Freiburger Informationspapiere
zum Völkerrecht und Öffentlichen Recht

Ausgabe 1/2021

UNI FREIBURG

Easing the Brakes on Autonomous Driving – International Law, Europan Law and German Law in Perspective

Eva-Maria Böning and Hannah Canny

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www.fiponline.de
ISSN 2192-6077

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Easing the Brakes on Autonomous Driving – International Law, Europan Law and German Law in Perspective*

Eva-Maria Böning[a] and Hannah Canny[b]

Recent draft legislation in various States have given new momentum to the debate on autonomous driving. The legislative wants to ease the brakes on autonomous cars, however, still finds itself facing a thicket of regulations, the interplay of which is not always entirely clear. This article aims to give an overview of the current legal framework at the international, European and German plane. It aims to identify remaining legal obstacles to the introduction of autonomous driving and thereby lay the ground to discuss possible future revisions of the law. It first examines the legal situation from the perspective of international and European law, taking recent changes into account. This is supplemented by an outline of additional national law implications with the German legal order as an example. This part emphasises constitutional law implications and demonstrates how the difficult but urgent balancing of values and rights that the introduction of autonomous driving requires can best be guided by constitutional and human rights law.

Keywords: Autonomous Driving; Regulatory Law; Constitutional Law; Dilemma Situation

A. Introduction: a dynamic and radiating topic[1]

I. General

More than 125 years ago, *Carl Benz* invented the automobile, which was, at that time, a tricycle without a roof. While these vehicles have undergone many transformations since then, right up to the kind of cars known and sold today, one thing has always stayed the same: a car needed a human driver, a person who was required to possess the power to control all of the car's functions. Recent technological[2] developments in the field of autonomous driving, however, demonstrate that the driver-centred principle in road traffic is beginning to lose its relevance and, in the future, may become the exception or eventually disappear entirely[3]. Cars with automated driving functions currently offered on the market

* The authors are deeply indebted to Prof. Dr. Silja Vöneky for her comments on earlier draft versions of this article.

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1 An early draft version of this paper has been published as Hannah Dittmers, 'Autonomous Driving', Draft FIP, Journal of Science Humanities and Arts, April 2019.

2 For a recent successful testing of an autonomous car in a 'complex urban environment', see Gwyn Topham, '"It's going to be a revolution": driverless cars in new London trial', *The Guardian (*London, 3 October 2019*)* < https://www.theguardian.com/technology/2019/oct/03/driverless-cars-in-new-london-trial-in-complex-urban-environment > accessed on 23 November 2020.

3 Cf. on the history of autonomous vehicles Jessica Brodsky, 'Autonomous Vehicle Regulation: How an Uncertain Legal Landscape May Hit the Brakes on Self-Driving Cars' [2016] Berkeley Technol. Law J. 851, 853 et seq.

still require the driver's attention at any time[4]. However, some commentators have predicted that the emphasis in driving will shift more and more towards the mere observation of a car's movements by the human "driver" rather than relying on the active steering[5]. The announcement of new projects in various States, for example in the USA[6], France[7] and Germany, that might permit autonomous driving from 2022 onwards[8], has given new momentum to this debate.

Three of the principal motivations for the development of self-driving systems are safety, convenience, and cost effectiveness in the area of transportation[9]. As for safety, institutions in charge pursue the so-called 'Vision Zero' characterized by a reduction of traffic injuries and deaths as well as lesser traffic accidents[10]. The European Commission, for example, has discussed the 'use of modern technology to increase road safety' in a communication paper from 2010[11] and has again taken new developments into account in the more recent Working Document concerning the EU Road Safety Policy from 2019[12]. From the standpoint of convenience, advances in autonomous driving aim to reduce traffic jams and to react to demographic change[13]. As autonomous driving might enhance mobility of those who would not be able to drive a traditional car themselves, the development of such a technology could also improve participation in society[14]. More automation could mean less costs – but also less employment – in certain sectors of transportation, as skilled drivers for buses, taxis, vans, will not be necessary anymore, and biological limits of a human driver, as tiredness, will matter less[15].

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4 Benedikt Wolfers, 'Autonomes Fahren: Ist das erlaubt?' [2017] RAW 2.

5 Volker Jänich, Paul Schrader and Vivian Reck, 'Rechtsprobleme des autonomen Fahrens' [2015] NZV 313.

6 Cf. the report of the National Science & Technology Council and the United States Department of Transportation, 'Ensuring American Leadership in Automated Vehicle Technologies' (Washington, January 2020) <https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/360956/ensuringamericanleadershipav4.pdf> accessed 23 November 2020.

7 For the governmental program, cf. Gouvernement française, 'La nouvelle France industrielle' (Paris, 14 May 2017) < https://www.gouvernement.fr/action/la-nouvelle-france-industrielle> accessed 23 November 2020.

8 Joachim Becker, 'Der Roboter von nebenan' *Süddeutsche Zeitung* (Munich, 10 September 2020) <https://www.sueddeutsche.de/auto/autonomes-fahren-zulassung-deutschland-1.5027065> accessed 23 November 2020.

9 Cf. Adeel Lari, Frank Douma and Ify Onyiah, 'Self-Driving Vehicles and Policy Implications: Current Status of Autonomous Vehicle Development and Minnesota Policy Implications' [2015] MJLST 735, 750; Lennart Lutz, 'Autonome Fahrzeuge als rechtliche Herausforderung' [2015] NJW 119; Jessica Brodsky (see above, fn. 3) 852; Carsten König, 'Gesetzgeber ebnet den Weg für automatisiertes Fahren – weitgehend gelungen' [2017] NVZ 249; cf. also the data on traffic accidents in Germany referred to by Jutta Stender-Vorwachs and Hans Steege, 'Grundrechtliche Implikationen autonomen Fahrens' in Bernd Oppermann and Jutta Stender-Vorwachs (eds.), *Autonomes Fahren* (2nd edn, Beck 2020) 371 et seq.

10 Volker Jänich, Paul Schrader and Vivian Reck (see above, fn. 5) 313; Miranda Schreurs and Sibyl Steuwer, 'Autonomous Driving, Political, Legal, Social and Sustainability Dimensions' in Markus Maurer and others (eds), *Autonomes Fahren* (Springer 2015) 151, 157; Carsten König (see above, fn. 9) 123; cf. the European Commission's reference to expert opinions, according to which about 95 % of road accidents involve some level of human error, Commission, 'Saving Lives: Boosting Car Safety in the EU' (Communication) COM (2016) 787 final, 4.

11 Commission, 'Towards a European road safety area: policy orientations on road safety' (Communication) COM (2010) 389 final, 9.

12 Commission, 'EU Road Safety Policy Framework 2021-2030 – Next steps towards „Vision Zero"' (Staff Working Document) SWD (2019) 283 final, 13 and with regard to the international activity of the EU in that area, 20.

13 Volker Jänich, Paul Schrader and Vivian Reck (see above, fn. 5) 313.

14 Jessica Brodsky (see above, fn. 3) 852.

15 This is stated as a factual observation, not implying that this should be a motivation to introduce autonomous vehicles; on the contrary, this shows that AI driven systems as autonomous cars will have many different effects on the way we work and live – negative and positive.

Security is not only the main objective, but also one of the major concerns that the introduction of autonomous driving functions has to face[16]. Additionally, it remains challenging to find a uniform level of safety, which can be considered sufficient for all potential scenarios. For this reason, the legal framework has until now only cautiously been adjusted to the new driving devices. While autonomous driving devices are still met with restraint, lawmakers at the international, the European and the national level have adopted first steps to ensure that the progress in technology for automated[17] driving is accompanied by a parallel development in the legal area[18], following a so-called 'top-down' approach to regulation. More importantly, further amendments to the existing sets of rules that could help autonomous driving devices to achieve their breakthrough are currently under discussion.

