DRIVING THE FUTURE: ANTIQUATED TREATIES, UNINTENDED EFFECTS, AND INCONSISTENT IMPLEMENTATION OF AUTONOMOUS VEHICLE LAW

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INTRODUCTION

Road traffic injuries account for over 1.35 million deaths and 50 million non-fatal injuries world-wide each year.[1] In light of increased global population and motorization, the fact that the rate of deaths has plateaued since 2007 shows that global efforts to increase safety have saved lives.[2] However, this picture is not quite what it seems. Low- and middle-income countries—with 90% of road traffic deaths worldwide, 82% of the world's population, and yet only 54% of the world's registered vehicles—currently bear a disproportionate amount of these deaths.[3] Furthermore, sixty-eight countries, 84% of which are low- to middle-income, have actually seen an increase in road-related deaths.[4] Finally, while stabilization of death rates is a step in the right direction, there is no evidence that the rate of vehicular related deaths is set to decline in the coming years.[5]

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1 World Health Organization [WHO], *Global Status Report on Road Safety 2018*, at ix (2018) [hereinafter *Global Status Report on Road Safety 2018*].

2 *Id.* at 4; World Health Organization [WHO], *Global Status Report on Road Safety 2015*, at 2 (2015) [hereinafter *Global Status Report on Road Safety 2015*].

3 *Global Status Report on Road Safety 2015*, *supra* note 2, at 4; *see also Global Status Report on Road Safety 2018*, *supra* note 1 (reiterating that "low- and middle-income countries [continue to] bear the greatest burden of road traffic fatalities and injuries.").

4 *Global Status Report on Road Safety 2015*, *supra* note 2, at 5.

5 *Id.* at 2; *Global Status Report on Road Safety 2018*, *supra* note 1, at xi, 4.

Research has shown that 90-94% of road-related accidents are the result of human error.[6] The onset of autonomous vehicle technology promises to reduce the number of road-related deaths and injuries by taking the human driver out of the equation.[7] However, current regulations were not designed in contemplation of autonomous vehicle technology.[8] The result thus far has been individual countries slowly modifying regulations to permit testing and use of autonomous vehicles in a regulatory patchwork.[9]

While individual countries may be able to make moderate adaptations to their current regulations, a more comprehensive, international framework is needed to truly effectuate the safety benefits autonomous vehicles could bring on a global scale. Given that the advent of the modern vehicle called for such an international framework, it seems as though such a transformative shift in the way society views and handles transportation, such as autonomous vehicles, requires a similar comprehensive and international framework.[10] Revamping the international framework becomes all the more pertinent given the critical role the current international frameworks play in bringing about increased road safety in low- and middle-income nations[11]—especially when these same countries are seemingly more ready to accept and implement the

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[6] In the U.S., the National Highway Traffic Safety Administration has estimated human error to be a critical factor in 94% of crashes. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., DOT HS 812 115, CRITICAL REASONS FOR CRASHES INVESTIGATED IN THE NATIONAL MOTOR VEHICLE CRASH CAUSATION SURVEY (2015); NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., DOT HS 811 059, NATIONAL MOTOR VEHICLE CRASH CAUSATION SURVEY, REPORT TO CONGRESS 24 (2008). The European Parliament's Committee on Transport and Tourism has found human error to be a critical factor in 90% of crashes. ROBERTA FRISONI ET AL., SELF-PILOTED CARS: THE FUTURE OF ROAD TRANSPORT? 87 (Adrienn Borka ed., 2016).

[7] *See* Michelle Bertoncello & Dominik Wee, *Ten Ways Autonomous Driving Could Redefine the Automotive World*, MCKINSEY & COMPANY (June 2015), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world [https://perma.cc/H69E-D7TB].

[8] *See* David Z. Bodenheimer, *Message from the Chair – SciTech Tackles the Latest Revolution: Autonomous Vehicles*, 14 SCITECH LAW. 2 (2018).

[9] *See* Tony Peng, *Global Survey of Autonomous Vehicle Regulations*, SYNCED (Mar. 15, 2018), https://syncedreview.com/2018/03/15/global-survey-of-autonomous-vehicle-regulations/ [https://perma.cc/BBF6-TBK8].

[10] *See* Bodenheimer, *supra* note 8.

[11] Press Release, U.N. Econ. Comm'n for Europe [UNECE], 50 Years On, the 1968 Conventions on Road Traffic and Road Signs and Signals are Still at the Core of Road Safety Efforts Worldwide (Nov. 8, 2018), https://www.unece.org/info/media/presscurrent-press-h/transport/2018/50-years-on-the-1968-conventions-on-road-traffic-and-road-signs-and-signals-are-still-at-the-core-of-road-safety-efforts-worldwide/doc.html [https://perma.cc/VF9U-LYSZ] [hereinafter UNECE Press Release].

recent advances in automotive technology.[12] However, low- and middle-income nations would not be the only major beneficiaries of a new international framework; many European countries are also hampered by the current regulatory scheme, thus slowing development of the industry.[13]

The rate at which autonomous vehicle technology has been progressing is faster than many industry experts and regulatory bodies have anticipated, resulting in antiquated vehicle regulatory schemes which are inadequate to govern and facilitate the adoption of autonomous vehicle technology.[14] This note argues for starting anew and implementing international regulations specifically for the operation of autonomous vehicles. The argument draws on the faults in the current regulatory scheme as it pertains to autonomous vehicle technology and the infeasibility of amending these regulations to permit smooth adoption of the technology.

This note will begin with a brief description of the current state of the autonomous driving industry in Part I, by outlining how autonomous vehicles are categorized and providing a brief overview of current international treaties governing driving. Part II will follow with an analysis of the language of the current international treaties and the respective effects that their interpretations have had on the adoption and legality of autonomous vehicles. Part III will discuss the efforts being taken to avoid the deleterious effects of the limiting language in those frameworks. Part IV identifies some related regulations and concerns that must be considered when enabling the use of autonomous vehicles. Part V then expands on these changes and discusses the need for additional regulations to ensure modifications in the definition of a driver are actually effectuated and not merely symbolic. Finally, Part VI provides a more in-depth discussion on some recent amendments to the treaties, made in an attempt to keep pace with technological advances in the industry.

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[12] *See* IPSOS, PUBLIC OPINION ON A FUTURE WITH DRIVERLESS CARS 18–19 (March 2018), https://www.ipsos.com/sites/default/files/ct/news/documents/2018-03/driverless_cars-2018.pdf [https://perma.cc/E6TN-9AYU].

[13] *See* Frisoni, *supra* note 6, at 54.

[14] *See* CTR. FOR THE STUDY OF THE PRESIDENCY & CONG., THE AUTONOMOUS VEHICLE REVOLUTION: FOSTERING INNOVATION WITH SMART REGULATION 2 (2017).

I. BACKGROUND

A. QUICKLY ADVANCING TECHNOLOGY AND SLOW LEGISLATIVE REACTION

The progression of autonomous vehicle technology over the course of the last decade has advanced faster than many could have imagined.[15] Large automakers are promising fully autonomous vehicles in the near future,[16] newcomers to the market are making promising strides to bring the technology to consumers,[17] ride-sharing services are beginning to provide their services using autonomous vehicles,[18] and large technology companies not traditionally associated with the vehicle sector

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[15] *Id.*; XAVIER MOSQUET ET AL., BOS. CONSULTING GRP., REVOLUTION IN THE DRIVER'S SEAT: THE ROAD TO AUTONOMOUS VEHICLES 16–18 (2015) (predicting that autonomous vehicles will reach a 25% market share between 2035 and 2040).

[16] General Motors, with collaboration from Honda, is the first major manufacturer to use mass-production methods for the production of autonomous vehicles and has planned to begin commercialization in 2019. Masayasu Ito, *Honda Stakes Self-Driving Future on GM with $2.8bn Investment*, NIKKEI (Oct. 3, 2018, 9:47 PM), https://asia.nikkei.com/Business/Companies/Honda-stakes-self-driving-future-on-GM-with-2.8bn-investment [https://perma.cc/DJC3-YX3B]. Ford Motor Company plans to deploy a Level 4 self-driving vehicle by 2021. Neal E. Boudette, *Ford Promises Fleets of Driverless Cars Within Five Years*, N.Y. TIMES (Aug. 16, 2016), https://www.nytimes.com/2016/08/17/business/ford-promises-fleets-of-driverless-cars-within-five-years.html [https://perma.cc/GE7S-HLHN]. Fiat Chrysler expects to bring a vehicle with fully autonomous capabilities to market by 2023. Tommaso Ebhardt, *Here's What Fiat Chrysler's Five-Year Road Map Looks Like*, BLOOMBERG (Jun. 01, 2018, 1:49 AM), https://www.bloomberg.com/news/articles/2018-06-01/what-to-expect-from-marchionne-s-farewell-show-at-fiat-chrysler [https://perma.cc/VPT6-YVQV]. BMW has announced plans to bring a self-driving electric vehicle to the market by 2021. Peter Valdes-Dapena, *BMW Unveils Its Vision for a Self-Driving Electric Car*, CNN BUS. (Sep. 15, 2018), https://www.cnn.com/2018/09/27/cars/bmw-vision-inext-self-driving-electric/index.html [https://perma.cc/A2U8-FNPQ].

[17] *See* Erika Fry, *How Tesla and Elon Musk are Designing a New Paradigm for Drivers,* FORTUNE (Dec. 22, 2017), http://fortune.com/2017/12/22/tesla-elon-musk-design/ [https://perma.cc/ZE74-9JSS]; Elisabeth Behrmann & Christoph Rauwald, *Parts Supplier to Challenge VW, Ford with $14 Billion Push into Self-Driving Cars*, BLOOMBERG: HYPERDRIVE (Sep. 19, 2018, 7:38 AM), https://www.bloomberg.com/news/articles/2018-09-19/vw-ford-get-competition-from-zf-s-14-billion-autonomous-push [https://perma.cc/9BQF-AFWG].

