AUTONOMOUS VEHICLES REGULATION IN BEIJING*

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Table of Contents

I. INTRODUCTION 132
II. DEVELOPMENT AND CHARACTERISTICS 134
III. WHY LOCAL LEGISLATION FIRST 138
A. CONDITIONS ARE NOT RIPE FOR NATIONAL LEVEL LEGISLATION 138
B. LOCAL LEGISLATION IS PREDICATED ON ESTABLISHED REGULATORY FRAMEWORK 141
C. BEIJING'S LOCAL LEGISLATION PIONEERS HAVE FUNCTIONAL ADVANTAGES 145
IV. THE CHOICE OF LEGISLATIVE MODEL 149
A. COMPARISON OF EXISTING LOCAL LEGISLATIVE MODELS 149
1. SPECIAL ECONOMIC ZONE LEGISLATION 149
2. PROMOTIONAL LEGISLATION 151
3. REVISION OF LOCAL ROAD TRAFFIC REGULATIONS 152
B. COMMON FOCUS IN LOCAL LEGISLATION 153
C. BEIJING: SPECIALIZED LEGISLATION FOR AVS 154
V. PRIMARY LEGISLATIVE CHALLENGES 155
A. VEHICLE ACCESS RESTRICTIONS 155
B. INSURANCE ISSUES 157
C. SUBJECT OF LIABILITY IN TRAFFIC ACCIDENTS 158
VI. HIGHLIGHTS AND INNOVATIONS 161
A. CLARIFICATION OF ADMINISTRATIVE AUTHORITIES 161
B. BEIJING-TIANJIN-HEBEI COORDINATION 161
C. TECHNICAL INNOVATION CHAPTER 162
D. BUILDING SUPPORTING INFRASTRUCTURE 162
E. HIGH PRIORITY ON DATA SECURITY 163
VII. CONCLUSION 164

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Abstract

Beijing has experienced rapid development in autonomous driving industry, yet lacks supporting local legislation. Examining Beijing's policy framework in autonomous driving since 2015 reveals its pioneering role in policy implementation, promoting cross-regional collaboration, developing multi-scenario deployments, and emphasizing data security. While national legislation remains premature, local legislative pilots can accumulate valuable experience to inform national lawmaking. Additionally, local legislation can mediate the tension between technological advancement and legal stability, fostering autonomous vehicle industry development through regulatory competition. Analysis of existing local legislative models nationwide reveals three patterns: special economic zone legislation, promotional legislation, and local traffic law amendments, all addressing access requirements, entity responsibilities, data governance, and application scenarios. Beijing is better suited to adopt specialized autonomous vehicle legislation, focusing on challenging issues including vehicle access, insurance, and traffic accident liability. The distinctive features of Beijing's autonomous vehicle legislation include clear administrative authority, promotion of Beijing-Tianjin-Hebei coordination, effective utilization of technological advantages, development of supporting infrastructure, and strong emphasis on data security.

Key words: Autonomous Vehicles; Beijing; Regulation; Legislative model; Challenges; Highlights

I. INTRODUCTION

The leading developed nations globally have positioned the advancement of artificial intelligence as a pivotal strategy to bolster national competitiveness and ensure national security. Autonomous vehicles (hereinafter referred to as “AVs”) represent the culmination of the profound integration of electronics, communications, artificial intelligence, and big data technologies within the automotive sector, marking a contemporary pinnacle in scientific and technological rivalry among nations. Fueled by the triad of electrification, intelligence, and connectivity, the traditional automotive industry is currently experiencing a phase of accelerated growth.

The implementation of autonomous vehicle technology demonstrates significant potential in mitigating traffic-related incidents. Recent empirical evidence indicates that AVs exhibit substantially lower accident rates compared to conventional human-operated vehicles, with notable reductions of 50% in rear-end collisions and 20% in side-swipe incidents.[1] Furthermore, the technology demonstrates a remarkable capacity to

[1] *See* Abdel-Aty, M., Ding, S. *A matched case-control analysis of autonomous vs human-driven vehicle accidents*, Nature Communications 15, 4931 (2024).

enhance road infrastructure efficiency, yielding a 2.73-fold improvement in utilization metrics[2] and consequent urban congestion reduction. The deployment of AVs also presents promising implications for environmental sustainability and urban transportation optimization. However, it is imperative to acknowledge that during the developmental phase, technological limitations may contribute to unavoidable traffic incidents. In response to these safety considerations, Chinese regulatory authorities have implemented a methodical, policy-driven deployment strategy that prioritizes safety protocols and systematic risk management.

In June 2024, nine automotive companies were selected as autonomous vehicle application pilots.[3] In July of the same year, the Ministry of Industry and Information Technology and other five ministries jointly published a comprehensive roster of municipalities designated for the implementation of integrated Vehicle-to-Everything (V2X) intelligent connected vehicle systems. This initiative, encompassing vehicle-road-cloud integration, identified 20 strategic urban centers, with Beijing securing a prominent position among the selected localities.[4] Projections indicate that Beijing is poised to achieve comprehensive autonomous driving capabilities within a contained operational domain spanning 12 administrative districts and encompassing an impressive 2,000 square kilometers, representing more than 10% of Beijing's total metropolitan area.[5]

Currently, China's autonomous driving regulatory framework operates without national-level legislation, relying instead on a guidance system comprising regulatory documents and standardized protocols. The central governance structure predominantly consists of ministerial and commission-issued normative documents, implementing a three-phase approach: testing and demonstration applications, pilot access and road

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[2] *See* Evan Ackerman, *Study: Intelligent cars Could Boost Highway Capacity by 273%*, IEEE Spectrum (June 8, 2016).

