	
	(e) Collision producing a vehicle fire, or	ADS-12-31 (China)
	(f) Any other collision which requires the attendance of road safety agent.	
4.	Restraint system and Delta-V threshold	Redundant: These specifications are already present in 3.16.1. Delete §4.
4.1.	The restraint system triggering condition and Delta-V threshold aims at promoting the reporting of occurrences in case one of the following applies:	
	(a) the deployment of any non-reversible deployable occupant restraint systems,	
	(b) the deployment of vulnerable road user secondary safety system, such as airbags, pretensions, and active bonnet systems, or	
	(c) the applicable Delta-V thresholds to be met according to the EDR system fitted on the vehicle.	

Annex 5.	ODD-based Behavioural Competencies and Scenario Identification Approach	Annex 7.	ODD-based Behavioural Competencies and Scenario Identification Approach	ADS-12-25 (OPI) Renumbering for consistency with the rest of the Regulation.
	The wording of the annex sometimes implies that ODD analysis is optional or one approach among many. The main body seems clear that ODD analysis is required and shall produce nominal, critical, and failure scenarios for testing the ADS capability to meet the requirements. Is there any disagreement that the manufacturer is required to thoroughly analyse the ODD and show that the scope of the testing covers the functional and behavioural competencies necessary to navigate the ODD?			
1.	Introduction			
	This annex provides an overview on an approach that may be used to derive verifiable performance criteria for the approval or, as relevant, for self-certification of ADS, based on the manufacturer's description of the Operational Design Domain (ODD) of the ADS. Such criteria would be developed by identifying behavioural competencies that embody and correspond to specific ADS safety requirements and relevant scenarios that may be used to validate the ADS's competencies.			Remove reference to "self-certification". Refine to focus on a set of purposes: ODD analysis to develop sufficient scenarios to assess ADS functional and behavioural capability to perform the entire DDT.
	The suggested approach includes a description of how such competencies can be classified into nominal, critical and failure and mapped to the relevant scenarios, selected either from existing databases or identified through the application of different approaches.			Fix wording.
	Different approaches may exist to perform such an activity; therefore, the approach herein presented should be considered as a recommended guideline for both manufacturers and authorities.			Problematic wording for a regulation. The annex provides elements that can be integrated into what one would expect to be a more sophisticated set of analytical tools and processes.
1.1.	Operational Design Domain			
	The external conditions constituting the ODD in which the ADS was designed to operate will help determine which ADS competencies are required. For example, if an ADS has an ODD which comprises of roads with non-signalised junctions, one of the required behavioural competencies for the ADS in that ODD could potentially be "unprotected left or right turn". However, the same behaviour competency may not be required if the ODD of an ADS is limited to motorways or highways.			Wording: complex passive. Consistency with ODD definition in the Regulation. "unprotected turn" is not a competency: the competency would be that capability to perform unprotected turns safely (i.e., the ADS demonstrating the behaviour to be expected whenever it encounters such turns).
1.2.	Behavioural competencies			

	Behavioural competencies track the three broad categories of driving situations that may be encountered in the performance of the DDT: nominal, critical, and failure.	Wording "track the categories". Works if proposals on definition of nominal, critical, and failure driving situations are accepted.
	[Nominal driving situations are those in which behaviour of other road users and the operating conditions of the given ODD are reasonably foreseeable (e.g., other traffic participants operating in line with traffic regulations) and no failures occur that are relevant to the ADS's performance of the DDT.]	Needs to align with definitions (although elaboration might be helpful). Seems disconnected from Regulation context: Nominal situations would seem related to identifying functional scenarios (such as the unprotected turn) and verifying the ADS capabilities to navigate the situations.
	[Critical driving situations are those in which the behaviour of one or more road users (e.g., violating traffic regulations) and/or a sudden and not reasonably foreseeable change of the operating conditions of the given ODD (e.g., sudden storm, damaged road infrastructure) creates a situation that requires a prompt action of the ADS to avoid or mitigate a collision. In this case, it is recognised that the ADS may not be able to avoid a collision, but mitigation may be possible.]	Needs to align with definitions (although elaboration might be helpful). The critical situations would likely be derivatives of the nominal functional scenarios. Crash data might show collisions in unprotected turns due to the behaviour of another vehicle. The ADS avoids the collision until the scenario parameters constitute an unavoidable collision scenario. Problem: "critical" defined as "collision avoidance" only. A "sudden storm" does not automatically translate into a collision situation (even though this occurrence could require "prompt action").
	[Failure situations involve those in which the ADS or another vehicle system experiences a fault or failure that compromises the ADS's ability to perform the DDT, such as sensor or computer failure or a failed propulsion system.]	Wording to remove ambiguity. Align with definitions and link to failure analyses under SMS.
2.	Approach Description	
	The ODD-based behavioural competencies and scenario identification approach is based on the interaction of the following elements:	
	(a) Behavioural competencies and scenario generation	Handle as separate but related activities? The annex follows with 2.1. covering behavioural competencies and 2.2. covering "scenario identification" (then 2.3. for "Behavioural competencies and scenarios mapping", 2.4. for "Assumptions", and 2.5. "Performance Evaluation").