This article aims to give an overview of the current legal framework, identify legal obstacles to the introduction of autonomous and automated driving and thereby lay the ground to discuss possible future revisions of the law. Although many other legal areas are affected as well, the field of public regulatory law can have decisive (and possibly unifying) influences on civil law or criminal law[19]. The article will therefore first examine the legal framework from this angle, starting with international law (B) as the set of rules with the geographically broadest scope of application. It will then take a closer look at the European (C) and national rules in Germany (D) applicable to autonomous and automated driving. As for the national level, the most important constitutional provisions will be outlined as well as the secondary law provisions that were intended to be the 'most modern traffic law of the world'[20]. Alongside with the analysis of the statutes, the interplay of the different sets of rules will be considered. Another legal discipline that concerns certain technical standards for self-driving vehicles and has to be taken into account as well is the law of data protection (E).

II. Terminology

The definition of autonomous driving poses problems[21]. Even if a common ground has evolved regarding the levels of automation that can occur in a vehicle, a clear and uniform terminology seems to be lacking hitherto. To facilitate the discussions, the Society of Automotive Engineers (SAE) has introduced a scale composed of six distinct levels of automation (from zero – no automation at all – to five)[22],

16 Spencer Mathews, 'When Rubber Meets the Road, Balancing Innovation and Public Safety in the Regulation of Self-Driving Cars' (2020) 61 B. C. L. Rev. 295; Joanna Moody, Nathalie Bailey and Jinhua Zhao, 'Public perceptions of autonomous vehicle safety: An international comparison' (2020) 121 Safety Science 634.

17 For the differentiation between autonomous and automated driving cf. below A. II.

18 For the "pacing problem" that both - legislation and technical development - have to face, see Jeremy Carp, 'Autonomous Vehicles: Problems and Principles for Future Regulation' (2018) 4 U. Pa. J.L. & Pub. Aff. 81, 103.

19 Benedikt Wolfers, at a presentation held at the University of Freiburg, Germany on 29 November 2018.

20 Cf. the speech of Alexander Dobrindt, the former Minister for Traffic and Digital Infrastructure, in the parliament, CDU/CSU, 'Alexander Dobrindt: "Wir schaffen das modernste Straßenverkehrsrecht der Welt" (Berlin, 30 March 2017) <https://www.cducsu.de/themen/alexander-dobrindt-wir-schaffen-das-modernste-strassenverkehrsrecht-der-welt> accessed on 23 November 2020.

21 Cf. Benedikt Wolfers (see above, fn. 4) 3, who gives an overview over the different – German – terms used.

22 SAE, "SAE International Releases Updated Visual Chart for Its "Level of Driving Automation" Standard for Self-Driving Vehicles' (Warrendale, 11 December 2018) https://www.sae.org/news/press-room/2018/12/sae-international-releases-updated-visual-chart-for-its-%E2%80%9Clevels-of-driving-automation%E2%80%9D-standard-for-self-driving-vehicles accessed 23 November 2020.

referred to by institutional bodies[23] and commentators[24]. *Level 1* means that certain systems embedded in the vehicle *assist a human driver* when using specific functions of the car. *Level 2* concerns a *partial automation* where routine actions (i.e. parking) are carried out by the vehicle's internal systems. *Level 3* means that the act of driving is *highly automated* and the human driver is not required to supervise the system constantly. *Level 4* concerns a *full automation* of the vehicle in which the system can order the driver to take over if necessary. *Level 5*, by contrast, represents *full automation with no human input*. In this article, the term *"autonomous driving"* will be used to refer to fully automated driving by a vehicle without the assistance of a human driver, turning the driver into a mere passenger in the vehicle (*level* 5). In contrast, *"automated driving"* will be used referring to a vehicle that has automatic functions but also requires a human driver to overlook its operation or relies on a – natural – person to take over the steering (*level 3 and 4*).

B. Public International Law

Road traffic is a fundamentally international issue: in an increasingly globalized world, not only the consumers – the drivers – travel beyond national borders. Manufacturers, in particular, also depend on agreements on technical requirements at the international level in order to achieve a broader admissibility of their cars and vans in various States and thus reduce trade barriers. These needs were addressed by different international legal frameworks that can be divided into a regulatory and a behaviour-related set of rules[25]. On the regulatory side, there are the rules made by a working group under the umbrella of the United Nations Economic Commission for Europe (UNECE). Concerning the regulation of behaviour in road traffic, the Vienna Convention on Road Traffic of 3 November 1968 is the central instrument.

I. UNECE-Regulations

The United Nations Economic Commission for Europe (UNECE) is responsible for setting standards in the area of road traffic. The leading groups in developing standards are the specialized Group 1 (Working Party on Road Safety) and the Group 29 (Working Party on the Harmonization of Vehicle Regulation). The groups' work is based on the Agreement Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles concluded in 1958 (so-called '1958 Agreement')[26]. There are 53 parties to the agreement including the European Union[27]. The contracting parties

23 For the automated driving definition adopted by the UNECE see in this regard ECE/Tans/WP.29/1140; cf. also OECD/ITF, 'Automated and Autonomous Driving: Regulation under uncertainty' *International Tranportation Forum Policy Papers* (Paris, 2015) 13, <https://www.oecd-ilibrary.org/docserver/5jlwvzdfk640-en.pdf?expires=1579683547&id=id&accname=guest&checksum=6A06FAC75D27D62646BFA018E6B77047 > accessed 23 November 2020).

24 Cf. for example Matthias Kaler and Sylvia Wieser, 'Weiterer Rechtsetzungsbedarf beim automatisierten Fahren' [2018] NVwZ 369; Tracy Pearl, 'Hands on the Wheel: A Call for Greater Regulation of Semi-Autonomous Cars' (2018) 93 Ind. L.J. 713, 717; Damien Riehl, 'Car Minus Driver: Autonomous Vehicles Driving Regulation, Liability and Policy' [2018] 35/5 CILW 1, 2; for a different approach cf. Markus Gollrad, 'Baukastenmodell statt Automatisierungsstufen – Anknüpfungspunkte für die Regulierung automatisierter Fahrzeuge' [2020] RAW 103.

25 Benedikt Wolfers (see above, fn. 4) 4.

26 Agreement Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis on these United Nations Regulations, UNTS 335 (1959), 211.

27 UNTS 335 (1959), 211 <https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XI-B-16&chapter=11&clang=_en > accessed 23 November 2020.

are obliged to ensure that vehicles are in conformity with the UNECE Regulations when granting type approval (Article 2 para. 1 of the 1958 Agreement). In the following, the various UNECE rules that are particularly relevant for autonomous and automated driving will be analysed.

1. UNECE Regulation No. 13-H (Brakes)

UNECE Regulation No. 13-H[28] refers to the requirements for the admissibility of brakes. Its paragraph 2.20. gives a definition of automatically commanded braking. The definition includes the possibility of slowing or stopping a vehicle 'with *or without* a direct action of the driver, resulting from the automatic evaluation of on-board initiated information'[29]. This rule therefore does not pose obstacles to the introduction of autonomous or automated driving systems[30]. Similarly, paragraph 2.21. of the Regulation addresses 'selective braking' and refers to systems where the 'actuation of individual brakes is made by automatic means'. These provisions demonstrate an openness to the introduction of automatic functions in cars[31]. A provision that takes technological progress into account but only covers automated (level 3 and 4) and not autonomous (level 5) driving is paragraph 2.25.5. It refers to an assistance of the driver through an Electronic Stability Control System 'in maintaining control of the vehicle' through algorithms concerning the functioning of the propulsion torque.

2. UNECE Regulation No. 79 (Steering Equipment)

a. General

By contrast to the rules mentioned before, it was until recently commonly agreed upon that UNECE Regulation No. 79[32] renders autonomous cars inadmissible[33]. The regulation aims to establish uniform provisions for the layout and performance of steering systems fitted to vehicles used on the road[34]. In its introductory section, the regulation takes the advancements of technology into account. It acknowledges that 'it will now be possible to have steering systems in which there is not any positive mechanical connection between the steering control and the road wheels'[35]. The following provisions explicitly distinguish between two different types of steering systems: the ones in which the driver retains primary control of the vehicle ('Advanced Driver Assistance Steering Systems') on the one hand, and steering systems that do not require the presence of a driver ('Autonomous Steering Systems') on the other hand.