[3] According to the "Notice on Pilot Work for Intelligent Connected Vehicle Access and Road Operation" (MIIT Joint Communication Equipment [2023] No. 217), four ministries - the Ministry of Industry and Information Technology, Ministry of Public Security, Ministry of Housing and Urban-Rural Development, and Ministry of Transport - have selected nine enterprises to pilot the operation of production-ready intelligent connected vehicles equipped with autonomous driving capabilities (Level 3/Level 4). See *Si Bumen Youxu Kaizhan Zhinengwanglian Qiche Zhunru He Shanglu Tongxing Shidian* (四部门有序开展智能网联汽车准入和上路通行试点) [*Four government departments have launched a coordinated pilot program for market entry and road operation of connected and autonomous vehicles*], CHINESE GOV'T (June 4, 2024), https://www.gov.cn/lianbo/bumen/202406/content_6955487.htm.

[4] *See Guanyu Gongbu Zhinengwanglian Qiche "Cheluyun Yitihua" Yingyong Shidian Chengshi Mingdan de Tongzhi* (关于公布智能网联汽车“车路云一体化”应用试点城市名单的通知) [*Notice Regarding the Announcement of Pilot Cities for Integrated Vehicle-Road-Cloud Applications in Connected and Automated Vehicles*], CHINESE GOV'T (July 1, 2024), https://www.gov.cn/zhengce/zhengceku/202407/content_6965771.htm.

[5] *See* Cao Zheng (曹政)，*Benshi Zidong Jiashi Shifanqu Jiang Kuo Zhi 3000 Pingfang Gongli* (本市自动驾驶示范区将扩至 3000 平方公里) [*The autonomous driving demonstration zone in Beijing will be expanded to 3,000 square kilometers*], BEIJING RIBAO (北京日报)[BEIJING DAILY]，Oct. 21, 2024, at A5.

deployment, and mass-market implementation. Significantly, the Road Traffic Safety Law's revision has been incorporated into both the State Council's 2024 legislative agenda and the primary category of the 14th National People's Congress Standing Committee's legislative plan.

In terms of local autonomous driving legislation, several metropolitan areas have emerged as pioneering jurisdictions in this technological revolution. Notable municipalities including Shenzhen, Shanghai's Pudong New Area, Jiangsu Province, Wuxi, Suzhou, Yangquan, and Hangzhou have initiated groundbreaking local legislative frameworks. These jurisdictions have successfully facilitated practical autonomous driving applications through legislative innovation, thereby establishing valuable precedents for autonomous driving governance structures.

Beijing, as China's preeminent economic hub, exhibits unparalleled dynamism, market accessibility, and innovative capacity, particularly in the autonomous vehicle sector. Despite the rapid advancement of its automated driving industry, the absence of comprehensive local legislative framework has impeded the sector's progression to subsequent developmental phases. In response to both central and municipal governmental legislative initiatives, the regulatory landscape for AVs has emerged as a critical focus. Consequently, on June 30, 2024, Beijing authorities promulgated the "Beijing Autonomous Vehicles Regulation (Draft)," marking a significant milestone in local autonomous vehicle governance.

II. DEVELOPMENT AND CHARACTERISTICS

In a pioneering initiative dating back to 2015, Beijing Government initiated a strategic framework for AVs development. The implementation of the "Made in China 2025" Beijing Action Outline in December of that year delineated eight novel industrial ecosystems, with particular emphasis on "intelligent new energy vehicles." This framework prioritized the advancement of V2X connectivity, intelligent mobility systems, and advanced driver assistance technologies. [6]

The year 2017 marked a pivotal moment in the evolution of autonomous vehicle technology, characterized by significant advancements both globally and within China's domestic market. Beijing pioneered the nation's first regulatory framework for autonomous vehicle road testing, establishing a precedent for the country's autonomous driving sector. The Beijing Municipal Commission of Transportation, in collaboration with the Traffic Management Bureau and the Commission of Economy and Information Technology, promulgated two seminal policy documents:

[6] *See* Beijing Government, Zhongguo Zhizao 2025 Beijing Xingdong Gangyao (《中国制造 2025》北京行动纲要) ["Made in China 2025" Beijing Action Outline].

"Beijing Municipal Guidance on Accelerating the Work Related to Road Testing of Autonomous Driving Vehicles (Trial)" and "Beijing Municipal Implementing Rules for the Management of Road Testing of Autonomous Driving Vehicles (Trial)." These regulatory frameworks delineated comprehensive protocols encompassing test vehicle specifications, testing entity requirements, operator qualifications, and liability allocation in the event of incidents.

