DENTONS

Global Guide to Autonomous Vehicles 2024

Grow | Protect | Operate | Finance

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Contents

3 ... Executive Summary

5 ... Canada

21 ... China

30 ... Germany

46 ... Hungary

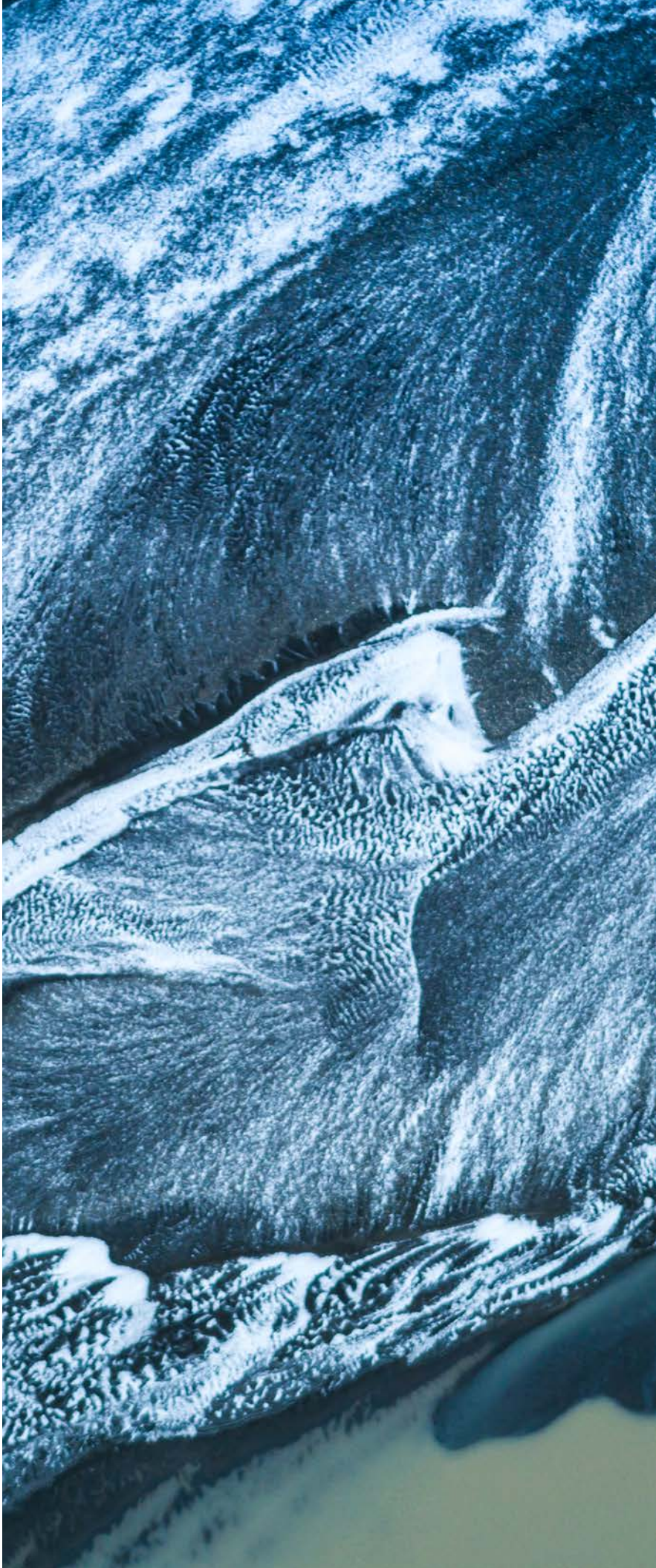
51 ... India

60 ... Poland

68 ... South Korea

91 ... United Kingdom

98 ... United States



Executive Summary

The legal and regulatory landscape governing the testing and deployment of autonomous vehicles (AVs) across the globe continues to evolve but stakeholders still face a complicated array of laws, policies, and regulations. Companies in or around the AV space need clear guidance, despite regulatory schemes that can vary greatly across the world, and sometimes even within a single county. This guide dives deep into this tapestry by summarizing the key AV related regulatory and legal developments from several countries around the world.

Concerns such as traffic congestion, pedestrian safety, and infrastructure readiness continue to be front of mind. Underpinning these technological and regulatory advancements are the twin pillars of safety and liability. Regulators in 2023 focused heavily on safety, while critical questions remain around issues of liability. Data privacy, cybersecurity, and the responsible deployment of artificial intelligence also emerged as significant concerns amongst regulators and lawmakers, reflecting the data-intensive nature of AV operations. These ongoing debates underscore the ongoing complexity between innovation and accountability in this space. The narrative around AV law and regulation in 2023 was also interwoven with broader public policy ambitions, from alleviating urban congestion and cutting emissions to enhancing mobility for those who need it most. Regulations are starting to mirror these larger societal goals, nudging AVs to integrate more seamlessly with public transportation systems and urban planning efforts. Amidst this whirlwind of technological advancement, a plotline of collaboration began to further unfold in 2023, featuring an ensemble cast of automotive manufacturers, tech giants, universities, and government entities. This evolving partnership trend, marked by public-private initiatives and cooperative regulatory efforts, continues to underscore the collective journey toward a future where innovation, safety, and the public good converge on the roads all across the world.

The Dentons 2024 Global Guide to Autonomous Vehicles attempts to step into the fray and provide a detailed roadmap of the legal, regulatory and political landscape for autonomous vehicles so stakeholders can have the tools to navigate this emerging industry.

What Does the Guide Cover?

Authored by our global autonomous vehicles team members, the guide covers the core areas outlined below:

Regulatory Developments

Driverless Testing

Emerging Technologies – Developments in data privacy, 5G, electric vehicles and more

Key Influencers – Key entities, sectors and individuals (public and private) who are influencing the AV space

Regions

The guide focuses on the following 9 countries whose governments and automotive and technology industries have taken unique approaches to supporting the autonomous vehicles industry:

- Canada
- China
- Germany
- Hungary
- India
- Poland
- South Korea
- United Kingdom
- United States

Questions?

Should you have questions regarding any of the covered countries, please do not hesitate to contact our authors identified throughout the guide.

If you have questions of a more general nature, about the guide or the sector overall, please feel free to contact the leaders of our Global Autonomous Vehicles group, found below.

Eric J. Tanenblatt
Co-leader, Global Autonomous Vehicles and Principal, Washington DC and Atlanta
eric.tanenblatt@dentons.com

Peter Stockburger
Co-leader, Global Autonomous Vehicles and Partner, San Diego
peter.stockburger@dentons.com

Dr. Michael Malterer
Co-leader, Global Autonomous Vehicles and Partner, Munich
michael.malterer@dentons.com

Dentons' Global Autonomous Vehicles group

Dentons' global autonomous vehicles group can help you navigate the labyrinth of national, regional and local laws, regulations and guidance relating to the development and deployment of driverless vehicles. We offer a full array of tech, regulatory, transactional and litigation support the autonomous mobility ecosystem, including to startups, emerging companies, multinational vehicle manufacturers, automotive OEMs, vehicle or parts retailers and driverless-technology firms, insurance organizations, financial institutions.

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For more updates to help you stay connected, click here to subscribe to our autonomous vehicles blog to get the latest developments sent straight to your inbox. The Driverless Commute blog is geared to autonomous vehicles and clocking the most important technical, legal and regulatory developments shaping the path to full autonomy.
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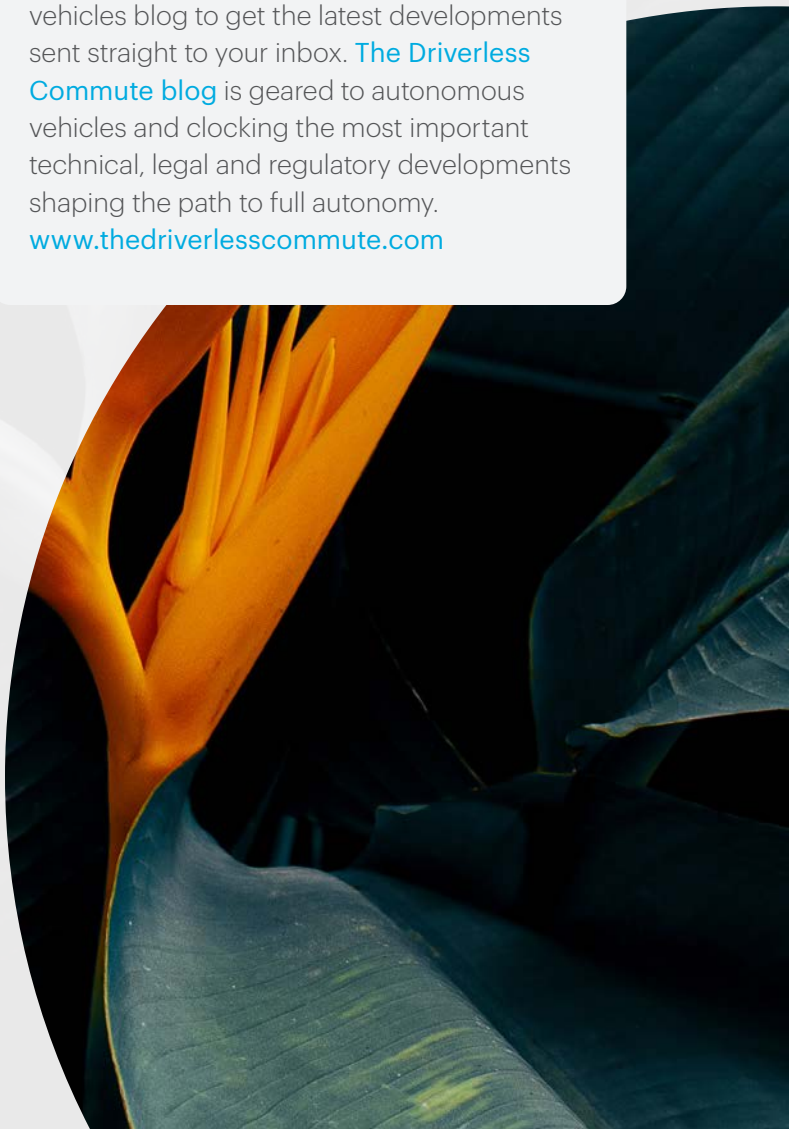


Canada

Regulatory Developments and Roadblocks

Regulatory Overview

Autonomous vehicles in Canada are subject to regulation at three levels of government:

i. **Federal:** responsible for regulating manufacturing and infrastructure as it relates to vehicles;

ii. **Provincial and Territorial:** responsible for the licensing of drivers, vehicle registration and insurance, and laws and regulations regarding the safe operation of vehicles on public roads; and

iii. **Municipal:** responsible for creating and enforcing bylaws for vehicle movement and exercise de facto control over public transportation.

As such, the deployment of autonomous vehicles in Canada requires action from all levels of government.

Despite some cooperation and coordination between different levels of government and industry stakeholders, Canada lacks a national framework for the rollout of autonomous vehicles. A national framework would ensure consistency and limit the potential for legislative gaps.

Federal

Legislation

At the federal level, section 7(1)(a) of the *Motor Vehicle Safety Act* permits testing of autonomous vehicles. Section 7(1)(a) provides for an exception that allows people or companies to temporarily import a vehicle that does not comply with the Canadian Motor Vehicle Safety Standards, if the vehicle is for testing, demonstration, or evaluation.[1] Guidelines released by Transport Canada clarify best practices that organizations should follow when conducting research and development testing of ADS-equipped vehicles in Canada.[2]

Canadian Jurisdictional Guidelines for Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems: Version 2.0[3]

1 Motor Vehicle Safety Act, SC 1993, c 16 and Motor Vehicle Regulations, CRC, c 1038.
2 Transport Canada, "Guidelines for testing automated driving systems in Canada,"
3 Canadian Council of Motor Transport Administrators, "Canadian Jurisdictional Guidelines For the Safe Testing and Deployment of Vehicles Equipped With Automated Driving Systems,"

Purpose

In February 2022, the Canadian Council of Motor Transport Administrators and Transport Canada released the *Canadian Jurisdictional Guidelines for the Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems: Version 2.0* (Jurisdictional Guidelines), replacing the earlier 2018 edition. Developed in consultation with provincial and territorial road transportation officials and the American Association of Motor Vehicle Administrators, these guidelines promote a "consistent approach to connected and automated vehicle policy across jurisdictions." The purpose of the new guidelines is to achieve the dual goals of significantly reducing traffic collisions while maintaining road safety during testing and deployment of automated driving systems on public roads.[4]

Scope

The Jurisdictional Guidelines address how automated vehicle technology will affect:

- Vehicle credentialing (e.g., permit programs and registering vehicles);
- Training and testing of drivers;
- Traffic law enforcement; and
- First responders' approach to traffic incidents.[5]

These guidelines do not apply to the testing and deployment of ADS-equipped heavy commercial vehicles; however, they may be considered in future editions. Jurisdictional Guidelines primarily focus on facilitating consistent regulatory framework across jurisdictions choosing to regulate testing and deployment of ADS systems.[6]

Canadian Innovation Corporation (CIC)

- The federal government's 2022 budget proposed allocating $1 billion over five years to support the creation of an operationally independent federal innovation and investment agency.[7] Following consultation with a broad variety of stakeholders[8], the Canadian Innovation Corporation (CIC) was launched in 2023 with a budget of $2.6 billion over the next four years.
- The CIC is a Crown corporation with a clear mandate to "help Canadian businesses across all sectors and regions become more innovative and productive."[9] The CIC is Canada's latest attempt to leverage its innovation potential to compete in the changing global economy.
- Similar market-oriented innovation and investment approaches have helped countries like Finland and Israel transform themselves into global innovation leaders. For instance, the Israel Innovation Authority has spurred the growth of R&D intensive sectors such as the autonomous vehicle sector.
- Provincial and Territorial

These provinces have enacted or proposed legislation to govern autonomous vehicles:

Manitoba: On May 20, 2021, Manitoba's Bill 23, *The Vehicle Technology Testing Act* (Bill 23), came into force. Bill 23 amends the *Highway Traffic Act*, the *Insurance Act and* the *Manitoba Public Insurance Corporation Act* to allow for the testing of vehicles with automated driving systems or other new technology.

4 *Ibid.*
5 *Ibid.*
6 *Ibid.*
7 Canada, "Budget 2022,"
8 Innovation, Science and Economic Development Canada, "A Canadian Innovation and Investment Agency: What We Heard Report", (2022).
9 *Ibid.*

- **Nova Scotia:** Autonomous vehicles will be regulated under Nova Scotia's new *Traffic Safety Act* once it receives royal proclamation. It would allow the Minister to make regulations with respect to autonomous vehicles.
- **Ontario:** Ontario was the first Canadian province to allow on-road testing of autonomous vehicles through its 10-year pilot program, which started in 2016.[10] Ontario meets with program participants to discuss testing progress twice per year and participants are required to complete annual reporting forms. Ontario's *Highway Traffic Act* regulates the operation of autonomous vehicles[11] by distinguishing the types of automated vehicles that parties can operate. The public, for example, can drive an automated vehicle that is labelled as "conditional automation", or Level 3 under the SAE International Standard. Operating a vehicle that is classified as "high automation" or "full automation," Level 4 and Level 5, respectively, requires authorization.
- **Quebec:** In 2018, Quebec amended its *Highway Safety Code* (HSC) to define "autonomous vehicle" to include an SAE Level 3, 4, or 5 road vehicles and to permit pilot projects of autonomous vehicles on Quebec roads.[12] The HSC was also amended to prohibit the operation of autonomous vehicles, with the exception of SAE Level 3 vehicles, on public highways and roads where public traffic is allowed
- **Saskatchewan:** Saskatchewan's *Traffic Safety Amendment Act, 2020* will govern autonomous vehicles once the provisions related to autonomous vehicles come into force.[13] These provisions will provide the provincial administrator with the authority to issue permits for the operation of automated vehicles.[14]

Driverless Testing and Deployment

This section provides an overview of driverless testing across the country by, among other things, outlining some driverless testing initiatives and studies demonstrating consumer appetite for deployment:

10 Ontario, "Ontario Automated Vehicle Pilot Program,"
11 Ontario, "Pilot Project – Automated Vehicles" O Reg 306/15,
12 Highway Safety Code, CQLR c C-24.2, <https://www.legisquebec.gouv.qc.ca/en/document/cs/c-24.2>
13 An Act to amend The Traffic Safety Act, 2020, SS 2004, c T-19.1, <https://canlii.ca/t/54qjd>
14 *Ibid.*

Region	Driverless Testing
Alberta	The Alberta Motor Transport Association (AMTA) successfully completed two trial runs for autonomous semi-trucks. The first phase saw the semi-trucks drive on the Queen Elizabeth II Highway from Calgary to Edmonton in 2021. The second phase resulted in the trucks' deployment on the Trans-Canada Highway from Calgary to Banff in 2022.[15] "Commercial trucking is essential to Alberta's economy and we're proud to trial new ways to get our goods to market," says Ric McIver, Alberta's Minister of Transportation.[16] As of 2023, Calgary-based Suncor Energy Inc., reports using 31 autonomous trucks in its oil-sands mining operations. Suncor aims to increase that number to 91 by the end of 2024.[17]
British Columbia	Teck Resources Ltd., a mining company, uses an autonomous haulage system at its coal mine in British Columbia. The company plans to transition to a fully autonomous fleet of haul trucks within the next few years.[18] In September 2023, a study released by researchers from the University of British Columbia Research on Active Transportation Lab (REACT) revealed British Columbians are hesitant about the introduction of self-driving vehicles on public streets. The study showed respondents two sets of videos - one series with human-driven cars and another with self-driving cars. Most respondents perceived the human-driven car as safer for pedestrians. However, the videos were the same. In response to these findings, researchers recommend the province adopt a gradual introduction of self-driving cars on city streets.[19] "At this critical point in the introduction of automated vehicles, it is essential to understand and consider their effects on everyone who shares city streets – especially pedestrians," says **Alex Bigazzi, associate professor of civil engineering at the University of British Columbia and REACT principal investigator.**[20]
Manitoba	In December 2022, Winnipeg Richardson International Airport became the first airport in North America to offer its passengers autonomous wheelchairs. The wheelchairs transport the passenger from the check-in counter, through security, and to the boarding gate. "By 2038, it is estimated that one in three travelers will need some form of assistance. [This] partnership will influence and expand mobility globally by raising the standard of reliable accessibility in public spaces," says **Nick Hays, president and CEO of the Winnipeg Airports Authority.**[21]

15 Alberta Motor Transport Association, "Cooperative Truck Platooning System on-road trials successfully conclude in Alberta" (March 17, 2022).

16 Alberta Motor Transport Association, "Release: Canada's first automated commercial trucks to roll onto Alberta highway" (May 3, 2021).

17 Emma Graney, "Suncor CEO boasts improved worker safety, profitability in quarterly update," (November 9, 2023),

18 Amanda Stephenson, "Mining companies betting on autonomous technology to make dangerous jobs safer," (June 25, 2023), Teck, "Mine of the Future,"

19 React Lab, "Perceived Safety and Comfort of Pedestrian Interactions with Self-driving Vehicles" (June 2023).

20 Jeremy Hainsworth, "B.C. is not ready for self-driving cars, study finds" (August 31, 2023).

21 Winnipeg Airports Authority, "YWG Becomes First Site in North America to Implement WHILL Self-Contained Wheelchair Service" (December 13, 2022).

Region	Driverless Testing
Ontario	In July 2023, the Ontario government announced it was investing $2.5 million to develop two "Demonstration Zones" in the cities of Markham and Vaughan, Ontario. Companies can test automotive and smart mobility solutions, including autonomous vehicles, in real-world environments. Ontario's investment was made through the Ontario Vehicle Innovation Network (OVIN). An additional $4.8 million was invested into the project by the private sector and the two municipalities, amounting to a total of $7.3 million of funding.[22] "What the demonstration zone will do is allow Ontario companies as part of the commercialization process to use real infrastructure, to use real railways and to use real sidewalks or whatever the case may be, to showcase how their technology works," says **Raed Kadri, Vice President, Strategic Initiatives, and Head of OVIN.**[23] In 2019, Loblaw partnered with Gatik to deploy autonomous vehicles to transport grocery delivery orders between Loblaw facilities. Initially, the autonomous vehicles had safety drivers on board. In 2022, Loblaw and Gatik made its first delivery without the safety driver.[24]
Quebec	The City of Montreal deployed two autonomous shuttles along Plaza St-Hubert in two phases. The first phase was completed in fall 2021 and the second in fall 2022.[25]
Other Canadian jurisdictions	The CCMTA recommends any testing regulations be at least as strict as those implemented in Ontario. As such, a disengagement/engagement mechanism, failure alert and mechanism enabling the driver to take over all dynamic driving tasks are all likely to be required for AVs that are operated with a driver. Companies will need to obtain a test permit pursuant to an approved application to test on public roads and have a minimum $5 million in liability insurance coverage and beyond $5 million when testing larger vehicles (eight or more passenger capacity). Moreover, employees of the company testing the AV will likely be required to complete training (provided by the company) with respect to the capabilities and limitations of the test vehicle. The training logs must be submitted to the applicable provincial agency.
All jurisdictions	Underwriters Laboratories (UL) has released UL 4600, "Standard for Evaluation of Autonomous Products," which is the first dedicated safety standard for fully autonomous vehicles.

22 City of Markham, "Markham & Vaughan Awarded $2.5M for Automotive & Mobility Technology Demonstration Zones," (July 25, 2023), Electric Autonomy Canada, "Ontario launches demo zone for real-world automotive and mobility tech testing," (July 25, 2023)

23 *Ibid.*

24 Loblaw Companies Limited, "Driverless vehicles hit the road," (October 5, 2022),

25 Montreal, "Automated electric shuttles at Plaza Saint-Hubert," (July 26, 2022).

Connected Vehicles and Logistics

5G

1. Canada's spectrum regulator, Innovation, Science and Economic Development (ISED), has implemented a variety of approaches to spectrum sharing to support the deployment of 5G wireless networks and systems in Canada, including:
    a. a policy to allow terrestrial mobile and fixed services to share the millimeter wave bands (26.5-27.5 GHz, 27.5-28.35 GHz, and 37-40 GHz) with fixed satellite service;
    b. allowing license-exempt use of the 64-71 GHz band on a no-interference, no-protection basis;
    c. decisions to issue flexible-use licenses in the 600 MHz, 3500 MHz, and 3800 MHz bands to enable both mobile and fixed operations, thereby enabling spectrum sharing with existing services when practicable;
    d. allocating 1200 MHz in the 5925-7125 MHz frequency range to Radio Local Area Network (RLAN) applications, including allowing higher-power RLAN operations in 950 MHz of this spectrum in which sharing of spectrum will be managed through automated frequency coordination systems; and
    e. decision on a non-competitive local licensing framework in the 3900-3980 MHz band.
2. In parallel with this work from ISED, Canada's telecommunications regulator (the CRTC) and the telecommunications industry in Canada have done the necessary work to implement telephone numbering resource policies and procedures to prepare for the proliferation of devices in the Internet of Things (IoT) universe.
3. While both the CRTC and ISED have adopted many strategies over the course of the past two years to enable more efficient spectrum use and innovative new wireless applications, 5G network deployment has been slow in Canada. Thus far, the three dominant Canadian mobile wireless carriers' 5G deployments have been confined to limited local deployments.
4. This slowness may be due to a number of factors: (i) the relatively small size of the Canadian wireless subscriber market (as compared to its vast geographic expanse); (ii) the pace at which ISED has auctioned licensed 5G spectrum, which generally lags behind the US and other OECD countries by at least one and in some cases two or more years; (iii) wireless carriers in Canada individually have access to lesser amounts of contiguous spectrum given that spectrum set asides and caps have been a constant feature of each and every commercial mobile spectrum auction in Canada since 2007; and (iv) the Government of Canada's decision to prohibit Huawei and ZTE network equipment in Canadian 5G networks.
5. The phenomenon of working from home during COVID-19 related lockdowns has made closing the ever-present broadband connectivity gap between rural/remote Canada and urban Canada the undisputed telecommunications policy priority over 5G deployment. Between March 2015 and March 2022, the Government of Canada has announced CAD $7.2 billion in available funding and various provincial governments have made approximately CAD $10 billion available for rural and remote Internet infrastructure to help ensure that all Canadians have access to fast and reliable Internet, no matter where they live or work.

6. However, with the incorporation of mobile satellite capabilities in chipsets for mobile devices, the merger of Canada's second largest telecom (Rogers) with the fourth-largest (Shaw) earlier in 2023, the auction of 3800 MHz spectrum in Q3 2023 and planned releases of flexible use millimeter wave (26 GH, 28 GHz and 38 GHz) spectrum in 2024, 5G use cases and network deployments will undoubtedly take center stage once again in Canada, as in the rest of the world.

Data Privacy and Security

Much of the data collected by autonomous vehicles has the potential to be personal information.

Canada has a robust privacy regime which regulates the collection, use and disclosure of "personal information."[26] Generally, the handling of personal information by the private sector is governed by the federal *Personal Information Protection and Electronic Documents Act* ("PIPEDA"); however, organizations operating in Alberta, British Columbia and Quebec may be excluded from the application of PIPEDA as those jurisdictions have their own applicable privacy legislation. Key considerations for owners and operators of AVs:

1. Legal Authority

- The handling of personal information in Canada is generally permitted through a consent-based framework.
- The collection, use and disclosure of personal information without consent is permissible in limited circumstances, none of which are likely to apply in the case of AVs handling personal information for the standard operation of the vehicle.

2. Transparency

- Privacy notices must be drafted in plain language, be made widely accessible and sufficiently detailed such that individuals can meaningfully understand what they are consenting to.

3. Purpose Limitation

- Before an organization collects personal information, it must identify the purpose for which it needs the information, keeping in mind that the purpose must be reasonable in the circumstances.
- Collecting personal information for speculative uses, or "just because," is not permitted.
- **Privacy Developments**
- Bill C-27, the *Digital Charter Implementation* Act, 2022, would rewrite privacy law in Canada, by replacing PIPEDA with a new privacy law, the *Consumer Privacy Protection Act* ("CPPA"). The Bill is still moving through the legislative process.[27]
- The CPPA would move Canada's privacy regime closer to that found in Europe under the *General Data Protection Regulation* ("GDPR"). Some of the most impactful changes include:
    - **Lawful authority - legitimate interests**
    - A new exception to consent for activities in which the organization has a legitimate interest that outweighs any potential adverse effect on the individual, provided that a reasonable person would expect the collection or use for such an activity, and the personal information is not collected or used for the purpose of influencing the individual's behavior or decisions.

26 "Personal Information" is interpreted broadly and includes any information about an "identifiable individual" - where there is a serious possibility that an individual could be identified through the use of the information, alone or in combination with other information.

27 For further information see, "Canada's new federal privacy Bill C-27 – Summary of significant impacts and new proposals"

- **Takeaway:** Under the new regime, AV owners and operators may be able to rely on legitimate interests as a lawful ground to collect and use certain personal information generated by the vehicle. This could offer a preferable approach given the challenges of securing meaningful consent in the AV ecosystem.

- **Automated decision making**

- New transparency and explainability obligations on organizations using automated decision systems to make predictions, recommendations or decisions about individuals that could have a significant impact on them.

- An automated decision system is defined as any technology that assists or replaces the judgment of human decision-makers through the use of a rules-based system, regression analysis, predictive analytics, machine learning, deep learning, a neural network, or other technique.

- **Takeaway:** It is unclear at this time whether the systems and software used in AVs are intended to be captured by this broad language - on a plain reading of the language, it appears to be the case. It is also unclear whether a decision about a vehicle will be a decision "about an individual." Assuming this is so, owners and operators of AVs will need to think about which systems are making predictions, recommendations or decisions that could be considered "significant" and for whom or what.

Quebec Privacy Developments

- A significant wave of new provisions recently came into effect under Quebec's privacy legislation, the *Act respecting the protection of personal information* — including steep penalties for non-compliance.

- A unique requirement to Quebec relates to cross border transfers of personal information. Any communication of personal data outside Québec requires a privacy impact assessment to determine that protection in the receiving jurisdiction would be "adequate" according to privacy principles.

    - **Takeaway:** Owners and operators of AVs who use service providers in other jurisdictions, for example, must conduct a privacy impact assessment before transferring personal information.

Electric Vehicles

"Canada is cementing its position as a global leader in the EV supply chain. This means good jobs for Canadian workers, a cleaner future, and a stronger and more resilient economy," says the **Hon. François-Philippe Champagne**, **Minister of Innovation, Science and Industry**.[28]

- In 2023, Canada surpassed "a critical EV tipping point" after 5% of new car sales were those powered only by electricity. The experiences of other countries suggest that electric vehicle adoption increases at a much faster rate once this inflection point is reached. In doing so, Canada joined 22 other countries that have crossed this threshold.[29]

28 Canada, "Building electric vehicles in Canada to create jobs and a cleaner future for everyone," (January 17, 2023),

29 Tom Randall, "Canada among new countries to pass crucial tipping point that triggers mass EV adoption," (August 28, 2023). <https://financialpost.com/commodities/energy/electric-vehicles/electric-cars-pass-a-crucial-tipping-point-canada>.

Federal Initiatives Supporting the Adoption of Electric Vehicles in Canada

Key Investments

- In May 2023, the Minister of Natural Resources announced over $35 million in federal investments to support the development of electric vehicle charging infrastructure across Canada. This funding will result in nearly 150 new fast chargers and over 3,500 new Level 2 chargers which will be installed across the country, primarily in Ontario and British Columbia.[30]
- In May 2023, Natural Resources Canada announced a total federal investment of $5.9 million into 28 Canadian organizations across the country to undertake projects aiming to improve Canadians' awareness of zero-emission vehicles. This funding was provided through the federal government's Zero-Emission Vehicle Awareness Initiative.[31]

Incentives for Zero-Emission Vehicles (iZEV) Program

- The iZEV program provides point-of-sale incentives of up to $5,000 for Canadian consumers purchasing or leasing eligible zero-emission vehicles. iZEV incentives can be used in addition to any incentives provided by provincial or territorial governments.[32]
- Since May 2019, iZEV incentives have been applied to over 280,000 zero-emission vehicles, amounting to over $2 billion in total program funding.[33]
- In 2022, the federal government announced a $1.7 billion investment to develop and extend the iZEV program until March 2025.[34]

Incentives for Medium and Heavy Duty Zero-Emission Vehicles (iMHZEV) Program

- Launched in July 2022, the iMHZEV program provides point-of-sale incentives up to $200,000 for Canadian organizations and businesses that are purchasing or leasing eligible medium and heavy duty zero-emission vehicles, such as trucks, buses, and vans.[35]
- The federal government has committed to providing almost $550 million in funding to support the iMHZEV program over four years from 2022 to 2026.[36]

30 Natural Resources Canada, "New Electric Vehicle-Related Investments Across Ontario and Canada," (May 26, 2023).
31 Natural Resources Canada, "Electric Vehicle-Related Investments," (May 18, 2023).
32 Transport Canada, "Incentives for zero-emission program,"
33 Transport Canada, "Canada Zero-Emission Vehicle Approach and Zero Emission Bus Toolkit" (October 23, 2023).
34 Newswire, "Minister of Transport announces new Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles Program," (July 11, 2022).
35 Transport Canada, "Incentives for medium and heavy-duty zero-emission vehicles."
36 Newswire, "Minister of Transport announces new Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles Program," (July 11, 2022).

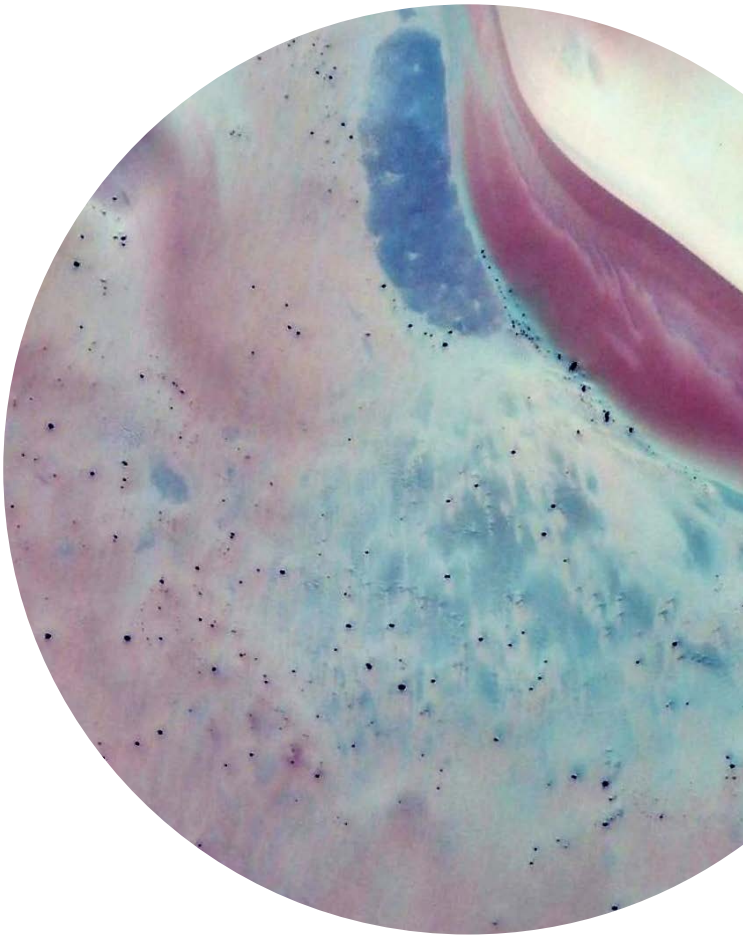
- Businesses and organizations can receive a maximum of up to ten incentives or $1 million in incentives in a calendar year. Such incentives can be used in addition to any incentives provided by provincial or territorial governments.[37]

Zero Emission Vehicle Infrastructure Program (ZEVIP)

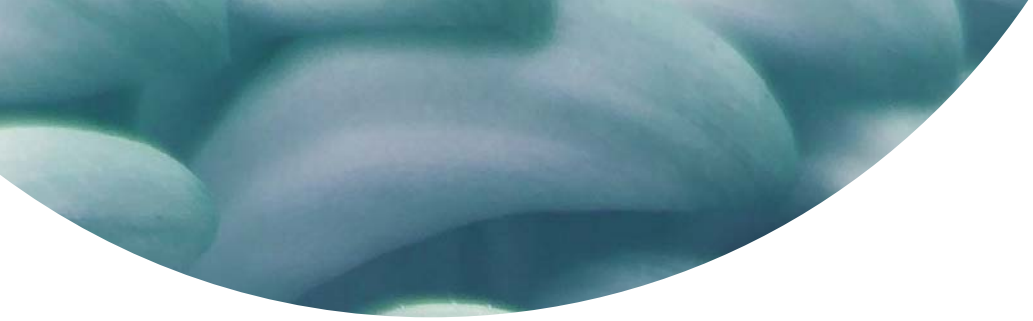
- ZEVIP is a $680 million initiative by the federal government running until 2027 to increase the availability of localized charging and hydrogen refuelling opportunities.[38]
- ZEVIP will support electric vehicle charging infrastructure deployment in public places, on-street, workplaces and multi-unit residential buildings. Through initiatives like ZEVIP, the Government of Canada strives to deploy 84,500 electric vehicle chargers and 45 hydrogen refuelling stations by 2029.[39]

Zero Emission Transit Fund

- Through the Zero Emission Transit Fund, the Government of Canada is investing $2.75 billion over five years, starting in 2021, to facilitate the electrification of public transit and school bus operators, support the purchase of 5,000 zero emission buses, and build supporting infrastructure, including charging infrastructure and facility upgrades.[40]
- On March 30, 2022, the federal government announced that the Canadian Urban Transit Research & Innovation Consortium (CUTRIC) was selected to work with transit bus operators to provide zero emission transit bus electrification and planning studies through the Zero Emission Transit Fund.[41]



37 Transport Canada, "Incentives for medium and heavy-duty zero-emission vehicles."
38 Natural Resources Canada, "Zero Emission Vehicle Infrastructure Program."
39 Natural Resources Canada, "Zero Emission Vehicle Infrastructure Program."
40 Canada, "Zero Emission Transit Fund."
41 Infrastructure Canada, "Government of Canada advances supports for zero emission bus transportation."



Key Provincial Developments Supporting the Adoption of Electric Vehicles

British Columbia

British Columbia is leading Canadian provinces in taking the most comprehensive approach to enabling electric vehicle adoption, including the implementation of purchase incentives, investments in infrastructure, and a strong mandate for minimum electric vehicle sales according to a scorecard released by Electric Mobility Canada.[42]

In 2023, British Columbia had the highest percentage of electric vehicle sales of any province in Canada. Approximately 21% of all light-duty passenger vehicles sold were electric.[43] These findings mirror the results of a recent study, which found that Canadian consumer interest in electric vehicles is highest in British Columbia.[44]

In October 2023, the Government of British Columbia announced its intention to legally require all new vehicles sold in the province to be zero-emission by 2035, which is five years earlier than its original goal of 2040.[45]

In April 2023, British Columbia announced $26 million in new funding for public electric vehicle charging stations. This investment will support the installation of approximately 250 new light-duty fast-charging stations in British Columbia. There are currently over 3,800 electric vehicle charging stations in the province.[46]

Ontario

Ontario's goal is to build at least 400,000 electric vehicles and hybrids by 2030.

In April 2023, Ford Motor Company announced a $1.3 billion investment to create an electric vehicle manufacturing plant in Oakville, Ontario. In doing so, Ford will be revamping an existing plant into one that has the capacity to manufacture electric vehicles. The renovations are expected to take six months and begin in early 2024.[47]

In July 2023, the City of London and the Government of Canada announced a $400,000 joint investment to transition all public transit buses in London, Ontario to zero-emission buses. The federal government's contribution was made through the Zero Emission Transit Fund (discussed above).[48]

42 Electric Mobility Canada, "Canada electric vehicle scorecard: ranking provincial and territorial strategies, policies & investment,"
43 The Canadian Press, "B.C. moves up electric vehicle target, with 100-per-cent sales goal by 2035," (October 24, 2023),
44 J.D. Power, "Consumers in Canada Sour on EVs and Consideration Significantly Lags U.S., J.D. Power Finds," (June 29, 2023),
45 The Canadian Press, "B.C. moves up electric vehicle target, with 100-per-cent sales goal by 2035," (October 24, 2023),
46 British Columbia, "B.C. expands EV charging, leads country in going electric," (April 11, 2023),
47 Michael Wayland, "Ford to invest $1.3 billion to build EV manufacturing hub in Canada," (April 11, 2023),
48 Infrastructure Canada, "The government of Canada and the City of London invest in planning for transition to zero-emission buses," (July 25, 2023).

In June 2023, Mitsui High-tec (Canada), Inc. announced a $102.3 million investment to expand the company's facilities based in Brantford, Ontario. Mistui High-tec (Canada) manufactures motor cores, which form the basic structure of motors used in electric vehicles. This investment will bolster the development of Ontario's electric vehicle supply chain.[49]

In 2023, the Toronto Parking Authority (TPA), which is the largest municipally owned commercial parking operator in North America, began offering electric vehicle chargers in parking areas located in downtown Toronto. By the end of 2023, the TPA will offer almost 400 electric vehicle charging stations in parking locations in Toronto, Ontario. The TPA expects to offer more than 650 chargers by 2025.[50]

In 2022, Stellantis and LG Energy Solution announced plans to create a joint venture which will invest over $5 billion to modernize electric vehicle assembly and manufacturing plants in Windsor, Ontario. The Government of Canada is providing additional funding of up to $529 million into the project.[51]

Ontario launched Phase 2 of *Driving Prosperity: The Future of Ontario's Automotive Sector* in November 2021. Phase 2 focuses on transforming the auto sector by building electric, autonomous and connected vehicles and supporting a broader supply chain, including the exploration, mining and production of critical minerals for the manufacturing of electric batteries in Ontario.[52]

Quebec

In September 2023, the federal government and Quebec announced a combined total of $2.7 billion in government funding to build a new electric vehicle battery manufacturing plant near Montreal, Quebec. The facility is estimated to have an annual battery cell manufacturing capacity of up to 60 GWh, which could power approximately one million electric vehicles per year. The first phase of the project is set to be completed by the end of 2026. According to the federal government, the initiative will create as many as 3,000 jobs.[53]

- In August 2023, the federal government and Investissement Québec, the Quebec government's investment branch, announced a combined $644 million investment to build a new Ford manufacturing plant. The new facility will produce materials that are used in the company's electric vehicle batteries. The project is estimated to create over 345 jobs. The plant will be located in Bécancour, Quebec, a small city in central Quebec.[54] In 2022, General Motors also announced plans to build an electric vehicle battery manufacturing plant in Bécancour.[55]

Quebec plans to have two million electric vehicles on its roads by 2030 and aims to have all new vehicle sales be electric vehicles by 2035.[56]

49 Ontario, "Ontario Welcomes $102 Million Investment in Growing Electric Vehicle Sector," (June 29, 2023),
50 Mehanaz Yakub, "Toronto Parking Authority begins operating its own EV charging network," (January 10, 2023),
51 Canada, "Building electric vehicles in Canada to create jobs and a cleaner future for everyone," (January 17, 2023),
52 Ontario, "Driving Prosperity: The Future of Ontario's Automotive Sector,"
53 Benjamin Shingler, "Canada is pouring billions of dollars into the electric vehicle industry. Will it pay off?" (September 30, 2023),
54 CBC News, "Quebec, Ottawa investing $644M for construction of new Ford EV plant in Bécancour," (August 17, 2023),
55 The Canadian Press, "GM and POSCO to build plant in Quebec to produce battery material," (March 7, 2022),
56 The Canadian Press, "GHG emissions in cars: Quebec plans to raise standards," (April 21, 2023),

In September 2023, the Quebec government announced a $514 million investment to deploy over 116,000 electric vehicle charging stations in the province. Quebec is aiming to facilitate the transition to electric vehicles by improving access to charging stations.[57]

At 3.3 cents per kilowatt hour, Quebec has some of the lowest utility costs in North America, which supports the transition to electric vehicles.[58]

Quebec also offers rebates of up to $7,000 for the purchase of an electric vehicle.[59]

Key Concerns and Challenges for Electric Vehicle Adoption in Canada

"Despite current legislation that is pushing hard for EV adoption, consumers in Canada are still not sold on the idea of automotive electrification. Growing concerns about affordability and infrastructure (both from charging and electrical grid perspectives), have caused a significant decline in the number of consumers who see themselves in the market for an EV anytime soon," says **J.D. Ney**, **Director, Canadian Automotive Practice, J.D. Power Canada**.[60]

Approximately one in ten Canadians currently own an electric vehicle, although according to multiple surveys, Canadians' interest in electric vehicles has declined from 2022 to 2023.[61] For example, J.D. Power's Canada Electric Vehicle Consideration Study found that 66% of Canadians reported they were unlikely to consider purchasing an electric vehicle for their next car, which is a 13% increase from 2022.[62]

Canada should take inspiration from the United States, in which government regulations have supported greater private investment in battery manufacturing, an increased and more diverse supply of EVs to the market, and higher consumer demand. For instance, the United States' *Inflation Reduction Act* introduced a federal tax credit of up to $7,500 for EVs assembled in the U.S. and purchased between December 2022 and January 2033.[63]

Canadians' primary concerns about buying an electric vehicle are: inadequate driving distance per change, the high up-front cost of electric vehicles, and unavailability of charging stations.[64] The lack of sufficient charging infrastructure is also the most prominent barrier to widespread electric vehicle adoption at the global level.[65]

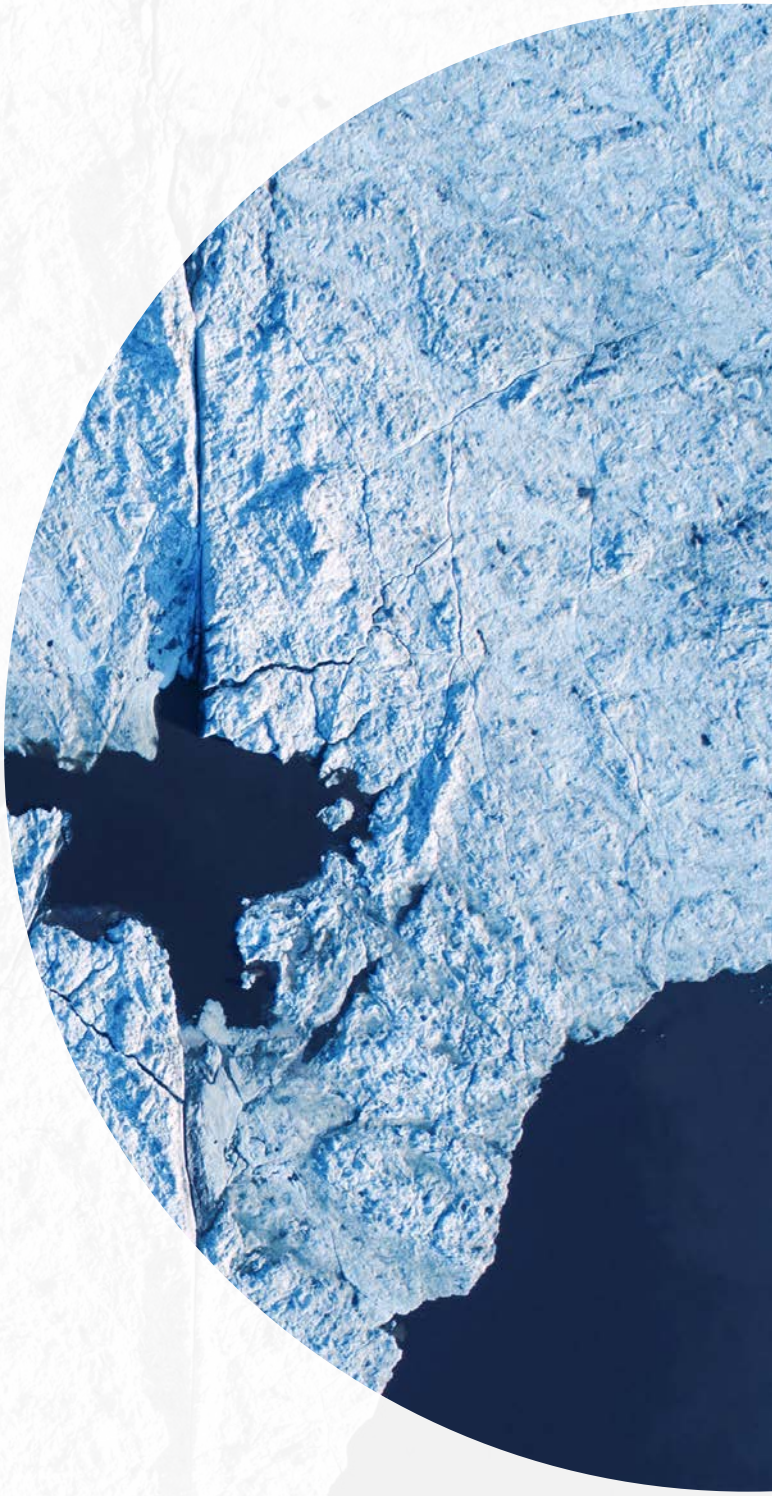
57 Franca Mignacca, "Quebec government to invest $514M in electric vehicle charging stations," (September 7, 2023),
58 Electric Autonomy Canada, "Attracting global companies is the key to cementing Canada's EV legacy," (May 10, 2023),
59 Quebec, "Quebec new vehicle rebate,"
60 J.D. Power, "Consumers in Canada Sour on EVs and Consideration Significantly Lags U.S., J.D. Power Finds," (June 29, 2023),
61 CBC News, "Q&A: Interest in EVs has softened, according to Canada's largest auto marketplace," (April 23, 2023), Holly McKenzie-Sutter, "Canadians less keen to buy EVs, despite government policy push: Study," (June 29, 2023),
62 J.D. Power, "Consumers in Canada Sour on EVs and Consideration Significantly Lags U.S., J.D. Power Finds," (June 29, 2023),
63 EY Global, "US gains ground in electric vehicle readiness, but China and Norway remain out in front," (September 9, 2023),
64 J.D. Power, "Consumers in Canada Sour on EVs and Consideration Significantly Lags U.S., J.D. Power Finds," (June 29, 2023),
65 EY Global, "The cost-of-living crisis is fueling a rise in electric vehicle popularity – EY analysis," (June 27, 2023),

According to a report by Clean Energy Canada released in September 2022, Canada has the potential to build a domestic electric vehicle battery supply chain that could support up to 250,000 jobs by 2030 and add $48 billion annually to Canada's economy.[66] However, swift government action is required for Canada to realize its jobs and GDP potential. Where no additional government action is taken, the supply chain would create only 60,000 jobs and contribute $12 billion in GDP.[67]

A stronger federal policy supporting the electrification of vehicles would help Canada reach its mandatory target for all new light-duty vehicles and passenger trucks to be zero-emission by 2035 and its long-term goal of net-zero emissions by 2050.