	(b) Competencies and scenario mapping	Is this defining the competencies expected under the scenarios? Seems important to clarify since post-deployment occurrences would related to whether the ADS exhibits the competencies demonstrated under the scenarios used for approval.
	(c) Assumptions	
	(d) Performance and acceptance criteria evaluation	
	Figure 2 describes the overall approach. Once acceptance criteria are defined based on overall requirements, different approaches (described below) are used to generate nominal, critical and failure scenarios tests. Testing is performed using various test methods, and the outcome is evaluated to see if there is sufficient evidence to support the safety case claims and the acceptance criteria. The following section describes the different stages and steps.	See figure at end. Wording: passive
2.1.	Behavioural Competencies Identification	Confusing given wording of 2(a). It would be better to have alignment between the "elements of the approach" and the following subsections.
	The approach suggests a series of analytical frameworks that could help to derive measurable criteria appropriate for the specific application. These frameworks are divided into:	
	(a) ODD Analysis	
	(b) Driving interactions analysis	
	(c) OEDR analysis	Spell out "Object and Event Detection and Response". Does this present any concerns for the "end-to-end" systems?
2.1.1.	ODD analysis	

This analysis represents the first step with the aim to identify the characteristics of the ODD. An ODD [specification/description] may consist of stationary physical elements (e.g., physical infrastructure), environmental conditions, dynamic elements (e.g., reasonably expected traffic level and composition, vulnerable road users) and operational constraints to the specific ADS application. Various sources provide useful guidance for precisely determining the elements of a particular ODD and their format definition.[49,50, 51, 52]

Collapse standards references into single footnote. Are the standards covered in the "regulations, directives, standards, etc." section? Can this be cross-referenced (so the standards listing can be updated over time)?

"operational" has been a subject of discussion: any link to SOTIF?

Is "dynamic" the intended word (the "e.g.," suggests we are talking about "variable" elements.

Is this really all we have to say about "ODD analysis"? What happened to guidance text about accidentology to identify critical scenarios or the requirement to identify potential faults, show that the OBD can detect the faults, and demonstrate ADS capabilities to manage failures? This paragraph seems more about what an ODD description might include than the analysis that should be performed to identify and characterise the elements of an ODD.

2.1.2. Driving interactions analysis

In the driving interactions analysis, the behaviours of other road users that are reasonably expected and the presence of roadway characteristics in the ODD are explored in more detail by mapping actors with appropriate properties and defining interactions between the objects.

An example of this analysis is given in Table 1, where static and dynamic behaviours of other objects (including other road users) that the ADS is reasonably expected to encounter within the ODD are described. In the case of vehicles, this includes behaviours such as "acceleration", "deceleration", "cut-in"; for pedestrians, examples of dynamic behaviours include "crossing road", "walking on sidewalk", etc.

[49] *AVSC Best Practice for Describing an Operational Design Domain: Conceptual Framework and Lexicon*; and *A Framework for Automated Driving System Testable Cases and Scenarios* (NHTSA).
[50] BSI PAS 1883:2020 Operational Design Domain (ODD) taxonomy for an automated driving system (ADS) - Specification
[51] ASAM OpenODD
[52] ISO 34503 - Road Vehicles — Test scenarios for automated driving systems — Taxonomy for operational design domain

	The behaviour of other road users and the condition of physical objects within the ODD may fall at any point along a continuum of likelihood. For example, deceleration by other vehicles may range from what is expected and reasonable in the traffic circumstances, to unreasonable but somewhat likely rapid deceleration, to extremely unlikely (e.g., a sudden cut-in combined with full braking on a clear high-speed road). The analysis of the ODD and reasonably expected driving situations within the ODD should make distinctions that include an estimate of the likelihood of situations to ensure that the ADS's performance is evaluated based on response to reasonably likely occurrences involving nominal, critical and failure situations but not on the expectation that the ADS will avoid or mitigate the most extremely unlikely occurrences.[53]	
2.1.3.	Object and Event Detection and Response (OEDR) Analysis: Behavioural competencies identification	Why is this header different from 2.1.(c)?
	Once the objects and their reasonably expected behaviours have been identified, it is possible to map the appropriate ADS response, which can be expressed as a behavioural competency. The detailed response is derived from more general and applicable safety requirements . The acceptable ADS response will vary depending on whether the driving situation involves nominal, critical, or failure characteristics.	"reasonably foreseeable". Maybe elaborate on the concepts for defining ORU attributes and assumptions on their behaviours? Given that "behavioural competency" is defined as an expected behaviour, can different wording be used for the objects and "reasonably expected behaviours"? Are these not assumptions about possible behaviours?
	The outcome of the analysis is a set of behaviour competencies that can be applied to the events characterizing the ODD. Table 2 provides a qualitative example of a matching event – response.	"Behavioural competencies" Clarify: Isn't this associating one or more behavioural competencies with one or more scenarios derived from the ODD analysis? In other words, can the wording be aligned with the overall concept that ODD analysis generates scenarios that are used in testing to generate evidence that the claims (for behavioural competencies?) of the safety case are valid?
	The combination of objects, events, and their potential interaction, as a function of the ODD, constitute the set of potential situations pertinent to the ADS under analysis.	

