Regulations regarding autonomous vehicles and their use in South Africa

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ABSTRACT

This study addresses the question to what extend automated vehicles and their use are regulated in South Africa. To answer this question the autonomous vehicle legislation of various countries was critically discussed as well as to what extend autonomous vehicles are regulated in South Africa. Several countries have passed laws to regulate autonomous vehicles and the manufacturing thereof, these countries include Germany and the United States of America (USA). The legislation of autonomous vehicles of Germany and the USA was critically discussed as these countries' legislation can be used to guide the legislation process of South African autonomous vehicles.

This study shows that South Africa does not have legislation on autonomous vehicles, but it does recommend possible autonomous vehicle legislation for South Africa. It is clear that in order for South Africa to draft such legislation, the government should invest in and improve the country's infrastructure as well as ensure that vehicles will have access to data and that the infrastructure has access to the data.

It is concluded that South Africa may not be ready for autonomous vehicle legislation and that the improvement of current infrastructure and the maintenance thereof may be necessary and expensive for the country. However, this should not stop South Africa to start the legislative process in this regard, as it may take a while for legislators to draft a bill.

Keywords

Autonomous vehicles, self-driving, automated, Germany, USA, South Africa, legislate, assisted driving, driverless

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
EC	Ethics Commission
FMVSS	Federal Motor Vehicle Safety Standards
HAV	Highly Automated Vehicles
JSAEM	Journal of the Society of Automotive Engineers Malaysia
NHTSA	National Highway Traffic Safety Administration
RAIL	Journal for Robotics, Artificial Intelligence & Law
UNECE	United Nations Economic Commission for Europe Regulations
USA	United States of America
VC	Vienna Convention
WULR	Washington University Law Review

1 Introduction

The world is ever-changing, and over the course of time, transportation has changed from horse carriages, bicycles and automobiles to electric cars and now to self-driving vehicles known as autonomous vehicles which is the latest notion in transportation.[1] These vehicles are not necessarily a new concept, as semi-automated vehicles – that is, vehicles with speed control or even autopilot – are already being used.[2] These vehicles can, however, still be seen as a challenging concept that could open up a whole world of new possibilities.

Autonomous vehicles use technology that could change the fundamentals of transportation.[3] The technology includes a combination of radar, sensors, cameras and artificial intelligence (AI) to travel between point A and point B without being operated by a human.[4] These autonomous vehicles are also known as self-driving or driverless vehicles.[5] In order for a car to be considered as an autonomous vehicle, the vehicle must have the ability to reach a pre-programmed destination without the intervention or interference of humans.[6] Companies such as Google and Tesla have been testing autonomous vehicles on public roads for the past few years, although they use different forms of technologies.[7] Tesla is regarded as the leader of autonomous vehicles and -driving and its autonomous vehicle technologies are focused on cameras that show different angles of the vehicle, whereas Google is focused on radar technologies that use light, such as Lidar.[8]

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1 Rodrigue, Comtois and Slack The Geography of Transport Systems 1-15.

2 Rodrigue, Comtois and Slack The Geography of Transport Systems 1-15.

3 Anderson et al Autonomous Vehicle Technology xiii.

4 Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

5 Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

6 Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

7 Gugleta 2019 https://medium.com/swlh/everything-you-need-to-know-about-autonomous-driving-ea54abd17e16.

8 Gugleta 2019 https://medium.com/swlh/everything-you-need-to-know-about-autonomous-driving-ea54abd17e16.

The United States National Highway Traffic Safety Administration (NHTSA) sets out certain automation levels:

(i) Level Zero – the driving is done by humans;

(ii) Level 1 – the vehicle assists the driver in either braking, accelerating, or steering (this indicates that only one function is automated);

(iii) Level 2 – the vehicle assists the driver in either accelerating or braking simultaneously (this indicates that more than one function is automated);

(iv) Level 3 – the vehicle can execute driving tasks in certain situations, like parking the vehicle, and the driver must be able to retake control at any time;

(v) Level 4 – the vehicle can execute and monitor all driving tasks in certain situations and the driver does not have to pay attention;

(vi) Level 5 – the vehicle drives itself and does not anticipate humans to drive it at any time.[9]

Although this innovation of autonomous vehicles is seen as benefitting society through reducing pollution, vehicle collisions, energy consumption and allowing productive use of time, it is not without its challenges.[10] Autonomous vehicle technology and the regulation thereof are important, as commercial automakers are involved in research in this field in order to introduce autonomous vehicles commercially.[11] Before the current legislation is discussed, it is important to briefly discuss where certain countries' current road traffic legislation originated or how their legislation on autonomous vehicles was influenced.[12]

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9 Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

10 Anderson *et al Autonomous Vehicle Technology* xiii.

11 Anderson *et al Autonomous Vehicle Technology* 4.

12 Global Auto Regs 2019 https://globalautoregs.com/rules/157-1968-vienna-convention-on-road-traffic%20wp.29.

According to the United Nations Treaty Collection, the *Convention on Road Traffic* (*VC*)[13] was signed in 1968 by various countries, South Africa accessioned the *VC* in 1977.[14] The *VC* covers safety regulations for road traffic and establishes principles that govern the countries' legislation on traffic.[15] Countries such as Germany and South Africa based their road traffic legislation on the *VC*, with certain reservations.[16] The *VC* does not make provisions for autonomous vehicles, as it states that the driver of a vehicle must remain entirely in control of the vehicle at all times and that the driver is responsible for the vehicle's actions in traffic.[17] Automated systems were permitted in the *VC* because the *VC* was amended in 2016 to include the autonomous systems in vehicles – such as cruise control, lane control, et cetera – but as mentioned above, the *VC* prohibits autonomous vehicles from driving due to the provision thereof that a driver must always be in control of the vehicle.[18]

Other than the *VC* – which is only applicable to the few[19] countries that signed it – no other international legal framework for autonomous vehicles exists.[20] Legislation should be kept up to date with innovations such as autonomous vehicles, otherwise these vehicles should not be used.[21] An international legal framework is thus

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13 *Vienna Convention on Road Traffic* of 1968 (hereafter *VC*).

14 Global Auto Regs 2019 https://globalautoregs.com/rules/157-1968-vienna-convention-on-road-traffic%20wp.29.

15 Global Auto Regs 2019 https://globalautoregs.com/rules/157-1968-vienna-convention-on-road-traffic%20wp.29.

16 Global Auto Regs 2019 https://globalautoregs.com/rules/157-1968-vienna-convention-on-road-traffic%20wp.29.

17 Global Auto Regs 2019 https://globalautoregs.com/rules/157-1968-vienna-convention-on-road-traffic%20wp.29.

18 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-framework.html.

19 82 countries are parties to the *VC*; Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-framework.html.

20 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-framework.html.

21 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-framework.html.

necessary, as legal certainty is seen as a prerequisite for automated vehicles to be accepted in society.[22]

In light of the above, this study focuses on three countries – namely Germany, the United States of America (USA), and South Africa – to answer the question as to what extent these countries legislate autonomous vehicles as well as to what extent automated vehicles and their use are regulated in South Africa. Several countries have passed laws to regulate autonomous vehicles as well as the testing and manufacturing of autonomous vehicles.[23] Both Germany and the USA are considered to be leaders in the automotive world.[24]

Germany is one of the leading countries when it comes to vehicle production and it is home to major automakers, such as Volkswagen and BMW.[25] Focusing on Germany is of value in this study, seeing as it was amongst the first countries to initiate regulations at the testing stage of autonomous vehicles.[26] Prior to the *German Road Traffic Act*[27] or the *VC*, there was no regulatory framework for automated driving in Germany.[28] The *VC* – which is the basis of Germany's Road Traffic legislation – and the *German Road Traffic Act* provide that the control of the vehicle lies with the driver at all times, therefore Level 5 of the automated levels, as mentioned above, would be considered illegal under the current legislation,

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22 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-framework.html.

23 Anderson et al Autonomous Vehicle Technology 4-5.

24 Anderson et al Autonomous Vehicle Technology 4-5.

25 Van der Schaft 2018 https://www.roboticsbusinessreview.com/unmanned/germany-creates-ethics-rules-autonomous-vehicles/.