Driving Forces

"Canada is the world-leading hub of AI. There is a talent capability in AI, decision-making software and sensors at a density found nowhere else in the world. All the conditions should be right for Canada to be forging ahead in AVs," says **Colin Earp**, **KPMG Canadian National Transport Leader and Global Chair in Infrastructure Technology**.[68]



66 Clean Energy Canada, "Canada's New Economic Engine: Modelling Canada's EV battery supply chain potential-and how best to seize it," (September, 2022),

67 *Ibid.*

68 Matthew Halliday, "Canada has a secret weapon in the race for self-driving cars: winter," Toronto Star, (April 19, 2022),

Autonomous Vehicles Startups to Watch in Canada[69]

Company	Description	Location and Year Founded
Algolux	Provider of computer vision and cloud-based video analytics solutions	Montreal (2014)
LeddarTech	Provider of sensing, fusion and perception solutions for automotives	Quebec City (2007)
Waabi	AI-enabled platform offering self-driving technology for trucks	Toronto (2021)
Area X.O	Provider of solutions for the development, testing and application of technologies	Ottawa (2020)
NovAtel	Provider of global navigation satellite system	Calgary (1978)
NuPort	AI-enabled platform offering autonomous driving solutions for trucks	Toronto (2019)
Tiny Mile	Manufacturer of last-mile delivery robots for food delivery	Toronto (2019)
Downtown.AI	Provider of human movement predictive platform for mobility services	Vancouver (2017)
LoopX	Manufacturer of AI-powered autonomous delivery robots	Waterloo (2021)
intramotev	Developer of autonomous electric cargo trains	Canada (2020)

69 Tracxn, "Autonomous Vehicles Startups in Canada,"

Edited by

Michael Ledgett
Partner, Toronto
michael.ledgett@dentons.com

Amer Pasalic
Partner, Toronto
amer.pasalic@dentons.com

Contributions from

Monica Song
Partner, Ottawa
monica.song@dentons.com

Jen Rees-Jones
Senior Manager,
Privacy and Data, Toronto
jen.rees-jones@dentons.com

Eli Berman
Articling Student
eli.berman@dentons.com

Nikita Munjal
Articling Student
nikita.munjal@dentons.com

China

2023 Regulations and industrial development of driverless driving in China

1. Introduction

A rapid development in driverless industry can be viewed in China in recent years. Benefited from not only the unique economic structure covering the whole industrial chain and massive application scenarios, driverless industry in China also enjoys firm support from the government, through both policy and infrastructure. The capital market also shows willingness to invest in driverless industry. Autonomous vehicles are concerned with significance in China. In 2023, the government continues to introduce relevant regulations and policy to this field, and several national policies have been issued successively, including:

- *Circular of the Ministry of Industry and Information Technology, the Ministry of Public Security, the Ministry of Housing and Urban-Rural Development, and the Ministry of Transport on Launching the Pilot Program for the Entry and Road Testing of Intelligent Connected Vehicles*, which allows road testing and deployment of L3 and L4 autonomous vehicles through application and approval;
- The revised and formed *Guideline for Developing National Internet of Vehicles Industry Standard System (Intelligent & Connected Vehicle) (2023)*, which introduces a complete system of intelligent connected vehicle standard;
- *The Guidelines for Autonomous Vehicle Transportation Safety Services (Proposed Regulation) (draft for comment)*, which strictly limits the application scenarios of autonomous vehicles and recognizes the liability in accidents;
- Overall structure and main technical indexes of highway engineering facilities supporting automatic driving.

Development in driverless testing practice can be viewed in many areas in China. China currently has 17 national-level intelligent connected vehicle test demonstration zones, more than 3,200 kilometers of test roads, and over 700 test licenses. 26 provinces and municipalities have issued relevant administrative rules. Demonstration trails of manned or loaded autonomous vehicles have been carried out in Shanghai, Beijing, Changsha and other cities. The first test site for 5G intelligent connected vehicle is officially put into operation in Shangrao. In Shanghai, drive test is now permitted to be carried out on open roads, rather than merely practice in closed roads. And with no more safety officer required in the vehicle, the test now turns to absolute driverless. High-level autonomous buses are implemented in ground public transport operating scenario in Beijing.

In the first half year of 2023, 27 financing events took place in autonomous driving field, including sections of autonomous driving solutions, sensing hardware, drive-by-wire chassis and computing hardware. Statistics shows that half of those enterprises were in the A round or angel round. Among the total 27 financing events, there are 3 companies in the angel round, 1 in the Pre-A round, 7 in the A round, 2 in the A+ round. In the field of passenger vehicles, Freitech received several billion Chinese Yuan in B+ round of financing in January 2023, and the amount of B series financing accumulated to nearly one billion Chinese Yuan in about 2 months. Hong Jing Drive also obtained several billion Chinese Yuan in B+ round financing in May this year.

Conversely, technical problems, especially chips, are still fatal obstacles for the driverless driving industry in China. The representative enterprises in domestic autonomous driving chips can be generally categorized into three, namely startup technology

enterprises such as Horizon and Black Sesame Technologies, automobile OEMs represented by BYD and Geely Auto, and traditional chip enterprises. Compared with previous versions, the chips from leading enterprises like Horizon and Black Sesame Technologies now have their computational power significantly improved. Nevertheless, domestic chip for autonomous vehicle has not yet developed maturely, still with ongoing necessity of further exploration.

2. Regulatory developments and roadblocks

2.1 Central Government Policies

At the briefing on the policy of high-quality development of new energy vehicles on June 21, 2023, the State Council indicated its schedule to support vital research in key technology for intelligent vehicles, as well as to improve network infrastructures such as integration of vehicle and cloud. More scenarios for testing and demonstration applications were permitted. In general, positive attitude towards L3 and above autonomous driving can be viewed at a national level. And the application of autonomous driving in commercial areas was emphasized.

On July 18, 2023, the Ministry of Industry and Information Technology jointly published the revised *Guideline for Developing National Internet of Vehicles Industry Standard System (Intelligent & Connected Vehicle) (2023)* with the National Standardization Administration. This updated version focuses on generally applied standards, core technologies, and application of key products in intelligent connected vehicle area. It develops systematic standards for intelligent connected vehicles, including basic requirements, technology, products and testing standards. This revised guidance also provides basis for further regulations and standards at industrial level. Aiming at providing practical guidance for the vehicle networking industry, while accelerating the generation of related standards, a unified industrial standard system must also coordinate with the *Guideline for Developing National Internet of Vehicles Industry Standard System*.

On August 8, 2023, the Ministry of Transport issued the *Guidelines for Autonomous Vehicle Transport Safety Services (Trial) (Draft for Comment)* at its official website. The guideline highlights that the application of autonomous vehicles must be strictly limited to permitted scenarios at this stage. It also clarifies the assignment of liability of involved parties in accidents. For vehicles engaged in transport operations, it is compulsory to have a driver in conditionally self-driving and highly self-driving vehicles, while a fully autonomous vehicle is required to have a remote driver or safety officer. Systematic training and assessment and relevant qualifications are obligatory requirements for the above-mentioned drivers and safety officers.

On October 8, 2023, the Ministry of Transport issued *Technical Guidelines for Highway Engineering Facilities Supporting Automated Driving,* which supports driverless driving through the overall architecture and main technical indicators of highway engineering facilities. It covers topics such as the technical requirements of cloud control platforms for automatic driving, traffic sensing facilities, traffic control and guidance facilities, and communication facilities, testing and application of automated driving technology.

On November 17, 2023, the *Circular of the Ministry of Industry and Information Technology, the Ministry of Public Security, the Ministry of Housing and Urban-Rural Development, and the Ministry of Transport on Launching the Pilot Program for the Entry and Road Testing of Intelligent Connected Vehicles* was published, together with a pilot guideline and an application format. Based on road testing and demonstration applications, intelligent networked vehicle products with mass production conditions will be selected to carry out entry pilots. Notably, the autonomous driving function carried by intelligent networked vehicles in this policy typically refers to the L3 conditional autonomous driving and L4 highly autonomous driving as defined in the national standard "Automobile Driving Automation Classification" (GB/T 40429-2021). This policy will be further introduced in 3.1 the new development of driverless testing in China in 2023.

2.2 Local policies

In February 2023, Shanghai Pudong New Area issued the first local regulations for driverless vehicles in China, *Regulations of Shanghai Pudong New Area on Promoting the Innovative Application of Driverless Intelligent Connected Vehicles*. This regulation provides firm support for technological innovation, drive testing, and commercial operations of driverless vehicles.

On June 25, 2023, *Rules on Implementation of Drive Test and Commercial Demonstration of Driverless Delivery Vehicles (Trial)* was jointly published by the Shunyi Branch of Beijing Municipal Public Security Bureau, the Commerce Bureau of Shunyi District and the Postal Administration of Shunyi District. This document regulates on standardized implementation of drive tests and commercial demonstration activities of driverless delivery vehicles in the administrative area of Shunyi.

On June 29, 2023, China's first legal document on the innovative application of driverless driving equipment, *Several Provisions of Pudong New Area on Promoting the Innovative Application of Driverless Driving Equipment*, was voted to approve, and was officially implemented on September 1. The regulation requires to strengthen daily supervision and administration on the operation process of driverless intelligent connected vehicles. It also clarifies the requirements of emergency management and related legal responsibilities.

On July 7, 2023, Beijing High-level Autonomous Driving Demonstration Zone officially announced the opening of the commercialization pilot of "driverless vehicle" for intelligent networked passenger cars in Beijing. After meeting the corresponding requirements, enterprises can provide regular automatic driving paid travel services to the public in the pilot zone.

On September 5, 2023, Hefei Bureau of Industry and Information Technology issued the *Draft of Several Implementation Rules on the Policies to Further Impel the Promotion and Application of New Energy Vehicles and Smart Connected Vehicles in Hefei City*. It proposes subsidy policies in the field of smart connected vehicles from three aspects.

On September 8, 2023, the General Office of the Beijing Municipal People's Government issued a notice on the issuance of *Beijing Municipality Implementation Plan for Promoting Innovative Development of Industries in the Future*. Focusing on new energy vehicles and driverless driving technology, this plan supports industrial technology integration, such as intelligent connected vehicles, general aviation and unmanned aircraft.

3. Driverless testing and deployment

3.1 The new development of driverless testing in China in 2023

The letter of reply to the proposal No. 03715 at the Fifth meeting of the 13th National Committee of the CPPCC (No. 410) introduces the following development in driverless testing in China. 17 national-level test demonstration zones for intelligent connected vehicles have been constructed; administrative implementation rules have been introduced respectively by 26 provinces (municipalities); more than 3,200 kilometers of roads have been opened for driverless testing; over 700 test licenses have been issued; pilot demonstrations of manned transport have been supported to take place in cities including Shanghai, Beijing and Changsha.

On July 8, 2023, at the WAIC2023 Intelligent Driving Forum, the government of Pudong New Area issued the first batch of drive test licenses to 15 driverless intelligent connected vehicles from three companies, namely Baidu Intelligent Mobility Technology, AutoX and Pony.ai. Enterprises with license can carry out absolute "driverless" test in designated areas in Pudong New Area. The driverless testing is permitted to extend from closed roads to open roads. And the obligation to have a safety officer in tested vehicle has been removed. This action aims to encourage innovation and development in driverless industry, together with the commercialization of related technology in Pudong New Area.

In September 2023, Beijing Public Transport Corporation, taking the leading role, obtained the *Intelligent Network Vehicle Road Test Notice* issued by the Beijing High-level Autonomous Driving Office, and the drive test license issued by the Beijing Traffic Management Bureau. This means that in Beijing, high-level autonomous vehicles for public transport have officially developed from drive test within closed site to open road test with actual operation scenario of public transport on the ground. Moreover, on-road tests will be carried out in the Beijing Intelligent Connected Vehicle Policy Pilot Zone.

As is introduced above in 2.1 central government policies part, the new policy introduced on 17th November 2023 set out entry and road testing pilots for L3 and L4 autonomous driving. To apply for the entry and road testing under this policy, vehicle manufacturers and users need to form a consortium and formulate a declaration plan regarding the implementation guide. With approval from city and provincial level of the targeted place of operation, the application will be further examined by experts at the ministry level. For products that have gained approval, road testing pilots will be carried out in restricted areas. And those used for transport operations will be required to meet the relevant operational qualifications and management requirements. The pilot program will be required to be suspended, rectified or even withdrawn if:

- Vehicles involved in road traffic safety offenses or traffic accidents under specific circumstances;
- Automobile manufacturers and subjects using automobiles fail to fulfill their safety-related responsibilities or mandatory protection, etc., making the pilot project a potential safety hazard.

4. Achievements in commercial deployment and application

4.1 Unmanned sanitation

In 2023, the pilot project of unmanned sanitation was promoted across the country. Policies to accomplish the construction of unmanned sanitation demonstration zones, as well as demonstration applications, have been introduced in many places. In February, Shenzhen Urban Management and Law Enforcement Bureau issued *Notice of Shenzhen Urban Management and Law Enforcement Bureau on Further Promoting the Mechanization and Intelligence of Sanitation Operations*, which requires to "improve the proportion of unmanned sanitation vehicles, sanitation robots and so on. Expand the application scenario of artificial intelligence products in environmental sanitation."

On July 24, 2023, *Rules for the Management of Intelligent Networked Sweeper (Drive Test and Demonstration Application) in Beijing Intelligent Networked Vehicle Policy Pilot Zone (Trial)* was published. It is the first normative document for sweeper drive test and demonstration application activities on urban roads. WeRide obtained the intelligent network sweeper drive test notice issued by Beijing High-level Autonomous Driving Demonstration Zone Office. It is the first autonomous driving company allowed to carry out unmanned cleaning operations in the economic development zone in Beijing. However, the commercial application of unmanned sanitation can still encounter obstacles. At national level, no unified standard is concluded for unmanned vehicles for sanitation, neither for manufacture, quality inspection, drive test, nor for the right

of way. Technical problems do exist as well. Solutions remain unsatisfying in fine welt cleaning, autonomous route planning, detection of external obstacles and interference signal.

4.2 Autonomous bus

Seven cities in China, Suzhou, Chongqing, Shenzhen, Zhengzhou, Guangzhou, Haikou and Tianjin, have deployed unmanned bus routes operating on open roads. Currently, China has 54.6 kilometers of open roads for unmanned bus routes under operation, accounting for about 85% of such routes around the world. Although part of driverless buses has achieved L4 of highly autonomous driving capabilities and interaction capabilities, accidents cannot be completely avoided. It is still challenging to deploy driverless bus.

4.3 Unmanned distribution

In China, major companies with their own logistics services, such as Jingdong, Cainiao, Suning, SF Express and Meituan, have entered the field of unmanned distribution, usually through the combination of both their own research and cooperation. Meanwhile, other rising stars in unmanned delivery also worth mentioning.

In May 2023, Haomo AI officially announced their unmanned delivery vehicle, Little Magic Camel 3.0 version, which has not only better intelligent driving capability, but also competitive price.

White Rhino cooperated with Yonghui Supermarket in unmanned delivery vehicles. White Rhino cooperates with Tianhong Supermarket, which is held by Texhong International Group, to provide unmanned delivery services in Pingshan District, Shenzhen.

In April 2023, Neolithic Autonomous Vehicle signed up for cooperation with ZTO Express. Their first batch of unmanned vehicles under this cooperation agreement has been put into operation in Yancheng and other places.

Nevertheless, the tremendous cost to manufacture is an inevitable obstacle for unmanned delivery vehicles. Last year, FedEx and Amazon have announced to terminate their unmanned delivery vehicle projects, due to the disparity between massive amount of investment and extremely limited output.

4.4 Unmanned agricultural machinery

In July 2023, at Xiayuan Base of Haina Modern Agricultural Ecological Park in Guangdong, an unmanned grain transport truck cooperated with an unmanned harvester to complete the whole procedure of harvesting operation, while an unmanned tractor accomplished the plough operation.

4.5 Unmanned mining trucks

In August 2023, 100 mining trucks from EACON were put into operation in southern outdoor coal mine of Xinjiang Tianchi Energy. It was the first time around the world that over 100 unmanned mining trucks were commercially applied in one mine.

5. The development of artificial intelligence and its impact on autonomous driving

Artificial Intelligence (AI) is vital to autonomous driving, as it is the core technology for autonomous decision-making and intelligent perception. Environmental perception, and better decision-making and reactions become possible for autonomous driving through deep learning, computer vision and natural language processing.

In 2023, the industry has increased investment in AI technology and achievements can be viewed.

In January 2023, Haomo AI released a video self-supervised large model, a self-supervised learning method of AI large models. By reducing data annotation, it can solve the problems of high cost, long period and low accuracy of manual annotation to a certain extent.

In January 2023, Geely Auto officially published its Star Wisdom Computing Center, with a total investment of 1 billion yuan and 5,000 planned cabinets. The center's current cloud-client power is 8.1 trillion times per second. And by 2025, the scale of computing power is expected to be 12 billion times per second. Servicing business areas such as intelligent networking, intelligent driving, new energy security, and experiments on trial production, this computing center can improve Geely Auto's overall R&D efficiency by 20%.

In April 2023, Haomo AI announced its AI large model named DriveGPT in English at the eighth Haomo AI Day.

2023 World Conference on Artificial Intelligence (WAIC), an essential event in AI industry, was held in Shanghai on July 6. Huawei displayed its "large model gigafactory," Shengteng AI, and claims its intention in the development and innovative application of large models. Based on Shengteng AI, Huawei has originally built the first 200 billion parameter Chinese NLP large model in the industry, *Pengcheng · Pangu*; the industry's first multi-modal large model *Zidong · Taichu*; and more than 20 domestic large models, including *Pangu* series of Huawei Cloud. Baidu has also brought its own large model, *Wenxin*. Tencent brought its industrial large model solution, Tencent Cloud. Relying on the full-stack capability of Tencent Cloud IT platform, with multiple industry models built-in, Tencent Cloud provide open support for multi-modal training tasks to its customers. Large models can contribute to breakthroughs in advanced intelligent driving technology.

On October 11, 2023, Zhang Yaqin, academician of the Chinese Academy of Engineering, professor of Tsinghua University, and president of the Tsinghua Institute of Intelligent Industry (AIR), attended the 9th Haomo AI Day held by Haomo AI and said: "Recently, there are many new breakthroughs in AI. New algorithms and frameworks have been noticed. We also noticed the tendency for pre-training, multi-model, multi-supervised learning and large models to become mainstream. Tsinghua AIR applies generative AI to build an autonomous driving simulation platform, as well as the Real2Sim2Real base model platform. Meanwhile, Tsinghua AIR and Haomo AI have launched in-depth exploration in the direction of data-driven decision optimization. The two parties jointly promote comprehensive and in-depth cooperation between university and industry, with the intention to accelerate the application of AI technology in autonomous driving."

6. Vehicle networking and logistics

6.1 Data Privacy

Data is the basis for the development of driverless vehicles. Due to the wide coverage, tremendous quantity and high quality of data collected by autonomous vehicles, it has considerable commercial value, as well as close relationship with public interest. Relevant regulations must be taken into consideration. Generally applied legislation include *Personal Information Protection Law* and *Data Security Law*. Autonomous driving industry should additionally notice *Autonomous driving Data Security White Paper (2020)*; *Requirements and Methods for Building Data Acquisition Platform for Intelligent Connected Vehicle Scenarios (2020)*; *Security Requirements for Data Collection of Information Security Technology Connected Vehicles (Draft for Comment) (2021)*. Industry regulations such as the *Several Regulations on Automotive Data Security Management (Draft for Comment) (2021)* can also be referred. The following new regulations introduced in 2023 worth noticing:

- In May 2023, the Ministry of Industry and Information Technology solicited public opinions on mandatory national standards on the technical requirements and test methods of recording system for the automatic driving data of intelligent connected vehicle through *Technical Requirements for Vehicle information Security* and *Intelligent Connected Vehicle Automatic driving data recording System*. Security defense mechanism should be adopted by autonomous vehicles to protect the key data stored in the vehicle from being deleted and modified without authorization.

- On May 12, 2023, Beijing High-level Autonomous Driving Demonstration Zone Work Office officially issued the *Beijing Intelligent Connected Vehicle Policy Pilot Zone Data Security Management Measures (Trial)*. Data security management is thus under control at demonstration district level. Key procedures of data security management in the intelligent connected automobile industry are clarified. Relevant compliance risks are sorted out in detail by categories of key data, including personal information protection, important data security, geographic information security and so on.

6.2 5G

5G communication has a crucial role in driverless vehicle. Due to its low latency and high reliability, 5G networks can provide firm support for driverless vehicles. Autonomous vehicles will be controlled with more accuracy and speediness. And synchronized driving also becomes possible. Thereby, safety and travelling experience can both be improved.

In June 2023, the first testing ground for 5G intelligent connected vehicle in China, Shangrao New Energy Intelligent Integrated Vehicle Testing Ground, had its first phase put into operation. 31 5G base stations are allocated in the region, to ensure full coverage of 5G signals in the field. A "highway" is built to transmit relevant data to the cloud-client control center.

On August 21, 2023, two group standards, *5G Network planning and Construction and Acceptance Requirements for Supporting High-level autonomous Driving* and *5G Network Performance Requirements for Supporting high-level autonomous Driving,* were officially released and implemented by the Shanghai Internet of Vehicles Association. These are the first standards for the performance and construction acceptance of 5G network for high-level autonomous driving in China. They provide solid foundation for the innovative application and industrial development of intelligent connected vehicles in Shanghai.

6.3 Electric Vehicles

With great importance attached to clean energy, Chinese government issued several documents in 2023 to assist the development of new energy.

On June 8, 2023, the General Office of the State Council issued *Guiding Opinions on Further Building A High-quality Charging Infrastructure System,* where several requirements to charging network are proposed:

Build convenient and efficient intercity charging network;

- Interconnect urban agglomeration charging network;
- Build effective coverage of rural charging network;
- Accelerate research on related technologies, i.e. fast charging, high-power charging, intelligent and orderly charging, wireless charging, optical storage and charge collaborative control.

On June 12, 2023, five departments, namely the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Commerce, the Ministry of Agriculture and Rural Affairs, and the National Energy Administration, jointly issued the *Notice on Carrying Out New Energy Vehicles to the Countryside Activities in 2023*. This notice requires to introduce new energy vehicles to the countryside in 2023, with the intention to promote the use of new energy vehicles in rural areas.

On June 21, 2023, the Ministry of Finance, the State Taxation Administration, and the Ministry of Industry and Information Technology jointly issued the *Announcement on the Continuation and Optimization of the Purchase Tax Reduction and Exemption Policy for New Energy Vehicles*. The production and sales of new energy vehicles in China both have ranked first in the world for eight consecutive years. According to the data released by the China Passenger Association, the total wholesale of new energy passenger car manufacturers from January to September 2023 in China reaches 5.92 million. The year-on-year

growth rate is 36%. In the first half of the year, the new energy vehicle market showed a trend of rising month by month. According to the forecast by the China Passenger Federation, the amount of new energy vehicles sold in 2023 will reach 8.5 million, accounting for 36% of the entire sale of passenger car (in narrower sense). Meanwhile, new energy vehicle in China takes an increasing proportion of the global market. Specifically, from January to July in 2023, the 4.42 million units of new energy passenger car sold in China consisted of 61% of the new energy passenger car sales around the world.

7. Driving forces — Major companies and individuals (public and private) affecting the AV sector

7.1 Pony.ai

Founded in late 2016 and headquartered in Guangzhou, Pony.ai is the first company in the world to launch robotaxis in both China and the United States. It has three major business segments, which are autonomous travel services, autonomous trucks, and intelligent driving of passenger cars.

By April 2023, Pony.ai has obtained the qualification or license for driverless testing and operation in many places around the world. In urban and high-speed roads, it has operated driverless driving for 21 million kilometers.

On January 11, 2023, Pony.ai officially launched its intelligent driving business product line for passenger cars, including the intelligent driving software brand "Pony Knowledge Road", the domain controller "Fangzai" and the data closed-loop tool chain "Sky." Pony.ai has set up an independent business division POV (Personally Owned Vehicles) to operate relevant business.

In August 2023, GAC Toyota Motor Co., LTD., Toyota Motor (China) Investment Co., Ltd. and Pony.ai signed an agreement to establish a joint venture company focused on autonomous taxi (Robotaxi) in 2023, and to improve L4 automatic driving to driverless, large-scale and commercialization. The total investment of the project will exceed 1 billion Chinese Yuan.

On September 22, 2023, Pony.ai announced receiving the notice of demonstration application of intelligent connected heavy trucks in Beijing Intelligent Connected Vehicle Policy Pilot Zone. Cooperated with China Foreign Transport, autonomous trucks from Pony.ai will provide demonstration freight services in real scenarios.

On September 25, 2023, according to Pony.ai official Weibo account, Pony.ai obtained the first unmanned demonstration application license in Shenzhen, and was thus allowed to provide L4 unmanned autonomous driving service (Robotaxi) to the public in the core urban area of Shenzhen. Before receiving this license, Pony.ai had implemented its fully unmanned autonomous travel services in Beijing, Guangzhou and other first-tier cities.

7.2 WeRide

Founded in 2017, WeRide is the world's leading L4 autonomous driving technology company. Aiming at the development of safe and reliable driverless driving technology, its commercial application scenarios covers smart travel, smart freight and smart sanitation. With its global headquarters located in Guangzhou, WeRide also has ten branches worldwide. WeRide is the only enterprise with automatic driving licenses in China, the United States and the United Arab Emirates.

WeRide has a fleet of more than 600 autonomous vehicles, with more than 20 million kilometers of autonomous driving.

On March 13, 2023, WeRide is reported to have filed confidentially for an IPO in the United States, seeking to raise up to $500 million.

On June 8, 2023, WeRide announced that it has been officially certificated under *ISO 26262:2018 ASIL-D Road Vehicles Functional Safety*, with certification issued by UL Solutions, a globally renowned certification institution.

On July 3, 2023, WeRide obtained the first nationwide autonomous driving license in the Middle East. WeRide will carry out drive tests and operate various autonomous vehicles in the UAE under this license.

7.3 Mogo Auto

Mogo Auto is the world's leading automatic driving service provider in full stack and operation. It implemented the first city-level automatic driving commercial project in China. Mogo Auto owns a leading vehicle-road-cloud integration system solution for intelligent transportation. It is capable to operate large-scale L4 autonomous fleet for public service at city level.

In June 2023, Mogo Auto proposed BalanceHRNet human pose estimation model, which can assist to accurately identify the moving direction of pedestrians. This research achievement has been included by the top international journal, Neural Networks.

On September 21, Mogo Auto attended the 2023 World Intelligent Network Car Conference. MOGO PACKAGE 2.0, the only complete vehicle-road-cloud integration standard product package within the industry, was displayed at the conference with overall upgrade of the product matrix:

- MOGO AI Station 2.0, AI digital road base, makes real-time digitization of road condition possible, with the shortest link delay in the industry
- The full range of autonomous vehicles come with a standard configuration of vehicle-road coordination V2X.
- The cloud-client service can fully enable intelligent connected vehicles at all levels of L0-L4.

7.4 Momenta

Momenta is an autonomous driving technology developer with global operations in China, Germany and Japan. It has received strategic investments from SAIC, General Motors, Mercedes-Benz, Toyota and Bosch. With technologies such as environmental perception, high-precision map and path planning algorithm, Momenta provides users with L3-L4 automatic driving solutions and products, including real-time lane detection, driving area detection, human feature point detection and other SDK. The service is mainly for the perception of vehicles, pedestrians and road environment, as well as real-time positioning on high-precision maps.

On April 16, 2023, Momenta officially released its medium mass-produced intelligent driving solution, Mpilot Pro. Momenta and NVIDIA will further develop close strategic co-operation and increase the strategic layout of products in order to launch the Mpilot Pro mid-range production intelligent driving solution based on the cost-effective chip configuration, NVIDIA DRIVE Orin.

7.5 Local unicorn enterprises

The following 12 companies were awarded the 2023 Intelligent Driving Unicorn in 2023 Annual Smart Driving Unicorn Selection launched by the World Intelligent Driving Summit: Benewake, Pateo, Morningcore, Neusoft Reach, China Unicom Smart Connection, MaxiEye, Momenta, QCraft, Soterea, SemiDrive, Neolithic Autonomous Vehicle, IdDrive.

The awards covers many aspects of driverless driving, including chip (Morningcore and SemiDrive), lidar (Benewake), autonomous driving (MaxiEye, Momenta, QCraft, Soterea, Neolithic Autonomous Vehicle and IdDrive), vehicle-road-cloud collaborative solution (China Unicom Smart Connection), full stack solution of intelligent cabin (Pateo) and automotive operating system (Neusoft Reach).

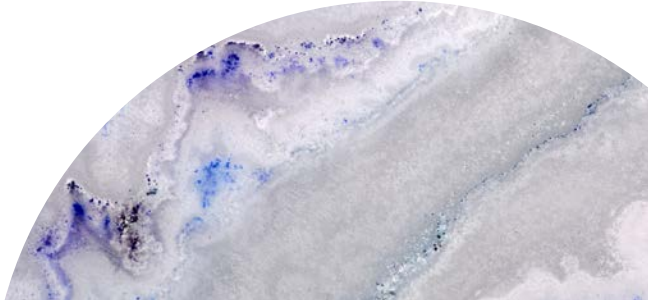
Key contacts/ authors:

Yuelei Jiang

Henry Chang

Darian Cai

Simon Zhu



Germany

In Germany as in most other countries of the world, smooth and safe transportation is a cornerstone of economic growth and prosperity. The future of traffic lies in automated, or even autonomous, connected and, apparently, electrified vehicles.

As far as autonomous driving is concerned, auto manufacturers and tech companies have invested dozens of billions of US Dollars since 2010 with diminished returns. In the past years, providers of autonomous driving tech have experienced a drastic drop in their predictions as to when the technology will be available. Progress in software technology is key when it comes to finally introducing fully autonomous vehicles to the streets. Currently, the onboard computer evaluates images from its surroundings. Overall, even though the technology is not yet 100% accurate, it works quite well. However, in complex areas the software still tends to get confused and may make undesired maneuvers. Also, weather occurrences, such as snow and rain or even sun have a big impact on driving capabilities. Sensors, most importantly the camera and radar or lidar, scan the area with electromagnetic waves and lasers, and are still a very necessary component to ensure that in situations with impaired visibility, the vehicle can proceed towards its destination.

The global objective is road safety. The vehicle must be able to perform the driving maneuver within a defined and approved operating range. It must know where it is to the nearest centimeter and detect static objects and other road users. All traffic rules must be obeyed. Vehicles make highly complex decisions in fractions of a second. So, besides regulatory obstacles, driving software development forward is important for the progress of autonomous driving.

As in accordance with international practice, the classification of automated driving is divided into levels according to the international standard of the Society of Automotive Engineers, from level 0, no automation, to level 5, full autonomy. Level 1 provides assisted driving - i.e.: cruise control, park assistance; the driver is still fully handling the vehicle. Level 2 means partial automated driving – the vehicle can partly keep the lane on its own. The driver is still fully handling the vehicle but can remove their hand for a few seconds. In between Level 2 and Level 3 there are new subcategories of Level 2+ (semi-automated driving) and/or Level 2++. Level 3 is called highly automated driving: the vehicle can do most of the work, the driver can simultaneously concentrate on other things, however upon request, the driver must back control. Level 4 is the so-called fully automated driving when the former driver becomes a passenger – he can sleep, eat, drink, and work. The ultimate stage of Level 5 means true autonomous driving: a vehicle can drive without passengers and conquer traffic on its own - there will be no more drivers.

The focus of most carmakers currently lies on Level 2+ or Level 2++ with a shy but confident view to Level 3. The industry has recognized that the hurdles for Level 4 cars are very high. On the hardware side, there is still a lack of a redundant and, above all, reliable sensor set. Affordable lidar sensors still have a way to go. Many manufacturers lack the appropriate electronic architecture to process the data in the vehicle. The software is also not fully developed. And testing and validating the systems is a challenge - although all work on it with effort.

The concentration of car manufacturers lies right now rather on advanced driver assistance systems, while tech companies and investors have an eye on autonomous driving and corresponding mobility concepts.

Regulatory Developments and Roadblocks

Government and Authorities

Germany, home to several leading automotive companies, is a leader in autonomous transportation, even when more testing may occur at other places.

Among the public institutions leading the effort to welcome autonomous vehicles in Germany is the **Federal Ministry for Digital Affairs and Transport**, a supreme federal authority of Germany. The Ministry, together with its subordinate authorities, carries out departmental tasks in the fields of mobility of persons, goods, and data. This responsibility includes the federal transport infrastructure (federal trunk roads, railway networks, waterways, and air traffic routes).

The highest state authorities in the field of transport are the **Ministry of the Interior and Community** and the **Ministry of Housing, Urban Development and Building**. In addition, there are several **road traffic authorities** that engage the **Road Traffic Regulations**, the **Holiday Travel Ordinance,** and the **Federal Emission Control Act**.

These are the following: Municipalities belonging to the district (local road traffic authorities); District authorities and municipalities (lower road traffic authorities); Governments (higher road authorities); and State Ministries (supreme road administration).

The **Federal Motor Transport Authority** (KBA) was established by law on August 4, 1951, as the federal authority for road traffic. It belongs to the division of the Federal Ministry of Digital Affairs and Transport and sees itself as a service provider for motor vehicles and their users. In Germany, the Federal Motor Transport Authority is the only type-approval authority.

Type-approvals confirm that the legal safety and environmental standards, as they relate to transportation, are fulfilled. In addition, there are other type-approvals required via the European Economic Area (EEA) and ECE regulations. The Federal Motor Transport Authority informs other contracting states and national official monitoring organizations (Sections 19 and 29 Road Traffic Licensing Regulations (StVZO) of type-approvals granted.

With the **type-approval**, the authority confirms that the serially manufactured approved product meets legal standards. Type-approvals stand for safe and environmentally friendly technology on the roads.

- Vehicle type-approvals can be granted in accordance with national regulations (Section 20 StVZO) or EC regulations (Directives 2002/24/EC, 2003/37/EC or 2007/46/EC).
- Component type approvals can be granted in accordance with national regulations (Section 22 or 22a StVZO), EU regulations (EC directives and regulations, EU regulations) and UNECE regulations (ECE regulations).
- Type-approvals for systems can be granted in accordance with EU regulations and UNECE regulations.

In Germany, the Road Traffic Authority is the administrative authority, determined by state law, responsible for monitoring and implementing the Road Traffic Regulations. The Road Transport Authority is not an independent organizational unit, but part of the local municipal administration (city administration, or in municipalities with a smaller population, the district administration).

For years, the Federal Ministry for Digital Affairs and Transport has been working to make Germany fit for the future in terms of modern mobility. For example, since 2013, the Federal Ministry has established the **Automated Driving Round Table** (RTAF) as an advisory body. It facilitates a close exchange among actors from industry, science, associations, and administration. The necessary know-how is bundled in such a way that a broad social consensus can be reached on all relevant aspects of automated and connected driving systems. The Automated Driving Round Table meets twice a year and has developed the necessary cornerstones for a successful introduction of such systems, which formed the basis for the **federal government's "Strategy for automated and connected driving-remain the lead provider, become the lead market, initiate regular operation."**

It must be noted that part of the economy is still skeptical. And a general issue is that many fail to recognize the fact that the autonomous car is not only about **driverless mobility**, but also about an **energy** and **traffic revolution**. To improve the safety of cars driving autonomously, chip manufacturer Qualcomm is calling for clear political guidelines for carmakers and suppliers. This involves the use of technologies so that vehicles from different manufacturers can communicate with each other. "*The role of the regulatory authorities is central here,*" technology head Matthew Grob told the German Press Agency. "*They have to announce by what date what percentage of autonomous vehicles must use this technology.*" Germany has achieved an international pioneering role in creating the framework conditions for automated and connected driving systems. Automated driving is a cross-border issue, especially in Europe. At an international level, a lot has been done and actively led by Germany:

2015

A G7 declaration on automated and connected driving was adopted.

2016

The National Development and Reform Commission launched the national innovative development strategy of intelligent vehicles. With the declaration of Amsterdam on self-driving and connected vehicles a joint agreement was made by member states, the European Commission and private sector.

2017

A G7 declaration on cooperation for modern transport infrastructure and advanced technologies in transport was adopted.

2018

A joint Declaration of Intent on the Cooperation in the Area of Automated and Connected Driving between Germany and the People's Republic of China was adopted.

2019

In April, the G7 French Presidency held a technical workshop in Paris to exchange national policy updates with focus on safety validation, responsibility, and acceptance.

2023

The G7 have agreed on common guidelines for the development of artificial intelligence in a "Code of Conduct." The "Code of Conduct" is aimed at the developers of advanced AI systems and calls on them to take measures to promote safe and trustworthy AI. These include early identification and mitigation of risks, transparency about the capabilities and limitations of AI and labeling of AI-generated content. The Code of Conduct was published on October 30, 2023, with a declaration by the G7 heads of state and government. Organizations that develop advanced AI systems such as generative AI should respect democracy, human rights, and the rule of law during development and not create systems that undermine these values.

2024

In Europe, the EU Commission works with the member states and the European Parliament on its own AI regulation. On December 8, 2023, the European institutions reached provisional political agreement on the world's first comprehensive law on artificial intelligence: the new AI Act. While this has been in negotiation in Europe for many years, last-minute debates regarding the regulation of foundational models and potential disagreements on whether the legislation would hamper innovation too much meant that last-minute agreement was required. Political agreement has been reached. The new rules establish obligations for providers and users depending on the level of risk from artificial intelligence, and was approved by the European Parliament on March 13th, with a 523 – 46 vote. The general-purpose AI rules will apply in May of next year, and the obligations for high-risk systems in three years. They will be under the oversight of national authorities, supported by the AI office inside the European Commission.

In March, the European Parliament passed the Cyber Resilience Act which stipulates many security requirements for products with digital elements. However, the law still must pass the Council before it can enter into force.

Furthermore on April 16, Germany and China signed a joint declaration of intent on dialogue and cooperation in the field of automated and connected driving, and are therefore continuing the dialogue from 2018.

International Law

In principle, road traffic is not limited to one national area. Instead, it enables cross-border traffic and, for this reason, naturally affects the interests of several sovereign states at the same time. Vehicles are not only produced in the state in which they will later operate, but the automotive industry is characterized by imports and exports on a global market. Therefore, it is not surprising that international agreements were concluded with the intention of creating uniform traffic and registration rules for motor vehicles to guarantee the safety of road traffic across national borders.

One of these agreements is the **Vienna Convention on Road Traffic** (WÜ) of November 8, 1968, which is an international treaty obliging the contracting parties to adopt uniform traffic and licensing rules. Compliance with these provisions is a prerequisite for admission to international traffic.

There are also numerous regulations at the European level that are intended to standardize the automotive sector in the individual member states of the European Union. For example, according to Art. 4 Para. 2 of Directive 2007/46/EC, member states may only grant approval for vehicles, systems, components, or separate technical units if they comply with the requirements of this directive. Regarding these approval requirements, Art. 35 Para. 1 of Directive 2007/46/ EC refers inter alia to the **UNECE regulations** listed in Annex IV, Part II and declares them to be equivalent components of secondary community law. The abbreviation "ECE" is derived from the United Nations Economic Commission for Europe (UNECE).