28 Regulation No. 13-H of the Economic Commission for Europe of the United Nations (UNECE) — Uniform provisions concerning the approval of passenger cars with regard to braking (2015/2364).
29 Italics added by the authors.
30 Benedikt Wolfers (see above, fn. 4) 5.
31 Lennart Lutz, 'Automatisiertes Fahren – rechtliche Herausforderungen aus deutscher Perspektive' in Iris Eisenberger, Konrad Lachmayer and Georg Eisenberger (eds), *Autonomes Fahren und Recht* (Manz 2017) 211, 214.
32 Regulation No 79 of the Economic Commission for Europe of the United Nations (UNECE) — Uniform provisions concerning the approval of vehicles with regard to steering equipment.
33 Michael Rodi, 'Die Zulassung zum Straßenverkehr aus rechtlicher und rechtspolitischer Sicht' in Bernd Oppermann and Jutta Stender-Vorwachs (eds), *Autonomes Fahren* (2nd edn, Beck 2020) 429 et seq. with further evidence.
34 Regulation's Introduction.
35 Ibid.

b. Advanced Driver Assistance Steering Systems

> 'Advanced Driver Assistance Steering System' means, according to No. 2.3.4. of the Regulation, 'a system, *additional to the main steering system*, that provides assistance to the driver in steering the vehicle but in which the driver remains at all times in primary control of the vehicle. (…)'[36]

These Advanced Driver Assistance Steering Systems are characterized by the fact that they have an 'automatically commanded steering function' (2.3.4.1.) and/or a 'corrective steering function' (2.3.4.2.). 'Corrective steerin' also extends to features that do not 'positively actuate the steering system'. In both cases, the actuation of the steering system occurs due to an 'automatic evaluation of signals on-board the vehicle'. Such systems are admissible pursuant to the Regulation. The driver's readiness to take over the relevant function seems to be assumed for the use of these features. In fact, the rules declare assistance and warning of the driver as the aim of such devices (2.3.4.1. and 2.3.4.2.). No. 5.1.6. pertaining to construction provisions is relevant as well. Sentence two of that Number states that advanced driver assistance steering systems 'shall be designed such that the driver may, at any time and by deliberate action, override the function'. This norm also confirms the principle that the driver is the primary actor controlling the driving process.

c. Autonomous Steering Systems

Autonomous Steering Systems, by contrast, are explicitly excluded from the scope of Regulation No. 79 (1.2.2.). They are defined as systems that incorporate

> 'a function within a complex electronic control system that causes the vehicle to follow a defined path or to alter its path in response to signals initiated and transmitted from off-board the vehicle. The driver will not necessarily be in primary control of the vehicle' (2.3.3.).

The Contracting Parties are therefore obliged to refuse type-approval for cars with autonomous functions within the sense of Regulation No. 79. The wording of this definition does not extend to many designs for highly, or even fully, automated vehicles which receive signals from cameras and laser scanners located *within* the vehicle[37]. What nevertheless excludes the autonomously driving vehicles from the regulation's scope is the fact that the automated steering function must terminate if the vehicle reaches a specific speed (12 kilometres per hour, cf. No. 5.1.6.1.)[38].

This definition of the scenarios not covered by the set of rules once more reflects the traditional principle in driving: a human driver must remain the primary actor when it comes to controlling the steering wheel. As will be demonstrated below, this traditional principle is increasingly challenged by the contracting parties.

d. New regulation for Automated Lane Keeping Systems

Although autonomous steering systems are *de lege lata* inadmissible, there are already first signs for a cautious opening to autonomous driving. A revision of Regulation No. 79 was discussed with

36 Italics added by the authors.

37 Benedikt Wolfers (see above, fn. 4) 6.

38 Benedikt Wolfers (see above, fn. 4) 6; Antje von Ungern-Sternberg, 'Völker- und europarechtliche Implikationen autonomen Fahrens' in Bernd Oppermann and Jutta Stender-Vorwachs (eds), *Autonomes Fahren* (2nd edn, Beck 2020) 467, 471.

regard to the already mentioned speed limit of 12 kilometres per hour, which *de facto* excludes autonomous driving functions from the scope of the Regulation No. 79. It was planned to either raise the speed limit or abolish it entirely[39].

In June 2020, a proposal for a new UN Regulation for Automated Lane Keeping Systems was adopted[40]. These new provisions, which will enter into force in January 2021, allow for a speed limit up to 60 km/h (cf. No. 2.1. of the new Regulation). The new Regulation still relies on a human driver to take over the steering if ordered to do so by the machine[41]. This is why the regulation does *not* include Level 4 and 5 automation.

The first difficult question arising in this context is what time is appropriate for taking over the steering. According to a study of the International Organization of Motor Vehicle Manufacturers, four seconds would be a sufficient amount of time for the transition[42]. It can however be questioned whether that period of transition is sufficient not only to allow drivers to take over but also to enable them to re-establish the concentration necessary to drive safely in complex traffic situations[43]. The follow-up question is which requirements should be established for a vehicle in case the driver does not take over despite the warning signal by the car. According to the new Regulation, the car should in this case 'carry out a minimum risk manoeuvre'[44], noting that the definition only concretizes this as a 'procedure aimed at minimising risk in traffic' (cf. No. 2.7. of the new Regulation).

It is noteworthy that the World Forum for Harmonization of Vehicle Regulations has recently published a revised framework document on automated and autonomous vehicles[45]. It aims to guide the WP.29 in their work, with safety being at the core of the principles laid down in that framework[46]. The framework, being soft law,[47] can serve as a reassurance and clarification of the key points that the working group has to take into account in its regulatory projects. For instance, the framework document emphasizes the need to consider issues such as system safety, failsafe response and human machine interface in the regulatory projects. By contrast, it lacks definitions for the most central terms. For ex-

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39 For the proposal of a speed limit of 130 kilometers per hour see No. 5.6.1.1.4. in Informal Document ACSF-06-05; cf. also the proposal submitted by the expert from Germany in No. 5.1.6.2 in Informal Document ACSF-01-08.

40 UNECE, 'Proposal for a new UN Regulation on uniform provisions concerning the approval of vehicles with regards to Automated Lane Keeping System' ECE/Trans/WP.29/2020/81; UNECE, 'UN Regulation on Automated Lane Keeping Systems is milestone for safety introduction of automated vehicles in traffic' *UNECE Press Releases* (Geneva, 25 June 2020) <https://www.unece.org/info/media/presscurrent-press-h/transport/2020/un-regulation-on-automated-lane-keeping-systems-is-milestone-for-safe-introduction-of-automated-vehicles-in-traffic/doc.html> accessed 23 November 2020.

41 Cf. e.g. the rules concerning the "transition demand" in No. 5.4. et seq. of the new Regulation.

42 Informal Document ASCF-16-08.

43 For a driving simulator study implicating that more time would be necessary for the driver to regain situation awareness see Natasha Merat and others, 'Transition to manual: Driver behaviour when resuming control from a highly automated vehicle' (2014) 27 Transportation Research Part F 274.

44 Cf. No. 5.6.2.5.1. in Informal Document ACSF-06-28.

45 Revised Framework document on automated/autonomous vehicles, ECE/Trans/WP.29/2019/34/Rev.1.

46 UNECE, 'Safety at core of new Framework to guide UNN regulatory work on autonomous vehicles' *UNECE Press Releases* (Geneva, 4 September 2019) <https://www.unece.org/info/media/presscurrent-press-h/transport/2019/safety-at-core-of-new-framework-to-guide-un-regulatory-work-on-autonomous-vehicles/doc.html > accessed 23 November 2020.

47 As defined by Daniel Thürer, soft law "covers all those social rules generated by States or other subjects of international law which are not legally binding, but which are nevertheless of special legal relevance", cf. Daniel Thürer, 'Soft Law' in *MPEPIL*, last updated March 2009, para. 8. It can be generated either through resolutions of International Organizations or Inter-State Agreements, cf. *ibid*. para. 10-12.

ample, as for system safety, the framework document only states that the 'automated/autonomous vehicles should be free from unreasonable risk'. It therefore misses the opportunity of giving any guidance in the assessment of what is safe enough and what would have to be classified as a non-tolerable risk[48].

