

In collaboration
with Accenture



Autonomous Vehicles: From Regulatory Diversity to Shared Learning

WHITE PAPER
SEPTEMBER 2026



Contents

Foreword	3
Executive summary	4
Introduction	5
1 A framework for AV policy-making	6
1.1 Strategic and foundational building blocks	8
1.2 Implementation building blocks	10
From regulatory diversity to shared evidence-based learnings	18
Appendices	19
A1 List of abbreviations	19
A2 Regional deep-dives	20
Contributors	29
Endnotes	31

Disclaimer

This document is published by the World Economic Forum as a contribution to a project, insight area or interaction. The findings, interpretations and conclusions expressed herein are a result of a collaborative process facilitated and endorsed by the World Economic Forum but whose results do not necessarily represent the views of the World Economic Forum, nor the entirety of its Members, Partners or other stakeholders.

© 2026 World Economic Forum. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, including photocopying and recording, or by any information storage and retrieval system.

Foreword



Akshay Joshi

Head, Centre for Frontier Technologies and Innovation; Head, Centre for Cybersecurity; Member of the Executive Committee, World Economic Forum



Juergen Reers

Senior Managing Director, Global Automotive & Mobility Lead, Accenture

Autonomous vehicles are entering a new stage of development. What was, until recently, a series of pilots and demonstrations is becoming a commercial reality across an increasing number of cities and freight corridors. As deployments grow, so too does the need for governance that enables innovation while maintaining public trust and safety.

This transition requires a different kind of collaboration. Technological progress alone is no longer the limiting factor. The challenge increasingly lies in translating operational experience into effective policy and regulation. Governments, industry and the wider mobility ecosystem each hold part of that knowledge, but no single organization or jurisdiction has the full picture.

That is why the World Economic Forum and Accenture have partnered on this white paper. Drawing on the Forum's DRIVE-A: Vehicle Autonomy executive community, it captures practical experience from jurisdictions already deploying level 4 autonomous vehicles. Rather than advocating a single regulatory model, it aims to support policy-makers as they navigate the choices needed to enable safe and scalable deployment.

The opportunity now is to move beyond learning within individual jurisdictions towards learning across them. Sharing implementation experience, strengthening collaboration and building on operational evidence will help ensure that autonomous vehicles deliver safer, more efficient and more accessible mobility systems around the world.

Executive summary

AV regulators face common trade-offs between safety, deployment speed and flexibility, creating opportunities for cross-regional learning.

Autonomous vehicles (AVs) are moving from pilots to commercial deployment across a growing number of cities and freight corridors worldwide. As deployments expand, policy-makers face a new challenge: how to govern safely, consistently and at scale.

This white paper provides a practical framework for AV policy-making. It structures the regulatory journey into five building blocks: policy objectives, liability, vehicle approval, trials and commercial operations. The latter three building blocks are supported by five cross-cutting implementation considerations: roles and responsibilities, the safety case, data governance, feedback loops and public acceptance. Together, these provide a common framework for understanding the policy choices authorities face as AVs are deployed on their roads.

The analysis compares regulatory approaches across China, Germany, Saudi Arabia, Singapore, the United Arab Emirates, the United Kingdom and the United States. Together, these jurisdictions capture a significant share of current L4 deployment activity worldwide. While the report body uses selected examples to illustrate the key policy trade-offs within each building block, the appendix provides a comprehensive overview of the regulatory approaches of each studied jurisdiction for the vehicle approval, trials and commercial operations stages.

A clear finding emerges: despite different legal systems, institutional structures and policy priorities, jurisdictions are increasingly confronting the same policy questions. For example, authorities consistently navigate similar trade-offs between safety assurance and deployment speed, regulatory oversight and operator flexibility, and harmonization and local adaptation. While regulatory approaches differ, the underlying governance challenges are remarkably similar.

This points to the next phase of AV policy-making. One priority is to continue strengthening the technical foundations for AV regulation by advancing a shared understanding of safety and a more consistent approach to safety evidence. This should build on the progress already achieved through the United Nations Economic Commission for Europe (UNECE) Global Technical Regulation on Automated Driving Systems (ADS). Another priority is to strengthen cross-regional learning from implementation. As more jurisdictions move from isolated trials to commercial deployment, exchanging practical experience across regulatory design, commercial operations and ecosystem integration can accelerate evidence-based policy-making, reduce unnecessary fragmentation and support the safe deployment of AVs.

Introduction

As AVs move from trials to commercial deployment, regulation must evolve to govern safety and operations at scale.

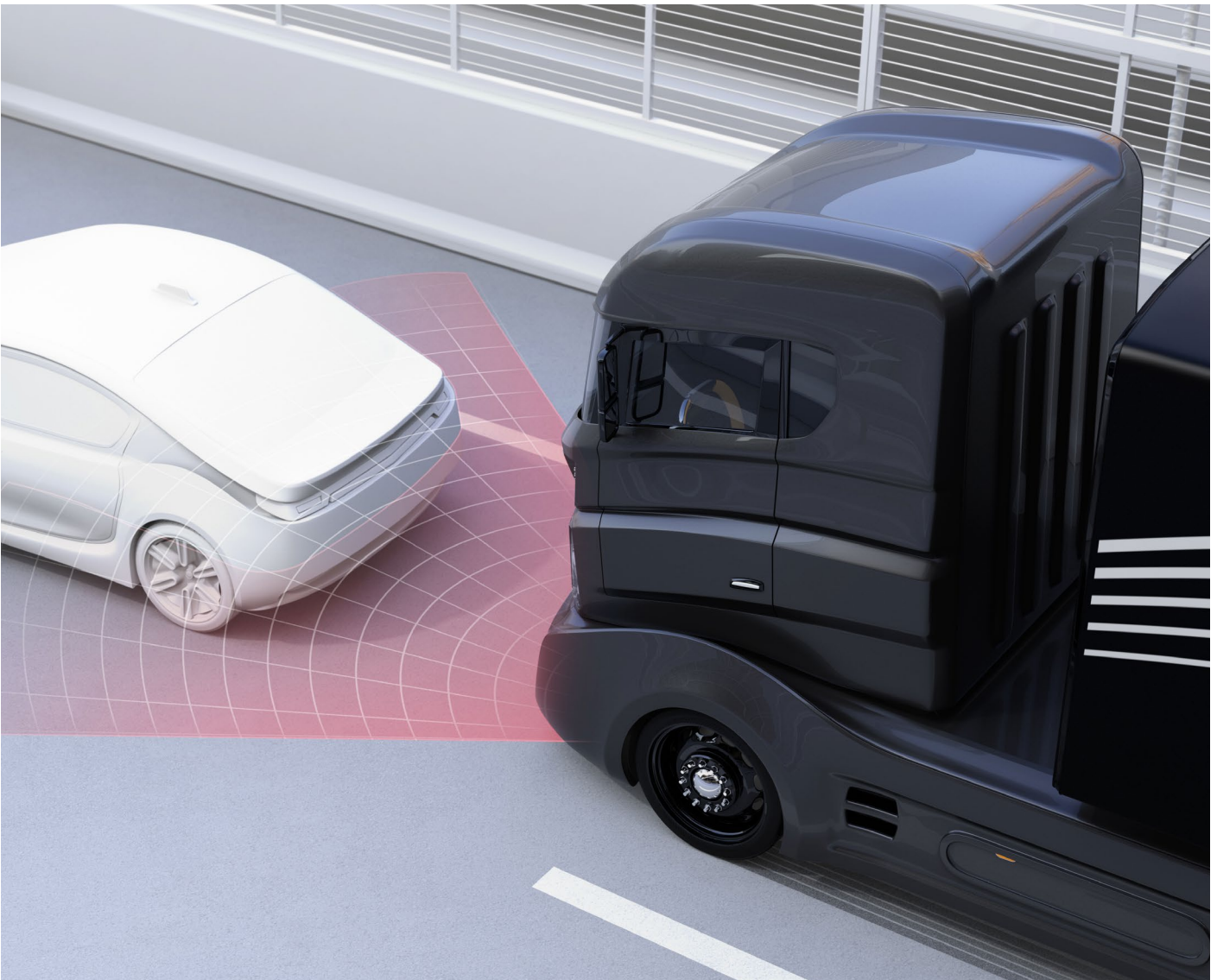
“ Jurisdictions continue to make different trade-offs between safety assurance and deployment speed, regulatory control and operator flexibility, and standardization and local adaptation.

No technology reaches safe deployment at scale without an enabling policy and regulatory framework. Autonomous vehicles (AVs) are no exception. As AV deployments expand worldwide, governments have had to define responsibilities, authorize operations and adapt existing regulatory frameworks.

The United Nations Economic Commission for Europe (UNECE) has established a common foundation for AV regulation, but many decisions remain unresolved. Jurisdictions continue to make different trade-offs between safety assurance and deployment speed, regulatory control and operator flexibility, and standardization and local adaptation.

There is no single right approach, but greater cross-jurisdictional exchange can accelerate learning and reduce unnecessary fragmentation.

This white paper examines level 4 (L4) AVs, as defined by SAE J3016,¹ which are capable of operating without a human driver within a defined operational design domain (ODD). It organizes AV policy-making into five regulatory building blocks, compares approaches across China, Germany, Saudi Arabia, Singapore, the United Arab Emirates, the United Kingdom and the United States, identifies common policy challenges, and outlines priorities for stronger cross-regional and public-private collaboration.



1

A framework for AV policy-making

Five building blocks frame the AV regulatory journey, from policy objectives to commercial deployment.

AV policy-making can be organized into five core building blocks (Figure 1). Policy objectives and liability establish the strategic foundation, while vehicle approval, trials and commercial operations govern implementation. Cross-cutting implementation considerations underpin the building blocks of implementation. Together, these elements evolve iteratively as deployments generate new evidence and experience.

This paper examines all five building blocks, with particular emphasis on those in the implementation layer, where many of the most pressing policy questions remain unresolved and where cross-regional and public-private collaboration can have the greatest impact.

Figure 2 shows the main L4 robotaxi, roboshuttle and autonomous truck deployments across the jurisdictions examined in this paper: China, Germany, Saudi Arabia, Singapore, the United Arab Emirates, the United Kingdom and the United States (California, Nevada and Texas). The jurisdictions examined capture a significant share of current L4 deployment activity worldwide.

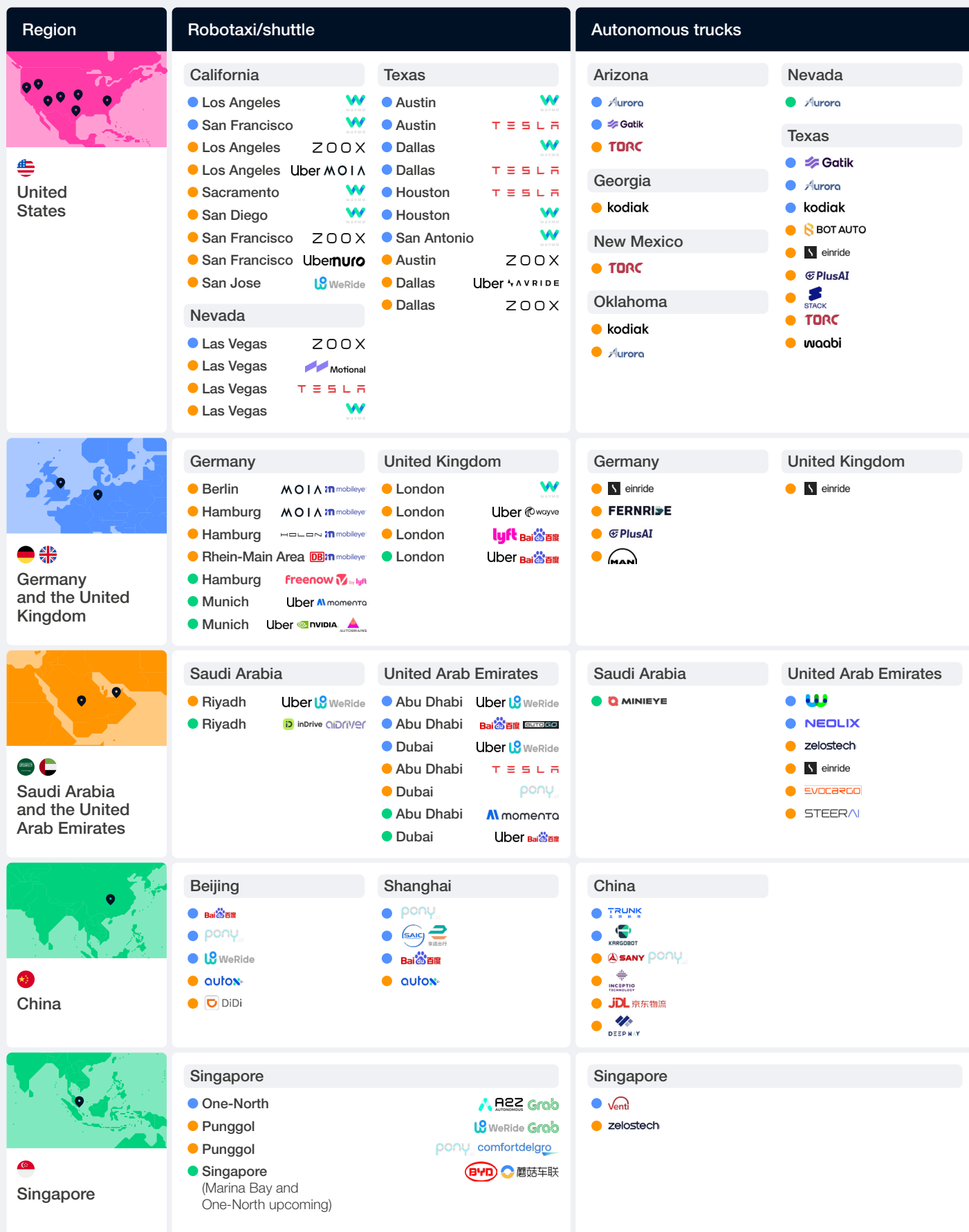
While the main text highlights selected examples to illustrate key policy choices and trade-offs, Appendix 2 provides a comprehensive overview of the regulatory approaches in each studied jurisdiction for the vehicle approval, trials and commercial operations stages.