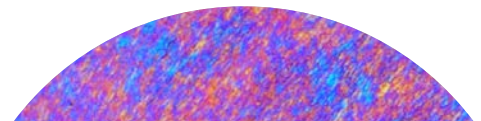
Based on the **Vehicle Parts Convention** (FTÜ), the contracting parties crafted ECE regulations for wheeled vehicles, equipment and parts that can be fitted to wheeled vehicles by means of an administrative committee to which all contracting parties belong, in accordance with the procedural rules set out in Annex 1. This includes, for example, brake systems, steering systems, or headlights. The contracting parties involved are the EU and, in addition to Germany, 46 other states. These ECE regulations, agreed based on the FTÜ, constitute a set of instruments designed to harmonize the international technical requirements for motor vehicles to remove barriers to trade in motor vehicles and their accessories. All contracting parties to the FTÜ may accept the individual provisions but are not obligated to do so. Where a contracting party has accepted a regulation, it shall be bound by international law, and shall undertake to register vehicles or parts approved, in accordance with the regulation in its own country.

To make the ECE regulations binding at a national level, they must be transposed into national law. In the case of countries of the EU, this is regularly done by approving the regulation in accordance with the requirements of Directive 2007/46/EC. For Germany, this recognition is standardized in Section 21 a Para. 1 StVZO.

Recent Developments

Recent development is the amendment to **UN Regulation No. 157** which extends the maximum speed for **Automated Driving Systems** (ADS) for passenger cars and light duty vehicles up to 130 km/h on motorways, and allows automated lane changes, among other dispositions. In its amended draft for **Automated Lane Keeping Systems**, it specifies how the vehicle must behave when the automated lane change is activated. This new regulation entered into force in January 2023, but only in those Contracting Parties (countries) that opted for its application. Amongst those countries besides the European Union and many European states are also countries like the UK, South Africa, Korea, Japan, Australia, and New Zealand.

Another interesting example is **UN Regulation No. 79**, which specifies uniform requirements for the design and characteristics of steering systems. It defines the automatic lane change process, including activation of the direction indicator by a conscious action of the driver, the lateral movement of the vehicle towards the lane edge, the lane change maneuver, the resumption of the lane keeping function, and the deactivation of



the direction indicators. It also deals with physical measurement of lateral side acceleration, with critical situations and with sensor range. Regulations such as **UN Regulation No. 139** describe driving maneuvers that are intended to prove the capability of driving systems.

The ECE regulations now comprise **more than 130 technical regulations** which, in addition to systems and components for active and passive safety, also deal with environmentally relevant regulations. Both the EU and Germany have accepted most of these regulations. Some of these technical regulations have already been developed for autonomous and automated driving beyond assistance systems by the UNECE.

Since July 6, 2022, the **General Vehicle Safety Regulation** (Regulation (EU) 2019/2144) is applicable. This introduces mandatory advanced driver assistance systems to improve road safety and establishes the legal framework for the approval of automated and fully driverless vehicles in the EU. It also empowered the Commission to complete the legal **framework for automated and connected vehicles**. The provisions of Regulation (EU) 2019/2144 will apply to all new vehicles from July 7, 2024, with some of the measures being extended to different types of road vehicles by 2029.

In September 2022, the ADS Regulation (Implementing Regulation (EU) 2022/1426) entered into force with detailed rules for the implementation of the above-mentioned Regulation (EU) 2019/2144. Now there is the possibility of a stand-alone EU type-approval for automated driving systems (ADS).

TTo amend Annexes I, II, IV and V to Regulation (EU) 2018/858 of the European Parliament and of the Council in regard to the technical requirements for vehicles produced in unlimited series, vehicles produced in small series, fully automated vehicles produced in small series and special purpose vehicles, and with regards to software updating, the Delegated **Regulation (EU) 2022/2236** entered into force in November 2022.

In various UNECE working parties, Germany is actively lobbying for the adaptation of international rules and standards to automated and connected driving. Since 2020, Germany has been chairing the important **GRVA Working Party** (Groupe de Rapporteurs pour les Véhicules Autonomes) within the UNECE WP29 (United Nations Economic Commission for Europe – World Forum for Harmonization of Vehicle Regulations).

Federal Minister of Digital Affairs and Transport Volker Wissing wants to **establish a common framework with the USA** for technologies such as artificial intelligence and autonomous driving. Germany and the USA are global leaders in this field. Broad-based regulations across EU borders are in the interests of the German transport and digital economy. He discussed this with US Secretary of Transportation Pete Buttigieg and Secretary of Commerce Gina Raimondo in Washington in October 2023.

"It makes sense for us to coordinate closely. This will also enable us to create an international market so that the necessary high investments can pay off," **Wissing said**. The Minister spoke out in favor of not regulating artificial intelligence too narrowly. In principle, however, he supports the EU Commission's approach of adopting a risk-based approach for the upcoming AI law. "The higher the risks, the higher the regulatory requirements must be. However, we should not simply regulate as much as possible. This would hinder innovation instead of enabling it." Wissing emphasized that artificial intelligence will have a strong influence on the competitiveness of national economies. "We have therefore decided to attempt to find a uniform regulatory framework not only within the European Union, but, if possible, at the level of the G7 states or beyond."

With European AI regulations, companies are hoping for legal certainty in the development and use of generative AI systems. On June 14, 2023, Members of the European Parliament adopted their negotiating position on the Artificial Intelligence Act. The AI Act is a vital piece of legislation that will regulate the role of AI in Europe and help set a global standard for how we expect AI systems to operate. Europe has a unique opportunity to show global leadership in the AI framework, for the benefit of EU citizens, creators, rights holders, industry, and the wider economy.

"With the German approval of the AI Regulation, we are committed to legal certainty and trustworthy AI made in Europe," commented **Robert Habeck, Minister for Economic Affairs and Climate Action**. And **Marco Buschmann, the Federal Minister of Justice**, said: "With the European AI Regulation, we are paving the way for a secure legal framework for artificial intelligence that promotes innovation and at the same time adequately addresses risks in its application."

The AI Act follows a risk-based approach and accordingly defines four levels of risk for AI systems, which are minimal risk, limited risk (AI systems with specific transparency obligations), high risk and unacceptable risk. AI systems identified as high-risk include AI technology used in critical infrastructures (e.g. transport), that could put the life and health of citizens at risk. These high-risk AI systems, which include automated driving functions, will be subject to strict obligations before they can be put on the market, like adequate risk assessment and mitigation systems, high quality of datasets feeding the system, logging of activity, detailed documentation, etc.

Since AI is a fast-evolving technology, the proposal has a future-proof approach, allowing rules to adapt to technological change. To provide ongoing quality and risk management and to oversee the AI Act's enforcement and implementation within the EU member states, the European AI Office was established in February 2024 within the Commission. Through this approach, Europe's pioneering role as a leader in the ethical and sustainable development of AI technologies is to be consolidated.

For AI use cases, in addition to the general regulation of AI by the EU AI Act, other requirements are important: horizontal, such as the GDPR or the proposed EU Data Act, and vertical or sectoral, such as the German Ordinance on the Approval and Operation of Motor Vehicles with Autonomous Driving Functions in Specified Operating Areas (AFGBV). In March, the EU Parliament adopted the Cyber Resilience Act (CRA). The CRA is a legal framework that describes the cybersecurity requirements for hardware and software products with digital elements placed on the market of the European Union.

As the CRA is a regulation, it applies directly in all European member states - a national transposition act is therefore not required. It is currently unclear which authority in Germany will be responsible for supervising the CRA regulations. In addition to the Federal Office for Information Security (BSI), a new responsibility of the Federal Network Agency (BNetzA) is also being discussed. Within its scope of application, the CRA will apply to software or hardware products and cloud solutions connected to them, but also to software and hardware components marketed separately. Due to this broad scope of application, which in principle does not differentiate between B2B and B2C applications, it can already be assumed that the CRA will cover a significant number of products with digital elements across all industries - including the automotive industry.

The CRA also introduces the principle of "security by design" into European technology law for the first time. In future, it will no longer be sufficient to ensure CRA conformity for a product with digital elements only at the time of market entry; instead, an ongoing risk assessment must be carried out. References are also made to other EU legislation such as the AI Act with regard to high-risk AI systems.

On April 16, 2024, the Federal Minister for Digital and Transport Affairs, Dr. Volker Wissing, the Parliamentary State Secretary to the Federal Minister for Economic Affairs and Climate Protection, Dr. Franziska Brantner, and the Chinese Minister for Industry and Information Technology, Jin Zhuanglong, signed a Memorandum of Understanding on Dialogue and Cooperation in the Field of Automated and Connected Driving between the Federal Republic of Germany and the People's Republic of China.

Federal Minister Dr. Volker Wissing said: "Autonomous and connected driving is associated with the hope of safer and more efficient mobility in the future. We are currently in a crucial development phase in which the aim is to get the technology out of the laboratories and onto the roads. The key to this lies in fair competition. Common standards and norms, which our joint declaration of intent will help to develop, are important and useful for this."

Furthermore, **Parliamentary State Secretary Dr. Franziska Brantner** commented, "Automated and connected driving will play a central role in future mobility and open up new business models for the automotive industry. At the same time, we are aware of the challenging business environment in China, especially the increasingly restrictive data legislation, which in some cases imposes strict limits on cross-border data transfer in particular. This is where the joint declaration of intent should come in and not only contribute to advancing international standardization and fair competition in this area, but also enable concrete progress on the topic of reciprocal data transfer - and this in respect of national and EU data law. To this end, we will work to achieve tangible results."

Germany and China want to drive the topic on autonomous driving forward quickly by improving the framework conditions. The declaration signed in April 2024 continues a dialog that Germany and China began back in 2018.

Road Traffic Law

As part of administrative law, traffic law is concerned with regulating traffic on public roads in Germany in such a way that no road user is harmed, endangered, obstructed, or exasperated. It is not summarized in a single set of laws, but consists of several laws and ordinances, which are passed at the federal level and thus apply throughout Germany.

International level with impact on Germany

At the international level, there are several agreements that provide the legal framework for national road transport legislation. One of the most important is the **Vienna Convention on Road Traffic of 1968**. Automated systems were unknown in 1968 and therefore not regulated. Regulations at that time were based on a vehicle controlled by a human driver. By the change of the Convention in March 2016, automated systems have been allowed. However, fully autonomous (level 5) driving was not yet possible, as the Convention still provided for a driver. In July 2022, further amendments to the Convention entered into force, which now also open the Convention to the use of driverless vehicles.

Germany

Road traffic law in Germany is composed of the following laws and ordinances:

The **Road Traffic Act** (StVG) contains rules on penalties and fines and lays down the basis for driving licenses and the registration of vehicles. Otherwise, it authorizes the Federal Ministry of Transport and Digital Infrastructure (BMDV) to implement these general provisions more precisely by means of ordinances.

The **Road Traffic Ordinance** (StVO) is probably the most familiar aspect of traffic law and makes up most driving lessons for German students. In short, it includes all the traffic rules that must be observed on German roads.

The **Road Traffic Licensing Regulations** (StVZO) define the conditions under which motor vehicles and trailers can be registered for road traffic. It sets out in detail how these vehicles must be constructed and how they may be operated. The StVZO is to be gradually replaced by the Vehicle Registration Ordinance (FZV). Up until now, the FZV has regulated precisely how the approval procedure should look, under which circumstances license plates are awarded, and which insurance coverage vehicles must have.

At the German legal situation, it becomes apparent that according to Section 1a of the Road Traffic Act there are no legal restrictions against highly and fully automated driving at least for level 3 (highly automated driving) and 4 (fully automated driving). In fact, the latest implemented right to enable level 3 and 4 vehicles (except driverless/level 5 vehicles) is already in force. The modified law regulates the interaction between the vehicle with the highly or fully automated driving function and the driver. The new law provides for the use and concept of highly and fully automated driving functions.

According to Section 1l StVG, the Federal Ministry of Digital Affairs and Transport will evaluate the application of the provisions of the Act of July 12, 2021 after the end of 2023, in particular with regard to the effects on the development of autonomous driving, the compatibility with data protection regulations and the findings obtained on the basis of test permits within the meaning of Section 1 i Para.

2 StVG on a scientific basis in a non-personalized form and inform the German Bundestag (national parliament of the Federal Republic of Germany) of the results of the evaluation. The evaluation of the regulations provided for in Section 1l StVG after the end of 2023 also serve to further develop the legal framework. For this reason, the "Autonomous Driving Act" was conceived as an interim solution until corresponding harmonized regulations exist at EU and UNECE level, which is now the case.

Vehicles with highly automated or fully automated systems may be used in traffic in such a way that the driver can hand over vehicle control to the system in certain situations. The system takes over the longitudinal and lateral guidance of the vehicle as well as acceleration and deceleration for defined applications, or for a limited time. The driver must no longer monitor the system permanently. The operation of vehicles by means of highly and fully automated driving function systems is only permitted within the framework of normal use, whereby the intended purpose depends on the design. If an automated driving function is only intended for use on motorways, the system must not (and usually cannot) be used for traffic on other roads. During operation of a highly or fully automated driving system, the driver is allowed to turn away from the traffic situation. Within the scope of the mandatory system description, the driver may take his hands off the steering wheel, look away from the road and carry out other activities, such as processing e-mails in the infotainment system. The driver no longer must monitor the system permanently. However, he must remain vigilant. The driver is obliged to resume vehicle control immediately if he recognizes or should recognize, due to obvious circumstances, that the conditions for an intended use of highly or fully automated driving functions no longer exist.

Following a bill proposed by **former Transport Minister Andreas Scheuer, the Autonomous Driving Act** came into force in Germany **in July 2021**, enabling Level 4 autonomous driving in defined operating areas, such as traffic between logistics terminals. Among other things, the law regulates the following for vehicles with autonomous driving functions:

- Technical requirements for construction, condition, and equipment;
- Testing and procedures for the granting of an operating permit by the Federal Motor Transport Authority;
- Regulations relating to the obligations of persons involved in the operation;
- Regulations relating to data processing during the operation;
- Enabling the (subsequent) activation of functions of already type-approved motor vehicles ("dormant functions"), and;
- Adapting and creating uniform regulations to enable the testing of such vehicles.

In **February 2022**, the German government took note of the ordinance submitted by the Federal Minister of Digital Affairs and Transport to regulate the operation of motor vehicles with automated and autonomous driving functions and to amend road traffic regulations, which completes the national legal framework for autonomous driving. Core of the legal ordinance is the regulation of the procedure for the admission of motor vehicles with autonomous driving function to road traffic.

In **July 2022**, the Ordinance on the Approval and Operation of Motor Vehicles with Autonomous Driving Functions in Specified Operating Areas (**Autonomous Vehicles Approval and Operation Ordinance - AFGBV**) came into force. The ordinance supplements the law on autonomous driving, which already came into force in 2021, and regulates the basic legal requirements for the operation of motor vehicles with autonomous driving functions and caused corresponding amendments to the law. The ordinance determines the technical requirements, the procedural regulations, and the requirements for those involved in the operation of motor vehicles with autonomous driving functions, such as: the granting of the operating permit, the approval of defined operating ranges, the admission to road traffic, market surveillance, the requirements and obligations for manufacturers, owners and the technical supervision, data storage, and the test permit. With the ordinance, the traffic approval and operation of

autonomous vehicles according to SAE level 4 is made possible, but only in officially approved areas of operation (so-called defined operating areas) and only with an external supervisor always present (so-called technical supervision).

All in all, Germany continues to underline its intention to remain a global leader in the field of transport in the future and is the first country with a fully comprehensive legal framework for automated driving.

Quotes

Olaf Scholz, Chancellor of Germany: "Policymakers must be tougher, clearer and more demanding than before when it comes to digitization. I want a gigabit society. To achieve the climate targets, we need more innovative developments in transport, a modern electricity infrastructure and rapid digitization."

Volker Wissing, Federal Minister of Transport: Germany must have the ambition to play in the "Champions League" digitally, Wissing said - and when it comes to autonomous driving, he even sees the Republic soon as "Number One in the World." "I believe that we will be faster than China in this respect," Wissing said. He also pointed out: "Especially in rural areas, autonomous on-demand transportation can be a key to more individual mobility - for older people and anyone who cannot or does not want to drive their own car. Autonomous shuttles that come exactly when you need them can be a cost-effective addition to public transport in rural areas."

Christian Lindner, Federal Minister of Finance: "Autonomous driving is a "gamechanger" that will change business models and pose new challenges for German automakers. However, I am optimistic that German automakers will be leaders in autonomous driving."

Driverless Vehicle Testing

With its strong automotive industry, Germany is naturally also a sought-after testing ground for autonomous vehicles. With the speed limit-free autobahn, high-speed driving can also be tested here without any problems. Germany is Europe's biggest automotive market; number one in production and sales terms, accounting for around 25% of all passenger cars manufactured and almost 20% of all new registrations. Germany also boasts the largest concentration of OEM (Original Equipment Manufacturer) plants in Europe.

Legal Framework

Testing relates specifically to the legal framework for testing of autonomous vehicles in Germany, vehicles may only be operated on public roads according to the Vehicle Registration Ordinance and only if they are registered. The approval of prototypes for testing on public roads by means of a special permit is governed by the German Road Traffic Act. The granting of permits must be obtained from the responsible District Office (*Landratsamt*) and is based again on the Vehicle Registration Ordinance for type approval and for individual approval.

The vehicle is tested for its suitability and safety for public road traffic within the framework of the approval procedure (i.e., it is checked whether the vehicle, its design or its equipment meets the construction and operating requirements). Regarding safety, the focus is on whether, based on general life experience or scientific findings, it is sufficiently likely that public road traffic and other road users may be endangered.

If the requirements are fulfilled, the administrative authority grants approval and the vehicle is registered as a test vehicle. If the vehicle does not correspond to the regulations, an exception permission can be given by the highest national authority under certain conditions.

There are no special insurance requirements for autonomous vehicles which go beyond the motor vehicle liability insurance prescribed in the general law. However, it might be useful for the manufacturer to ensure the test vehicle comprehensively to avoid possible liability issues, since the strong connectivity can also lead to completely new risks (e.g., cyber-attacks).

There are a few safety requirements that are important to note: As a minimum, requirement for functional safety, hardware and software systems must separate vehicle functions from infotainment,

telematics, and navigation applications. The control systems must contain sufficient redundancy. For example, safe holding must be ensured even in the event of a failure of the main control system. Suitable protection against external (cyber) attacks must be provided, as well as against manipulation of security-relevant elements.

manipulation of security-relevant elements.

At every stage of development, the vehicle must navigate at least as safely as if a human being controlled it. However, the possibilities of automated and autonomous driving must not be used to limit the autonomy of the road user elsewhere. An example could be a general speed limit that is "enforced" by the vehicle driving in strict compliance with the regulations. Data collection must not be used to establish new restrictions and controls throughout the country (e.g., for recording driving times). Technological development will make traffic safer and reduce risks such as those posed by overtired drivers.

All pilot projects must be applied for on a case-by-case basis. As soon as the automated vehicle (shuttle) is to be driven on public roads, it needs, in addition to the obligatory liability insurance, an "approval on the basis of an exemption permit" in accordance with the Vehicle Registration Ordinance.

Finally, regarding autonomous taxi-like services, an operating permit in accordance with the Passenger Transport Act is required, just as it is for a normal bus or taxi company. As soon as revenues are generated from the trial operation, an operating permit is required.

The guideline "Autonomous and connected driving in public transport" was published in the Federal Gazette on September 9, 2022. It is intended to fund application-oriented research projects in the field of autonomous and connected driving in road transport, including consideration of interfaces to other modes of transport.

Publicly Funded Projects

Over the past ten years, the German government has funded 109 research projects in the field of autonomous driving. It sees great potential for 13 projects, which could also be used in real road traffic.

In 2022, Mercedes and Bosch were permitted by government officials to equip vehicles with fully automated self-parking software. At Stuttgart Airport the vehicles park in pre-booked spots and return to drivers when summoned. Drive into the parking garage, get out and send the car to park with a click on your smartphone - the automated parking service works without the need for a driver. While the driver can already leave the parking garage and walk to the terminal, the car drives itself to an assigned parking space and parks.

Also in 2022, Lower Saxony, Baden-Württemberg, the City of Hamburg and North Rhine-Westphalia launched a cross-state project on automated and connected mobility, which was initially set to run for two years. The project focuses on the topics of standardization, data protection and security as well as whether and, if so, which infrastructure is required for automated and connected driving applications in real-life operation. The aim is to evaluate and pool the many valuable experiences of automated and connected driving that have been gathered in the various test fields in Germany and to use the results in a targeted manner. The project supports the fastest possible transfer of knowledge into actual application and literally puts the research findings "on the road." This contributes to securing individual, intelligent, environmentally friendly and integrated mobility.

An important project was launched in Hamburg in October 2023; With a modern on-demand transport service, a mobility solution will be created in Hamburg that supplements the traditional public transport system of buses and trains with a new product and represents an attractive alternative to the car. The ALIKE project will test a system with up to 20 autonomous shuttles that can be easily booked via an app and pick up passengers directly and take them to their destination. The system meets strict safety requirements and should also be scalable across regions, making it suitable for use in rural areas. The aim of the pilot project is also to research the acceptance of autonomous driving services in practice. The project results are intended to create the basis for the future commercial provision and scaling of ridepooling services.

The Volkswagen Group has ambitious plans in Hamburg. Its vision is by the end of the decade, up to 10,000 autonomous ride-sharing shuttles will be driving through the city as part of the federally funded "Alike" project. Other partners include vehicle manufacturer HALON and the Hamburg Authority for Transport and Mobility Transition. Around 300 vehicles are currently on the road in Hamburg, driven by around a thousand employees who work in shifts. The test phase for autonomous operation will start in 2025, providing impetus for expansion at a national level. The Ministry of Transport, headed by Volker Wissing, is supporting this project with 26 million euros. The aim is to ease the burden on local public transport, reduce the number of private vehicles on the roads and test the practicality of autonomous driving. In addition, this concept should also work in rural regions and thus eliminate the limitations of local public transport.

Within the ALIKE project, SAE automation level 4 (highly automated driving) will be achieved and implemented. The project is scheduled to run for three years and is divided into three main phases: In the preparation phase, detailed project planning and software development will take place. In the integration phase, the vehicles are linked to the operating software. In addition, the permits for vehicles and the operating area are obtained, e.g., in accordance with the new legislation on autonomous driving. The autonomous ridepooling service will start with the operating phase in 2025, when the first passengers will be able to ride the shuttles. Six partners have come together in this consortium: HOCHBAHN as consortium leader, the on-demand service MOIA, the vehicle manufacturers HOLON and Volkswagen Commercial Vehicles, the Karlsruhe Institute of Technology ("KIT") as research partner and the Hamburg Authority for Transport and Mobility Transition.

The Federal Ministry for Digital and Transport Affairs finances a research project on autonomous driving. The project is called **LEAF**, which stands for "rural development with autonomous vehicles:" The project will run from September 2023 until June 2026 in Potsdam-Mittelmark and Vorpommern-Rügen and the Federal Ministry for Digital Affairs and Transport is funding the project. The project partners are to set up an on-demand shuttle service with three self-driving vehicles. The vehicles will take people from their homes to train stations and bus stops. It is also being investigated whether and how digitalization can improve transport conditions in rural areas and to what extent an improvement in the CO2 footprint is possible.

Liability

In the commonly raised question on liability in the event of an accident, in Germany and in some other countries, the legal situation is clear because there is a three-pillar model consisting of driver, owner and manufacturer liability. This combination of liability on behalf of drivers, owners, and manufacturers offers a balanced distribution of risk. The liability model also provides a good foundation for new systems and the next stages in the development of autonomous driving.

In a **traditional scenario up to Level 2+**, the driver is responsible for the driving task and must always monitor the vehicle and intervene in the event of an emergency, for example in the case of semi-automated driving functions. If he fails to comply with his duties of care and thereby causes an accident, he is liable alongside the owner for the resulting damage.

The **manufacturer** may be liable under product liability laws for damage caused by a product defect. This combination of driver, owner and manufacturer liability offers a balanced distribution of risk, ensures victim protection, and has proven itself in practice. The liability model is also a good basis for new systems and the next steps in automated driving.

Politically, when CSU politician Alexander Dobrindt was still Transport Minister, he had a simple solution to this complex problem. In the event of an accident with autonomous cars, he said, "the moment the computer takes over, liability passes to the manufacturer." That is true, even if the legal reasoning is not as easy as expressed.

The **insurance industry**, considering liability issues for robotic cars, had a different view closer to the real legal situation. According to insurers, the

(insured) owner would have to be liable even if he did not make a mistake. This corresponds to the current legal regulation. However, the insurance company would pay for the damage and may seek recourse from the manufacturer if the latter is liable for a failure of the driving system.

Car makers have announced that they will accept legal responsibility for collisions that occur in their cars fitted with a new Level 3 system. Effectively autonomous driving will improve road safety and it will lead to an overall fall in the number of accidents. Some say drivers could face civil and criminal liability risks when using such automated driving systems,. However the discussion became relatively quiet.

For **fleet operators**, their liability depends on whether they are also manufacturers or vehicle owners. If they are owners, strict owner liability applies based on the German Road Traffic Act. Producers of automated driving systems could in the future face a higher risk of potential liability under the AI Liability Directive (EU), which introduces a causality presumption to simplify the burden of proof in AI-related accidents. This directive also extends warranty liability under product liability laws and producer liability against the manufacturer.

In Germany, as in many other countries, strict liability extends to vehicle owners, even in highly or fully automated driving scenarios. This approach makes it more straightforward for injured parties to seek compensation through compulsory insurance rather than pursuing manufacturers for AI programming faults. Principles of producer liability and product liability further bolster this framework. Seeking compensation directly from the manufacturer might become more relevant in the future because of the **Artificial Intelligence Liability Directive**. There's a proposal for an EU Directive introducing a causality presumption to ease legal actions against AI manufacturers in the event of accidents. This pending legislation could reshape the liability landscape for autonomous vehicles. Also, the litigation environment is evolving. Previously, model declaratory actions filed by qualified institutions/ associations were the primary avenue for legal action. However, a new corrective action suit has emerged. This legal action, introduced in June 25, 2023, runs parallel to model declaratory actions, and is designed to provide consumers with more accessible routes for litigation. Most of all, it provides an immediately enforceable judgment. The intention is to empower consumers, particularly in cases related to product liability, and extends beyond specific consumer protection provisions under EU law, encompassing various disputes between consumers and entrepreneurs, even in cross-border contexts within the EU. All in all, there is a shift in the German and European legal landscape aimed at facilitating collective redress for consumers. Duties of care will increase for manufacturers as the EU Commission adapts the liability rules to the age of artificial intelligence.

In terms of **ethics**, the vehicle must not make inadmissible assessments between particularly important legal interests. In the event of an unavoidable alternative risk to human life, no further assessment may be made based on personal characteristics.

Connected Vehicles

Connectivity refers to communication between vehicles and with the infrastructure, such as traffic lights or traffic management systems. In networked mobility, the term vehicle-to-x communication covers direct communication between vehicles (vehicle-to-vehicle) as well as between road users and fixed infrastructure (vehicle-to-infrastructure). During connected driving, traffic-related information is exchanged via wireless technologies. The combination of automated and connected driving and intelligent transport systems can increase road safety and driving comfort. The traffic flow can be designed in a more efficient way, thereby opening potential for reducing transport-related emissions. Connected cars are typically in close contact with a connected service platform on the backend.

Connected Cars and Privacy

The data collected by autonomous vehicles (location data, sensor data, etc.) is considered "personal data" as defined by the **Federal Data Protection Act** (now BDSG) and as of May 2018, the **EU Data Protection Regulation** (GDPR). Such data can be traced back to the owner, driver or passenger and identified as information about personal or actual circumstances of a person. Most of the data collected by modern cars is assigned to the vehicle identification number (VIN).

The collection, storage and use of personal data is permitted under data protection law if there is a justification for doing so or if the data subject has given his effective consent. Limiting requirements (data economy, scoring) must be observed for both mass collection and automated processing of personal data. Further restrictions apply to particularly sensitive data. More than four decades ago, the Federal Constitutional Court put a stop to the creation of total personality profiles (profiling).

Before collecting the data, the organization should make sure that all data is necessary and proportionate to the purpose for which it was collected. As is already the case under previous legislation, there is a right to information on the processing of personal data. Upon request, companies must provide information on data processing in a precise, transparent, comprehensible, and easily accessible form in clear and simple language. This includes, for example, the storage period, the purpose for which the data are processed, which categories of personal data are processed, information on the origin of the data and possible recipients of the data.

A new feature is the right to copy data. You can specifically request information about which personal data is processed by the responsible person (e.g., surname, first name, address, date of birth, profession, medical findings) and receive this in the form of a copy provided by the company. Under certain circumstances, companies must delete data. This is the case, for example, when the data are processed unlawfully or are no longer needed for the original purpose for which they were collected. Individuals may also request, under certain circumstances, that your data not be further processed. The data is therefore not deleted, but the data processor must block the data and cannot continue to use it as usual.

To address data security, the Act to Increase the **Security of Information Technology Systems (IT Security Act)**, came into force in July 2015. Through this Act, the federal government intends to make Germany's IT systems and digital infrastructures the most secure in the world. In addition, The **Federal Office for Information Security**, which is responsible for security in information technology in Germany, has numerous references to the correct protection of data on its homepage.

The IT Security Act requires that operators of critical infrastructures in certain areas will have to comply with a minimum standard of IT security and report significant IT security incidents to the authority. For the information technology and telecommunications sector, which is also highly relevant for automated and autonomous driving, the Ordinance on the Determination of Critical Infrastructures under the BSI Act (BSI-KritisV) already defines the scope of application.

The transport and traffic sectors also fall within the scope of the IT Security Act. The first regulation amending the Kritis Regulation of June 21, 2017, determines exactly which annexes are included. It lists the traffic control and guidance system for the federal motorway network, as well as the traffic control and guidance system for municipal road traffic for cities with more than 500,000 citizens.

Additional sources are the Data Act, the Data Governance Act, the Digital Services Act and the Digital Markets Act, with which the EU aims to promote and regulate digitalized business models. The **Data Act**, the wording of which was agreed by the Council, the EU Parliament and the EU Commission at the end of June 2023, will be one of the EU's fundamental pieces of legislation on digitalization. The Data Act entered into force on January 11, 2024, and it will become applicable in September 2025. In future, manufacturers of connected products have to design their products in such a way that the data generated by the product can be made accessible to the user.

The **data collected** when using a vehicle is always personal if it is linked to the license plate number or vehicle identification number. Such data processing is permissible if it is based on the informed consent of the user. In certain situations, the legal basis may also result from a legal requirement or a duty of care on the part of the manufacturer. Users shall have sovereignty over the data collected and stored, they should be able to recognize and switch off individual data processing functions. Manufacturers are called upon to provide the relevant technology and provide information about it.

Data protection law becomes even more complex when the smartphone is switched on and connected to the infotainment system via connectivity apps such as Google's Android car or Apple's CarPlay. In fact, the car develops more and more to a moving mobile phone with dedicated driving functions.

In any event **car manufacturers** have a special duty of care, which is reflected in the principles of privacy by design and privacy by default. **Privacy by default** means that a data protection-friendly basic setting is in place. The data remains under lock and key and is only released with expressed permission. However, their protection already begins in the des**ign phase: in accordance with** Privacy by Design, security-relevant systems are isolated from navigation, telematics, and infotainment applications, surrounded by firewalls, and encrypted during transmission using cryptographic procedures in order to be immune to hacker attacks.

The **European Data Protection Board issued Guidelines January 2020** on the processing of personal data in the context of connected vehicles and mobility and mobility-related applications. The guidelines address car manufacturers and providers of services in the ecosystem of connected vehicles, suppliers of technologies, providers of telemedia services. The guidelines provide for much detail and major takeaways for everybody involved in the environment of connected vehicles.

Automotive and Cybersecurity

Automotive cybersecurity and data protection must encompass the entire supply chain around the connected vehicle. To identify weak links in the supply chain and protect the growing volumes of sensitive data from security incidents, OEMs must carefully select and audit their suppliers. As complexity increases, so do the risks within a digital supply chain.

UN R155 and UN R156 set the framework for automotive cybersecurity. The UNECE regulation UN R155 requires the operation of a certified cybersecurity management system (CSMS), UN R156 that of a software update management system (SUMS) as a future condition for type approval. They are intended to ensure the safety of vehicles and set the framework for cybersecurity in the automotive sector. This makes cybersecurity mandatory for type approval. In **R157** the focus here is on the safety of modern driver assistance systems, including the Advanced Driver Assistance System (ADAS) and the Automated Lane Keeping System (ALKS). Both require a high level of cybersecurity.

UN R155 refers to the industry standard **ISO/ SAE 21434 "Road Vehicles Cybersecurity Engineering"** (Cybersecurity in motor vehicles). This standard defines the technical requirements for cybersecurity risk management in relation to the design, product development, production, operation, maintenance and decommissioning of electrical and electronic systems in motor vehicles, including their components and interfaces. R155 and R156 prescribe measures to be implemented by the vehicle manufacturer for passenger cars, vans, trucks and buses, light four-wheeled vehicles if they are equipped with automated driving functions from level 3 upwards.

The regulations require measures in four different disciplines: (1) Management of vehicle-related cyber risks; (2) Constructive protection of vehicles to mitigate risks within the value chain; (3) Detecting and responding to security incidents in the vehicle fleet; (4) Providing secure software updates and ensuring the integrity of vehicle security by introducing a legal basis for so-called over-the-air or OTA updates of vehicle software. In addition, two different perspectives must be considered with regard to the requirements for type approval from R155 of UNECE WP.29: (1) processes and organizational structures related to cybersecurity management and (2) Vehicle requirements for the management of cybersecurity risks.

The **Federal Motor Transport Authority** (KBA) has appointed **TÜV Süd** as the technical service for cybersecurity and software updates in motor vehicles. TÜV Süd is authorized to assess the management systems and the security architecture about cybersecurity and update capability and to prepare the corresponding expert reports for approval by the KBA.

Telecommunications and 5G

One of the most important basic requirements for automated and connected driving is telecommunications connectivity. 5G speed is data transmission in real time. Enabling an even faster connection between transport systems, the 5G network will offer new options advancing the development of autonomous cars. Not only will they be able to make autonomous decisions in the future. Cars will communicate and cooperate with each other. In the years to come, a fully interconnected and intelligent road transport system will be created because of these capabilities. One huge benefit of 5G is what is known as network slicing. The wireless network is subdivided into virtual network levels. One network level is then used only for automated driving, for instance. This ensures that safety-relevant notifications to self-driving cars will not end up in a traffic jam on the data highway.

The **auction of the 5G frequencies** in the 3.6 gigahertz range by the Federal Network Agency began on March 19, 2019, and ended with 6.55 billion EUR offered in total by the four bidders. The coverage obligations for the license winners include a requirement to supply speeds of a minimum of 100Mbps to at least 98% of households in each state by the end of 2022, as well as all federal highways, and the major roads and railways.

The 5G **rollout** in Germany has been carried out **in stages** so far. Initially, the existing 4G infrastructure was primarily used to expand 5G Dynamic Spectrum Sharing (5G DSS). This form divides the available frequency spectrum for 4G and 5G technologies dynamically and in line with demand between the end devices. In later phases, the expansion will increasingly focus on 5G Standalone (5G SA).

The **expansion of 5G networks is well underway in Germany in 2023**. This is shown by the latest results of the Federal Network Agency's mobile communications monitoring. Coverage with 5G by at least one network operator has risen to 90% of Germany (as of October 2023). A year ago, this figure was still around 79%. Deutsche Telekom, Telefónica and Vodafone Germany each achieve 5G coverage of between 59% and 77%. In 2022, Deutsche Telekom said its 5G network already reaches 94% of the overall population in Germany. Vodafone Germany says 5G network now reaches 90% of the population. O2 Telefonica provides for a 5G coverage of about 95% of the German population as of January 2024.

As confirmed by the **Bundesnetzagentur**, 5G coverage by at least one network operator has increased in recent months to around 79% of the area of the country, as of October 2022. When the first data were collected in October 2021, coverage was at around 53%. Current data show that the 5G coverage achieved by individual mobile operators ranges from about 37% to 55% of the country.

Driving Forces

After the euphoria on autonomous future driving of the past decade, it was assumed that robotaxis would be part of the street scene in every modern city in the early 2020s, the results of the "autonomous revolution" are mostly Level 3 functions, with continuing research and development into Level 4.

Level 3 Autonomous Driving Coming to the Mass Market in 2024

Some examples are:

- Car manufacturer Mercedes-Benz becomes the first manufacturer in the world to receive UN approval for a Level 3 Autopilot in the new model S-Class. In Germany, the system can be used on 13,191 kilometers of highway in traffic jam situations and up to a speed of 60km/h after the Road Traffic Act was opened to Level 3 systems.
- Volkswagen, for example, presented prototypes of an autonomously driving “Bulli” bus with electric drive at the last IAA. Initially, Volkswagen plans to test the technology with five upgraded ID Buzz prototypes; series operation with such self-driving cab shuttles should then be possible in 2025. The series ID. buzz AD vehicles in 2025 will first be used by MOIA in Hamburg. Other cities in Germany and the USA will follow. Initial Level 3 functions will be placed in Porsche and Audi models.

- In BMW, Level 3 autonomous driving will be available as an extra option in the new BMW 7 Series in 2024.

Robotaxis and Public Transport

- Mobileye receives TÜV approval: Following a strict safety procedure, the Israeli subsidiary of the Intel Group has received approval from TÜV SÜD to operate its NIO ES8 vehicles on German roads.
- Six robotaxis with a person behind the wheel for safety were supposed to be driving through Munich by 2023. However, according to a company spokeswoman, this has been delayed: "In this ambitious project, the necessary safety has the highest priority. We are therefore taking it one step at a time. This means that the project will take more time."
- In Ford, The Mustang Mach-E is the first model in Europe that can be equipped with BlueCruise technology. The Level 2 plus system works up to 130 km/h and steers automatically.
- Public transport providers in Berlin, Hamburg, and Frankfurt, as well as the national railway company Deutsche Bahn AG, are testing autonomous buses in a range of settings, and there are more than 20 AV test sites nationwide.
- Many market observers believe that the most promising and obvious use case for autonomous driving is in the commercial vehicle sector and in hub-to-hub transportation with driverless long-distance trucks.
- The automation of driving systems is a driving force for the development of the transportation industry towards new frontiers of safety and efficiency.

General Environment and Outlook

Market conditions in 2023 have been challenging (chip shortage, supply chain, regional turbulance, and inflation). However, the technical development goes on. Regional conflicts generally cause a long-term risk for the automotive supply chain. Demand for cars, often purchased on credit, tends to fall when higher interest rates make auto loans more expensive. Also, transport equipment is vulnerable to interest rates. The electric vehicle transition currently fights against decreasing demand in the luxury sector and the EV transition is generally not as fast as expected. At least companies in Germany were able to survive the pandemic and the related economic tumult. However, many companies generally struggled with the decrease in sales and had to adjust production due to COVID-19 regulations, such as reducing the number of employees in factories or sending employees on short time/reduced working hours. This ultimately has led to a reduction in production as well as a slowdown in research and development regarding autonomous driving in 2021. For 2024, a need for more collaboration in the automotive industry is expected. This is also the reason why many car manufacturers have already entered into partnerships with chip manufacturers, software and AI specialists. Autonomous vehicles will therefore be more than just a car. They are driving computers that need to record and understand their surroundings in real time using cameras. This data also needs to be processed in order to derive driving maneuvers and implement them safely in the end. In terms of automated driving, Level 3 functions will increasingly drive on the roads of Germany. Sales of commercial vehicles generally will continue to increase.

Key contact/author:

Dr. Michael Malterer
Leader Europe and Global Subsector Automotive
Co-leader Global Autonomous Vehicles
Partner, Munich
michael.malterer@dentons.com

Hungary

Regulatory Developments and Roadblocks

The key regulatory instruments governing autonomous vehicles remained unchanged in Hungary over the past few years. Testing of autonomous vehicles on public roads is permitted; however, a test driver with special qualifications must always be present to monitor the systems and must be able to intervene if necessary. Most Hungarian policy-makers and key business figures support the implementation of modern technologies, such as 5G and electric vehicles, and the development of autonomous vehicles, even if other policy issues take precedence at certain points.

The former Minister of Technology and Innovation introduced the Artificial Intelligence Strategy of Hungary in 2020 for the next 10 years[70]. The Strategy mostly contains general aims for developments in the field of artificial intelligence. The Strategy includes the aim to form a supporting research and development environment for the symbiotic development of all professions necessary for the creation of the self-driving ecosystem. The Strategy aims to further develop testing facilities of autonomous vehicles and integrate them into the European testing environment.

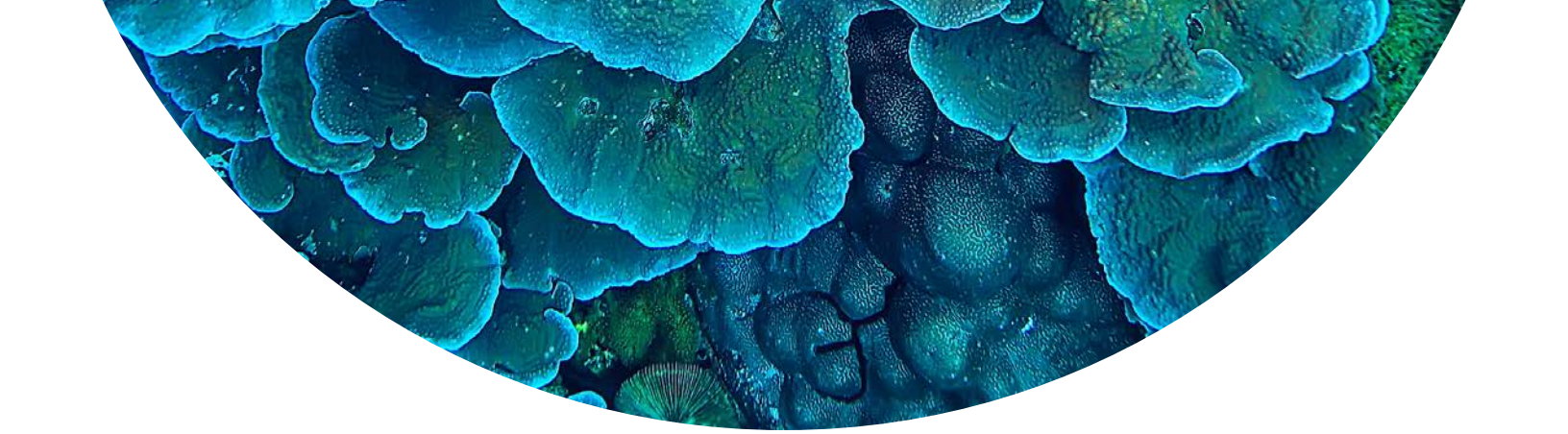
In 2022, the former Minister responsible for transportation announced at a press event that Hungary was working on legislation to allow Level 3 autonomous driving; however, no further plans were announced in the past year in this regard. The main regulatory obstacle to the introduction of comprehensive AV testing may be the lack of specific regimes for autonomous vehicles.

In certain areas, for example in case of liability rules, the same regulations apply to all vehicles in the testing phase, irrespective of the specific needs of autonomous vehicles. Fortunately, however, the COVID-19 pandemic, the economic disruption caused by the war in Ukraine and high inflation levels in the EU seemingly did not affect the ongoing autonomous vehicle projects.

Driverless Testing and Deployment

The primary testing location for driverless vehicles in Hungary remains the 250 ha (617acre) ZalaZONE test park in Zalaegerszeg, West-Hungary[71]. The test park and its construction is highly supported by the Hungarian government. Management rights over test park have been recently transferred to the Széchenyi István University Foundation. The University resides in Győr, where Audi's biggest output engine manufactory operates, and the University works in close cooperation with Audi on the development of electric vehicles and autonomous technologies. The aim of the transfer of management rights over the test park is to further enhance cooperation between industry stakeholders and scientific experts to expedite the development of futureproof mobility solutions[72]. The Foundation also aims to establish cooperation with Hungaroring, the race track where F1 grand prixs are held, to further enhance testing possibilities in Hungary. The ZalaZONE test park already offers a wide range of test facilities, including a high-speed handling course, smart city zone, motorway section and a special zone for testing advanced driver-assistance systems.

70 Hungary's Artificial Intelligence Strategy 2020 - 2030; Ministry for Innovation and Technology; May 2020
71 ZalaZONE: Welcome
72 HUMDA: ZalaZONE and HUMDA join forces with the Széchenyi István University Foundation (humda.hu)



The test park is supported by Ericsson's 5G technology installed on the communication towers of Magyar Telekom. The ZalaZONE Automotive Proving Ground facility was awarded with an Excellent Research Infrastructure Certificate by the National Research, Development and Innovation Office of Hungary[73] in 2021.