Beijing established its inaugural autonomous vehicle testing facility in Shunyi district on December 29, 2017, followed by the implementation of the city's first dedicated autonomous driving test route in Yizhuang on January 3, 2018.[7] Subsequently, Baidu achieved a notable milestone by securing Beijing's initial autonomous vehicle testing permits, enabling the company to commence public road trials of their self-driving vehicles in the Yizhuang region of Daxing District.[8]

In September 2020, Beijing officially set up the Beijing High-Level Autonomous Driving Demonstration Zone (hereinafter referred to as the " Demonstration Zone "),[9] facilitating the widespread deployment of Level 4 AVs and implementing cloud-connected autonomous driving control systems through the integration of critical technological components.

In April 2021, the People's Government of Beijing Municipality decided to take advantage of the policy opportunities arising from the construction of the two districts to set up Beijing Intelligent Connected Vehicle (ICV) Policy Pioneer Zone (hereinafter referred to as the " pilot zone") relying on the Demonstration Zone. In order to create a policy-friendly environment for industrial development, and to effectively support the application and promotion of new technologies, products and modes, the pilot zone takes special policy and institutional innovation as a breakthrough.

With the establishment of the pilot zone, "Overall Implementation Plan for the Beijing ICV Policy Pilot zone" has been released. As the top-level design document, it outlines Beijing's initiative to explore regulatory innovation directions for the application and promotion of new technologies, products, and models of ICVs. Meanwhile, Beijing has also taken the lead in the country by releasing several leading policies. The comprehensive policy initiative encompasses four key provisions: (1) authorization of commercial deployment of AVs with fee-based services;

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[7] *See* Beijing Municipal Bureau of Economy and Information Technology (北京市工信局), Beijing Rengong Zhineng Chanye Fazhan Baipishu(2018 Nian)(北京人工智能产业发展白皮书(2018 年))[Beijing Artificial Intelligence Industry Development White Paper (2018)].

[8] Beijing Municipal Bureau of Economy and Information Technology (Ed.). Beijing Industry Yearbook 2019 (Vol. 29). Beijing Publishing House, 107 (2019).

[9] *See* Wang Haonan(王昊男), *Beijing Jingkaiqu: Ronghe Fazhan Qixiang Xin* (北京经开区：融合发展气象新)[*Beijing Economic Development Zone: New Weather for Integrated Development*], RENMIN RIBAO (人民日报)[People's Daily], Apr. 11, 2021, at A4.

(2) establishment of legal right-of-way protocols for autonomous delivery vehicles; (3) implementation of a novel cross-jurisdictional validation system for ICV testing - an unprecedented initiative nationwide; and (4) expansion of autonomous driving trials to include highway environments.

Beijing maintains a leading national position in autonomous vehicle testing across key metrics, including open test road mileage, number of testing companies, and quantity of test vehicles. The autonomous vehicle industry faces pressing regulatory demands concerning the certification and registration protocols for intelligent connected vehicles (ICVs). Key areas requiring regulatory framework include autonomous testing protocols, commercial deployment parameters, extended highway testing provisions, and comprehensive liability frameworks for incident resolution. The current legislative landscape exhibits notable gaps in addressing these critical aspects, underscoring the imperative for establishing robust statutory guidelines.

Since 2022, the Municipal Bureau of Economy and Information Technology, in conjunction with the Municipal Autonomous Driving Office, has initiated comprehensive legislative research and established a dedicated task force to expedite the development of pertinent regulatory frameworks. This strategic initiative aims to create a conducive legal environment for the advancement of autonomous vehicle technology while ensuring public safety and operational clariy. In June 2024, the Beijing Municipal Bureau of Economy and Information Technology drafted the "autonomous vehicles Regulation in Beijing (Draft)" and openly solicited comments from the public.

Overall, Beijing's development in the autonomous driving sector has progressed from policy formulation to legislative safeguards, gradually establishing a comprehensive autonomous driving ecosystem. Throughout this process, Beijing has issued a series of significant regulatory documents encompassing various aspects, including autonomous shuttles, autonomous delivery vehicles, passenger vehicles, transit buses, heavy-duty trucks, street sweepers, data collection and mapping, and data management. The developmental trajectory of AVs in Beijing exhibits the following characteristics.

(1) Beijing implements a strategic framework characterized by "pioneering innovation with measured prudence." The municipality has demonstrated leadership in policy experimentation and regulatory advancement, particularly in autonomous vehicle technologies. While maintaining rigorous safety protocols, Beijing has systematically facilitated technological innovation across multiple domains. The city has achieved several national precedents, including: authorization of peak-hour autonomous vehicle testing, establishment of cross-jurisdictional testing

protocols, integration of autonomous delivery vehicles into urban infrastructure, initiation of commercial autonomous services, implementation of highway-based testing programs, development of fully autonomous testing frameworks, and institution of comprehensive data security governance mechanisms.

(2) Beijing is committed to integrating AVs with urban mobility, smart logistics, and intelligent transportation systems. Rather than solely focusing on testing and developing autonomous cars, the city aims to incorporate autonomous driving technology into various life scenarios, enabling multi-scenario applications of autonomous driving artificial intelligence. Comprehensive demonstrations have been successfully implemented across eight major application scenarios, including autonomous taxis, unmanned delivery vehicles, autonomous vending vehicles, self-driving minibuses, driverless shuttle buses, autonomous cleaning vehicles, unmanned patrol vehicles, and trunk logistics transportation.