[53] *IEEE 2846 – Standard for Assumptions in Safety-Related Models for Automated Driving Systems*

To confirm:	Under the first steps, the manufacturer establishes an inventory of ODD objects and the conditions under which the ADS might encounter those objects given the limitations of the ADS feature(s). These permutations of objects and conditions constitute driving interactions. The manufacturer then defines acceptable ADS responses across these interactions. For example, given its feature design, the ADS might encounter a pedestrian at night while performing the DDT at 60 kph where the desired behavioural competency is for the ADS to fulfill the DDT performance requirements.	
2.2.	Scenario Identification To ensure that the behavioural competencies identified in the previous paragraphs are ready to be assessed, ODD-relevant scenarios must be identified. Scenario can be described at different abstraction levels (i.e. functional, abstract, logical and concrete) by focussing the scenario description on specific aspects, while leaving other details for further processing. Sampling techniques can be used when selecting parameters to be used in creating logical and concrete scenarios for the ADS validation for a particular ADS and its ODD to avoid the ADS being optimized for a set of known test cases.	It would be helpful to clarify that, under 2.1., the manufacturer studies the ODD to identify driving situations that the ADS might encounter and to define ADS behavioural competencies to manage these interactions in accordance with the DDT performance requirements. The next step (under 2.2.) is to transform these driving situations into scenarios suitable for testing whether an ADS has the behavioural competencies identified under 2.1. (Link with “test environments” section that sets requirements to ensure credibility).
	This approach suggests complementary methodologies to derive reasonably expectable scenarios which might occur for a given ODD: (a) Knowledge-based methods, (b) Data-based methods, and (c) Goal-based methods.	“foreseeable”. “derive”→”generate” for clarity and consistency.
	A knowledge-driven scenario generation approach utilizes domain specific (or expert) knowledge to identify nominal, critical and failure events systematically and create scenarios. Examples of knowledge-driven scenarios generation approaches include: (a) Experience acquired during ADS development, (b) Synthetically generated scenarios from key parameter variations, (c) Engineered scenarios based on functional safety requirements and safety of intended functionality, (d) Composing complex scenarios from basic scenarios,	“knowledge-based” for consistency with previous paragraph. Wording can be simplified. Simplify to enable translation. Term “complex scenario” deleted during ADS-07. Rephrase?

(e) Random variations of scenario parameters, both for the ADS an ORUs.

A data-driven approach utilizes the available data to identify and classify occurring scenarios. Data-driven scenarios generation approaches include:

(a) Analysing human driver behaviour, including evaluating naturalistic driving data,

Research and analysis of human driver behaviours, such as through naturalistic driving studies

(b) Collision data from accident databases, insurance records, and law enforcement authorities.

Analysis of data from accident databases, insurance records, crash investigations, and other sources,

(c) Traffic patterns relevant for the ODD from real-world driving logs;

What exactly is this referring to? Is this something like tachographs or eventually DSSAD? Why "traffic patterns"? Is this something like highway authority traffic monitoring?

(d) Situations recorded using instrumented vehicles, the ADS vehicle's sensors, infrastructure or drones.

A little prescriptive. Is this basically using test vehicles to gather data during product development?

(e) ISMR ref

Something like data based on monitoring the post-deployment safety performance of ADS vehicles (with cross-reference to PDS/ISMR provisions)?

Figure 3 illustrates various data-based and knowledge-based scenario generation methods.

[While many of the knowledge based method are looking at existing data and knowledge, a different method is goal based. As the acceptance criteria are defined, they are actually setting the goals that should be demonstrated by testing and coverage, and used as evidence for for safety claims. Starting from these goals, and looking at the existing status of the evidence, gaps in testing and coverage can be identifies, and mapped back to missing scenarios that should be used for testing.]

OPI proposal for goal-based method description.

Furthermore, existing scenarios already defined in standards, regulations or guidelines can also be utilized for the testing of ADSs. Additional scenarios include those that occur during real world trials and deployments. Such scenarios might have not been considered pre-deployment but are key learnings. At the time of publishing this text, there is significant experience gathered with existing trials and tests, and thus a significant amount of driving logs and recording can be used.

Are we getting too far off-topic?

For AI centric ADS systems, training required usage of a lot of data of driving logs and recordings. The same data resources can be used to test the behavioural competencies. The challenge is to map these into the scenario categories, in order to ensure that this testing and its results are counted correctly toward the acceptance criteria evaluation.