The Hungarian Road Management Company (Magyar Közút Nonprofit Zrt.) signed an agreement in 2019 with its Austrian and Slovenian counterparties to work together to prepare for collaborative, networked and autonomous vehicles.

The Hungarian-founded autonomous vehicle technology company, aiMotive, continues to carry out road testing in Hungary and in the USA using Toyotas and other vehicles equipped with aiMotive hardware and software[74].

In November 2022, global automotive giant Stellantis announced the acquisition of aiMotive to enhance Stellantis' artificial intelligence and autonomous driving technology, expand its global talent pool and boost the mid-term development of its STLA AutoDrive platform.[75] In October 2023, Stellantis injected further capital of approximately 55 million USD into aiMotive and the Hungarian Government also committed to provide further funds of approximately 14 million USD[76].

Connected Vehicles and Logistics

5G

In July 2019 – to fulfil the obligation stipulated in Directive (EU) 2018/1972 regarding 5G – the National Media and Infocommunications Authority of Hungary organized an auction for 5G frequencies in the 700 MHz, 2100 MHz, 2600 MHz and 3600 MHz frequency bands. The bidding companies purchased frequency usage rights for 15 years in three frequency bands for more than HUF 125 billion (approximately USD 320 million). The final results were published in 2020.

Although 5G deployment in Hungary is not robust, all major network providers offer 5G services. Additionally, infrastructure for 5G is continuing to be built, and as of 2023, 5G services are available in most cities and along major transportation routes. At the same time, due to the availability of full 4G network coverage, 3G telecommunications services in Hungary have been terminated in November 2023[77].

Apart from Budapest, the ZalaZONE test park was the first location in the country to have the proper infrastructure for 5G testing.

73 ZalaZONE Automotive Proving Ground received Excellent Research Infrastructure Certificate - ZalaZONE - Research And Innovation

74 Test schedule - aiMotive

75 Stellantis Accelerates Autonomous Driving Journey with Acquisition of aiMotive, a Leading Artificial Intelligence and Autonomous Driving Start-up I Stellantis

76 Stellantis invests HUF 20 billion in its Hungarian company (villanyautosok.hu)

77 3G services terminated in Hungary in November 2023 (villanyautosok.hu)

Data privacy

The provisions of the General Data Protection Regulation (Regulation (EU) 2016/679) (GDPR) are directly applicable to data privacy issues in Hungary. However, there are a number of areas where the GDPR permits Member States to enact national legislation. In the course of implementing the provisions of the GDPR, the Hungarian Parliament adopted an act, the Right of Informational Self-Determination and on Freedom of Information Act ("Hungarian Information Act"). Autonomous vehicles are governed by both the provisions of GDPR and the Hungarian Information Act. All data collected by autonomous vehicles relating to individuals is considered "personal data," as these data are information relating to an identified or identifiable natural person (e.g., location data).

According to the rules pertaining to autonomous vehicles for development purposes, such vehicles must be equipped with a data recording device, which shall collect the following data: (i) name of the test driver; (ii) information on whether the vehicle operates in a manual or in an automatic mode; (iii) speed of the vehicle; (iv) GPS coordinates; (v) operation of the lighting and light signaling devices; and (vi) usage of the audible warning device.

Additionally, under the GDPR, personal data cannot be stored longer than it is necessary for the purposes for which it is processed. The rules pertaining to autonomous vehicles for development purposes specify that after the end of the test, the data specified above must be stored securely for 72 hours. Upon request, the data (including video and audio recordings) shall be sent to the competent authorities. In the case of a traffic accident, the data collected one hour before and one minute after the accident must be stored for three years.

Electric vehicles

Electric vehicles are now a daily sight on the roads of Hungary. According to the data of the Ministry of Interior Affairs, the year-on-year growth of the number of environmentally friendly vehicles in Hungary as of August 2023 rose by 38%, and at that time there were more than 43,000 fully electric passenger vehicles and 2600 trucks registered in Hungary[78]. The number of electric and hybrid vehicles registered in Hungary has passed 78,000[79] in August 2023.

The Hungarian government already launched several rounds of state-subsidized EV purchase programs; applicants were granted with subsidies of up to HUF 2.5 million (approximately USD 7,500). Companies are also encouraged to purchase EVs for the company fleets with certain corporate income tax rebates and reductions made available.

In November 2023, the Hungarian Government announced the next round of state-subsidized EV development program; the Government will provide approximately 170 million USD, half of which will be allocated to the construction of 170 high-speed EV chargers, while the other half will be put up for tender between companies to speed up the transition to green fleets[80].

The National Bank of Hungary proposed in a publication that instead of subsidized purchase programs, citizens should be entitled to a subsidy for the purchase of new electronic vehicles[81].

The government has decided to apply for funding under the Connecting Europe Facility EU funding instrument and requested an HUF 3.4 billion (approximately USD 8.6 million) subsidy for the installation of 127 ultra-high-speed e-chargers at 25 locations, along with the first hydrogen charging stations in the country[82].

78 There are a lot of cars with green license plates already running in Hungary - Electric car drivers (villanyautosok.hu)
79 There are more than seventy-eight thousand vehicles with green license plates (kormany.hu)
80 Hungarian Government provides 170 million USD subsidy for EV transition (villanyautosok.hu)
81 A fenntarthato egyensuly es felzarkozas 144 pontja (mnb.hu)
82 Hydrogen wells and ultrafast chargers can be installed in Hungary - e-cars.hu and Government Resolution 1544/2022 (XI.16.)

Further, the government has passed legislation that a certain percentage of vehicles purchased under the public procurement regime must be zero emission or hybrid, and every second newly purchased city bus is required to run on clean energy, with the ratios gradually increasing for other types of vehicles as well until 2030[83].

The production of EVs began in the Kecskemét plant of Mercedes-Benz; the EQB model is the first mass-produced EV manufactured in Hungary[84].

In the beginning of 2022, Hungary and the KAMAZ group, Russia's biggest automotive manufacturer, announced their partnership. In the first phase of the cooperation, a research and development team will start working in Hungary and from 2025, the manufacturing of KAMAZ electric vehicles is planned to start[85].

The biggest vehicle engine manufacturing plant in the world, the Audi plant in Győr is also ramping up the production numbers of electric engines, which surpassed 250,000 units in 2021[86].

The construction of BMW's new production site in Debrecen, East Hungary, started in 2022, where 150,000 electric cars are planned to be constructed in each year starting in 2025[87].

BYD, the second largest EV producer in the world, is set to be constructing its first passenger vehicle manufacturing plant in Europe in Szeged, South-Hungary[88].

Driving Forces

- The Eötvös Loránd Research Network created a new, neural-net based model using big data for the control systems of autonomous vehicles that could allow for the introduction of Level 5 autonomy[89].
- aiMotive, the Hungarian-founded AV company, continues its road tests in Hungary[90] and abroad and announced further expansions and new solutions in 2021. In November 2022, Stellantis announced acquisition of aiMotive, which thus will continue its development programs under the wings of one of the largest automotive producers in the world[91]. In 2023, Stellantis committed to a further capital injection of approximately 55 million USD to expedite developments.
- A collaboration started between the Technical University of Budapest, Ericsson and Magyar Telekom. The parties established a 5G test network in the vicinity of the university's buildings and intend to carry out the testing of 5G-based data communication solutions, allowing communication of autonomous vehicles and smart roads.
- The state-supported ZalaZONE autonomous vehicles test park received further upgrades and is ready for complex high-capacity testing, including a high-speed handling course, smart city zone, motorway section and a special zone for testing advanced driver-assistance systems.
- The research center of leading AV technology developer AVL started operations in Zalaegerszeg (West Hungary), where the company intends to develop and test AV solutions[92].

83 Government decree prescribes the proportion of clean vehicles in Hungary - Electric motorists (villanyautosok.hu)
84 The first electric car of Hungary completed - Electric car drivers (villanyautosok.hu)
85 KAMAZ develops and manufactures electric vehicles in Hungary (kormany.hu)
86 Audi in Gyor: a Hungarian success story | audi.com
87 The foundation stone of the BMW plant in Debrecen has been laid - Electric motorists (villanyautosok.hu)
88 BYD to construct its first passenger vehicle factory in Europe in Hungary
89 Research network | ELKH - Eatvos Lorand Research Network
90 Test schedule - aiMotive
91 Stellantis Completes Acquisition of aiMotive to Accelerate Autonomous Driving Journey | Stellantis
92 AVL's new vehicle technology center has been handed over - autopro.hu

- The Future Mobility Association was established with the aim to further spread information and facilitate research initiatives in the fields of electromobility and traffic management. The Association includes a number of high-profile Hungarian and international companies ranging from the energy sector, automotive manufacturers and IT solutions companies and also local municipalities and state-owned companies[93].
- The R&D center of Knorr-Bremse is working on the development of autonomous trucks. The company already produced prototypes that are able to autonomously maneuver in closed sites and have equipment, allowing Level 4 autonomy driving on highways[94].
- The Autonomous Systems National Laboratory was established under the initiative of the Hungarian State, aiming to facilitate research cooperation between research institutes, universities and companies. The laboratory focuses on research, development, patent, publications and workforce training in the fields of autonomous systems[95].
- Parts manufacturer active in AV development, Continental, invested further HUF 4 billion (approximately 12 million USD) to increase the capacity of its Artificial Intelligence Development Center, which aims to create next-generation automotive software solutions, making automated driving safe and affordable[96]. Besides its R&D bases in Budapest and Veszprém, Continental has recently inaugurated a new AV research center in Szeged.
- Huayou Cobalt will construct its first European cathod factory in Ács, West-Hungary in a 1.5 billion USD investment to provide raw materials for lithium-ion EV batteries[97].
- Sunwoda, one of the largest battery producers in the world, will construct its first European battery factory in Nyíregyháza, East-Hungary in a 1.6 billion USD investment. The factory will supply lithium-ion energy sources to the automotive industry on the continent[98].

Key contacts/authors:

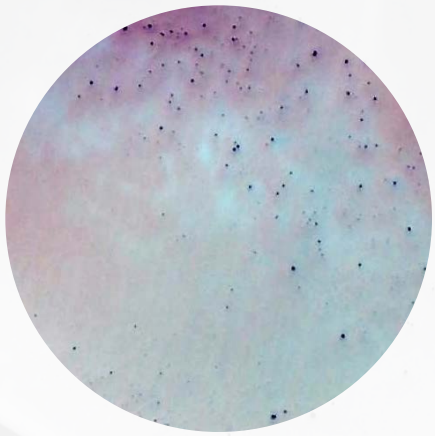
Marcell Szőnyl
Partner, Budapest
marcell.szonyi@dentons.com

Zsombor Frankó
Junior Associate, Budapest
zsombor.franko@dentons.com

93 Mobility of the future (jovomobilitasa.hu)
94 Smart trucks (knorr-bremse.hu)
95 Autonomous Road Vehicles | National Laboratory for Autonomous Systems (nemzetilabor.hu)
96 Continental Artificial Intelligence Development Center Budapest - Continental Hungary
97 Huayou Cobalt to construct its first European cathod factory in Hungary (villanyautosok.hu)
98 Sunwoda to construct its first European battery factory in Hungary (villanyautosok.hu)

India

- Over the past two decades, the automotive industry has emerged to be one of the main pillars of the Indian economy. As per a recent report published by the National Investment Promotion & Facilitation Agency of India, the Indian market is the 3rd largest automotive market in the world, surpassing Japan[99].
- As per a report dated February 17, 2023 published by the Press Information Bureau of India, the automotive industry's contribution to India's GDP has risen to about 7.1% now from 2.77% in 1992-93 whilst providing direct and indirect employment to over 19 million people[100].
- India has seen foreign investment of up to USD 35 million in the automobile industry from April 2000 to June 2023[101].



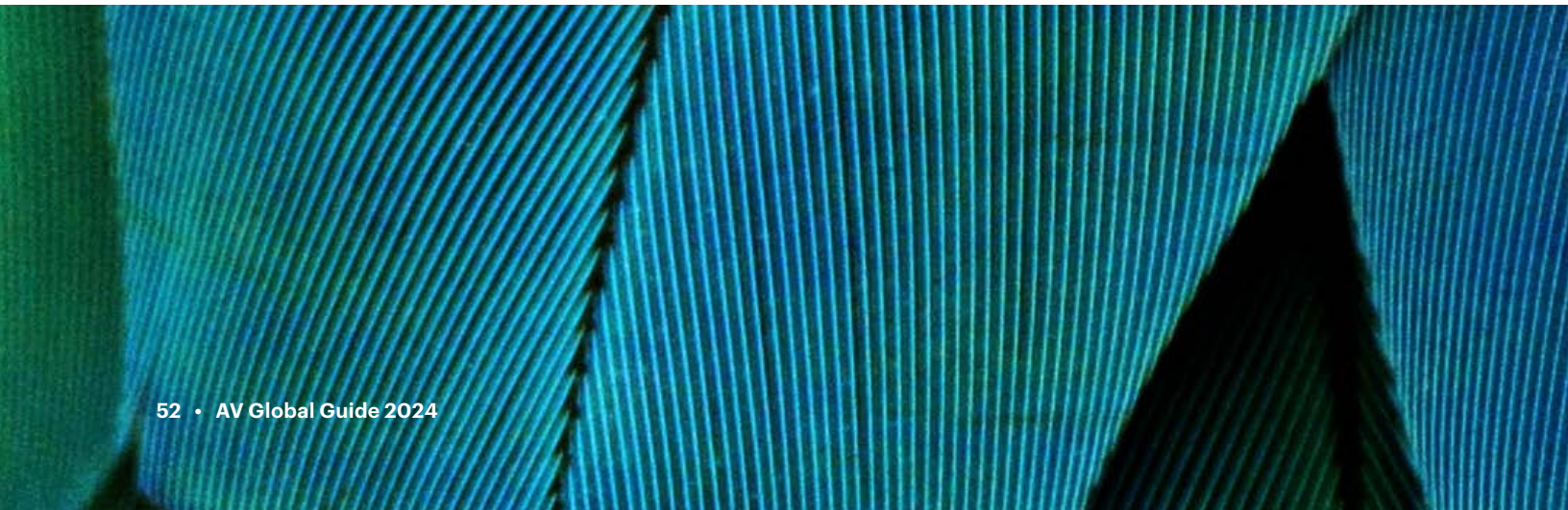
Regulatory Developments & Roadblocks

Existing Laws

- The Motors Vehicle Act, 1988 ("**MV Act**") and the Consumer Protection Act, 2019 ("**CPA**") are the two major laws that govern the operation of motor vehicles in India. In their present form, neither the MV Act nor the CPA specifically regulate autonomous vehicles or self-driving vehicles.
- The MV Act *inter alia* governs the minimum driving age for a motor vehicle in India as well as the licensing and registration processes applicable to vehicles. According to the MV Act, a "motor vehicle" or "vehicle" is defined to mean any mechanically propelled vehicle adapted for use upon roads whether the power of propulsion is transmitted thereto from an external or internal source and includes a chassis to which a body has not been attached and a trailer. The definition of a "motor vehicle" or "vehicle" under MV Act does not include a vehicle running upon fixed rails or a vehicle of a special type adapted for use only in a factory or in any other enclosed premises or a vehicle having less than four wheels fitted with engine capacity of not exceeding 25 cubic centimeters.

99 https://www.investindia.gov.in/team-india-blogs/indias-ev-economy-future-automotive-transportation.
100 doc2023217160601.pdf (pib.gov.in)
101 Invest in Indian Automobile Industry, Auto Sector Growth Trends (investindia.gov.in)

- The MV Act requires that motor vehicles are operated in a manner that ensures that a vehicle remains under the effective control of the driver of the vehicle. Even the Motor Vehicle Driving Regulations, 2017, which governs the conduct of drivers in India require that every vehicle or a combination of vehicles, while moving on the road shall have a driver.
- In 2019, the Central Government amended the MV Act with the object of addressing issues relating to road safety, citizen facilitation, strengthening public transportation, automation, and computerization. Through the amendment, the Central Government has been conferred with the power to exempt certain mechanically propelled vehicles from the application of the provision of the MV Act to promote innovation, research and development in the field of transportation. Even though the legislators have not specifically exempted automated vehicles from the MV Act, the law does confer such powers upon the Central Government.
- The CPA regulates damages arising from negligence, industrial errors, construction defects, and unfair trading practices. The CPA has substituted the erstwhile Consumer Protection Act, 1986 and has introduced a much wider definition of a 'consumer' and introduced concepts like product liability. As per the CPA, product liability is defined to mean the responsibility of a product manufacturer or product seller, of any product or service, to compensate for any harm caused to a consumer by such defective product manufactured or sold or by deficiency in services relating thereto.
- Autonomous vehicles or self-driving cars use artificial intelligence technology to control the vehicles. In case such artificial intelligence technology is considered as a product, then any damage that may be caused by an autonomous vehicle may be attributed to the manufacturer of the autonomous vehicle as per the current definition of product liability under the CPA. That said, it may be argued that artificial intelligence technology may also be considered as a service. As per the extant Indian laws, there is no clarity on this aspect relating to artificial intelligence and the extant laws would require modifications to resolve this ambiguity.
- **Liability in Case of Accidents:** In absence of a legal framework pertaining to autonomous vehicles in India, the most significant question that needs to be considered is the aspect of liability and enforcement of claim on occurrence of an accident caused by an autonomous vehicle.
- Currently, under the provisions of the MV Act, in case of a road accident, the claimant is awarded compensation for death or permanent disablement arising out of a road accident, based on the principle of 'no fault liability'. Since the MV Act does not currently permit any form of transportation without human intervention, apportionment of liability in case of accident caused by autonomous or driverless vehicles would require a detailed legal analysis.



Roadblocks

- In a move primarily aimed at securing employment of people engaged in the automotive industry, the Road Transport and Highways Minister of India had in 2019 made a statement that the Government will not permit the operation of driverless cars.[102]
- According to a KPMG's 2020 Autonomous Vehicles Readiness Index ("**AVRI**") report which assessed the degree of readiness for autonomous vehicles in 30 different countries and regions, ranked India as 29th out of the 30 countries assessed. India garnered the least favorable ratings in various aspects of AVRI, notably in the policy category, regulations, the establishment of a department for AVs, and the provision of government-funded pilots projects.[103]
- India has come a long way since and the Central Government has shown an inclination towards autonomous vehicles in India, as discussed in the section below.

Key Government Initiatives

- **India AI 2023:** The Ministry of Electronics and Information Technology, Government of India "MietY" had launched an initiative called the 'India AI' which is the national AI portal of India.[104] India AI is poised to assume the pivotal role of a content repository for the India AI program. Driving on the impetus provided by this initiative, India was ranked 1st in the AI Skill Penetration and 1st in the Number of GitHub AI Projects as per the Stanford AI Report 2023.[105]
- Furthering to India's commitment towards developing AI in the country, MeitY had set up seven working groups to collectively brainstorm on the vision, objectives, outcomes, and design of AI in India. The working groups have shared the first edition of their report in October 2023 ("**India AI Report**").[106] The India AI Report acknowledges that self-driving cars will increase the efficiency and effectiveness of operations. The report further explains how AI in vehicles eases the complex tasks that are required to be completed in split seconds like navigation, collision, avoidance, and situational awareness. The expert group draws a connection between the importance of these tasks and the increased number of accidents caused due to the negligence of the drivers and emphasizes upon the role of autonomous vehicles and artificial intelligence in the coming years.
- **Automotive Research Association of India ("ARAI"):** ARAI is a research and development institute of the automotive industry established as an autonomous body affiliated with the Ministry of Heavy Industries, Government of India. It is working on an internal research and development program titled "SwayamGo" which aims to improve safety using the latest electronic and safety technologies.[107] As a part of this program, ARAI had developed an autonomous vehicle prototype using a standard electric passenger car. This autonomous vehicle prototype is equipped with complete sensors for Advanced Driver Assistance Systems ("ADAS") or fully autonomous functions. Additionally, there are selective auto or manual drive capabilities installed as well. The said autonomous vehicle prototype is also useful for road trials & validation and for traffic data acquisition.

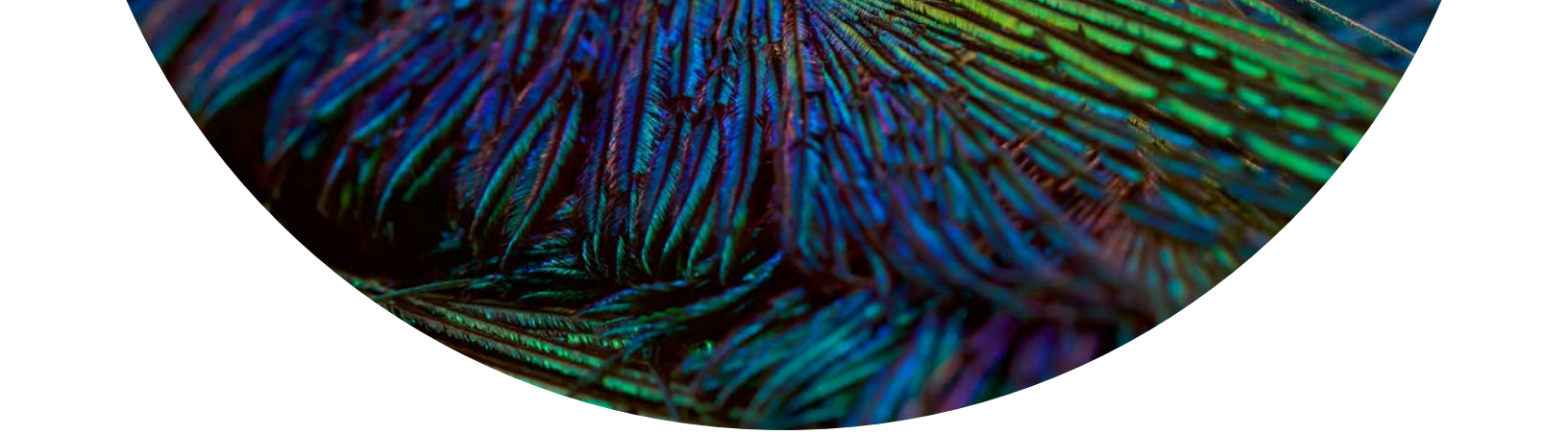
102 https://www.indiatoday.in/auto/latest-auto-news/story/union-minister-nitin-gadkari-not-in-favour-of-allowing-driverless-cars-in-india-1602957-2019-09-25.
103 https://kpmg.com/xx/en/home/insights/2020/06/autonomous-vehicles-readiness-index.html.
104 https://indiaai.gov.in/
105 https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index-Report_2023.pdf.
106 https://www.meity.gov.in/writereaddata/files/IndiaAI-Expert-Group-Report-First-Edition.pdf.
107 https://www.araiindia.com/services/technology-and-products/autonomous-vehicle-deployment-platform.

- **NITI Aayog Report:** In June 2018, NITI Aayog, which is the premier policy making institution of the Government of India, had published an extensive report titled 'National Strategy for Artificial Intelligence #AIFORALL' ("**NITI Aayog Report**").[108] The genesis of the said report lies in the budget speech for 2018-2019 of Hon'ble Finance Minister of India, which directed NITI Aayog to establish the National Program on AI, with a view to guide the research and development in new and emerging technologies. The Niti Aayog Report *inter alia* focuses on the 'Smart Mobility and Technology', emphasizing upon the variety of issues faced by the Indian transportation sector including congestion and road accidents, high number of traffic deaths, need of sustainable transportation and so on.
- The NITI Aayog Report further elucidates upon the importance of investing in autonomous vehicle technologies and the research and development of the broader suite of technologies that are essential for assistive artificial intelligence by the Indian manufacturers since these technologies can play a pivotal role in reducing fatalities and decreasing vehicular congestion.
- **India's Automotive Mission Plan 2016-26:** The Central Government and the Society of Indian Automobile Manufacturers have come out with the second automotive roadmap, known as the Automotive Mission Plan for 2016–26 ("**AMP 2026**")[109]. The AMP 2026 is aimed at boosting the country's vehicle manufacturing operations and sets an ambitious objective to drive the country's automotive industry into the top three globally in terms of engineering, manufacturing, and the export of vehicles and components.

Driverless Testing & Deployment

- As noted earlier, the extant Indian law does not provide for any specific regulation or a competent body to deploy and expand driverless vehicle testing. However, the Indian Institute of Science ("**IISc**") in Bengaluru, Karnataka has established the Artificial Intelligence and Robotics Technology Park ("**ARTPARK**"), a not-for-profit organization in partnership with AI Foundry, a venture studio to build leapfrog AI companies and ecosystem globally, in a public-private collaborative model.[110] The initiative has received seed funding of INR 230 crores from the Department of Science & Technology, as part of the National Mission on Interdisciplinary Cyber-Physical Systems by the Karnataka government.
- ARTPARK-IISc aims to influence sectors like healthcare, education, mobility, infrastructure, agriculture, retail, and cyber-security through ambitious R&D projects. ARTPARK-IISc is in the process of setting up a 'Centre for Advanced Manufacturing for Robotics and Autonomous Systems', approved by the Ministry of Heavy Industries, for technology development in robotics and autonomous systems.
- In 2022, ARTPARK-IISc has set up India's first test track for driverless vehicles on the 1,500-acre campus of IISc in Chitradurga district of Karnataka. The track aims on providing companies and startups that are involved in the manufacture of autonomous vehicles with an advanced computer-assisted track to test driverless vehicles in Indian conditions.

108 https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf.
109 https://www.siam.in/uploads/filemanager/47AUTOMOTIVEMISSIONPLAN.pdf.
110 https://www.livemint.com/auto-news/artpark-plans-india-s-first-autonomous-vehicle-test-track-11629312464755.html.



- Additionally, in July 2022, the Minister of State for Science & Technology inaugurated the Technology Innovation Hub on Autonomous Navigation ("**TiHAN**") located on the Indian Institute of Technology, Hyderabad campus.[111] The initiative, funded by the Ministry of Science & Technology with a budget of INR 130 crores (approximately USD 15.63 million), aims to position India as a leader in the next generation of 'Smart Mobility' technology. Within this facility, a unique testbed for autonomous navigation has been developed to create unmanned ground and aerial vehicles at the Indian Institute of Technology Hyderabad. The testbed has the capability to replicate various real-world scenarios. In terrestrial systems, this includes scenarios such as smart cities, signalized intersections, interactions between autonomous vehicles and cyclists or pedestrians, as well as wireless networking between vehicles and roadside units. The autonomous vehicle testbed also provides simulated signboards, pedestrians, overpasses, and bikers to test under all conceivable real-world conditions.
- Dr. Srivari Chandrasekhar, the current Secretary of the Department of Science and Technology, was quoted as saying that the standard operating procedures for unmanned vehicles will significantly aid in formulating the regulations and operating policies for different applications in the Indian scenario.

Connected Vehicles and Logistics

Data Privacy & Security

- Autonomous vehicles heavily rely on interconnected systems and software that control their operations. These systems make use of various sensors, cameras, and communication technologies to navigate and interact with the external environment. Such technologies are prone to cyber security attacks and can potentially exploit vulnerabilities in the software to gain unauthorized access to critical functions like steering, acceleration, or braking, leading to dangerous consequences on the road.
- Connected vehicles generate and process vast amounts of data, including personal and sensitive information about passengers, driving patterns, and routes.
- The Information Technology Act, 2000 ("**IT Act**") read with the Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules, 2011 ("**IT Rules**") is the current data protection legislation in India. The IT Act does prescribe a penalty for offenses relating to computer resources, however concept of "computer resource" does not involve autonomous vehicles and therefore hacking of autonomous vehicles would be beyond the scope of the current provisions under the IT Act.

111 https://dst.gov.in/first-its-kind-testbed-autonomous-navigation-develop-unmanned-ground-and-aerial-vehicles-inaugurated

- In August 2023, the Central Government passed the Digital Personal Data Protection Act, 2023 ("**DPDP Act**"), a cross-sector legislation on data privacy.[112] Though the DPDP Act is legally a 'statute' but the provisions of DPDP Act have not yet come into effect. The provisions of DPDP Act will come into force on a date as may be notified in the official gazette by the Central Government. The Central Government may opt to enforce the provisions of DPDP Act in a phased manner. Till the time the provisions of DPDP Act come into force, the existing legislative framework for protection of data in India persists. Accordingly, the extant law on data protection in India continues to be fragmented and broadly contained under the IT Act and the IT Rules.

5G

- The Department of Telecommunications, under the Ministry of Telecommunications, Government of India ("**DoT**") exercises the powers of licensing and regulatory authority for telecoms in India. In 2017, the DoT formed a High-Level Forum ("**HLF**") to suggest policies for the swift rollout of efficient 5G networks, boost semiconductor manufacturing, and foster research in 5G technology.[113] The Forum released a report with recommendations on spectrum and regulatory policies, creating labs for applications, setting standards, and evaluating international norms.[114]
- Additionally, the Telecom Regulatory Authority of India ("**TRAI**"), which is an independent regulator of telecommunications industry registered under the TRAI Act to provide a fair and transparent policy environment to promote a level playing field and facilitate fair competition amongst various telecom players.
- In a recent publication paper dated September 29, 2023, the TRAI discussed various sectors, including autonomous vehicles, and emphasized the transformative potential of 5G technology.[115] The paper underscored how 5G can enable connected and autonomous vehicles to communicate with each other and with infrastructure, leading to optimized traffic flow, reduced accidents, and enhanced mobility. Further, the role of 5G in smart transportation was highlighted, enabling real-time communication between vehicles and infrastructure for improved traffic management, advanced driver assistance systems, and support for electric vehicles through wireless charging and battery management.
- The paper further emphasized on how 5G technology holds the potential to revolutionize the automotive sector, fundamentally transforming how we interact with vehicles. The key benefits and applications of 5G in this domain include enhanced connectivity, providing vehicles with high-speed, low-latency communication with road infrastructure and cloud-based systems. This facilitates advanced features like improved traffic management, predictive maintenance, and advanced driver assistance systems.

112 https://www.meity.gov.in/writereaddata/files/Digital%20Personal%20Data%20Protection%20Act%202023.pdf.
113 https://indianexpress.com/article/business/centre-constitutes-high-level-forum-on-5g-technology-india-4862098/.
114 https://dot.gov.in/sites/default/files/5G%20Steering%20Committee%20report%20v%2026.pdf.
115 https://www.trai.gov.in/sites/default/files/CP_29092023.pdf.

- Additionally, 5G enables vehicles to receive real-time information about their surroundings, enhancing autonomous driving capabilities and improving safety and efficiency. The technology also allows for remote vehicle management, enabling automakers and dealers to diagnose, troubleshoot, and update vehicles remotely, reducing the need for costly in-person maintenance visits. 5G opens up opportunities for new business models and services such as connected car insurance, in-car entertainment and commerce, and location-based advertising. Further, 5G technology contributes to improved energy efficiency by enabling real-time communication and data transfer between vehicles and the grid, leading to enhanced energy management and more efficient charging of electric vehicles.

Electric Vehicles

- The current legal framework in India does not provide specific guidelines for the production of Electric Vehicles ("**EV**"), their components, and waste management. As the EV industry in India is fast developing, there is a need for clear policies regarding sustainable practices for waste disposal, especially for batteries.
- In the union budget for the financial year 2023-24, substantial funds were allocated for the production of EVs, adoption of hydrogen fuel, and advancements in technology. Notably, the Goods and Services Tax ("**GST**") on EVs was reduced from 12% to 5%, and on chargers and charging stations, it was lowered from 18% to 5%.[116]
- Government programs like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles Scheme – I & II, Production-Linked Incentive schemes for Auto and Auto Component, and advanced chemistry cell batteries have played a significant role in encouraging local production and driving EV adoption. With an allocation of INR 51.72 billion (about $631 million) towards the FAME-II scheme, marking an 80% increase from previous years, India aims to incentivize the adoption of clean energy vehicles. Additionally, reduced custom duty on lithium-ion batteries used in EVs and excise duty exemptions on natural gas and biogas could potentially lead to an increase in imports of electric vehicles.
- Both Indian and international automakers have entered the EV market, indicating a growing presence in the EV sector. By December 2022, EVs accounted for an impressive 16.8% of all vehicle sales in New Delhi, representing a year-on-year growth of 86%. In 2023, India achieved a milestone of over 1 million EV sales in less than nine months, a target which took an entire year in 2022. Data from the Ministry of Road Transport and Highways revealed that these EV registrations constituted 6.4% of total automobile sales.[117] Among the segments, two-wheelers led at 56%, followed closely by three-wheelers and four-wheeler passenger vehicles.

116 Press Information Bureau (pib.gov.in).
117 https://mybs.in/2cHnsdh.

Driving Forces

- **zPod:** Minus Zero, an AI startup in Bengaluru, introduced the zPod in June 2023, India's first prototype of an AV.[118] Unlike regular cars, the zPod doesn't have a steering wheel and uses advanced cameras to navigate through traffic. Minus Zero claims that the zPod can drive itself without needing a human to take over, known as 'Level 5' autonomy.
- **Tech Mahindra and Anyverse Partnership:** Tech Mahindra has recently announced a collaboration with Anyverse, a hyperspectral synthetic data platform, aimed at facilitating the development of computer vision solutions for autonomous applications within the automotive sector.[119] The partnership seeks to streamline the utilization of synthetic data for training, testing, and validating AI systems, with an emphasis on ADAS, in-cabin systems, and other autonomous vehicle applications.
- **Tata Autonom AI:** The Tata Autonom AI platform is a middleware equipped with deep learning and AI capabilities, making it a tool for Original Equipment Manufacturer ("**OEM**") and suppliers in developing custom autonomous vehicle applications.[120] Notably, this platform has been licensed to one of the world's top 5 automotive OEMs for their driverless car research and development. This comprehensive and modular solution covers perception, guidance, navigation, and control, and drive-by-wire systems, enabling carmakers and Tier 1 automotive suppliers to rapidly build, test, and deploy autonomous vehicles. Moreover, the platform supports sensor fusion, seamlessly integrating various sensors such as cameras, radar, and LiDAR. It also provides complete algorithm frameworks for ADAS and assisted driving use cases, demonstrating Tata's commitment to delivering the intricate capabilities expected of driverless cars.

118 India's first autonomous car zPod is truly a game changer (indiaai.gov.in).
119 Tech Mahindra and Anyverse partner to accelerate AI Adoption in the Automotive Industry.
120 Tata Elxsi - Tata Elxsi Is Driving Autonomous Adoption Across Geographies.

- **Mercedes-Benz R&D Unit:** In 2013, Mercedes-Benz Research and Development India ("**MBRDI**") had inaugurated its single largest R&D facility outside of its home country, Germany in Bangalore, India. In accordance with the publicly available sources, the Head of Group Research, Mercedes-Benz Cars Development had made a statement saying that "India is a high potential market for Mercedes-Benz."[121] This facility is reportedly responsible for most of the company's technological developments for autonomous cars and connected cars worldwide.[122] India being the choice of one of the largest players of the automotive industry to develop cutting edge technology does induce the confidence in all the stakeholders for a bright future of the Indian autonomous vehicle industry in the country.
- In 2021, Tesla Inc., one of the most valuable car manufacturers in the world announced their entry into the Indian market and registered itself with an office in Bangalore, Karnataka. However, since its incorporation in India Tesla has had to abandon its plans for India due to disagreements over import duty reductions, with the Indian government insisting on a commitment to local manufacturing in exchange for import duty concessions and encouraged the company to apply for the production-linked incentive scheme, offering direct subsidies to manufacturers instead of customs duty concessions. However as per recent public reports[123], Tesla's CEO, Elon Musk is set to meet Indian Trade and Commerce minister, Mr. Piyush Goel in November of 2023 to discuss the American automaker's plans to setup a manufacturing facility in south India. The Indian government is working on an electric vehicle policy that would allow international car manufacturers to import battery-powered vehicles on concessional duty rates if they commit to eventually building them in India.

Key contacts/authors:

Anuj Trivedi

Anand Srivastava

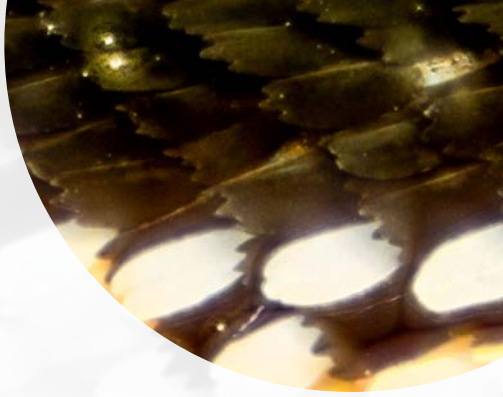
Kartikeya Singh

Dakshita Arora

Udbhav Handa

121 Daimler to nearly double India R&D staff (deccanherald.com).
122 Mercedes-Benz Research & Development India (mbrdi.co.in).
123 India commerce minister to meet Tesla's Musk amid market entry talks-sources | Reuters.

Poland



Regulatory Developments and Roadblocks

The Act on Electromobility and Alternative Fuels, effective January 2018, marked an important step toward the development of the autonomous vehicle market in Poland. The Act amended the Road Traffic Act to allow autonomous vehicle testing. It introduced to the Polish legal system a definition of "autonomous vehicle" as a motor vehicle equipped with systems controlling the vehicle's movement and enabling movement without interference by the driver, who can take control of the vehicle at any time.

In September 2019, the government adopted the "**Strategy for Sustainable Development in Transport until 2030**" emphasizing its focus on autonomous vehicles deployment "in the foreseeable future." The strategy underlines the need to provide support for the effective functioning and competitiveness of the domestic automotive market and the IT market, through setting up the National CAD Contact Point, defining the rules for testing and introducing autonomous vehicles for use in a way that ensures safety and social acceptance for such technology[124].

The most important works at the government level aimed at preparing for autonomous road transport have been conducted by the Ministry of Infrastructure. This includes the project **"Poland's Road to Transport Automation" (AV-PL-ROAD)**, the goal of which was to set up a green book of autonomous vehicles, create a CAD contact point and a road map for the introduction of autonomous vehicles in Poland.

One of the results of the AV-PL-ROAD project was the establishment of the **Autonomous and Connected Vehicles Competence Center (CK: PAP)** within the structure of the Motor Transport Institute in June 2021. The overriding goal of the Center is to support the government administration in the efficient and safe implementation of autonomous vehicles in Poland.

Recent years have also seen initiatives at the local level.

- In July 2019, the Mayor of Rzeszów signed a letter of intent with companies responsible for network infrastructure, telecommunications and cybersecurity regarding a partnership aimed at research and implementation of 5G technology. It will support the introduction of autonomous buses in the city, which will initially run on a line connecting two railway stations, and ultimately on the route from the city center to the airport.
- In September 2019, tests of automated electric minibuses were carried out in Gdañsk with a view to public passenger transport, in particular "first and last mile" connections, all under the aegis of the Sohjoa Baltic project.
- Other groundwork preparations for autonomous vehicles have taken place in the city of Jaworzno. The city has mapped streets and their surroundings to create a 3D map to support navigation for autonomous vehicles. The city also intends to develop legal, technical and organizational guidelines to ensure safety on the roads where autonomous vehicles will drive.

124 The strategy is available at: https://www.gov.pl/web/infrastruktura/projekt-strategii-zrownowazonego-rozwoju-transportu-do-2030-roku2 (only in Polish).

"Before autonomization comes to us for good, there are many legal, infrastructural and technological challenges to be solved that require a systemic and coordinated approach. One barrier is, for example, the law, which in many cases does not keep pace with technical development. The technology is not good enough to deal with every potential road scenario. There is also the issue of building an expensive infrastructure that will be in a kind of symbiosis with the cars of tomorrow."[125]

- In January 2020, autonomous trams were tested in Cracow. The test was conducted in cooperation with Cracow University of Technology - Institute of Rail Vehicles, MPK Kraków and companies Newag, Cybid and Medcom. The aim of the project is to introduce autonomous trams to Cracow[126].
- In February 2020, the Autonomous Vehicles Working Group was established in Gdañsk. The inaugural meeting was attended by representatives of the Governor of the region, businesses interested in autonomous vehicles, clusters, and scientists. The task force is seeking to create the conditions for the development and sale of services and products related to autonomous vehicles.
- In November 2023, an autonomous bus developed by Blees[127] (a Polish startup) was tested in Katowice. The vehicle moved along a 2-kilometer route at a maximum speed of 25 km/h. It was later announced that further tests would be conducted in Gliwice.

According to experts, one of the roadblocks to faster implementation of autonomous vehicles in Poland is relatively strict regulations governing testing. Under current laws, such tests cannot take place if local residents raise objections. The government is aware of the problem and is working on liberalization of the current regulations.

Marcin Ślęzak

Head of the Motor Transport Institute's Connected and Autonomous Vehicles Competence Center

"There are many necessary changes. For example, there are problems with organizing testing. However, changes to the infrastructure seem to be more urgent. In both Poland and Europe, it is not always in a good condition - and sometimes it does not meet the requirements of autonomous vehicles. Beginning with road markings, not all roads have lanes marked with white lines that the software must 'see' to keep the vehicle on course."[128]

Michaf Sikora

President of the Polish Automobile and Motorcycle Federation

125 Please see https://www.its.waw.pl/download,5063,edd8247b261064fe2071c7c3a0232551,pl.html.
126 Please see the report "Autonomiczny Transport Przyszłości," Polski Instytut Ekonomiczny, Ministerstwo Infrastruktury, kwiecień 2020 r. (available at https://www.gov.pl/web/infrastruktura/autonomiczny-transport-przyszlosci).
127 Please see https://blees.co/en/.
128 Please see Autonomous vehicles: A promising but distant future - Public Transport (transport-publiczny.pl).

Driverless Testing and Deployment

Following the amendment of the Road Traffic Act in 2018, companies can test autonomous vehicles on public roads in Poland if safety requirements are met and they have a permit from the relevant traffic management authority.

i. Application - formal requirements

The organizer of autonomous vehicle testing must submit a written application to the traffic authority responsible for management of the road on which the testing is going to take place. The application should state at least:

- full name and address/company name and registered office of the test organizer;
- place and date of start/end of the testing;
- planned route;
- a list of people responsible for securing the route of the autonomous vehicle; and
- signature of the organizer/representative.

Mandatory attachments:

- proof of compulsory civil liability insurance for damage arising in connection with such testing, which should take effect upon obtaining a permit for autonomous vehicle testing;
- proof of payment of the premium for this insurance; and
- a copy of the decision on professional vehicle registration.

ii. Consultations with residents

When the full application is submitted, the traffic management authority conducts local consultations with residents of the municipality (Polish: gmina) where the autonomous vehicle testing is to be conducted, by placing the application on its website and setting a window of at least seven days for comments. Property owners along the planned route of the autonomous vehicle may voice objections.

iii. Permit from the traffic management authority

The traffic management authority may issue a permit after obtaining the consent of the road administrator and the opinion of the relevant regional police officer regarding the impact of testing on traffic flow on the planned route of the vehicle. If such consent and opinion are not obtained, the permit will not be granted. In addition, the traffic management authority will not issue a permit where there is a risk that the autonomous vehicle testing will pose a threat to human life or health or to property of great value, or an objection is raised by an owner of real estate located along the planned route of the autonomous vehicle.

iv. Obligations of the test organizer

Once a permit is issued, the test organizer is required to:

- enable the police to perform activities to ensure road safety and protect human life and health and property during the testing;
- ensure that during the testing, in a place intended for the driver, there is a person with a driving license who can take control of the vehicle at any time, in particular in the event of a road safety hazard;
- publicly disclose information about the testing and the route of the autonomous vehicle; and
- provide the Director of the Transport Technical Supervision with a report on the testing of autonomous vehicles and their equipment, in accordance with the form set out in the regulations, within three months of completing the tests.

As the presence of a backup driver during testing is compulsory, all autonomous vehicles must be equipped with a steering system and other elements the driver requires to physically take control of the vehicle. As a result, it is currently impossible to conduct testing of fully autonomous vehicles without a human at the wheel (Level 5 AVs as defined by SAE).

The current legal framework does not permit consumers to use Level 3-5 AVs on public roads in Poland.

Wider deployment of autonomous vehicles should be stimulated by the **UN Regulation on uniform provisions concerning the approval of vehicles with regard to Automated Lane Keeping System (ALKS)**, adopted in June 2020, which is the first binding international regulation on Level 3 AV. It took effect in January 2021 and is applicable in EU Member States.