FIGURE 1 Building blocks on the path to AV implementation

	Strategic and foundational building blocks		Implementation building blocks		
	Policy objectives	Liability	Vehicle approval	Trials	Commercial operations
Definition	Strategic goals and societal priorities guiding AV deployment	Legal framework allocating responsibility for AV-related incidents, including insurance, civil and criminal liability	Certification frameworks and requirements for approving AVs for operation on public roads	Structured pilot deployments designed to generate evidence for regulatory, safety and operational decision-making	Operational rules and conditions governing the deployment and integration of AVs into the transport ecosystem
Key dimensions			- Approval model - Safety validation - Approval life cycle	- Trial access - Trial safety oversight - Trial conditions - Trial evaluation	- Safety oversight - Safety operations - Ecosystem integration
Cross-cutting implementation considerations			Roles and responsibilities		
			Safety case		
			Data governance		
			Feedback loops		
				Public acceptance	

Source: World Economic Forum.

FIGURE 2 | Overview of main L4 robotaxi/shuttle and autonomous truck deployments across leading regions (non-exhaustive snapshot, as of July 2026)



Deployment status ● L4 commercial deployment ● Test/pilot/early access – with and/or without safety driver ● Announced



1.1 Strategic and foundational building blocks

Policy objectives

Policy objectives define what jurisdictions seek to achieve through AV deployment and shape the regulatory choices that follow. A review of published AV strategies identifies four recurring objectives (Figure 3):

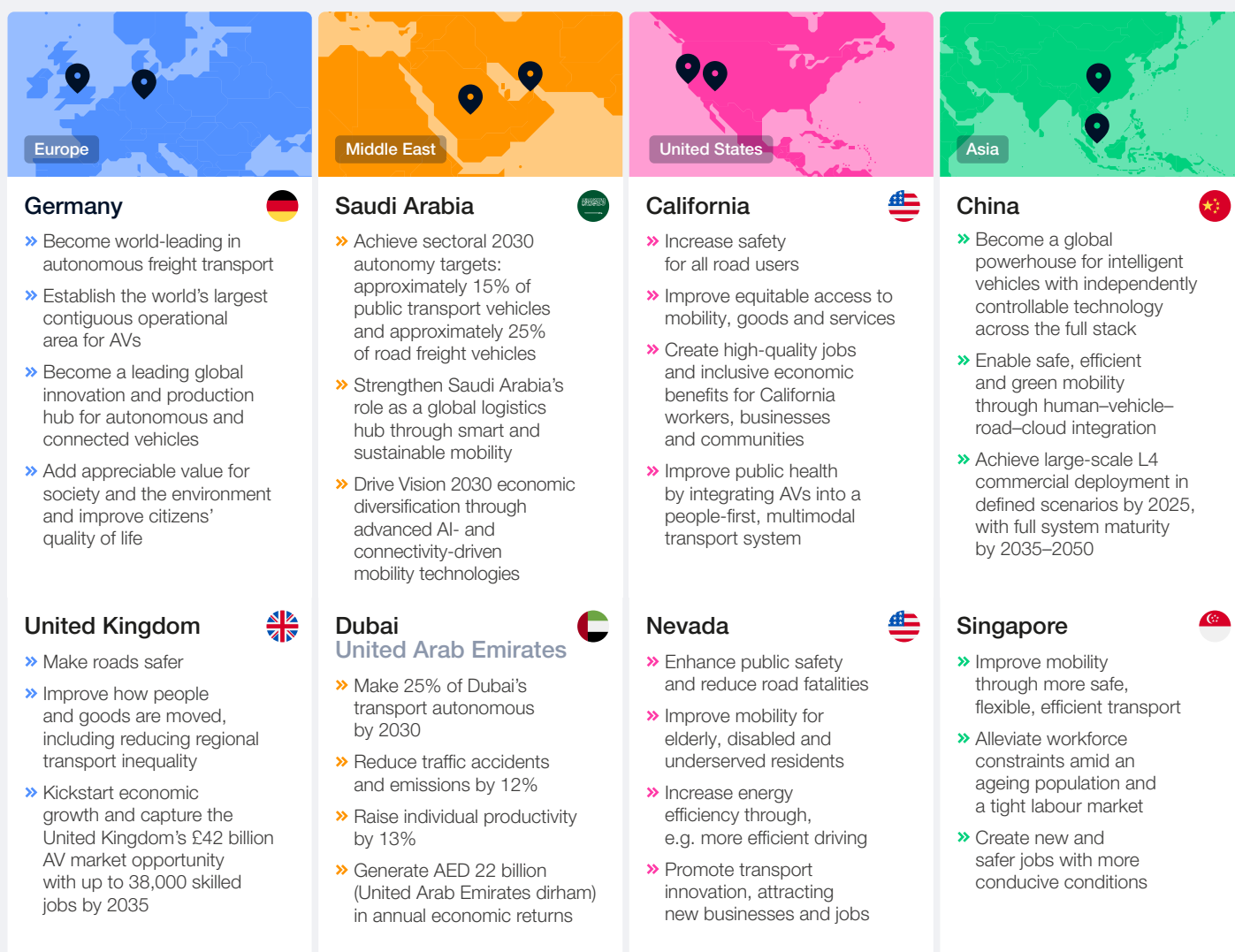
-  **Safety:** reduce road accidents and fatalities by addressing human error
-  **Transport and mobility:** improve the efficiency, reliability and accessibility of passenger and freight transport
-  **Industrial competitiveness:** attract investment, encourage innovation and strengthen domestic AV ecosystems
-  **Environmental:** reduce emissions and support broader decarbonization goals, including electrification

These objectives differ in the degree to which they depend on AV deployment. Safety is the technology's core value proposition and the objective for which evidence is currently strongest. For example, early analyses of Waymo² and Baidu³ Apollo technologies suggest lower injury-causing crash rates than comparable human-driven vehicles. Industrial competitiveness can also be advanced directly through AV deployment by attracting investment, accelerating innovation and building domestic capabilities.

By contrast, transport and environmental outcomes depend largely on the broader policy framework in which AVs operate. Whether AVs improve transport efficiency or reduce emissions is shaped by complementary policy choices, including service design, fleet electrification, vehicle occupancy, modal shift and integration with the wider transport system.

The objectives that jurisdictions prioritize ultimately shape regulatory decisions across vehicle approval, trials and commercial operations, as explored throughout this paper.

FIGURE 3 | Autonomous vehicles policy objectives (non-exhaustive) across selected geographies



Sources: Federal Ministry of Transport (BMV). (2024). *Strategy for Autonomous Driving in Road Traffic*; Centre for Connected and Autonomous Vehicles (CCAV). (2022). *Connected & Automated Mobility 2025: Realising the Benefits of Self-Driving Vehicles in the UK*; Shatnawi, I., Gonzalez, J. N., & Masoud, N. (2025). *Toward AV-CAV deployment in the Kingdom of Saudi Arabia: A readiness assessment based on expert feedback. Research in Transportation Business & Management*, vol. 60, no. 101378; Connected Automated Driving Europe (CCAM). (2023). *Strategic Deployment Agenda*; California State Transportation Agency (CalSTA). (2022). *Autonomous Vehicles Strategic Framework: Vision and Guiding Principles*; Nevada Department of Transportation (NDOT). (n.d.). *Autonomous and Connected Vehicles*. <https://www.dot.nv.gov/mobility/avcv>; National Development and Reform Commission (NDRC). (2020). *Strategy for Innovation and Development of Intelligent Vehicles*; Ministry of Transport Singapore (MOT). (n.d.). *Automated/Autonomous Vehicles*. <https://www.mot.gov.sg/what-we-do/automated-autonomous-vehicles/>.

Liability

Liability is one of the defining policy decisions for AV deployment. At L4, where no human driver is responsible for the driving task, traditional driver-based fault models become less applicable, while establishing manufacturer liability under conventional product liability regimes may be challenging given the complexity of autonomous systems. Determining who bears primary responsibility, therefore, influences the design of insurance, operational oversight and accountability.

Four broad approaches can be observed across leading jurisdictions (Figure 4): statutory insurer-

first liability (United Kingdom), distributed statutory liability (Germany), operator-centric liability (China and Dubai) and litigation-driven product liability (United States). Other jurisdictions, including Saudi Arabia and Singapore, continue to operate under transitional arrangements while developing dedicated AV liability frameworks.

As AV deployment expands, greater alignment between liability frameworks will become increasingly important. Freight operations are expected to extend across borders, while operators expanding internationally already face fundamentally different risk profiles depending on the jurisdiction. These differences affect insurance, pricing and operational models. Unlike vehicle approval,

however, liability remains rooted in national civil and insurance law, with no dedicated international framework governing AV liability.

Aviation illustrates how international alignment can support cross-border operations while maintaining high safety standards. Three lessons are particularly relevant for AVs. First, greater convergence around minimum insurance requirements could reduce fragmentation for operators and insurers. Second,

separating safety investigations from liability proceedings could encourage data sharing and strengthen evidence-based regulation. Third, as AV operations increasingly cross national borders, greater interoperability between national liability frameworks may become necessary. This could ultimately require either a dedicated international convention establishing common liability principles or building on existing frameworks for the recognition and enforcement of foreign judgments.

FIGURE 4 Primary liability allocation models across selected geographies

Primary liability models

Statutory insurer-first liability

Insurer is liable to compensate injured parties first; recovery from manufacturers or other responsible parties follows

Distributed statutory liability

Liability is allocated across multiple statutory duty-holders

Operator-centric liability

Operator is the primary risk-bearer; recovery from manufacturers or technology providers is managed through contracts and insurance

Litigation-driven product liability

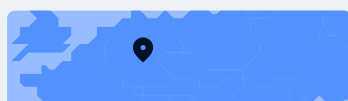
Product-liability litigation as primary mechanism rather than AV-specific legislation

Regional examples



United Kingdom

The 2018 Automated and Electric Vehicles Act makes the motor insurer directly liable to victims. The 2024 Automated Vehicles Act identifies the authorized self-driving entity (i.e. the manufacturer or software provider) and the no-user-in-charge operator (i.e. the service operator) as the entities from which insurers may recover costs.



Germany

Three statutory duty-holders share liability: the vehicle keeper is strictly liable under the Road Traffic Act regardless of fault; the manufacturer is liable where a defective product is proven; the technical supervisor is personally liable for breaches of supervisory duties under the 2021 Autonomous Driving Act.



Dubai United Arab Emirates

The operator is the primary risk-bearer for any damage caused during AV operations. Recovery from manufacturers or technology providers is governed through commercial contracts and insurance.

Beijing China

The manufacturer bears responsibility for vehicle quality and production, while the operator bears responsibility for operational performance.