26 Van der Schaft 2018 https://www.roboticsbusinessreview.com/unmanned/germany-creates-ethics-rules-autonomous-vehicles/.

27 Änderung der Artikel 8 und 39 des Übereinkommens von 1968 über den Straßenverkehr translated: Amendments to Article 8 and 39 of the Convention on Road Traffic 1968 (hereafter the *German Road Traffic Act*).

28 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 54.

seeing as the driver is not in control of the vehicle.[29] Germany drafted and later amended the *German Road Traffic Act* to include fully automated vehicles; these vehicles will, however, still require having a driver in certain situations.[30] These situations include that a driver is obligated to retake control if it is requested by the vehicle or where the driver realises that he or she needs to retake control of the vehicle.[31]

The USA is considered to be the world's second-largest vehicle manufacturer.[32] Here, companies such as Tesla, Uber and Google have already tested autonomous vehicles on their public roads.[33] The USA's legislation is flexible in that the legislation addresses many autonomous vehicle issues, but there are state, federal and local laws being enacted that specifically deal with autonomous vehicles.[34] In 2016, the United States (US) Department of Transportation introduced the *Federal Automated Vehicles Policy.*[35] This policy paved the way for autonomous vehicles.[36] It also states how autonomous vehicles will be regulated by the federal government.[37] The policy

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29 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 54.

30 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 54-55.

31 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 54-55.

32 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 8.

33 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 58.

34 Keller 2018 *RAIL* 101-109.

35 Federal Automated Vehicle Policy of 2016.

36 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

37 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 5-6.; Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-

focuses on the regulation of the technology and equipment of these vehicles; therefore, liability issues are assigned for each state to regulate.[38] However, there is no general applicable legislation that regulates AI used in autonomous vehicles.[39]

It seems that South Africa, contrary to Germany and the USA, does not have any legislation on the manufacturing or use of autonomous vehicles on South African roads.[40] The *National Road Traffic Act*[41] of South Africa has no regulations on autonomous vehicles on South African roads.[42] The South African National Department of Transport stated that companies are allowed to test autonomous vehicles, but only if the testing does not endanger any road users.[43] The National Department of Transport further stated that, in order for these vehicles to be allowed on South African roads, legislation would have to be introduced.[44]

Current legislation is inadequate to deal with the problems that are presented by AI-controlled technologies such as autonomous vehicles.[45] Legislation for autonomous vehicles is critical, since ethical, safety and security issues regarding these vehicles could have dire consequences.[46] As South Africa does not have legislation on autonomous vehicles, the legislation of Germany and the USA is

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legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 7-8.

38 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a 12.

39 Keller 2018 *RAIL* 101-109.

40 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

41 93 of 1996 (hereafter the *National Road Traffic Act*).

42 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

43 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

44 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

45 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

46 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

examined and compared in order to help South Africa in drafting autonomous vehicle legislation.

In short, the following question is addressed in this study: To what extent do the above-mentioned countries legislate autonomous vehicles and to what extent are automated vehicles and their use regulated in South Africa?

The above-stated question is addressed in the following chapters. Chapter 2 focuses on Germany as regards the legislation of the *Road Traffic Act* as well as the amended legislation in order to make way for legislation for autonomous vehicles in Germany. Legislation applicable to the manufacturing stage of autonomous vehicles and legislation on these vehicles are explored in chapter 2. Chapter 3 focuses on the USA as regards the legislation on autonomous vehicles as well as the *Federal Automated Vehicle Policy* in the USA. This chapter provides a discussion on legislation as well as the effective use of legislation on autonomous vehicles in the USA. Chapter 4 focuses on South Africa and explores the current legislation on autonomous vehicles in South Africa. Furthermore, this chapter explores the need for legislation on autonomous vehicles in South Africa and suggestions are made for legislation on these vehicles during the manufacturing process as well as legislation on these vehicles on South African roads. Chapter 4 serves as an introduction to regulating autonomous vehicles in South Africa. In chapter 5, a conclusion is drawn on how each country legislates autonomous vehicles and recommendations are made. Chapter 5 gives clarity as to why it is necessary to regulate autonomous vehicles.

2 Autonomous vehicle legislation in Germany

2.1 Introduction

This chapter focuses on autonomous vehicle legislation in Germany. The objective is to explore Germany's legislation on autonomous vehicles at the manufacturing stage and this country's current autonomous vehicle legislation. Germany is the first country with legislation on autonomous vehicles and automated systems. This

country's position prior to the new legislation, the developing legislation and the current legislation is also discussed in this chapter.

2.2 Germany's legislation prior to the autonomous vehicle legislation and the VC

The *VC* is an international public law instrument whose objective is to facilitate international road traffic and to increase road safety by adopting uniform traffic rules.[47] Germany's road traffic legislation is indirectly influenced by the *VC*, as Germany signed the *VC* in 1968 and ratified the *VC* in 1978.[48]

According to Article 8(1) of the *VC*, a driver is required in all moving vehicles.[49] The *VC* defines a driver in Article 1(v) as a person.[50] Therefore, a vehicle must always be driven by a person. Furthermore, the *VC* states in Article 8(5) as well as in Article 13(1) that the driver must always be able to control the vehicle and have the vehicle under control in order to exercise due and proper care.[51] The *VC* and the *German Road Traffic Act* prior to 2016 did not prevent automated function, such as assisted driving or partially automated driving, seeing as these functions still require the driver to be in control of the vehicle at all times and to monitor the vehicle and its systems.[52]

Advanced levels of automation or fully automated driving functions were not allowed under the *VC* or the *German Road Traffic Act* prior to 2016, as it was stipulated in legislation that the driver should be in control of the vehicle at all times, which is

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47 Henkel et al 2016 Norton Rose Fullbright Whitepaper 42; Article 1 of the Vienna Convention on Road Traffic of 1968.

48 Henkel et al 2016 Norton Rose Fullbright Whitepaper 40.

49 Article 8(1) of the Vienna Convention on Road Traffic of 1968.

50 Henkel et al 2016 Norton Rose Fullbright Whitepaper 42-43; A 1(v) of the Vienna Convention on Road Traffic of 1968.

51 Henkel et al 2016 Norton Rose Fullbright Whitepaper 42-43; Aa 8(5) and 13(1) of the Vienna Convention on Road Traffic of 1968.

52 Henkel et al 2016 Norton Rose Fullbright Whitepaper 43.

not the case with fully automated vehicles.[53] Therefore, German legislators believed that there was a significant requirement for changing the *VC*-influenced regulation in order to allow fully automated driving functions in Germany.[54]

2.3 Germany's autonomous vehicle legislation at the manufacturing stage

Germany is one of the first countries to implement autonomous vehicle legislation at the manufacturing stage. The purpose of this legislation is to determine liability in the case of a collision or any form of accident the autonomous vehicle has. The autonomous vehicle legislation requires that a black box be installed in every autonomous or automated vehicle. Black box technology is usually used in airplanes to assist crash investigators to find out what had happened before the airplane crashed; this technology consists of a cockpit voice recorder and a flight data recorder.[55]

The black box of autonomous vehicles is an event data recorder, and it records the speed, airbag deployment, brake application and seatbelt use from sensors in and around the vehicle.[56] The event data recorder technology records data five seconds before and one second after a crash.[57] The black box used in autonomous vehicles uses data simultaneously from 16 different sensors – this includes information about the driver's profile, tire pressure, radar data and camera images.[58] The black box is also used to read, record and store data such as the vehicle surroundings, people,

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53 Henkel et al 2016 Norton Rose Fullbright Whitepaper 43; A 1(v) of the Vienna Convention on Road Traffic of 1968.

54 Henkel et al 2016 Norton Rose Fullbright Whitepaper 43-44.

55 National Geography 2011 https://www.nationalgeographic.com.au/engineering/what-is-a-black-box.aspx.

56 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/; Bose 2015 *WULR* 1324-1327.

57 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/; Bose 2015 *WULR* 1325.