The UN Regulation allows for the introduction of automated vehicles equipped with the Automated Lane Keeping System on roads where pedestrians and cyclists are prohibited and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions. In a first step, the Regulation limits the operational speed to 130 kph maximum (effective as of January 2023; previously the limit was 60 kph[129]) and to passenger cars. Moreover, the driver should always have an option to override the system at any time.

Connected Vehicles and Logistics

Data privacy

Much of the data generated by autonomous vehicles will relate directly or indirectly to identified or identifiable individuals and thus may be classified as "personal data" within Article 4(1) GDPR. Such personal data may include vehicle data insofar as it can be associated with a natural person.

According to the GDRP (a principal data protection regulation in Poland), the processing of personal data is lawful if processed with the consent of the data subject concerned or on some other legitimate basis laid down by law. Special rules apply to processing sensitive data (e.g., biometric data or health-related data). Processing of such data is prohibited unless the data subject has granted explicit consent (a law may rule out this option), personal data are manifestly made public by the data subject or processing is necessary for specific reasons listed in the GDPR.

Under the GDPR, the **data controller** (e.g., a vehicle manufacturer gathering data on the wear and tear affecting the vehicle's parts to improve its quality) is obliged, inter alia, to:

- Have appropriate legal grounds for the processing of personal data;
- Implement appropriate technical and organizational measures to be able to demonstrate that processing is performed in accordance with data protection laws and ensure a level of security appropriate to the risk;
- Fulfil the information obligations and respect the rights of **data subjects** (e.g., car owners) (the right to be informed, the right of access, the right to rectification, the right to erasure, the right to restriction of processing, the right to data portability, the right to object to processing, the right not to be subject to automated individual decision-making, including profiling);

129 Please see UN Regulation extends automated driving up to 130 km/h in certain conditions | UNECE.

- Follow the principles of data protection by design and default;
- Maintain records of processing activities (there is a limited exemption from this obligation);
- Notify a personal data breach to supervisory authorities;
- Carry out a data protection impact assessment (DPIA), if required; and
- Designate a data protection officer (DPO), if required.

The data controller may use a third party to collect and process personal data on its behalf (e.g., an equipment manufacturer or automotive supplier). In such case, the data controller should ensure that it has a written contract with the **data processor** setting out the subject-matter and duration of the processing, the nature and purpose of the processing, the type of personal data and categories of data subjects and the obligations and rights of the controller.

You may also check EDPB Guidelines 1/2020 on processing personal data in the context of connected vehicles and mobility-related applications adopted on March 9, 2021, available at https://edpb.europa.eu/our-work-tools/ our-documents/guidelines/guidelines-012020-processing-personal-data-context_it.

5G

On 6 March 2020, the President of the Office of Electronic Communications (UKE) announced a highly anticipated 5G auction. The auction was supposed to cover four nationwide frequency licenses in the 3.6 GHz band, and each booking included an 80 MHz block valid until June 30, 2035. The reserve price for each block had been set at PLN 450 million (approximately USD 120 million). Following the outbreak of COVID-19, the auction was suspended and not resumed. Instead, the government decided to launch a new auction.

The new auction was officially announced on June 22, 2023. It covered four 100 MHz blocks in the 3400-3800 MHz band. According to the results of the auction announced on October 18, 2023 by the President of the Office of Electronic Communications, 15-year reservation rights to use respective bands will be granted to Polkomtel, P4, Orange Polska and T-Mobile Polska (reservation decisions should be issued in December 2023).

In the meantime, operators are using already possessed spectrum to offer commercial 5G networks for their subscribers. However, such commercial networks face some limitations on data speeds and territorial coverage.

Electric vehicles

The key piece of legislation regulating the electric vehicle market in Poland is the Act of 11 January 2018 on Electromobility and Alternative Fuels, which transposes Directive 2014/94/EU of the European Parliament and of the Council of October 22, 2014 on the deployment of alternative fuels infrastructure.

It sets out a list of incentives for owners of electric vehicles, including:

- Exemption from excise duty,
- More favorable depreciation write-offs,
- Possibility of using bus lanes,
- Free parking in paid parking zones.

The Act also aims to establish the legal framework for the development of the infrastructure required for electric vehicles. One of the recent amendments to the act introduced a requirement to design and construct residential and non-residential buildings so that they can host EV charging stations.

In July 2021, the Ministry of Climate and Environment announced a new support scheme named "My Electric Vehicle." The goal of the program is the reduction of air pollutant emissions, e.g., by co-financing purchase or lease of zero-emission vehicles.

Electromobility Poland SA, a state-controlled joint venture established in 2016 by four Polish energy companies (Tauron, Enea, Energa and PGE), is working on a Polish electric car under the Izera brand name. Prototypes of Izera were presented in July 2020.

In November 2022, it was announced that ElectroMobility Poland SA and China's largest private automotive group (Geely Holding Group) signed a licensing agreement under which Geely Holding Group would provide ElectroMobility Poland SA with a dedicated SEA (Sustainable Experience Architecture) platform for electric cars.

For more information, please check https://izera.com/.

According to publicly available data, at the end of August 2023, there were:

- 84,947 electric passenger cars registered in Poland (compared to 52,011 in August 2022), namely 43,567 fully electric vehicles (BEVs) and 41,380 plug-in hybrids (PHEVs). The number of hybrid passenger cars and vans increased to 600,742 units (compared to 426,884 in August 2022).
- 3,003 charging stations for electric vehicles in Poland (compared to 2,427 in August 2022). 33% of them were fast DC charging stations and 67% were AC chargers with a power less than or equal to 22 kW.

Up-to-date statistics can be found here: https://www.pzpm.org.pl/en/Automotive-market/E-Mobility-Index.

Driving Forces

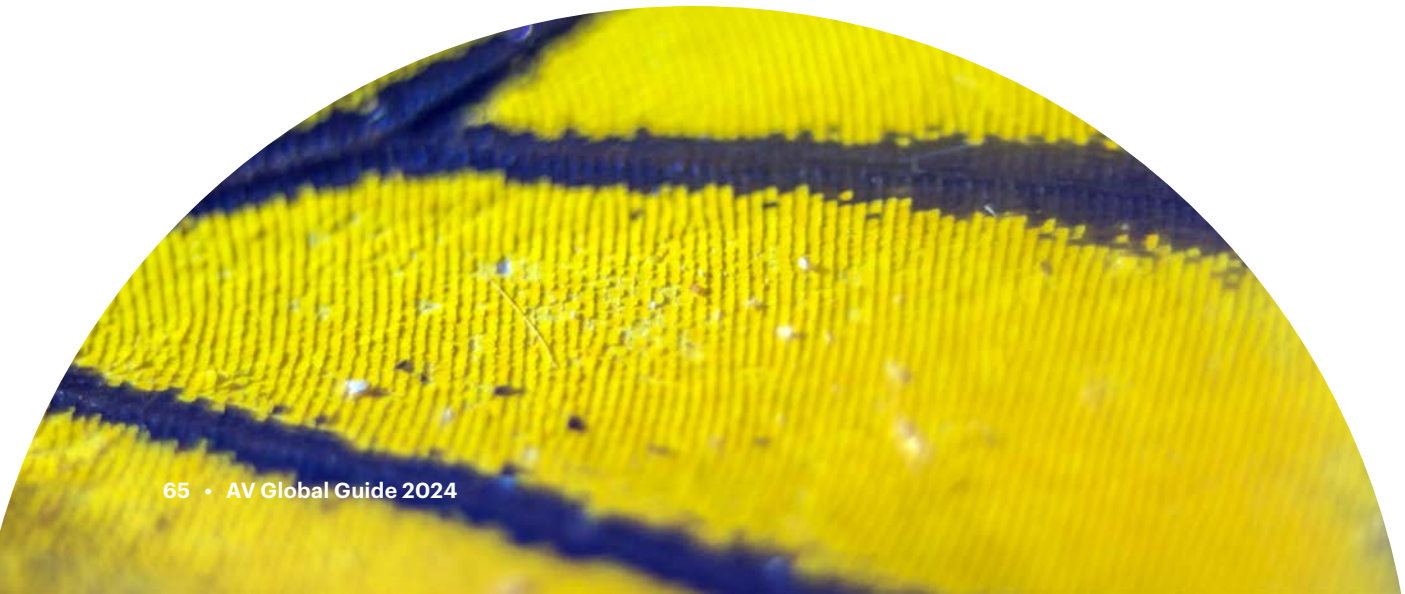
Motor Transport Institute's Connected and Autonomous Vehicles Competence Center (CK:PAP)

The Connected and Autonomous Vehicles Competence Center was established as part of the "Polish Road to Automation of Road Transport" (AV-PL-ROAD) project, an initiative of the Motor Transport Institute, the Ministry of Infrastructure, and the Faculty of Transport of Warsaw University of Technology.

The Center serves as an expert institution and supports the government administration, among others, in the implementation of EU law. It also serves as a national contact point in the field of connected and autonomous vehicles. Additionally, it aims to coordinate and monitor research and development works. Plans of the Center include the expansion of advanced technical facilities of the Motor Transport Institute and the development of infrastructure, enabling in-depth research of technologies supporting the development of road transport automation.

The employees of the Center include experts in the field of road transport automation, intelligent transport systems (ITS), road safety, transport psychology and national and international vehicle type-approvals.

Marcin Ślęzak – Head of CK:PAP, Director of the Motor Transport Institute.



Ministry of Infrastructure

The Ministry of Infrastructure is a central government body responsible for formulating transport policy. In recent years, the Ministry of Infrastructure has conducted works intending to enable the development of the unmanned aerial vehicle industry and preparation for the autonomous transport system. The Ministry has been supervising, e.g., the AV-PL-ROAD project, which was the most important initiative devoted to autonomous transport at government level, serving to create a green book of autonomous vehicles, conduct social research on the subject and prepare a roadmap for the implementation of autonomous vehicles in Poland.

Robotec.ai

Robotec.ai is a software company that develops high-tech solutions for automated and connected vehicles. Its multidisciplinary team consisting of experts in robotics, electrical engineering, software development, machine learning and human factors supports car manufacturers in the field of software monitoring drivers and passengers. The company also implements machine-learning technologies in vehicles.

Michał Niezgoda – CEO at Robotec.ai

In Poland, there are several thriving centers dealing with autonomous driving. The works are carried out, among others, by Aptiv and Intel.

Aptiv

Aptiv's center in Cracow has been operating since 2000 and is considered one of the most innovative and developed research centers in Aptiv's portfolio. Currently, its local staff numbers almost 3,000 people, including 2,000 engineers. Offices are located closer to the center of Cracow, while in the suburbs there is a machine park and a special test track (SmarTrack), which is the first test track for autonomous vehicles in Poland[130].

The engineers from Aptiv's technical center in Cracow are developing a range of technologies for autonomous vehicles, including software, autonomous driving and multimedia audio systems, navigation, entertainment and communication systems, e.g., innovative gesture recognition systems. While some solutions are already available on the market, the company's local team is also working on technologies of the future for the automotive industry[131].

Tomasz Miśniakiewicz – Country Director at Aptiv

Intel

Intel has recently announced the opening of a new competence center in Gdańsk. In its new laboratories, employees will work on projects related to autonomous vehicles, artificial intelligence, machine learning and data storage security. It is worth noting that the campus in Gdańsk is already Intel's largest research and development center in the European Union[132].

130 Please see https://www.youtube.com/watch?v=iG9QTuRj0N0. Please also check: https://motofocus.pl/producenci-czesci-idystrybutorzy/96473/wizyta-w-centrum-badawczo-rozwojowym-aptiv-w-krakowie (in Polish).

131 Please also check https://www.aptiv.com/pl/aptiv-w-polsce

132 For more, check https://constructionmarketexperts.com/en/news/intel-to-invest-in-artificial-intelligence-in-gdansk/

Blees

Blees is a Polish startup which developed the prototype of the first Polish autonomous minibus. The bus can take 15 people on board and travel about 200 kilometers on one charge. The first tests of the prototype were conducted in November 2023 in Katowice. Blees' goal is to develop SAE level 4 autonomy, at which the vehicle drives fully independently.

Martyna Wiśniowska – CEO at Blees

For more information, please check: https://blees.co/en/.

On June 7, 2022, the Polish Motor Transport Institute organized an international conference "AV-POLAND Autonomous Future of the Road Transport." It was the biggest event of the year related to autonomous vehicles in Poland.

A recording is available in English at https://www.youtube.com/watch?v=NUgVQwmjBTs.

For more information, please check https://avpoland.com/en/.

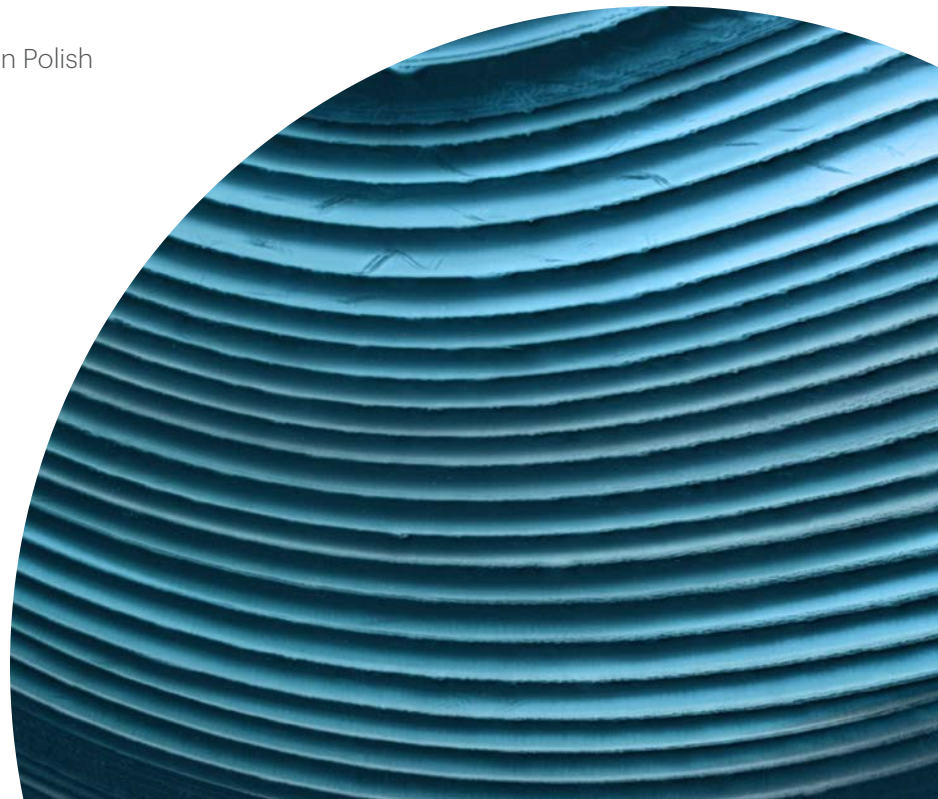
On October 12-13, 2022, the Polish Association of Automotive Parts Distributors and Manufacturers (SDCM) organized the "XVII Automotive Industry and Market Congress." One of the panels was devoted to autonomization of transport and other technological challenges and Polish law.

Recordings from the congress are available in Polish at https://kongres.sdcm.pl/relacja.

Key contacts/authors

Karol Laskowski
Partner, Warsaw
karol.laskowski@dentons.com

Bartosz Dobkowski
Associate, Warsaw
bartosz.dobkowski@dentons.com



South Korea

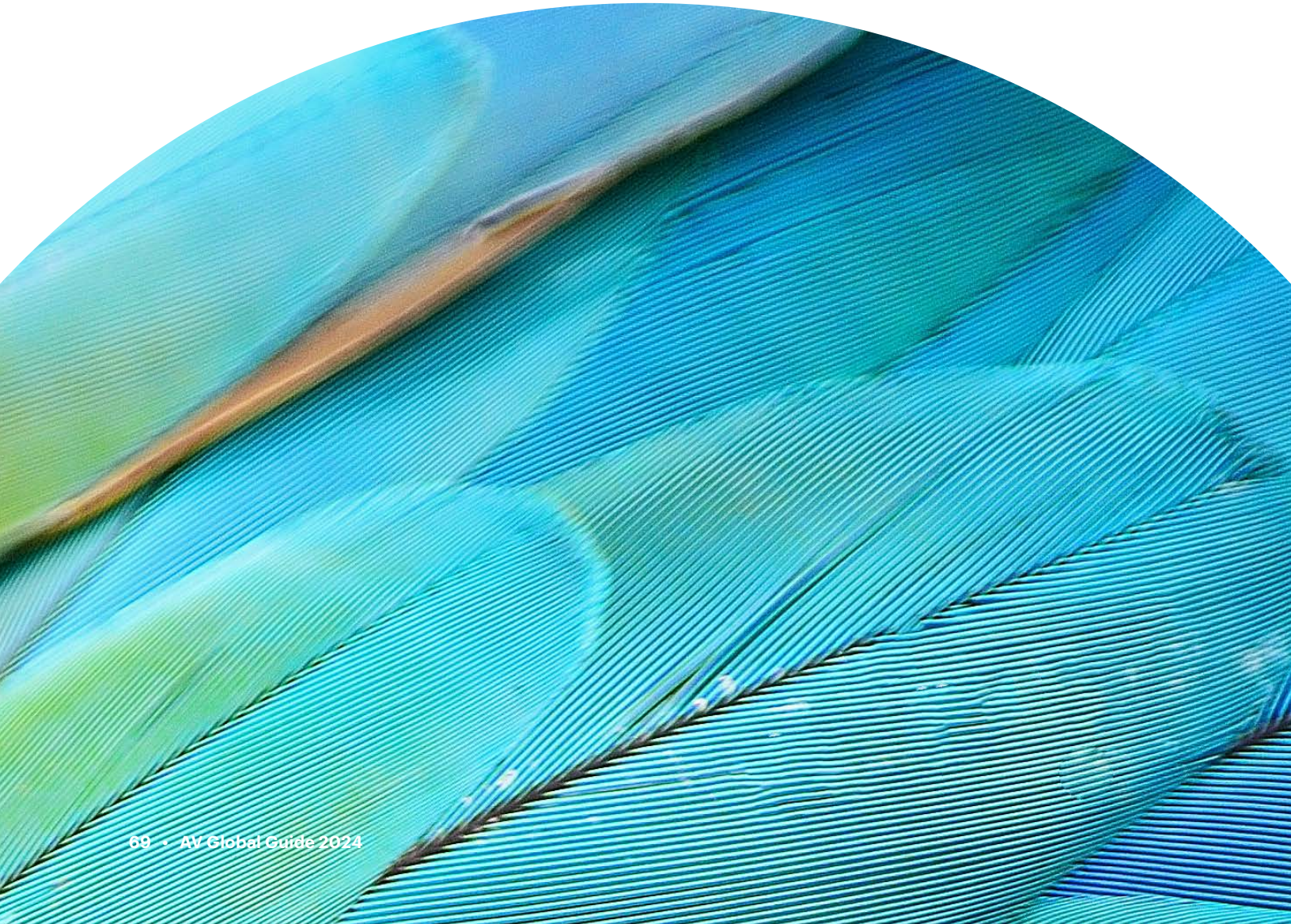
Regulatory developments and roadblocks

Key Korean government agencies and their roles

Government agencies	Role	Governing/Relevant Laws
Ministry of Land, Infrastructure and Transport (MOLIT) *(n.b. KATRI (Korea Automobile Testing & Research Institute) is an institution under MOLIT)*	Provides ITS (Intelligent Transport Systems) services and platforms.133 Makes Laws & Regulations (e.g., Announces safety standards for Level 3 AVs).	**Motor Vehicle Management Act** This is a law governing the management, performance quality and safety of automobiles. It serves as the basis for operating AVs, e.g., provides the definition of AV, allows test driving, etc. The Enforcement Decree of this Act stipulates the requirements for safe driving and test driving of autonomous vehicles. **Guarantee of Automobile Accident Compensation Act** This is a law that governs compensation for damage caused by the operation of automobiles. The Act specifies the obligations of the car owners, e.g., to subscribe to an insurance policy. (A requirement for insurance, even for the operation of test-driving, is stated in this law as well).
Ministry of Science and ICT (MSIT)	Information and Communication Technology Infrastructure ICT Service/Platform Frequency Distribution	Transport for NSW
Korean National Police Agency (KNPA)	Governs/regulates matters occurring on the roads (e.g., accidents). Issues driving licenses / Verifies authenticity of the licenses. Builds high-tech infrastructure in response to development of AVs (Currently in the process).	**Road Traffic Act Amendment** This is a law that aims to resolve traffic problems on the road and regulate safe driving. From April 20, 2022, a partial amendment to the Road Traffic Act became effective. The new amendment adds the definition of a "self-driving motor vehicle" as a motor vehicle (i) which can move on its own without the control of a driver or passenger, and (ii) is equipped with a self-driving system. A "self-driving system" means automated equipment, software and all other related devices that enable the motor vehicle to move by recognizing and judging surrounding circumstances and road information on its own without the input of a driver or passenger. In addition, using vehicles, horse-led carts, or trams on the road through a self-driving system is also included in the definition of "driving."

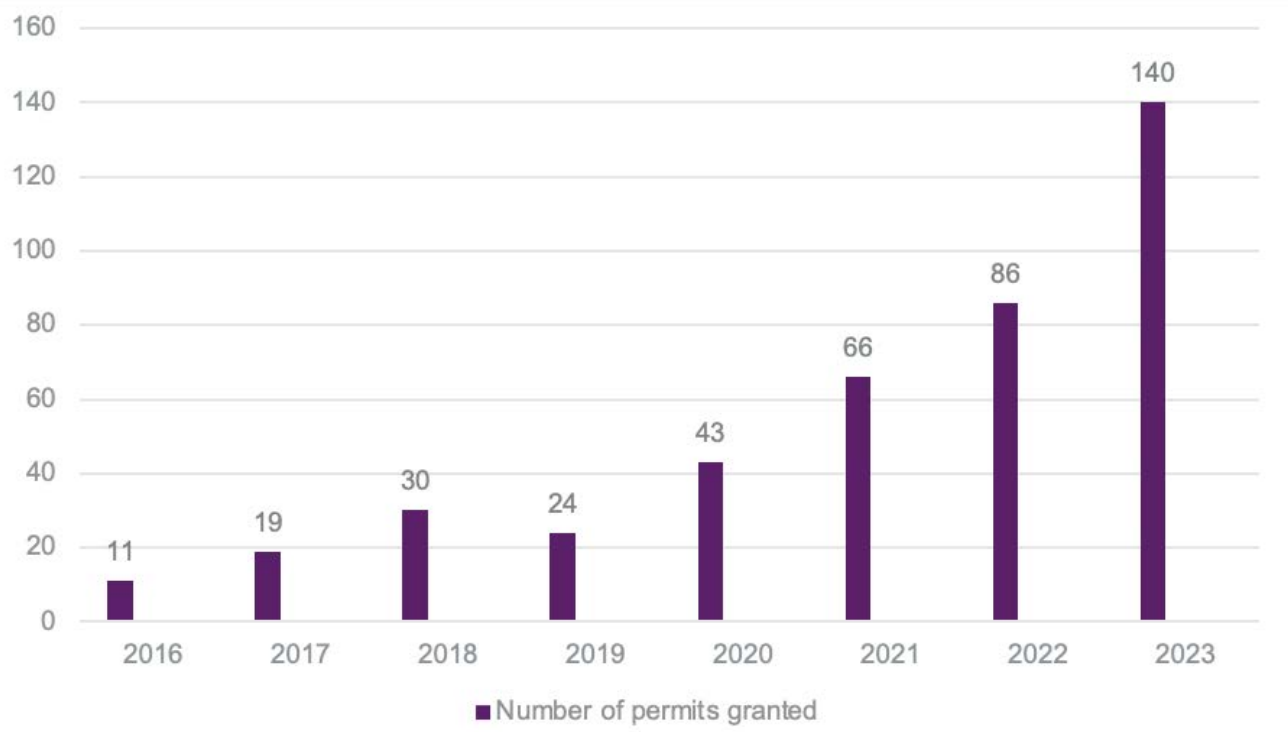
133 Major ITS services and platforms designed and provided by MOLIT include AFC (Automatic Fare Collection), ETCS (Electronic Toll Collection System), and ATES (Automatic Traffic Enforcement System). The government provides national ITS data collected as such to the private sector to help the private sector with enhancing and expanding their ITS services.

Government agencies	Role	Governing/Relevant Laws
Ministry of Trade, Industry, and Energy (MOTIE)	Advancement of Autonomous Technology Commercialization of Technology SME Globalization & Trading Support	
Korea Transportation Safety Authority (TS) *(Korea Automobile Testing & Research Institute)*	Conducts research before the government makes laws. Involved in drafting and publishing transportation-related policies.	



Rules, regulations, laws and guidance at the federal level

Autonomous Vehicle Act



Source: Number of permits granted in the past years, Korea Transportation Safety Authority

Effective from May 1, 2020

- Objectives: Provides necessary support/ infrastructure for introduction, spread and safe operation of AVs. Regulates necessary requirements in relation to AVs. Ultimately, the Act aims to contribute to the improvement of the public's living conditions and the development of the national economy by promoting and supporting the commercialization of AVs. (Paraphrased Article 1)

Key parts of the act

- (1) Designation of autonomous driving safety zones: The act offers a basis for the Minister of Land, Infrastructure and Transport's authority to designate "autonomous driving safety zones" and certain places on public roads where people can operate their vehicles autonomously.

In designating the zones, the Minister can consider whether the infrastructure has been created to support safe operation of AVs (Article 6 of the Act). In line with this provision, the Enforcement Decree of this Act provides the regulations on the standards and procedures for designating autonomous driving safety zones. More specifically, the Enforcement Decree requires that road structures, autonomous driving cooperation systems and the construction status of detailed road maps be considered when designating such safety zones. When designating or changing such safety zones, the authority shall notify autonomous vehicle manufacturers, etc. (Article 5 of the Enforcement Decree of the Act).

- (2) The Autonomous Vehicle Act enables the designation of AV pilot zones in which paid passenger ride and delivery services using AVs are allowed.
- Unconventional vehicles not complying with the Korea Motor Vehicle Safety Standards (KMVSS),[134] such as delivery robots, will be allowed if safety measures are provided by the operating entity.
- Pilot tests of the new V2X technology will also be allowed in the AV pilot zones.
- **Designation procedure:** Application by municipal & provincial governors Committee Review (chaired by MOLIT minister) Designation of AV pilot zone.

Three guidelines were announced on December 15, 2020

> *"'Guidelines' currently, and thus, do not have binding effect – persuasive/recommendation only. Published as government publications with the statement "considering the complex nature of the matter [AVs], it is hard to institutionalize in a short period of time" (press release by MOLIT on December 15).*

1. The Ethics Guideline for AVs and Stakeholders

Press release:

> *"The principal rule is that AVs shall be designed and manufactured in a manner such that protection of human life can be prioritized. Accordingly, rules such as 'human lives shall be prioritized over property' and 'if avoiding accidents completely is impossible, [devise a method to] minimize the loss of life' are included in the Guideline. Also, there are some ethics guidelines in relation to the user of the AV, such as 'one's operating an AV should not infringe others' freedom and rights' and 'the user is required to take safety education to operate an AV properly.'"*

2. The Guideline for Cyber Security

- Based on the UNR No.155 introduced in June 2020, MOLIT has written the Guideline for Cyber Security focusing mainly on a recommendation for automobile manufacturers. The guideline was announced on December 15, 2020.
- *According to the guideline, a manufacturer should "preserve security by utilizing cybersecurity management procedures, for example, by "detecting and notifying users of risks, based on a 'risk evaluation process'; reducing the level of risk by utilizing a 'security measures process'; carrying out a 'verification process' to confirm the adequacy of the security measures." (press release)*

134 KMVSS refers to the corresponding standards of the Automobile Management Act of Korea. (a.k.a. Motor Vehicle Management Act) – See Chapter III of the Act for further details.

- MOLIT is planning to revise the relevant law to in-corporate the guidelines and obligate the relevant parties to take actions to preserve cybersecurity. (According to a press release dated December 15, 2020, the government plans to implement a law incorporating this guideline in July 2022)

(3) The Guideline for the Manufacture/Safety of Level 4 AVs

- The government provided a system for commercialization of Level 3 AVs in July 2020 and is currently in the process of introducing one for Level 4 AVs. The guideline was announced on December 15 to promote technology development for AVs by providing recommendations on necessary requirements for the safe operation/design/manufacture of AVs before the government's official enactment of the law.
- **The guideline is composed of three parts**
  - **i.** System security area;
  - **ii.** Safe operation area;
  - **iii.** and Safety education and ethical considerations.

Part (i) provides guidelines to minimize design defects and malfunctions of the AV and to protect the AV from cyber threats. **Part (ii)** aims to minimize the risk of accidents in the operation stage by providing guidelines for safe interaction among the users of the road (e.g., pedestrians, other cars, etc.) under diverse road conditions. **Part (iii)** concerns proper design and operation of AVs.

Key governmental policies on AVs

Regulations for Drivers of Self-Driving Motor Vehicles

- Drivers of self-driving motor vehicles that are not equipped with a complete self-driving system will be required to immediately respond to the demand of the system to drive the car in person. The drivers must take direct control of the steering wheel and braking system to assume driving. A violation of this obligation may be subject to a fine of up to KRW 200,000 or detention or penalty.
- In the case of a road without a center line among roads where sidewalks and roadways are not separated, drivers of self-driving motor vehicles have obligations such as maintaining a safe distance, slowing down, or temporarily stopping to protect pedestrians.

Act to Support Mobility Innovation and Revitalization

Instituted in April 2023, the "Act to Support Mobility Innovation and Revitalization," a specialized regulatory sandbox covering all sectors related to means, infrastructure, services, and technology has been introduced, establishing a new support system for the commercialization of new mobility technologies. This legislation is designed to establish a legal framework to address a range of emerging transformations, extending beyond just autonomous driving technologies. Numerous Korean companies are gearing up to deploy new modes of transportation across various sectors, including air taxis, robots, and automated cars. Notably, firms with strong technological foundations in areas like semiconductors and mobile communications are making significant advancements. The South Korean government is actively working to establish a robust future mobility ecosystem. Despite these efforts, there are still considerable challenges in expanding beyond the limited Korean business market.

"The regulatory sandbox system included in the Mobility Innovation Act is broadly composed of

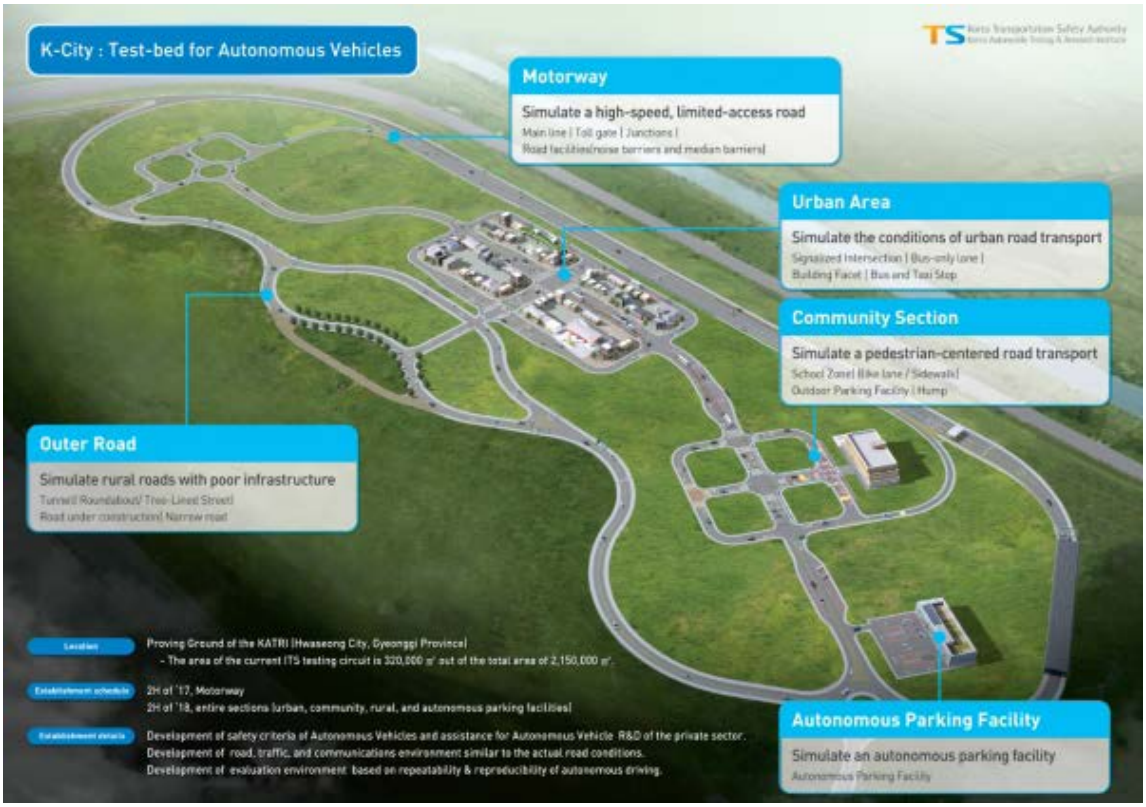
1. A system for rapid confirmation of regulations, and
2. A system for exceptional demonstration, with their specific details as follows.

Quick Confirmation (Article 11)

This system allows businesses related to new mobility means, infrastructure, services, and technology to request MOLIT to confirm whether licensing or permits are necessary for their operation. The Ministry is required to respond within 30 days, and if there is no response within this period, it is considered that the matter is not under the jurisdiction of the Ministry or that no license or permit is required.

Exceptional Demonstration (Articles 12 to 14)

1. This system allows businesses to operate within a certain area, period, and scale in cases where there are no relevant standards, specifications, or requirements in the licensing or permitting basis laws for the particular mobility means, infrastructure, services, or technology (ambiguity),
2. it is inappropriate to apply the standards, specifications, or requirements according to the licensing or permitting basis laws (unreasonable),
3. it is impossible to apply for licensing or permits under other legal provisions (prohibition). Typically, the validity period is set for within two years, and if the laws are not revised before the expiration of the validity period, it can be extended for up to two more years. The business operator can request the revision of related laws."



Source: 'Test-bed' plan, Korea Transportation Safety Authority

'ICT Regulatory Sandbox'[135]

The aim of this scheme is to help the market entry of new technologies and services that are acknowledged to be innovative and safe. The scheme allows technology and service developers to conduct demonstration tests (albeit with restrictions as to time, place, and scale).

Key contents/system

- **(1) Prompt Confirmation:** When a company is starting a new technology/industry, it can inquire whether any relevant regulations exist and whether a permit is required. The government agency will reply within 30 days. (If it receives no reply from the government within 30 days, then the company making the inquiry may assume there is no regulation that applies to its case).
- **(2) Temporary License:** Where companies providing new products/services are having difficulties in releasing their products/services in the market be-cause of the ambiguous or unreasonable regulations, notwithstanding the safety and innovation of such products/services having been proven, a temporary license may be granted. Once the temporary license is granted the products/services are not subject to the existing regulations upon satisfying certain conditions. Licenses can be granted to cover a maximum of 2+2 years, with the approval of the "Public-Private Regulatory Special Case De-liberation Committee" (allowed for a two-year term, which may be extended for another two years, subject to an obligation to improve the relevant laws and regulations within the period of the license).
- **(3) Demonstration Exception:** When testing and verification of new products/new services are required at a time when relevant laws and regulations are ambiguous and unreasonable or when there are some prohibitive regulations, etc., testing of new technologies or services is permitted, despite the existing regulations, under certain conditions (e.g., within a limited area/scale/period). This exception can be allowed for a maximum of two plus two years with the approval of the "Public-Private Regulatory Special Case Deliberation Committee" (allowed for a two-year term, which may be extended for another two years, subject to an obligation to improve the relevant laws and regulations during that period. When delayed, a temporary license may be used).

A case that benefited from the system is the Siheung Bae-got New Town Life Park and its Autonomous patrol vehicle "Goalie." While the release was delayed, the project received permission for test-operating through the ICT sandbox system.

135 This Regulatory Sandbox scheme is being governed by the Ministry of Science and ICT of Korea, thus often referred to as ICT Regulatory Sandbox in a short form. (https://www.korea.kr/special/policyCurationView.do?newsId=148857563)

‘Land Transportation Innovation Fund’

Operation began in 2020 with an investment of approximately KRW 17 billion but has since expanded. According to the Minister of Land, Infrastructure and Transport, it created KRW 340 billion of general and specialized sub-funds, recruiting private management companies for the No. 4 and No. 5 sub-funds of the “Land Transportation Innovation Fund” to support the innovative growth of small and medium-sized enterprises and ventures with promising technologies in the field of land transportation. The sub-funds are earmarked as follows:

- **1) General (No. 4):** Invest more than 70 percent in small and medium-sized venture companies that possess, develop, or commercialize land transport technology in the land transport industry and related industries.
- **2) Specialization (No.5):** (i) Drone, (ii) Smart logistics, (iii) Autonomous vehicle (including ITS), (iv) Smart city, (v) Smart construction (including digital engineering, architectural BIM, etc.), (vi) Invest more than 60 percent in small and medium-sized venture companies in the field of green remodeling.

Establishment of an ‘Innovative Growth Support Center’

- The government invested KRW six billion to start the establishment of an Innovation Growth Support Center which is slated to be completed in early 2022. This two-story center will be as large as 2000m2 and will be equipped with self-driving R&D facilities, such as a vehicle maintenance garage, security garage and a data analysis facility. This is a policy that enables small and medium-sized enterprises, for whom it has been difficult to equip their own vehicle storage facilities and research facilities, to develop and secure technologies without incurring large costs.

Cross-ministry R&D plan for Commercialization of Level 4 AVs (investing approximately KRW1.1 trillion) commenced in 2021

Government stance/government representatives' statements

Overall attitude: Supportive and willing to cooperate

- Many regulatory obstacles remain, but government/relevant authorities are making efforts to alleviate them by implementing policies such as regulatory sandboxes.
- The Ministry of Land, Infrastructure and Transport has collaborated with the Korea Transportation Safety Authority (KOTSA) to upgrade facilities of K-City, an autonomous vehicle testbed in Hwaseong some 40 kilometers (24.8 miles) southwest of Seoul, to provide various environments that can simulate low-visibility weather conditions such as heavy rain and thick fog. The new testbed will be usable in the first half of 2022. The establishment of the next-generation intelligent transportation system (C-ITS) as well will be initiated soon, so that it can be built on major highways and national highways by 2022."[136]
- In June 2021, the Korea Transportation Safety Authority established the AV Transportation and Logistics Master Plan 2025 to commercialize autonomous driving-based transportation and logistics systems through the commercialization and proliferation of autonomous vehicles.

AV Master Plan 2025

Vision: The era of autonomous driving commercialization begins in 2025.

Goal:

1. Provision of autonomous driving commercial service on highways and major branches;
2. Development of technology based on autonomous driving service (BRT, on demand); and
3. Regulation improvement and infrastructure establishment for AV service.

Strategy:

1. Advancement of autonomous driving service technology;
2. Expansion of an autonomous service demonstration;
3. Creating the autonomous driving service business;
4. Reinforcement of autonomous driving safety; and
5. International cooperation related to autonomous driving job expansion.

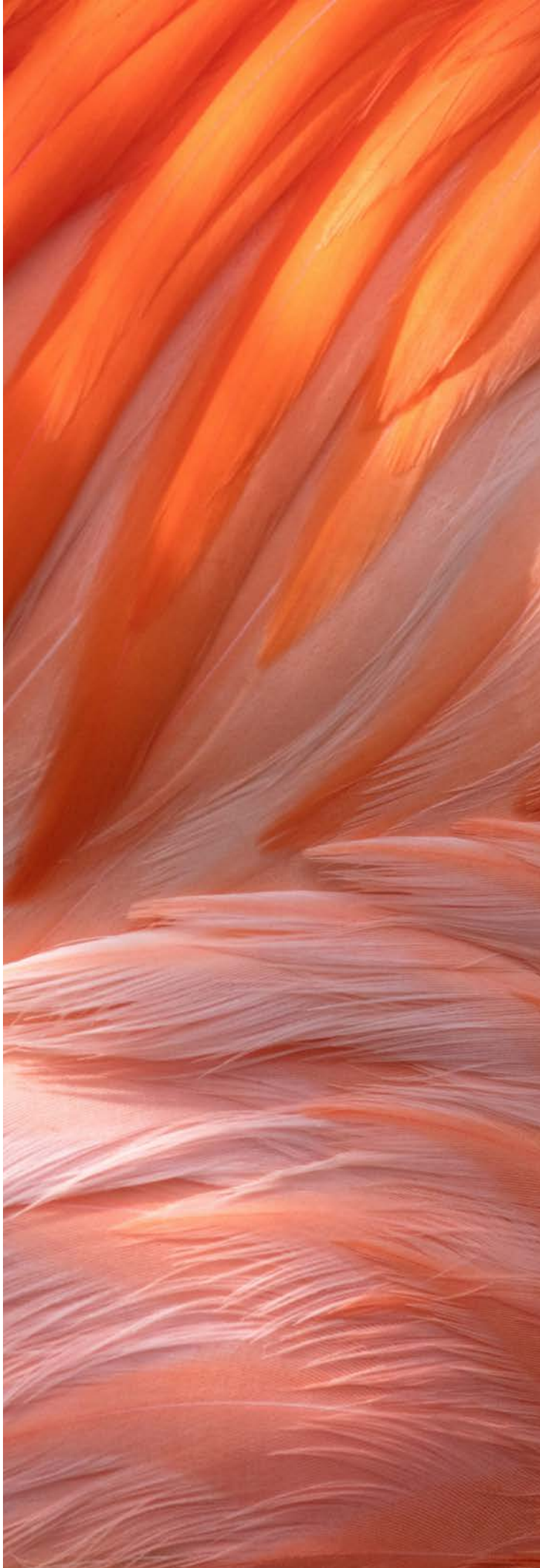
136 Resource: Article titled "Government will speed up to support the AV-developing companies … 'Innovative Growth Support Center' construction commenced" (dated June.19, 2020) published on the website, "Republic of Korea Policy Briefing (www.korea.kr)"; (https://www.korea.kr/special/policyCurationView.do?newsId=148857563)

Driverless vehicle testing and deployment

The Korean government has been operating a “temporary permit scheme” since 2016 to support the development of autonomous-driving technology. The scheme allows test-operation/test-driving of qualified AVs on public roads.

In 2020, 119 AVs from 41 entities received permits and the distance driven in Korea has exceeded 1,170,000 km. As of November 2022, the Ministry of Land, Infrastructure and Transport (MOLIT) gave temporary permits to 258 self-driving cars. The number of pilot zones has also increased to 14 including Seoul, Sejong City, Gwangju, Daegu, Jeju, and Pangyo. The pilot zones are areas where various commercial autonomous vehicle-related services such as car-hailing services are demonstrated.

STRADVISION, a trailblazer in deep learning-based vision perception technology for the automotive industry, has recently established a new 'Autonomous Driving Workshop' in Dongtan, Gyeonggi-do, South Korea. This workshop is focused on enhancing vehicle object recognition technology. Spanning nearly 18,000 square feet, STRADVISION's facility is dedicated to the optimization and calibration of cameras and sensors for autonomous vehicles. The workshop boasts facilities for testing and advancing camera-based autonomous driving, as well as other sophisticated technologies like lidar and radar, facilitating a variety of research and development projects tailored to different levels of autonomous driving technology. Designed as a standalone facility, it can accommodate up to 40 engineers working concurrently on 6 test vehicles for simultaneous testing and development.



Breakdown of permits issued across various entities

Total permits: 420

Number of permits issued across various entities

The MOLIT announced that it will establish and operate a weekly traffic safety training course for self-driving car test drivers (safety management personnel) to prevent safety accidents caused by self-driving car test operations.

Self-driving car test drivers are those who check driving conditions and normal operation inside and outside autonomous vehicles and take emergency safety measures. The MOLIT seeks to ensure safety by designating test drivers and imposing management obligations for safe driving. The curriculum is expected to strengthen self-driving stability by further enhancing test drivers' expertise and ability to cope with situations even in the face of the recent increase in self-driving cars.