(3) Beijing emphasizing inter-regional collaborative development. The Beijing-Tianjin-Hebei coordinated development represents one of China's major regional strategic initiatives. Beijing's autonomous driving development strategy actively aligns with this broader regional framework, leveraging Beijing's competitive advantages to facilitate regional growth. This includes supporting mutual recognition of intelligent connected vehicle test results across different jurisdictions, demonstrating a commitment to cross-regional technological integration and standardization. With the opening of the first testing expressway spanning the Beijing-Tianjin-Hebei regions, autonomous trucks have truly achieved inter-provincial transportation in April 2024.

(4) The realization of autonomous driving performance advantages requires the acquisition of massive data, and AVs continuously collect data from the moment their systems begin operation.[10] Network and data security represent one of the significant challenges introduced by autonomous driving. In 2016, the National Administration of Surveying, Mapping and Geoinformation issued the "Notice on Strengthening the Management of Autonomous Driving Map Production, Testing and Application," stipulating that the collection, editing, processing, and production of autonomous driving map data must be undertaken by entities possessing surveying and mapping qualifications for navigation electronic map production. Compared to other regions nationwide, Beijing's significance as the capital is self-evident. Consequently, Beijing has

[10] *See* Zheng Ge (郑戈), *Shuju Fazhi yu Weilai Jiaotong - Zidong Jiashi Shuju Zhili Chuyi* (数据法治与未来交通—自动驾驶数据治理刍议) [*Data Governance and Future Transportation - A Preliminary Discussion on Autonomous Driving Data Governance*], 1 ZHONGGUO FALÜ PINGLUN (中国法律评论) [CHINA LAW REVIEW] 203 (2022).

implemented an integrated "vehicle-road-cloud-network-map" construction approach to ensure data security. Additionally, Beijing has researched the standards of urban intelligent roads and digital platform in June 2023.

III. WHY LOCAL LEGISLATION FIRST

Through legislative frameworks, the advancement of autonomous vehicle technology can be effectively facilitated while mitigating potential regulatory impediments to innovation. The implementation of localized legislative initiatives serves as a crucial tested for regulatory approaches, generating empirical evidence and practical insights that can inform subsequent national policy development. This methodological approach helps reconcile the inherent tension between technological acceleration and legal stability, ultimately establishing a robust foundation for comprehensive national-level autonomous vehicle legislation. Such a strategic regulatory pathway enables the systematic accumulation of regulatory expertise while ensuring the sustainable development of autonomous driving capabilities within established legal parameters.

A. Conditions are not ripe for national level legislation

On August 20, 2021, China officially released the national standard "Taxonomy of Driving Automation for Vehicles" (GB/T 40429-2021), which classifies driving automation functions into six distinct levels: Level 0 (Emergency Assistance), Level 1 (Driver Assistance), Level 2 (Partial Automation), Level 3 (Conditional Automation), Level 4 (High Automation), and Level 5 (Full Automation). Generally, when discussing AVs, the reference is made to vehicles at Level 3 and above.

Regarding the national legislation on autonomous driving, there have been different views in Chinese academia. Some scholars believe that we should learn from the German legislative model and elevate the decentralized local legislation to national legislation with a higher level as soon as possible,[11] or revise the laws and regulations for L3 and the following levels of AVs first, and then formulate the Autonomous Driving Law for L4-L5 AVs.[12] It is also proposed to re-understand the established issues of motor vehicle subjects and principles of attribution by way of

[11] *See* Zhang Taolue (张韬略) & Qian Rong (钱榕), *Mairu Wuren Jiashi Shidai de Deguo Daolu Jiaotongfa - Deguo "Zidong Jiashi Fa" de Tansuo yu Qishi* (迈入无人驾驶时代的德国道路交通法—德国《自动驾驶法》的探索与启示) [*Entering the Era of Autonomous Driving in German Road Traffic Law - Exploration and Revelation of Germany's "Autonomous Driving Law"*], 1 DEGUO YANJIU (德国研究) [deutschland sdudien] 100 (2022).

[12] *See* Ye Qiang (叶强), *Deguo Zidong Jiashi Lifapingxi* (德国自动驾驶立法评析) [*Analysis of German Autonomous Driving Legislation*], 2 GUOWAI SHEHUI KEXUE (国外社会科学) [SOCIAL SCIENCES INTERNATIONAL] 85 (2022).

legal interpretation.[13] Some scholars have also proposed the way of autonomous driving legislation, which can be preceded by local pilot, separate legislation and administrative regulations under the idea of "progressive" legislation.[14] More scholars suggest amending the Road Traffic Safety Law and other legal norms related to autonomous driving.[15]

The introduction of unified, specialized legislation on autonomous driving at the national level necessitates mature legislative conditions. However, given the current state of autonomous driving technology development and application, such conditions are not yet present.