58 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

road marks and traffic lights.[59] The black box consists of a flash file system that is integrated with the event data recorder – this is to ensure that data are recorded even if there is no power during a crash or collision.[60] It is important that the recorded data are kept safe.[61] The company Tuxera is currently developing black box software which is expected to be available from 2020.[62]

As mentioned above, it is required that the black box be installed to determine liability in a crash. The black box records whether the vehicle was in charge through the self-driving system or whether the human driver was in charge of the vehicle during every moment the vehicle drove.[63] This is important in order for courts to determine blame in autonomous vehicle accidents.[64] As regards the new legislation, the driver is responsible for any accident, crash or collision that occurs while he or she is in charge of the vehicle, meaning the human driver is driving the vehicle with no assistance; if, on the other hand, the system fails while the self-driving system is activated and an accident, collision or crash is caused, the manufacturer will be held responsible.[65] Therefore, it is clear that the legislation on the installation of a black box during the manufacturing stage of these vehicles, is beneficial, not only to make it easier to prove liability in the case of an accident, but also to collect data that could indicate certain technical errors as well as reduce the amount of insurers' premiums.[66]

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59 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/; Bose 2015 *WULR* 1325.

60 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/; Bose 2015 *WULR* 1325, 1339-1340.

61 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

62 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

63 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

64 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

65 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

66 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

Furthermore, the registration of the vehicle is necessary.[67] According to the German Vehicle Registration Regulation, known as the *Fahrzeug-Zulassungsverordnung,* all vehicles that participate in Germany's public road traffic need to be registered with the *Zulassungsstelle*, which is the local homologation[68] authority.[69] The registration for a manufactured vehicle in Germany is a prerequisite that all vehicles must comply with in certain approved categories – this guarantees that all environmental standards and legislation on safety are fulfilled.[70] The vehicle registration is based on the Ethics Commission (EC)[71] type approval as set out in the German EC Vehicle Approval Regulation known as *EG-Fahrzeuggenehmigungsverordnung*.[72] The EC approval is, however, granted by the Kraftfahrt Bundesamt – the German Federal Motor Transport Authority; this authority also takes into account the *United Nations Economic Commission for Europe Regulations* (UNECE)[73] on the technical recommendations for vehicle parts and the vehicle itself.[74]

There are, however, certain limitations to the registration of vehicles, such as Regulation No 79 of the UNECE[75], which states that any form of steering that assists the driver, such as automatic steering, in following a path with the speed above 10 kilometres per hour is not allowed; however, these functions are permitted in a limited period of time that the vehicle assists the driver by self-parking.[76] Under this regulation, parking assist as well as lane-keeping assist are allowed.[77] Regulation No 48 of the UNECE[78] prevents manufacturers to equip vehicles with technology

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67 Henkel et al 2016 Norton Rose Fullbright Whitepaper 40.

68 All vehicles and its components must meet the safety critical characteristics or requirements.

69 Henkel et al 2016 Norton Rose Fullbright Whitepaper 41.

70 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41; S 6 of the Übereinkommens über den Straßenverkehr 1968.

71 Ethics Commission (hereafter EC).

72 EG-Fahrzeuggenehmigungsverordnung 2011; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

73 United Nations Economic Commission for Europe Regulations (hereafter UNECE).

74 Henkel et al 2016 Norton Rose Fullbright Whitepaper 41.

75 Regulation 79 of the UNECE.

76 Henkel et al 2016 Norton Rose Fullbright Whitepaper 42.

77 Henkel et al 2016 Norton Rose Fullbright Whitepaper 42.

78 Regulation 48 of the UNECE.

such as automated lane-changing technology, as this regulation still requires a driver to indicate that he or she is changing lanes.[79] Germany has begun to adapt the relevant UNECE regulations to ensure that higher levels of automation are allowed in the future.[80]

2.4 Germany's current autonomous vehicle legislation on public roads

Germany does not only have legislation on the manufacturing of autonomous vehicles, but also legislation on autonomous vehicles on public roads. Prior to 2016, only a driver[81] could have operated a vehicle on German roads.[82] In 2016, Germany's federal government formed an ethics commission in order to get answers regarding ethical and legal questions in context with autonomous vehicles and the driving of these vehicles.[83] This ethics commission led to Germany being the first country that regulated autonomous vehicles within a legal framework.[84] This legal framework creates regulations for fully and highly automated systems; the new legislation, however, does not permit autonomous driving where all the individuals inside the vehicle are passengers.[85] The legislation, therefore, requires that the driver must take over if the vehicle or system requires it.[86]

In short, three major requirements were set out by Christiaan Hetzner:[87] firstly, the licensed driver must be alert at all times; secondly, the driver should be able to

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79 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 43.

80 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 42-43.

81 A person who drives a vehicle; Hornby *et al Oxford Advanced Learner's Dictionary*.

82 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

83 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-frame work.html.

84 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-frame work.html.

85 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-frame work.html.

86 Brüngger date unknown https://www.daimler.com/innovation/case/autonomous/legal-frame work.html.

87 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

manually overwrite the system; and thirdly, a clear and concise protocol must be in place before the driver retakes control.[88] Furthermore, it is mandatory that a data recorder is installed in order to document driver-machine handovers.[89]

The United States NHTSA sets out automation levels, and Germany's Transportation Ministry additionally sets out certain automated driving functions.[90] These functions set out the technical aspects of automated driving:

(i) The assisted driving function: This function entails that the vehicle system can perform supportive tasks within a certain limit where the driver is still in control of the steering, acceleration and braking of the vehicle.[91] Lane-keeping assist,[92] adaptive cruise control[93] and parking assist[94] are examples of supportive tasks that assist the driver.

(ii) The partially automated driving function: This function entails that the vehicle can steer, brake and accelerate in specific times or for a period of time; the driver, however, should always be able to retake control of the vehicle.[95] Autopilot[96] and self-parking systems[97] are examples of partially automated driving functions.[98]

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88 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

89 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

90 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-41.

91 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-41.

92 This is where the vehicle automatically keeps itself in a lane; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-41.

93 This is where the vehicle adjusts its speed in order to maintain a safe distance from the vehicle in front; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

94 This is where the vehicle assists the driver in parking the vehicle in a suitable spot; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

95 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

96 This is a combination of adaptive cruise control and lane keeping assist; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41-42.

97 This is where the driver can activate a parking procedure for the vehicle, which the driver can stop at any time; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

98 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41-42.

(iii) The highly automated driving function: This function entails that the vehicle can steer, brake and accelerate in specific times or in certain circumstances; the driver, however, does not have to constantly monitor or be in control of the vehicle, as the automated system gives the driver a warning in advance to retake control of the vehicle.[99]

(iv) The fully automated driving function: This function entails that the vehicle automatically takes care of the braking, acceleration and steering of the vehicle in specified circumstances – for example, automatic driving.[100]

The biggest problem with the above-mentioned legislation is that it did not make provision for autonomous vehicles or driverless vehicles, and consequently, no autonomous vehicles were allowed on German roads.[101] This meant that autonomous vehicles were not allowed in Germany as this country's legislation stated that a driver was needed to monitor the system at all times.[102] Germany had to amend its legislation in order to allow autonomous vehicles on its roads.[103]

Germany's legislators proposed that articles of the *VC* – specifically Article 8 and Article 39(1) – be amended.[104] It is now believed that a driver fulfils his or her duty to remain in control of the vehicle at all times and that the system of the vehicle conforms with the *VC* only if it complies with the regulations of the UNECE or if the automated driving function can be switched off or be overridden by the driver.[105] The *VC* is referenced by the UNECE and that is seen as a great development, as the

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99 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41-42.

100 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41.

101 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41-42.

102 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 41-42.

103 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 42.

104 Articles 8 and 39(1) of the *Vienna Convention on Road Traffic*; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 42-43; Keller 2018 *RAIL* 102-204.

105 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 42-43.

UNECE adapts more regularly than the *VC* regarding any technical progress.[106] The amendments made by the *VC* are still considered to be vague and ambiguous.[107]

As driverless vehicles are not allowed, according to the *VC*, fully autonomous vehicles – such as Volkswagen Sedric, which has no pedals and no steering wheel – are considered to be illegal on German roads as Germany signed and ratified the *VC*.[108]

2.5 Conclusion

The *German Road Traffic Act* was amended in order for autonomous vehicles to be included in the Act. The amended Act includes fully automated vehicles, but these vehicles must have a driver in certain circumstances. In certain circumstances, the driver is obligated to retake control if it is requested by the vehicle automated systems or where the driver realises that he or she needs to retake control of the vehicle.[31]

Furthermore, under the new *Road Traffic Act,*[109] the automated system should be able to be manually overridden and a clear and concise protocol should be in place before a driver retakes control of the vehicle.[88] Germany also included mandatory legislation that requires that a data recorder be installed during the manufacturing stage of autonomous vehicles in order to document driver-machine handovers.[110] Germany has, to date, amended its legislation to allow the manufacturing and driving of self-driving vehicles. The EC focused on the liability aspect of these vehicles.