United States

No AV-specific civil liability statute. Courts determine liability under state product liability law, allowing claims for defective design, manufacturing or software without requiring proof of negligence.

Sources: UK Government. (2018). *Automated and Electric Vehicles Act 2018*; UK Government. (2024). *Automated Vehicles Act 2024*; Federal Republic of Germany. (2021). *Road Traffic Act, as amended by the Act on Autonomous Driving of 12 July 2021*; Government of Dubai. (2023). *Law No. (9) of 2023 Regulating the Operation of Autonomous Vehicles in the Emirate of Dubai*; Standing Committee of the Beijing Municipal People's Congress. (2024). *Regulations of Beijing Municipality on Autonomous Vehicles*. https://www.beijing.gov.cn/zhengce/dfxtg/202501/t20250103_3980149.html; Geistfeld, M. A. (2017). *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*. *California Law Review*, 105(6), 1611–1694. <https://ssrn.com/abstract=2931168>.

1.2 Implementation building blocks

Cross-cutting implementation considerations

Implementation rests on three building blocks: vehicle approval, trials and commercial operations. This paper first examines five cross-cutting considerations that underpin these three building

blocks: roles and responsibilities, the safety case, data governance, feedback loops and public acceptance. Table 1 summarizes their focus and illustrative approaches addressing them. Box 1 then highlights the international harmonization efforts on two of these aspects, the safety case and data governance, through the UNECE *Global Technical Regulation on Automated Driving Systems (ADS)*.

TABLE 1 | Cross-cutting considerations underpinning AV implementation

Cross-cutting consideration	Focus	Key challenge	Illustrative mechanisms to address the challenge
 Roles and responsibilities	Allocating institutional responsibilities and coordination across national, regional and local authorities	Fragmented responsibilities across levels, leading to gaps, overlaps and inconsistent regulatory decisions	United Kingdom: centralized statutory governance divides responsibility between the Vehicle Certification Agency (VCA) for pre-deployment authorization and the Driver and Vehicle Standards Agency (DVSA) for in-use regulation, with local authorities limited to passenger service consent
 Safety case	Defining what constitutes “safe enough” and how the safety case is established, maintained and updated	No common definition of “safe enough” and limited consensus on how the safety case should evolve as evidence accumulates	California, United States: a living safety case is continuously updated using operational and incident data shared with regulators to further assess safety as new evidence emerges
 Data governance	Determining data requirements, governance, access, storage and sharing	Lack of clear and consistent data frameworks limits oversight, learning and comparability across operators.	China: national data governance framework requires domestic storage of key data, with security assessments for cross-border data transfers
 Feedback loops	Establishing mechanisms to integrate operational learning into regulation and share knowledge across stakeholders	Limited mechanisms to systematically translate real-world experience into regulatory improvements and to share insights across stakeholders and regions	United Kingdom: automated passenger services (APS) permitting scheme designed to feed operational learning directly into secondary legislation Texas, United States: Connected and Autonomous Vehicles (CAV) Task Force provides a structured public-private forum for sharing experience and informing policy development
 Public acceptance	Building public trust and communicating AV deployment	Limited public understanding of AV technology and its safety performance can lead individual incidents to disproportionately shape perceptions of overall safety	United Kingdom: Partners for Automated Vehicle Education (PAVE) UK provides independent public education through a multi-stakeholder coalition Singapore: gradual deployment focuses on visible local benefits, predictable service design and minimizing disruption to existing transport services

BOX 1 | **UNECE framework for safety case and data governance harmonization for automated driving**

The UNECE global framework for ADS establishes the first globally harmonized regulatory baseline for L4 automated driving systems. It was adopted by the UNECE World Forum for Harmonization of Vehicle Regulations in June 2026 as both a UN regulation under the 1958 Agreement and a parallel Global Technical Regulation (GTR) under the 1998 Agreement.⁴

For the safety case, the UNECE ADS framework establishes a common methodology based on a claim–argument–evidence framework, supported by a life cycle safety management system, validation across simulation, test-track and real-world testing, and continuous in-service monitoring.

It also establishes a common safety objective by requiring an ADS to perform at least at the level of a “competent and careful human driver”. However, it does not prescribe quantitative safety thresholds, evidence requirements or assessment methodologies, leaving these decisions to national authorities.

For data governance, the framework requires vehicles to be equipped with a data storage system for automated driving (DSSAD) and establishes standardized reporting of safety-relevant operational data. Decisions on data ownership, access, localization, sharing and the regulatory use of data remain within national frameworks.

Vehicle approval

Vehicle approval determines the conditions under which AVs may operate on public roads. Within vehicle approvals, testing permits and exemptions enable trials, while more comprehensive approval mechanisms govern commercial deployment. Unlike traditional vehicle homologation, which

verifies that vehicle hardware meets defined requirements at the point of approval, AV approval concerns software-defined systems that continue to evolve through updates. Safety must therefore be demonstrated through new forms of evidence and continuously assured in operation.

Two foundational regulatory philosophies have emerged for the approval of AVs: type approval

“ Regardless of the approval model, authorities face a common set of policy choices.

and self-certification. **Type approval**, used across the European Union, the United Kingdom and China, requires a designated authority to assess the vehicle and its ADS before deployment. Germany has developed one of the world’s most comprehensive pathways for L4 type approval, requiring extensive documentation, scenario-based validation, as well as assessment of safety, cybersecurity and data governance. However, no operator has yet been in a position to pursue the full operating-permit regime, as all current deployments remain at the testing stage. China initially applied a comparable approval model through local pilot programmes, notably in Guangzhou, and is now extending it nationwide through mandatory ADS safety requirements that will take effect in 2027.⁵

Self-certification, used in the United States, places responsibility on manufacturers to demonstrate compliance with Federal Motor Vehicle Safety Standards (FMVSS). As these standards were developed for human-driven vehicles, certain AV configurations continue to require exemptions while the regulatory framework evolves.⁶

Alongside these two foundational models, a growing number of jurisdictions, including Dubai,

Saudi Arabia and Singapore, are adopting a third approach: **continual operational safety assessment**. Rather than relying on a single approval decision, deployment expands progressively as operators demonstrate safe performance through technical assessment and real-world operational evidence.

Elements of this third approach are also emerging within type-approval and self-certification regimes, as they move towards continuous oversight based on safety management systems, post-deployment monitoring and standardized operational data, consistent with the UNECE Global Technical Regulation on Automated Driving Systems. This convergence is reflected in the National Highway Traffic Safety Administration’s (NHTSA) increasing emphasis on post-deployment oversight^{7,8} and in UN Regulations 155 and 156, which require ongoing manufacturer compliance with cybersecurity and software-update requirements under regulatory supervision.^{9,10} Figure 5 illustrates this convergence.

Regardless of the approval model, authorities face a common set of policy choices. Table 2 illustrates the main trade-offs by comparing contrasting regulatory choices across leading jurisdictions.

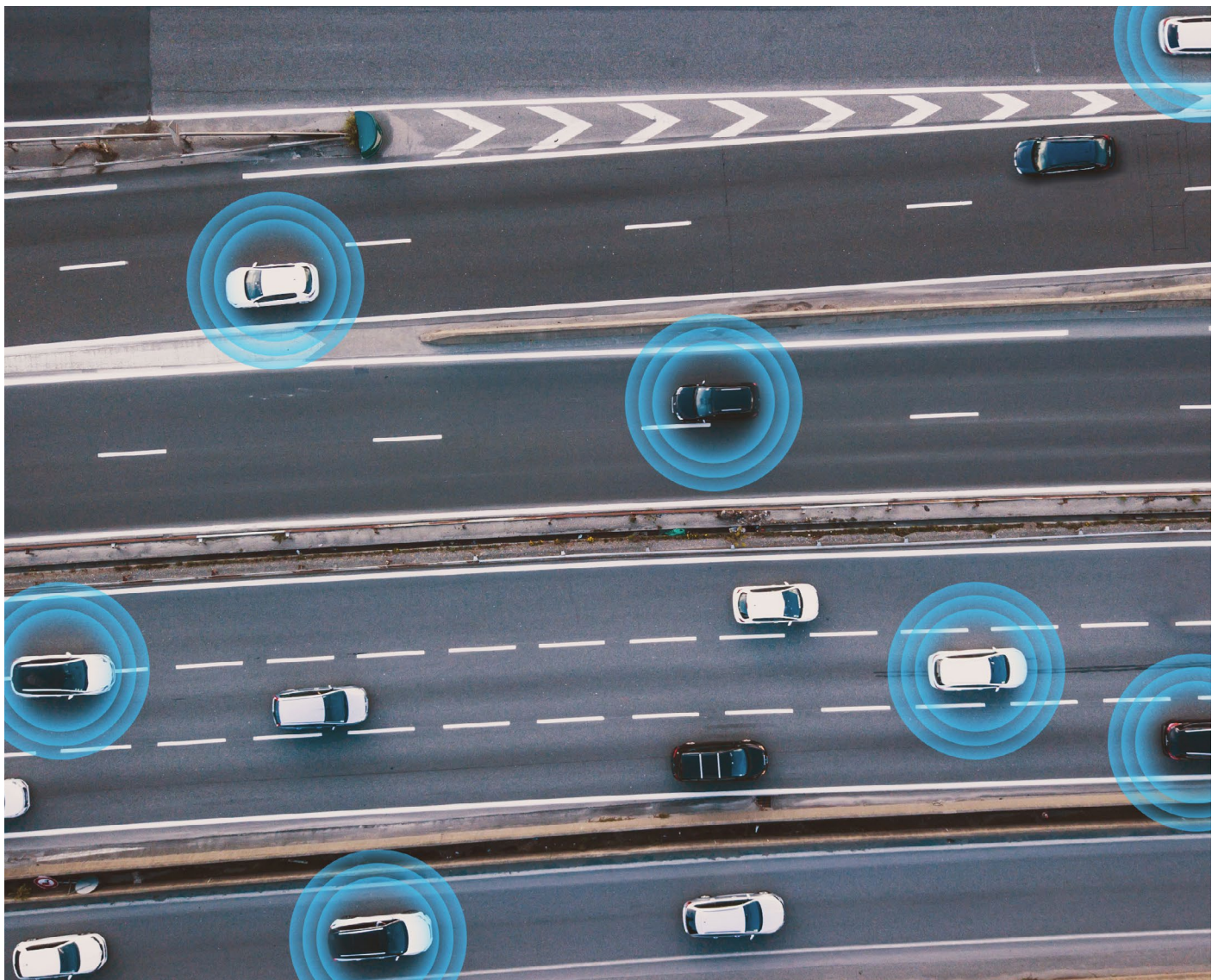
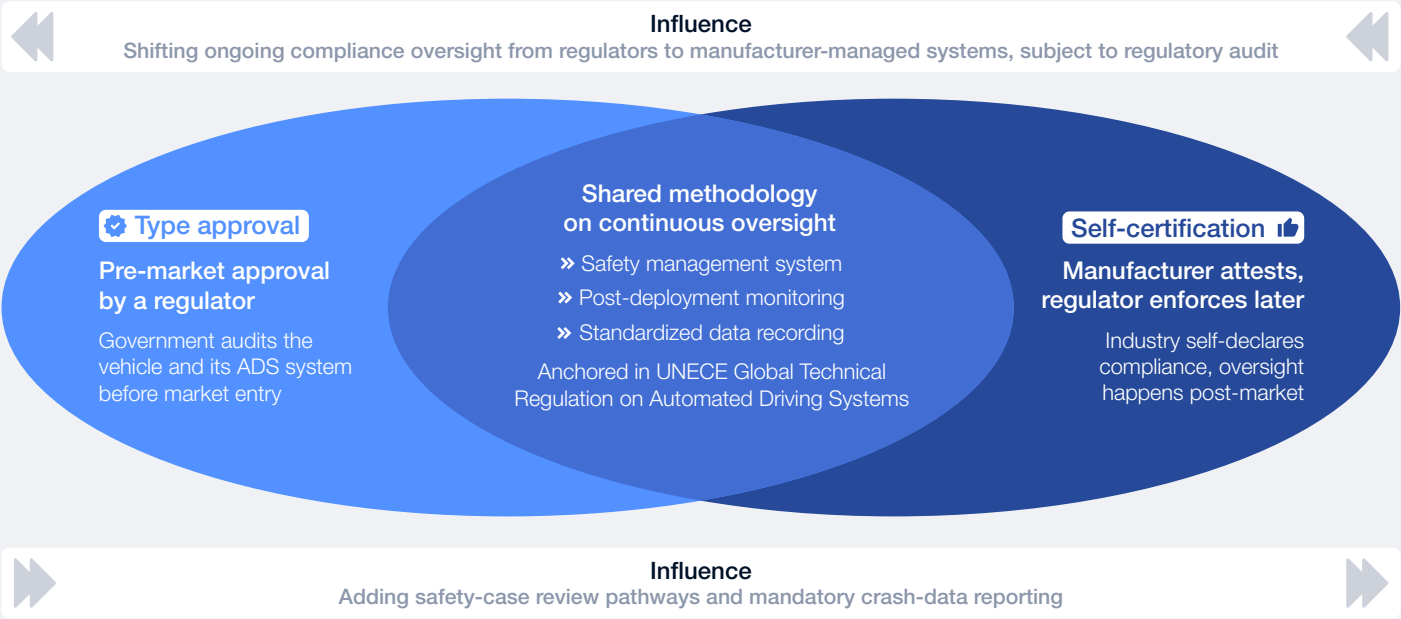


FIGURE 5 | Convergence between type approval and self-certification towards continuous oversight



Source: World Economic Forum.