[18] Addison Lee, a London taxi firm, has partnered with Oxbotica to bring self-driving taxis to London by 2021. Jeremy Kahn, *London Taxi Firm Addison Lee Promises Self-Driving Cars by 2021*, BLOOMBERG (Oct. 21, 2018, 6:01 PM), https://www.bloomberg.com/news/articles/2018-10-21/london-taxi-firm-addison-lee-promises-self-driving-cars-by-2021[https://perma.cc/WQ83-JKHH]. Zipcar, Uber, Lyft, and BlaBlaCar are working to shape policy to limit autonomous vehicle operations in dense urban areas to shared fleets. Becca Caddy, *Uber and Co Don't Want You to Own your Own Self-Driving Car*, TECHRADAR (Feb. 2, 2018), https://www.techradar.com/news/uber-and-co-dont-want-you-to-own-your-own-self-driving-car [https://perma.cc/6LLV-DT5S].

are testing their own software and hardware for use in autonomous vehicles.[19] However, while industry may be racing to bring this technology to market[20] to ensure future profitability,[21] the legislature has not been so quick to address it, leaving the industry to self-govern in this new arena.

B. LEVELS OF AUTONOMY

The Society of Automotive Engineers (SAE) has promulgated SAE Standard J3016, which defines six levels of vehicle automation on a scale of 0–5—with 0 representing no automation and 5 representing full automation.[22] Countries have adopted this definition of autonomous

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[19] Intel/Mobileye is testing their self-driving technology in Jerusalem. Max Chafkin, *The Autonomous-Car Company That's Selling Safety First*, BLOOMBERG BUSINESSWEEK (May 16, 2018, 4:00 AM), https://www.bloomberg.com/news/features/2018-05-16/intel-s-autonomous-car-company-is-selling-safety-first [https://perma.cc/23QS-6WF8]. NVIDIA offers hardware and software targeted toward the self-driving vehicle market. Karl Fruend, *NVIDIA: From the Datacenter to the Autonomous Car*, FORBES (Sep. 28, 2018, 11:44 AM), https://www.forbes.com/sites/moorinsights/2018/09/28/nvidia-from-the-datacenter-to-the-autonomous-car/#62da90267d23 [https://perma.cc/PMF7-L57S]. Apple is looking at testing its own self-driving technology. Andrea Miller, *Some of the Companies that are Working on Driverless Car Technology*, ABC News (Mar. 21, 2018, 3:03 PM), https://abcnews.go.com/US/companies-working-driverless-car-technology/story?id=53872985 [https://perma.cc/ZJU4-XK3F]. Google/Waymo has begun testing Level 4 autonomous vehicles with a limited selection of the public, in some cases without a backup safety driver. Tom Randall & Mark Bergen, *Waymo's Self-Driving Cars Are Near: Meet the Teen Who Rides One Every Day*, BLOOMBERG (July 31, 2018, 11:45 AM), https://www.bloomberg.com/news/features/2018-07-31/inside-the-life-of-waymo-s-driverless-test-family [https://perma.cc/ULP4-BTTE].

[20] Major players and would-be competitors in the autonomous vehicle market formed 271 strategic partnerships in 2017, up from just 131 in 2016, to try and get ahead of other competitors, share costs, and spread risk. William Boston & Sean McLain, *Auto Allies Plan for Tech-Driven Future*, WALL ST. J., Oct. 18, 2018, at B3.

[21] The global market for autonomous vehicles is expected to be $54.23 billion in 2019, with an increase to $556.67 billion by 2026. Ed Garsten, *Sharp Growth in Autonomous Car Market Value Predicted but May be Stalled by Rise in Consumer Fear*, FORBES (Aug. 13, 2018), https://www.forbes.com/sites/edgarsten/2018/08/13/sharp-growth-in-autonomous-car-market-value-predicted-but-may-be-stalled-by-rise-in-consumer-fear/#27573ded617c [https://perma.cc/X5U6-Q58G]. The World Economic Forum estimates show that the transformation of the automotive industry will bring another $3.1 trillion in other societal benefits between 2016 and 2025. World Econ. Forum [WEF], *Digital Transformation of Industries: Automotive Industry* 4 (Jan. 2016).

[22] SAE INT'L, TAXONOMY AND DEFINITIONS FOR TERMS RELATED TO DRIVING AUTOMATION SYSTEMS FOR ON-ROAD MOTOR VEHICLES 2 (June 15, 2018), https://doi.org/10.4271/J3016_201806 [https://perma.cc/3MNE-M2K6] [hereinafter Standard J3016].

vehicles and it has become the industry standard.[23] However, most governments have gone no further, reluctant to put any concrete measures in place and instead have deferred to non-binding responses to industry questioning and created working groups and councils to explore this burgeoning area of technology.[24]

The levels of automation are based on (1) whether a human driver or an automated driving system is in control of the driving task—split into lateral/longitudinal motion (steering/acceleration) of the vehicle and detection of external stimuli—on a sustained basis, and (2) whether a human driver is expected to take over in response to external stimuli.[25] Sustained control of the driving task includes controlling all or part of the driving task in the absence of external stimuli, as well as responding to external stimuli and continuing the driving task thereafter.[26] Based on this definition, active safety systems, such as dynamic stability control, lane keeping assistance, and emergency braking—which merely intervene in dangerous situations without changing or eliminating the role of the driver—are not considered automated driving systems and may be included in vehicles of any level of automation.[27] The level of automation is determined by what features are engaged at any particular time, not by what level of automation the vehicle is ultimately capable of reaching.[28]

Level 0, no automation, is controlled solely by a human driver.[29] The human driver controls both lateral and longitudinal motion and is responsible for detecting and responding to external stimuli.[30] These types of vehicles encompass the majority of vehicles on the road today.

Level 1, driver assistance, is the lowest level of automation.[31] Here, the automation system is responsible for a single aspect of the driving task, either the lateral or the longitudinal motion of the vehicle,

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[23] *See* Kyle Hyatt & Chris Paukert, *Self-driving Cars: A Level-by-Level Explainer of Autonomous Vehicles*, ROAD SHOW (Mar. 29, 2018, 1:13 PM), https://www.cnet.com/roadshow/news/self-driving-car-guide-autonomous-explanation/ [https://perma.cc/A4DE-TLV9].

[24] Araz Taeihagh & Hazel Si Min Lim, *Governing Autonomous Vehicles: Emerging Responses for Safety, Liability, Privacy, Cybersecurity, and Industry Risks*, 39 TRANSP. REVIEWS 103, 103 (2019), available at doi.org/10.1080/01441647.2018.1494640.

[25] Standard J3016, *supra* note 22, at 2, 6.

[26] *Id.* at 15.

[27] *Id.* at 2–3.

[28] *Id.* at 2.

[29] *Id.* at 19, 21.

[30] *Id.* at 19. Lateral movement encompasses steering while longitudinal motion includes acceleration and braking. *Id.* at 6.

[31] *Id.*

with the human driver responsible for the remaining driving tasks, as well as detecting and responding to external stimuli.[32] In response to external stimuli, the driver is expected to take control of the entire driving task immediately, thereby requiring the automation system to disengage instantly upon request by the driver.[33] The most common examples of this type of automation are cruise control and adaptive cruise control.[34]

Level 2, partial driving automation, allows for the automation system to assist in multiple aspects of the driving task, both lateral and longitudinal motion of the vehicle.[35] The driver determines when to engage the automation system and is required to perform the remaining parts of the driving task, including monitoring for external stimuli.[36] In response to stimuli, the driver determines whether to disengage the automated driving system.[37] Should the driver decide to disengage the automation system, they must manually do so, such as by pressing the brakes, and immediately take over all parts of the driving task.[38] Examples of this level of automation include General Motors Super Cruise, Mercedes-Benz Drive Pilot, Volvo Pilot Assist, Nissan ProPilot Assist, and Tesla Autopilot.[39]

Level 3, conditional driving automation, permits that the automation system controls all aspects of the driving task when a human driver decides to engage the system, provided that the automation system determines driving conditions are within its allowable scope of operation.[40] Once engaged, the automation system controls lateral and longitudinal motion while monitoring and responding to external stimuli and while determining how to achieve a minimal risk condition.[41] If the

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[32] *Id.* at 19, 21.

[33] *Id.* at 21.

[34] Robert J. Szczerba, *Rise of the Machines: Understanding the Autonomy Levels of Self-Driving Cars,* FORBES (Jul. 19, 2018, 11:43 AM), https://www.forbes.com/sites/robertszczerba/2018/07/19/rise-of-the-machines-understanding-the-autonomy-levels-of-self-driving-cars/#273aef669593 [https://perma.cc/E5H7-57D9].

[35] Standard J3016, *supra* note 22, at 19, 21.

[36] *Id.*

[37] *Id.* at 21.

[38] *Id.*

[39] Szczerba, *supra* note 34.

[40] Standard J3016, *supra* note 22, at 19, 22. The scope of operation is the "[o]perating conditions under which a given [automation system] is specifically designed to function, including, but not limited to, environmental, geographical, and time-of-day restrictions, and/or the requisite presence or absence of certain traffic or roadway characteristics." *Id.* at 14.

[41] Standard J3016, *supra* note 22, at 19, 22. A minimal risk condition is defined as a "condition to which a [human driver] or an [automation system] may bring a vehicle after [responding to an

automated system is unable to respond to stimuli or control either lateral or longitudinal motion appropriately, the automation system must request the human driver to intervene before disengaging, allowing a reasonable time for driver response.[42] Additionally, the system should immediately disengage upon any request by the human driver.[43] The only current example of a production system reaching this level of automation is Audi Traffic Jam Pilot.[44]

Level 4, high driving automation, requires that the driver, whether present in a vehicle or not, determine when to engage the driving automation system, provided that the automation system determines driving conditions are within its allowable scope of operation.[45] Once the system is engaged, if the human driver is present in the vehicle, the driver becomes a passenger, and the automation system controls all aspects of the driving task; the human driver may opt to respond to a request to intervene from the automation system.[46] The automation system disengages only if it achieves a minimal risk condition or if the human driver is performing the entire driving task; any request to disengage by the human driver may be delayed until a minimal risk condition is achieved.[47] This technology is not currently on the market, but the most prominent example is the test cars used by Waymo/Google.[48]

Level 5, full driving automation, is the highest level of automation.[49] The human driver, whether present in the vehicle or not, determines when to engage the system, and the system permits

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external stimulus] in order to reduce the risk of a crash when a given [action] cannot or should not be completed." *Id.* at 11 (emphasis removed).

42 Standard J3016, *supra* note 22, at 19, 22.

43 *Id.* at 22.