II. Vienna Convention on Road Traffic (1968)

The Vienna Convention on Road Traffic concluded in 1968 (in the following: Vienna Convention)[49] shapes the international law landscape in the field of autonomous and automated driving when it comes to norms governing the behaviour of participants in road traffic. According to the prevailing opinion, however, the Vienna Convention's requirements apply to the *admission* of vehicles into public traffic as well.[50]

The treaty obliges the 50 parties to it (including the European Union) to adopt certain rules pertaining to the regulation of traffic and the authorization of vehicles as well as to recognize national drivers' licenses. It is noteworthy that some States that play a vital role in the development of autonomous and automated driving techniques are *not* a party to the Convention, such as China and the United States. The standards of the Vienna Convention are nevertheless relevant for these States, as they affect their possibility to export the cars produced in their countries[51].

Until 23 March 2016, this international treaty laid down that legislation adopted by a party had to require a human driver to be able to control the vehicle constantly[52], thus excluding automated and autonomous functions from level 3 onwards[53]. This was due to Articles 8 and 13 of the Vienna Convention. Pursuant to Article 8 para. 1 of the Vienna Convention, every vehicle must have a driver who – according to para. 5 of this rule – is able to control his or her vehicle at all times. Confirming this driver-centred principle, Article 13 para. 1 states that 'every driver of a vehicle shall in all circumstances have his vehicle under control so as to be able […] to be at all times in a position to perform all manoeuvres required of him'. Some think that the 'operator', i.e. the computer, in a remote-controlled car falls under the term 'driver' in Article 8 of the Vienna Convention[54]. The teleology and the statutory system seem to indicate, in any case, that 'driver' relates to a human being[55].

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48 For the difficulty in drawing the line between a tolerable and non-tolerable risk see Peng Liu, Run Yang and Zhigang Xu, 'How Safe Is Safe Enough for Self-Driving Vehicles?' (2019) 39 Risk Analysis 315.

49 UNTS 1042 (1977), 17.

50 Cornelia Bewersdorf, 'Zur Vereinbarkeit von nicht-übersteuerbaren Fahrerassistenzsystemen mit dem Wiener Übereinkommen über den Straßenverkehr vom 8. November 1968' (2003) NZV 266.

51 Ulrich Lange, 'Automatisiertes und autonomes Fahren – eine verkehrs-, wirtschafts- und rechtspolitische Einordnung' (2017) NZV 345, 347.

52 Viktória Ilková and Adrian Ilka, 'Legal Aspects of Autonomous Vehicles – an Overview', Proceedings of the 2017 21st International Conference on Process Control (PC), Pleso, Slovakia, June 6–9, pp. 428–433, III B <http://publications.lib.chalmers.se/publication/249781 > accessed 23 November 2020.

53 For the former legislative situation with further references to different opinions cf. Antje von Ungern-Sternberg (see above, fn. 38) 470.

54 Lennart Lutz and Markus Lienkamp, 'Die rechtliche Situation von teleoperierten und autonomen Fahrzeugen' [2013] NZV 57, 58; for a similarly broad understanding of the notion of 'control' cf. British Department for Transport, 'Ratifying the 1968 Vienna Convention' *Policy Paper* (London, 20 March 2018) <https://www.gov.uk/government/publications/road-haulage-and-driving-in-the-eu-post-brexit/ratifying-the-1968-vienna-convention> accessed on 23 November 2020.

55 Nynke Vellinga, 'Automated driving and its challenges to international traffic law: which way to go?' (2019) 11 Law Innov. Technol. 257, 259 et seq.

A revision of Article 8 led to the implementation of Article 8 para. 5bis that came into force in March 2016[56]. According to the new rule, the use of automated vehicles is in accordance with Article 8 para. 5 and Article 13 para. 1 of the Convention as long as the cars comply with the UNECE-Regulations or if their mechanism can be overridden or deactivated by the driver. The second alternative (their mechanism can be overridden or deactivated) seems to introduce a rather low standard for the introduction of automated vehicles.[57] Some consider it a political compromise that with regard to practical matters is of smaller relevance than the first alternative[58]. Regardless of its practical impact, this second alternative stands in the way of enhancing legal certainty, which initially was one of the revision's purposes[59].

The first alternative (compliance with the UNECE-Regulations) aims to introduce a unanimous standard for the assessment of behaviour-related rules and of those concerning the admission of vehicles[60]. The modification in Article 8 para. 5 of the Convention had the effect – *prima facie* – of linking the development of automated driving to the current state of the UNECE Regulations, thereby enshrining in the law the openness for new technical developments[61]. As a driver is still required pursuant to Art. 8 para. 1 this modification does, however, not extent to autonomous driving[62].

Although the wording appears to be straightforward, the extent of the reference to the UNECE-Regulations remains unclear due to the systematic context of Article 8: other behaviour-related norms in the same chapter of the Vienna Convention explicitly demand certain actions of the driver, for example Article 7 para. 2. This article was outside of the scope of the modification. Its wording clearly is diametric to the concept of Level 3 and Level 4 automation, which allows drivers to at least temporarily turn their attention away from the road. The question is, whether the reference made by Article 8 para. 5bis only extends to those systems that are compatible with the further provisions of the Vienna Convention as well. Some view Article 8 para. 5bis as a *lex specialis* to the other behaviour-related rules.[63] However, the other articles, for example Article 7 and 10, contain more precise behavioural requirements than Article 8 and Article 13, meaning that this conflict-of-law rule does not apply.[64] It will therefore be interesting to see whether a clear state practice emerges regarding this question; such state practice could be used for the interpretation of the Vienna Convention on Road Traffic according to Article 31 para. 3 (b) of the Vienna Convention of the Law of Treaties (VCLT)[65].

In any event, this apparent contradiction between the new Article 8 para. 5bis and Article 7 as well as the other behaviour-related duties calls for further clarification[66]. The procedure for (further) modifications on the Vienna Convention on Road Traffic is laid down in its Article 49. According to this rule,

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56 Benedikt Wolfers (see above, fn. 4) 9.
57 Benedikt Wolfers (see above, fn. 4) 9.
58 *Ibid*.
59 For an extensive interpretation in order to achieve consistency between the Vienna Convention and the UNECE Regulations cf. ECE/Trans/WP.1/163, para. 13.
60 Benedikt Wolfers (see above, fn. 4) 10.
61 Antje von Ungern-Sternberg (see above, fn. 38) 476.
62 Antje von Ungern-Sternberg (see above, fn. 38) 477.
63 Ibid.
64 Benjamin von Bodungen and Martin Hoffmann, 'Das Wiener Übereinkommen über den Straßenverkehr und die Fahrzeugautomatisierung (Teil 1)' [2016] SVR 41, 46; for further opinions for a solution of this apparent conflict of the two norms, see *idem*, 'Das Wiener Übereinkommen über den Straßenverkehr und die Fahrzeugautomatisierung: Wege aus dem Zulassungsdilemma (Teil 2)' [2016] SVR 93 et seq.
65 Antje von Ungern-Sternberg (see above, fn. 38) 477.
66 By contrast, a new provision that did enhance legal certainty can be found in a new sentence inserted in Article 39. Para. 1 of this Article stipulates that vehicles have to fulfil technical conditions as laid down in Annex 5 to the treaty.

states can propose alterations to the Convention that can come into effect, for example, when the other member states do not object within a period of twelve months (Article 49 para. 2 of the Vienna Convention). The modification of Article 8 para. 5 of the Convention has been effectuated through this procedure as well.

III. Implementation of international regulatory law

Neither the provisions of the UNECE-Regulations, nor the norms of the Vienna Convention on Road Traffic are directly applicable in the States parties.[67] They have to be implemented through national law. In practice, cars need the so-called type approval to be authorized for road use. The national law governing type approval has to incorporate the standards set forth by the international legal framework[68]. Legally, nothing would hinder a State from withdrawing the international treaties. However, as mentioned above, these States would still have to overcome trade barriers.[69] Therefore, for States that feel held back by international treaty rules, the aforementioned possibilities to revise the frameworks are the preferable course of action[70].