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106 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 43.

107 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 43.

108 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

109 Übereinkommens über den Straßenverkehr 1968.

110 Hetzner 2018 https://europe.autonews.com/article/20180810/ANE/180809841/germany-seeks-to-create-self-driving-infrastructure.

The next chapter focuses on autonomous vehicle legislation and the *Federal Automated Vehicle Policy* in the USA. Additionally, the USA's state and federal legislation on the manufacturing as well as driving of autonomous vehicles is discussed.

3 Autonomous vehicle legislation in the United States of America

3.1 Introduction

The USA is home to several innovative companies such as Uber, Tesla and Google that have already started to manufacture, test and sell autonomous vehicles, and these vehicles are already on their public roads.[111] In this chapter, the USA's *Federal Automated Vehicle Policy* and the legislation on autonomous vehicles (federal, state and local legislation) are examined and discussed.

In 2016, the US Department of Transportation introduced the *Federal Automated Vehicles Policy*.[112] This policy paved the way for autonomous vehicles in the USA.[113] This policy consists of four sections, which are further explained.[114] In short, the four sections comprise the following:

(i) The first section, known as "Guidance", outlines the practices for the development and testing of highly autonomous vehicles (HAVs) as well as the safety pre-development designs. This section further prescribes new reporting mechanisms to manufacturers.[115]

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111 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

112 Federal Automated Vehicle Policy of 2016.

113 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

114 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

115 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

(ii) The second section comprises the recommendations on how these policies should be implemented at the state level.[116]

(iii) The third section of the policy describes all the current regulatory tools available for manufacturers to change or adjust the existing regulations in order for autonomous technology to be tested and further developed.[117]

(iv) The fourth section lists potential authorities and new regulating tools that could change the environment of automotive regulators – that is, if these potential authorities and new regulatory tools are implemented.[118]

3.2 The United States of America's federal, state and local legislation, and the challenges that autonomous vehicle legislation faces

The USA has different types of laws, namely federal, state and local laws.[119] Federal law applies to all the states in the USA and includes laws that deal with immigration law, bankruptcy law, copyright and patent law, anti-discrimination and civil rights law, and so forth.[120] State law applies to the people who work or live in a particular state.[121] There are 50 states, and each state has its own laws and courts to handle matters of divorce, family, criminal, personal injury, wills and estates, real estate, welfare, et cetera.[122] Local laws apply to different cities, municipalities, towns,

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116 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

117 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

118 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

119 Legal Aid Society of North Eastern New York date unknown https://www.lawhelp.org/resource/the-differences-between-federal-state-and-loc.

120 Legal Aid Society of North Eastern New York date unknown https://www.lawhelp.org/resource/the-differences-between-federal-state-and-loc.

121 Legal Aid Society of North Eastern New York date unknown https://www.lawhelp.org/resource/the-differences-between-federal-state-and-loc.

122 Legal Aid Society of North Eastern New York date unknown https://www.lawhelp.org/resource/the-differences-between-federal-state-and-loc.

villages and townships in every state and some of them have their own legislation to regulate rent laws, local safety and zoning.[123]

At the national level, the USA's House of Representatives has passed autonomous vehicles legislation in order to establish identical standards for autonomous vehicles.[124] There are 42 states that have considered legislation on autonomous vehicles.[125] Even though the legislation process for autonomous vehicles in the USA is at the beginning stage, the public has a few issues with and concerns about autonomous vehicles, which include that they are unsafe, uncertain and create more risks.[126]

While autonomous technologies are progressing at an exponential rate, the progress of legislation is considered to be nonexponential,[127] and even though autonomous vehicles face numerous obstacles in the USA, the market for them is too large to ignore.[128]

3.3 The United States of America's federal automated vehicle policy

3.3.1 Vehicle Performance Guidance for Automated Vehicles: Guidance

The *Guidance* section of the policy was implemented to give instructions, advise and provide guidance on the safety measures that must be complied with as regards

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123 Legal Aid Society of North Eastern New York date unknown https://www.lawhelp.org/resource/the-differences-between-federal-state-and-loc.

124 Araya 2019 https://www.forbes.com/sites/danielaraya/2019/01/29/the-challenges-with-regulating-self-driving-cars/#47aa6bc0b260.

125 Araya 2019 https://www.forbes.com/sites/danielaraya/2019/01/29/the-challenges-with-regulating-self-driving-cars/#47aa6bc0b260.

126 Araya 2019 https://www.forbes.com/sites/danielaraya/2019/01/29/the-challenges-with-regulating-self-driving-cars/#47aa6bc0b260.

127 Araya 2019 https://www.forbes.com/sites/danielaraya/2019/01/29/the-challenges-with-regulating-self-driving-cars/#47aa6bc0b260.

128 Araya 2019 https://www.forbes.com/sites/danielaraya/2019/01/29/the-challenges-with-regulating-self-driving-cars/#47aa6bc0b260.

autonomous vehicles.[129] This section of the policy explains the process and regulations that these vehicles must comply with in order to ensure the safety of drivers and the public.[130]

The policy generally applies to all companies as well as individuals that manufacture, design, test and/or plan to sell automated vehicles and/or their systems in the US.[131] It also extends to suppliers and equipment designers and not only to car manufacturers.[132]

This section is comprehensive and introduces assessments known as "safety assessment letters".[133] The NHTSA[134] requests that entities as well as manufacturers voluntarily provide the safety assessment letter which explains how they followed the *Guidance* section.[135] The NHTSA states that future legislation and/or regulations will make the assessment process mandatory.[136] Therefore, it is suggested that manufacturers should implement their own internal assessments as it is prescribed in the *Guidance* section.[137]

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129 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

130 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

131 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 5-6.

132 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 5-6.

133 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

134 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 6-7.

135 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 7.

136 Keller 2018 *RAIL* 102-204.

137 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 11-13.

These safety assessments must be clear and concise.[138] However, this will be no simple task, as there are 15 guidance areas that need to be analysed.[139] The *Guidance* section of the policy states that entities and manufacturers must submit these safety assessments for each HAV system to the chief counsel of the NHTSA.[140] This indicates that entities and manufacturers must complete the safety assessment letter for each HAV system for each of the 15 guidance areas, which include, but are not limited, to: validation methods; ethical considerations; vehicle cybersecurity; crashworthiness; privacy; data recording; data sharing, and others.[141] The safety assessment for each HAV system and for each of the 15 guidance areas is not all that needs to be submitted to the NHTSA: entities and manufacturers will need to update these assessments regularly if there is a significant update on the HAV system or the vehicle.[142]

The NHTSA will facilitate the process of safety assessments by implementing certain steps.[143] The steps include that the NHTSA will publish a method that will help entities and manufacturers to classify their vehicle's automated system as well as to publish a template of the safety assessment.[144] The NHTSA is considering to mandate the safety assessments and the requirement that entities, who plan on operating and/or testing HAVs on the USA's public roads, must register with the

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138 Keller 2018 *RAIL* 102-204; Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

139 Keller 2018 *RAIL* 102-204; Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

140 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 11-13.

141 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 12-13.

142 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 13.

143 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

144 Keller 2018 *RAIL* 102-204.

NHTSA.[145] This will entail that the entities and manufacturers are required to report to the NHTSA items in relation to the *Guidanc*e areas.[146]

3.3.2 Model State Policy

The Model State Policy section states the intention of the Department of Transportation for the regulation of autonomous vehicles.[147] The Department of Transportation urges states to allow them to regulate the functioning and performance of HAV vehicles and technologies alone.[148] This Department further states that, even though technology has changed radically with regard to the technology of autonomous vehicles, there is no need to advocate for change between the states and the NHTSA's regulatory responsibility division.[149] The regulatory responsibility division for the operation of motor vehicles between the authorities of state and federal is evident; it states that the areas of responsibility should remain the same for HAVs.[150] The areas of responsibility are discussed below.[151]

The NHTSA's responsibilities include:[152]

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145 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 13.