44 Hyatt, *supra* note 23. While debuting in 2019, this technology will not be immediately available to the U.S. market due to regulatory issues, namely "a patchwork of existing (and sometimes conflicting) state-to-state regulations," and consumer misuse and over-trust. Chris Paukert, *Why the 2019 Audi A8 Won't Get Level 3 Partial Automation in the US*, ROAD SHOW (May 14, 2018, 9:01 AM) https://www.cnet.com/roadshow/news/2019-audi-a8-level-3-traffic-jam-pilot-self-driving-automation-not-for-us/ [https://perma.cc/WW7G-6LBA]. With regard to consumer issues, Google encountered similar problems with Level 3 test vehicles back in 2012, leading the company to refrain from bringing the technology to market. Hyatt, *supra* note 23.

45 Standard J3016, *supra* note 22, at 19, 22.

46 *Id.* at 22.

47 *Id.*

48 Szczerba, *supra* note 34; FRISONI, *supra* note 6, at 13 (noting Google's prominence in the autonomous vehicle industry).

49 Standard J3016, *supra* note 22, at 19, 23.

engagement under any condition.[50] Any human driver present in the vehicle becomes a passenger.[51] The automation system will react to all stimuli, and while the system may still request human driver intervention, it does not require that the human driver respond or intervene.[52] However, the former human driver, now passenger, may request that the system disengage, but the system may delay fulfilling the request until it determines that a minimal risk condition has been reached and that the driver is performing the entire driving task.[53] This technology is not currently available on the market.[54]

C. GOVERNING INTERNATIONAL TREATIES

Currently there are two treaties governing international vehicle regulations: the 1949 Geneva Convention on Road Traffic (the Geneva Convention) and the 1968 Vienna Convention on Road Traffic (the Vienna Convention).[55] While the two treaties contain language that is quite similar, there are subtle differences that have had a substantial impact on where autonomous vehicles have been allowed to operate. One of the most prominent and noteworthy examples of this is that the US and China are not subject to the stricter regulatory frameworks, such as the Vienna Convention, that most European countries are, and as a result the US and China have proven to be the preferred testbed for autonomous vehicle technology.[56]

The Geneva Convention requires that "every vehicle or combination of vehicles proceeding as a unit shall have a driver,"[57] the

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[50] *Id.* at 23.

[51] *Id.*

[52] *Id.*

[53] *Id.*

[54] Kathleen Walch, *The Future with Level 5 Autonomous Cars*, FORBES (Jun. 20, 2019, 10:22 PM), https://www.forbes.com/sites/cognitiveworld/2019/06/20/the-future-with-level-5-autonomous-cars/#2a9d77f4382b [https://perma.cc/8AZV-4RKN] ("No commercial production of a level 5 vehicle exists, but companies such as Zoox, Google's Waymo, and many others are working towards this goal.").

[55] Convention on Road Traffic, Sept. 19, 1949, 3 U.S.T. 3008, 125 U.N.T.S. 22 [hereinafter Geneva Convention]; Convention on Road Traffic, Nov. 8, 1968, 1042 U.N.T.S. 17 [hereinafter Vienna Convention].

[56] *See* Frank Jacobs, *Why Europe is Losing the Race for Autonomous Vehicles*, FLEET EUROPE (Aug. 28, 2018), https://www.fleeteurope.com/en/smart-mobility/europe/features/why-europe-losing-race-autonomous-vehicles [https://perma.cc/9MEN-WDZX].

[57] Geneva Convention, *supra* note 55, art. 8 (1).

"driver" defined as "any person who drives a vehicle,"[58] who "shall at all times be *able* to control their vehicle[]."[59] It has been suggested that this language permits the use of high levels of autonomy which permit a human driver to intervene in the driving task if they so desire, even though it is not required for operation of the vehicle.[60] This interpretation has some weight given that it has been generally accepted by the signing states, including both the United States and China, where the majority of autonomous vehicle testing is occurring.[61]

The language of the Vienna Convention is similar, requiring that "every moving vehicle or combination of vehicles shall have a driver,"[62] defined as a "person who drives a motor vehicle,"[63] who "shall at all times be able to control [their] vehicle."[64] However the Vienna Convention is more restrictive, further requiring "every driver of a vehicle *shall in all circumstances have his vehicle under control* so as to be able to exercise due and proper care and to be at all times in a position to perform all manoeuvres required of him."[65] Because of this language, the Vienna Convention has been subject to minor amendments in a futile attempt to reduce the effect of the treaty in hamstringing the adoption and advancement of autonomous vehicles.[66] To circumvent the restriction that the driver must have the vehicle under control at all times, something that is not possible if you are considered a passenger, the amendment provides:

> Vehicle systems which influence the way vehicles are driven shall be deemed to be in conformity with paragraph 5 of this Article and with paragraph 1 of Article 13, when they are in conformity with the conditions of construction, fitting and utilization according to international legal instruments concerning wheeled vehicles,

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[58] *Id.* art. 4.

[59] *Id.* art. 8 (5) (emphasis added).

[60] Andrew Swanson, *"Somebody Grab the Wheel!": State Autonomous Vehicle Legislation and the Road to a National Regime*, 97 MARQ. L. REV. 1085, 1123–25 (2014); Bryant Walker Smith, *Automated Vehicles are Probably Legal in the United States*, 1 TEX. A&M L. REV. 411 (2014).

[61] *See* Jacobs, *supra* note 56.

[62] Vienna Convention, *supra* note 55, art. 8 (1).

[63] *Id.* art. 1 (v).

[64] *Id.* art. 8 (5).

[65] *Id.* art. 13 (emphasis added). The similar provision of the Geneva Convention is less restrictive, requiring that "the driver of a vehicle shall at all times have its speed under control and shall drive in a reasonable and prudent manner." Geneva Convention, *supra* note 55, art. 13 (emphasis added).

[66] *See* FRISONI, *supra* note 6, at 54; *see also* Jacobs, *supra* note 56.

> equipment and parts which can be fitted and/or be used on wheeled vehicles.[67]

The intent of the amendment was to permit use of automation systems under the Convention, allowing for the use of automation systems that influence the way a vehicle is driven and those that can be engaged and disengaged by the driver.[68] However, the amendment is not broad enough to allow operation of high-level autonomous vehicles. Instead, it merely makes clear that driver assistance (Level 1), partial driving automation (Level 2), and conditional driving automation (Level 3) systems fall within the scope of the Convention.[69] Bringing more advanced autonomous technology, high level or full automation (Level 4 and Level 5, respectively), within the scope of the Vienna Convention would require further amendments to the Convention to account for the fact that these systems may not require a driver at all.[70]

II. INTERPRETATION OF EXISTING INTERNATIONAL TREATIES

As mentioned earlier, the advent of the motor vehicle was a highly significant event in history, warranting not one, but two international treaties: first, the Geneva Convention, and later, the Vienna Convention.[71] The Conventions were designed not only to promote safety in international travel, but also to promote the development of and facilitate international travel.[72] Thus far, the treaties have seemingly met this purpose, with studies showing that the global rate of traffic deaths has plateaued, and both Conventions setting out requirements for international driving permits that will be recognized in the respective signatory nations.[73]

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[67] Econ. Comm'n for Eur., Inland Transp. Comm., Rep. of the Sixty-Eighth Session of the Working Party on Road Traffic Safety, at 9, U.N. Doc. ECE/TRANS/WP.1/145 (Apr. 17, 2014) [hereinafter Working Party 68].

[68] FRISONI, *supra* note 6, at 54.

[69] *Id.* at 55.

[70] *Id.*

[71] Geneva Convention, *supra* note 55; Vienna Convention, *supra* note 55.

[72] Geneva Convention, *supra* note 55, at 15; Vienna Convention, *supra* note 55, at 1.

[73] *See Global Status Report on Road Safety 2018*, *supra* note 1, at 4; *Global Status Report on Road Safety 2015*, *supra* note 2, at 2, 55; Geneva Convention, *supra* note 53, art. 24, annex 9; Vienna Convention, *supra* note 53, art. 41–42, annex 7.

A. INCONSISTENCIES BETWEEN TREATIES

However, in an effort to create uniformity in international driving regulations, the two conventions have fallen short; not every nation has signed on as a party to both treaties.[74] There are 98 parties to the Geneva Convention, including most of the European nations and the United States, but excluding China.[75] On the other hand, there are currently 79 parties to the Vienna Convention, likewise including most of the European nations, but, notably, missing both the United States and China.[76] While this discrepancy in signatory nations may not have had large implications in the past, the introduction of autonomous vehicle technology combined with increased globalization over the past few decades have brought this discrepancy to light.

The treaties were not designed with such advances as autonomous vehicles in mind, defining drivers not only as those who drive a vehicle, but in the case of the Geneva Convention, those who "guide[] draught, pack or saddle animals or herds or flocks,"[77] and in the case of the Vienna Convention, those who "guide[] cattle, singly or in herds, or flocks, or draught, pack or saddle animals, on a road."[78] In addition, both treaties hold to the traditional assumption that a vehicle requires a driver and that the driver is a human being.[79]

B. SLIGHT VARIATIONS IN LANGUAGE LEAD TO SUBSTANTIALLY DIFFERENT RESULTS

As alluded to in Part I of this note, there are subtle differences in the language of the two treaties which have substantial implications for the responsibility of the driver under each scheme. The Geneva Convention is written in such a way that the responsibility of the driver is more relaxed;

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[74] *Compare* United Nations, 201 Multilateral Treaties Deposited with the Secretary General, Ch. XI-B-19, available at https://treaties.un.org/doc/Publication/MTDSG/Volume%20I/Chapter%20XI/XI-B-19.en.pdf [https://perma.cc/42DD-SMGN] [hereinafter MTDSG - Vienna Convention], *with* United Nations, 201 Multilateral Treaties Deposited with the Secretary General, Ch. XI-B-1, available at https://treaties.un.org/doc/Publication/MTDSG/Volume%20I/Chapter%20XI/XI-B-1.en.pdf [https://perma.cc/8LC7-YKAK] [hereinafter MTDSG - Geneva Convention].

[75] *See* MTDSG - Geneva Convention, *supra* note 74.

[76] *See* MTDSG - Vienna Convention, *supra* note 74.

[77] Geneva Convention, *supra* note 55, art. 4.

[78] Vienna Convention, *supra* note 55, art. 1 (v).