For those States parties that are at the same time Member States of the EU, the possibilities to be more proactive are limited anyway. The EU, as contracting party of the UNECE Regulations and the Vienna Convention on Road Traffic, has to incorporate the standards into its directives and regulations as well[71]. These, in turn, either have binding effect for the Member States or have to be implemented in their national regulatory laws[72]. The role of the EU in the regulation of technical standards for vehicles will be discussed below.

C. European Law

I. General

The European Union and the Member States have a shared competence to regulate in the field of road traffic[73]. The norms governing the area can be found in the Articles 90 et seq. of the Treaty on the Functioning of the European Union (TFEU). There are several Regulations and Directives based on these articles, in particular Regulation 661/2009[74] and Regulation 2016/0014[75]. The latter substituted Directive 2007/46/EC ('Framework Directive')[76] as of 1 September 2020, which until then was the most

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The new sentence in Article 39 para. 1 establishes the legal fiction that systems, parts and equipment of vehicles that are in conformity with the legal instruments referred to in the new Article 8 para. 5bis shall be deemed to be in conformity with the aforementioned Annex 5 as well.

67 Michael Rodi (see above, fn. 33) 433.

68 See e.g. Sec. 3 Fahrzeugzulassungsverordnung in German law.

69 Michael Rodi (see above, fn. 33) 433.

70 Ibid.

71 Antje von Ungern-Sternberg (see above, fn. 38) 472.

72 Article 288 para. 2 and 3 TFEU.

73 Peter Schäfer 'Art. 90' in Rudolf Streinz (ed), *EUV/AEUV* (3rd edn, Beck 2018) para 1.

74 Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning the type-approval requirements for the general safety of motor vehicles, their trailers and systems and separate technical units intended therefor.

75 Regulation of the European Parliament and of the Council on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles.

76 Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (Framework Directive).

important set of rules regarding road traffic. It should be stressed, however, that the relevant norms for the purpose of this article have remained the same. The changes of the new Regulation mainly concern the procedure of type approval.

II. Regulation 2016/0014

The EU-authorization pursuant to the new Regulation 2016/0014 is the most important mechanism for authorization thus far. The EU-Regulation in turn refers to the UNECE Regulations: according to Article 57 of the EU-Regulation, the UNECE Regulations that the EU has consented to are part of the EU requirements for type approval[77]. A change in the UNECE Regulations would due to this dynamic referral have an effect on the admissibility of cars in the EU Member States.

A notable provision is Article 39 of this Regulation as it allows exemptions for new technologies or new concepts. The norm allows admitting certain technologies that are incompatible with a regulatory act annexed to the Regulation. In order to be granted such an approval, the manufacturer must apply to a Member State, being the approval authority, and the Commission must grant an authorization as well. The provision furthermore allows the Member State to issue a provisional approval that is valid only in its territory for the time the Commission's decision is pending (Article 39 para. 4). It is also interesting that other Member States can accept such a provisional approval on their territory (Article 39 para. 5). Article 39 of Regulation 2016/0014 therefore demonstrates a certain openness to technological changes and – through the possibility of granting a provisional approval – accommodates for the needs of the often quick character of technological development. It is considered, that as long as UNECE Regulation No. 79 has not been modified, States can use Article 39 of the Framework Direction to obtain provisional approval for highly or fully automated driving systems[78].

The Regulation is directly binding the EU Member States pursuant to Article 288 para. 2 TFEU[79]. However, this does not render national law irrelevant altogether. On the contrary, the possible exemptions leave enough room for national deviations. The next part will spell out the relevant rules of German Law including the constitutional bases.

D. German Law

I. Constitutional law implications

The fundamental considerations and balancing of values that precede all legislative projects in this area can best be expressed by the constitutional and human rights that could be affected by autonomous driving. Of course, constitutional norms come into play in various ways in this context and a comprehensive analysis is beyond the scope of this paper[80]. There is already a wide range of natural and legal

77 Article 57 para. 1: 'UN Regulations or amendments thereto which the Union has voted in favour of, or that the Union applies and that are listed in Annex II, shall be part of the requirements of the EU type-approval of vehicles, systems, components or separate technical requirements.'

78 Benedikt Wolfers (see above, fn. 4) 6.

79 This was different with regard to the Framework Directive which had to be implemented through national law, cf. Art. 288 para. 3 TFEU.

80 This also applies to the fact that, depending on to what extent the case is determined by the law of the European Union, the articles of the Charter of Fundamental Rights of the European Union might apply pursuant to Article 51 of that Charter instead of the national constitutions. This article is nevertheless confined to questions of German constitutional law.

persons whose fundamental rights could be affected. The rights of manufacturers, drivers, and pedestrians could be analysed, not to mention the ones of those who participate in processing the data generated by the car[81]. In order to better understand the considerations that guide the adoption of regulatory norms, the constitutional provisions that could provide an answer as to whether autonomous driving devices should (or maybe even have to) be authorized will be presented here. In order to do so, the first part aims to give an overview of the most important constitutional principles that have to be taken into account (1). We will then take a closer look at the responsibility to protect constitutional and human rights and propose a solution to dilemma situations (2).

1. Setting the scene: the constitutional frame

As for the German Basic Law (*Grundgesetz*, GG)[82], the articles laying down the fundamental rights (i.e. constitutional and human rights) do not explicitly refer to terms such as "technology"[83]. The *Grundgesetz*, however, is deemed open for progress in technology: science and research explicitly fall within the scope of application of Article 5 para. 3 GG. The use of autonomous vehicles by the individual falls in the scope of application of Article 2 para. 1 GG that protects the general freedom to act as he or she wishes to.[84] Furthermore, the freedom of occupation of the companies pursuant to Art. 12 para. 1 GG has to be respected as well.

Another question is whether the legislator could oblige manufacturers to only build autonomous cars and consumers to only use those, if – in future times – autonomous vehicles will be significantly safer than those with human drivers[85]. Such developments are to be considered problematic with regard to the fundamental rights of the occupational freedom, Article 12 GG (Freedom of choosing and exercising a profession) and Article 2 para. 1 GG, among others[86]. Limiting these and other fundamental rights would require that the legal obligation pursues a legitimate goal, is capable to reach that aim, necessary and in proportional[87]. Such a justification, however, can be possible, as the aim of the law would be to protect life and health of human beings (as enshrined in Article 2 para. 2 GG), and the premise is that an autonomous car is safer, hence the law would be suitable to reach that aim; the law would be necessary if there are no other – less intrusive – ways to achieve the aim that are equally effective. A less rigid means would be to allow autonomous and traditional cars at the same time. In the scenario discussed here, this would not be equally effective as autonomous cars are presumed to be safer.

81 Cf. below E.

82 In force since 23 May 1949; BGBl. I (1949), 1-20.

83 Jutta Stender-Vorwachs and Hans Steege (see above, fn. 9) 376; for the broad scope of the freedom of science and research pursuant to Art. 5 para. 3 GG, cf. Klaus Gärditz, 'Art. 5 Abs. 3' in Roman Herzog and others (eds), *Maunz/Dürig Grundgesetz* (Suppl. No. 91, Beck 2020) para. 52 *et seq*.; Markus Kempen 'Art. 5' in Volker Epping and Christian Hillgruber (eds), *Grundgesetz* (44th edn, Beck 2020) para. 179 *et seq*.; Friedhelm Hufen, 'Wissenschaft zwischen Freiheit und Kontrolle' [2017] NVwZ 1265, 1265.

84 Eric Hilgendorf, 'Teilautonome Fahrzeuge: Verfassungsrechtliche Vorgaben und rechtspolitische Herausforderungen' in Eric Hilgendorf, Sven Hötitzsch and Lennart Lutz (eds), *Rechtliche Aspekte automatisierter Fahrzeuge* (Nomos 2015), 15, 21.

85 Jutta Stender-Vorwachs and Hans Steege (see. above, fn. 9) 384 et seq.; cf. generally for the requirements that have to be met for the duty to protect to arise Mara Gerbig, *Grundrecht auf staatlichen Schutz* (Duncker & Humblot 2014) 62 et seq.

86 Jutta Stender-Vorwachs and Hans Steege (see above, fn. 9) 382 et seq.

87 Assuming that the formal requirements of constitutionality are met as well.

When presuming that autonomous cars are significantly safer, the prohibition of human driven cars would be constitutional.