146 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

147 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

148 Keller 2018 *RAIL* 102-204.

149 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 12-13.

150 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 13.

151 Keller 2018 *RAIL* 102-204.

152 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 38; Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

(i) setting Federal Motor Vehicle Safety Standards (FMVSS) for motor vehicle equipment and new vehicles;

(ii) educating and communicating motor vehicle safety issues to the general public;

(iii) enforcing compliance with the FMVSS;

(iv) managing and investigating the recall and the remedying the defects of vehicles with regard to safety and noncompliance thereof on a nationwide basis;

(v) releasing guidance for equipment manufacturers as well as vehicle manufacturers to abide by.[153]

The state's responsibilities include additional aspects of regulating motor vehicles, such as:[154]

(i) safety inspections, if the state decides to do so;

(ii) enforcing and enacting traffic regulations and laws;

(iii) regulating motor vehicle liability and insurance;

(iv) registering vehicles and licensing drivers in the state's own jurisdiction.[155]

The policy, however, states that the NHTSA prevents states from making standards that can regulate the performance if that specific standard is nonidentical to any of

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153 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 38.

154 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 38.

155 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 38.

the existing standards set by the FMVSS that regulate a similar facet of the performance.[156]

The policy further states – in addition to the fact that the safety regulations from a state cannot deviate from the federal safety regulations – that states are not allowed to implement regulations that will prevent any federal safety regulation to be implemented in the way it is meant to be implemented.[157] The Supreme Court of the USA stated that, if state law prohibits the execution and success of the safety standards of the NHTSA, it may be pre-empted.[158] The policy aims to guide states in fulfilling their responsibilities for the regulation of autonomous vehicles, including, for example, that:

(i) states should identify an agency that will be responsible for the consideration of the testing of HAVs;

(ii) the internal process should be developed by states, which should include the application for HAVs to be tested by manufacturers;

(iii) entities and manufacturers ought to submit applications to the agency that the state chose in the specific jurisdiction where they intend to test the HAVs;

(iv) the designated agency that the state identified should send a letter of authorisation to the entities or the manufacturers that will allow them to test HAVs in that state.[159]

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156 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

157 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

158 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 38; *Geier v American Honda Motor Co* 529 US 861 (2000).

159 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 40-41.

3.3.3 The NHTSA's current regulatory tools

The third section of the policy is where the NHTSA evaluates the current regulatory tools – the NHTSA urges the tools to be used to further the technology of autonomous vehicles.[160]

The policy describes three key regulatory devices, namely:

(i) rulemaking to create new standards or to amend the existing standards;

(ii) the exemption and interpretations for existing standards;

(iii) enforcement authority to address the defects that present an unnecessary safety risk.[161]

This third section, therefore, sets out methods that manufacturers and entities that are ready to proceed with the testing and the development of the technology of the autonomous vehicles can adhere to.[162] Interested entities should ask for guidance on the tools that they have at their disposal or they should consider the regulator tactic.[163]

3.3.4 New regulatory tools and authorities

In the fourth section of the policy, the NHTSA recognises the fact that HAVs are evolving rapidly, which therefore merits a review of the NHTSA's authorities as well as a regulatory tool.[164]

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160 Keller 2018 *RAIL* 102-204.

161 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 48.

162 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

163 Keller 2018 *RAIL* 102-204; US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

164 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

This resulted in possible new authorities and new tools that can be used to speed up the regulatory change and to regulate autonomous vehicles. The authorities include pre-market approval authority; safety assurance; enhanced data-collection tools; cease-and-desist authority; regular reviews; expanded exemption authority for HAVs; variable testing procedures; additional recordkeeping/reporting; and post-sale authority to regulate the changes in the software.[165]

The first authority – the pre-market approval authority – is worth analysing.[166] This authority drastically represents a change from the existing federal vehicle regulatory policy. At the moment, manufacturers are certifying their own vehicles and stating that their vehicles comply with the FMVSS.[167] With a new pre-approval framework, the NHTSA should determine if manufacturers' vehicles comply with the standards by testing the vehicle prototypes rather than having the manufacturers certify their own vehicles.[168] This will prohibit any manufacturer from selling their HAVs, unless the NHTSA assesses the safety of the vehicles, its performance and then approves the vehicle to ensure it complies with the policy and regulations.[169] This, however, could be seen as a burden for manufacturers, as this process may slow down the manufacturers' places of these new vehicles on the market every year.[170]

The NHTSA has a new policy that suggests its willingness to work with manufacturers to use the regulatory tools to reduce the requirements of the FMVSS

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165 Keller 2018 *RAIL* 102-204.

166 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 71.

167 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 73.

168 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf 72-74.

169 Keller 2018 *RAIL* 102-204

170 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

when the standards would unnecessarily hinder autonomous technologies to develop.[171]

3.4 The United States of America's legislation on autonomous vehicles

As mentioned above, the USA passed federal legislation, namely the *Safely Ensuring Lives Future Development and Researched in Vehicle Evolution Act*.[172] A similar bill was introduced, called The American Vision for Safer Transportation through the Advancement of Revolutionary Technologies (known as the AV START) Bill.[173] The above-mentioned Act and Bill prohibit states from enforcing or even enacting regulations or legislation on the construction, design or the performance of an HAV, an automated driving system, or a component thereof.[174] The Act and the Bill would, therefore, permit states to enforce the same standards as stated by the NHTSA.[175] The Act and the Bill prevent any state regulations or laws that relate to the registration, licensing, insurance traffic management, or law enforcement, unless that regulation or legislation is an arbitrary restriction of the automated driving system or the HAVs design, performance, or construction.[176]

The Act and Bill permit manufacturers and entities to acquire approval in order to sell up to 100,000 HAVs per annum from the third year that these bills are enacted, but only as long as the entities and the manufacturer can show that the approval mentioned above is in line with public interest as well as that HAVs are as safe as the current vehicles that are under the control of humans.[177]

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171 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

172 *Safely Ensuring Lives Future Development and Researched in Vehicle Evolution Act* 2017 (hereafter the *SELF DRIVE Act*).

173 Keller 2018 *RAIL* 102.

174 Keller 2018 *RAIL* 102.

175 Keller 2018 *RAIL* 102.

176 Keller 2018 *RAIL* 102-103.

177 Keller 2018 *RAIL* 102-103.

The Act and Bill require that each entity and manufacturer of automated driving systems or the HAV must submit an evaluation report on safety to the Secretary of Transportation.[178] Such an evaluation report is required to contain explanations on the way that the entities and manufacturer are addressing nine different subject areas; this would be done by validation, documented testing and assessment that relate to the progress of the HAV or the automated driving systems.[179] These reports would be made available to the public with the necessary confidential information redacted.[180] States are beginning to pass legislation that exempt persons that operate autonomous vehicles from obtaining a driver's license.[181]

Liability is a cause for concern, since autonomous vehicles, manufacturers and the driver or operator of the vehicle may be at fault.[182] The fault would not necessarily be with the manufacturer if the vehicle had signalled the driver/operator to take over and the driver/operator failed to do so.[183] Manufacturers are, however, only responsible for what the autonomous vehicle's technology system can reasonably foresee. However, it would be difficult to prove that the autonomous vehicle technology system sends a signal for the driver or operator to retake control.[184]

The liability claim is one that the USA still must provide clarity on. Certain states in America have enacted laws that protect manufacturers against liability claims, as a claim against manufacturers regarding a defect/defective part of the autonomous vehicles is not allowed, but only if the defect was caused by defective equipment

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178 Keller 2018 *RAIL* 103.