Wording.
Is it really beneficial to refer to "AI-centric" without additional context given the WP.29 discussions on the use of artificial intelligence in automotive applications?

	One method to categories these logs and recordings is to match them to existing abstract scenario libraries, and classify them to nominal, critical and failure scenarios. With categorization and classification, the evaluation of this scenarios, and counting their contribution to the evidence and the success criteria, can take place.	
	The scenario-generation method should include adequate coverage of relevant nominal, failure, and critical scenarios to effectively validate the ADS. “Coverage” refers to the degree to which scenarios sufficiently incorporates driving situations in order to validate the relevant requirements of this regulation. Sufficient coverage is essential to the overall effectiveness and credibility of these methodologies as a validation approach. Sufficient coverage should be with respect to the ADS feature or ODD. Coverage can be measured across different domains, and metrics can be used to determine sufficiency.	Needs work and links back to the Regulation. These aspects are central to the functioning of the regulation where “sufficient coverage” needs more elaboration. “Coverage” in the context of ODD analysis means (a) nominal scenarios sufficient to verify that the ADS has the functional capabilities to perform the entire DDT and that these functions have been properly calibrated given the ODD, (b) critical scenarios corresponding to the risks of conflicts and known crashes in the ODD, and (c) failure scenarios that enable demonstration of ADS responses to potential faults based on the severity of their impact on the capability to continue performing the DDT. Each of these aspects is based on the methods described earlier.
2.3.	Behavioural competencies and scenarios mapping	
	Once relevant scenarios and behavioural competencies have been identified, it is necessary to link them. The classification in the three broad categories of driving situations an ADS might encounter such as nominal, critical and failure, serves the purpose.	
2.3.1.	Nominal Situations Competencies	By this point, behavioural competencies are being mapped to scenarios per 2.3.
	In these situations, ADS competencies can often be derived by applying traffic laws of the country where the ADS is intended to operate, as well as by applying general safe driving principles for situations not addressed adequately by current traffic laws for human drivers. Examples of such competencies may include adherence to legal requirements to maintain a safe distance from vehicles ahead, provide pedestrians the right of way, obey traffic signs and signals, etc. Of course, some nominal competencies (e.g., safe merging, safely proceeding around road hazards) may not be explicitly articulated or mandated by traffic laws. In some instances, traffic laws may provide wide discretion for the driver to determine the safest response to a particular situation (for example, how to respond to adverse weather conditions). As such not all traffic laws are stated with sufficient specificity to provide a clear basis for defining a competency.	

	Therefore, an approach to codify rules of the road to provide additional specificity was developed (see Appendix 1). Additionally, application of models involving safe driving behaviour may be needed in addition to reference to codified rules of the road in developing behavioural competencies for nominal driving situations.	
	Table 3 provides an example of competencies and scenario mapping for nominal situations.	See table at end.
2.3.2.	Critical Situations Competencies	Competencies under critical scenarios
	The development of these competencies requires analysis of (1) what constitutes such unreasonable behaviour by ORUs and/or a sudden change of the operating conditions that are not reasonably foreseeable and (2) what constitutes an appropriate ADS response to avoid or mitigate the imminent crash. Additionally, it is also important to identify the occurrence of unplanned emergent behaviour in critical situations.	
	Analysis of the first type may be based on a variety of methodologies, including e.g. IEEE 2846 (which offers guidance on what behaviours by other road users are reasonably foreseeable) and other models of reasonable driving behaviour. Analysis of the second factor may be based on various models of acceptable human driving behaviour in crash imminent situations.	
	Hazard identification methods (e.g. STPA as mentioned in SAE J3187) which analyse the system design for functional and operational insufficiencies can help identify the occurrence of emergent behaviour which may lead to critical situations.	Link back to provisions in regulation that require STPA, etc.
	Development of behavioural competencies for critical driving situations faces several challenges. No general consensus exists on the appropriate models for the behaviour of ORUs or appropriate responses by the ADS to unreasonable ORU behaviours that make a crash imminent.	Reference to Table 4?
	[Critical situation behavioural competencies should provide evidence that an ADS needs to be responsive to actions by other road users, which may make a crash unavoidable. Therefore critical scenarios should not be limited to those that are deemed preventable by the ADS. Unsafe behaviours of other road users (e.g., vehicle travelling in the wrong direction, sudden unsignalled lane changes, and exceeding the speed limit) — if reasonably foreseeable within the appropriate ODD — should be included as part of validation testing.]	
2.3.3.	Failure Situations Competencies	Competencies under failure scenarios
	The ADS safety requirements include management of various failure modes. As noted above, failure situations scenarios involve those in which the ADS or another vehicle system experiences a fault or failure that compromises the ADS's ability to perform the DDT, such as sensor or computer failure or a failed propulsion system.	