2. Autonomous driving and the responsibility to protect constitutional and human rights

Autonomous driving is also a topic that potentially invokes the government's responsibility to protect constitutional and human rights[88]. The state's responsibility to offer protection to individuals is recognized in particular in areas that are covered by the fundamental rights. This particular function of the fundamental rights can be derived from the so-called objective dimension[89] of these rights[90], and is in coherence with general interpretation of international human rights and the duty to protect these rights[91]. In its essence, the responsibility to protect constitutional and human rights renders unconstitutional any conduct by the German legislative that is fundamentally ineffective to protect constitutional and human rights. To stay in the field of transportation, the introduction of compulsory use of seat belts can be cited as an example of how such a protection obligation was fulfilled.

Concerning autonomous driving, some consider whether the state's responsibility to protect is being affected with regard to the duty to not violate and protect human dignity according to Article 1 para. 1 GG[92]. First of all, the mere admission of autonomous cars could conflict with the duty to protect human dignity. When using an autonomous vehicle, humans essentially hand over their wellbeing to a machine. According to one opinion, this might trigger Germany's duty to intervene in the relationship even between private actors – the company and the customer – on the basis of this constitutional right (Art. 1 para. 1 GG)[93]. Some explicitly reject this consideration, arguing that the principle of human dignity is designed to prevent damages to human beings that are linked to cruel behaviour, like torture, serving as a last resort to protect the core of what is human[94]. It is moreover reasoned that the person using an autonomous car in that case makes a conscious choice and thereby also uses a possibility of digital developments in a society that the constitution cannot avoid[95]. To strengthen the argument that the driver is making a conscious decision, it should be ensured that information asymmetries are balanced out as far as possible and that the driver is given the opportunity to fully reflect on the potential risks of an autonomous car.

However, the state's responsibility to protect could also arise in connection with the so-called dilemma situation. A dilemma situation could, for example, occur in the form of the so-called "trolley"-problem. In this scenario, the car drives towards two people or two groups of people. A collision is unavoidable in any case, but the question is in which direction the car should steer.

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88 Jutta Stender-Vorwachs, 'Die grundrechtlichen Aspekte Autonomen Fahrens' *Informatik Aktuell* (Frankfurt am Main 20 March 2018 <https://www.informatik-aktuell.de/management-und-recht/it-recht/die-grundrechtlichen-aspekte-autonomen-fahrens.html> accessed 23 November 2020.

89 The term 'objective' signifies that each basic right enshrined in the GG is objectively valuable in itself and worthy of protection.

90 Eric Hilgendorf (see above, fn. 84) 18.

91 Cf. e.g. Sandra Stahl, *Schutzpflichten im Völkerrecht: Ansatz einer Dogmatik* (Springer 2012) 78; Sarah Joseph and Melissa Castan, *The International Covenant on Civil and Political Rights: cases, materials and commentary* (3rd edn, OUP 2014) 39.

92 Jutta Stender-Vorwachs and Hans Steege (see above, fn. 9) 376 et seq.

93 Jutta Stender-Vorwachs (see above, fn. 88).

94 Eric Hilgendorf (see above, fn. 84) 21.

95 Jutta Stender-Vorwachs and Hans Steege (see above, fn. 9) 378.

Such a scenario may seem unlikely and of course the easiest solution would be to avoid these dilemma situations in the first place. Nevertheless, the occurrence of such a situation cannot be excluded with absolute certainty. This requires, also in view of the serious consequences for high-ranking legal interests such as physical integrity, life and dignity, a solution for the situation programmed *ex ante* by the manufacturer. In this context, a distinction must be made between two questions: one question is what the programming of the car should look like. This is in part an ethical question, a solution to which is outside the scope of this article[96]. The other - constitutional - question, is whether the state has an obligation to regulate the programming by the manufacturers. In this case it would be a mere assertion that the duty to protect arises from Art. 1 para. 1 GG or Art. 2 para. 1 GG in such a way that a certain solution to the dilemma should be imposed upon the manufacturer by means of an act of parliament. Instead, it is submitted that certain programming by the State should be excluded by regulation. This concerns for example the prohibition of such programming which, violating Art. 3 GG, differentiates on the basis of age, gender or skin colour (ethnicity).

It is questionable, however, whether there are other approaches to the dilemma-situation that should be prohibited. It is worth noting at this point that the government's obligation to protect dignity, life and bodily integrity arises when the conduct of a third (private) party would constitute a breach of constitutional norms if it was carried out by the State (so-called equivalence of the private party's interference)[97]. This has so far been considered primarily with regard to a solution according to which the car always steers towards the numerically smaller group[98]. According to this solution, the car would be programmed to always drive into the group of individual that is smaller, if an accident is unavoidable, in order to save the greater number of human lives. This solution has sometimes been considered incompatible with the previous case law of the Federal Constitutional Court, according to which human dignity pursuant to Article 1 para. 1 GG prohibits the balancing of lives if an airplane that is under the control of terrorist to commit a terrorist act shall be shot down in order to save human beings.[99] More precisely, the former §14 para. 3 Aviation Security Act (*Luftsicherheitsgesetz*) allowed armed forces to shoot down

96 In the field of new technologies, and in particular when it comes to autonomous driving, questions of (constitutional) law and ethics are particularly intertwined. This is why a German Ethics Commission was appointed in 2016 to elaborate on various ethical aspects of autonomous driving. The Commission was appointed by the Federal Ministry for Traffic and Digital Infrastructure in Germany and came together under the chairman Udo Di Fabio, a former judge at the German Federal Constitutional Court. The report of the Commission is available under https://www.bmvi.de/SharedDocs/DE/Publikationen/DG/bericht-der-ethik-kommission.pdf?__blob=publicationFile. For an overview of the ethical debate in this area cf. Patrick Lin, 'Why Ethics Matters for Autonomous Cars' in Markus Maurer and others (eds), *Autonomes Fahren* (Springer 2015) 70; Hannah Dittmers, 'Draft FIP: Autonomous Driving' (2019) 6 Journal of Science, Humanities and Arts 1, 15; Michael Decker, 'Ethische Fragen bei autonomen Systemen' in Kevin Liggieri and Oliver Müller (eds), *Mensch-Maschine-Interaktion* (Springer 2019) 309 et seq.; Dietmar Hübner, Lucie White and Markus Ahlers, 'Ethische Aspekte von Crash-Algorithmen für autonome Fahrzeuge: Rechte, Ansprüche und Konstitutivität von Verkehrsregeln' in Bernd Oppermann and Jutta Stender-Vorwachs (eds), *Autonomes Fahren* (2nd edn, Beck 2020), 61. One of the approaches discussed therein is to let the autonomous vehicle always stay on its initial path. This solution has its advantage in that it refrains from actively sacrificing one life in order to safe another life. Instead, the consequence of an algorithm always letting the car stay on its initial path results in the letting die of a person already threatened. This is best illustrated by the trolley problem. In a situation in which an autonomous vehicle is steering towards A and then alters its path in order to safe A, B who is hit instead, is actively sacrificed. However, when the car stays on its initial path, A is hit and not saved but also not actively sacrificed in order to safe B.

97 Volker Epping, *Grundrechte* (8th edn, Springer 2019) 65.

98 For a discussion cf. Philipp Weber, 'Dilemmasituationen beim autonomen Fahren' [2016] NZV 249; Eric Hilgendorf, 'Dilemma-Probleme beim automatisierten Fahren' (2018) 130 ZStW 674, 681 et seq.