[79] Geneva Convention, *supra* note 55, arts. 4, 8 (5); Vienna Convention, *supra* note 55, arts. 1 (v), 8 (1).

pursuant to Article 8, "[d]rivers shall at all times be able to control their vehicles."[80] The Vienna Convention uses similar language, requiring that "[e]very driver shall at all times be able to control his vehicle,"[81] but then restricts the clause under Article 13 by requiring that:

> Every driver of a vehicle *shall in all circumstances have his vehicle under control* so as to be able to exercise due and proper care and to be at all times in a position to perform all manoeuvres required of him. He shall, when adjusting the speed of his vehicle, pay constant regard to the circumstances, in particular the lie of the land, the state of the road, the condition and load of his vehicle, the weather conditions and the density of traffic, so as to be able to stop his vehicle within his range of forward vision and short of any foreseeable obstruction. He shall slow down and if necessary stop whenever circumstances so require, and particularly when visibility is not good.[82]

This additional language in Article 13 of the Vienna Convention not only requires that a driver shall have their vehicle under control in all circumstances, but then goes on to enumerate specific tasks which the driver must constantly monitor and specific actions that the driver must take.[83] As a result, those nations that have signed on to neither treaty, or solely the Geneva Convention, have greater freedom in adapting their own laws to permit autonomous vehicles.[84]

III. CIRCUMVENTING LIMITING LANGUAGE

A. LIMITATIONS UNDER THE VIENNA CONVENTION

The additional restrictions set by the Vienna Convention limit the adoption of autonomous vehicles in signatory countries, and these limitations are already being realized. The European Parliament's Committee on Transport and Tourism has recognized that Europe is falling behind in autonomous vehicle technology and has at least partially

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[80] Geneva Convention, *supra* note 55, art. 8 (5).

[81] Vienna Convention, *supra* note 55, art. 8 (5).

[82] *Id.* art. 13 (1) (emphasis added).

[83] *Id.* arts. 8 (5), 13 (1).

[84] *See* Ivo Emanuilov, *Autonomous Driving in Europe Post-Uber: In Search of Responsible AI Teachers*, KU LEUVEN CTR. FOR IT & IP L. (Apr. 17, 2018), https://www.law.kuleuven.be/citip/blog/autonomous-driving-in-europe-post-uber-in-search-of-responsible-ai-teachers/ [https://perma.cc/9757-3HX2].

attributed it to the language of the Vienna Convention.[85] This language is also the predominant reason behind the fact that autonomous vehicle testing is largely carried out in the United States and China.[86]

1. The United Nations Working Party on Road Traffic

In response to the limitations recognized by the European Parliament's Committee on Transport and Tourism, the Working Party on Road Traffic has alleviated some of the effects of this language by amending the Vienna Convention in 2014 to allow for lower levels of autonomy, up to Level 3, and permitting driving assistance systems to transfer some of the driving tasks, such as those enumerated in Article 13, to the vehicle.[87] These systems may be used only if they comply with United Nations general safety requirements for vehicles or if they can be overridden or switched off by the driver.[88]

2. European Signatory Nations

Some European signatory nations, however, have decided to take independent action. To avoid the more stringent requirements and language of the Vienna Convention, some signatory nations have begun to work around the limitations on their own.[89] Demark and Germany are two examples that show both conservative and aggressive approaches.

Denmark has taken a relatively conservative approach to reach beyond what is allowed by the Vienna Convention. The Danish Parliament passed the Danish Road Traffic Act, which allows up to Level 4 autonomous vehicles to operate on public roads, but with significant

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[85] *See* FRISONI, *supra* note 6, at 14–15, 53–60 ("amendments to existing international . . . regulations concerning both areas of vehicle operation/design and driver behavior will be required . . . to permit a wide implementation of a number of automated systems." "[W]hilst systems . . . up to level 3 . . . could be operated in accordance with the Convention, . . . level 4 and level 5 systems are mostly still incompatible with the Vienna Convention—even as amended in 2015—because a driver may not be required in these systems, depending on the use case. Therefore, a further amendment process would be necessary to permit fully driverless vehicles.").

[86] Jacobs, *supra* note 56.

[87] Working Party 68, *supra* note 67, at 9.

[88] *Id.*

[89] *See* Mathieu Relange et al., *At a Glance: Autonomous Vehicles*, BIRD & BIRD (July 2017), https://www.twobirds.com/en/news/articles/2017/global/at-a-glance-autonomous-vehicles [https://perma.cc/J5GS-VBMX].

restrictions.[90] Some restrictions include operation only on designated portions of roads and only at designated times. Furthermore, operation of a Level 4 vehicle requires the operator to obtain a special permit.[91]

Germany, however, has taken a more aggressive approach, passing amendments to the German Road Traffic Act in June 2017. The amendments allow for operation of vehicles with "highly or fully automated driving function . . . provided the function is used for its intended purpose."[92] This definition encompasses Level 5 vehicles and permits operation on all public roads.[93] In this regard, the German approach is more aggressive than the Danish law, not restricting where or when the systems can be used, unless such use would fall outside the intended use of the system. However, it should be noted that the law still requires that the driver be able to immediately resume control when required.[94] The amendments also add the requirement that the vehicle have a data logging system to record who or what is in control of the driving task and when the vehicle requests human intervention.[95]

B. U.S. CIRCUMVENTION OF CONFLICTING GENEVA CONVENTION LANGUAGE

While much focus has been put on the limitations set by the more restrictive Vienna Convention, there is still a potential complication in the language of the Geneva Convention, which has yet to be fully recognized. This complication arises as technology reaches Level 4 and Level 5 autonomy, wherein the automated driving system takes a larger, more predominate role in the driving task. Even with its slightly broader language, the Geneva Convention still requires that the driver be able to control their vehicle.[96] However, SAE Standard J3016, in defining Level

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[90] *See* Danish Road Traffic Act § 92(f)–(g), available at https://www.retsinformation.dk/Forms/R0710.aspx?id=204976.

[91] Danish Road Traffic Act § 92(h), available at https://www.retsinformation.dk/Forms/R0710.aspx?id=204976.

[92] Straßenverkehrsgesetz [StVG] [Road Traffic Act], Mar. 5, 2003, BUNDESGESETZBLATT, TEIL I [BGBL I] at 310, 919, last amended by Art. 3 Gesetz [G], Dec. 4, 2018, BGBL I at 2251, § 1a, para. 1 (Ger.), https://www.gesetze-im-internet.de/stvg/BJNR004370909.html.

[93] The German Road Traffic Act only places restrictions on how autonomous vehicles are to be operated, it does not place any restrictions on where autonomous vehicles may be operated. *See generally* StVG (Ger.).

[94] StVG § 1b (Ger.).

[95] *See* StVG § 63a (Ger.).

[96] Geneva Convention, *supra* note 55, art. 8 (5).

4 and Level 5 vehicles, provides that the automated driving system may delay any request to disengage until the vehicle has determined that a minimal risk condition has been achieved.[97] This language creates a period of time during which the driver cannot be in control of their vehicle.

Moving forward, a few different actions could be taken to avoid this issue. One option would be to change the definitions under the SAE J3016 standard to require that Level 4 and Level 5 vehicles must afford the driver the option to manually and immediately override the system to take control of the vehicle, without having to wait for the system to achieve a minimal risk condition. Another option would be to use different definitions for the levels of autonomy so that the levels do not fall victim to this language.

1. Defining Levels of Autonomy

While the use of different definitions has the potential to resolve many current issues, implementation of such a strategy is more difficult than it may appear. Prior to the September 2016 adoption of the SAE J3016 levels of autonomy,[98] the United States National Highway Traffic Safety Administration (NHTSA) had defined its own levels of autonomy, Levels 0-4,[99] which avoided the issues presented by the SAE definitions. NHTSA Level 0 and Level 1 vehicles, "no-automation" and "function-specific automation," respectively, keep the driver in control of the vehicle at all times.[100] NHTSA Level 2, "combined function automation," and Level 3, "limited self-driving automation," focus solely on the vehicle requesting the human driver take control of the driving task, making no mention of the driver's ability to request control back, or of the vehicle's ability to delay such a request.[101] NHTSA Level 4 "full self-driving automation," is defined such that the human driver is never in control of the driving task, other than merely providing destination or navigation

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[97] Standard J3016, *supra* note 22, at 22–23.

[98] *See* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN. (NHTSA), DEP'T OF TRANSP., FEDERAL AUTOMATED VEHICLES POLICY: ACCELERATING THE NEXT REVOLUTION IN ROADWAY SAFETY 9–10 (2016), https://www.hsdl.org/?view&did=795644 [https://perma.cc/2ZTG-3LB6].

[99] NHTSA, PRELIMINARY STATEMENT OF POLICY CONCERNING AUTONOMOUS VEHICLES 4–5, https://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf [https://perma.cc/EZZ8-Q43X].

[100] *Id.* at 4.

[101] *Id.* at 5.

input, with "safe operation rest[ing] solely on the automated vehicle system."[102]

NHTSA adopted the SAE standard to "ensure consistency in taxonomy usage."[103] This need for consistency arose from the broad definition of Level 4 autonomy under the original NHTSA definitions.[104] The broadness of this definition was proving quite unworkable and confusing within the industry, resulting in SAE publishing their own definitions based upon the original NHTSA definitions and essentially subdividing NHTSA Level 4 into SAE Levels 4 and 5.[105] These new definitions proved to be substantially more useful to industry and regulatory experts, who quickly came to rely on them.[106] But the coexistence of these two sets of definitions was less than harmonious. The NHTSA and SAE definitions eventually came to be seen as competing, yet joint, standards by industry and media, resulting in much confusion.[107] The adoption of the SAE J3016 standard by NHTSA resulted in a more practicable framework for the ongoing conversation between industry stakeholders, advocates, and state and local governments that can help direct ongoing, proactive regulatory efforts.[108]

2. Redefining the Driver

Given past confusion resulting from having multiple definitions, the United States took a slightly different approach, one that does not include modifying current definitions or reverting to the previous NHTSA definitions. Because the United States does not belong to the Vienna Convention, it has avoided official legislative action on the issue. Instead, it has taken unilateral action through administrative policy, an action that

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[102] *Id.*

[103] NHTSA, AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY 1 (2017), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf [https://perma.cc/733H-RJWL] [hereinafter NHTSA – A VISION FOR SAFETY].