	In developing the behavioural competencies appropriate for failure situations, the objective is to describe the ability of the ADS to detect and respond safely to specific types of faults and failures. Depending upon the nature and extent of the fault or failure, the responses can include identifying a minor fault for immediate repair after trip completion, responding to a significant fault with restrictions (such as limp-home mode) for the remainder of the trip, or responding to major failures by achieving a minimal risk condition. Communication of the fault or failure condition to vehicle users may also be a desirable ADS behavioural competency.	Reference to Table 5?
2.4.	Assumptions	
	Concrete performance requirements depend on the specific situations the ADS encounters, on a reference behaviour that is deemed appropriate for a human driver or a technical system, and on assumptions (e.g. cut-in speed values, reaction times, …) about the behaviour of the vehicle and other road users. Assumptions concerning the actions of other road users may need to account for cultural differences in driving styles in different geolocations, making it impracticable to harmonise these assumptions across different domains. Therefore, evidence should be provided to support the assumptions made. Existing standards e.g. IEEE 2846-2022 provide a set of assumptions to be considered by ADS safety-related models for an initial set of driving situations. Additionally, several other tools including data collection campaigns performed during the development phase, real-world accident analysis and realistic driving behaviour evaluations, constraint randomisation, Bayesian optimisation besides others can be used to inform values for such assumptions.	
2.5.	Performance Evaluation	
	As previously highlighted, nominal situations are considered reasonably foreseeable for a given ODD and therefore it is expected that the ADS would be capable of handling them without any resulting collision.	
	On the other hand, failure situations are performed to assess the ADS ability to recognise faults/failures in the system and safely react to such cases.	
	For the purpose of defining performance criteria in critical situations, those where others are at fault, behaving unforeseeably, and the collision might potentially not be prevented have to be analysed further. In these situations, different considerations can be made.	
2.5.1.	Evaluation of target evidence and residual risk	

As testing by the manufacturer is an ongoing process, the outcome of the testing is constantly evaluated. The goal of the evaluation is to assess if sufficient evidence to support the claims of the safety case is achieved, and if an assessment of an acceptable residual risk can be developed. This evaluation is major input to the decision of acceptance criteria are met, or if more scenarios and tests are required. If more are required, then additional effort is invested (by using all method shown above) in increasing the ODD and scenario coverage, until the goals of the acceptance criteria is met.

2.5.2. Application of Rules of Road

An approach to define an acceptance criterion related to nominal driving situations is to evaluate the ADS performance against the rules of the road. Furthermore, ADS safety requirements state that, “The ADS shall comply with traffic rules in accordance with application of relevant law within the area of operation.”

It is challenging to test against this requirement in the absence of codified rules of the road.

One possible approach is the codification of Rules of the Road; Figure 3 illustrates the using of Rules of the Road as pass-criteria for individual scenarios. The following approach for codification of Rules of the Road can be used to link individual rules with corresponding scenarios using ODD and behaviour labels.

Current rules of the road (for human drivers) have three components:

Operating conditions include both ODD aspects and vehicle states (e.g., system failures, hardware failures etc.). Every set of traffic laws or behaviour rules (for human drivers) defined in any country are based on an understanding of the expected behaviours of human drivers. As a result, they do not explicitly define all aspects of the expected driving behaviour but can be argued to include “implicit assumptions” based on this understanding.

Following the process (illustrated in section 8.1), a “codified” rule of the road for an automated driving system, will also have three components:

Codified Rule of road = Operating condition + Behaviour competency + Driving decisions

The process of codification helps identify where “implicit assumptions” about driving behaviour are present in the rules for human drivers. The codified rules of the road help to turn “undefined” attributes in the rules of the road (for human drivers) to “defined” attributes in the codified “rules of the road”.

				Unsure whether previous contents on codification of rules of the road have been intentionally omitted. See ADS-10-05.
Annex 6.	Use-case for Nominal, Critical, and Failure Situation Mapping	Annex 8.	Use-case for Nominal, Critical, and Failure Situation Mapping	
				Unsure whether previous contents on codification of rules of the road have been intentionally omitted. See ADS-10-05.
Annex 7.	Data Storage Systems for Automated Driving	Annex 9.	Data Storage Systems for Automated Driving	Annex to be populated with EDR/DSSAD guidance contents.
1.	This annex defines Data Storage System for Automated Driving (DSSAD) as the data storage capability of a vehicle to monitor the safety performance of ADS, and establishes requirements to enable the evaluation of ADS safety performance.			The "definitions" section defines the term "DSSAD". The purpose of the annex is to explain the requirements/expectations for DSSAD installed on ADS vehicles. Paragraph 5.3.1. of this Regulation requires the installation of a Data Storage System for Automated Driving (DSSAD) on all ADS vehicles. This annex establishes the requirements for these DSSAD and management of DSSAD data.
2.	Data Storage and Security			
2.1	The DSSAD shall be capable of recording and storing time-stamped and time-series data elements as defined in Paragraph 5 of this Annex.			
2.2	The DSSAD shall be protected against both unauthorized access and manipulation.			
2.3	In the case of the data intended to be stored off-board the vehicle cannot be transmitted, it shall remain stored on the vehicle.			
3.	Data Format			
3.1	Each data element listed in Paragraph 5 of this Annex shall be available in a standardized and readable format.			The data elements listed under paragraph 5 of this annex shall be available in a standardised and readable format.
3.2	Time stamp data format			Formatting of time-stamped data