Firstly, the automatic driving technology is not fully mature. The current automatic driving technology is still mainly in the L3 stage (conditional automatic driving) and below, in the domestic L4 driving stage (highly automated driving) technology is not fully mature, only in a limited area of open road testing and commercialization of trial operation.L5 stage (unmanned) technology, in Beijing, Shenzhen and other places only began to test and commercialization of trial operation. As far as technical conditions are concerned, there are problems such as irrational features of AI solutions, "algorithmic black boxes", "mixed driving between humans and machines", and insecurity of core data.[16] 5G communications and high-precision maps on which autonomous driving depends have not been popularized and applied, and eligible less intelligent road infrastructure. Autonomous driving has problems in terms of insufficient recognition of road conditions due to sensors and algorithms, and errors in decision-making and execution, for example, a collision can

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[13] *See* He Tan (何坦), *Lun Woguo Zidong Jiashi Qiche Qinquan Zeren Tixi de Goujian - Deguo "Daolu Jiaotong Fa" de Xiuding Jiqi Jiejian* (论我国自动驾驶汽车侵权责任体系的构建—德国《道路交通法》的修订及其借鉴) [*On the Construction of China's Autonomous Vehicle Tort Liability System - Revisions and Lessons from Germany's "Road Traffic Law"*], 1 SHIDAI FAXUE (时代法学) [Presentday Law Science] 58 (2021).

[14] *See* Li Shuo (李烁), *Zidong Jiashi Qiche Lifa Wenti Yanjiu* (自动驾驶汽车立法问题研究) [*Research on Legislative Issues of Autonomous Vehicles*], 2 XINGZHENG FAXUE YANJIU (行政法学研究) [ADMINISTRATIVE LAW REVIEW] 104 (2019); Wang Quansheng (汪全胜) & Song Linlin (宋琳璘), *Wuren Jiashi Qiche yu Woguo Daolu Jiaotong Anquan Falü Zhidu de Wanshan* (无人驾驶汽车与我国道路交通安全法律制度的完善) [*Autonomous Vehicles and the Improvement of China's Road Traffic Safety Legal System*], 3 ZHONGGUO RENMIN GONGAN DAXUE XUEBAO (SHEHUI KEXUE BAN) (中国人民公安大学学报(社会科学版)) [Journal of People's Public Security University of China:Social Sciences Edition] 107 (2020).

[15] *See* Jiang Su (江溯), *Zidong Jiashi Qiche dui Falü de Tiaozhan* (自动驾驶汽车对法律的挑战) [*Challenges of Autonomous Vehicles to Law*], 2 ZHONGGUO FALÜ PINGLUN (中国法律评论) [CHINA LAW REVIEW] (2018); Hu Yuanchong (胡元聪) & Li Mingkang (李明康), Zidong Jiashi Qiche dui "Daolu Jiaotong Anquan Fa" de Tiaozhan ji Yingdui (自动驾驶汽车对《道路交通安全法》的挑战及应对) [*Challenges and Responses of Autonomous Vehicles to the "Road Traffic Safety Law"*], SHANGHAI JIAOTONG DAXUE XUEBAO (上海交通大学学报) [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] (2019).

[16] *See* Zhongguo Zhinen Jiaotong Xiehui & Zhongguo Qiche Jishu Yanjiu Zhongxin Youxian Gongsi (中国智能交通协会、中国汽车技术研究中心有限公司), *Zhongguo Zidong Jiashi Chanye Fazhan Baogao (2021)* (中国自动驾驶产业发展报告（2021）) [*China Autonomous Driving Industry Development Report (2021)*], Social Sciences Academic Press (社会科学文献出版社) 13 (2021).

occur if it fails to recognize the vehicle in front of it.[17]

Secondly, limited commercial application experience exists in autonomous driving, presenting a stark contrast to ride-hailing services which accumulated substantial operational experience through "aggressive development" prior to regulatory framework implementation. Autonomous driving trials have proceeded cautiously under close scrutiny from national and local governments, resulting in limited commercial application data. In February 2020, eleven governmental departments, including the National Development and Reform Commission, jointly issued the "Intelligent Vehicle Innovation Development Strategy," establishing targets for 2025: development of a comprehensive framework encompassing technological innovation, industrial ecosystem, infrastructure, regulatory standards, product supervision, and cybersecurity for Chinese-standard intelligent vehicles. The strategy aims to achieve scale production of conditional AVs and market application of highly AVs in specific environments. According to the Intelligent Connected Vehicle Technology Roadmap, China projects that L2 and L3 vehicles will collectively account for 50% of the market by 2025. However, L4-L5 AVs face significant barriers to mass market entry in the personal vehicle segment due to limitations in road infrastructure, AI training requirements, and other technical constraints. The lack of sufficient commercial implementation samples and accident dispute cases has created a knowledge gap for regulatory authorities in determining appropriate legal frameworks for autonomous driving. Consequently, legislative bodies face challenges in formulating comprehensive legislation due to limited empirical evidence and practical experience.