TABLE 2 | Key decisions and trade-offs for authorities for vehicle approval

Dimension	Key policy question	Core trade-off	Contrasting regulatory choices	
Approval model	How should AV approval be organized?	Purpose-built framework vs. adapting existing regulation	United Kingdom: The Automated Vehicles Act 2024 establishes a dedicated AV authorization regime alongside type approval, assigning legal responsibility to an Authorized Self-Driving Entity (ASDE). It provides AV-specific regulatory tools but requires significant institutional and legislative investment.	United States: AVs are self-certified against existing Federal Motor Vehicle Safety Standards (FMVSS), with exemptions required only where vehicles cannot comply with legacy standards (e.g. no steering wheel). This enables rapid deployment but provides limited AV-specific regulatory tools.
Safety validation (safety evidence and assessment capability)	What evidence should demonstrate safety?	Upfront assurance vs. deployment speed	European Union: Pre-market approval requires a comprehensive safety case, including a safety management system, scenario-based validation and independent technical assessment before deployment.	United States: No federal pre-market assessment of ADS performance. Safety evidence is primarily reviewed after deployment through Standing General Order (SGO) crash reports and investigations.
	Who should assess the safety evidence?	Centralized independent assessment vs. multiple accredited assessors	Singapore: The Land Transport Authority relies on CETRAN AV Test Centre (Centre of Excellence for Testing & Research of Autonomous Vehicles) as the current designated independent technical assessor, concentrating assessment capability within a single nationally appointed institution.	Germany: Assessment is delegated to multiple accredited technical services (e.g. TÜV, DEKRA), harnessing established private-sector expertise while the regulator retains approval authority.
Approval life cycle	When should approval be revisited?	Regulatory certainty vs. adaptability	European Union: Safety-relevant software updates that affect type approval require renewed regulatory assessment, while other updates do not. Enables continuous oversight but may slow software iteration.	United States: Software updates do not trigger formal re-approval. Manufacturers remain responsible for continued compliance, while regulators intervene retrospectively through investigations and recall powers where safety concerns arise.

“ Despite differences across jurisdictions, trial design consistently revolves around four dimensions: trial access, safety oversight, trial conditions and evaluation.

Trials

Trials expose AVs to real-world conditions and operational complexity that simulation and structured validation cannot fully replicate. While trials with a safety driver allow earlier public-road testing, driverless trials provide the strongest evidence of system performance and are therefore widely treated as the final step before commercial deployment.

Despite differences across jurisdictions, trial design consistently revolves around four dimensions: trial access, safety oversight, trial conditions and evaluation (Table 3). Decisions on these dimensions give rise to different trial regulatory approaches (Figure 6). These differ along two key dimensions: the degree of operator autonomy in designing and conducting trials, and whether trials operate under existing legal frameworks or within dedicated regulatory sandboxes.

Texas and Nevada represent operator-led approaches under existing legal frameworks. California and Dubai combine dedicated AV legislation with structured, milestone-based

progression towards deployment. Saudi Arabia and Singapore both operate regulatory sandboxes, but with different progression models: Saudi Arabia relies primarily on operator self-assessment against regulatory requirements, whereas Singapore defines progression through regulator-led milestones.

Despite these different approaches, three common challenges remain. First, differences in testing stages, safety oversight and progression criteria limit the comparability of trial results. Second, inconsistent safety conditions create different user expectations of AV safety. Lastly, the absence of common evaluation metrics makes it difficult to determine when systems are ready for commercial deployment. Together, these gaps limit cross-regional learning.

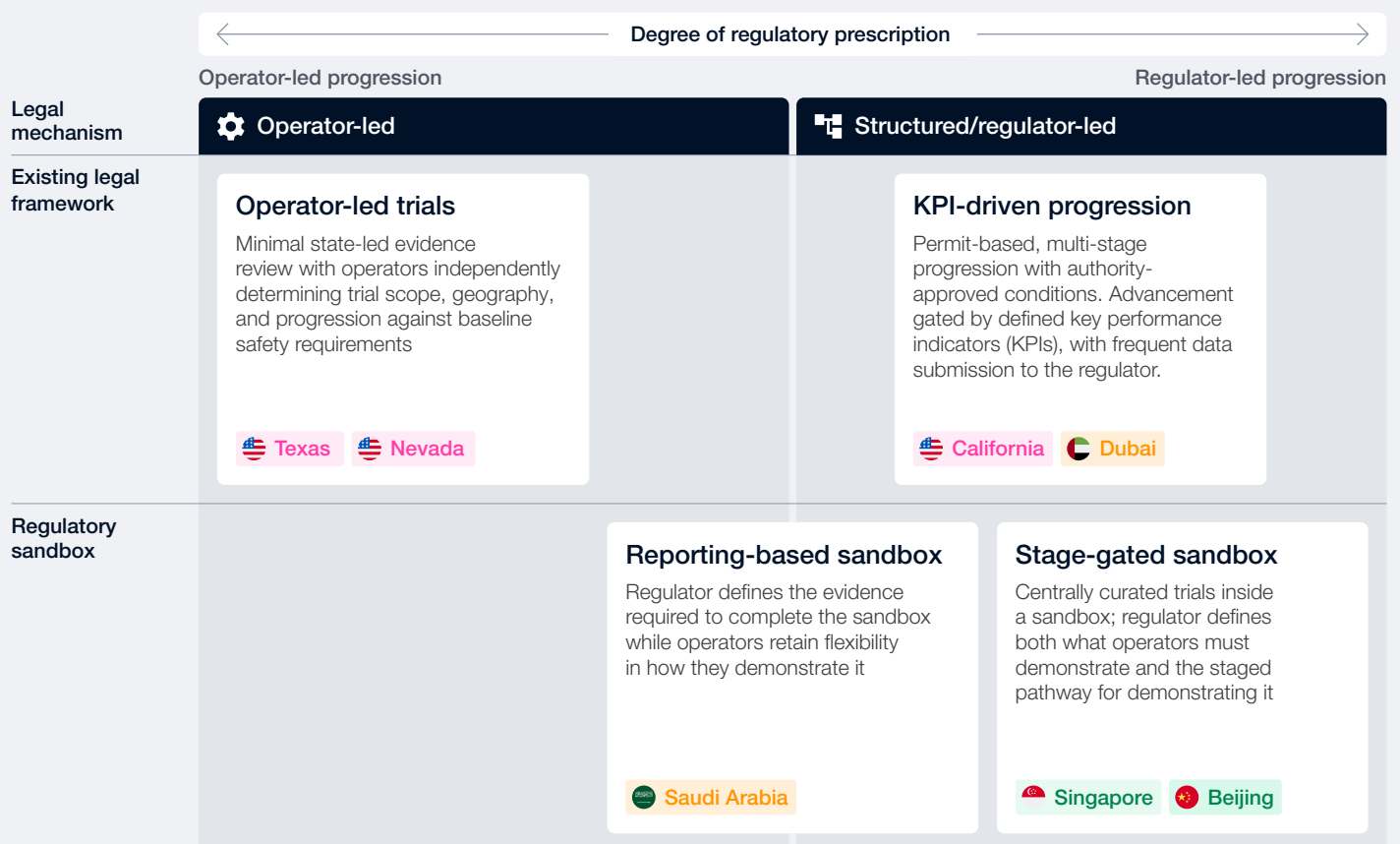
Addressing these challenges does not require a single global trial model. Greater alignment in trial design and evaluation (including common trial stages, baseline operational safeguards and more consistent performance metrics) would improve comparability while preserving flexibility for local conditions. Performance thresholds, however, could still remain jurisdiction-specific.

TABLE 3 Key policy choices and trade-offs in AV trials

Dimension	Key policy question	Core trade-off	Contrasting regulatory choices	
 Trial access	What requirements beyond vehicle approval should operators meet before public-road trials?	Upfront regulatory assurance vs. rapid ecosystem entry	Germany: Public-road trials require prior authorization by the Federal Motor Transport Authority (KBA), including review of the development concept, monitoring arrangements, qualified supervision and trial area. This provides stronger upfront assurance but raises the regulatory threshold for testing.	Texas, United States: There is no dedicated trial regime. Operators self-attest compliance with baseline legal and safety requirements and may begin trials without a state-led safety case review. This enables rapid entry but places greater reliance on operator responsibility.
 Trial safety oversight	What monitoring and reporting should apply during trials?	Continuous regulatory oversight vs. operator-led monitoring	Singapore: Operators must equip all trial vehicles with a black-box data recorder and submit operational data regularly to the Land Transport Authority (LTA), enabling ongoing regulatory oversight throughout the trial.	Texas, United States: There is no state-specific trial reporting. Safety oversight relies primarily on operators and federal reporting requirements after safety events.
 Trial conditions	How should operational conditions be defined and expanded?	Controlled risk exposure vs. real-world learning	Singapore: Trial conditions (including routes, operating environments and deployment scope) are progressively expanded as evidence accumulates, prioritizing safety assurance and public acceptance.	Nevada, United States: Operators have broad discretion to define the ODD and expand testing under general safety requirements. This maximizes operational learning and flexibility.
 Trial evaluation	How should trial outcomes inform progression towards commercial deployment?	Predefined progression criteria vs. regulator judgement	California, United States: Progression follows predefined permit stages supported by minimum operational evidence requirements, including mileage and standardized performance metrics. This provides transparent and predictable progression criteria.	Saudi Arabia: Progression is determined through regulator assessment of operational performance, technical compliance and operator self-assessment, without predefined mileage thresholds. This provides greater flexibility while relying more heavily on regulatory judgement.



FIGURE 6 | Contrasting regulatory approaches to AV trials across leading jurisdictions



Source: World Economic Forum.

Commercial operations

As AVs move into commercial deployment, the policy focus shifts from enabling operations to governing them. The central challenge is no longer whether AVs can operate safely, but how to ensure they continue to operate safely, transparently and as part of the broader transport system. This requires policy decisions across three dimensions: safety oversight, safety operations and ecosystem integration.

These three dimensions are closely interconnected. Reporting requirements shape the evidence available for regulatory intervention, operator obligations determine what can be monitored and enforced, and ecosystem integration determines how AV operations interact with the wider transport system.

Table 4 summarizes the key policy choices, trade-offs and contrasting regulatory approaches across leading jurisdictions.