3.2.1.	Time stamp data shall be recorded in a clearly identifiable way with following data:	What is the purpose or meaning of "in a clearly identifiable way"? Time-stamped data…shall include: ?
	(a) The time stamped data element, as listed in paragraph 5.2.1.	The event of time-stamped data element as listed in Table 1 under paragraph 5.2.1. of this annex,
	(b) The additional information noted in 5.2 for each time stamped data element as appropriate.	Additional information, if any, for the data element as listed in Table 1 under paragraph 5.2.1. of this annex,
	(c) Date (Resolution: yyyy/mm/dd);	Date format: YYYY-MM-DD (e.g., 2025-06-03 for 3 June 2025),
	(d) Timestamp	(d) Time format: HH:mm:ss (e.g., 11:59 and 25 seconds in the evening rendered as 23:59:25) (e) Time zone: [Universal Coordinated Time (UTC)] OR [local time in UTC with offset]
	(i) Resolution: hh/mm/ss timezone e.g. 12:59:59 UTC;	
	(ii) Accuracy: +/- 1.0 s.	3.2.2. The tolerance for time-stamped data accuracy is +/- 1.0 seconds.
3.2.2.	A single timestamp may be allowed for multiple elements recorded simultaneously within the time resolution of the specific data elements. If more than one element is recorded with the same timestamp, the information from the individual elements shall indicate the chronological order.	3.2.3. A single time stamp may be used for a record of data elements occurring within the same one-second period specified under paragraph 3.2.2. of this annex. 3.2.3.1. A record of data elements using the same time stamp shall indicate the chronological order of the elements.
4.	Data Accessibility	

Figure 1. Relationships across safety requirements, ODD analysis and scenario generation, and validation pillars

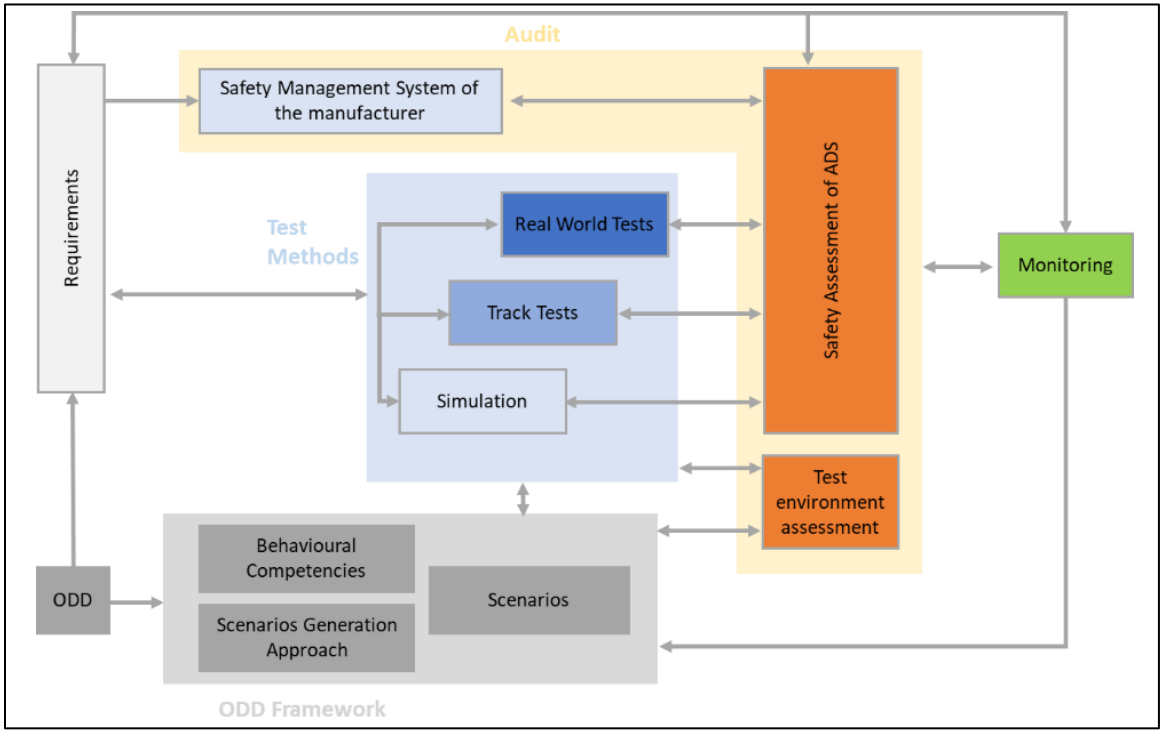

Figure 2. Example of a possible approach to identify behavioural competencies and scenarios