Key revisions to note

- Breakdown the category of AVs into three types; (A) the traditional type of AV; (B) AV without a driver's seat; and (C) Unmanned AV.
- Under the current procedures, type (B) and (C) AVs are not eligible to obtain a temporary permit. (In the case of type (B), a permit is obtainable only when an exception in the law applies.) After the revision occurs, both type (B) and (C) will be eligible to receive a permit.
- Tailored permitting requirements will apply for each type of AV. For example, for type (B) AVs, a temporary permit may be granted only if the AV has incorporated certain functions – e.g. an emergency stop button for passengers, emergency controls, automatic stop function in case of breakdown, etc. For type (C) AVs, emergency control buttons on the left and right side of the AV.

Temporary permits and other requirements for test driving

Currently, only autonomous vehicles that have received a temporary driving permit (upon the condition that a driver is on board) are allowed to operate on the roads across the country.

At least a "temporary driving permit" from the Minister of Land, Infrastructure and Transport is required for test driving of autonomous vehicles. Also, a preliminary test drive of 5000 km in accordance with the "Regulations on the Safe Driving Requirements and Test Driving of Autonomous Vehicles" is required.

Since February 2016, permits have been granted only to vehicles that meet the "minimum safe driving requirements."

"Minimum safe driving requirements"

[See "Regulations on the Safe Driving Requirements and Test Driving of Autonomous Vehicles" (Chapter 2, para 1)]

- Vehicle must be certified to meet minimum safe driving requirements through a self-certification process by eligible manufacturers, or by the government (Article 30(3) of the VMA; and Article 34 of the Enforcement Decree of VMA).

- Any car owner or party who has the right to use the car, who wishes to obtain a temporary driving permit for the purpose of testing/researching AVs ("applicant for autonomous vehicle temporary driving permit"), is liable for damages for personal injuries arising from the operation of such vehicle. In addition, he/she must subscribe to adequate insurance to ensure payment of damages.
- The applicant for an AV temporary driving permit must conduct sufficient pre-driving (5000 km) at a test facility, etc. to confirm the operation of the autonomous vehicle functions.
- The applicant for an AV temporary driving permit must submit a list of test products and related data to the performance test agent. The test products and related data which must be submitted include: the vehicle subject to the permit application, descriptions of technical stages, structures and functions of such vehicle, insurance and other subscription certificates, pre-test driving report, etc.
- To obtain a temporary driving permit to operate an AV, an "AV test drive" notice must be posted on the rear of the vehicle. The size of the letters must be at least 70 mm in length and width, respectively, and such notice must be attached to a position of an appropriate height that can be easily seen by a driver behind such vehicle and must be identifiable at night.
- Permitted zones/areas for operation: Since November 2016, it has been possible to operate on all roads in the country except for protected areas for the transportation of vulnerable people (e.g., children protected areas). (Article 26-2(1)3 of the Enforcement Rules of the Vehicle Management Act).
- For any vehicles that have difficulty meeting the safety driving requirements and safety standards ("Vehicle Rules") due to their technical features (e.g., autonomous shuttle bus has no available driver's seats – thus, particular regulations such as the safety driving requirements and safety standards based on the existence of a driver's seat cannot be fulfilled), temporary operation thereof is permitted by applying special regulations.[137]

Test driving of autonomous vehicles on the condition that the driver will be on board was permitted by Ordinance of the Ministry of Land, Infrastructure and Transport (the Vehicle Management Act and the Enforcement Decree of the Vehicle Management Act).

The test driver is responsible for any accidents that occur during temporary operation.

- **Scope of liability:** If a driver causes injury to another person, the driver is liable to compensate for the damage (injury) caused by the accident (Guarantee of Automobile Accident Compensation Act). However, in terms of criminal liability, AVs are not subject to punishment as an AV does not fall within the scope of 'vehicle' under the Act on the Aggravated Punishment, etc.

137 See Article 114 of the Regulation on the Performance and Standards of Automobiles and Automobile Parts; and Article 22 of the Regulation on Safe driving Requirements of AVs and Test-driving.

Personal Information Safe Zone

The PIPC intends to create a "Public-Private Joint Personal Information Regulation Innovation Group" with the goal of enhancing the private sector's capacity to utilize personal data. This will involve the elimination of redundant and overlapping regulations between the PIPA and related laws, as well as establishing a single point of access for addressing corporate grievances. Additionally, the PIPC aims to promote the adoption of pseudonymized data by setting standards for pseudonymizing unconventional data, operating support platforms, and transforming the Pseudonymized Data Use Support Center into a Personal Information Use Support Center.

In the latter part of 2023, the PIPC plans to actively recruit and provide support to startups and initiatives that leverage pseudonymized data within specialized industries in various regions. Furthermore, for the purposes of AI research and the development of autonomous driving technology, the PIPC will introduce a "Personal Information Safe Zone" to facilitate unrestricted analysis and utilization of personal information in a secure environment.

AV testing at the 'test-bed' (K-City)

AV proving ground, K-City, officially opened in December 2018. K-City provides a real-world environment, including highways, urban and suburban roads, parking lots with 35 experimental facilities such as tollgates, crosswalks, BRT lanes, intersections, WAVE and 5G stations.

Workspaces for participating companies and new facilities to simulate extreme weather and GPS shadowing will be added by 2022.

Pedestrians and traffic will simulate a busy city road using robots. Self-driving cars will be evaluated based on their ability to avoid traffic and counteract unexpected situations.

Mobility Innovation Roadmap

On September 19, 2022, the Ministry of Land, Infrastructure and Transport (MOLIT) established the 'Mobility Innovation Committee' to identify key technologies and prepare a future roadmap. The committee consists of experts from the private sector working solely in transportation, consumer products, and IT fields. The MOLIT plans to enlarge and reorganize the Mobility Innovation Committee into a public-private joint organization for the smooth implementation of the mobility roadmap, to check the implementation status of the roadmap, and to discuss discovering new tasks and supplementing existing ones.

The introduction of Level 3 autonomous vehicles in 2023 marks the start of the fully autonomous driving age. It is anticipated that Level 4 autonomous vehicles will hit the market in 2027, followed by Level 5 autonomous vehicles in 2035. In preparation for these advancements, the MOLIT aims to establish safety regulations and an insurance framework for Level 4 autonomous vehicles' debut in the country by 2025. Based on this future scenario, by 2030, a total of 40 regulatory innovation tasks will be prepared, including 20 new tasks in three areas: vehicle, infrastructure, and service. In order to enable free demonstration of autonomous driving technology and services, the MOLIT will designate autonomous vehicle trial operation districts by 2025 through the introduction of a system for designation of autonomous vehicle trial operation districts, and after that, a specific area will be designated.

The key targets under the roadmap were as follows:

1. A Level 3 autonomous car would be released by 2022 becoming the third country in the world to do so, after Germany and Japan.
2. Autonomous buses will be launched on public roads by 2025 and cars by 2027.
3. The country will also change car insurance, driver's license, and traffic-related laws to fit Level 4 automation.

4. By 2030, real-time communication infrastructure will be built on national roads (about 110,000 km), and congested areas such as downtown areas. A nationwide real-time communication infrastructure on national roads on a direct communication method (WAVE or C-V2X) will be established, but for non-congested areas, a hybrid method will be promoted, such as using the existing mobile communication network (V2N method).

The above target for release of a Level 3 autonomous car was changed to late 2023. However, as of late November 2023, testing is still continuing.

- **Short-term (2022–2023) major tasks:** (1) Allowing autonomous driving software over-the-air update (OTA); (2) Providing pseudonymization standards to promote the use of autonomous driving image data; (3) Establishing an authentication management system to strengthen the security of the autonomous driving cooperation system; (4) Expanding special cases for autonomous mobility service.
- **Mid-term (2024–2026) major tasks:** (1) Complementing safety standards for Level 4 autonomous vehicles and Level 3 commercial vehicles (buses, trucks); (2) Establishing an administrative sanctions system for traffic violations; (3) Revising driver concepts and deregulation of mandatory requirements; (4) Supplementing Level 4 autonomous vehicle insurance regulations; (5) Deregulating autonomous driving vehicle classifications to respond to the new mobility.
- **Long-term (2027–2030) major tasks:** (1) Establishing a Level 4 autonomous vehicle inspection/maintenance system; (2) Allowing new autonomous vehicles a simple license; (3) Deregulating the classification system for a passenger transportation business to introduce new services.

Connected vehicles and logistics

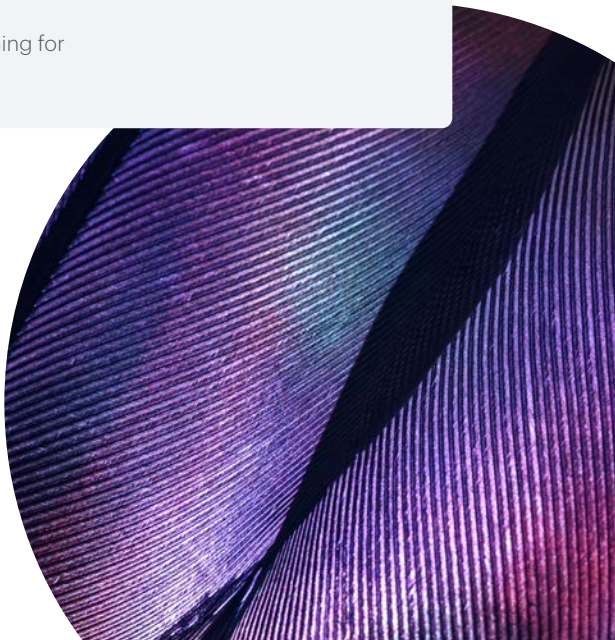
Liability

Responsibilities of the actors

The *Monthly KOTI Magazine on Transport* (2020.10) summarizes responsibilities of the relevant actors, set out in the Ethics Guideline for AVs and Stakeholders, as follows:

Government agencies	Role	Governing/Relevant Laws
Design Authorities - who design the AV utilizing relevant soft-ware and hardware technologies.	• Design authorities must design AVs in a manner such that the vehicles can store driving records, etc. • Design authorities must design AVs in a manner such that the vehicles may prevent accidents as much as possible. In the event of an unavoidable accident, AVs should be designed to minimize damage to the passengers and other parties.	
Manufacturers - who develop the AV technologies or manufacturers who assemble the cars	• Manufacturers must produce AVs in a manner such that the vehicle can record and store any driving-related data. • Manufacturers must produce and sell AVs in compliance with certification standards, bioethics, information & communication ethics and engineering ethics. • Manufacturers are responsible for any damage caused by manufacturing defects of AVs. • Manufacturers are obligated to provide AV owners and users with instructions (e.g. cautions in using certain functions of AVs and guidelines on safe driving) - they must provide the relevant information in writing and faithfully respond to any inquiries from the drivers and users. • Manufacturers must be equipped with a cyber security system and must always provide drivers and users with in-formation on any changing matters.	**Product Liability Act (by FTC)**: This law governs the liability of manufacturers for any damages caused by defects in products. AVs correspond to a product under the Product Liability Act, but the software (system/program used in AVs) therein cannot be considered as a product and therefore cannot be held responsible for the product. However, liability may be imposed if such software can be interpreted as embedded software.
Service Authorities - who provide services in response to the demand in the market, utilizing the AVs made by the manufacturers. (e.g. Siheungsi (City) provides patrol services with the 'Goalie' manufactured by Mando; Incheon Airport provides transport services with the autonomous trains and carts manufactured by Incheon Airport Corporation and domestic SMEs.)	Service authorities must protect the safety of users and shall not infringe or harm the interests of others or public interests. Service authorities must keep the software of AVs current to the most recent version available. Service authorities must protect the personal information produced in the course of providing services. Service authorities should make efforts to minimize any illegal use and abuse.	
Drivers	• Drivers must drive AVs according to the vehicle's intended purpose and functions. • Drivers must not make any arbitrary or illegal modifications that could cause safety problems in AVs. • Drivers must complete a sufficient amount of training for safety before driving.	

At least for now, the statutes/laws of Korea are silent on issues concerning allocation of liability in case of accidents (the AVA only going so far as to stipulate a narrow insurance requirement).



Additional liability imposed on the manufacturers under the UN regulation

- A new UN regulation will soon require vehicle makers in South Korea (together with those in Japan and EU) to secure connected vehicles from cyber security threats.
- Concern on cyber security threats: Hackers remotely accessing autonomous vehicles, posing a risk to public health and security.

UN regulation

- Aim: Ensure manufacturers take adequate steps (e.g., take action and respond when consumers' cars get hacked) to protect their vehicles and customers from these types of threats.
- Manufacturers must address specific threats, such as potential malware infiltration of servers, which could give hackers access to troves of connected vehicle data.
- Manufacturers must document ways they will protect vehicles from specific threats, how they will up-date authorities on the success of their efforts at least once annually, and how they will report pertinent data on cyberattacks.
- While the date of implementation varies by region, in South Korea the regulation was incorporated into the "Guidelines for Cyber Security," which was announced by MOLIT on December 15, 2020.

Data privacy and security

Exemption from general data privacy rules in the context of AV operation, subject to anonymization under the AVA

Generally, under the data protection laws of Korea, activities/businesses that collect and use personal information are subject to strict restrictions, such as consent requirements, use for consented/specified purposes only, etc. Traffic information of pedestrians, other drivers, and drivers of AVs, fall within the scope of 'restricted' information as those are personal information as well.

However, the Autonomous Vehicle Act (AVA) provides an exemption from data restrictions in the Korean data protection laws. More specifically, Article 20 of the AVA provides that the three Korean data protection[138] laws are not applicable to the use of personal information[139] collected during the operation of AVs, provided that the information is anonymized. *

- Implications of the AVA: Collecting and using personal data may not necessarily trigger general data protection requirements under the relevant laws.
- **Note*:** Providing an exemption for the data protection laws as such does not mean that use of the data is unconstrained throughout the interval between the collection of data and the anonymization of such data.
    - **i.** The AVA does not, by itself, clarify (to) what scope/extent the handling of such data is exempted from the restrictions before anonymization is done.
    - **ii.** Where personal data is collected outside Korea and anonymization is done outside, whether you need 'con-sent' to use such data or are permitted to use it without consent remains unclear.

138 Personal Information Protection Act, Act on the Protection, Use, etc. of Location Information, and Act on Promotion of Information and Communications Network Utilization and Information Protection, ETC.

139 Personal information' here means (i) personal information within the meaning of Article 2-1 of the Personal Information Protection Act, (ii) location information of individuals within the meaning of Article 2-2 of the Act on the Protection, Use, etc. of Location Information, and (iii) other information designated as personal information by Presidential decree.

The Guidelines for Cyber Security (announced by MOLIT on December 15, 2020)

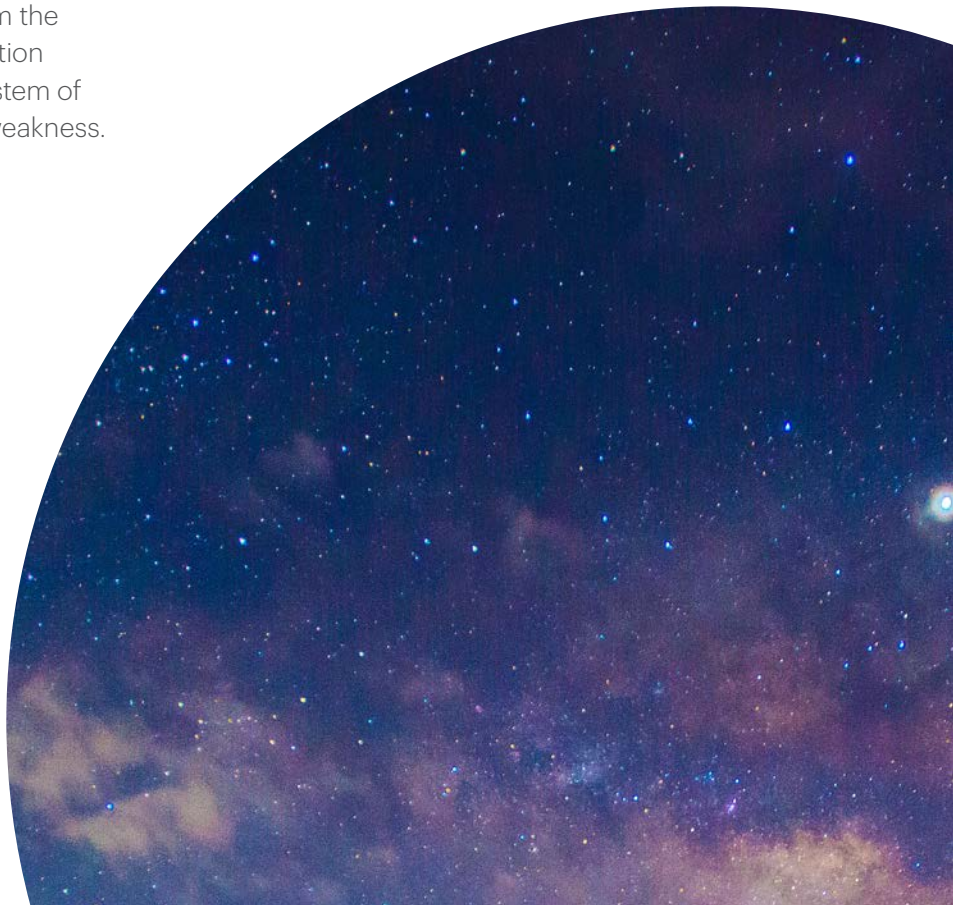
- Legal status of the guidelines: 'Recommendations' (i.e., not yet a 'law' and thus, persuasive only and not binding).
- However, the government stated in the Guidelines published on December 15, 2020, that this is just a first step. The government is planning to enact laws/legal standards regarding cybersecurity, with the goal of implementing such laws.
- The guidelines have been made based on the UN Regulation on Cybersecurity (UNR No.155).

Key contents:

- Manufacturers are recommended to adopt a CSMS (Cyber Security Management System).
- To preserve cyber security, manufacturers are recommended, *inter alia,* to:
  - set a deadline within which the risk can be managed and respond as soon as possible to cyber threats to prevent/minimize the damages; and
  - continue monitoring the system after initial registration of the car and be equipped to detect cyber threats/attacks from the information collected (e.g., information collected from the data storage system of the car) and analyze the system's weakness.

Global Information Security Standard

- Hyundai Motor and Kia are strengthening in-car cybersecurity features. They have earned certificates of the cyber security and management system (CSMS) to meet the United Nations Economic Commission for Europe (UNECE) regulation R-155 for new car releases starting in July 2022 and changed the entire work process for establishment and operation of the CSMS during the entire life cycle of cars.
- LG Electronics received 'TISAX (Trusted Information Security Assessment Exchange)' certification in all major areas of the electronic devices business to strengthen competitiveness in the automotive parts business.
- TISAX is a global information security certification created by a German automobile industry association to standardize the different security evaluation criteria of different automobile manufacturers. It evaluates security in four aspects: information security system, partner security system, data protection system, and prototype protection system.



Telecommunications and 5G

"50+ Strategy"

In April 2019, the Korean government announced a "5G+ Strategy" to realize innovative growth based on 5G technology, through cooperation among related departments and agencies. The government selected 10 "core industries" and 5 "core services" as strategic 5G industries and introduced support plans customized to each industry, based on market maturity and demand.

'5G vehicles-to-everything (V2X)' was selected as one of the ten "core industries," while 'autonomous vehicles' was selected as one of the five "core services."

For the selected "industries" and "services," the government is supporting the development of the technology and under such support some major Korean companies are devoting significant resources to its development.[140]

Development/progress currently

October 2022: On October 3, 2022, Hyundai Mobis, a South Korean auto parts and mobility solution maker, developed a 5G-based communication module for cars, a core part for autonomous driving and connected car systems that enables real-time, large-volume data processing.

- The new module combines communication and memory functions, as well as a radio frequency circuit and GPS, based on ultra-high speed, ultra-low latency and hyper connectivity technology.
- Hyundai Mobis will apply the 5G communication module in the vehicle's telematics service – a technology that connects the vehicle to the external control center to offer drivers with safety information and infotainment services. Examples of telematics services include Over The Air (OTA) update, real-time traffic information, and eCall service, through which the vehicle can make an emergency call following a collision. Also, the new module will be also used in various aspects of Advanced Driver Assistance Systems (ADAS), pairing with radar, LiDAR and camera sensors.
- Hyundai Mobis will create a new, integrated solution using 5G communication modules and already-developed vehicle-to-everything (V2X) technology, to target the global market. This integrated 5G communication module and V2X solution will be applied in technologies such as collision avoidance systems, automatic speed control near school zones, vehicle control during emergencies, which are all still in the initial development stage.

140 Further details available at http://www.businesskorea.co.kr/news/articleView.html?idxno=30733#:~:text=The%2015%20industries%20consist%20 of,%2C%20information%20security%2C%20edge%20computing%2C

Electric Vehicles

Key Trends and Government Support

South Korea aims to significantly boost production of electric vehicles to more than double domestic carmakers' global market share to 12 percent by 2030. From 2009 to the first half of 2022, the government has helped by installing 52,400 EVs and the number is anticipated to go over 80,000 by the end of 2022. The government vowed to provide tax incentives and various supportive measures to promote carmakers' investment worth about a combined 95 trillion won (US$66.03 billion) by 2026, according to the Ministry of Trade, Industry and Energy. The government also pledged to deploy 20 electric shuttle buses for commuting to government offices, medical institutions and other welfare purposes.

EV Charging Changes

Korean electric vehicle owners will be allowed to lease their electric vehicle (EV) chargers if government proposed legislative amendments are passed. In other words, EV chargers will soon be shared like houses on Airbnb. If the amendments to the Electric Utility Act are passed, privately owned EV chargers will be able to generate revenue. Installing EV charging facilities at gas stations will also be permitted, and areas where drones can be flown freely will also be gradually increased.

Under the current law, car owners can lease an EV charger only if they register as an EV charging company. The new law would allow for private EV chargers to be rented out in the form of online services or applications. As of now, temporary easing of regulations on some sharing services are being implemented, but when this ends, the sharing restrictions will be more relaxed.

Additionally, it will become easier to install EV chargers inside gas stations. Since gas stations are regulated for internal combustion vehicles, currently standards such as requiring EV charging facilities to be placed more than a certain distance from gas pumps are very rigid. These standards are to be relaxed. The government is proposing an improvement to the relevant standards, so that EV charging facilities can be installed inside gas stations taking into consideration the structure of gas stations and situations surrounding safety measures.[141]

Driving forces

Further developments

SK Telecom expands self-driving pilot zone to test advanced smart transportation system, June 2022, Korea-EU Research Centre: SK Telecom (SKT) has expanded a pilot driving zone for autonomous vehicles in Sangam, a western residential and commercial district of Seoul. Its purpose is to test a cooperative intelligent transport system (C-ITS) that provides real-time information such as traffic conditions, so that individual vehicles can share data and prevent traffic accidents. The smart road system incorporates smart vehicle and connected car technologies such as vehicle-to-everything (V2X) and internet of things (IoT) communications.

141 Further details available at https://koreajoongangdaily.joins.com/2022/09/05/business/industry/Korea-regulations-electric-vehicles/20220905183538425.html

SKT will test an advanced system in the 32.3-kilometer section. SKT will provide additional services for safe driving such as child protection, pedestrian notification, and CCTV images of unexpected situations. Self-driving cars can receive safe driving information by installing V2X terminals. SKT will use digital twin technology to create a virtual autonomous vehicle testing zone where researchers can use a control tower system to test the safety and efficacy of digital clones of their self-driving vehicles. Various weather conditions such as rain and snow can be simulated. The virtual zone will include actual roads, school zones, street trees, traffic lights, and real-time traffic.[142]

COVID-19 impact

Support policies as to COVID-19

Largely two types of support have been provided by the Korean government:

1. Production Support

a. Simplifying the import procedures for auto parts
b. Special extension of work hours by allowing more than 52 hours per week

2. Liquidity Support

a. Employment Retention Subsidies
b. R&D Support for localization of auto parts
c. Loan and credit guarantee program for SMEs
d. Extension of debt maturity periods

In Korea, it appears that COVID-19 has sped up AV legislation and adoption.

- **Incheon International Airport.** Introduced autonomous trains (and cart robots) - In operation since October 14, 2020; implemented without delay.
- **On October 14, 2020**, Incheon International Airport Corporation introduced and is operating the world's first indoor autonomous trains and cart robots. Each of the two autonomous trains are in operation in the duty-free area of the arrivals hall at Terminal 1 and the duty-free area in the Departures hall at Terminal 2 respectively. The trains assist vulnerable users (e.g. the elderly, pregnant women, disabled, etc.), while the six cart robots are supplied to transport passengers' luggage and/or certain cargos. Both autonomous trains and cart robots were developed by Incheon International Airport Corporation in cooperation with domestic SMEs.
- **Siheung Baegot New Town Life Park:** Autonomous patrol car "Goalie" will be in operation soon. An autonomous patrol car "Goalie" was developed by Mando, the second largest auto parts maker in Korea. The Goalies will be deployed in Siheung Baegot New Town Life Park to patrol the area at nighttime and video-record CCTV blind spots, sending the recordings to the control center. The project was partially necessitated by relevant regulations rather than COVID-19 concerns. However, the ICT Board for regulatory sandboxes has allowed the test operation of Goalies to proceed and the project was given a temporary respite from regulatory regimes until March 2022.

142 Further details available at https://k-erc.eu/sk-telecom-expands-self-driving-pilot-zone-to-test-advanced-smart-transportation-system/

- **"AV Pilot Zone" scheme:** A new system introduced under the Autonomous Vehicle Act (Effective from May 2020).
    - **AV Pilot Zone:** A special regulatory district to support the demonstration of autonomous driving services. If a district is selected as an AV pilot zone, self-driving manufacturers can carry out the simulation of a real-life situations (and actually receive fares/consideration). Moreover, a diverse range of (special) exemptions from regulations are available for private manufacturers who are willing to test-operate in the AV pilot zone (e.g., they can obtain a permit for test-operating without meeting the vehicle safety standards). This provides an opportunity for a manufacturer to gauge market reaction and the government can collect relevant data and ideas that may be useful in making further policies/institutional improvements.
    - Pursuant to the new law, "**AV Pilot Zones**" were designated[143] for the first time in November 2020. The regions that were selected and some key services that were allowed are as follows:

143 Under the supervision of the Ministry of Land, Infrastructure and Transport, the "Autonomous Vehicle Demonstration District Committee" was created to designate AV pilot zones. (The committee consists of six commissioners from public sectors (vice-ministers of the Ministry of Land, Infrastructure, and Energy/ Ministry of Economy and Finance/Ministry of Science and Technology/ Ministry of SMEs and Startups /National Police Agency, as well as the Minister of Land, Infrastructure, and Energy) and 12 commissioners from private sectors (experts in automotive/transportation/communication/ city)

No.	City/Province	Area designated as 'AV Pilot Zone'	Autonomous driving Services to be provided include
1	Seoul	Area of 6.2km2 range in San-gam-dong area, 3.4 km range circuit in downtown Seoul	**Shuttle service** between DMC station and commercial/residential/park areas.
2	Chungbuk/Saejong (Jointly applied)	About 22.4km of Osong-Saejong Terminal route of BRT.[144]	**BRT service** between Osong Station and Sejong Terminal.
3	Sejong	22.9km of BRT circular route; and Area of approx. 25km2 in living zones 1-4.	Demand-responsive **shuttle bus** service circulating within Sejong Government Complex.
4	Gwangju	Area of approx. 3.76km2 in 2 zones in Gwangsangu.	Road cleaning cars, Waste collecting cars.
5	Daegu	Area of approx. 2.2km2 in Suseong Al-pha City; Area of approx. 19.7km2 of Technopolis and Daegu National Industrial Complex; and Approx. 7.8km route of the road connected to industrial complex.	**Shuttle service** within Suseong Al-pha City (Samsung Lions Park-Daegu Museum of Art route). **Demand-responsive taxi** service in Technopolis and the National Industrial Complex.
6	Jeju	Certain parts of the route between Jeju International Airport and Jungmun Tourist Complex (38.7km); and Area of approx. 3km^2 within Jungmun Tourist Complex.	Airport pickup shuttle services (Jeju International Airport-Jungmun Tourist Complex route)
7	Pangyo	Area of approx. 1.34km2 of Techno Valley, 2 Valley, and connection section	**Unmanned shuttles** and **robot taxis** in Pangyo Techno Valley

Based on an announcement of the Ministry of Land, Infrastructure and Transport made on June 24, 2022

144 BRT, which stands for Bus Rapid Transit, is a transportation system in Korea, offering express buses-only lanes, convenient transit services, etc.

Summary

Since the outbreak of the pandemic, the need and demand for so-called 'untact' services has increased greatly in Korea, as in other countries around the world. Accordingly, the government has been supporting (and cooperating), more actively than ever, in relevant projects/businesses of AV manufacturers.

Many Korean companies developing AV systems had been forced to stay at a demonstration stage, even after sufficient technology development, due to regulatory obstacles. However, it seems that the situation has improved for those manufacturers because the government is being more supportive and relaxing certain regulations to meet the increased demand for untact services (e.g. taxis without drivers) within Korea.

The government intends to take a phased approach by adding and upgrading regulations and laws related to technology, communications and insurance in steps in order to satisfy the standards and structure associated with operating autonomous vehicles. Between 2024 and 2026, the government intends to focus on devising a legal framework for Level 4 self-driving vehicles in terms of insurance policies and traffic systems to provide clear standards for legal responsibilities. To further realize its vision, the government also plans to establish real-time telecommunications systems for communication between autonomous cars along 110,000 km of roads in major cities by 2030.

Key contacts/authors:

Kurt Gerstner
Senior Attorney, Seoul
kurt.gerstner@dentons.com

United Kingdom

Regulatory Developments

The UK government expects connected and autonomous vehicles to be a key area of growth over the coming decade, predicting that the technology will lead to the creation of 38,000 new high-skilled jobs, and that the industry could be worth over £40 billion by 2035.

To ensure that the UK is able to benefit from these new technological developments, steps are now being taken to ensure that the necessary legislation is in place to attract investment and to enable self-driving vehicles to be used on public roads.

Following publication of the Law Commission's *Joint Report on Autonomous Vehicles* (the **Joint Report**) and *Connected & Automated Mobility 2025: Realising the benefits of self-driving vehicles in the UK* by the UK government in August 2022 (**Mobility 2025**), the government has now drafted the Automated Vehicles Act 2024 (the **AV Act**). This new legislation introduces a new legal framework which aims to facilitate the deployment of self-driving vehicles in the UK.

In Mobility 2025, the government set out its vision for connected and automated mobility:

> **"By 2025, the UK will begin to see deployments of self-driving vehicles, improving ways in which people and goods are moved around the nation and creating an early commercial market for the technologies. This market will be enabled by a comprehensive regulatory, legislative and safety framework, served by a strong British supply chain and skills base and used confidently by businesses and the public alike."**

The AV Act actions many of the recommendations made by the Law Commission in their Joint Report, and ultimately delivers on the vision set out in Mobility 2025.

The primary purpose of Mobility 2025 was to realize the full potential of autonomous technologies in the UK's transport network, with a focus on the following areas:

- **Safety and security:** Mobility 2025 sets out proposals for a new safety framework which builds upon the existing safety framework for road and vehicle usage. Mobility 2025 will ultimately create a framework that allows for the safe operation of partial or fully autonomous vehicles on public roads, together with existing conventional driver-operated vehicles. Any such safety framework needs to be adaptable enough to allow for innovation within the sector without compromising the safety of all road users.

  The report identifies the testing and approval of self-driving systems as a particularly challenging area which needs to be addressed to ensure that all such systems are fit for purpose before entering into use on public roads. The government's ambition is that autonomous vehicles will improve road safety for *all* road users (ensuring that the technology does not increase safety for most users but have a negative effect on any one group of users). Additionally, it is the government's expectation that self-driving systems will be subject to ongoing assessments throughout their lifecycle to maintain a high level of public confidence in the safety of these systems.

- **Securing industrial and economic benefits:** In Mobility 2025, the government states that its focus will now shift from supporting the development of early stage technology and development to providing an environment which supports attempts to commercialise these technologies. To facilitate this, the government will focus on two area in particular: (i) de-risking commercial deployment of the services; and (ii) strengthening the UK supply chain capabilities.
- **Delivering societal benefits:** In order to realize the potential benefits of autonomous technology, the government will continue to engage with key stakeholders and the public to ensure that the measures which it has in place to encourage the deployment of autonomous technology and its adoption by the public remain fit for purpose.

Automated Vehicles Act 2024

The government's intention to draft the AV Act was announced in the King's Speech in November 2023. The Automated Vehicles Bill underwent consideration by the UK Parliament, and received Royal Assent on May 20, 2024, entering into force as the AV Act.

The AV Act implements many of the recommendations proposed by the Law Commission in its Joint Report on Autonomous Vehicles. These recommendations are considered further in the next section.

The AV Act sets out legal frameworks for the following key concepts:

- **Authorization:** Establishing a regulatory scheme for a vehicle to be authorized to operate in "self-driving" mode.
- **Operation of vehicles:** Developing an operator licensing scheme, together with mandatory requirements with which operators of self-driving vehicles must comply (e.g. mandatory information gathering obligations for the purposes of determining liability for accidents).
- **Civil liability and sanctions:** Setting out a range of civil sanctions for failure to comply with regulatory provisions introduced by the AV Act, together with the introduction of regulatory powers to monitor compliance and enforce any such sanctions.
- **Criminal offenses and enforcement:** Making provision for a host of new driving offenses which will apply to the use of automated vehicles, including in particular amendments to existing road traffic laws to bring software with the scope of existing offenses relating to the fitting and supply of defective car parts, and in relation to vehicle tampering.
- **Marketing restrictions:** In line with the Law Commission's recommendation, the AV Act introduces marketing restrictions aimed at avoiding consumer confusion about the capabilities and limitations of a vehicle's self-driving features.
- **Automated passenger services:** The AV Act makes provisions for the licensing of automated passenger services, and the disapplication of existing taxi, private hire and bus legislation to licensed automated passenger service providers in certain circumstances. It is anticipated that these proposals will pave the way for the development of automated mobility services in the future as the technology matures.

While the AV Act has only recently entered into force, and many of the concepts are currently only high level until further details or guidance is published by the UK Secretary of State, the AV Act brings much needed clarity to the UK's regulatory landscape, which should in turn encourage further innovation, development and investment in this sector.

Other Existing Laws

In addition to the new AV Act, the development and use of autonomous vehicles in the UK is governed by a number of different laws and guidelines, including:

- The Automated and Electric Vehicles Act 2018 (AEVA 2018)

  This sets out the legal definition of a vehicle which is "self-driving" (a vehicle which is "operating in a mode in which it is not being controlled, and does not need to be monitored by an individual"). It also overhauls the civil liability rules applicable to vehicles operating autonomously. These provide that the insurer is required to pay compensation to any person injured by an autonomous vehicle and afterwards seeks to recover its losses from any person or body actually responsible for the incident.

- The Road Traffic Act 1998

  This considers the licensing and insurance of all vehicles operating in the UK, as well as road regulation and traffic offenses. Currently all vehicles and motorists must comply with this Act when operated on UK roads. The AV Act makes a number of changes to the Road Traffic Act to ensure that it continues to effectively govern road usage in the UK following the adoption of autonomous technology.

- The Road Vehicles (Construction and Use) Regulations 1986

  The regulations set out rules governing the design, manufacture, maintenance, construction and use of motor vehicles in the UK. Regulation 104 currently prohibits the use of any vehicle on the road where the driver does not have proper control of the vehicle. When testing autonomous vehicles in the UK, all applicable regulations in the Road Vehicles (Construction and Use) Regulations must still be complied with at all times (and in particular, Regulations 104 to 107).

- The Highway Code

  With effect from July 1 2022, the UK Department for Transport made a number of changes to the Highway Code, including a new section relating to the use of autonomous vehicles. In particular, the new section has clarified that the driver of the car is liable for all incidents and damage caused by the vehicle where they are in control, but not where the vehicle is in self-driving mode. Where the vehicle is in self-driving mode, the individual is not required to pay attention to the road, but must be prepared to resume full control of the vehicle when prompted.

  These changes to the Highway Code only apply to autonomous vehicles which are approved by the Secretary of State for Transport under the Automated and Electric Vehicles Act 2018 and listed on the List of Self-Driving Vehicles. As of the date of publication of this guide, no vehicles are currently approved and listed on this list.

  It is important to distinguish between any such listed and approved autonomous vehicles, and vehicles which benefit from "driver assistance" features only, as the new sections of the Highway Code will only apply to the former, and drivers of vehicles fitted with any such "driver assistance" features shall at all times retain full responsibility for the safe operation of their vehicle, and will be required to pay attention at all times.

Law Commission Reports

The Centre for Connected and Autonomous Vehicles (**CCAV**) was created in 2015 as a new governmental body in the UK with specific expertise in the field. It was given a mandate to work together with academia and industry to promote autonomous technology in the UK, and to guide the development of suitable regulations.

Automated Vehicles Report

In 2018, CCAV instructed the Law Commission of England and Wales and the Scottish Law Commission (the **Commissions**) to undertake a review of the current laws relating to autonomous vehicles, and to make recommendations for a new regulatory framework to govern the introduction and safe deployment of connected and autonomous vehicles on UK roads.

The Commissions published its findings in January 2022 in the Automated vehicles: Joint report. The report set out a number of recommendations which formed the basis for much of the issues which the UK government is seeking to address in the AV Act. Some of the key recommendations are:

- **A new Automated Vehicles Act**: Given the significant legal consequences which will arise with the widespread adoption of autonomous vehicles, the Commissions recommended that new, UK-wide, primary legislation is required to deal with the regulation of autonomous vehicles on public roads. As described in the above section, this recommendation has now been implemented by the government as the AV Act.
- **The test for self-driving**: A clear test should be developed to determine whether a vehicle is to be considered "self-driving" (rather than merely providing features which offer driving assistance). The Commissions suggested that a self-driving vehicle system should be able to control the vehicle safely and legally, even when not being monitored by any individual.
- **Safety standards**: The Secretary of State for Transport should publish a safety standard against which the safety of autonomous driving can be measured in practice and on a continuous basis. This should include a comparison against equivalent harm caused by human drivers, but the Commissions have not sought to define what level of safety would be acceptable.
- **Civil liability**: The Commissions considered issues relating to the insurance of autonomous vehicles, product liability laws and cases of contributory negligence. The key recommendations in this section are to: (i) expand the insurance provisions set out in AEVA 2018 so that they apply to all vehicles determined to be "self-driving;" (ii) review existing product liability laws to account for the additional challenges posed by emerging technologies; and (iii) ensure that there are provisions in place to provide compensation for injury or damage caused by uninsured usage of autonomous vehicles.
- **Wrongful interference**: The existing laws under the Road Traffic Act 1988 should be updated to create new offenses relating to the tampering, interference or theft of autonomous vehicles.
- **Passenger services**: Any new Automated Vehicles Act should grant powers to the Secretary of State to issue permits for the provision of passenger services by autonomous vehicles.
- **Responsibilities of the "user-in-charge:"** The new legislation should clearly define the responsibilities of the human "user-in-charge," and clearly distinguish these responsibilities from when any self-driving functions have control of the vehicle.
- **Marketing**: To avoid confusion, tighter controls should be introduced around what can and cannot be marketed to the public as an autonomous vehicle. It is envisaged by the Commission that it would be a criminal offense to use any terms (such as "autonomous" or "self-driving") to suggest that a vehicle is an autonomous vehicle, where it is not recognised by the Secretary of State as meeting the applicable test for self-driving.

Remote Driving Report

The Law Commission was also separately asked by CCAV to consider the law and regulation of *remote driving* on public roads, which relates to situations where vehicles are driven by a human operator at a remote location. Remote driving is commonly used on controlled environments, such as in mining and agriculture, but not currently on public roads. Remote driving is seen by many as a technology which can facilitate the adoption of fully autonomous vehicles on public roads, as it will allow operators to take over from the technology where situations arise which cannot be handled by the autonomous technology or to allow for autonomous driving on motorways, before handing over to an operator for driving on the final stages of a journey where a vehicle may be required to navigate smaller public roads with less consistent driving conditions.

The Law Commission has now published its Advice to the Government on Remote Driving. Their key recommendations are:

- For the Government to establish a new statutory licensing scheme for companies deploying remote drivers beyond line-of-sight;
- That remote driving from abroad should be prohibited until appropriate international agreements are in place to provide appropriate enforcement measures;
- That express rules should be introduced to ensure that victims of road traffic collisions involving remote drivers should be entitled to no-fault compensation on a similar basis to the insurance provisions for automated vehicles (as are set out in AEVA 2018).
- Responsibility for maintaining safety in areas beyond the remote driver's knowledge or control should lie with the organisation, not the individual.
- That the Road Vehicles (Construction and Use) Regulations 1986 should be amended to include a new provision prohibiting "beyond line-of-sight remote driving without having an appropriate "Vehicle Special Order" in place.

Driverless Testing and Deployment

In the UK, it is permitted to trial and test autonomous vehicles. There are already a number of well-established companies operating in this space.

Any testing of autonomous vehicles must comply with the Code of Practice: Automated Vehicle Trialling, which has been jointly published by CCAV, the Department for Transport and the Department for Business, Energy & Industrial Strategy. This aims to facilitate the safe deployment of the technology in the UK.

Interested parties are entitled to test autonomous vehicle technology on any UK road without the need to obtain specific permits in advance. Some of the key legal requirements are considered below.

The Code of Practice is guidance only and is not legally binding. However, while failure to follow the code is not a breach of law and so does not carry any direct legal penalties, in the event of any incident involving a self-driving test vehicle, any failure to comply with the code is likely to be taken into account by a court of law when allocating liability for any such incident.

Vehicle Standards

In accordance with the Code of Practice, any vehicle used for testing on UK roads must be roadworthy and meet the in-service requirements detailed in the Road Vehicles (Construction and Use) Regulations 1986.

Adequate Supervision

For autonomous vehicle trials on public roads, a suitably licensed and trained safety driver or safety operator should supervise the vehicle at all times. The safety driver/operator must ensure the vehicle is observing traffic laws, and should be ready and able to override automated operation if required. That person may be outside the vehicle as long as he or she has the ability to intervene and resume manual control, if necessary.

If the testing of any autonomous vehicle is to be undertaken on a remote basis, such remote-controlled trials should have appropriate redundancies in place to handle any failures or disengagements. These include warning systems and the ability to allow the safety driver/operator to take control of the vehicle at all times.

Those looking to undertake remote-controlled trials of an autonomous vehicle on public roads or other public places will need to ensure that the remote-control system is able to deliver the same level of safety as having a driver inside of the vehicle.

Insurance

Under UK legislation, the use of non-autonomous motor vehicles must be insured (with the insurance attaching to an individual) so as to cover third-party risks. Failure to do so is an offense.

As detailed above, AEVA 2018 introduced a statutory insurance regime for autonomous vehicles which provides that, where an accident is caused by an insured autonomous vehicle, the insurer is liable for damage suffered by a person (covering death, personal injury and property, with limited exceptions). Where there is no insurance in place, the owner of the vehicle is liable for the damage.

AEVA 2018 prohibits the insurer from making any exclusions and limitations from the applicable insurance policy. This is subject to two exceptions: where an accident is caused directly by software alterations made by or with the knowledge of the insured person; or where the insured person failed to install safety-critical software updates he or she ought reasonably to have been aware of. In such situations, the insurer is entitled to recover any amounts it has paid out as a result from that person.

Data Privacy

By its nature, the operation of autonomous vehicles will result in the collection and processing of vast amounts of data. Different types of data can be collected, generated, transmitted or processed, much of which will relate to the driver and/or passengers (for example, location data, information about the owner or driver of the vehicle and certain telematics data), and therefore be personal data for the purposes of the Data Protection Act 2018, the UK GDPR and the Privacy and Electronic Communications (EC Directive) Regulations 2003. While existing data protection laws were not drafted with autonomous vehicles in mind, these laws are *technology neutral* and so, where personal data is being processed by any autonomous driving system, it must be done so in compliance with all applicable data protection laws.

The UK Information Commissioner's Office (ICO) has considered the processing of personal data by autonomous driving systems and vehicles, and has published a response to the Law Commission's Joint Report, which provides key guidance on the application of data protection laws to the operation of automated and self-driving vehicles.