TABLE 4 | Key decisions and trade-offs for authorities for commercial operations

Dimension	Key policy question	Core trade-off	Contrasting regulatory choices	
 Safety oversight	How should operational safety performance be reported to authorities?	Continuous operational visibility vs. structured operational reporting	China: AV operational data must be continuously monitored, stored and transmitted to local authorities, giving regulators full real-time visibility of fleet performance.	California, United States: Structured operational reporting combines routine submissions with event-based reporting. Recent reforms replaced disengagement reporting with operational performance metrics better suited to commercial driverless deployment.
	What operational safety requirements should apply to AV operators?	Standardized operational requirements vs. operator flexibility	Germany: All L4 AV operations require a strongly qualified human technical supervisor with defined statutory responsibilities, including remotely monitoring the vehicle and placing it in a risk-minimal state when necessary.	Nevada, United States: No prescriptive operational safety requirements apply beyond baseline legal obligations. Operators determine their own monitoring, staffing and intervention procedures, maximizing operational flexibility.
	Where should operational control capabilities be located?	Local operations vs. global operating model	Dubai, United Arab Emirates: Operators must establish in-country control centres, ensuring low-latency remote operations, local incident response capability and domestic storage of operational data before deployment.	United States: No federal or state requirements mandate in-country control centres. Remote assistance may be provided from overseas, enabling global operating models.
 Safety operations	Who controls the pace of scaling?	Authority-driven scaling vs. market-driven scaling	Dubai, United Arab Emirates: Fleet expansion follows regulator-defined deployment roadmaps that progressively expand fleet size and operating areas based on demonstrated operational performance, allowing authorities to control the scaling pace.	Texas, United States: Fleet expansion is operator-driven, subject only to baseline safety compliance. This enables rapid market-driven scaling but leaves authorities without a direct mechanism to steer the pace or geography of deployment.
	How should AV operations be coordinated with emergency services?	Standardized emergency protocols vs. operator-specific coordination	California, United States: Regulations establish common emergency procedures for all operators, including standardized first-responder interaction plans, dedicated emergency contacts, physical vehicle controls for law enforcement and firefighters, and mandatory compliance with emergency geofencing directives.	Singapore: Emergency coordination forms part of each operator's deployment readiness assessment, with protocols tailored to the specific operating environment and system maturity. This enables precise local adaptation but results in coordination arrangements that vary across operators.
	How should AV services be positioned within the wider transport system?	Integrated mobility planning vs. market-led deployment	Singapore: AV deployment is planned as part of the public transport network through integrated procurement, coordinated fleet management and cross-government oversight, aligning deployment with national mobility objectives from the outset.	United States: Operators determine service models, operating domains and market expansion independently, with no requirement to integrate services into broader transport services or multimodal strategies.
 Ecosystem integration				

Commercial deployment does not mean the regulatory framework is complete. As operational experience accumulates, authorities continue to refine regulatory requirements

through evidence-based policy-making. Box 2 illustrates how California updated its operational framework after several years of commercial driverless operations.

BOX 2 **California's evolving AV regulatory framework**

Following several years of commercial driverless operations, the California Department of Motor Vehicles (DMV) updated its AV regulatory framework in April 2026.¹¹ The revisions strengthen oversight by adapting regulation to the realities of large-scale driverless deployment.

The framework introduces a more proportionate intervention ladder, allowing the DMV to progressively restrict operations in terms of fleet size, operating areas, speeds, hours of operation or weather conditions rather than relying primarily on permit suspension or revocation. It also modernizes safety

reporting, replacing disengagements (a metric designed for supervised testing) with reporting focused on dynamic driving task (DDT) system failures and other operational safety information.

The revised framework further strengthens operational governance by codifying requirements for emergency response, remote operations and geofencing, and enables law enforcement officers to issue notices of AV noncompliance for observed traffic violations, requiring timely follow-up from the permit holder.

From regulatory diversity to shared evidence-based learnings

AV deployments are expanding across continents. Governments have responded by developing policies and regulatory frameworks that reflect their own legal systems, institutional structures and policy priorities. This diversity is expected for an emerging technology. As deployments mature, however, regulation no longer needs to evolve primarily through trial and error. Authorities can increasingly build on operational evidence and regulatory experience generated elsewhere.

Realizing this opportunity requires stronger international learning. AV developers and operators increasingly operate across markets, while some use cases (particularly autonomous freight) are expected to extend across national borders. At the same time, more countries are preparing regulatory frameworks without yet having large-scale deployments of their own. More comparable approaches can reduce fragmentation, lower barriers to deployment and enable jurisdictions to build on the experience of early adopter geographies rather than starting from scratch.

Two complementary priorities emerge from this analysis.

The first is to strengthen the technical foundation for AV regulation by continuing to advance a shared understanding of safety and a common approach to safety evidence. The UNECE Global Technical Regulation on Automated Driving Systems has established an important common basis for demonstrating safety and for collecting and reporting safety-relevant data. The next step is to develop more consistent methodologies for interpreting that evidence and translating it into regulatory decisions.

Aviation provides a useful precedent.

Through the International Civil Aviation Organization (ICAO), countries have progressively developed common approaches for defining, demonstrating and continuously improving safety while retaining national responsibility for implementation. AV regulation can follow a similar path by harmonizing methodologies rather than regulatory outcomes, making safety assessments more comparable while preserving the flexibility to reflect national priorities and operating environments.

The second is to strengthen cross-regional learning from implementation, building a shared understanding of how AVs can be successfully deployed at scale. Beyond technical regulation, authorities continue to make different choices across trials and commercial deployments, from trial design and pathways to commercial operation to operational oversight and ecosystem integration. More comparable approaches would make it easier to exchange evidence, compare outcomes and understand how different regulatory choices contribute to broader policy objectives, including safety, accessibility, industrial competitiveness and environmental sustainability.

The World Economic Forum will continue supporting this second priority by providing a neutral platform for regulators, industry and other stakeholders to exchange implementation experience across jurisdictions. This includes both jurisdictions at the forefront of AV deployment and those now preparing their own regulatory frameworks. Rather than seeking regulatory convergence, this collaboration focuses on what jurisdictions can learn from one another: how deployments have been designed, governed, evaluated and scaled, and how those experiences can inform future policy-making elsewhere.

Appendices

A1 List of abbreviations

ADS	Automated Driving System
APS	Automated Passenger Services
ASDE	Authorized Self-Driving Entity
AV	Autonomous Vehicle
CETTRAN	Centre of Excellence for Testing & Research of Autonomous Vehicles
DDT	Dynamic Driving Task
DEKRA	Deutscher Kraftfahrzeug-Überwachungs-Verein/German Motor Vehicle Inspection Association
DMV	Department of Motor Vehicles
DSSAD	Data Storage System for Automated Driving
DVSA	Driver and Vehicle Standards Agency
FMVSS	Federal Motor Vehicle Safety Standards
GTR	Global Technical Regulation
ICAO	International Civil Aviation Organization
KBA	Kraftfahrt-Bundesamt/Federal Motor Transport Authority
LTA	Land Transport Authority
NHTSA	National Highway Traffic Safety Administration
ODD	Operational Design Domain
PAVE	Partners for Automated Vehicle Education
SAE	Society of Automotive Engineers
SGO	Standing General Order
TGA	Transport General Authority
TÜV	Technischer Überwachungsverein/Technical Inspection Association
UNECE	United Nations Economic Commission for Europe
VCA	Vehicle Certification Agency

A2.1

Regional deep-dive California (United States)



★ Key authorities

- California Department of Motor Vehicles (California DMV): Issues all AV testing and deployment permits, with the power to restrict, suspend or revoke them; runs the formal complaint and non-compliance process
- California Public Utilities Commission (CPUC): Regulates AV passenger service in pilot and deployment for companies that already hold a corresponding DMV permit
- California Highway Patrol (CHP) and local law enforcement: Conduct on-road traffic enforcement; police can issue formal AV violation notices to manufacturers; local emergency officials can issue geofencing

📄 Level 4 policy and regulation

- Senate Bill (SB) 1298 (2012): Establishes the first US framework to separate testing and deployment into distinct permit categories; authorizes AV operation on public roads with a DMV permit and tasks the DMV with implementing regulations covering testing, equipment, performance and a \$5 million insurance minimum
- DMV regulations (2014/2018/2026): Set detailed rules covering testing (2014), driverless testing and deployment (2018), and the new April 2026 update, which adds heavy-duty AVs, a structured safety case and stronger DMV enforcement tools
- Assembly Bill (AB) 1777 (2024, operative 1 July 2026): Adds first-responder protocols, two-way emergency communication, formal AV violation notices and emergency geofencing

📁 Implementation approach

Governance style: Two-regulator model – DMV controls AV permits; CPUC separately controls AV passenger services; cities are limited in their ability to set their own AV rules and cannot issue permits

Vehicle approval:

- Manufacturers self-certify conformity with the FMVSS; California runs no separate state vehicle-approval process — operational

permitting flows entirely through the DMV's three-stage trial-and-deployment regime

Trials:

- **Stage 1:** Testing-with-driver permit – companies apply to the DMV with proof of \$5 million coverage, driver certifications and a vehicle list; a safety driver must be present at all times
- **Stage 2:** Driverless testing permit – requires prior testing experience and minimum mileage (50,000 miles for passenger vehicles; 500,000 miles for heavy-duty trucks) within the proposed area; companies must submit a safety case covering organization, operations and vehicle; pre-trial conditions include notice to local authorities, a defined operating area, remote-operator training, a law-enforcement interaction plan and direct communication links for first responders. Monthly testing data must be submitted to the DMV; passenger-service trials (additional CPUC authority) run through separate pilot programmes that allow ride-hail-style testing without charging fares, with quarterly data reporting required
- Heavy-duty AVs (over 10,001 pounds) received a permit pathway with the April 2026 update; medium-duty AVs are restricted to use by public agencies and universities

Operations:

- **Stage 3:** DMV deployment permit – requires prior testing experience and minimum mileage in the intended area; companies must demonstrate through a written safety case that AV operation does not pose an unreasonable risk
- A separate CPUC paid-deployment permit is required to charge fares; companies must already hold the corresponding DMV deployment permit; airport pickups require separate authorization from the airport authority
- Ongoing operator duties include quarterly performance data to the DMV, annual first-responder plan updates and a 24/7 emergency line; DMV can impose targeted operating restrictions instead of full suspension; the CPUC can suspend, modify or revoke passenger-service permits and impose fines

📅 Selected AV policy milestones

2012

California enacts state law SB 1298, authorizing AV testing and deployment on public roads

2014

The California DMV's testing-with-driver regulations take effect, establishing the manufacturer testing-permit framework

2018

Driverless testing and deployment regulations take effect; the CPUC creates AV passenger-service pilot programmes

2020

The CPUC creates AV passenger service deployment programmes, allowing for fare-based commercial service

2022

The CPUC issues the first paid driverless robotaxi permit (Cruise), authorizing fared driverless rides in San Francisco

2023

The CPUC authorizes Cruise and Waymo to provide paid 24/7 driverless rides across San Francisco

2025

The CPUC opens new rule-making to update AV passenger-service regulations for the next era of AV pilot and deployment programmes

2026

The California DMV adopts comprehensive new AV regulations, allowing heavy-duty AVs and expanded oversight tools

Source: Based on information from California Department of Motor Vehicles (DMV), California Public Utilities Commission (CPUC) and press announcements.

A2.2

Regional deep-dive Nevada (United States)



★ Key authorities

- Nevada Department of Motor Vehicles (Nevada DMV): Regulates AV testing and deployment; receives manufacturer self-certification packets and issues red plates (AV testing) and green plates (AV registered operation)
- Nevada Transportation Authority (NTA): Licenses commercial passenger service. Issues autonomous vehicle network company permits that set fleet size and geographic scope for paid robotaxi operations
- Nevada Department of Transportation (NDOT): Sets safety and performance standards and designates test areas, though operational regulation is handled by the Nevada DMV
- Nevada State Police Highway Patrol (NHP): Conducts traffic enforcement on AVs operating on public roads; coordinates with the Nevada DMV on safety-related incidents

📄 Level 4 policy and regulation

- Assembly Bill (AB) 511 (2011): Establishes the world's first AV-authorizing law; directs the Nevada DMV to set rules permitting AV operation and tasks NDOT with safety and performance standards and test-area designations
- AB 69 (2017): Expands AB 511 to authorize fully autonomous operation (no human operator required); sets the statutory baseline with FMVSS conformity, traffic-law compliance, safe-stop capability on system failure, \$5 million insurance for testing and human override for non-fully-autonomous AVs ; adds a separate NDOT permit for carrying paying passengers
- DMV rules (2012, updated 2018): Operationalize the statutory baseline; cover the certificate of compliance process, certification-facility licensing, AV registration and confidentiality of submitted records

📋 Implementation approach

Governance style: Centralized statewide framework combining manufacturer self-certification with baseline safety, insurance, reporting and operational requirements; local jurisdictions are pre-empted from imposing separate operating, fee or fleet conditions

Vehicle approval:

- The manufacturer files a self-certification packet with the Nevada DMV, attesting that the AV meets Nevada's requirements (FMVSS conformity, traffic-law compliance and safe-stop capability on system failure); the DMV reviews the packet and issues red plates for testing vehicles or green plates for vehicles registered for operation – no state-administered vehicle test is conducted
- Certification is per make/model/year; additional packets are required when the technology is extended to other makes or models

Trials:

- The manufacturer or developer files an AV testing application with the Nevada DMV; baseline requirements include a \$5 million insurance or surety bond
- The DMV issues a certificate of compliance and red plates for each test vehicle; within 10 days of any crash causing personal injury or property damage exceeding \$750, or any traffic violation, the operator must file an incident report with the Nevada DMV

Operations:

- Upon receiving the certificate of compliance and the green plates, the AV is registered like any other vehicle and may operate statewide without operating-area approval, operating-area review or level-based gating; cities and counties cannot impose additional operating-area or fleet conditions
- Commercial passenger services require a separate autonomous vehicle network company NDOT permit, which sets fleet size and geographic scope individually
- Operators must report crashes to the Nevada DMV and submit incident data to NHTSA under federal reporting orders; Nevada relies on this federal-state reporting combination rather than continuous state-administered performance monitoring

📅 Selected AV policy milestones

2011

Nevada signs AB 511, becoming the first US state to formally allow AVs on public roads

2012

Nevada issues the first US AV testing license to Google

2015

Nevada issues the first US permit for an autonomous commercial truck on an open public highway (Daimler Freightliner Inspiration)

2017

AB 69 is enacted, allowing fully autonomous testing and operation

2018

DMV updates AV rules, adding licensing for AV certification facilities and confidentiality of submitted records

2023

Zoox begins fully driverless public robotaxi testing in Las Vegas

2025

Zoox launches robotaxi service on the Las Vegas Strip

2026

NDOT approves commercial robotaxi permits for Tesla, Uber and Waymo in Clark County, with a combined ceiling of 8,000 vehicles over twelve months

Source: Based on information from Nevada Department of Motor Vehicles (DMV), Nevada Department of Transport (NDOT) and press announcements.