[104] *See* Paul Godsmark, *The Definitive Guide to the Levels of Automation for Driverless Cars*, WONDERHOWTO (Apr. 9, 2017, 11:51 PM), https://driverless.wonderhowto.com/news/definitive-guide-levels-automation-for-driverless-cars-0176009/ [https://perma.cc/QHB9-DG97].

[105] *Id.*

[106] Lindsay Brooke, *U.S. DOT Chooses SAE J3016 for Vehicle-Autonomy Policy Guidance*, SAE INT'L (Sept. 20, 2016, 5:39 PM), http://articles.sae.org/15021/ [https://perma.cc/78HZ-JUNM].

[107] *Id.*

[108] *Id.* (quoting Jeremy Carlson).

could be seen as circumventing the more permissive language of the Geneva Convention, to which the United States does belong.

Recently, NHTSA responded to a request by Google to "interpret a number of provisions in the Federal Motor Vehicle Safety Standards . . . as they apply to . . . 'fully autonomous motor vehicles.'"[109] In doing so, NHTSA recognized that self-driving vehicles "will not have a 'driver' in the traditional sense that vehicles have had drivers during the last more than one hundred years," and thus "will interpret 'driver' . . . as referring to the [self-driving system], and not to any of the vehicle occupants."[110] NHTSA based its interpretation on the idea that "[i]f no human occupant of the vehicle can actually drive the vehicle, it is more reasonable to identify the 'driver' as whatever (as opposed to whoever) is doing the driving."[111] This resulted in a similar effect to changing the definitions under the SAE J3016 standard, but without actually changing the SAE defined levels of autonomy and without requiring action by, or input from SAE.

IV. OTHER EMERGING CONCERNS RELATED TO THE AUTONOMOUS DRIVER

But apart from the issue of who or what is driving the vehicle, there are other concerns surrounding the widespread adoption of autonomous vehicles which neither the Geneva Convention nor the Vienna Convention contemplate.

A. DATA AND DATA PRIVACY

One such issue is data. The data generated by an autonomous vehicle encompasses technical data, the data from vehicle sensors and systems, crowdsourced data, data influencing how and where a vehicle

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[109] Letter from Paul A. Hemmersbaugh, Former Chief Counsel, Nat'l Highway Traffic Safety Admin., to Chris Urmson, Dir. of the Self-Driving Car Project, Google, Inc. (Feb. 20, 2016), https://isearch.nhtsa.gov/files/Google%20—%20compiled%20response%20to%2012%20Nov%20%2015%20interp%20request%20—%204%20Feb%2016%20final.htm [https://perma.cc/YY3F-AUCV]. In the request, Google defined a "fully autonomous motor vehicle" as one "whose operations are controlled exclusively by a Self-Driving System[,] . . . an artificial-intelligence (AI) 'driver,' which is a computer designed into the motor vehicle itself that controls all aspects of driving by perceiving its environment and responding to it." *Id.*

[110] *Id.*

[111] *Id.*

travels, and personal data, which tracks specific users of the vehicle, where they go, what music they listen to, and more. To that end, autonomous vehicles are expected to produce unprecedented amounts of data, in the realm of 4,000 gigabytes of data per vehicle per day.[112] Should estimates be correct, that at least 10 million autonomous vehicles will be on the road by 2035,[113] this equates to 4000 petabytes of data per day, or 1460 exabytes per year.[114]

1. Technical Data

Autonomous vehicles rely on powerful sensors, including cameras, radar, lidar, and sonar, to view and analyze the current state of their surrounding environment.[115] These systems alone can generate upwards of 100.2 megabytes of data per second.[116] But, as technology advances in this area, it is likely that the amount of data produced is going to increase. In fact, companies such as Tesla have recently increased computing power in their vehicles and are developing new processors specifically to handle the sheer quantity of data coming in from on-board

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[112] Brian Krzanich, *Data is the New Oil in the Future of Automated Driving*, INTEL NEWSROOM (Nov. 15, 2016), https://newsroom.intel.com/editorials/krzanich-the-future-of-automated-driving/ [https://perma.cc/HS83-GEQ8].

[113] *See Autonomous Vehicle Sales to Surpass 33 Million Annually in 2040, Enabling New Autonomous Mobility in More Than 26% of New Car Sales*, IHS MARKIT (Jan. 2, 2018), https://ihsmarkit.com/research-analysis/autonomous-vehicle-sales-to-surpass-33-million-annually-in-2040-enabling-new-autonomous-mobility-in-more-than-26-percent-of-new-car-sales.html [https://perma.cc/Z4RX-HYSG].

[114] To put this amount of data in perspective, the estimated capacity of global data storage capacity was 1450 exabytes in 2018, increasing to just over 2000 by 2020. *See* Statista, *Data Center Storage Capacity Worldwide from 2016 to 2021, by Segment (In Exabytes)*, March 2018, https://www.statista.com/statistics/638593/worldwide-data-center-storage-capacity-cloud-vs-traditional/ [https://perma.cc/B4K3-4YFW]. While autonomous vehicles may not store all the data they generate for a prolonged period of time, they will play a role in driving future data generation and the subsequent the demand for increased data storage. *See generally* DAVID REINSEL, JOHN GANTZ & JOHN RYDNING, INT'L DATA CORP., WHITEPAPER NO. US44413318, DATA AGE 2025: THE DIGITIZATION OF THE WORLD FROM EDGE TO CORE (2018), https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf [https://perma.cc/3NHJ-SE5E].

[115] Krzanich, *supra* note 112.

[116] *Id.* The industry built around collecting this data is also quite large, currently valued at $3.36 billion and expected to grow to $5.46 billion by 2025. *$5.4 Billion Automotive Data Logger Market by End Market, Application, Post-Sales Application, Channels, Connection Type, and Region - Global Forecast to 2025*, CISION PR NEWSWIRE (Oct. 23, 2018, 11:45 AM), https://www.prnewswire.com/news-releases/5-4-billion-automotive-data-logger-market-by-end-market-application-post-sales-application-channels-connection-type-and-region---global-forecast-to-2025--300736178.html [https://perma.cc/7DKS-S2A3].

sensors.[117] This type of data can be helpful in finding liability in crashes, but that usefulness could be limited should automakers claim ownership of the data and withhold access.[118]

2. Crowdsourced Data

A second issue is crowdsourced data, predominantly mapping data.[119] Autonomous vehicles require exponentially more precise data than, for example, the maps supplied by sources such as Google Maps today. Not only will such mapping data need to constantly be updated, but it will need to have up-to-the-centimeter accuracy.[120] As a result, owning the most detailed and expansive maps will be an incredibly valuable asset, and the competition to gather this data is already heating up.[121] For instance, China has issued only fourteen licenses to generate high-definition maps within China, a policy that essentially locks out any form of foreign competition.[122] Elsewhere, companies are deploying vehicles with advanced mapping capabilities in an effort to build up their databases faster than the competition.[123]

A secondary issue in crowdsourced data involves vehicle-to-vehicle communication and vehicle-to-infrastructure communication.[124] Both forms of communication will be necessary for vehicles to navigate

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[117] Fred Lambert, *Tesla Deploys Massive New Autopilot Neural Net in v9, Impressive New Capabilities, Report Says*, ELECTREK (Oct. 15, 2018, 11:42 AM), https://electrek.co/2018/10/15/tesla-new-autopilot-neural-net-v9/ [https://perma.cc/R6V9-2FMD]; Eric C. Evarts, *Tesla Cars Will be Getting a New Self-Driving, Autopilot Chip Next Year*, BUS. INSIDER (Oct. 17, 2018, 12:53 PM), https://www.businessinsider.com/elon-musk-tesla-new-self-driving-autopilot-chip-in-spring-2019-2018-10 [https://perma.cc/9RH5-PZ56].

[118] Taeihagh, *supra* note 24, at 110, 112–13.

[119] *See* MARIO GERLA ET AL., INTERNET OF VEHICLES: FROM INTELLIGENT GRID TO AUTONOMOUS CARS AND VEHICULAR CLOUDS 242, 245 (Inst. of Elec. & Electronics Eng'rs 2014), https://ieeexplore.ieee.org/document/6803166 [https://perma.cc/MV37-RQ4T].

[120] Yan Zhang et al., *Wanted in China: Detailed Maps for 30 Million Self-Driving Cars*, BLOOMBERG (Aug. 22, 2018, 6:00 PM), https://www.bloomberg.com/news/articles/2018-08-22/wanted-in-china-detailed-maps-for-30-million-self-driving-cars [https://perma.cc/BZ9J-BM5J]; Mark Bergen, *Nobody Wants to Let Google Win the War for Maps All Over Again*, BLOOMBERG (Feb. 21, 2018, 4:00 AM), https://www.bloomberg.com/news/features/2018-02-21/nobody-wants-to-let-google-win-the-war-for-maps-all-over-again [https://perma.cc/R772-VJJ6].

[121] *See* Bergen, *supra* note 120.

[122] Zhang et al., *supra* note 120.

[123] *See* Bergen, *supra* note 120.

[124] *See* Siam Ahmed, *Get to Know Connected Vehicle Technology: V2V, V2X, V2I*, GEOTAB (Feb. 9, 2018), https://www.geotab.com/blog/connected-vehicle-technology/ [https://perma.cc/LAN4-29FS].

their surroundings. However, there is currently no single vehicle-to-vehicle communication standard; some automakers are utilizing the older dedicated short-range communications (DRSC), whereas others are moving to the newer Cellular V2X protocol.[125] Unfortunately, the two protocols are not interoperable.[126] Adding further confusion, countries have reserved different spectra for communication.[127] Not having a set communication standard within a single country is sufficient cause for concern on its own, and it is an issue that will only be exacerbated once autonomous vehicles begin to move internationally.

3. Personal Data

Finally, there is personal data, that which tracks where you go, what music and videos you like, your behavior, and your emotions.[128] But personal data in the context of autonomous vehicles can be substantially broader than one might think, going so far as to collect biometric data of users through integration of wearable technology,[129] web browsing history, personal schedules, and contacts.[130] While there is potential for

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[125] Mark Gardiner, *The Auto Industry's VHS-or-Betamax Moment*, N.Y. TIMES (Sep. 20, 2018), https://nyti.ms/2NtaqcX [https://perma.cc/U8MY-WQ8L]. Toyota and GM are planning to utilize DSRC protocol whereas Ford is planning on utilizing the newer Cellular V2X protocol. *Id.*; Sam Abuelsamid, *Toyota Has Big Plans to Get Cars Talking to Each Other and Infrastructure in the U.S.*, FORBES (Apr. 16, 2018, 1:00 PM), https://www.forbes.com/sites/samabuelsamid/2018/04/16/toyota-launches-aggressive-v2x-communications-roll-out-from-2021/#49144a75146c [https://perma.cc/7CNW-7MH3].