179 Keller 2018 *RAIL* 103.

180 Keller 2018 *RAIL* 103-104.

181 Keller 2018 *RAIL* 103-104.

182 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

183 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

184 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

from the manufacturer, or when a third party made the vehicle an autonomous vehicle.[185]

3.5 Conclusion

The USA's legislation is comprised of federal, state and local laws.[119] Federal law applies to all states and all people in the USA;[120] state law applies to everyone who resides and work in that particular state;[122] and local law applies to the different villages, townships, municipalities and cities in every state.[123]

The Department of Transportation introduced the *Federal Automated Vehicle Policy* in the USA; this policy consists of four sections.[114] The first section is known as "Guidance", which gives a guideline for the testing, developing and pre-development designs of autonomous vehicle.[115] The second section sets out recommendations on the implementation of the policy at the state level.[116] The third section of the policy sets out all the current regulatory tools that are available for manufacturers to adjust existing regulations and to further the development of autonomous technology.[117] The final section of the policy sets out a list of potential authorities as well as new regulatory tools that, if implemented, can change the automotive regulatory.[118]

The USA also passed two similar bills that indicate that no legislation or regulations can be permitted if they do not comply with the standard as stated by the NHTSA.[175] Both these bills also state that manufacturers should submit a safety report with regard to the HAV or the automated driving system, which will then be made available to the public.[180]

The next chapter focuses on South Africa and possible legislation on autonomous vehicles as well as the problems that this country may face in this regard.

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185 Keller 2018 *RAIL* 104.

4 Autonomous vehicle legislation in South Africa

4.1 Introduction

As mentioned in chapter 1, South Africa currently has no legislation on the manufacturing or the use of autonomous vehicles.[42] The South African *National Road Traffic Act* contains no regulations on autonomous vehicles or their technology.[186] The National Department of Transport in South Africa, however, states that companies may test autonomous vehicles as long as they do not endanger road users.[187] Furthermore, the National Department of Transport declared that legislation would have to be implemented before any autonomous vehicles would be allowed on public roads.[44]

In light of the above, South Africa must consider regulating autonomous vehicles. Autonomous vehicle legislation is being considered and drafted by countries because such legislation can make driving a lot safer for humans and countries hope that it would reduce accidents that cause serious injuries.[188] Statistics in South Africa show that the rate of road accidents in the country is extremely high, whether they are caused by speeding, human error, or driving under the influence.[189] Autonomous vehicles, on the other hand, would improve the statistics, as a drunk driver will no longer be seen as a drunk driver but as a drunk passenger.[190] The ability to drive will no longer be affected by drivers themselves; therefore, South African roads will be safer.[191]

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186 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

187 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

188 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

189 Autozone date unknown https://autozone.co.za/know-more/automotive-industry-news/autonomous-cars/.

190 Autozone date unknown https://autozone.co.za/know-more/automotive-industry-news/autonomous-cars/.

191 Autozone date unknown https://autozone.co.za/know-more/automotive-industry-news/autonomous-cars/.

4.2 Origin of current legislation on road traffic in South Africa

South Africa ratified the *VC* on Road Traffic in 1977.[192] As mentioned earlier, the *VC* is an international instrument that is based on regulating road traffic in order to create uniform regulations on road traffic.[193] One of the essential principles in the *VC* is that a driver must be in complete control of his or her vehicle, seeing as the highest level of autonomous vehicles are driven by the autonomous technology systems and they do not rely on any human to be their driver; fully autonomous vehicles do not comply with the essential principle of the *VC*.[194] In 2016, the *VC* was amended to include autonomous vehicles and to allow the driver to transfer certain tasks to the vehicle;[195] however, such a vehicle must comply with the United Nations regulations on vehicles and/or the vehicle must be able to be switched off or be overridden by the driver.[196]

By driving a non-autonomous vehicle, it is expected of the driver to be in control of his or her vehicle, and should a crash occur, the driver would be held liable.[197] The driver of an autonomous vehicle would also be liable if he or she had the chance to take or retake control of the vehicle.[198] Therefore, liability will only differ in cases where the autonomous vehicle system is in control of the vehicle.

South Africa's *National Road Traffic Act* defines the word "driver" as a person who attempts to or drives any vehicle, or a person who attempts to ride or rides any pedal, or a person who leads a pack, saddle animal, draught, flock of animals or a herd and "drives".[199] It is clear that South Africa's current legislation states that a person should be the driver.[200] In order for South Africa to introduce autonomous

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192 Hashim and Omar 2017 *JSAEM* 114.
193 Hashim and Omar 2017 *JSAEM* 115.
194 Hashim and Omar 2017 *JSAEM* 115.
195 Hashim and Omar 2017 *JSAEM* 115.
196 Hashim and Omar 2017 *JSAEM* 114, 116.
197 Hashim and Omar 2017 *JSAEM* 115.
198 Hashim and Omar 2017 *JSAEM* 115.
199 Definition xv of the *National Road Traffic Act*.
200 Definition xv of the *National Road Traffic Act*.

vehicle legislation, the legislators would have to expand the meaning of "driving" and "driver".[201] Furthermore, current legislation is inadequate and unable to handle the difficulties that AI-controlled technologies present.[202] Legislation for these autonomous vehicles is vital, as security, ethical and safety issues can have dire consequences.[203] South Africa does not have legislation on autonomous vehicles. South African legislation requires – according to chapter 3 of the *National Road Traffic Act* – that vehicles, manufacturers, builders and inspectors apply to the Member of the Executive Council to register the vehicle, manufacturer, builder, or inspector. The Member of the Executive Council is appointed in terms of the *Constitution of the Republic of South Africa*, 1996,[204] and this council is responsible for any road traffic issues.[205]

President Cyril Ramaphosa established a commission in order to prepare for and advise on the Fourth Industrial Revolution. The Fourth Industrial Revolution is defined as the merging of technologies, which means that the line between digital, biological and physical spheres is blurred.[206] Autonomous vehicles are considered to be a part of the Fourth Industrial Revolution, and South Africa's legislation must evolve with this revolution of technology. Technology is not an equalizer, as it requires regulations and legislation to maintain an equal society.[207] The Fourth Industrial Revolution is seen as a revolution that solves problems, and it is crucial for us to keep up with the revolution.[208]

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201 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

202 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

203 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

204 *Constitution of the Republic of South Africa*, 1996.

205 *Constitution of the Republic of South Africa*, 1996.

206 Business Tech 2018 https://businesstech.co.za/news/technology/288328/5-new-laws-south-africa-may-soon-look-at-introducing-including-self-driving-cars-and-gene-editing/.

207 Business Tech 2018 https://businesstech.co.za/news/technology/288328/5-new-laws-south-africa-may-soon-look-at-introducing-including-self-driving-cars-and-gene-editing/.

208 Business Tech 2018 https://businesstech.co.za/news/technology/288328/5-new-laws-south-africa-may-soon-look-at-introducing-including-self-driving-cars-and-gene-editing/.

4.3 Before autonomous vehicles are allowed on South African roads

South Africa has a long way to go and faces numerous challenges before autonomous vehicles can roam South African streets.[209] The CEO of Toyota South Africa, Andrew Kirby, stated at the Smarter Mobility Africa Summit that autonomous, connected, electrified and shared mobility services are indeed the future.[210] He believes that South Africa is not ready for autonomous vehicles and that they are at least a decade away on South African roads.[211] In his opinion, South Africa has to face a few challenges, such as infrastructure, road quality, smart cities, urban planning, technology advancements, and legislation.[212] Real-time data transfers are needed between the vehicles, as well as between the infrastructure and the vehicles in order to make South African roads a safe environment for these automated vehicles.[213]

South African legislators should take the following into consideration before drafting legislation on autonomous vehicles as well as the technology used in these vehicles:

4.3.1 Infrastructure

In preparation for autonomous vehicles, an important aspect will be the existing roads and the infrastructure thereof.[214] There are two aspects that autonomous vehicles would have to rely on, namely the external information system and the data input in order to navigate on a road.[215] Firstly, autonomous vehicles must rely on their own sensors, and secondly, those autonomous vehicles must rely on enhanced digital infrastructure.[216] This indicates that autonomous vehicles must be able to rely on their sensors to read the road ahead in order to process road signs

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209 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.
210 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.
211 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.
212 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.
213 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.
214 Hashim and Omar 2017 *JSAEM* 116.
215 Hashim and Omar 2017 *JSAEM* 117.
216 Hashim and Omar 2017 *JSAEM* 117.

or lane markings.[217] Unlike human drivers, autonomous vehicles would not be able to understand or interpret worn-out, confusing or non-existent road signs and lane markings.[218]

South Africa has unpaved as well as paved roads that are not up to standard with regard to the infrastructure requirements that autonomous vehicles need.[219] Therefore, major improvements are necessary before autonomous vehicles would be allowed on South African roads.[220]

Connected infrastructure[221] is the next step, where these systems are either installed within the road infrastructure or within the autonomous vehicle in order to collect information and process it.[222] This will also assist autonomous vehicles to communicate with each other and let the other autonomous vehicles know what or where they intend to go.[223] Autonomous vehicles can communicate with each other what the best possible strategy would be and optimise a driving plan with that information accordingly.[224]

4.3.2 Costs

Other problems with the implementation of autonomous vehicle legislation will be the costs.[225] Not only the expense – most South Africans will not be able to afford autonomous vehicles – but also the cost of establishing a commission to control the safety reports and the cost of repairing the infrastructure and maintaining it in order

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217 Hashim and Omar 2017 *JSAEM* 117-118.