A2.3

Regional deep-dive

Texas (United States)



★ Key authorities

- Texas Department of Motor Vehicles (TxDMV): Acts as sole state AV regulator; issues, modifies, suspends and revokes Texas commercial driverless authorizations
- Texas Department of Public Safety (DPS): Receives operator first-responder interaction plans as a prerequisite to TxDMV authorization; conducts on-road traffic enforcement jointly with local police
- Texas Department of Transportation (TxDOT) and Texas Connected and Autonomous Vehicle Task Force (CAV Task Force): State coordination body bringing government and industry together to publish guidance and shape policy direction

📄 Level 4 policy and regulation

- Senate Bill (SB) 2205 (2017): Authorizes driverless operation on public roads subject to traffic-law compliance, Federal Motor Vehicle Safety Standards (FMVSS) conformity, recording device and insurance; pre-empts city-level AV regulation
- House Bill (HB) 3026 (2021): Refines the 2017 SB by clarifying the remote-operator role and qualifications, extending provisions to autonomous trucks, and codifying insurance and liability arrangements
- SB 2807 (2025) and TxDMV rules (2026): Designates TxDMV as the central authorizer with proportionate intervention powers; introduces a mandatory state authorization for commercial driverless service, emergency response plans and a public portal for verifying operators and filing safety complaints

📁 Implementation approach

Governance style: Texas runs a single state-level regime holding state-wide pre-emption with one TxDMV authorization

Vehicle approval:

- At the federal layer, manufacturers self-certify conformity with FMVSS standards.

- At the state layer, Texas adds four attestation requirements at authorization – traffic law compliance, recording device, safe-stop capability on system failure and insurance – with the operator certifying each vehicle meets the full baseline

Trials:

- Trials operate under the same statutory baseline as commercial deployment; operators determine testing geography, methodology and scenario coverage within the boundaries set by that baseline
- Reporting flows through the federal channel where operators submit incident data to the National Highway Traffic Safety Administration (NHTSA) under the Standing General Order, while standard statutory crash-response duties apply at the state level

Operations:

- Companies file three things with the TxDMV: 1) operator and vehicle information, 2) a written statement that each AV meets the Texas baseline (traffic law, recording device, federal safety standards, ability to safely come to a stop on system failure, insurance) and 3) confirmation that the DPS has received their first-responder interaction plan; on approval, the TxDMV issues a unique operating number for statewide commercial driverless operation
- Authorization is one-time, free of charge and non-expiring; operators must notify the TxDMV within 30 days of any material change (failure can trigger immediate suspension); operators retain ongoing responsibility for safety-standard compliance, traffic-law compliance and federal incident reporting
- The TxDMV may suspend, cancel or restrict operations if a vehicle is found unsafe and its operation has caused (or is likely to cause) serious injury; there is a notice-and-cure procedure with a 10-day internal review and the right to a hearing within 60 days; operating without authorization is a misdemeanor and each day counts as a separate offence

📅 Selected AV policy milestones

2017

SB 2205 (Texas's first AV law) allows driverless vehicles on public roads and establishes AV regulation as a state-level responsibility

2019

Texas establishes the CAV Task Force as the central state coordination body

2021

HB 3026 refines AV rules with provisions on remote operators, autonomous trucks and insurance/liability

2023

Cruise starts AV passenger services in Austin

2025

Waymo and Uber launch a public driverless robotaxi service in Austin

Aurora launches the first US commercial driverless heavy-truck service on the I-45 Dallas-Houston corridor

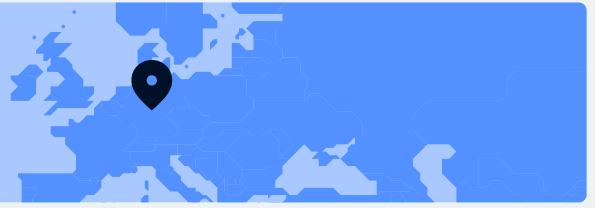
2026

SB 2807 enforcement begins, requiring TxDMV authorization for commercial driverless services

Source: Based on information from Texas Department of Motor Vehicles (TxDMV), Connected and Autonomous Vehicles Task Force (CAV) and press announcements.

A2.4

Regional deep-dive Germany



★ Key authorities

- Federal Ministry for Transport (BMV): Leads national AV policy and aligns the national framework with EU and UNECE law
- Federal Motor Transport Authority (KBA): Issues vehicle approvals and testing permits, and oversees market compliance
- Länder and local authorities: Approve and monitor compliance with the defined operating area; grant commercial passenger-transport concessions

📄 Level 4 policy and regulation

- Autonomous Driving Act (2021): Amends the Road Traffic Act to permit level 4 (L4) vehicles on public roads without a fallback driver, under technical supervision, within pre-approved operating areas
- Autonomous Vehicles Approval and Operation Ordinance (AFGBV) (2022): Sets out the approval procedure, technical requirements, data-storage rules and obligations of the operator, manufacturer and technical supervisor
- Road Traffic Remote Control Ordinance (2025): Introduces a dedicated framework for teleoperated driving (one operator per vehicle and real-time remote control; separate from L4 technical supervisor)

📋 Implementation approach

Governance style: Hybrid federal-state model with vehicle and operational design domain (ODD) approval at the federal level (KBA); geographic operating-area approval at the state level

Vehicle approval:

- For trial deployment: standard (non-AV-specific) individual or type approval suffices; autonomous-function modifications are approved separately as part of the testing permit

- For regular L4 operations: the manufacturer applies to the KBA for an operational permit under AFGVB; the application includes the safety concept, test-scenario catalogue and ODD definition. KBA assesses functional requirements, safety concept, cybersecurity, data protection and encrypted data transmission via documentation review and physical testing

Trials:

- The vehicle holder applies to the KBA with a description sheet and a development concept. The KBA assesses vehicle approval status, testing need, monitoring implementation, state-of-the-art compliance and personnel qualifications. No initial safety assessment is required, unlike for an operational permit
- Testing permits are time-limited (yet extendable) and may carry geographic, temporal or operational restrictions; an on-board safety driver or on-site technical supervisor (typically in the vehicle but not driving, or in immediate proximity, e.g. a chase vehicle) is required
- Commercial passenger transport requires a separate concession; carriage of test subjects without remuneration is permissible where development necessity is demonstrated

Operations:

- The operator applies to the relevant state authority for operating-area approval, in coordination with the relevant municipality; a KBA-issued operational permit is a prerequisite
- The operator is responsible for daily pre-operation checks, maintenance, data storage and incident reporting; a remote technical supervisor replaces the on-board safety driver of the trials regime and provides remote oversight
- KBA conducts market surveillance and vehicle conformity monitoring; the Land Authority monitors continued compliance and may withdraw or modify the operating-area approval

📌 Selected AV policy milestones

2017

The first autonomous shuttle in regular public road service launches in Bad Birnbach (under exception permit, with safety driver)

2021

Autonomous Driving Act is adopted, enabling L4 AVs

2022

AFGBV enters into force

2024

National Strategy for Autonomous Driving is published

2025

KIRA project launches in the Frankfurt Rhine-Main area, with L4 shuttles in public transport (with safety driver, under KBA testing permit)

ZF receives first nationwide L4 testing permit from the KBA for its shuttle and bus solution

2026

Momenta receives nationwide L4 urban testing permit, the second nationwide testing authorization after ZF (2025) and the first held by a non-German operator

Source: Based on information from Federal Ministry for Transport (BMV), Federal Motor Transport Authority (KBA) and press announcements.

A2.5

Regional deep-dive United Kingdom



★ Key authorities

- Department for Transport (DfT): Leads on AV policy; the Secretary of State holds statutory authorization, safety and monitoring powers
- Centre for Connected and Autonomous Vehicles: Serves as the central hub for AV strategy, funding and regulatory development, and runs the Automated Vehicles Act (AV Act) 2024 Implementation Programme
- Vehicle Certification Agency (VCA): Grants type approvals and is expected to lead on pre-deployment authorization under the AV Act 2024
- Driver and Vehicle Standards Agency (DVSA): Conducts market surveillance and recalls; will deliver in-use regulation and no-user-in-charge operator licensing under the AV Act 2024

🔒 Level 4 policy and regulation

- Automated and Electric Vehicles Act (2018): Establishes the insurer-first liability regime for AV-caused accidents (foundation for the AV Act 2024)
- AV Act 2024: Establishes the “self-driving test” as the central capability-based threshold (replacing reliance on SAE levels), anchors statement of safety principles (AV safety equal to or above a careful and competent human driver), and introduces two new legal actors – the Authorized Self-Driving Entity (ASDE) and the No-User-in-Charge Operator (NUiCO); full implementation targeted for Q4 2027
- Automated passenger services (APS) permitting scheme (2025): Introduces a bespoke route under the AV Act 2024, enabling commercial passenger pilots without a safety driver ahead of full AV Act implementation

📁 Implementation approach

Governance style: Centralized regime under the Secretary of State (DfT), delivered by the VCA and DVSA, with local authority or franchising body consent required for commercial passenger deployments

Vehicle approval:

- For trial deployment: vehicles require only standard type approval — no AV Act authorization and no statutory designation; operational responsibility falls on the trialling organization
- For commercial deployment: the ASDE submits the vehicle for authorization against the self-driving test and the Statement of Safety Principles; the assessment is capability-based and principles-driven, with detailed technical standards being developed in secondary legislation

Trials:

- The UK runs two parallel regimes: the non-statutory automated vehicle trialling code of practice (R&D testing) and the APS permitting scheme for commercial passenger pilots
- For the APS scheme, the applicant submits a permit application to the DVSA, demonstrating vehicle qualification, accessibility provisions, safeguarding arrangements, insurance, maintenance and operational competence; consent is required from each local licensing authority (taxi/private-vehicle-hire-like services) or from the relevant franchising body (bus-like services in franchised areas)
- For the APS scheme, permit holders must publish annual reports covering accessibility outcomes, safeguarding measures and safety-related incidents; routes, timetables, fares, live updates, accidents and complaint logs must be shareable with DVSA, police, consenting authorities and emergency services on request

Operations:

- Operations are covered under the in-use regulatory scheme (IURS), which couples vehicle authorization with continuing operator duties and ongoing authority powers; the APS scheme provides a bridging in-use framework for commercial passenger services since May 2026 and will be subsumed into the unified IURS architecture
- Operational details – including enforcement instruments, data-retention and reporting requirements, and procedures for ODD amendments – are still being defined in secondary legislation

📅 Selected AV policy milestones

2015

First framework for AV trials on public roads is established

2016

First public level 4 (L4) test takes place in Milton Keynes (LUTZ Pathfinder pods)

2018

Automated and Electric Vehicles Act is passed (insurer-first liability)

2024

AV Act is passed

AV Act Implementation Programme is launched

2025

APS permitting scheme is announced

2026

APS permitting scheme enters into force (May)

Q4 2027

Full implementation of AV Act targeted

Source: Based on information from Department for Transport (DfT), Centre for Connected and Autonomous Vehicles (CCAV) and press announcements.