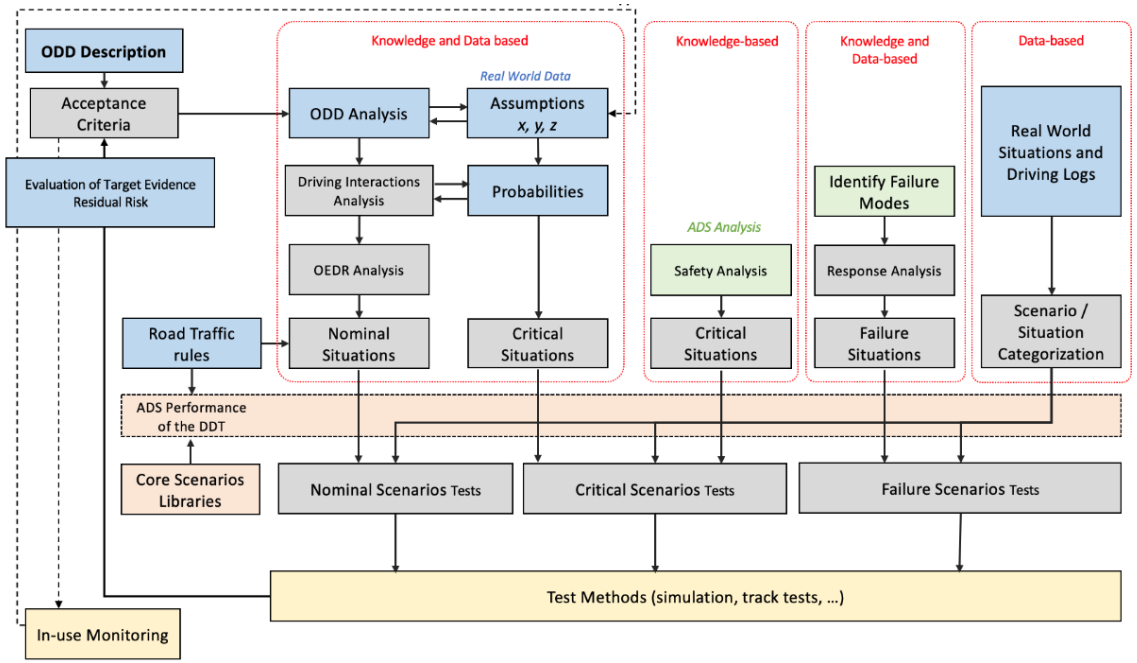

Figure 3. Examples of Data and Knowledge-based generation methods

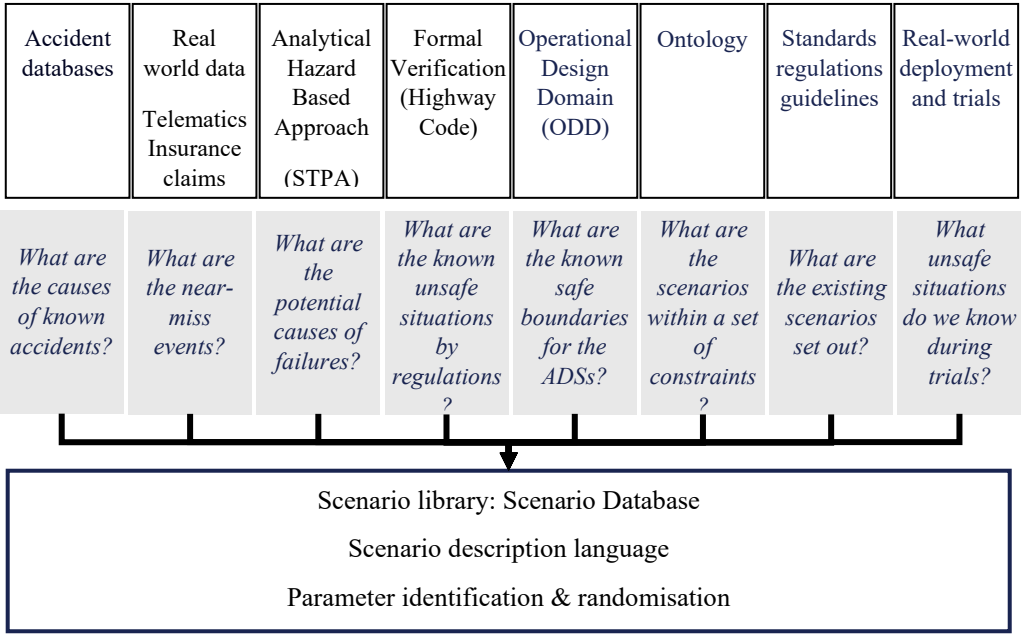

Table 1. Examples of Static / Dynamic elements and their properties

Objects	Events/Interactions
Vehicles (e.g. cars, light trucks, heavy trucks, buses, motorcycles)	Lead vehicle decelerating, Lead vehicle stopped, Lead vehicle accelerating, Changing lanes, Cutting in, Turning, Encroaching opposite vehicle, Encroaching adjacent vehicle, Entering roadway, Cutting out, …
Pedestrians	Crossing road -inside crosswalk, Crossing Road – outside crosswalk, Walking on sidewalk / shoulder
Cyclists	Riding in lane, Riding in adjacent lane, Riding in dedicated lane, Riding on sidewalk/shoulder, Crossing road – inside/outside crosswalk, …
Animals	Static in lane, Moving into/out of lane, Static/Moving in adjacent lane, Static/Moving on shoulder, …
Debris	Static in lane
Other dynamic objects (e.g. shopping carts)	Static in lane, Moving into/out of lane, …
Traffic signs	Stop,

	Yield, Speed limit, Crosswalk, Railroad crossing School zone, …
Vehicle signals	Turn signals

Table 2. Example of elementary behavioural competencies for given events.

Event	Response
Lead vehicle decelerating	Follow vehicle, decelerate, stop
Lead vehicle stopped	Decelerate, stop
Lead vehicle accelerating	Accelerate, follow vehicle
Lead vehicle turning	Decelerate, stop
Vehicle changing lanes	Yield, decelerate, follow vehicle
Vehicle cutting in	Yield, decelerate, stop, follow vehicle
Opposite vehicle encroaching	Decelerate, stop, shift within lane, shift outside lane
Adjacent vehicle encroaching	Yield, decelerate, stop
Lead vehicle cutting out	Accelerate, decelerate, stop
Pedestrian crossing road	Yield, decelerate, stop
Cyclist riding in lane	Yield, follow
Cyclist crossing road	Yield, decelerate, stop

Table 3. Example of competencies and scenario mapping in nominal situations

ODD Element	Driving Behaviour	Traffic Rule	ADS Requirements	Behavioural Competency	Test Scenario
Bicycle	Riding in lane		5.1.2.5. The ADS shall adapt its driving behaviour in line with safety risks	The ADS ensures relative velocity during passing manoeuvre does not exceed [30] km/h	The ADS travels between [30–50]km/h on the centre line of its lane A cyclist travels in the same direction as the ADS between [10–20] km/h, [0.2–1] m away from the lane edge