99 BVerfGE 115, 118 et seq.

aircrafts if they were misused as a weapon against human life. The Federal Constitutional Court declared this norm incompatible with Article 1 para. 1 GG. It based its considerations primarily on the fact that human dignity forbids weighing the lives of innocent airplane passengers against the lives of potential victims. Admittedly, the cases differ in that the weighing in the case decided by the Federal Constitutional Court was allowed by the State and executed by the ministry of defence as a State organ. If one uses the criterion of equivalence of the interference, however, this argument alone is not sufficient for a differentiation. A difference that seems decisive at first, however, results from the fact that the persons that are killed by the car in order to save the greater number are not yet individualized in advance during the programming. This argument is not convincing. First of all, it was not the order to shot the airplane itself, but the law permitting such orders – not individualizing the victims – that was declared unconstitutional by the Federal Constitutional Court. Secondly, this argument bears the danger of creating a slippery slope: it is in the nature of technologies using artificial intelligence that they make – in this sense – non-individualized decisions. If it were possible to always rely on this difference to justify new standards, the overall protection of life and dignity would decrease. The question should rather be how existing constitutional and human rights standards can be implemented in the algorithm.

This does not mean that every algorithm that ultimately protects the larger number of people is unconstitutional. It depends on the exact way of programming. It is conceivable that the car is programmed to drive in a dilemma situation in such a way that it reduces the risk of all parties equally[100]. In this way, the programming remains focused on protecting everyone. This represents a significant difference to the German Aviation Act, in which the balance was made one-sided and finally in favour of one group. An algorithm that aligns the way of driving to the calculation which course of action would reduce the risk for everyone immediately threatened the most does not have the character anymore of sacrificing one predetermined group of people in favour of another.

Regardless of the question of whether regulation is necessary, a genuine social debate is important to identify solutions that are also viable for consumers[101]. This applies in particular to the need to communicate transparently about the extent to which a solution always gives preference to the maximum protection for the passenger inside the car[102] - an approach that may not necessarily be the (ethically) best solution, but might be necessary that autonomous cars are to be successfully established on the market at all.

II. Modifications in the German Law on Road Traffic (StVG)

1. Introduction

In general, the German Law on Road Traffic (*Straßenverkehrsgesetz*, StVG) regulates traffic signs and the behaviour of drivers in road traffic. It was recently modified to adjust to technological developments in the field of autonomous driving[103]. The alterations concern three main areas: registration of

100 Report Ethics Commission, p. 18.

101 For an intriguing project that has tried to identify the solutions preferred by the people cf. Moral Machine <https://www.moralmachine.net> accessed 23 November 2020.

102 Patrick Lin (cf. above, fn. 96) 70.

103 For a comparison of the StVG with the legal situation in the UK see Mathias Schubert, 'Regulating the Use of Automated Vehicles (SAE Levels 3 to 5) in Germany and the UK' [2019] RAW 18 et seq.

vehicles, driver liability, and data storage[104]. The modifications, effective from 30 March 2017, have clarified that *automated* (i.e. Level 3 and 4) driving functions are permissible to the extent that drivers may *temporarily* turn away from traffic and driving (§ 1b StVG).[105] This means that the driver may remove his or her hands from the steering wheel[106]. German lawmakers did not lose much time in implementing the new rules. The German government declared the issue as particularly urgent and, pursuant to Article 76 para. 2 sentence 4 GG, did not have to wait for the statement of the German Federal Council (*Bundesrat*) in order to proceed with the implementation[107]. The opinion later issued by the *Bundesrat* criticized several aspects of the first draft produced by the German Parliament (*Bundestag*), as for instance uncertainties concerning questions of liability and data protection[108], but ultimately, albeit reluctantly, gave effect to its final version[109].

2. Key elements

In order for a driver to be allowed to turn his or her attention away from driving (§ 1b StVG), the requirements set forth by the new rule § 1a StVG have to be met. By allowing "vehicles with high or full automation" (Level 3 and Level 4) and listing several technical requirements, § 1a StVG defines the type of system that triggers the effect of § 1b StVG allowing the driver to carry out other actions while the car is moving[110]. However, this rule only concerns automated driving that also can be overridden or deactivated by the driver at any time, cf. §. 1a para. 2 StVG[111].

It is also important to note that the use of highly or fully automated functions is only admissible if it is used "in accordance with their purpose" ("*wenn die Funktion bestimmungsgemäß verwendet wird*"), § 1a para. 1 StVG. The admissible use is dependent on the level of automation and the field of implementation[112]. To this end, the requirements laid down by the manufacturer play a central role. The official considerations given for the new rule stress the importance of the manufacturer's instructions in order to ensure the vehicle's use in accordance with its purpose[113]. The manufacturer has to clarify the prerequisites and limits of the automated system, whereas drivers are required to inform themselves of these limits and keep them in mind when driving[114]. This constitutes an opening clause. It is debatable whether this emphasis on the responsibility of the manufacturer does not shift too far away from the responsibility of the state to regulate in areas that are particularly sensible and relevant for the protection

104 Jan-Eric Schirmer, 'Augen auf beim automatisierten Fahren! StVG-Novelle ist ein Montagsstück' [2017] NVZ 253, 254.

105 The statute nevertheless hints to autonomous systems when it determines in § 6 para. 1 No. 14a StVG that driverless parking systems may be allowed by ordinance as long as the use occurs in a private space and stays within the realm of a low speed.

106 Cf. as well Benedikt Wolfers, 'Rechtsfrage geklärt: Automatisiertes Fahren ist möglich' [2017] RAW 86, 88.

107 Carsten König (see above, fn. 9) 249; Jan-Eric Schirmer (see above, fn. 104) 254.

108 BR-Drs. 69/1/17, 1.

109 Carsten König (see above, fn. 9) 249.

110 Cf. Thomas Söbbing, *AI Law* (Fachmedien Recht und Wirtschaft, dvf Mediengruppe, 2019) 108.

111 Jan-Eric Schirmer (see above, fn. 104) 254.

112 Justification of the StVG ÄndEntw, BR-Drs. 69/17, 13.

113 Ibid.; cf. Silja Vöneky, 'Key Element of Responsible Artificial Intelligence: Disruptive Technologies, Dynamic Law' (2020) 1 OdW 9, 14, for a critical view of the "intended purpose" clause.

114 Benedikt Wolfers (see above, fn. 106) 88.

of human and constitutional rights, as health and life of the driver and other individuals[115]. This is problematic as well with regard to the requirement of legal clarity.[116]

As for the norms governing liability, the modifications are astonishing. To understand these rules, it has to be stressed that the StVG establishes a strict owner liability (§ 7 StVG), which means that in case of an accident the holder is liable and there is no need to prove any intent or negligence. As a counterweight to this strict liability, § 12 StVG stipulates a monetary cap. The strict owner liability is not changed if a car with high or full automation (Level 3 and Level 4) will be used. But, although automated driving functions are commonly seen as the safer alternative to traditional cars, this monetary cap has been increased from a liability coverage of 5 million to 10 million (§ 12 para. 1 No 1 StVG). This seems to be a hint to the uncertainty whether these cars that are allowed to be used according §§ 1a, 1b StVG will increase road safety in practice. However, it must be admitted that this is not surprising as empirical data are still missing and only estimations are available so far.

3. Summary

The analysis demonstrates that cars including Level 4 automation are regulated by German law, and only autonomous driving *strictu sensu* – including a driver who gives up the entire control over the car (Level 5) – is not covered by the (modified) norms of the StVG. However, even the Level 4 regulation is incomplete to the extent that it shifts the difficult question of which kind of driving represents an intolerable risk to the manufacturer. This is not to say, that it solely burdens the manufacturer with an additional task: By shifting the responsibility to further clarify the driver's duties from the State to the manufacturer, it allows him to have a certain margin of appreciation that the manufacturer can use to minimize his liability risk. There is a need for improvement at this point.

E. Data Protection

Autonomous and automated cars generate data in various ways. Through their communication with the infrastructure and with other cars, their on-board-cameras filming the surroundings and the overall connectivity with other smart services, an amount of data can be collected and processed that would allow to create a whole personality profile of those using the car, especially the drivers[117]. For this reason, the law of data protection is another field in the discipline of public law, which has to be considered when analyzing the current legal framework of autonomous and automated driving.

115 Silja Vöneky (see above, fn. 113) 14.
116 Ibid.
117 Nikolaus Forgó, 'Datenschutzrechtliche Fragestellungen des autonomen Fahrens' in Bernd Oppermann and Jutta Stender-Vorwachs (eds), *Autonomes Fahren* (2nd edn, Beck 2020) 353, 356.