A2.6

Regional deep-dive Saudi Arabia



★ Key authorities

- Ministry of Transport and Logistic Services (MOTLS): Sets national transport strategy and policy direction; chairs the Future of Mobility Committee coordinating government AV stakeholders
- Transport General Authority (TGA): Acts as lead AV regulator, runs the Regulatory Sandbox, issues autonomous driving permits and coordinates multi-agency vetting for AV deployments
- Roads General Authority (RGA): Maintains the Saudi Highway Code (SHC), including its AV-specific Volume 801 (SHC 801), and sets infrastructure readiness and safety oversight requirements for AVs
- Saudi Standards, Metrology and Quality Organization (SASO): Issues the technical regulations for AVs, defining vehicle technical requirements and economic operator responsibilities
- Saudi Data and AI Authority (SDAIA): Sets data and AI policy applicable to AVs and participates in multi-agency vetting for AV deployment permits
- General Directorate of Traffic: Enforces traffic law on the ground and oversees vehicle registration

📄 Level 4 policy and regulation

- TGA Regulatory Sandbox (2023): Allows vetted operators to test on public roads within defined geofences under supervised conditions, real-time monitoring and self-assessments
- SHC 801 Autonomous Vehicles Requirements (2024): Sets the technical, operational and legal framework for integrating AVs, covering infrastructure, digital systems, cybersecurity and pilot project guidelines
- SASO Technical Regulations for Autonomous Vehicles (2025): Define technical requirements and conformity assessment for AVs and market operators; structured around testing, performance requirements and limited technical exceptions
- Traffic law amendments (June 2026): Apply specified existing traffic-law obligations and accident liability to the vehicle owner when an AV operates without human intervention

📋 Implementation approach

Governance style: State-orchestrated, multi-agency sandbox-to-permit governance with performance-based approval and staged scaling

Vehicle approval:

- Vehicles (passenger and goods) must meet the SASO technical regulations for AVs before registration or deployment; performance requirements span six functional safety dimensions (sensing, perception, decision-making, vehicle control, fault response and behaviour under unexpected conditions); SASO retains conformity oversight throughout operational life

Trials:

- Operators apply to TGA for sandbox entry; applicant must hold a Saudi commercial licence or partner with a licensed Saudi entity (foreign companies admissible without local presence on a case-by-case basis); SASO technical conformity is a precondition for entry
- Trial conditions are geofenced to specific zones and routes approved by regulators; a safety officer is required on board during pilot phases; TGA monitors operations in real time through live tracking; operators submit self-assessments on a defined cadence
- Progression through the sandbox is phased and performance-based, with continued evaluation against operational and safety requirements; on successful completion, the TGA issues the autonomous driving permit authorizing commercial operation

Operations:

- Operators must maintain compliance with SASO regulations and SHC 801 throughout deployment, including serial-production conformity (manufacturer side), incident reporting and continued adherence to the safety and performance requirements
- Multi-agency oversight across the TGA (leads in-service oversight), SASO (vehicle-side conformity), SDAIA (data and AI policy), RGA (infrastructure compliance), Ministry of Interior (MOI)/General Directorate of Traffic (traffic law enforcement); permits may be modified, restricted or withdrawn where compliance is no longer met

📅 Selected AV policy milestones

2016

Saudi Arabia launches Saudi Vision 2030

2019

First autonomous shuttle launches on King Abdullah University of Science and Technology campus

2021

Saudi Arabia launches the National Transport and Logistics Strategy

2023

Dhahaina trial launches in Riyadh (Saudi Arabia's first level 4 autonomous shuttle on public roads)

TGA establishes the Regulatory Sandbox

2025

WeRide becomes the first AV technology company, through partnership with a licensed operator, to pass the first phase of the TGA Regulatory Sandbox requirements, enabling supervised test drives

2026

AV-specific traffic law amendments are adopted

Source: Based on information from the Transport General Authority (TGA) and press announcements.

A2.7

Regional deep-dive

Dubai (United Arab Emirates)



★ Key authorities

Federal level:

- Ministry of Interior (MOI): Sets the federal traffic law and vehicle registration baseline
- Ministry of Industry and Advanced Technology (MOIAT): Sets AV federal technical standards and conformity-assessment requirements
- United Arab Emirates Regulations Lab (RegLab): Provides a regulatory testing environment for emerging technologies, including AV-related use cases

Dubai level:

- Roads and Transport Authority (RTA): Sole AV regulator in Dubai; covers licensing, standard-setting, technical inspection, route designation, performance monitoring and enforcement
- The Executive Council of Dubai: Issues the resolutions implementing the Primary AV Law

📋 Level 4 policy and regulation*

- Executive Council Resolution No. 3 on Test Runs of AVs (2019): Establishes a dedicated AV trial framework and designates RTA as test-permit authority
- Dubai Law No. 9 (2023): Establishes a two-gate AV model (vehicle licensing plus activity permit); designates RTA as central regulator; introduces the operator (entity that commercially deploys the AVs) and agent (locally authorized distributor for an AV type) distinction
- Federal Decree-Law No. 14 on Traffic Regulation (2024): Introduces federal procedures for AV registration, inspection and licensing; detailed technical requirements to follow via cabinet decision
- Administrative Decision No. 939 (2025): Operationalizes Law No. 9 with a six-category AV taxonomy, “safety dossier” requirements and performance-monitoring obligations
- Heavy vehicles regulatory framework (2025): Introduces a dedicated framework for autonomous heavy vehicles in logistics, with five initial pilot routes designated

📁 Implementation approach

Governance style: Centralized, single-regulator governance under the RTA, with modular

technical standards and progression driven by key performance indicators (KPIs)

Vehicle approval:

- The operator applies to the RTA for vehicle licensing; the vehicle must be sourced from a locally authorized agent and registered in its country of origin with a proven track record on equivalent public roads
- Decision 939 defines category-specific technical requirements across 10 modular standards covering safety, security, operational capability, connectivity and United Arab Emirates/Gulf Cooperation Council (GCC) conformity
- The RTA conducts the technical inspection as the operative approval mechanism; standards are published in RTA manuals, allowing updates without legislative amendment

Trials:

- Each AV activity requires its own permit; the scope is expanded incrementally from initial testing, with progression governed by clear, standardized, KPI-driven evaluation criteria
- Dubai is divided into four operational zones based on complexity, three currently open for robotaxi deployment; for autonomous heavy-duty vehicles, the 2025 framework defines five initial pilot routes

Operations:

- Decision 939 makes local operational testing a prerequisite to commercial licensing; foreign testing or certifications alone are insufficient
- The operator’s activity permit authorizes full commercial deployment under specified conditions (vehicle types, zones, fleet size, service category); further expansion requires activity permit modifications subject to new RTA approval and follows a scaling roadmap to 2030, with fleet caps reviewed annually
- Foreign AV firms are incentivized to partner with experienced local operators for operational expertise, regulatory navigation and ecosystem integration
- Remote supervision must be conducted from local remote monitoring centres to ensure direct operational oversight, reduced latency and faster incident response; operators must submit regular performance reports to the RTA covering miles driven, disengagements, accidents and customer satisfaction

📅 Selected AV policy milestones

2016

Dubai launches its self-driving transport strategy

2019

Executive Council Resolution No. 3 on Test Runs of Autonomous Vehicles is adopted (first dedicated AV trial framework in Dubai)

2023

Law No. 9 of Dubai is enacted, codifying regulation for AV operations

Dubai launches its first robotaxi trial in partnership with Cruise (under the 2019 Trial Resolution)

2025

Administrative Decision No. 939 is enacted (executive regulations operationalizing Law No. 9)

Heavy vehicles regulatory framework is adopted

2026

First fully driverless commercial robotaxi operations launch (WeRide/Uber and Apollo Go)

Note: *All Dubai regulations are autonomy-level agnostic.

Source: Based on information from the Roads and Transport Authority (RTA) and press announcements.

A2.8 Regional deep-dive China



★ Key authorities

National level:

- Ministry of Industry and Information Technology (MIIT): Leads national AV vehicle access; grants road motor vehicle manufacturer and product admission and sets technical standards
- Ministry of Public Security (MPS): Sets road traffic laws and AV-related traffic safety rules; co-administers the four-ministry pilot
- Ministry of Transport (MOT): Sets transport policy applicable to AV-based passenger and freight services; co-administers the four-ministry pilot
- Ministry of Housing and Urban-Rural Development (MOHURD): Sets infrastructure and urban-planning standards for AV-related road and vehicle-road-cloud infrastructure; co-administers the four-ministry pilot

Subnational level:

- Municipal authorities (e.g. Beijing, Shenzhen, Wuhan): Issue local AV testing regulations; designate operating areas, issue driverless permits and conduct city-level oversight

📄 Level 4 policy and regulation

- Intelligent connected vehicle (ICV) access and road operation pilot (2023): Selects nine enterprises for level three and four (L3/L4) production-vehicle access and road operation under national oversight, jointly administered by MIIT, MPS, MOHURD and MOT
- Vehicle-road-cloud integration pilot (2024): Rolls out unmanned L4 applications across 20 cities (including Beijing, Shanghai, Shenzhen, Wuhan), backed by national smart-road infrastructure (V2X); jointly administered by MIIT and four other ministries
- National recommended standards (2024–2025): Establish a non-binding technical baseline covering requirements for automated driving systems (ADS), road testing and ODD; voluntary compliance, expected to inform the upcoming mandatory regime
- City legislation: Delivers substantive AV regulation through dedicated local laws, including the Beijing Autonomous Vehicle Regulations, the Shenzhen Special Economic Zone ICV administrative regulations and the Shanghai Pudong driverless ICV regulations

- Pending – Mandatory MIIT safety standard (in force 1 July 2027): Replaces the 2024 recommended standard with legally binding L3/L4 requirements; references the United Nations Economic Commission's (UNECE) Global Technical Regulations (GTRs)

📋 Implementation approach

Governance style: Layered national-local architecture, with nationally recommended standards and substantive AV regulation issued at city level

Vehicle approval:

- All vehicles (including L4) require manufacturer and product admission from MIIT, plus the China Compulsory Certificate (CCC) mark; no unified national L4-specific product admission exists yet (each city sets its own additional technical and access conditions under local AV legislation)
- The upcoming MIIT safety standard will introduce the first legally binding national vehicle-approval requirements for L4 systems: safety performance equivalent to that of a competent human driver, a mandatory safety management system, and a data storage system; supported by regulatory inspections of assurance processes and safety cases

Trials:

- The national procedural baseline is operationalized by city-level AV regulations. Example of Beijing's High-level Automated Driving Demonstration Area (BJHAD): the operator submits a documentation package including an ADS description, ODD, vehicle/driver records, RMB 5 million (renminbi) insurance and incident protocols; an expert committee reviews the application; a third-party institute handles daily supervision; operators progress through stages (safety driver → driverless with backup operator → fully driverless), each requiring new approval

Operations:

- The national baseline is set by the Ministry of Transport (MOT) guidelines on AV passenger and freight services (2023), layered on top of city regulations; operators must transmit operational data to city authorities in real time; remote operators may supervise up to three driverless vehicles simultaneously

📅 Selected AV policy milestones

2018

MIIT, MOT and MPS issue the first national guidelines for AV road testing

2020

National Development and Reform Commission (NDRC) and 10 ministries issue the Strategy for the Innovative Development of Intelligent Vehicles, targeting L4 market-oriented applications

2021

The national driving automation taxonomy is issued, providing the domestic legal definition of L4

2022

Wuhan and Chongqing issue China's first fully driverless commercial L4 robotaxi permits (Baidu Apollo Go)

2023

MIIT and three ministries launch national L3/L4 access pilot scheme

2024

MIIT and four ministries launch a vehicle-road-cloud integration pilot in 20 cities, promoting commercial L4 applications

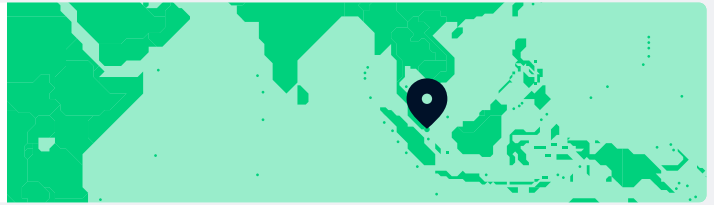
2026

China releases the draft of its first mandatory national safety standard for L3/L4 AVs for public comment

Source: Based on information from the Ministry of Industry and Information Technology (MIIT), Ministry of Public Security (MPS), Ministry of Transport (MOT) and press announcements.