		Drivers will need to use a minimum passing distance for bicycles of 1.5m in urban areas, and 2m out of town	5.1.2.9. The ADS shall comply with traffic rules in accordance with application of relevant law within the area of operation.	The ADS shifts in lane to pass by cyclist with 1.5.m lateral distance	
			5.1.2.4. The ADS shall avoid unreasonable disruption to the flow of traffic in line with safety risks.	The ADS crosses the centre lane marking to ensure the safe passing distance is not violated	
			5.1.2.10. The ADS shall interact safely with other road users	The ADS activates the turn signal if the centre lane marking is crossed	

Table 4. Example of competencies and scenario mapping in critical situations

Losses	Hazards	Unsafe Control Action	Loss scenario	Causal factors	Behavioural Competency	Test Scenario
Collision with object outside the vehicle	ADS does not maintain a safe distance from the lead motor vehicle	Braking demand is not provided	Object in vehicle trajectory is not detected	Undetected/misclassified object; Obscured object; Incorrect sensor fusion result	The ADS is following behind a lead vehicle, with the headway set by the ADS. The lead vehicle decelerates at the max assumed rate depending on the weather conditions	Lead vehicle decelerated to turn [right/left] or travel straight on a [mini /large] roundabout
			Object is not considered to be in the vehicle trajectory	Localisation issues leading to incorrect positioning of ego vehicle or object		Lead vehicle decelerated whilst shifting lane to avoid a [static object/other road user]

Table 5. Example of competencies and scenario mapping in failure situation

Failure Type	Failure Mode	Potential Cause	Behaviour Competency	ADS Requirements	Test Scenario	Pass / Fail Criteria
Perception	Fail to identify ODD boundary	Failure to detect ODD attribute e.g. heavy rain/fog	Safely stop in lane of travel	5.1.5.1. The ADS shall recognise the conditions and boundaries of the ODD of its feature(s)	The ADS operates beyond the predicted ODD	The ADS detects the ODD conditions are not met and issues a minimal risk manoeuvre
				5.1.4.3. In response to a fault, the ADS shall either execute a fallback response and prohibit activation of the impacted feature(s) if the fault prevents the ADS from performing the DDT in accordance with the requirements		The minimum risk manoeuvre should not cause the vehicle to decelerate greater than [4]m/s2

				of 5.1., or adapt its performance of the DDT in accordance with the severity of the fault provided the resulting performance complies with the requirements of section 5.1		