Thirdly, the legal framework surrounding AVs remains ambiguous and complex. Unlike conventional vehicles, AVs, as artificial intelligence-driven systems, present unprecedented challenges to established legal paradigms. The evolution of autonomous driving technology raises fundamental questions about legal personhood and liability attribution. A critical discourse emerges regarding whether autonomous systems should be recognized as independent legal entities

[17] In the first Tesla Autopilot fatality in China in January 2016, the person driving a Tesla Model S was killed in a rear-end collision after failing to recognize a road sweeper in front of him while driving on the Handan section of the Beijing-Hong Kong-Macao Expressway. See Zhenqi Zhang (张真齐), Weiquan Shi Weile Rang Beiju Bu Zai Chongyan (维权是为了让悲剧不再重演) [Defending Rights to Prevent Tragedies from Reoccurring], Zhongguo Qingnian Bao (中国青年报) [China Youth Daily], April 29, 2021.

capable of bearing civil or criminal liability.[18] Furthermore, even in the absence of legal personhood for AVs, significant uncertainty persists in delineating the legal relationships and respective liabilities among multiple stakeholders-including vehicle manufacturers, autonomous system developers, operators, and human drivers-particularly in the context of traffic incidents. This legal complexity necessitates a comprehensive reevaluation of existing regulatory frameworks to address the unique characteristics of autonomous vehicle technology.

Finally, there exists an excessive interconnection of legal frameworks. Autonomous driving legislation intersects with multiple laws, administrative regulations, and departmental rules across various aspects including product circulation, road operation, accident liability and insurance, cyber security, and cartographic surveying. Autonomous driving presents challenges to administrative law, civil law, and criminal law, potentially necessitating amendments to a series of legal provisions including the Road Traffic Safety Law, Insurance Law, Product Quality Law, and Criminal Law. National-level autonomous driving legislation requires thorough preparation and substantiation, as inadequate consideration could compromise legal uniformity and coherence.

Therefore, given the complex nature of autonomous driving systems and their intersection with multiple jurisdictional frameworks, premature centralized legislative action appears inadvisable. This assessment stems from several critical factors: the current ambiguity in legal frameworks, insufficient commercial implementation data, and the rapid technological evolution in this domain. The confluence of these elements suggests that comprehensive central legislation would be precipitous at this juncture.

B. Local Legislation is Predicated on Established Regulatory Framework

The foundational authority for local regulatory precedence is established under Article 82 of the Legislation Law. This provision facilitates preliminary legislative implementation at the local level, particularly in domains where national legislation remains nascent or experientially deficient. This approach enables the accumulation and synthesis of practical experience before potential elevation to unified national legislation—a methodology that demonstrates optimal legislative efficiency and effectiveness. The important premise of the application of

[18] See Zhang Jihong (张继红) & Xiao Jianlan (肖剑兰), *Zidong Jiashi Qiche Qinquan Zeren Wenti Yanjiu* (自动驾驶汽车侵权责任问题研究) [*Research on Tort Liability Issues of Autonomous Vehicles*], 1 SHANGHAI DAXUE XUEBAO (SHEHUI KEXUE BAN) (上海大学学报(社会科学版)) [JOURNAL OF SHANGHAI UNIVERSITY (SOCIAL SCIENCE EDITION)] 16 (2019); Si Xiao (司晓), *Lun Rengong Zhineng de Minshi Zeren: Yi Zidong Jiashi Qiche he Zhineng Jiqiren Wei Qieru Dian* (论人工智能的民事责任: 以自动驾驶汽车和智能机器人为切入点) [*On Civil Liability of Artificial Intelligence: Focusing on Autonomous Vehicles and Intelligent Robots*], 5 FALÜ KEXUE (法律科学) [SCIENCE OF LAW] 166 (2017).

this article is that the legislative affairs that need to be resolved through local prior legislation cannot be exclusively centralized legislative matters, that is, the situation stipulated in Article 11 of the Legislation Law, which is the "forbidden zone" of the legislation of local laws and regulations. The reason why autonomous driving can be resolved through local prior legislation is that autonomous driving is fundamentally a management matter in the field of road traffic and transportation.

Currently, China lacks explicit legal frameworks defining the concept and legal status of "autonomous driving" or "AVs". While discussions on autonomous driving center on the same subject matter, varying terminologies reflect different emphases. For example, "intelligent connected vehicles (ICVs)" approaches the topic from a product perspective, emphasizing intelligence and connectivity capabilities. The term "Vehicle-to-everything (V2X)" often used in conjunction with ICVs, emphasizes network technology infrastructure development. "Intelligent transportation" represents a macro-level system planning approach, with autonomous driving being one component. "Autonomous driving" primarily challenges traditional driving paradigms, highlighting the evolving role of human operators. Some literature restricts autonomous driving discussions to driverless vehicles, given their comprehensive challenges to existing legal frameworks.