[126] Monica Alleven, *Editor's Corner: DSRC vs C-V2X: It's One Fine Mess*, FIERCE WIRELESS (Mar. 18, 2019, 11:30 AM), https://www.fiercewireless.com/wireless/editor-s-corner-dsrc-vs-c-v2x-it-s-one-fine-mess [https://perma.cc/RL5Z-VF5F].

[127] *See* AUSTROADS, AUSTROADS' SUBMISSION TO THE '2014 REVIEW OF THE MOTOR VEHICLE STANDARDS ACT OF 1989' 6, 10 (2014), https://infrastructure.gov.au/vehicles/mv_standards_act/files/Sub136_Austroads.pdf [https://web.archive.org/web/20180827205959/https://infrastructure.gov.au/vehicles/mv_standards_act/files/Sub136_Austroads.pdf]; *Intelligent Transport Systems*, RADIO SPECTRUM MANAGEMENT, https://www.rsm.govt.nz/business-individuals/buying-electrical-and-electronic-products-in-new-zealand/intelligent-transport-systems [https://perma.cc/Q3KS-XP6L].

[128] Krzanich, *supra* note 112.

[129] Press Release, Ford Media Ctr., New Ford Lab Integrates Wearables and Vehicles; Ford Looks at Linking Health Data to Driver-Assist Technology (Jan. 11, 2016), https://media.ford.com/content/fordmedia/fna/us/en/news/2016/01/11/new-ford-lab-integrates-wearables-and-vehicles.html [https://perma.cc/4JMP-8VCZ].

[130] *See* PHILIPPA LAWSON ET AL., B.C. FREEDOM OF INFO. & PRIVACY ASS'N, THE CONNECTED CAR: WHO IS IN THE DRIVER'S SEAT? 5, 60 (2015), https://fipa.bc.ca/wordpress/wp-content/uploads/2015/03/CC_report_lite.pdf [https://perma.cc/LCL5-4YY5].

this data to be anonymized, it is likely that, with the growing sophistication of data deanonymization, those efforts will be futile.[131]

Personal data has come to the forefront of discussion and many countries are working to create policies to ensure that data is handled in a secure manner, rather than leaving an ethical determination to corporations.[132] As stated by Apple CEO Tim Cook, even "scraps of data, each one harmless enough on its own, are carefully assembled, synthesized, traded and sold[.] . . . This is surveillance. And these stockpiles of personal data serve only to enrich the companies that collect them. This should make us very uncomfortable."[133] As of now, no international policy exists to control what is done with this data, or even who owns it, but countries have begun to exert more control.[134]

Many questions remain regarding the autonomous vehicle market. For instance, a decision must be made as to whether companies can continue do as they wish, with regard to collecting and protecting data. Lack of regulation over transparency or how much data companies collect could result in undesirable outcomes.[135] Furthermore, a determination must be made as to how companies will be permitted to use the data they collect, including how the data is used to control vehicle reaction during an emergency.[136] Regarding the international landscape, the question

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[131] *See generally* Kalev Leetaru, *The Big Data Era of Mosaicked Deidentification: Can We Anonymize Data Anymore?*, FORBES (Aug. 24, 2016, 10:39 AM), https://www.forbes.com/sites/kalevleetaru/2016/08/24/the-big-data-era-of-mosaicked-deidentification-can-we-anonymize-data-anymore/#7f3488413f1e [https://perma.cc/R8AW-NRPY]; *see also* Robert McMillan, *Apple Expands Bet on Cutting Edge Privacy Technology*, WALL ST. J. (July 7, 2017, 7:00 AM), https://www.wsj.com/articles/apple-expands-bet-on-cutting-edge-privacy-technology-1499425201 [https://perma.cc/S25X-QGBG].

[132] Christopher Mims, *The Global Tech Backlash is Just Beginning*, WALL ST. J. (Oct. 26, 2018, 12:04 PM), https://www.wsj.com/articles/the-global-tech-backlash-is-just-beginning-1540476151 [https://perma.cc/SRS8-S9FB].

[133] Sam Schechner & Emre Peker, *Apple CEO Urges Action on Data Misuse*, WALL ST. J., Oct. 25, 2018, at B1.

[134] *See id.*

[135] A number of actions by large corporations have brought into question how large companies are collecting and handling data. Uber covered up a 2016 breach of the data belonging to 57 million riders and drivers. Kate Conger, *Uber Settles Data Breach Investigation for $148 Million*, N.Y. TIMES (Sept. 26, 2018), https://www.nytimes.com/2018/09/26/technology/uber-data-breach.html [https://perma.cc/V2UZ-B3SS]. Tesla seemingly will release data to authorities when it is in the company's best interest to do so but will not let drivers see data logs. Sam Thielman, *The Customer is Always Wrong: Tesla Lets Out Self-Driving Car Data – When it Suits*, THE GUARDIAN (Apr. 3, 2017, 6:00 AM), https://www.theguardian.com/technology/2017/apr/03/the-customer-is-always-wrong-tesla-lets-out-self-driving-car-data-when-it-suits [https://perma.cc/ZSX5-KUTU].

[136] Karen Hao, *Should a Self-Driving Car Kill the Baby or the Grandma? Depends on Where You're From*, MIT TECH. REV. (Oct. 24, 2018), https://www.technologyreview.com/s/612341/a-global-

remains open as to who will control data policy for the world and how to ensure input into the policy by all those affected.[137] If this question remains unaddressed, each country should be prepared to accept the consequences arising from other countries using this type of data to control how individuals are permitted to function within society.[138]

B. LIABILITY

A second, related issue is that of liability. So long as humans and autonomous vehicles share the road, accidents are inevitable.[139] The issue of liability is really a conflation of two separate questions. First, there is the obvious, overarching question of who is liable for the way that a vehicle reacts when it has no direct human input. Second, there is the underlying question which asks how these vehicles should react in the first place. After all, the fundamental underpinning is that autonomous systems are programmed by humans to do what they do, albeit the use of neural networks in self-driving systems are more of a black box. That said, the issue of liability, for the purpose of this note, is limited to laying out the

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ethics-study-aims-to-help-ai-solve-the-self-driving-trolley-problem/ [https://perma.cc/HR9G-NDR6].

[137] For example, the "GDPR applies only to the EU, but given the scale of the market, many companies are deciding it's easier – not to mention a public relations win – to apply its terms globally." Alex Hern, *What is GDPR and How Will it Affect You?*, THE GUARDIAN (May 21, 2018, 9:40 AM), https://www.theguardian.com/technology/2018/may/21/what-is-gdpr-and-how-will-it-affect-you [https://perma.cc/97EZ-WQY3]; *see also* Chris Albers Denhart, *New European Union Data Law GDPR Impacts are Felt by Largest Companies: Google, Facebook*, FORBES (May 25, 2018, 10:27 AM), https://www.forbes.com/sites/chrisdenhart/2018/05/25/new-european-union-data-law-gdpr-impacts-are-felt-by-largest-companies-google-facebook/#2862d084d367 [https://perma.cc/FU88-L92Z] (stating the GDPR impacts businesses in countries around the world, costing billions and forcing some companies to shut down).

[138] *See* Alexandra Ma, *China Has Started Ranking Citizens with a Creepy 'Social Credit' System — Here's What You Can Do Wrong, and the Embarrassing, Demeaning Ways They Can Punish You*, BUS. INSIDER (Oct. 29, 2018, 12:06 PM), https://www.businessinsider.com/china-social-credit-system-punishments-and-rewards-explained-2018-4 [https://perma.cc/BA5M-5M9N] (giving an overview of data collection and China's Social Credit system which is to be fully implemented by 2020).

[139] *See* MICHAEL SIVAK & BRANDON SCHOETTLE, UNIV. OF MICH. TRANSP. RESEARCH INST., ROAD SAFETY WITH SELF-DRIVING VEHICLES: GENERAL LIMITATIONS AND ROAD SHARING WITH CONVENTIONAL VEHICLES 2–3, 7 (2015), https://deepblue.lib.umich.edu/bitstream/handle/2027.42/111735/103187.pdf?sequence=1&isAllowed=y [https://perma.cc/PQG8-C8LT]; *see also* David Welch & Elisabeth Behrmann, *Who's Winning the Self-Driving Car Race?*, BLOOMBERG (May 7, 2018, 5:00 AM), https://www.bloomberg.com/news/features/2018-05-07/who-s-winning-the-self-driving-car-race [https://perma.cc/9HT2-L2HB] (stating Uber was involved in the first death of a pedestrian caused by an autonomous vehicle and Tesla was involved in the death of a driver using an assistance program).

initial, practical question of where and to what extent the distribution of liability shifts.[140] The discussion on how vehicles should react is a much broader ethical, cultural, and philosophical question, which is beyond the scope of this note.[141]

One way this issue is being addressed is by placing liability on the insurer of the autonomous vehicle. The United Kingdom attempted to pass a bill which would have placed liability on insurers for death, personal injury, and property where an automated vehicle is driving itself.[142] This liability, however, is limited by the contributory negligence of the injured party.[143] Further, it does not cover damage to the autonomous vehicle, itself, nor any property contained within the vehicle.[144]

Another way of looking at liability is from a products liability standpoint, putting the burden on the manufacturer. Some concerns with such a system are the potentially large shift in the liability distribution and how to properly determine the point at which the product is "defective."[145] A potential unintended effect of a products liability approach is that automotive manufacturers will avoid further developing the technology if exposed to too much risk. Should that be the case, this issue could be left to a free market to correct. Informed consumers could push for holding automakers liable where there is a bug or other programming defect. Still, at least one automaker, Volvo, doesn't seem to be worried about such a shift, saying that it will accept full liability whenever one of its cars is in autonomous mode.[146]

The issue of liability has traditionally been addressed at the national level, or lower. While this may still be the case moving forward,

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[140] Tatjana Evas, European Parliamentary Research Serv., *A Common EU Approach to Liability Rules and Insurance for Connected and Autonomous Vehicles*, at 22, PE 615.635 (Feb. 2018), http://www.europarl.europa.eu/RegData/etudes/STUD/2018/615635/EPRS_STU(2018)615635_EN.pdf [https://perma.cc/WJ3S-ABZW].