218 Hashim and Omar 2017 *JSAEM* 116-117.

219 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.

220 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.

221 This is where technologies are either installed on the road or in vehicles in order to collect, process and exchange information between the vehicle and infrastructures; Hashim and Omar 2017 JSAEM 116-117.

222 Hashim and Omar 2017 *JSAEM* 116.

223 Hashim and Omar 2017 *JSAEM* 117.

224 Hashim and Omar 2017 *JSAEM* 117.

225 Autozone date unknown https://autozone.co.za/know-more/automotive-industry-news/autonomous-cars/.

for it to be able to accommodate autonomous vehicles, will be problems.[226] South Africa will probably not be able to accommodate autonomous vehicles on its roads for at least a couple of years. However, this does not mean that the country should sit back and wait for infrastructure to be built. Legislators now have the time they need to draft legislation by learning from other countries', such as Germany and the USA, legislation on autonomous vehicles in order to create or draft legislation as well as to form a commission to regulate these vehicles and the manufacturers long before it is needed.

4.3.3 Liability

Other issues that the legislator should consider are data protection, legal liability as well as legislation to punish or prevent malicious disruption of automated vehicle technologies.[227] South Africa's current legal liability is based on which person, involved in the accident, can prove the blame was on the other person for the injury or loss.[228] The legislator should, therefore, create legislation that states who is at fault in certain or specific situations, or at least give a guideline that courts can use.[229]

To determine the liability related to an autonomous vehicle, it is important to ascertain who was in control of the said vehicle, and if the driver was in control or was instructed by the autonomous vehicle to retake control of the vehicle, the driver will be held liable; however, if the autonomous technology system was in control of the vehicle, the manufacturer or the vehicle insurer can be held liable.[230] When regulations or legislation on autonomous vehicles are considered, it is important to

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226 Autozone date unknown https://autozone.co.za/know-more/automotive-industry-news/autonomous-cars/.

227 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

228 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

229 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

230 Hashim and Omar 2017 *JSAEM* 116, 117.

note that autonomous vehicles and their technology are evolving rapidly, which means that the regulations or legislation should be adaptive – this will be necessary to allow autonomous vehicles and their technology to evolve.[231]

From the discussion above, it is clear that South African legislation is not ready for autonomous vehicles. South Africa must, therefore, begin the legislative process before it is too late. South Africa's transport researchers and academics should lead a qualitative conversation about autonomous vehicles legislation in order to start the drafting of legislation.[232]

4.4 Recommended legislation on autonomous vehicles for South Africa

4.4.1 Introduction

Autonomous vehicle legislation and regulations are at an early age. Germany and the USA have legislation and/or regulations to regulate autonomous vehicles. Both countries are improving their legislation on autonomous vehicles and the technology that these vehicles use.

4.4.2 Legislation in the manufacturing stage

As stated above, both Germany and the USA have legislation in place that deals with the issue of autonomous vehicles from the manufacturing stage. Legislation that starts the regulation process of these vehicles from the manufacturing stage is vital, as the safety and security of autonomous vehicles can have dire consequences if not done correctly.[233] Regulating manufacturers is beneficial, as it ensures that all the safety standards are met and that the autonomous vehicles do not have any defects or other issues.

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231 Hashim and Omar 2017 *JSAEM* 116-118.

232 Wheels24 2019 https://www.wheels24.co.za/news/guides_and_lists/self-driving-vehicles-electric-cars-future-car-trends-and-major-disruptors-is-sa-ready-to-face-them-20190709?mobile=true.

233 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

Germany has implemented legislation that specifies that a black box or event data recorder must be installed in autonomous vehicles at the manufacturing stage.[56] This black box or event data recorder is used to collect and store data five seconds before and five seconds after a crash with the help of 16 sensors that record data simultaneously; it can also record data in a collision or crash without any power.[57] This black box is a vital part of an autonomous vehicle, as it helps with liability claims, which are subsequently discussed in more detail.[58]

Furthermore, Germany's legislation requires that autonomous vehicles be registered with the German authorities – this is a prerequisite to ensure that all the safety legislation, approved categories as well as the environmental standards are met.[234] The registration of vehicles is approved by the EC known as the German Federal Motor Transport Authority.[235]

The USA has similar regulations in place. The USA's policy section known as *Guidance* sets out the requirements of autonomous vehicle development, testing as well as pre-development designs which apply to manufacturers that design, test and manufacture autonomous vehicles and their technology systems, or the policy applies to individuals.[236] The *Guidance* section introduces safety assessments that should be completed for each autonomous vehicle system.[237] This assessment consists of 15 guidance areas that must be analysed and submitted to the NHTSA.[238] Autonomous vehicle manufacturers must also register with the NHTSA.[239]

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234 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

235 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

236 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

237 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

238 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

239 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

4.4.3 Autonomous vehicles and liability

As mentioned above, in Germany, the requirement that autonomous vehicles have a black box is so that the courts can determine liability in a collision or crash.[240] The black box records who was in control of the vehicle – that is, whether the driver or the autonomous vehicle system was in control of the vehicle.[241] According to German legislation, the driver would be held liable if he or she was in control of the vehicle when it crashed or collided; the manufacturer would be held responsible if the system failed and the autonomous vehicle system was in control of the vehicle in the case of a crash or collision.[242] Germany benefits from the black box, as it makes it easy for courts to prove liability in the case of an accident, but it also collects data that indicate whether technical errors occurred and reduces the amount of the premiums paid to insurers.[243]

The liability of autonomous vehicles in the USA is a cause for concern. The USA states that manufacturers would not be held liable if the autonomous vehicle system gave a signal to the driver and they failed to retake control of the vehicle.[244] The problem with liability in the USA is that it is difficult to prove who was in control of the autonomous vehicle technology system at the time of a collision or crash.[245] Thus, is it important to note that the black box regulation implemented by Germany can solve this problem, as it records who is in control of the vehicle.[246] South Africa would, therefore, benefit from the implementation of the regulation that requires a black box.

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240 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

241 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

242 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY.

243 Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

244 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

245 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf.

246 Keller 2018 *RAIL* 102-204.

Germany and the USA both make safety a continuous priority, as it is embedded in their legislation from the manufacturing stage where safety reports need to be filled out and sent to the respective authorities.[247] In Germany, the safety reports are sent to the EC, and in the USA, the reports or assessments are sent to the NHTSA.[248] These authorities are similar, as both countries have commissions to regulate the manufacturers and vehicles and to ensure that there is no defect or risk involved.[249]

South Africa should create or establish a commission that regulates and controls autonomous vehicle manufacturers as well as the vehicles so that the safety standards can be met.

4.5 Conclusion

South African road traffic legislation is based on the *VC*. The *VC* amended their definitions and legislation to include autonomous vehicle driving; however, a driver is still needed to retake control of the vehicle in the case of an emergency or if the autonomous vehicle system requires the driver to do so.[250] South Africa's *National Road Traffic Act* has no regulations for autonomous vehicles and their technology.[251] In order for South Africa to regulate autonomous vehicles, the country must improve its road infrastructure.[252] Autonomous vehicle legislation should also determine the liability of the driver or operator in a collision or crash.[253]

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247 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

248 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

249 US Department of Transportation 2016 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/federal_automated_vehicles_policy.pdf; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

250 Hashim and Omar 2017 *JSAEM* 111-123.

251 McKane 2018 https://mybroadband.co.za/news/motoring/257325-self-driving-cars-are-not-allowed-on-south-african-roads.html.