More frequently, autonomous driving is examined within the broader context of artificial intelligence research. In the early stages of research, there are many scholars who propose to give AVs legal subject status, such as "giving AVs independent legal personality"[19], "AVs can become the subject of traffic collision"[20], "tort liability legislation centered on instrumental personhood for AVs".[21] However, as research progressed, the independent subject criterion became less mainstream, as noted by scholars who observed that "the academic community has reached a

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[19] *See* Zhang Jihong (张继红) & Xiao Jianlan (肖剑兰), *Zidong Jiashi Qiche Qinquan Zeren Wenti Yanjiu* (自动驾驶汽车侵权责任问题研究) [*Research on Tort Liability Issues of Autonomous Vehicle*s], 1 SHANGHAI DAXUE XUEBAO (SHEHUI KEXUE BAN) (上海大学学报(社会科学版)) [JOURNAL OF SHANGHAI UNIVERSITY (SOCIAL SCIENCE EDITION)] 16 (2019); Xiao Si (司晓), *Lun Rengong Zhineng de Minshi Zeren: Yi Zidong Jiashi Qiche he Zhineng Jiqiren Wei Qieru Dian* (论人工智能的民事责任: 以自动驾驶汽车和智能机器人为切入点) [*On Civil Liability of Artificial Intelligence: Focusing on Autonomous Vehicles and Intelligent Robots*], 5 FALÜ KEXUE (法律科学) [SCIENCE OF LAW] 166 (2017).

[20] *See* Lu Youxue(卢有学) & Dou Zezheng (窦泽正), *Lun Xingfa Ruhe Dui Zidong Jiashi Jinxing Guizhi - Yi Jiaotong Zhaoshi Zui Wei Shijiao* (论刑法如何对自动驾驶进行规制——以交通肇事罪为视角) [*How Criminal Law Regulates Autonomous Driving - A Perspective from Traffic Accident Crimes*], 4 XUESHU JIAOLIU (学术交流) [ACADEMIC EXCHANGE] 77 (2018); Cheng Long (程龙), *Zidong Jiashi Cheliang Jiaotong Zhaoshi de Xingfa Guizhi* (自动驾驶车辆交通肇事的刑法规制) [*Criminal Regulation of Traffic Accidents Involving Autonomous Vehicles*], 4 XUESHU JIAOLIU (学术交流) [ACADEMIC EXCHANGE] 87 (2018).

[21] *See* Xu Zhongyuan (许中缘), *Lun Zhineng Qiche Qinquan Zeren Lifa - Yi Gongju Xing Renge Wei Zhongxin* (论智能汽车侵权责任立法—以工具性人格为中心) [*On the Legislation of Tort Liability for Intelligent Vehicles - Centered on Instrumental Personality*], 4 FAXUE (法学) [Law Science] 67 (2019).

consensus that it is currently inappropriate to grant AVs legal subject status."[22] Generally speaking, contemporary discussions of autonomous driving remain fundamentally within the category of "automobiles" or "motor vehicles." This essentially falls under the domain of road transportation management, where governance, implementation, and administrative matters are predominantly considered local affairs, or at minimum, should be classified as shared jurisdictional responsibilities between central and local authorities. [23]

In the field of transportation, a substantial corpus of local precedential legislation exists. Statistical analysis indicates that post-China's reform and opening-up period, approximately 145 distinct local legislative instruments have been enacted within the transportation sector, encompassing various subsectors including road traffic administration, urban infrastructure management, vehicular rental services, and public transit systems. Local legislative autonomy manifests particularly in areas where central legislation exhibits regulatory gaps or ambiguous provisions.[24] A paradigmatic example is the regulation of electric bicycles (e-bikes), where in the absence of comprehensive national legislation, provincial jurisdictions such as Jiangsu and Zhejiang have implemented pioneering regulatory frameworks. Multiple jurisdictions have developed sophisticated regulatory mechanisms for e-bikes, yielding valuable empirical data and establishing mature regulatory protocols. These include: directory management systems, registration and licensing protocols, prohibitions on unauthorized modifications, anti-tampering regulations, etc.[25] These local legislative innovations present a robust foundation for potential incorporation into future centralized regulatory frameworks at the national level, demonstrating the efficacy of bottom-up policy development in transportation governance.

As a city with districts, Beijing's local legislative initiatives must comply with Article 81 of the Legislation Law, which restricts legislation

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[22] *See* Zheng Zhifeng(郑志峰), *Zidong Jiashi Qiche Jiaotong Shigu Zeren de Lifalun yu Jieshi Lun - Yi Minfa Dian Xiangguan Neirong Wei Shijiao* (自动驾驶汽车交通事故责任的立法论与解释论——以民法典相关内容为视角) [*Legislative and Interpretative Discussions on Liability for Traffic Accidents Involving Autonomous Vehicles - A Perspective from the Relevant Content of the Civil Code*], 3 DONGFANG FAXUE (东方法学) [Oriental Law] 156 (2021).

[23] *See* Yu Lingyun(余凌云), *Lun Daolu Jiaotong Anquan Fa Shang de Difang Shiquan* (论道路交通安全法上的地方事权) [*On Local Authority in the Road Traffic Safety Law*], 2 XINGZHENG FAXUE YANJIU (行政法学研究) [ADMINISTRATIVE LAW REVIEW] 22 (2019).

[24] *See* Zhou Ai yan (周艾燕), Di Gao (高峘), & Li Yin (李胤), *Woguo Jiaotong Yunshu Difang Xianxing Lifa Yanjiu* (我国交通运输地方先行立法研究) [*Research on Local Pilot Legislation for Transportation in China*], 16 JIAOTONG JIANSHI YU GUANLI (交通建设与管理) [TRANSPORTATION CONSTRUCTION AND MANAGEMENT] 84-85 (2016).