The ICO emphasizes the importance of *data protection by design,* meaning that developers of autonomous technology should consider potential issues which could arise from the processing of personal data from the outset of the design process, to ensure that adequate protections are built into the technology and not left to be addressed at a later stage of development. Autonomous technologies should be designed to minimize the collection of personal data, provide privacy-protective default settings and ensure that data subjects are well informed and have the option to easily modify configurations associated with their personal data. Additionally, such systems should aim to process personal data *locally* where it is possible to do so, to avoid the need to transfer personal data outside of the vehicle itself; where personal data must be transferred out of the vehicle itself, care must be taken to anonymise or pseudonymise such data where it is possible to do so. The developer of any automated vehicle system must undertake data protection impact assessments to identify and mitigate the identified risks.

For the purposes of data protection law, the entity which is operating the autonomous systems and providing the service to the end user will be the *controller* of that personal data. Developers of autonomous technology should consider the following issues in particular:

- **Legal basis for processing**: The controller must ensure that it has a valid legal basis for processing all personal data which is collected by the system, in accordance with the requirements of Article 5 of the UK GDPR.
- **Data minimization**: To comply with data minimization requirements, the developer of the autonomous system must ensure that the system only collects personal data which is relevant and necessary to deliver the legitimate purpose of the processing. Developers of autonomous technologies are particularly encouraged to ensure that they only collect location data where it is absolutely necessary to do so, due to the invasive nature and the potential for location data to be used for surveillance purposes.
- **Notification of processing**: The controller of the personal data collected by the autonomous system must make a data privacy notice available to the data subjects, containing all necessary information required to comply with the requirements of Articles 13 and 14 of the UK GDPR. This can be particularly difficult in the case of autonomous vehicles where personal data can be collected from a number of data subjects in addition to the driver or owner of the vehicle (for example, passers-by who are captured by the autonomous vehicles recording equipment), and the controller must ensure that it has a workable way in which to provide notification of the data processing in situations where it does not have a direct relationship with the data subject or where the data is not obtained directly from the data subject.
- **Security**: The controller must ensure that adequate measures are in place to guarantee the security and confidentiality of all personal data which it collects and stores in the process of operating any autonomous vehicles. All reasonable steps should be taken to prevent such personal data being accessed by any unauthorized persons; for example, by using state-of-the-art algorithmic technology to encrypt such personal data, controlling access to the relevant systems through the use of passwords and other reliable user authentication technologies, setting up system partitions to ensure that personal data is segregated from other functions of the vehicle which also have online connectivity so that any compromise of a related system will not lead to loss of personal data stored separately and remaining vigilant to emerging cybersecurity threats and rapidly deploying patches to remedy identified vulnerabilities.

Key contacts/authors:

Matthew Gilhooly
Senior Associate, London
matthew.gilhooly@dentons.com

Simon Elliott
Partner, London
simon.elliott@dentons.com

Martin Fanning
Partner, London
martin.fanning@dentons.com

United States

Federal Overview

Developments and roadblocks

As (AVs) increasingly join human drivers on public roads within the US, the federal government continues to develop a cohesive strategy governing their testing and deployment. It is estimated that more than 3.5 million AVs will be on public roadways by 2025.[145] With states like California, Texas, Arizona, and Nevada becoming home to hundreds of AVs, from robotaxis to delivery vehicles, federal lawmakers and regulators are continuing to wrestle with developing "rules of the road" for original equipment manufacturers (OEMs), secondary party manufacturers, AV developers, researchers, and testers.

From a legislative perspective, progress has slowed since 2017 when the US House of Representatives (US House) passed the SELF DRIVE Act and the US Senate Commerce Committee passed the AV START Act. Issues of preemption, technology, arbitration and trucks continue to hamper discussions. Since 2017 no AV bill has moved out of the US Congress, despite more than 20 congressional hearings[146] over the past 10 years, including one as recent[147] as July 2023. At the beginning of 2023, the Autonomous Vehicle Industry Association (AVIA) released federal policy recommendations to Congress, outlining recommendations for the development of a federal framework governing AVs.5 Whether and to what extent those recommendations will be adopted in 2024 remains to be seen.

Although inaction on federal legislation from Congress has limited the rollout of AVs within the US, lawmakers on Capitol Hill are indicating a desire to address the technology with comprehensive legislation. However, lawmakers on Capitol Hill are seemingly gearing up for a comprehensive legislative package surrounding autonomous vehicles in the coming years. Momentum is building amongst members of the bipartisan Congressional Autonomous Vehicle Caucus, which added 15 additional members in 2022. In 2023, the House Energy and Commerce Subcommittee on Innovation, Data, and Commerce hosted a legislative hearing entitled "Self-Driving Vehicle Legislative Framework: Enhancing Safety, Improving Lives and Mobility, and Beating China," as the initial step toward reviving the legislation regulating AVs introduced in 2017.

Leaders on the Energy & Commerce Committee agreed that in order to ensure Americans can reap the benefits of self-driving vehicles, the Congress must enact a comprehensive national law that establishes a pathway to safe deployment. Leaders on committees of jurisdiction and those representing Congressional districts that include major auto manufacturers are setting their sights toward progress in the second half of the 118th Congress and the ensuing sessions. It is anticipated that any federal legislation would address issues such as Chinese AV testing on US roads, which is collectively seen as a security concern, clarify the levels of automation, develop strategies for consumer education, and better define policies such as right to repair and data privacy.

145 Autonomous Vehicle Legislation: Integration Of Self-Driving Cars For States
146 Congress has stalled on autonomous vehicles, and that's hurting the US
147 Hearing on "self-driving vehicle legislative framework: enhancing safety, improving lives and mobility, and beating china"

The epicenter of these discussions on Capitol Hill are within the Michigan delegation.

Representative Debbie Dingell, who co-chairs the Autonomous Vehicle Caucus and leads many ongoing House of Representatives efforts on AVs, is actively reviewing proposals and developing a framework for a larger piece of legislation. In February 2023, Representative Dingell, along with Senators Debbie Stabenow and Gary Peters, helped bring $3 million in federal funding for the University of Michigan Center for Connected and Automated Transportation (CCAT) to help advance research in connected infrastructure and autonomous vehicles.

The executive branch continues to fill the void as it relates to federal AV guidance. The US Department of Transportation (DOT) under both Presidents Obama and Trump issued plans and strategies for AV development and deployment. These plans and strategies served as guideposts for manufacturers, stakeholders, and states to help think through future AV regulation and guidance. The Trump Administration also published three advanced notices of proposed rulemaking (ANPRMs) relating to AVs, but moved only one to rulemaking - the National Highway Traffic Safety Administration (NHTSA) Notice of Proposed Rulemaking (NPRM) on Occupant Protection for Automated Driving Systems. The Biden Administration moved this proceeding to a final rule, which was published on March 30, 2022 – the first DOT final rule on AVs.

The Biden Administration has also taken steps toward crafting AV regulations, issuing a Standing General Order for AV companies to follow. While neither Secretary Buttigieg, DOT nor NHTSA has openly addressed changing the nation's entire regulatory approach, these agencies are at least moving the proverbial regulatory ball forward in some respects. NHTSA, for example, amended its reporting requirement[148] for crashes involving autonomous vehicles in April 2023.

One of the most significant developments in the AV space happened in November 2023 when NHTSA withdrew its vehicle-back to-vehicle (V2V) communications rule.[149] This rule dates to 2017 and, if not withdrawn, would have required V2V communications technology in all new light vehicles.

While the rule is officially dead, many automakers are still rolling out this technology. The reason behind the change is that the old rule relied on dedicated short-range communication, a now obsolete technology. This has been replaced by cellular vehicle-to-everything technology (C-V2X). DOT has affirmed its commitment to this new technology and unveiled a plan to accelerate its deployment along with $40 million in grants to help its deploy.

Recently, the DOT announced $94 million[150] in funding related to AV technology development for states and local governments to improve transportation technology and systems through its Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program and a $25 million funding opportunity for its new Rural Autonomous Vehicle Research Program.[151] The hope for the Rural Autonomous Vehicle Research Program is that it will lay a foundation for bringing the potential benefits of AVs to rural communities across the US. Accredited universities are eligible to apply for this award. One $15 million award will focus on passenger transportation and a separate $10 million award will focus on movement of freight.

Finally, a conversation about the federal approach to AVs would not be complete without mentioning the ongoing federal struggle to comprehensively regulate the development and deployment of artificial intelligence (AI) - the technological backbone to many AVs and their systems. Congress is actively working on many AI bills that may impact the AV industry in 2024. The White House continues to push federal agencies forward in thinking about responsible deployment of AI, with an Executive

148 2023 Legislative and Regulatory Developments Affecting Autonomous Vehicles
149 Federal Motor Vehicle Safety Standards; V2V Communications
150 2023 Legislative and Regulatory Developments Affecting Autonomous Vehicles
151 U.S. Department of Transportation Announces New Rural Autonomous Vehicle Research Program

Order on AI being issued in October 2023. And federal agencies are zeroing in on how private organizations are developing and deploying the technology. The AV ecosystem will be impacted by any federal AI regulatory effort now and into the future.

Data Privacy & Cybersecurity

The laws and regulations governing data privacy and cybersecurity within the US continue to evolve. As the development and deployment of AVs progresses, the risk of improper processing of personal information and cybersecurity risk becomes increasingly material to the AV industry.

AVs are rolling computers. They may collect and maintain a wide variety of personal information about the owner of the vehicle, passengers, pedestrians, and other individuals involved with their development and operation. This includes data such as specific geolocation data and other sensitive information about physical movements of passengers. AVs can be embedded with several features including location sharing, web-based entertainment, smartphone integration, and cameras. The data collected by AVs can include information about a consumer's location, personal preferences, and details about daily activities.

US states are also increasingly adopting laws with widespread effect impacting the AV industry that regulate how personal information can be collected, used, stored, and shared. At the time of this writing, these states include California (California Consumer Privacy Act as amended by the California Privacy Rights Act [CCPA], effective January 1, 2023), Colorado (Colorado Privacy Act effective July 1, 2023), Connecticut (Connecticut Personal Data Privacy and Online Monitoring Act effective July 1, 2023), Delaware (Delaware Personal Data Privacy Act effective January 1, 2025), Indiana (Indiana Consumer Data Protection Act effective January 1, 2026), Iowa (Iowa Consumer Data Protection Act effective January 1, 2025), Kentucky (Kentucky Consumer Data Protection Act effective January 1, 2026), Montana (Montana Consumer Data Privacy Act effective October 1, 2024), Nebraska (Nebraska Data Privacy Act effective January 1, 2025), New Hampshire (SB 255 effective January 1, 2025), New Jersey (SB 332 effective January 15, 2025), Oregon (Oregon Consumer Privacy Act effective July 1, 2024), Tennessee (Tennessee Information Protection Act effective July 1, 2025), Texas (Texas Data Privacy and Security Act effective July 1, 2024), Utah (Utah Consumer Privacy Act effective December 31, 2023), and Virginia (Virginia Consumer Data Protection Act effective January 1, 2023). In some cases, AVs may be collecting information about the physical or mental condition of passengers and biometrics, which could trigger additional laws such as the Illinois Biometric Information Privacy Act, Texas Capture or Use of Biometric Identifier Act, Washington Biometric Law, and the Washington My Health My Data Act. New and expanding laws governing the collection and use of neural activity may also present challenges in the AV industry as the technology expands.

At least one state regulator has focused its enforcement attention on the collection of personal information in connected vehicles. In July 2023, the California Privacy Protection Agency (CPPA), which enforces the CCPA, announced it was focusing enforcement efforts on reviewing the data privacy practices by connected vehicle manufacturers and related technologies.

At the federal level, data privacy is also taking center stage. In April 2024, a bi-partisan, bi-cameral federal privacy bill was released called the American Privacy Rights Act. This bill, if signed into law, would create a 50-state data privacy law that would preempt state laws and include requirements on data minimization, consumer rights, and data security requirements.

AVs also face a changing landscape in the US as it relates to cybersecurity threats and legal requirements. AVs are known in the security industry as a cyber-physical system (CPS) – that is, they operate at the intersection of the Internet of Things (IoT) and the physical world. As a technology that can have a significant impact on human and physical safety, AVs present a significant risk of being subject to physical and cyber attacks at the enterprise and asset level. The US Cybersecurity and

Infrastructure Security Agency (CISA), for example, has identified a number of threats impacting AVs, including: (i) the stealing of proprietary and sensitive information; (ii) making AVs inaccessible and/or stealing the vehicle; (iii) causing AVs to malfunction; (iv) and controlling the operation of AVs. CISA recommends AV manufacturers and those stakeholders within the AV ecosystem develop and implement a robust set of enterprise and asset risk mitigation strategies, prioritizing communication, coordination, and collaboration across security functions and the supply chain supporting the development and deployment of AVs.

At the federal level, NIST is advancing research efforts to adapt the NIST Cybersecurity Framework to AVs and develop standards for assessing the security of AVs. Whether these efforts bear fruit remains to be seen.

Artificial Intelligence

Perhaps no technology impacts the future of AVs more than artificial intelligence (AI). The laws and regulations governing the use of AI are changing at a rapid pace in light of the development of generative AI in 2022. At the federal level, several executive orders have been issued that direct federal government policy and practice with respect to AI governance. These actions have triggered a series of federal agency regulations primarily related to government use of AI. Numerous states have also proposed and, in some cases, enacted AI laws. And federal agencies, including the Federal Trade Commission, have made clear that they will apply their existing legal authorities apply to the use of new technologies, including AI.

On October 30, 2023, the White House published an Executive Order on AI that advocates for a responsible approach o the deployment of AI within the federal government. The Executive Order directs various federal agencies to develop guidelines, initiatives, and guardrails relating to the deployment of AI. The Executive Order also calls on NIST to coordinate with key US allies, partners, and standards development organizations to drive and implement "AI-related consensus standards, cooperation and coordination, and information sharing."

Organizations deploying AI, including those in the AV ecosystem, are increasingly focused on the deployment of "responsible" or "trustworthy" AI, as measured by myriad frameworks. In January 2023, for example, NIST released an AI Risk Management Framework in January 2023. The AI RMF aims to serve as "a resource to the organizations designing, developing, deploying or using AI systems to help manage the many risks of AI."

The pathway forward as it relates to AI legislation in the US remains unclear. There are continued efforts at the legislative level to hold informational sessions and develop a US framework for the deployment of AI. Such proposals include creating a licensing regime for AI that impacts physical safety, which may implicate the deployment of AI within the AV industry. At the state level, proposed legislation to regulate the deployment of AI based on "risk" may also impact the use of AI within AVs on roadways.

Due to the cyber-physical nature of AVs, technical standards may ultimately be the pathway forward for effective AI legislation and policy. In 2019, NIST called on the development of technical standards when developing and deploying AI. In May 2023, the G7 nations issued a joint communique calling for the "development and adoption of international technical standards in standards development organizations through multi-stakeholder processes" to address AI risk. The focus on technical standards to address AI may be a logical next step as it relates to cyber-physical systems. Technical standards permeate every aspect of modern life, from phone calls to powering devices. Technical standards help ensure seamless communication, connection, and collaboration.

The focus on technical standards alone, however, may not be enough to address the challenges AI poses to the AV industry. In 2022, NIST warned against an over-reliance on technical solutions to address the complex challenges of AI, including those relating to social, political, economic, and ethical concerns. As AI systems become self-governing, self-improving, and self-adapting, technical controls alone may be insufficient to harness the potential of AI while mitigating the peril. NIST therefore has called for the development of socio-technical standards that can bridge the

gap between technical and social standards and expectations. Such standards are being considered at the international level by the Institute of Electrical and Electronics Engineers. Whether they will be adopted remains to be seen.

State Overview

Alabama

Alabama has been active in the regulation of AVs since it first formed a committee on the subject in 2016. The Alabama Department of Transportation has sole and exclusive jurisdiction over automated driving systems, AVs and teleoperation systems. At present, commercial vehicles are authorized to operate autonomously either with or without a physical driver, as long as a remote driver is capable of operating the vehicle.

Since 2017, there have been numerous bills considered in the Alabama legislature to regulate AVs. In 2019, Senate Bill 47 was passed and signed into law, which created a framework and codified the rules for commercial AVs. State Senator Gerald Allen has been a strong supporter of AVs and earlier this year introduced SB 311, which calls for motor vehicles equipped with automatic driving systems (ADS) to be allowed to operate on public roads. While SB 311 has a long way to go, it is further proof that Alabama is ripe for investment from the AV industry.[152]

Universities in the state have also taken great interest in autonomous technology, with the two largest institutions, Auburn University and the University of Alabama, competing in the Indy Autonomous Challenge. The University of Alabama won in 2021 and 2022.

Auto manufacturing in Alabama has also ramped up operations in recent years due to the rise in popularity of electric vehicles. This investment in the state will affect the AV industry in the coming years.

In 2022, Mercedes-Benz began production of its all-electric EQE SUV in Alabama. In 2023, Hyundai began manufacturing its new EV, Genesis Electrified GV70. This SUV is the first Genesis model to be assembled in the US. To help with building this new vehicle, $300 million was invested in the facility, creating about 200 new jobs. Since AVs and EVs are fundamentally connected, these developments may be a precursor of things to come in the industry.[153]

Bills Introduced in 2021: Senate Bill 154

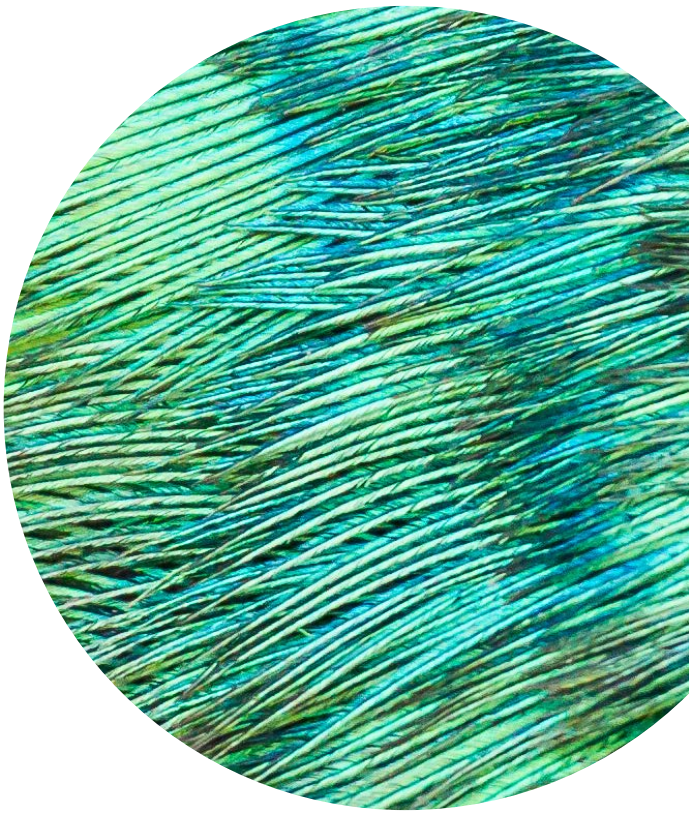
Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 311

Bills Passed in 2023: N/A



152 Self-driving bill wouldn't require driver to be present
153 Hyundai's Alabama plant debuts first-of-its-kind electric vehicle

Alaska

Although Alaska has yet to pass significant legislation regarding AVs, the state continues to move forward with efforts to harness the emerging technology. In 2021, the Alaska Connected and Automated Vehicle Working Group released a strategic plan for connected and autonomous vehicles in Alaska. The working group, housed in the Alaska Department of Transportation and Public Facilities, laid out a near-term, mid-term and long-term focus for the state's adoption of AV technology.[154]

The state's focus on connected AV technology is logical considering Alaska's challenging geography and environment. While that environment may prove challenging for autonomous robotaxis and delivery vehicles in their current state, the communication between infrastructure, a vehicle and other systems would likely provide more efficient and safe transportation in Alaska. However, this challenging environment also generates opportunities in this space. In 2023, the world's first autonomous ocean mapping mission of Alaska was completed.[155] The Saildrone Surveyor SD 1200 mapped 4,739 nautical miles of unknown seafloor around Alaska's Aleutian Islands. This region is notorious for severe weather that prevents most crewed survey vessels from entering. The state also began trials in 2023 of an unmanned aircraft developed by Merlin.[156] The aim of this autonomous route is to deliver goods to underserved communities around the state. The company was awarded a $1 million contract from the FAA to demonstrate this technology in the state.

Finally, although electric vehicles have had some issues in Alaska due to the cold and harsh environment, that is not stopping municipalities from adding autonomous vehicles to their suite of vehicles. For example, the state's capital, Juneau, has bought seven new electric buses for the city.[157]

Arizona

Arizona has long been one of the nation's leaders in AV research, deployment and acceptance. The historically welcoming nature of Arizona's AV regulatory structure has now solidified the state's standing as a hotbed of AV innovation. In 2023, Waymo became fully operational and now provides autonomous commercial rides within a 225-square-mile radius of the Phoenix area, including Chandler and Scottsdale.[158] In this same area, Waymo and Uber have partnered to offer self-driving vehicles as an option on the popular ride-hailing app.[159] Autonomous trucking companies have also begun to leverage the state's friendly framework for testing and commercialization.

Arizona's rise to prominence in the AV space began with a series of executive orders signed by former Governor Doug Ducey. These efforts led to the state legislature codifying an AV framework in 2021, which formally outlines the requirements for AVs to operate in the state. The framework provides operators and owners with guideposts concerning accidents, taxes, operational requirements and permitting processes. Under this framework, fully autonomous vehicles may operate with the system engaged on public roads, without submitting supporting documents, as long as there is a licensed driver ready to take over the driving task, where necessary.

In 2022, the Arizona legislature passed two additional bills addressing AVs. The first was House Bill 2273, which allows transportation networks to use AVs, and the second was House Bill 1333, which defines "Neighborhood Occupantless Electric Vehicles," such as autonomous delivery devices. These bills will provide certainty to autonomous technology companies looking to join Arizona's AV industry.

154 Connected & Automated Vehicle Working Group Strategic Plan
155 World's First Autonomous Ocean Mapping Mission of Alaska Completed
156 Merlin to deliver Alaska cargo with self-flying aircraft
157 Despite Buying a 'Lemon,' Juneau, Alaska, Is Not Done with Electric Buses
158 Waymo expands coverage area in Phoenix. Here's what to know to hail a robotaxi
159 Uber begins offering rides in self-driving Waymo cars

Bills Introduced in 2021: House Bill 2007, House Bill 2476, House Bill 2083, House Bill 2813

Bills Passed in 2021: House Bill 2813

Bills Introduced in 2022: House Bill 2014, House Bill 2187, House Bill 2263, House Bill 2273, Senate Bill 1333

Bills Passed in 2022: House Bill 2273, Senate Bill 1333

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Arkansas

Arkansas first addressed the use of AVs in 2019 when it created an AV pilot program overseen by the State Highway Commission. Two years later, in 2021, the state legislature unanimously passed House Bill 1562, which transitioned the pilot program into a formal AV program. The law also introduced the concept of an On-Demand Driverless Vehicle Network, which would create the operation of a vehicle network that connects autonomous vehicles to consumers for goods delivery or transportation. The State Highway Commission remains responsible for overseeing the implementation of the law.

The state also allowed Driver Assistive Truck Platooning (DATP) under legislation that took effect in 2017. This legislation permits vehicle-to-vehicle communication to sync with the vehicle's acceleration and braking systems, while leaving the steering to each individual driver. This process allows for quicker response times to an emergency braking event. House Bill 1321 amended this law in 2023 and now requires a human operator in only the lead vehicle of an autonomous trucking platoon. Previously, each truck in the autonomous trucking platoon needed a human operator. Tyson Foods is testing the new law by teaming up with autonomous vehicle maker Gatik to test a driverless truck route in the state. These trucks will be used to make short deliveries from a production plant to multiple cold storage facilities.[160]

While Arkansas does not have as many large cities or the level of infrastructure as some other states, Governor Asa Hutchinson made autonomous vehicle industry recruitment a key part of his vision for Arkansas before he left office. In 2022, he announced a new partnership with Governor Kevin Stitt of Oklahoma to collaborate on AV and future mobility work. The states are encouraging their universities, economic development organizations and industry leaders to work together to advance the future of transportation.

Bills Introduced in 2021: House Bill 1562

Bills Passed in 2021: House Bill 1562

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 1321

Bills Passed in 2023: House Bill 1321

California

California continues to lead the nation in AV development, deployment and acceptance. With a comprehensive approach to regulating AVs and the participation of numerous AV operators, California stands at the forefront of the future of AVs.

Since 2017, California has enacted several laws that lay out procedures for the testing and deployment of AVs in the state. The state expanded its program from requiring backup drivers in all test vehicles to also allowing self-driving car tests without backup drivers. To qualify for a driverless testing permit, companies must show proof of insurance or a bond equal to $5 million, verify that the vehicles are capable of driverless operation and confirm that the vehicles meet Federal Motor Vehicle Safety Standards. As of 2021, 54 companies hold permits to test while completely driverless. In 2021, the state legislature also passed SB 500, which ensured that new light-duty AVs starting in model year 2031 are zero-emission vehicles. The state legislature also passed SB 570, which exempts AVs from regulations that are irrelevant to their operation (i.e., windshield wipers and speedometers) and provides alternative standards.

160 Tyson enlists self-driving trucks to deliver chicken wings and hot dogs

In 2022, the state legislature passed a law requiring any dealer or manufacturer that sells a vehicle equipped with or a vehicle able to be equipped with a Level 2 driver assistance program to provide the buyer or owner with a notice describing its abilities and limitations. In early 2023, A.B. 316 was introduced, which would have required all vehicles weighing more than 10,000 pounds to have a human driver behind the wheel. The measure made it to Governor Gavin Newsom's desk, where he vetoed it.[161] While seen as a big win for the future of transportation, autonomous vehicles are now under a microscope in the state. There are many opponents in the state legislature.

This past year was another year of growth in the AV space in California. In August, state officials on the California Public Utilities Commission voted to allow certain driverless cars to operate like taxis in San Francisco 24 hours a day, all week.[162] Several cities in and out of the state have followed suit and have started to offer robotaxis, including Los Angeles. While this was a huge step in the right direction, it has come with some added challenges. Safety has increasingly become a concern of regulators in the state, with the California Department of Motor Vehicles and Public Utilities Commission a leading role in investigating accidents. As we mentioned prior in this report, 2023 became the first year where level 3 autonomous vehicles went on sale. Mercedes Benz Drive pilot can be legally sold in California and Nevada. The technology can only be used in certain situations and only on some freeways but it marks a big step in the future of AVs.

We are five months into the new year and California is continuing to drop legislation related to Autonomous Vehicles. SB 915 was introduced in the middle of March and would prohibit an AV service from commencing operation within a local jurisdiction until authorized by a local ordinance. Another piece of pending legislation is AB 1777 which would require AVs to be operated by a permittee and comply with all traffic laws and would require the permittee with the license to pay all relevant fines.

Bills Introduced in 2021: Senate Bill 66, Senate Bill 570, Senate Bill 500

Bills Passed in 2021: Senate Bill 500, Senate Bill 570

Bills Introduced in 2022: Senate Bill 1398, Assembly Bill 2441

Bills Passed in 2022: Senate Bill 1398, Assembly Bill 2441

Bills Introduced in 2023: Assembly Bill 96, Assembly Bill 316, Assembly Bill 1201

Bills Passed in 2023: Assembly Bill 96

Bills Introduced in 2024: Assembly Bill 1777, Senate Bill 915

Colorado

Colorado has welcomed AVs in the state since at least 2017, when legislation was passed that allows driverless vehicles to operate in the state so long as they can comply with existing state and federal law. Legislation passed in 2019 further authorized the Colorado Department of Transportation (CDOT) to convene a working group to examine the impact of technology, including autonomy, on transportation business models. The group made its recommendation to the legislature in November 2019. The CDOT is supporting connected technology and has equipped miles of Colorado highways with roadside units that utilize both vehicle-to-vehicle and vehicle-to-infrastructure communication. In July 2022, the CDOT partnered with a private firm to provide 150 roadside units and expand its connected vehicle program. There was no legislation brought forth by the Colorado legislature in 2023 regarding AVs; however, the US Department of Transportation increased funding for AV technology development through the Strengthening Mobility and Revolutionizing Transportation (SMART) grant program, and the CDOT was awarded part of $94 million in funding, along with several other states[163]

161 Newsom blocks California bill that would have banned driverless trucks
162 Cruise, Waymo get green light to give paid rides 24/7 across San Francisco
163 Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program

Bills Introduced in 2021: N/A Bills

Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Connecticut

Connecticut currently has a framework in place that permits the testing of AVs. To comply with Connecticut's regulatory framework, operators must undergo a multistage approval process, and testing is only allowed in select municipalities. Connecticut loosened its restrictive framework by allowing operators to not be in the driver's seat as long as they are physically inside the AV to engage the system. The state has also established a task force to study fully autonomous vehicles. In 2022, the state legislature passed a bill permitting and creating regulations for platooning. In 2021, the Connecticut Department of Transportation (CTDOT) released a "Strategic Plan" for the adoption of Connected Autonomous Vehicle Technology. CTDOT has made a strategic decision to focus its efforts on connected AV technology instead of pushing autonomous-only projects.

While 2023 did not bring any new legislation regarding AVs, Connecticut passed SB 1103, a bill concerning artificial intelligence. The bill prohibits the state from implementing any system that uses AI unless an impact assessment has been conducted to make sure the system will not result in any unlawful discrimination and establishes a 21-member working group to make recommendations to the General Law Committee.[164]
Bills Introduced in 2021: House Bill 6486

Bills Passed in 2021: N/A

Bills Introduced in 2022: House Bill 5255

Bills Passed in 2022: House Bill 5255

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Delaware

Delaware has yet to pass any major AV legislation or see any significant public investment from the AV industry. In 2017, Governor John Carney signed an executive order to establish an Advisory Council on Connected and Autonomous Vehicles. The Advisory Council was tasked with developing recommendations for innovative tools and strategies that can be used to prepare Delaware's transportation network for connected and autonomous vehicles. The Advisory Council's final report was submitted a year later in 2018. The report did not spur any successful legislation.

This does not mean officials are not preparing for the future of transportation. Delaware is in the process of adding artificial intelligence to the operation of all traffic signals in the state. The system involves traffic lights, cameras and sensors, along with data obtained from weather stations and emergency responder channels. Artificial intelligence will ultimately make traffic management decisions based on the data collected and processed.[165] Delaware's efforts today may pave the road for Delaware to take advantage of legislative changes and further AV enhancement in the future.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

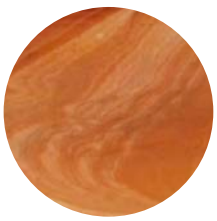
164 An Overview of Connecticut SB 1103
165 AI playing increasing role in managing traffic on nation's roads

Florida

In 2019, Florida began allowing AV testing on public roads without a human operator in the vehicle. Soon after, autonomous trucking took off in the state, with several companies expanding their service. In 2022, Kodiak Robotics, a leader in autonomous trucking, expanded service along the I-10 corridor to Jacksonville, Florida. After beginning service, Kodiak carried freight nearly 5,600 miles from San Antonio, Texas, to the San Francisco Bay Area, to Jacksonville, Florida, and then back to San Antonio.

In 2021, The Florida legislature passed House Bill 1289, which legalized and developed a framework for autonomous delivery vehicles. At the University of Florida, two driverless shuttles are operating with Yunex on-board units that communicate with roadside units to create a connected AV network.

Orlando, Florida debuted a self-driving shuttle in 2023 that will take passengers around a one-mile loop in the downtown area.[166] This autonomous shuttle service is operated by Beep Inc. The company operates self-driving routes in several cities across the US, but is based in Orlando. Also in 2023, the Suntrax test facility opened in Florida. It sits on 475 acres and has a 2.25-mile-long track. This multi-lane track is the only high-speed autonomous vehicle testing facility in the Southeast United States.[167] Finally, in September, Waymo, an autonomous robotaxi company, began testing its vehicles on Miami streets.[168] These rides will be in autonomous mode, but have an operator inside at all times. The tests are intended to improve autonomous driving in wet conditions.



Bills Passed in 2020: House Bill 1303

Bills Passed in 2021: House Bill 1289

Bills Introduced in 2022: Senate Bill 150, House Bill 1525

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 425, Senate Bill 586

Bills Passed in 2023: House Bill 425

Georgia

Georgia allows the operation of both AVs and trucks under legislation passed in 2017. Driverless vehicles are free to operate in the state, so long as they are fully insured and lawfully registered. In Northwest Atlanta, the Cumberland Community Improvement District (CID) began an autonomous shuttle service, transporting riders to popular locations in the area, including Truist Park, where the Atlanta Braves play.169 There are several other autonomous shuttle routes in the surrounding Atlanta area, including a shuttle that traverses a 1.5-mile track in Peachtree Corners and another airport project that will begin testing in the near future.[170]

During the 2022 legislative session, Georgia lawmakers passed House Bill 1009, which permits the introduction of autonomous delivery vehicles in the state. 2023 brought autonomous robotaxi testing to the state, as well as a new autonomous shuttle in an Atlanta suburb. It also attracted several EV auto manufacturers to the area. Governor Brian Kemp has made this a focal point during his second term as governor. Companies including Hyundai, Rivian and SK Innovation, along with many suppliers, have all broken ground on new facilities with Hyundai's Metaplant projected to be one of the largest EV plants in the country.[171]

166 SWAN Shuttle: Shuttling with Autonomous Navigation
167 Self-driving vehicle facility for testing and research opens in Auburndale
168 Waymo's self driving cars on Miami streets as company tests its technology
169 Cumberland CID to Launch "The Hopper" Autonomous Vehicle Shuttle Pilot Program
170 MARTA to test automated vehicles at Atlanta airport
171 Hyundai Motor Group Breaks Ground on Metaplant America Dedicated EV and Battery Plant

While no new legislation was passed in 2023, a House Subcommittee on Artificial Intelligence was formed and had its first hearing in November. Two similar subcommittees were formed in the Georgia Senate. These subcommittees will look at potential guardrails on artificial intelligence systems throughout the state.

Bills Introduced in 2021: House Bill 249

Bills Passed in 2021: Senate Bill 165

Bills Introduced in 2022: House Bill 249, House Bill 1009

Bills Passed in 2022: House Bill 1009

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Hawai'i

In 2020, Governor David Ige signed House Bill 2590 into law, creating a pilot program within the Hawai'i Department of Transportation (HDOT) to allow for AV testing on Hawai'i public roads. The law requires that a conventional human driver be physically present in the vehicle at all times to supervise the vehicle and prevent collisions, if possible. The passage of the law was due to the efforts of the Hawai'i Autonomous Vehicle Task Force, which included Dentons Partner Bill Kaneko. Hawai'i represents a unique environment for AV testing and deployment. The combination of an insulated traffic environment, relatively short commuting routes, a smaller population and a limited number of weather and road variables should make Hawai'i an attractive AV testing environment. In 2023, the Hawai'i Department of Transportation, in collaboration with the University of Hawai'i, launched its first autonomous shuttle. The shuttle will run every 30 minutes and make 11 stops throughout the University of Hawai'i campus.[172]

Bills Passed in 2020: House Bill 2590

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Idaho

In 2018, Idaho Governor C.L. "Butch" Otter signed Executive Order 2018-01, creating the Autonomous and Connected Vehicle Testing and Deployment Committee. The Committee's charge is to identify relevant state agencies to support the testing and deployment of autonomous and connected vehicles within the state. The Committee submitted its report in November 2018. The report has yet to spur any successful legislation or additional executive action relating to autonomous or connected vehicles.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Illinois

The state's autonomous vehicle history began with an executive order signed October 25, 2018 by former Governor Bruce Rauner, which allowed AVs to operate in the state. The order established the Autonomous Illinois Testing Program, overseen by the Illinois Department of Transportation. This order permits AVs to operate within Illinois with an employee of the manufacturer behind the wheel. In 2023, four bills were proposed to define AVs and set safety standards. The first, SB306, would allow AVs to operate if a human is physically present and has the ability to monitor the vehicle's performance and intervene if necessary. The second bill, SB1471, would create an Automated Driving Systems Review Committee and allow Level 2 AVs to be sold, but prohibit the sale or operation of AVs classified as Levels 3, 4 or 5. The third proposed bill, HB2913,

172 Hdot, uh mānoa launch first autonomous electric shuttle

would make the manufacturer liable for incidents where the AV is at fault for that incident. The last proposed bill, HB3245, would provide that a dealer or manufacturer shall not sell any new passenger vehicle that is equipped with any partial driving automation feature without giving notice of the functions and limitations of the features.

There continues to be stakeholder movement in the AV space as well. The Illinois Autonomous Vehicle Association (IAVA), a group of stakeholders and interested parties, has partnered with the Smart Transportation Infrastructure Initiative at the University of Illinois Urbana-Champaign in announcing plans to build the Illinois Autonomous and Connected Track (I-ACT). The I-ACT will cover 430 acres of the former Chanute Air Force Base in Rantoul, Illinois.[173] The project has already received support from the city, the university community and the Illinois Department of Transportation.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 306,

House Bill 1403, Senate Bill 1471, House Bill 2053,

House Bill 2913, House Bill 3245

Bills Passed in 2023: N/A

Indiana

While Indiana does not have any current laws or regulations regarding autonomous passenger vehicles, truck platooning has been regulated in the state since 2017. There have been efforts in the past to create an autonomous task force with the power to approve the operation of fully driverless vehicles in the state, but all have failed to garner enough support to pass into law.

The Indianapolis Motor Speedway, the Energy Systems Network and multiple other stakeholders have worked together to introduce the Indy Autonomous Challenge (IAC). This challenge features college and university teams from around the world in an autonomous race around the Indianapolis Motor Speedway. All teams utilize the same Dallara-produced AV-21 retrofitted for autonomation. The teams are responsible for loading software able to put their cars across the finish line first over 20 miles, averaging at least 120 miles per hour. After the inaugural challenge, the IAC announced events in Las Vegas and at the Texas Motor Speedway.[174]

In 2023, the state announced a partnership with the State of Ohio to test partially automated trucks on a 166-mile stretch of Interstate 70.[175] A professional driver will always be at the wheel, but the project aims to advance truck automation.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 141

Bills Passed in 2023: N/A

Iowa

Iowa allows driverless vehicles to operate on public highways without a conventional human driver physically in the vehicle if they meet a set of conditions, including that the vehicle is capable of achieving a minimal risk condition in the event of a malfunction and that the vehicle is capable of operating in compliance with the applicable traffic and motor vehicle safety laws and regulations. In 2019, Iowa passed Senate File 302, establishing more regulation for autonomous vehicles, including terms for insurance, liability, and penalties. Iowa also authorizes on-demand driverless-capable vehicle networks to facilitate the transportation of persons or goods, including transportation for hire. In 2021, the Iowa Transportation Department issued rules that guided the implementation of Senate File 302.

173 U of I autonomous vehicle track is building the future of mobility
174 Indy Autonomous Challenge
175 Semi-Automated Trucks to Be Tested on Ohio-Indiana Route

The John Deere factory assembly line in Waterloo, Iowa, has been producing autonomous tractors for several years.[176] Autonomous tractors serve as an interesting test case for autonomous technology, as they bring the technology to corners of the country where consumers may not expect to find it.

A team at the University of Iowa is one of the few research institutions to study automated vehicles on gravel. The project is called Automated Driving Systems (ADS) for Rural America.[177] The team is testing the use of automated driving technologies on rural roadways to examine and understand the unique needs of rural environments. UI is one of the only places testing self-driving vehicles on rural roads.

Iowa currently has pending legislation involving driverless vehicles. Senate Bill 2218 would require human drivers to be physically present in certain driverless-capable vehicles. The bill is currently in the Iowa Senate Technology Committee.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 141

Bills Passed in 2023: N/A

Bills Introduced in 2024: Senate Bill 2218

Kansas

In 2018, the Kansas Department of Transportation created the Statewide Connected and Autonomous Vehicle Task Force to increase awareness and educate state agencies about the process of deploying connected AV systems in Kansas. In 2019, the task force released a strategic plan to introduce connected AV technology in Kansas.

In 2022, Kansas adopted a full legal framework surrounding the operation of AVs within the state with the passage of SB 313. "Driverless-capable vehicles" are now allowed to operate on public roads if they can reach a minimal safety condition, comply with state and federal laws and regulations, do not exceed a weight limit of 34,000 lbs. on tandem axles and have a human driver in the vehicle for the first 12 consecutive months the vehicles operate in the state. Vehicles are exempt from the human-driver requirement if they lack controls or are not designed for human occupancy. Driverless-capable vehicle owners must submit an interaction plan to the Kansas Highway Patrol before the vehicles operate on public roads in Kansas.

Kansas is already seeing an investment in the industry. Autonomous truck provider Gatik is deploying AVs alongside Walmart and other key stakeholders in the state, including the Kansas Department of Transportation, the House and Senate and the Kansas Sheriffs Association.[178] Additionally, Panasonic announced it will start building a new battery plant in Kansas and aims to begin mass production by March 2025.

Bills Passed in 2021: N/A

Bills Introduced in 2022: Senate Bill 313, Senate Bill 379, Senate Bill 546

Bills Passed in 2022: Senate Bill 313

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Kentucky

Kentucky passed legislation in 2018 permitting commercial vehicles to operate in a platoon so long as there is a licensed driver behind the wheel and a marker designating that the vehicle is part of a platoon.

In 2023, the state voted on HB 135, which would have established a regulatory framework for the operation of fully autonomous vehicles on public highways. The bill also established requirements for AVs. The bill passed the Kentucky House and Senate but was vetoed by Governor Andy Beshear.[179] The governor thought the bill did not address safety concerns and explained that the state needed more time to carefully study the technology.

176 Self-driving Deere tractors to be made in Waterloo
177 Automated Driving Systems (ADS) for Rural America
178 Gatik and Walmart Partner to Advance Autonomous Vehicle Legislation
179 Kentucky autonomous vehicle bill vetoed by Beshear

The 2024 Kentucky legislative session has brought a new interest in autonomous vehicles. The Kentucky legislature passed HB 7 which established a regulatory framework for the operation of fully autonomous vehicles on public highways. The bill also established requirements for AVs. The bill is currently awaiting the signature of Governor Beshear. Another piece of legislation being debated on in the Kentucky house is House Resolution 36, which would establish an Autonomous Vehicle Task Force. The committee would study safety benefits and concerns, liability and insurance issues, as well as the economic impact.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 135

Bills Passed in 2023: N/A

Bills Introduced in 2024: House Bill 7, House Resolution 36

Bills Passed in 2024: House Bill 7

Louisiana

Louisiana passed legislation in 2019 governing the operation of autonomous freight carriers and other autonomous commercial vehicles. This law permits the operation of autonomous truck platoons and specifically authorizes autonomous commercial motor vehicles to operate without a conventional driver physically present in the vehicle if the autonomous commercial motor vehicle meets a set of criteria, including that the vehicle is capable of operating in compliance with applicable law and is capable of achieving a minimal risk condition in the event of an emergency.

Louisiana passed further legislation in 2021 permitting the operation of autonomous personal delivery devices within the state, limiting such devices to 20 miles per hour at most, requiring that an employee be able to monitor and control the device, and requiring that any business operating such a device maintain an insurance policy with coverage not less than $100,000. The law also allows local governments to further restrict delivery devices in their jurisdictions.

Louisiana passed additional legislation in 2022 exempting vehicles intended to be operated exclusively by an autonomous driving system from requirements that are not applicable to those vehicles.

Bills Passed in 2021: Senate Bill 147

Bills Introduced in 2022: Senate Bill 453

Bills Passed in 2022: Senate Bill 453

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Maine

Maine does not have any laws or regulations pertaining to AVs. Legislation authorized in 2018 created a Commission on Autonomous Vehicles to coordinate efforts among state agencies and knowledgeable stakeholders to develop a process for testing automated driving systems on public roads. The law requires that the Commission issue a final report containing findings and recommendations, including suggested legislation. Additionally, Governor Paul LePage signed an executive order creating the Maine Highly Automated Vehicles Advisory Committee to oversee the introduction of highly automated vehicles.

While there have been pushes for AV legislation in recent years, none have succeeded. Maine still has no standards for the registration of AVs, nor for the licensure of AV operators. In 2022, the University of Southern Maine deployed autonomous delivery bots on campus to assist students and faculty. These robots, supplied by Sodexo, will make the campus more efficient and accessible.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Maryland

The Maryland Connected Autonomous Vehicles Working Group was formed in 2015 as the central point for coordination of statewide connective and autonomous vehicle efforts. In 2017, the Maryland Department of Transportation adopted regulations for AV testing, including an approval process for all testing on public roads.