A2.9

Regional deep-dive Singapore



★ Key authorities

- Ministry of Transport (MOT): Sets the overarching legislative basis and strategic direction
- Land Transport Authority (LTA): Acts as the AV regulator by setting technical safety, security and operating requirements; facilitates and approves trials and deployments on public roads
- Steering Committee on Autonomous Vehicles (formed in July 2025): Oversees AV rollout across deployment, regulation/liability and industry workgroups; chaired by the Acting Minister for Transport and spans industry, academia, unions and public service

📄 Level 4 policy and regulation

- Road Traffic (Amendment) Act (2017): Recognizes AVs in primary legislation, empowering the Minister of Transport to make subsidiary AV legislation and allowing exemptions from existing road traffic laws for AV trials
- Road Traffic (Autonomous Motor Vehicles) Rules (2017): Details trial authorization, conditions of use, black-box data recording, third-party liability insurance and reporting obligations; designates the LTA as the sole approval authority
- Technical Reference 68 (TR 68, first published 2019, revised 2021): Represents a non-statutory, industry-led national standard functioning as the de facto deployment guideline on public roads; aligned with emerging international standards (e.g. ISO 37181:2022)
- AV legislative framework in development (public consultation May–June 2026): Intends to replace the sandbox regime with a comprehensive statutory framework covering safety, liability, insurance, enforcement, data, cybersecurity and advanced driver assistance systems (ADAS) handover (legislation targeted for 2027)

📦 Implementation approach

Governance style: Centralized, single-regulator, standards-led governance with a maturity-based sandbox progression

Vehicle approval:

- All AVs must pass a closed-circuit assessment (M1 test) at the Centre of Excellence for Testing & Research of Autonomous Vehicles (CETRAN) before operating on public roads
- LTA approves vehicles in small batches (e.g. two to three vehicles out of 10 are physically assessed, with performance extrapolated to the others in the batch); batch size will grow as confidence in the methodology increases
- The MOT public consultation (May–June 2026) explicitly addressed vehicle approval processes as a substantive redesign item under the new AV legislation

Trials:

- Trials require LTA authorization and follow a staged progression across two tracks calibrated to system maturity: the deployable solutions track for systems transitioning towards driverless commercial operations, and the developmental track for early-stage testing under stricter, more controlled conditions. Systems transition from the developmental to the deployable solutions track as evidence accumulates
- The deployable solutions track progression (selected activities run in parallel): M1 closed-circuit test → stakeholder demo on deployment site → document review → remote operations assessment → deployment readiness assessment (on-road, data-backed, AV operator on board) → eligibility for driverless operations
- Developmental track progression: M1/ M2 test → accumulate good operational records → present viable use case → eligibility for safety-driver operations and graduation to the deployable solutions track

Operations:

- Commercial AV use requires written authorization by the LTA, specifying the route or restricted zones, vehicle types, operating hours, weather conditions and fleet size
- Specified person bears statutory duties: maintain the AV, fit a black-box recorder (capturing speed, operating mode, sensor inputs, video and telemetry), submit captured data to the LTA daily and notify the LTA of any incident or accident involving the AV
- LTA retains the power to require the AV to undergo additional tests at any point during authorized operation

📌 Selected AV policy milestones

2016

nuTonomy launches the world's first public robotaxi trial in one-north (with safety driver)

2017

CETRAN opens as the first dedicated AV test centre

Road Traffic Rules are amended to enable AV trials on public roads

2025

Steering Committee on Autonomous Vehicles is formed to guide AV rollout

WeRide Robobus launches at Resorts World Sentosa (Southeast Asia's first fully driverless AV service)

2026

ComfortDelGro/Pony.ai and Grab/WeRide launch first by-invite AV shuttle trials on residential public roads (Punggol), with safety operators on board

MOT runs a public consultation (May–June) on a dedicated new AV legislative framework with a subsequent review process

Source: Based on information from the Land Transport Authority (LTA) and press announcements.

Contributors

World Economic Forum

Maria Alonso

Lead, Autonomous Systems

Lukas Milan

Project Fellow, World Economic Forum;
Manager, Accenture

Pirus Schmidt

Project Fellow, World Economic Forum;
Consultant, Accenture

Markus Schober

Project Fellow, World Economic Forum;
Consultant, Accenture

Accenture

Christof Horn

Managing Director, Global Software-Defined
Vehicle Lead

Juergen Reers

Senior Managing Director,
Global Automotive & Mobility Lead

Acknowledgements

Miguel Acosta

Chief, Autonomous Vehicle Branch, Department
of Motor Vehicles (California, United States)

Ali Saif Alnuaimi

Deputy Director, Transportation System
Department, Roads & Transport Authority
(Dubai, United Arab Emirates)

Ahmed Bahrozyan

Chief Executive Officer, Roads & Transport
Authority (Dubai, United Arab Emirates)

Omaimah Bamasag

Deputy, Transportation Enablement,
Transport General Authority (Saudi Arabia)

David Caroll

Vice-President, Commercialization,
Hyundai Motor Group Motional

Michael Chan Ting Bond

General Manager, Corporate Strategy, MTR

Francis Chow

Vice-President and General Manager,
In-vehicle OS and Edge, RedHat

Richard Damm

Chair, Working Party on Automated/Autonomous
and Connected Vehicles (GRVA), United Nations
Economic Commission for Europe (UNECE)

Paul Farrell

Executive Vice-President and
Chief Strategy Officer, BorgWarner

Anita Geißler

Deputy Head of Division, Automated Driving,
Federal Ministry of Transport (Germany)

Christoph Hartung

President, Cross-Domain Computing, Robert Bosch

Henry (Haijian) He

Chief Financial Officer, Baidu

Tao He

Head, Development Research Center, Baidu

Michael Hoerig

Senior Vice-President, Technology
and Engineering, Bosch Mobility

Gerado Interiano

Senior Vice-President, Government Relations
& Public Affairs, Aurora Innovation

Shinpei Kato

Founder and Chief Executive Officer, Tier IV

Siddartha Khastgir

Expert, Science Advisory Council,
Department of Transport (UK)

Dong Jo (DJ) Kim

Senior Vice-President,
Global Policy Office, Hyundai Motor

Yasmine King

Corporate Vice-President and Head of Automotive
Business Unit, Analog Devices

Andrea Kollmorgen

Chief Executive Officer, Simulytic

Badari Kotejshyer

Vice-President, AD & ADAS, KPIT Technologies

Lutz Kuehnke

Vice-President, Engineering,
Magna International

Wee Shann Lam

Chief Technology Officer,
Land Transport Authority (Singapore)

Stephan Liening

Head of Division, Automated Driving,
Federal Ministry for Transport (Germany)

Will Lin

Head, Automotive Vertical, Applied Intuition

Thomas Martin

Manager, Department of Motor Vehicles
(Nevada, United States)

Yuri Misnik

Chief Technology Officer, inDrive

Thomas Mueller

Vice-President, Chief Technology Officer
and Automotive Lead, Wipro Engineering

Ekrum Mukbil

Director, Global Automotive
Developer Relations, NVIDIA

Nicholas Ng

Director, Centre for Autonomous Mobility,
Land Transport Authority (Singapore)

Joerg Ohlsen

Chief Executive Officer,
Cognizant Mobility, Cognizant

Dominic Ong

General Manager, Autonomous;
Chief of Staff to Group CEO, Grab

James Owens

Chief Legal Officer, Nuro AI

Omkar Panse

Chief Technology Officer,
KPIT Technologies

Manaswini Rath

Senior Vice-President, ADAS and Autonomous
Vehicles Business, KPIT Technologies

Zeke Reyna

Emerging Technology Lead, Department
of Transportation (Texas, United States)

Tom de Schutter

Senior Vice-President,
Product Management, Synopsys

Christian Senger

Chief Executive Officer,
ADMT, Volkswagen Group

Sophie Tang

Community Engagement Specialist,
Autonomous Systems, World Economic Forum

Remco Timmer

Senior Vice-President, Product & Technology,
HERE Technologies

Huibert Verhoeven

Senior Vice-President, Digital Cockpit,
Harman International Industries

Jung Yeop Woo

Senior Vice-President, Global Policy Office;
Chief Executive Coordinator, Washington Office,
Hyundai Motor America Company

Kandee Bahr Worley

Division Chief, Sustainability and Emerging
Transportation, Department of Transportation
(Nevada, United States)

Jack (Zhenghua) Yu

Chief Executive Officer, Motovis

Ismail Zohdy

Expert, Future and Innovative Mobility, Roads &
Transport Authority (Dubai, United Arab Emirates)

Noah Zych

Global General Manager, Autonomous
Mobility & Delivery, Uber Technologies

Production

Laurence Denmark

Creative Director, Studio Miko

Martha Howlett

Editor, Studio Miko

Jay Kelly

Designer, Studio Miko

World Economic Forum Public Engagement

Maxwell Hall

Creative Editorial Lead

Floris Landi

Design Lead

Gayle Markovitz

Head, Written and Audio Content

Sybille Penhirin

Head, Video and Design

Endnotes

1. SAE International. (2021, 3 May). *SAE Levels of Driving Automation™ Refined for Clarity and International Audience*. <https://www.sae.org/news/blog/sae-levels-driving-automation-clarity-refinements>.
2. Kusano, K. D., Scanlon, J. M., Chen, Y. H., McMurtry, T. L., Chen, R., Gode, T., & Victor, T. (2024). Comparison of Waymo Rider-only crash data to human benchmarks at 7.1 million miles. *Traffic Injury Prevention*, vol. 25, S66–S77. <https://doi.org/10.1080/15389588.2024.2380786>.
3. Zhou, R. et al. (2024). How would autonomous vehicles behave in real-world crash scenarios?. *Accident Analysis & Prevention*, vol. 202. <https://pubmed.ncbi.nlm.nih.gov/38657314/>.
4. United Nations Economic Commission for Europe (UNECE). (2026, 24 June). *UNECE adopts first-ever global rules allowing fully autonomous vehicles*. <https://unece.org/sustainable-development/press/unece-adopts-first-ever-global-rules-allowing-fully-autonomous>.
5. Sidley Austin. (2026, 21 April). *China Moves Toward Nationwide Autonomous Vehicle Regulation*. <https://environmentalhealthsafetybrief.sidley.com/2026/04/21/china-moves-toward-nationwide-autonomous-vehicle-regulation/>.
6. National Highway Traffic Safety Administration (NHTSA). (2025, 6 August). *NHTSA Issues First-Ever Demonstration Exemption to American-Built Automated Vehicles* [Press release]. US Department of Transportation. <https://www.transportation.gov/briefing-room/nhtsa-issues-first-ever-demonstration-exemption-american-built-automated-vehicles>.
7. National Highway Traffic Safety Administration (NHTSA). (2021, amended 2023, 2025). *Standing General Order 2021-01: Incident Reporting for Automated Driving Systems (ADS) and Level 2 Advanced Driver Assistance Systems (ADAS)*. <https://www.nhtsa.gov/laws-regulations/standing-general-order-crash-reporting>.
8. National Highway Traffic Safety Administration (NHTSA). (2025). *ADS-Equipped Vehicle Safety, Transparency, and Evaluation Program*. <https://www.federalregister.gov/documents/2025/01/15/2024-30854/ads-equipped-vehicle-safety-transparency-and-evaluation-program>.
9. United Nations Economic Commission for Europe (UNECE). (2021). *UN Regulation No. 155 - Cyber security and cyber security management system*. <https://unece.org/transport/documents/2021/03/standards/un-regulation-no-155-cyber-security-and-cyber-security>.
10. United Nations Economic Commission for Europe (UNECE). (2021). *UN Regulation No. 156 - Software update and software update management system*. <https://unece.org/transport/documents/2021/03/standards/un-regulation-no-156-software-update-and-software-update>.
11. California Department of Motor Vehicles (DMV). (2026, 28 April). *New Autonomous Vehicle Regulations Strengthen Oversight and Enforcement, Authorize Trucks and Transit* [Press release]. <https://www.dmv.ca.gov/portal/news-and-media/new-autonomous-vehicle-regulations-strengthen-oversight-and-enforcement-authorize-trucks-and-transit/>.



COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

The World Economic Forum is the trusted global platform for public-private cooperation, bringing together leaders from business, government, civil society, international organizations, academia and the next generation to turn foresight and dialogue into meaningful action on the world's most pressing challenges.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org