I. The General Data Protection Regulation (GDPR)

The relevant rules for data protection within the European Union are enshrined in the GDPR[118]. Though the GDPR does not contain regulations specifically tailored to automated or autonomous vehicles[119], its rules nonetheless govern this area. The data that are collected by a car can be linked to the holder or even the driver if they are connected with different data that identify the car[120]. Therefore, the data are relatable to a person within the meaning of Article 4 No. 1 GDPR and thus are governed by data protection laws[121]. The person responsible for data in the context of automated and autonomous driving is the manufacturer that generally determines how and to what end data are being collected[122]. Inevitably, manufacturers are not the only actors that have an interest in the data generated by the car, as the data can, for example, also be useful in entertainment, provision of services, insurance, and advertising[123].

The question what processing of personal data has to be considered lawful is regulated in Article 6 GDPR. Pursuant to Article 6 No. 1 lit. c GDPR, one scenario in which the processing of data is lawful is when it is necessary for compliance with a legal obligation to which the controller, i.e. the manufacturer, is subject. Such obligation can be established either by European or national law[124].

Article 25 para. 1 of the GDPR states that the controller must implement appropriate measures such as pseudonymization and integrate necessary safeguards in order to protect the rights of the data subject. This rule reflects the necessity that adequate protection of privacy nowadays requires that even at the early stages of programming and technical setup, the protection of data must be secured[125]. This necessarily plays a role in the process of developing autonomous systems. The developers of automated or autonomous driving systems must ensure that the interests of affected persons are being given attention even in the stadium of development[126].

Another rule that is relevant in the context of autonomous systems is Article 25 para. 2 of the GDPR, stating that the controller must ensure that only data necessary for each specific purpose of the processing are processed. The norm furthermore stresses the aspect of the individual controlling the accessibility of their data. The autonomous vehicle therefore cannot simply collect data without an examination of the proportionality of the process[127]. This accords with the principle of data economy, according to which data generated must serve a particular purpose[128].

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118 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). As a Regulation within the meaning of Article 288 para. 2 TFEU, it is directly applicable in the Member State of the European Union. According to its Article 3, the territorial scope of the GDPR is somewhat extended beyond the European Union, as it also applies e.g. to processing of data outside the European Union where Member State law applies due to public international law (para. 3).

119 Nikolaus Forgó (see above, fn. 117) 357.

120 Kai Wendt, 'Autonomes Fahren und Datenschutz – eine Bestandsaufnahme' [2018] ZD-Aktuell 06034, II.

121 Cf. in greater detail Thilo Weichert, 'Der Personenbezug von Kfz-Daten' [2017] NZV 507.

122 Kai Wendt (see above, fn. 120).

123 Thilo Weichert, 'Der Personenbezug von Kfz-Daten' [2017] NZV 507.

124 Eike Frenzel, 'Art. 6' in Boris Paal and Daniel Pauly (eds), *DS-GVO, BDSG* (Beck 2018), para. 16; for the relevant German provision cf. below E. II.

125 Mario Martini 'Art. 25', in Boris Paal and Daniel Pauly (eds), *DS-GVO, BDSG* (Beck 2018), para. 10.

126 Nikolaus Forgó (see above, fn. 117) 365. The situation is different, however, when the data is processed for scientific purposes pursuant to Art. 89 GDPR, which allows for derogation from certain provisions.

127 Cf. also Nikolaus Forgó (see above, fn. 117) 366.

128 Mario Martini 'Art. 25', in Boris Paal and Daniel Pauly (eds), *DS-GVO, BDSG* (Beck 2018), para 12; Jutta Stender-Vorwachs and Hans Steege (see above, fn. 9) 404 et seq.

Besides, there must be adherence with Article 40 GDPR. This rule sets out the importance of codes of conduct that contribute to the concretization of the Regulation's rules[129]. These rules of conduct constitute a measure of self-regulation that can also serve to fill gaps in the Regulation and increase legal certainty[130]. "Best practice" guides drafted by the automobile industry, for example, therefore can gain relevance for the Regulation's application with regard to autonomous and automated driving systems.

II. Securing evidence

The data collected by an autonomous vehicle might as well serve as proof in case of an accident. Recognizing this potential, § 63a StVG has been established simultaneously with the modernization of the German Law on Road Traffic that has already been discussed above. The norm requires every vehicle with automated driving functions to have a data-recording device – similar to a "black box" as used in airplanes. The rule intends to prevent the driver from generally referring to the automated system as a whole when an accident occurs, which would effectively lead to the driver's blanket exemption from liability[131].

The device saves information on the vehicle's position and time in three cases: firstly, given a transition from the car to the human driver or vice versa; secondly, if the driver is being ordered by the system to take over control and thirdly, in case a technical problem occurs, § 63a para. 1 StVG. The data collected may be submitted to public authorities in the federal States. The holder of the vehicle is required to submit the data collected by the device to third parties if necessary for the assessment of liability in case of traffic accidents[132]. The rule makes it possible to verify the driver's account of the course of the accident[133]. The primary purpose of § 63a para. 1 StVG, however, is to collect the relevant data in order to verify the driver's compliance with his or her obligations pursuant to § 1b StVG[134]. This is why the processing of this data is lawful pursuant to Article 6 No. 1 lit. c GDPR.

F. Summary and Outlook

The analysis has demonstrated that important steps towards the inclusion new driving systems into the legal landscape have already been taken or are planned. Whereas lawmakers have demonstrated openness towards *automated driving functions*, the basis to allow *autonomous driving* still requires a lot of regulatory work. Although the number of norms applicable to road vehicles give a rather scattered impression at first, current modifications have simplified their interplay, making the UNECE Regulations, an international treaty, the guiding framework.

Hence, there is common ground that can be utilized in drafting further regulations or principles in order to ensure the safety of those affected by the automated and autonomous systems. It seems to be of specific importance that it is public international law that takes the lead in the development of new rules,

129 Nikolaus Forgó (see above, fn. 117) 367.
130 Boris Paal, 'Art. 40' in Boris Paal and Daniel Pauly (eds), *DS-GVO, BDSG* (Beck 2018), para. 3.
131 Matthias Kaler and Sylvia Wieser (see above, fn. 34) 371.
132 Cf. Carsten König (see above, fn. 9) 252.
133 Thomas Hoeren, 'Ein Treuhandmodell für Autodaten?: § 63 StVG und die Datenverarbeitung bei Kraftfahrzeugen mit hoch- oder vollautomatisierter Fahrfunktion' [2018] NVZ 153, 154.
134 Judith Klink-Straub and Tobias Straub, 'Nächste Ausfahrt DS-GVO – Datenschutzrechtliche Herausforderungen beim automatisierten Fahren' [2018] NJW 3201, 3203.

not least because the topic is strongly international in nature, with many relevant parties acting in various jurisdictions.

With regard to dilemma situations, it could be considered whether there is a need for developing universal (ethical or soft law) principles at the international level. Arguments that would support this are, that hard choices in the context of dilemma situations are materially the same everywhere and human rights are a universal ethical and legal basis for all States, at least as they are part of customary international law, as the right to life or non-discrimination. Hence, soft law principles could serve as a supplement to the rules on technical standards, where the need for a uniform treatment has already been expressed and partly been realized (e.g. in the European Union). If there were international (ethical) guidelines on dilemma situations, they would have to be coordinated with and distinguished from (tort) principles and rules on responsibility in the respective States. It is desirable to work on a common solution that particularly reflects the governments' responsibility to protect constitutional and human rights.

Ultimately, it is difficult to predict how the legal landscape of autonomous driving will develop in the coming years. With regard to Article 8 para. 5bis of the Vienna Convention, there have already been suggestions to introduce a distinction between different levels of automation[135]. Moreover, UNECE Regulation No. 79 is being revised with the aim of extending the autonomous functions. Manufacturers and scientists seem to be optimistic that much development is possible within a rather short period of time. However, next to the possibilities of technology, dangers and risks are present in people's minds as well. As these technological possibilities progress, it remains to be seen how innovation can serve to improve road safety while preserving and protecting human life and dignity.

135 Viktória Ilková and Adrian Ilka (see above, fn. 52) fn. 7

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