[141] *See* Hao, *supra* note 136.

[142] Vehicle Technology and Aviation Bill 2016-17, HC Bill [143] cl. 2 (UK), https://publications.parliament.uk/pa/bills/cbill/2016-2017/0143/cbill_2016-20170143_en_2.htm#pt1-l1g2 [https://perma.cc/2Z6F-EZUE].

[143] *Id.* [143] cl. 3.

[144] *Id.*

[145] Evas, *supra* note 140.

[146] Press Release, Volvo Car Grp., US Urged to Establish Nationwide Federal Guidelines for Autonomous Driving (Oct. 7, 2015), https://www.media.volvocars.com/global/en-gb/media/pressreleases/167975/us-urged-to-establish-nationwide-federal-guidelines-for-autonomous-driving [https://perma.cc/97FM-4BYH].

the implications that autonomous vehicles have on the current system of liability determination are substantial and cannot fall by the wayside.

V. TECHNICAL REGULATIONS AND MINIMUM STANDARDS IN AUTOMATED DRIVING SYSTEMS

Despite recognition that changes are required to permit use of autonomous vehicles under the current international regulatory scheme, technical regulations defining minimum standards that a self-driving system must meet to ensure safe operation on public roads are absent. Under current regulations, aspects of safe operation and capabilities have been left to the automotive industry to self-govern.[147]

Both the Vienna Convention and the Geneva Convention set minimum standards for ensuring that human drivers are capable of operating a vehicle safely.[148] The Geneva Convention states that "[e]ach Contracting State shall allow any driver admitted to its territory . . . who holds a valid driving permit issued to him, after he has given proof of his competence, by the competent authority of another Contracting State . . . , to drive on its roads," suggesting that it is the responsibility of the Contracting State to set appropriate requirements to ensure the competence of its drivers.[149] The Vienna Convention is more explicit in the criteria that a driver must meet to be competent, requiring that "[e]very driver shall possess the necessary physical and mental ability and be in a fit physical and mental condition to drive" and that "[e]very driver of a power-driven vehicle shall possess the knowledge and skill necessary for driving the vehicle."[150] Given that both Conventions recognize the need for a driver to meet minimum standards to ensure safety on the road, if regulatory bodies move to define an automated driving system as a driver while it is in control of the driving task in its entirety, there should be similar guidance and minimum standards defined by metrics that are more applicable to a computer system than to a human driver.[151]

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[147] *See, e.g.,* NHTSA – A VISION FOR SAFETY, *supra* note 103. However, NHTSA does at least offer twelve suggestions encompassing the most salient points on safety for manufacturers to consider when designing self-driving systems. *See id.* at 5–16.

[148] *See* Geneva Convention, *supra* note 55, art. 24; Vienna Convention, *supra* note 55, art. 8.

[149] Geneva Convention, *supra* note 55, art. 24 (1).

[150] Vienna Convention, *supra* note 55, art. 8 (3)–(4).

[151] Looking to the language of the Vienna Convention, new regulations must define the analogous physical and mental capabilities of an automated driving system. *See id.*

Given that autonomous vehicles are likely to be used all over the world and many will travel internationally, there must be consensus on what these minimum capabilities will be. Currently, these minimum standards are difficult to discern. Even the most sophisticated companies in the industry are experimenting with how to approach this issue; while a majority are using LIDAR systems, others are using purely visual cameras.[152] Given that even those immersed in the technology differ on the best approach, there will need to be input and debate from industry experts before any governing body can make a rational, well-founded decision as to what these minimum standards should be.

Eventually, both treaties will require such regulations. It is possible that those regulations will be adopted separately, resulting in the same sort of language differences that have resulted in the current state of affairs. Alternatively, a single set of regulations could be adopted under both treaties, but this would require the signatory nations of both treaties agreeing with one another. Such a strategy, which will take much time and effort, will only put a band-aid on the current inadequacy. Rather than committing extensive resources to obtain a merely passable, temporary result, it may be better to start from scratch. Drafting a new structure could potentially garner support from both of the current sets of signatory nations and may additionally gain support from nations that have not yet adopted either treaty.

VI. AMENDMENTS TO THE CONVENTIONS

The United Nations' Working Party on Road Traffic Safety (hereinafter the Working Party) was established to study and assist with "traffic regulations likely to effect a marked improvement in road safety."[153] It is the only permanent body in the United Nations System focusing on improving road safety and its primary function is to harmonize traffic rules.[154] In doing so, the Working Party has already made some

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[152] Jack Stewart, *Tesla Says Its New Self-Driving Chip is Finally Baked*, WIRED (Aug. 4, 2018, 7:00 AM), https://www.wired.com/story/tesla-self-driving-car-computer-chip-nvidia/ [https://perma.cc/L2E3-3F5S].

[153] Economic Commission for Europe Inland Transport Committee Res. No. 22, U.N. Doc. E/ECE/TRANS/SC.1-77 (Mar. 15, 1950) [hereinafter Resolution No. 22]. The Working Party on Road Traffic Safety is now known as the Global Forum for Road Traffic Safety. UNITED NATIONS ECON. COMM'N FOR EUR., *Road Traffic Safety: About Us*, UNECE, https://www.unece.org/trans/roadsafe/rsabout.html [https://perma.cc/CW9H-SYRD].

[154] Resolution No. 22., *supra* note 153.

amendments to both the Geneva Convention and the Vienna Convention in light of the proliferation of autonomous vehicle technology.[155]

A. ENSURING LEGALITY IN THE USE OF SOME AUTONOMOUS VEHICLE TECHNOLOGY

In 2014, the Working Party made an initial effort to regulate automated driving technology by amending Article 8 and Article 39 of the Vienna Convention.[156] The amendment added a new paragraph, 5bis, to Article 8 and appended another new paragraph to Article 39. Paragraph 5bis, explained that the use of an automated driving system to influence how a vehicle is driven is permitted under both Article 8 and Article 39, so long as such a system conforms with UN Global Technical Regulations.[157] Should a system not conform with UN Global Technical Regulations, use of the system may still be allowed if the system can be overridden and switched off by the driver. The appended paragraph of Article 39, meanwhile, provides that use of such systems, when in conformity with UN Global Technical Regulations, also conforms with the provisions for domestic driving permits set out in Annex 5.[158]

B. A FORWARD-LOOKING ALTERNATIVE TO AMENDING EXISTING CONVENTIONS

The justification for the Working Party amendments recognizes that there is great variability in the skill of human drivers, and that it is the failure of these skills that is the leading cause of accidents.[159] While recognizing that utilization of automated driving systems can have immediate benefits for road safety, the amendments adhere to the idea that the human driver shall maintain a superior role in the driving tasks, as "systems are not designed to overrule decisions taken by sane, accountable

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[155] *See* Working Party 68, *supra* note 67, at 5, 9–11; *see generally* Economic Commission for Europe, Inland Transport Committee, Rep. of the Seventieth Session of the Working Party on Road Traffic Safety, U.N. Doc. ECE/TRANS/WP.1/149/Add.1, at 9 (Jun. 30, 2015) [hereinafter Working Party 70].

[156] Working Party 68, *supra* note 67, at 5.

[157] *Id.* at 9.

[158] *Id.* at 9–10; Vienna Convention, *supra* note 55, annex 5.

[159] Working Party 68, *supra* note 67, at 11.

drivers."[160] To ensure that this element remains, the ability to override or switch off the autonomous driving system is essential.[161]

1. Amendments Only Permit Low-Level Automation Systems

While the justification for the amendments purports to allow for the adoption of autonomous vehicle technology, there are key limitations that make the amendments less progressive than they seem. Mainly, the language of the justification, in referring to "Driver Assistance Systems" and "[k]eeping the driver in a superior role," shows that this is only meant to encompass systems with SAE Level 1 and Level 2 automation systems.[162] Furthermore, the justification only contemplates "vehicle systems available today."[163] At the time that these amendments were adopted, companies such as Google were preparing to announce some of the first fully autonomous systems; however, the technology actually available to consumers was limited to semi-autonomous functions such as adaptive cruise control.[164] The gap between the technology that was available on the open market for purchase by consumers and that which was only available to developers is illustrative of the ambiguity such a justification creates.

Later, in 2015, the Working Party adopted substantively identical amendments to Article 8 and Article 22 of the Geneva Convention, despite its already more permissive language.[165] The purported justification for adopting these amendments was also substantively identical.[166] It is unclear why, when the language under the Geneva Convention already permits use of autonomous vehicles, the Working Party would implement

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[160] *Id.*

[161] *Id.*

[162] *Id.*; *see also* FRISONI, *supra* note 6, at 55.

[163] Working Party 68, *supra* note 67, at 11.

[164] Keshav Bimbraw, *Autonomous Cars: Past, Present and Future - A Review of the Developments in the Last Century, the Present Scenario and the Expected Future of Autonomous Vehicle Technology*, 12 INT'L CONF. ON INFORMATICS IN CONTROL, AUTOMATION AND ROBOTICS 191, 194–96 (2015).

[165] Working Party 70, *supra* note 155. Paragraph 5bis of Article 8 in the Vienna Convention corresponds to Paragraph 6 of Article 8 in the Geneva Convention. *Compare* Working Party 68, *supra* note 67, at 9, *with* Working Party 70, *supra* note 155, at 2. The appended paragraph of Article 39 of the Vienna Convention corresponds to the appended paragraph of Article 22 of the Geneva Convention. *Compare* Working Party 68, *supra* note 67, at 9, *with* Working Party 70, *supra* note 155, at 3.

[166] *Compare* Working Party 68, *supra* note 67, at 11, *with* Working Party 70, *supra* note 155, at 4–5.

such changes. In fact, scholars already recognize the more permissive language, merely limiting the compliance with the Convention to systems where the driver shall be able to maintain control.[167] This interpretation, at its broadest, would allow use of all levels of autonomy.[168] That said, one could surmise that the amendments to the Geneva Convention were for one of three reasons: to remedy issues that have yet to be discovered, to clarify what the treaty actually allows, or, alternatively, to harmonize the two treaties by limiting the scope of allowable technology under the Geneva Convention.