252 Malinga 2019 https://www.itweb.co.za/content/kYbe97XxPyQ7AWpG.

253 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

The legislation on autonomous vehicles of both Germany and the USA can be used as a guide to draft such legislation in South Africa to regulate autonomous vehicles as well as the technology used in these vehicles. This was addressed in this chapter.

Chapter 5 concludes with a brief discussion on autonomous vehicles legislation in Germany and the USA as well as the current position of South Africa in this regard. The previous chapters are summarised, and legislation is recommended.

5 Conclusion and recommendations

5.1 Background and research question

Autonomous vehicles are not a new concept, seeing as semi-automated vehicles – such as those including park distance control or speed control – are already in use.[254] These autonomous vehicles and their manufacturers are not regulated internationally or in South Africa. This study focused on autonomous vehicle legislation in Germany and the USA as well as the use and regulations of vehicles and autonomous vehicles in South Africa.

In this study, the following question was addressed: To what extent are automated vehicles and their use regulated in South Africa? Autonomous vehicle legislation was critically discussed in previous chapters. Both Germany and the USA have drafted and implemented autonomous vehicle legislation or regulations in order to allow these vehicles on their roads. The legislation and regulations of these countries can be used to guide South Africa with regard to the legislation process of autonomous vehicles.

5.2 Autonomous vehicle legislation in Germany and the USA

There is currently no international legal framework for autonomous vehicle legislation.[22] As mentioned above, autonomous vehicles range from humans driving

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[254] Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

the vehicle to the vehicle system assisting the driver and finally the vehicle technology system being in complete control of the vehicle.[255]

The *Vienna Convention* (VC) – that is, the origin of road traffic legislation of Germany and South Africa – does not allow fully autonomous vehicles, as the legislation requires a driver to retake control of the vehicle if the vehicle system notifies him or her to retake control or in the case of an emergency.[10] Germany adapted its legislation to include fully autonomous vehicles on their roads; however, this legislation still entails that there should be a driver in certain circumstances.[256]

Furthermore, Germany included legislation on the manufacturing of autonomous vehicles that requires an autonomous vehicle to include the following: (i) a black box or data recorder must be installed in the autonomous vehicle in order to help courts determine liability in the case of a collision or crash – thus, to determine who is to blame for the collision or crash; (ii) the vehicle, inspector and manufacturer have to register with the German Federal Motor Transport Authority, who has the discretion to register or to enable an autonomous vehicle, inspector and manufacturer to register.[257]

Germany's current legislation can be summarised as follows: (i) the driver must at all times be alert; (ii) the technology system of the autonomous vehicle must be able to be manually overridden; and (iii) a black box must be installed in the autonomous vehicle during manufacturing and the manufacturer, other entities and the vehicle must be registered.[82] Germany and its legislators are continuously busy adapting their legislation in order for technology to evolve.

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255 Rouse 2018 https://searchenterpriseai.techtarget.com/definition/driverless-car.

256 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

257 Escritt 2017 https://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY; Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

The USA introduced a policy to regulate autonomous vehicles.[113] This policy contains four sections covering autonomous vehicles and their safety.[115] The first section is known as *Guidance*.[115] This section consists of the following: the development and testing of HAVs and the pre-development designs and their practices; and a safety report mechanism containing 15 areas that need to be filled out with regard to each HAV system in each autonomous vehicle.[115] The second section recommends how the autonomous policies must be implemented at the state level.[116] The third section indicates all current regulating tools that are available for manufacturers to adjust or change current regulations so as to ensure that the technology is further tested and developed.[117] The final section covers new regulatory tools as well as potential authorities that can implement change in the autonomous vehicle environment.[118]

The USA's policy is applicable to each state in the country, but liability issues must be regulated by each state.[39] The liability issue is due to the fact that autonomous vehicles, manufacturers and the operator or driver may be at fault, [258] because there is no way of proving who was at fault in a collision or crash.[259]

South Africa has no legislation on autonomous vehicles, their technology systems, or the manufacturers.[40] Therefore, it was recommended in this study that the autonomous vehicle legislation of both Germany and the USA be examined and compared to guide the drafting of such legislation for South Africa. Other issues to consider before such legislation can be implemented in South Africa are the cost of infrastructure, the data and the manufacturing of autonomous vehicles.[260] The

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258 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

259 Norton Rose Fulbright 2017 https://www.nortonrosefulbright.com/-/media/files/nrf/nrfweb/imported/20170712--autonomous-vehicles-the-legal-landscape-of-dedicated-short-range-communication-in-the-us-u.pdf?la=en&revision=c0232f72-ad26-4bad-a444-af9223a7899a.

260 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

legislator should also consider data protection as well as storing autonomous vehicle data.[261]

5.3 Autonomous vehicle legislation: recommendations

Germany and the USA both have regulations that help them regulate the use, manufacturing and driving of autonomous vehicles. These countries are both improving their legislation on autonomous vehicles and their technology. They legislate or regulate autonomous vehicles from the manufacturing stage, as mentioned above.[262] Both these countries ensure safety and make sure that the standards as set out in their legislation are met in order to regulate autonomous vehicles and the products used to make them. It is, therefore, important for South African legislators to note that it is essential to legislate autonomous vehicles from the manufacturing stage, because the products, manufacturers and inspectors are held to a certain standard, which ensures that these vehicles, once manufactured, are safe to be on public roads.

Furthermore, the regulations of both these countries require that the manufacturers register the autonomous vehicle with the appropriate authority.[263] South Africa already requires vehicles and manufacturers to register; therefore, this legislation can be extended to include further registration in creating an autonomous vehicle.[264]

The legislation of these countries differ in that Germany implemented legislation to include a black box or an event data recorder that should be installed during the manufacturing stage.[56] The black box is not only beneficial to determine liability by indicating who was in control of the said vehicle in a crash, but it also records data that can be used in the future to improve the regulations or technology of

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261 Ngwenya 2019 https://www.ppmattorneys.co.za/self-driving-vehicle-laws-exist-only-in-the-future/.

262 Kassner 2017 https://www.techrepublic.com/article/why-laws-regulating-autonomous-vehicles-are-needed-now/.

263 Henkel *et al* 2016 *Norton Rose Fullbright Whitepaper* 40-44.

264 Chapter 3 of the *National Road Traffic Act*.

autonomous vehicles.[58] As mentioned above, the USA struggles with the liability issue; the black box is a beneficial way to solve the issue of who was in charge of the vehicle at the time of a collision or crash – the autonomous vehicle system or the driver.[265] South Africa would benefit from implementing regulation that requires a black box or data recorder.

South Africa must establish a commission that controls and regulates autonomous vehicles, manufacturers and other entities in order to ensure that the safety standards are met. Legislators should also act in regulating or at least begin the process of drafting legislation on autonomous vehicles.

5.4 Concluding remarks

This study showed that South Africa does not have legislation on autonomous vehicles and in order to draft such legislation, the government should invest in and improve the country's infrastructure as well as ensure that vehicles will have access to data and that the infrastructure has access to the data. Seeing as autonomous vehicles would be expensive and that the most of South Africa would not be able to afford or maintain an autonomous vehicle, it is advised that the infrastructure of big cities in the country, such as Cape Town and Johannesburg, improve their infrastructure to meet the required standard to enable these vehicles to drive on public roads until the infrastructure in the rest of South Africa can match that of these cities.

South Africa may not be ready for autonomous vehicle legislation. The improvement of current infrastructure and the maintenance thereof may be expensive for the country. However, this should not stop South Africa to start the legislative process in this regard, as it may take a while for legislators to draft a bill.

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[265] Hall-Geisler 2016 https://techcrunch.com/2016/05/13/the-importance-of-black-boxes-in-an-autonomous-automotive-future/.

This study was conducted to make recommendations on possible autonomous vehicle legislation in South Africa and to determine the country's position on autonomous vehicles. It is important to keep up with technology, as it is ever-changing.

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