The state released its Connected and Autonomous Vehicles Strategic Framework in 2020. This report establishes the state's thinking about connected and autonomous vehicles and the ways in which partners can support the state's goals and overarching focus areas for resources. This framework invited public and private partners to consider connected and autonomous vehicle systems and evaluate how emerging technology can be integrated into and change their future objectives and plans.

The state passed AV-adjacent legislation in 2021 that allowed for truck platooning and empowered the state to create regulations to carry out the law. In the private space, the Maryland Autonomous Technologies Research Innovations and eXploration lab (MATRIX) is sponsored by the University of Maryland and gives students a personal look at the future of autonomy. These students work alongside several AV companies who utilize the space.[180]

In 2023, the Maryland Legislature passed SB 806 and the House bill equivalent HB 806, which made it legal to sell or resell a vehicle that has been converted to an autonomous vehicle.

Bills Passed in 2021: Senate Bill 291

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 685, House Bill 806

Bills Passed in 2023: Senate Bill 685, House Bill 806

Massachusetts

While the state of Massachusetts has yet to pass a comprehensive framework concerning AVs, prior executive orders issued by Governor Charlie Baker established a process for testing AVs within the state. An additional executive order established an Autonomous Vehicles Working Group. In the past two years, multiple bills have been introduced in the legislature to regulate AVs on a more comprehensive basis, but none have passed.

Despite a lack of public movement on AV regulation, within the private space, Massachusetts could become a hotbed for AV research and testing, as researchers and students at the Massachusetts Institute of Technology, among other educational institutions, are closely studying AVs and their related technologies.

The Massachusetts state legislature introduced a series of bills that would regulate autonomous vehicles and collectively provide a regulatory framework. The bills would allow autonomous vehicles to operate on Massachusetts roads, but only if they are electric and produce net-zero carbon emissions. These bills are currently pending in the Joint Committee on Transportation.

Bills Passed in 2021: N/A

Bills Introduced in 2022: House Bill 3595, House Bill 4618

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 2257,

House Bill 3298, House Bill 3324, House Bill 3430

Bills Passed in 2023: N/A

180 MATRIX Lab

Michigan

Michigan approved legislation in 2016 allowing for pilot testing of AVs. The state is also home to several large testing facilities, including the University of Michigan-owned Mcity. These projects were funded in part by the $60 million federal grant allocation for automated driving systems research for its Michigan Mobility Collaborative.

By investing in an autonomous future, Michigan is preparing itself for the coming transformation to AV manufacturing. Several major brands have announced plans to manufacture their vehicles in Michigan, including GM, Google and Ford.

Michigan passed legislation in 2022 clearing the way for the state's department of transportation and key collaborators to construct a Connected and Autonomous Vehicle Corridor.[181] This corridor is currently slated to be a dedicated roadway alongside I-94, from Detroit to Ann Arbor, fitted with new technology and key safety measures. The state claims this stretch of I-94 will be "the world's most sophisticated roadway."

Bills Passed in 2021: N/A

Bills Introduced in 2022: House Bill 5601,

House Bill 6369, Senate Bill 706, Senate Bill 1168

Bills Passed in 2022: Senate Bill 706

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Minnesota

Although Minnesota has no laws or regulations specifically addressing the testing or operation of AVs, the state's Department of Transportation (MNDOT) is actively promoting and preparing for widespread autonomous technology deployment within the state following an executive order signed in 2018 by Governor Mark Dayton creating a Governor's Advisory Council on Connected and Automated Vehicles to recommend a path forward within the state. Its resulting 66-page report delivered a rosy outlook on automated cars and included draft legislation setting up a permit system and giving MNDOT wide latitude to decide whether to allow a business to test, based on its history with self-driving technology. The Minnesota legislature has yet to pass legislation addressing AVs.

There were two bills in 2021 that concerned autonomous vehicles, but both stalled in the legislature. Senate Bill 214 sought to prohibit Level 4 or 5 automated driving systems from operating in the state. House Bill 230 encouraged the state to investigate using autonomous vehicles for mass transit through a micro transit rideshare pilot program. Despite the legislature's unwillingness to pass legislation, the state has helped launch several driverless shuttle projects over the past several years. This includes one in Grand Rapids through goMARTI, Minnesota's Autonomous Rural Transit Initiative.[182] The goMARTI shuttle project utilizes several partners, with the majority of funding coming from MNDOT, to launch five driverless shuttles provided by May Mobility, three that are ADA-compliant and able to be requested for pickup from a mobile phone app. Over the next 18 months, the partners hope to gain key experience and data, further educate the public and provide safe and accessible mobility to those who face transportation challenges.

181 I-94 Connected & Automated Vehicle (CAV) Corridor Proposed Project
182 goMARTI: Grand Rapids, Minnesota

Important projects such as goMARTI are encouraged and supported by MNDOT's focus on connected and autonomous vehicles. In particular, the state sponsors a CAV Challenge, which encourages people to submit ideas for possible funding from MNDOT.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Mississippi

Mississippi has yet to pass legislation concerning autonomous passenger vehicles. However, the state does permit platooning, as long as the operator receives approval from the Department of Transportation and the Department of Public Safety.

Although there is no widespread adoption or deployment of autonomous vehicles in the state, one of its educational institutions is supporting the technology's development through the Mississippi State University Center for Advanced Vehicular Systems (CAVS).[183] MSU CAVS has spent time focusing on how autonomous technology might operate in an off-road setting. In addition to its physical "proving grounds," it is developing an open-source simulator that will allow autonomous software to be tested in a virtual environment before it hits the open road (or off-road). In 2022, MSU CAVS announced a partnership with the Quantum Corporation to help store and process the large amounts of data needed to develop autonomous technology.

In 2023, the Mississippi legislature passed HB 1003, the Fully Autonomous Vehicle Enabling Act of 2023. The bill authorized the operation of fully autonomous vehicles on public roads within the state without a human driver, provided that certain conditions are met.

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 1003, Senate Bill 2569

Bills Passed in 2023: House Bill 1003

Missouri

Missouri does not have any laws regarding the registration, testing or deployment of autonomous vehicles. In past legislative sessions, lawmakers have proposed legalization to prohibit the use of autonomous vehicles. In 2021, legislators introduced Senate Bill 452, which would have codified autonomous vehicles and laid ground rules for their operation. This bill did not generate momentum and failed. Senate Bill 176, which sets regulations for delivery robots, passed in 2021 and became law.

In 2022, lawmakers failed to pass Senate Bill 1038, a bill that would have legalized platooning in Missouri. In 2023, a set of bills (Senate Bill 188, House Bill 624) relating to platooning was introduced. While neither bill appears to have been passed by the legislature, the Missouri Senate Transportation, Infrastructure and Public Safety Committee did pass Senate Bill 188. While the state has been reticent thus far to engage with autonomous vehicle legislation, perhaps the new developments in its neighbor states, Arkansas, Oklahoma and Kansas, will help Missouri feel more comfortable opening up the state to the autonomous vehicle industry.

Bills Introduced in 2021: Senate Bill 176, Senate Bill 452

Bills Passed in 2021: Senate Bill 176

Bills Introduced in 2022: Senate Bill 1038

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 188, House Bill 624

Bills Passed in 2023: N/A

183 Center for Advanced Vehicular Systems

Montana

Montana currently has no laws or executive orders governing AVs; however, the legislature did introduce, albeit fail to pass, a 2023 bill (House Bill 339) relating to the use of AVs in connection with platooning and passed House Joint Resolution 10 establishing a study committee on autonomous vehicles in 2021. The committee will include people from the state's department of transportation, department of justice, highway patrol and automobile and insurance community, among others.

The lack of explicit regulation, however, has not deterred the state from working with AV companies. In 2022, Aurora announced its plans to build a 78,000-square-foot facility at the Montana State University Innovation Campus. Aurora purchased Blackmore, a Montana-based company that specializes in Lidar, in 2019 and will now return to Bozeman for further investment. Montana State faculty are particularly excited for students and professors to work alongside a company in this innovative space.

Embark Trucks announced that it completed a groundbreaking test on snowy conditions in the spring of 2022 in Montana. The truck completed a 60-mile round trip on public roads during a period of snowfall, with rates up to one-sixth inch per hour – eventually an inch of snow accumulated over three hours.

Due to these recent developments and the completion of the state's study committee, stakeholders may look for potential action in Montana during the upcoming legislative session.

Bills Adopted in 2021: House Joint Resolution 10

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 339

Bills Passed in 2023: N/A

Nebraska

In April 2018, Nebraska lawmakers cleared the way for companies to test self-driving vehicles, as long as the vehicle is capable of operating in compliance with traffic and motor vehicle safety laws. The AV may or may not contain a human driver, but if a human driver is present, he or she must be a licensed driver and covered by insurance. The law also authorizes the operation of an on-demand AV network for the transport of persons or goods, including for-hire transportation or public transportation.

While there has been limited deployment and testing across Nebraska, the state has not yet seen widespread deployment. Except for a bill (LB625) introduced in January 2023 to establish a comprehensive regulatory framework for AVs in Nebraska, which appears to have stalled in committee, there has been no momentum for further legislation. In recent years, a proposal to study autonomous vehicles as they relate to a variety of unconsidered issues did not pass.

Bills Introduced in 2021: LR155

Bills Passed in 2021: N/A

Bills Introduced in 2022: LR 155

Bills Passed in 2022: N/A

Bills Introduced in 2023: LB625

Bills Passed in 2023: N/A

Nevada

Since Nevada passed AV legislation in 2012, the state has been at the forefront of driverless vehicle innovation. In 2017, with the passage of Assembly Bill 69, Nevada permitted the testing and commercial public deployment of AVs—later that year, Las Vegas had its first completely autonomous electric shuttle deployed for public use. In 2019, the AV startup Zoox received permission from the Nevada Department of Motor Vehicles to deploy AVs on state roads.

In 2021, the Nevada State Legislature passed two new bills that updated the state's code and kept it at the forefront of autonomous technology. Assembly Bill 412 codified requirements and exceptions for "neighborhood occupantless vehicle[s]" such as the autonomous delivery vehicles beginning to roll out across the country. These vehicles, such as Nuro, are introducing consumers to autonomous vehicles and commercializing the technology.

Senate Bill 288 permits an autonomous technology company to enter into an agreement with a transportation network in the state. This bill will clearly benefit rideshare companies looking to partner with autonomous vehicle companies.

From 2021 to 2022, Motional has launched rides in autonomous vehicles on the Las Vegas strip on three separate transportation networks: Via, Lyft and Uber. Motional has partnered with the State of Nevada to bring high-paying jobs to the state and cutting-edge technology to Las Vegas. Instead of trying to build its own operation entirely from the ground up, Motional has partnered with three established players in the space who can focus on deployment. Motional, therefore, has the luxury of giving the technology its complete attention. For now, these rides are non-commercial and include safety drivers in the front seat.[184]

In 2023, a bill (Senate Bill 182) to impose heightened proof of ownership requirements on autonomous vehicle owners was introduced and passed. The law appears to exempt manufacturers of fully autonomous vehicles in Nevada from some franchise and repair regulations. Also, the Nevada Department of Motor Vehicles posted forms on its website enabling AV manufacturers and developers interested in testing their vehicles in Nevada to self-certify that their vehicles meet Nevada vehicle safety standards.

Bills Enrolled in 2021: Assembly Bill 412, Senate Bill 288

Bills Passed in 2021: Assembly Bill 412, Senate Bill 288

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 182

Bills Passed in 2023: Senate Bill 182

New Hampshire

After previously vetoing a bill to permit autonomous vehicle testing in New Hampshire, in 2019 Governor Chris Sununu signed into law a bill that created an automated vehicle testing pilot program in New Hampshire. The new law created an autonomous vehicle advisory commission, a testing pilot program and set requirements for vehicle deployment. The pilot program permits testing on public roads. House Bill 116, which did not pass the state legislature, would have codified delivery robots. Other efforts in the state are underway with respect to the use of autonomous technology, including in connection with maritime-related activities. In 2023, the University of New Hampshire entered into a partnership with Exail to launch an innovation hub to engage in all aspects of marine autonomous operations, including surface vehicles for exploration and ocean mapping, to "help meet the challenges of the growing blue economy.[185]"

Bills Introduced in 2021: House Bill 116

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

184 Motional opens Las Vegas robotaxis service to nighttime hours
185 UNH and Exail Open New Maritime Autonomy Innovation Hub

New Jersey

In 2019, New Jersey established an 11-member task force called the New Jersey Advanced Autonomous Vehicle Task Force to study autonomous vehicles and recommend laws, rules and regulations that New Jersey may enact to integrate autonomous transportation into the state's transportation system. However, since then, New Jersey has not passed any major legislation around autonomous vehicles. Year after year, bills are introduced to create a legal framework for AVs, but they never come to fruition.

However, after years of inactivity, things are beginning to change. In December 2021, Governor Phil Murphy announced that his office would partner with the New Jersey Department of Transportation, the City of Trenton and Princeton University to launch Trenton MOVES. Trenton MOVES will be the first autonomous vehicle-based urban transit system in the US. Companies are invited to share their interest in building an on-demand transit system that features 100 autonomous vehicles and serves the 90,000 residents of New Jersey's capital city. In February 2022, Trenton MOVES received a $5 million grant from the state's Department of Transportation to help support the project. Trenton MOVES says it has received interest from 20 different autonomous vehicle companies who want to participate in the project and has held a demo with May Mobility. The project won a state transportation award for its planning as it continues to move toward actuality.

Elsewhere in New Jersey, the Port Authority of New York and New Jersey (PANYNJ) ran a test period for two platooning autonomous shuttles from Navya that could be used to assist with first/last mile transport in crowded places of interest. The shuttles received rave reviews and were featured in a daily New York Times newsletter, where reporter James Barron described his experience stepping out in front of the shuttle to test its capabilities.[186] In Monmouth County, New Jersey, NJ Transit, in partnership with Rutgers University and Infratek Solutions, launched the AVATAR Pilot (Autonomous Vehicle Assessment, Testing and Research, Pilot). The pilot tested two 15-passenger AV shuttle vehicles on a closed course separate from public roads at the former Marlboro Airport.[187]

This year New Jersey lawmakers have introduced Assembly Bill 1589 which would permit testing and use of autonomous vehicles on State roadways under certain circumstances. Also introduced was Assembly Bill 1591 which clarifies that owners of self-driving vehicles must comply with existing insurance requirements.

Bills Introduced in 2021: SJR 17, AJR 138, A 1187, A 1189, A 1607, Senate 2129, A 2807

Bills Passed in 2021: N/A

Bills Introduced in 2022: Assembly Bill 1810, Assembly Bill 1812, Assembly Bill 2030, Assembly Bill 2031, Assembly Bill 2038, Assembly Bill 2495, Assembly Joint Resolution 43, Senate Joint Resolution 20

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Bills Introduced in 2024: Assembly Bill 1589, Assembly Bill 1591

186 The Day I Stood in the Path of a Driverless Bus
187 Can Autonomous Vehicles address the First-mile, Last-mile Problem?

New Mexico

New Mexico has historically seen a fair amount of autonomous vehicle investment, especially concerning autonomous trucks. However, until 2022, the state had no formalized framework for autonomous vehicles or autonomous vehicle testing. House Bill 270 defines autonomous vehicles as those with Level 3, 4 or 5 systems, regulates autonomous vehicles and autonomous vehicle testing, and allows for platooning. A bill was introduced in 2023 (House Bill 378) to prohibit an autonomous vehicle from transporting goods or passengers without a human operator physically present, but the bill appears to have been effectively rejected by the New Mexico legislature.

Already, New Mexico has seen this new legal framework pay dividends. Torc Robotics operates a testing center in Albuquerque.[188] Through its recent legislation, New Mexico has joined other Southwestern states such as Nevada, Arizona and Texas to create a sizable surface area of autonomous vehicle-supporting jurisdictions. This collaboration provides a solid testing area for autonomous trucks in particular, as they travel longer routes.

Moving forward, autonomous vehicle supporters are already expressing the need to invest in broadband access to fully realize the potential of CAV technology.

Bill Introduced in 2021: House Bill 270

Bills Passed in 2021: House Bill 270

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 378

Bills Passed in 2023: N/A

New York

New York has highly restrictive regulations on AV testing. Under legislation approved in 2017, any testing must be approved by the commissioner of the Department of Motor Vehicles, supervised by the New York State Police and levied with significant hourly and per mile rates. Some autonomous companies have tested their technology in private areas away from New York's regulations, but there have not been any sustained large-scale testing efforts.

From 2021 through 2022, there were reports that Mobileye, the Intel-backed autonomous vehicle company, tested at least two vehicles in New York City for a period of time. The rollout was not highly publicized, but was conducted in alignment with New York regulations.

In 2023, one Assembly bill (A00539A), and its Senate companion (S1012), were introduced to allow fully autonomous vehicles to operate on New York roads without a driver. However, neither bill appears to have gained any traction and may have been effectively discarded. The same fate appears to have befallen two other bills introduced in 2023: A00525, a bill to establish a task force on automated vehicle technology to study and assess the future of automated vehicle technology, and A2598, a bill to establish a task force to study autonomous vehicle usage on the roads located within the State of New York. Lastly, the Port Authority of New York and New Jersey partnered with Navya to launch two platooning autonomous shuttles as a limited project at John F. Kennedy International Airport.189

This year has brought a welcome change to the big apple. New Yorkers will soon see robotaxis fill their streets. Mayor Eric Adams signed off on allowing several autonomous vehicle companies to begin the testing phase.[190] "This technology is coming whether we like it our not, so we're going to make sure that we get it right."

188 Autonomous trucks prove their mettle on historic Route 66
189 PANYNJ to Host Second Platooning Demonstration of Autonomous Vehicles at JFK Airport
190 Eric Adams green-lights robotaxis in NYC

Adams said in a statement. "If we do, our streets can be safer, and our air could be cleaner." The main requirement during the testing phase is that all robotaxis will have a human operator if the car needs to be taken over manually. The city will also require companies that seek a permit to undergo a testing procedure and submit a safety plan to the DOT.

Bills Introduced in 2021: A639, A3743, A4280, A7744, S3909, S6993

Bills Passed in 2021: N/A

Bills Introduced in 2022: A9485, A9705, S8468

Bills Passed in 2022: N/A

Bills Introduced in 2023: A00539A, A00525, S1012, A2598

Bills Passed in 2023: N/A

North Carolina

In 2020, Governor Cooper signed Senate Bill 739 into law, allowing autonomous delivery devices in pedestrian areas and on highways. In 2022, the state legislature followed by passing Senate Bill 814, which codified and regulated "neighborhood occupantless vehicles." In contrast to SB 739, neighborhood occupantless vehicles are fully autonomous and do not require an operator.

The State of North Carolina has done more than pass legislation supporting autonomous vehicle technology and the autonomous vehicle industry. In 2023, the North Carolina Department of Transportation and the City of Cary, North Carolina, launched an experiment relating to autonomous vehicles involving the use of an all-electric, driverless shuttle pilot known as CASSI (Connected Autonomous Shuttle Supporting Innovation).[191] The experiment included a four-stop route from the Cary Senior Center to Bond Park Community Center.

North Carolina's esteemed universities have created a culture of excitement throughout the state at the thought of future technologies and mobility options. Researchers at NC State University have developed a technique that allows AVs to make important calculations more quickly through a cooperative distributed algorithm that breaks problems down into sub-parts that are solved in parallel.[192]

At North Carolina AT&T, university leaders are investing in autonomous vehicles and growing the school's fleet. Now, they have unveiled a two-mile test track that allows researchers to test vehicles in real-world conditions.[193] Faculty believe these autonomous shuttles could create more equitable transportation solutions in low-demand rural areas that need flexible solutions. When these shuttles are launched, City of Greensboro officials have discussed integrating their operations into the wider city-wide transportation equation.

Bills Introduced in 2021: House Bill 814

Bills Passed in 2021: House Bill 814

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

North Dakota

North Dakota permits autonomous vehicle operation, as long as the vehicle is capable of operating in compliance with all applicable federal and state laws. State law does not require a human driver to operate on the public highway if the autonomous vehicle is capable of achieving a minimal risk condition in case of a system failure. The law permits on-demand autonomous vehicle networks to provide transportation of persons or goods.

191 NCDOT releases data on CASSI autonomous shuttle pilot program
192 Connected and Autonomous Vehicles
193 N.C A&T UNVEILS AUTONOMOUS SHUTTLE ROUTE TO DOWNTOWN GREENSBORO

North Dakota also allows for truck platooning, subject to the Department of Transportation, in coordination with the State Highway Patrol superintendent, developing an operational plan that provides guidelines for operation. The plan must include operational information that is provided by a platoon technology provider or commercial motor vehicle operator.

In North Dakota, the agriculture industry is focused on utilizing autonomous technology to increase efficiency and production. The University of North Dakota received a $1 million grant from the Economic Development Administration (EDA) to study the economic impact of the state's uncrewed aerial systems network. Grand Farm, an initiative dedicated to improvements in farming, hosted an event bringing together growers, stakeholders and autonomous industry experts to focus on possible opportunities to collaborate. Relatedly, the State of North Dakota recently introduced and passed a law (ND H 1519) providing appropriations to the Department of Career and Technical Education and the Agriculture Commissioner for autonomous vehicle-related and other autonomous technology grants.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 1519

Bills Passed in 2023: House Bill 1519

Ohio

There are no laws in Ohio governing AVs, but there are relevant executive orders (EO) signed by former Governor John Kasich in 2018. The first EO created DriveOhio, a new division of the state DOT, that allows any company to test AVs in the state, so long as they register with DriveOhio and have a human operator behind the wheel. Four cities—Columbus, Dublin, Athens and Marysville—have already signed agreements with DriveOhio to test AVs on their streets, and the state has designated a 35-mile stretch of US Route 33 a "Smart Mobility Corridor" for the deployment of connected vehicle technologies. A $45 million SMART Testing Center opened in Logan County and is funded by a partnership between Ohio State University and the State of Ohio, will include an indoor highway track capable of simulating ice and snow year-round. The second EO created regulations for testing self-driving vehicles in the state.

DriveOhio previously deployed its Rural Automated Driving Systems project after two autonomous semi-trucks completed their controlled testing and, in partnership with the Indiana Department of Transportation and the Transportation Research Center, will build an I-79 Truck Automation Corridor.[194] The Corridor will be a lane for autonomous trucking between Columbus, Ohio, and Indianapolis, Indiana. DriveOhio continues to focus on long-term deployment of autonomous technology across the state.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

194 DriveOhio Deploys Automated Vehicles on Ohio Roadways

Oklahoma

Historically, Oklahoma has not prioritized autonomous vehicles, nor constructed any type of regulatory or legal framework. However, Governor Kevin Stitt has continued to sign autonomous vehicle legislation, including platooning laws, and the creation of the Oklahoma Advanced Mobility Pilot Program, which focuses on autonomous vehicle adoption. In the 2022 session, Oklahoma passed a law approving autonomous delivery vehicles. Notably, Oklahoma law makes clear that "Only the State of Oklahoma may enact a law or take any other action to regulate the operation of motor vehicles equipped with driving automation systems in Oklahoma" and state law "preempts county or municipality authority and supersedes county or municipality laws or ordinances."

In 2022, Governor Kevin Stitt partnered with outgoing Arkansas Governor Asa Hutchinson to create an innovative partnership for the states to collaborate on autonomous vehicle and future mobility work. Together, Arkansas and Oklahoma are paving a new path forward for states that want to attract the AV industry. While they may not possess the same natural advantages as California or Arizona, Arkansas and Oklahoma are encouraging their public educational institutions, economic development organizations and industry leaders to work together in creating an environment that advances current work while encouraging new investment from companies involved in future mobility work.

By creating out-of-the-box solutions, Governor Stitt and Governor Hutchinson have ensured that their states will not fall behind others, but still gather the full benefit of autonomous technology. An example of such a benefit is the fall 2023 launch of the first commercial autonomous trucking lane between Houston and Oklahoma City involving A.P. Moller – Maersk and Kodiak Robotics, Inc.[195]

Bills Passed in 2020: Senate Bill 1688

Bills Introduced in 2021: N/A

Bills Passed in 2021: Senate Bill 706

Bills Introduced in 2022: House Bill 3317, House Bill 3483, Senate Bill 1541

Bills Passed in 2022: Senate Bill 1541

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Oregon

Oregon has no current regulations in place concerning autonomous vehicles. However, House Bill 4063, signed by Governor Kate Brown on April 10, 2018, named the Oregon Department of Transportation (ODOT) the state's lead agency on automated vehicle policy and directed the ODOT to facilitate a task force on automated vehicles. The task force submitted its first report to the legislature on September 10, 2018 and its second on September 9, 2019. The task force voted to continue meeting on an ad hoc basis in response to significant developments in automated vehicle technology and policy. The task force dissolved on January 2, 2021. Meanwhile, ODOT's Office of Innovative Funding continues to provide a voluntary testing notification form to initiate the exchange of information between AV manufacturers and the agency. This voluntary notification process allows ODOT to provide safety information to interested companies, solicit feedback from AV system developers and track AV testing in the state.

In the past, different agricultural producers have utilized autonomous technology in Oregon and more integration in this space is anticipated in the future.

195 Maersk and Kodiak Robotics Launch the First Commercial Autonomous Trucking Lane Between Houston and Oklahoma City

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Pennsylvania

After years at the forefront of autonomous vehicle research, due in part to Carnegie Mellon University's history in the space, Pennsylvania has finally passed a comprehensive legal framework for autonomous vehicles via House Bill 2398, which took effect in July 2023.The law has successfully spurred autonomous vehicle-related initiatives into action, including a project funded by the Delaware Valley Regional Planning Commission's "Travel Options Program" that is designed to enhance access to the Navy Yard in South Philadelphia involving Drexel University and a mid-sized self-driving transit shuttle.[196] Consequently, Pennsylvania will be able to join in the investments from an industry that it helped incubate for years.

Now that autonomous vehicles can operate on public roads, many of the state's AV companies are looking forward to quickly moving toward commercialization. Even still, the state's autonomous technology industry has experienced some consolidation while major players in the space dissolve and send their expertise to other players in the field. This consolidation can benefit the industry in the long run as key experts collaborate and amplify each other's development efforts.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: House Bill 2398, Senate Bill 965

Bills Passed in 2022: House Bill 2398

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Rhode Island

Rhode Island has yet to pass legislation on that affects autonomous vehicles. The Rhode Island Department of Transportation started the Rhode Island Transportation Innovation Partnership (TRIP) in 2017 to encourage autonomous vehicle testing and usage. Multiple autonomous shuttles, including those relating to the "Little Roady" Pilot Project (which offered free rides on an autonomous shuttle along a 12-stop, 5.3-mile fixed route between Olneyville Square and the Providence Train Station), have conducted limited runs in the state.

Researchers at the University of Rhode Island continue to find innovative uses for automated technology and plan on including it in their new project, alongside the University of Hawai'i, to research "the shape, size and drifting speed of the icebergs, and the properties of the surrounding water."

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

196 Philadelphia navy yard embraces innovation with automated shuttle launch

South Carolina

South Carolina has yet to pass legislation that affects autonomous passenger vehicles, but it has exempted platoons from certain traffic laws.

As a major automotive manufacturing state, South Carolina will likely play a large role in producing the next generation of automobiles. BMW Manufacturing opened a new logistics center on Freeman Farm Road in Spartanburg, South Carolina, that utilizes autonomous vehicles to transport goods across two public bridges that lead to I-85. Additionally, Latitude AI, Ford's new wholly owned subsidiary whose mission is to develop a hands-free, eyes-off-the-road, automated driving system, will operate a highway-speed test track facility in Greenville, South Carolina.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

South Dakota

South Dakota has directed the Transportation Commission to promulgate rules to authorize the testing and operation of platooning at electronically coordinated speed and distance intervals that are closer than otherwise allowed under the "following too closely" laws in the state. Further, in January 2023, South Dakota introduced House Bill 1120, a bill designed to set up parameters for using autonomous vehicles in the state. However, the bill appears to have been, at least temporarily, discarded through an obscure legislative technicality known as a "Deferral to the 41st legislative day."

Raven Industries, a South Dakota-based company, is continuing to lead the way in integrating autonomous technology with agriculture, a process it calls "autonomous farming.[197]"

This year, the South Dakota legislature passed a law that established provisions for the operation of automated motor vehicles. The bill allows fully autonomous vehicles to operate on public roads of the State without a human driver. The bill was signed into law by Governor Kristi Noem.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 1120

Bills Passed in 2023: N/A

Bills Introduced in 2024: HB 1095

Bills Passed in 2024: HB 1095

Tennessee

Legislation passed in 2017 allows certified autonomous vehicles to operate in the state, provided they contain automatic crash recording and notification technology. The law also preempts local regulation of ADS-operated vehicles and specifies that the ADS shall be considered a driver for liability purposes when it is fully engaged and operated properly. Legislation introduced in 2023 (House Bill 0139 and Senate Bill 0083) appears to build on the 2017 legislation by eliminating regulatory requirements relating to the platooning of commercial vehicles and thus allowing, if not promoting, the use of autonomous commercial vehicles in platoons.

197 Driverless and Driver Assist Ag Solutions

The TennSmart consortium, made up of government agencies, universities and companies with ties to the state, hopes to encourage collaboration and innovation in the AV area.[198]

Vanderbilt University and the Tennessee Department of Transportation announced a partnership to conduct a road study on I-24 that examines how autonomous vehicles impact traffic. By recording traffic data and analyzing the videos, researchers will be able to identify where "phantom traffic" originates.[199] Phantom traffic is slowdowns created by human reactions to traffic conditions instead of wrecks or emergencies. In addition to analyzing video tape, researchers will introduce 100 autonomous vehicles onto the road to see if they can help mitigate the causes of phantom traffic. Last fall, researchers from the CIRCLES Consortium, which includes the previously stated members plus Nissan, Toyota and GM, launched this project in full. Now, selected testers are travelling along I-24, equipped with collection devices, each morning to gather data about traffic.

These vehicles utilize adaptive cruise control and communication technology to work in sequence to eliminate the stop-and-go traffic that clogs up morning commutes. If this project is successful, it could go a long way to eliminating "phantom traffic" as we know it.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023:
House Bill 0139, Senate Bill 0083

Bills Passed in 2023: N/A

Texas

Texas' geography and friendly regulatory climate have made it a magnet for autonomous vehicle testing for some time. However, over the last year, it seems almost every major autonomous vehicle company has launched a project across Texas' wide plains. Texas is commanding a California-like status in the AV industry, with new projects from several leading players in the AV space. The I-45 corridor, in particular, has become a hotspot for autonomous truck testing. State law allows an automated motor vehicle to operate in the state, regardless of whether a human operator is present in the vehicle, as long as certain requirements are met. Texas also preempts local regulation of automated motor vehicles and automated driving systems. During their 2021 legislative session, Texas lawmakers passed two autonomous vehicle laws. Senate Bill 1308 instructs the legislature to study autonomous and connected vehicles and House Bill 3026 exempts autonomous vehicles from irrelevant regulations. Texas provides the AV industry with interesting opportunities, as it encompasses both the idyllic college town-like setting of Austin, perfect for robotaxis, with major economic powerhouses, including Dallas-Fort Worth, and a strong trucking industry.

198 TennSMART SHAPING THE FUTURE OF INTELLIGENT MOBILITY IN TENNESSEE
199 Vanderbilt University conducts groundbreaking study to uncover cause of phantom traffic jams

While Texas may be positioned for maximum growth in the AV sector as an autonomous future moves forward, there appears to be some backlash to the rapid implementation of AV technology in the state. In 2023, of the bills introduced, two (Senate Bill 2024, Senate Bill 2156) may pose particular obstacles to the growth of AV in the state. Senate Bill 2024 would prevent the state from requiring the use of autonomous vehicles (and thus preclude a future where autonomous vehicles are required by the state), while Senate Bill 2156 would require human operators of autonomous vehicles to hold a valid divers' license (and thus exclude certain segments of the population with unique transportation needs, such as the elderly or disabled, from operating an autonomous vehicle).

Bills Enrolled in 2021: House Bill 3026,

Senate Bill 1308

Bills Passed in 2021: House Bill 3026, Senate Bill 1308

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House Bill 3274,

House Bill 4435, Senate Bill 2024, Senate Bill 2156

Bills Passed in 2023: N/A

Utah

Driverless vehicles are regulated on Utah roads under legislation approved in 2019. While all properly insured autonomous vehicles are allowed to operate, autonomous networks must be registered with the state. Vehicles must be operated in compliance with all applicable traffic and safety laws and must be able to achieve a minimal risk condition or make a request to intervene if a system failure occurs. Finally, Utah permits the Department of Transportation to obtain, collect and utilize anonymized location data of connected vehicles. In 2022, the state legislature passed House Bill 137, which clarified that a "human driver" operating an autonomous vehicle is still subject to traffic laws, including a prohibition against driving under the influence. Unlike some other Southwestern states, Utah has not seen widespread autonomous vehicle testing and acceptance. However, Utah is leading the way out West by partnering with the surrounding states of Montana, Idaho, Wyoming, Utah, Nevada, Colorado, New Mexico and Arizona to create ChargeWest. ChargeWest is committed to improving electric vehicle charger availability throughout the region. At the same time, the US Department of Transportation in 2023 increased funding for AV technology development, and the Utah Department of Transportation was one of the recipients of these funds. Altogether, these efforts will assist the AV movement by laying the groundwork for mass EV deployment and adoption.

Bills Introduced in 2021: House Bill 31

Bills Passed in 2021: N/A

Bills Introduced in 2022: House Bill 137

Bills Passed in 2022: House Bill 137

Bills Introduced in 2023: Senate Bill 264

Bills Passed in 2023: Senate Bill 264

Vermont

Vermont has established an automated vehicle testing program and granted authority to the Agency of Transportation to adopt specific rules. State law (Vt. Stat. Ann. tit. 23, § 4203 et seq.) requires that during a test, an operator is seated in the driver's seat of the automated vehicle monitoring the operation of the vehicle and is capable of taking immediate control, if necessary. Although the state may not be at the forefront of the autonomous vehicle industry, Vermont has spent significant effort ensuring that electric vehicles are able to secure a charger in the state when they need one.

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Virginia

Although Virginia has no laws or regulations specifically pertaining to autonomous vehicles, the state has taken an active role in encouraging testing and deployment. Seventy miles of Virginia highways have been designated "automated corridors"[200] and outfitted with high-definition mapping and data acquisition systems to support automated-vehicle testing. Virginia has become a hotbed of autonomous vehicle activity and shows that autonomous vehicles can operate in regulation-less states, as long as the operator adheres to state and federal laws.

Virginia's universities and institutions of higher learning are researching autonomous technology and continue to contribute to the autonomous sector. Virginia Tech has worked with Ford to research signals and communication systems for autonomous vehicles. Virginia Tech is home to the Virginia Tech Transportation Institute, which has partnered with the Governors Highway Safety Association (GHSA) to research how first responders can best interact with autonomous technology.[201] The University of Virginia is also making a name for itself in the autonomous space. UVA's Autonomous Racing Team participated in the Indy Autonomous Challenge and earned a spot as the fastest launched a new open-access tool that allows autonomous vehicle companies to examine and compare different cities and their conditions for autonomous driving.

At the beginning of 2022, Governor Glenn Youngkin appointed W. Sheppard "Shep" Miller III as Virginia's new Secretary of Transportation. Secretary Miller was the former chairman of Virginia Beach-based defense contractor KITCO Fiber Optics and a member of the Commonwealth Transportation Board. Miller has said he wants to position Virginia for success when future mobility options become more widespread.

To that end, Iteris Inc, a company focused on smart mobility infrastructure management, signed a contract to provide the Virginia Department of Transportation with connected and automated vehicle-related planning services.[202]

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: House 6001, Senate 6001

Bills Passed in 2023: House Bill 6001

Washington, DC

In 2012, the District of Columbia became one of the first jurisdictions to pass legislation regarding the testing of autonomous vehicles. On November 2, 2020, Mayor Muriel Bowser signed the Autonomous Vehicles Testing Program bill, which was approved by Congress just a few days later. The Act regulates the testing of autonomous vehicles on District roads through a testing program at the District Department of Transportation. To test an autonomous vehicle on public roads, an autonomous vehicle-testing entity must submit certain information to the DDOT for approval, including vehicle information for each vehicle tested; a safety and risk mitigation plan; and a description of the area and conditions under which an autonomous vehicle can function while being tested autonomously. Among other things, the bill requires crash and data reporting, including any crash of its vehicles while under autonomous operation that results in property damage, bodily injury or death.

In early 2022, Bill 24-134 was introduced in the DC City Council to modernize the city's autonomous vehicle framework. The bill has been unable to gain traction and has languished in committee.

200 Virginia Automated Corridors
201 ADVANCING TRANSPORTATION THROUGH INNOVATION
202 Iteris Selected By Virginia Department Of Transportation For Statewide Traffic Operation Center Services

In fall 2022, Mayor Bowser announced the city's first Mobility Innovation District (The MID) anchored in Southwest DC along the waterfront. The MID will include partnerships with the Office of the Deputy Mayor for Planning and Economic Development (DMPED), the Southwest Business Improvement District (Southwest BID) and community leaders. The district will focus on equitable access to transportation, Universal Basic Mobility (UBM) and electrification. Through the MID, DC has an opportunity to establish itself as a global hub for innovative transportation solutions.

Bills Passed in 2020: Bill 23-232 (Autonomous Vehicles Testing Program Bill)

Bills Introduced in 2021: Bill 134

Bills Passed in 2021: Bill 285

Bills Introduced in 2022: Bill 24-134

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Washington

While Washington State has a legal framework for autonomous vehicle, its regulations are not overbearing. Governor Jay Inslee signed an executive order in June 2017 to require that state agencies with pertinent regulatory jurisdiction "support the safe testing and operation of autonomous vehicles on Washington's public roads." The executive order establishes an interagency workgroup and enables pilot programs throughout the state. The order specifies certain requirements for vehicles operated with human operators present in the vehicle and for vehicles operated without human operators in the vehicle. In 2020, Washington passed House Bill 2676, which established minimum requirements for testing AVs, necessitating the reporting of planned local testing and any collision accidents. In 2021, Senate Bill 5460 defined autonomous vehicles as Levels 4 through 5, clarifying that Level 3 was not considered autonomous in Washington. The bill also provided the Department of Licensing additional rulemaking authority. In 2022, the state legislature considered multiple bills to change the reporting requirements for autonomous vehicles and autonomous vehicle testing. None of these bills were passed.

Multiple companies are self-certified to operate autonomous vehicles in Washington. Seattle, in particular, provides autonomous vehicle companies with an interesting test environment due to its unique streets, weather and diversity of transportation modes. However, in late 2022, Seattle passed new regulations for AV companies wanting to test their vehicles in the city. Now, AVs must obtain a permit from the city, have a human driver in the vehicle ready to take control, notify the city before testing and prominently display company logos on self-driving vehicles. The regulations also include an interesting requirement that companies notify the public before they launch a pilot program through two community events in order to receive a permit. These new regulations from Seattle, as well as an AV strategic plan published by Seattle and Bellevue in February 2023, show how cities can be active participants in the autonomous vehicle industry. Instead of relying on states to regulate, cities can make sure that the industry reflects their wishes and vision. It is possible, however, that such active participation by cities may come to an end should Senate Bill 5594, introduced in January 2023, come to pass.

Bills Passed in 2020: House Bill 2676

Bills Passed in 2021: Senate Bill 5460

Bills Introduced in 2022: House Bill 1731, House Bill 2070, House Bill 2100, Senate Bill 5828

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 5594

Bills Passed in 2023: N/A

West Virginia

After years of inaction, West Virginia has finally passed major autonomous vehicle legislation. In 2021, it approved legislation offering tax credits for autonomous vehicle companies. In 2022, the state legislature passed two bills concerning autonomous vehicles. House Bill 4675 codifies, regulates and defines autonomous and semi-autonomous delivery robots. House Bill 4787 is a comprehensive legal framework that defines autonomous vehicles as Level 4 and Level 5 systems, regulates autonomous vehicles and allows for all manners of operation, including commercial and non-commercial, with a driver and without a driver present and platooning. This new legislation will give autonomous technology companies security and certainty as they begin to deploy in West Virginia. West Virginia is clearly taking steps to make itself a home for autonomous vehicle activity.

Bills Introduced in 2021: House Bill 2760

Bills Passed in 2021: House Bill 2760

Bills Introduced in 2022: House Bill 4675, House Bill 4787

Bills Passed in 2022: House Bill 4675, House Bill 4787

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Wisconsin

Former Governor Scott Walker signed an executive order in May 2017 creating the Governor's Steering Committee on Autonomous and Connected Vehicle Testing and Deployment within the state's Department of Transportation. The committee was tasked with advising the governor "on how best to advance the testing and operation of autonomous and connected vehicles in the State of Wisconsin." The Committee submitted its report in 2018 and made several recommendations, including requiring municipal oversight, an application process and backup drivers. While these have yet to be enacted, the committee also noted that it believes current state law "does not prohibit the operation of autonomous vehicles." This position is reflected by official statements by the State of Wisconsin Department of Transportation.

Despite the lack of any legal framework, Wisconsin regularly sees autonomous vehicle activity in the state. In 2017, the USDOT named University of Wisconsin–Madison one of 10 "proving ground pilot sites" for autonomous vehicles. Since then, UW–Madison has helped create the Wisconsin Connected and Automated Transportation Consortium alongside multiple partners, including engineering firms, the city of Madison and even the Road American race course. Together, these partners provide support and designated testing facilities for autonomous vehicles. This year, the City of Racine announced the launch of its own driverless shuttle, the "Badger." Painted to resemble the University of Wisconsin mascot, this driverless shuttle is built in partnership with Perrone Robotics in Virginia, and help's the City of Racine live up to its "smart city" moniker.

The Wisconsin Department of Transportation partnered with Racine, Gateway Technical College and UW-Madison to use the "Badger" to train local law enforcement officials on how to interact with autonomous vehicles. Now that AVs are a part of the city's transportation infrastructure, officials wanted to ensure they are able to safely adapt to vehicles without a driver to deal with directly. Projects like these reinforce how important it is that the public be introduced to AVs in a safe and moderated environment where they can learn without any unnecessary fear or misunderstanding.

Bills Passed in 2019: N/A

Bills Introduced in 2020: N/A

Bills Passed in 2020: N/A

Bills Introduced in 2021: N/A

Bills Passed in 2021: N/A

Bills Introduced in 2022: N/A

Bills Passed in 2022: N/A

Bills Introduced in 2023: N/A

Bills Passed in 2023: N/A

Wyoming

In 2018, the Wyoming Department of Transportation director argued for the need to prepare for driverless vehicles. Wyoming is one of three states that received a grant from the USDOT in 2015 to participate in a connected vehicle pilot program tested along I-80. Yet, although Wyoming has established a voluntary reporting system for manufacturers conducting automated driving system vehicle testing within the state, there are still no laws or executive orders governing AV use in Wyoming, though self-driving vehicles are not specifically prohibited by law. In 2021, Yellowstone National Park launched autonomous shuttles named TEDDY (The Electric Driverless Demonstration in Yellowstone). These shuttles, provided by Beep, helped alleviate the summer crowds. In 2022, Senate File 16 sought to institute a comprehensive regulatory framework for autonomous vehicles in Wyoming, but failed in committee. The bill would have created markings requirements, insurance requirements and reporting requirements, and would have given authority to the Wyoming Department of Transportation to create further rules or regulations.

Bills Introduced in 2021: Senate Bill 7

Bills Passed in 2021: N/A

Bills Introduced in 2022: Senate Bill 16

Bills Passed in 2022: N/A

Bills Introduced in 2023: Senate Bill 1

Bills Passed in 2023: N/A

Key contacts/authors:

Eric Tanenblatt
Co-leader, Global Autonomous Vehicles and Principal, Washington, DC and Atlanta
eric.tanenblatt@dentons.com

Peter Stockburger
Co-leader, Global Autonomous Vehicles and Partner, San Diego
peter.stockburger@dentons.com

Anthony Pascua, Jr.
Managing Associate, Washington, DC
anthony.pascua@dentons.com

Walker Boothe
Associate Managing Director, Atlanta
walker.boothe@dentons.com

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