But there is also a narrower reading of the Geneva Convention, one which would only permit, at most, Level 3 autonomy. That narrow reading exists, not based on the language of the Geneva Convention itself, but due to the interplay of the language used to define the various levels of autonomy in SAE Standard J3016, with the language of the Geneva Convention. As previously mentioned, the Geneva Convention requires that the human driver "shall be able to control their vehicle at all times."[169] This language suggests that a human driver may cede control of the entire driving task to the vehicle should they choose to do so, with the caveat that the human driver be able to take over control of the driving task whenever they choose to do so.

2. Technical Regulations Remain Absent

The United Nations Economic and Social Counsel has thus far proven to be no better in contemplating vehicle technical regulations for the international sphere, let alone adopting any. Governance and regulation of international vehicle technical regulations is overseen by a separate working group, the World Forum for Harmonization of Vehicle Regulations. With regard to autonomous vehicle specific regulations, the World Forum for Harmonization of Vehicle Regulations has only just established a new Working Party on Automated/Autonomous and Connected Vehicles as of June 2018.[170] The new group held its first

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[167] *See* Smith, *supra* note 60, at 440.

[168] This is based on the definitions given by SAE Standard J3016, which mandates that either the human driver is the one in control of the driving task or the human driver may request that the vehicle return control of the driving task to the human driver. *See* Standard J3016, *supra* note 22, at 21–23.

[169] Geneva Convention, *supra* note 55, art. 8 (5).

[170] The former Working Party on Brakes and Running Gear was converted to the new Working Party on Automated/Autonomous and Connected Vehicles following recognition of the importance of

meeting in September 2018, but the process of standardizing autonomous vehicle regulations is merely superficial at this point.[171] Hopefully, this group will bring about substantive changes in the near future, including defining the driver and other critical issues such as data security and liability. However, it is likely to take some time before this occurs, all while the industry continues its progress toward widespread adoption of the technology.

On another front, the Working Party has made some recent strides that seem to overcome confusion relating to the legal operation of autonomous vehicles on public roads.[172] In its seventy-seventh session, the Global Forum for Road Traffic Safety adopted a resolution permitting the deployment of highly and fully automated vehicles on public roads, citing their importance in improving road safety and the recognized need to provide guidance for the safe adoption thereof.[173]

While this is a significant step in the right direction, it only lays out the most basic groundwork. The resolution offers definitions of both highly and fully autonomous vehicles but comes nowhere close to the specificity offered by the SAE standard.[174] Rather, the approach taken by the resolution speaks to a broader conceptual view, reminiscent of the original NHTSA approach. The resolution specifies that a "highly automated vehicle" uses an automated driving system to operate within specific operational limits without the need for human intervention within those limits.[175] A "fully automated vehicle" uses an automated driving system that does not have any operational limits and does not require any human intervention.[176] These definitions are too broad to provide a truly workable structure, given the great variability in the types of automated systems that exist today and their respective capabilities and reliance on a human driver as a failsafe.

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activities in this area by the Inland Transport Committee in February 2018. U.N. Econ. Comm'n for Eur., Introduction: Working Party on Automated/Autonomous and Connected Vehicles (GRVA), https://www.unece.org/trans/main/wp29/meeting_docs_grva.html [https://perma.cc/LFN8-N83E].

171 *See* Econ. Comm'n for Eur., Rep. of the Working Party on Automated/Autonomous and Connected Vehicles on its First Session, U.N. Doc. ECE/TRANS/WP.29/GRVA/1 (Oct. 23, 2018).

172 *See* Econ. Comm'n for Eur., Report of the Global Forum for Road Traffic Safety on its Seventy-Seventh Session, at 10–13, U.N. Doc. ECE/TRANS/WP.1/165 (Oct. 3, 2018) [hereinafter Global Forum 77].

173 *Id.* at 10.

174 *Compare id.* at 11, *with* Standard J3016, supra note 22, at 19.

175 Global Forum 77, *supra* note 172, at 11.

176 *Id.*

Furthermore, the included recommendations amount to stating that use of such automated systems should keep the roads safe in complying with traffic regulations and interacting with other drivers. Additionally, the recommendations state that systems must be able to communicate effectively with the user and give appropriate notice when it encounters a situation outside the scope of its defined operating range.[177] Finally, this basic framework is left open to changes and amendments to address future technological and regulatory developments, as well as issues dealing with data security and liability.[178]

C. AN IMPETUS FOR CONSISTENCY AND RELEVANCY IN THE INTERNATIONAL FRAMEWORK

The more interesting part of this resolution is how its implementation affects both the Geneva Convention and the Vienna Convention. As previously stated, in the past, the treaties have been amended separately with respect to autonomous vehicles. However, the Working Party has intended its resolution to guide both treaties in tandem.[179] This change in the manner of amending the treaties demonstrates that both treaties are lacking when it comes to autonomous vehicles. It also demonstrates a desire for consensus between the language of the two treaties with respect to their treatment of autonomous vehicles. While this is achieved in some manner with these resolutions, this method of modification may prove to be cumbersome in the future, as there is still a difference between nations that have signed on to the respective treaties.

Given the amount of effort required to keep the treaties in sync, and considering the number of changes in the industry yet to come, it seems as though a more efficient use of time and resources would be to start anew with a single treaty for autonomous vehicles; one which has the potential to garner approval not only from all current signatory nations to both the Geneva and Vienna Conventions, but also nations that have not yet signed on to either treaty.[180]

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[177] *Id.* at 11–12.

[178] *Id.* at 13.

[179] *Id.* at 10.

[180] *See* Press Release, Economic Commission for Europe, Autonomous Transport Must be Developed with a Global Eye, (Feb. 19, 2019), available at https://www.unece.org/?id=51264 [https://perma.cc/V9DH-JA2V] [hereinafter ECE Press Release]; *cf.* Jason Cannon, *Wild West Approach to Autonomy Regulation isn't Working*, COMMERCIAL CARRIER JOURNAL (Jan. 16,

In addition, one may ask why there is a need for different definitions with these new resolutions. Given the widespread use and proven workability of the SAE J3016 standard, it is likely a better and more efficient use of resources to adopt an existing framework that industry experts and regulatory bodies are already familiar with. Indeed, the language of the resolution alludes to other terminology and system requirements already used in the SAE J3016 standard. One such example appears in the requirement that the vehicle must be able to reach a minimal risk condition.[181] This, in combination with the widespread adoption and use of the SAE standard, suggests that, although different, the SAE standard may be used in future guidance and development of the new definitions.

2020), https://www.ccjdigital.com/wild-west-approach-to-autonomy-regulation-isnt-working/ [https://perma.cc/L9GL-C7S2]. Cannon states:

> If you want to truly hamstring something in the transportation industry, let the government regulate it. Governmental overreach via the EPA, FMCSA, DOT or a host of other made-for-acronym agencies can complicate otherwise fundamentally simple processes. But in the case of autonomy, a Wild West approach to governmental oversight is slowing down the evolution of a bubbling technology. . . . Dozens of local, state and federal statutes drafted in an attempt to create a framework for the safe testing of autonomous trucks . . . ultimately impede the creation of a universal autonomous truck network. . . . The path to long-term viability of autonomous tech doesn't lead through 50 states with various regulations and allowances. There needs to be a common standard just like every Wild West border town needed a sheriff.

The Economic Commission for Europe has recognized the need for a global regulatory scheme to effectively implement autonomous vehicle technology:

> Automation in transport, including "self-driving" autonomous vehicles, has the potential to improve the lives of billions of people and transform mobility as we know it. It could enable a safer, more efficient, accessible and ecological means of transport. It could also ultimately save billions of dollars every year and help combat climate change while reducing congestion and emissions.
>
> However, these advancements can only be realized on a global scale if countries work together on the necessary international laws and regulations. Otherwise, with different systems in place in different countries, all autonomous vehicles would stop at the border, meaning that international transport of people and goods could not benefit from these technologies. Furthermore, manufacturers would have to develop different vehicles for every country, making them prohibitively costly.

ECE Press Release, *supra*.

[181] Global Forum 77, *supra* note 172, at 12.

VII. CONCLUSION

There are currently two treaties which govern the international sphere of driving regulations. Both treaties are antiquated in their scope, as neither was drafted with autonomous vehicles in mind. For example, each assumed that a human driver would always control the vehicle, an assumption that autonomous vehicles have since proved to be invalid. The more restrictive language of the Vienna Convention has inhibited the adoption of autonomous vehicle technology in European countries. While attempts to amend the language of the Convention are being made, they are insufficient given the incredibly fast pace at which the technology is growing. For that reason, some signatory nations have begun unilaterally passing legislation in direct violation of the treaty. Furthermore, the signatory nations to the Geneva Convention may be limited by language requiring the human driver be able to control the vehicle at all times,[182] a limitation which the United States is already trying to work around.

The purpose of the treaties was to adopt a uniform set of laws to improve road safety around the globe. Just as the advent of the motor vehicle was sufficient to warrant international concern for safety, so too is the paradigm shift caused by autonomous vehicle technology. The fact that the treaties differ slightly, in that a signatory nation may be party to one treaty, but not both, is currently affecting the way autonomous driving technology is being developed and adopted.

Even more concerning, nations who have signed on to the respective treaties have begun to ignore what the provisions allow and have been implementing their own laws to facilitate the technology. An important purpose of these treaties is to benefit the developing nations who also signed on and have the most to gain from these types of frameworks. If this antiquated and varying language continues to pervade the governance of autonomous vehicle technology, it is those developing nations, who arguably have the most to gain from these treaties, that will end up suffering the most.

Valiant efforts have been made over the past few years to have the regulatory framework catch up with the technology. But this approach is merely an elaborate game of cat and mouse; as soon as the law begins to close in, the technology jumps ahead yet again. Rather than spending time trying to amend treaties that are over a half a century old, efforts would be

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[182] Geneva Convention, *supra* note 55, art. 8 (5).

better placed in developing a new forward-looking framework that can encompass the abounding future advances in autonomous vehicle technology.[183]

A regulatory system could be developed that is proactive rather than reactive. Such a system would improve the odds of achieving consensus on a single regulatory framework. Rather than having to work with divided agreement on two treaties utilizing slightly different, yet critical, language, a new international framework would further the goal of increasing road safety across the globe, possibly reaching a level of safety never before thought possible.

[183] *See* ECE Press Release, *supra* note 180.