[25] *See* Shi Lidong (施立栋) & Yu Lingyun (余凌云), *Diandong Zixingche de Zhili* (电动自行车的治理) [*Governance of Electric Bicycles*], 2 ZHEJIANG XUEKAN (浙江学刊) [Zhejiang Academic Journal] 167-168 (2015).

to "urban-rural development and management, ecological civilization construction, historical and cultural protection, and grassroots governance". This raises the question: Does autonomous driving legislation at the municipal level align with Article 82 of the Legislation Law?

The concept of "urban-rural development and management" is notably broad and comprehensive. The Legislative Affairs Commission of the 12th National People's Congress, in its 2015 draft amendment to the Legislation Law, defined this term to encompass three fundamental jurisdictions: urban-rural planning, infrastructure construction, and municipal administration.[26] Scholarly perspectives suggest that urban traffic infrastructure and traffic management fall within the scope of urban administration.[27] Urban and rural planning (including traffic planning), public facilities construction (including traffic infrastructure construction), municipal management (including traffic management),[28] so road traffic and transportation management should be included. Taking the regulation of online car hailing service in cities with districts as an example, the basis for its management authority lies in the fact that online car hailing service belongs to the field of "urban transportation management" and can be included in the scope of "urban and rural construction and management".[29] Therefore, autonomous driving, as an integral component of road transportation and management, faces no jurisdictional restrictions for local legislative initiatives in cities with districts.

In addition, national policies encourage local legislation for early and pilot implementation. In January 2021, the Ministry of Transportation issued the "Guiding Opinions on Promoting the Development and Application of Automatic Driving Technology in Road Traffic", which encourages conditional regions to explore the development of management methods for the new automated driving industry, and to formulate relevant rules and regulations in due course. In November 2021, the "14th

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[26] *See* Deng Youwen (邓佑文), *Lun Shequ de Shi Lifa Quanxian Shijian Kunjing Zhi Pojie-Yi Ge Falü Jieshi Fangfa de Shijiao* (论设区的市立法权限实践困境之破解—一个法律解释方法的视角) [*On Solving the Practical Dilemma of Legislative Authority in District-Level Cities - A Perspective from Legal Interpretation Methods*], 10 ZHENGZHI YU FALÜ (政治与法律) [Political Science and Law] 62 (2019).

[27] *See* Wei Zhi Xun (魏治勋), *Shi Yu Shehui Zhili Shiyu Xia Shequ de Shi Chengshi Guanli Quanxian Jieding* (市域社会治理视阈下设区的市城市管理权限界定) [*Defining Urban Management Authority in District-Level Cities from the Perspective of Urban Social Governance*], 5 FALÜ KEXUE (法律科学) [SCIENCE OF LAW] 101 (2021).

[28] *See* Li Xiaoping (李小萍), *Dui Shequ Shi Lifa Quanxian Zhi "Chengxiang Jianshe yu Guanli" de Jieding* (对设区市立法权限之“城乡建设与管理”的界定) [*Defining "Urban-Rural Construction and Management" in Legislative Authority of District-Level Cities*], 3 FAXUE LUNTAN (法学论坛) [Legal Forum] 44 (2017).

[29] *See* Zheng Yi (郑毅), *Zhongyang yu Difang Lifa Quan Guanxi Shijiao Xia de Wangyueche Lifa - Jiyu "Lifafa" yu "Xingzheng Xukefa" de Fenxi* (中央与地方立法权关系视角下的网约车立法—基于<立法法>与<行政许可法>的分析) [*Legislation on Ride-Hailing Vehicles from the Perspective of Central and Local Legislative Authority - An Analysis Based on the "Legislation Law" and "Administrative Licensing Law"*], 2 DANGDAI FALÜ XUE (当代法学) [CONTEMPORARY LAW REVIEW] 19 (2017).

Five-Year Plan" for Transportation proposed that, in areas where the conditions for national legislation are not yet ripe, local legislation should be encouraged to be enacted on an early and pilot basis, so as to accumulate experience for national legislation, and to effectively bring into full play the role of local legislation as a means of implementing, supplementing and exploring in the construction of the rule of law.

C. Beijing's Local Legislation Pioneers Have Functional Advantages

Compared to technological and cost factors limiting the widespread adoption of autonomous driving, legal and regulatory frameworks represent the most significant barrier, substantially constraining the development of Beijing's autonomous driving industry. Currently, Beijing's support for autonomous driving development primarily stems from policy-level initiatives by normative documents. While policies offer flexibility, they inherently possess volatility and instability characteristics. Moreover, policies tend to be overly macro-oriented and principle-based, which compromises their operational feasibility and continuity.[30] In contrast, legislation derives its value from its stability, binding force, and predictability.

1. The legal advantages of local legislation

On the one hand, compared with normative documents, local legislation has stability and predictability. For the new industry of transportation, China is better at promoting the development of new industries through normative documents. Normative documents are characterized by flexibility and can be adjusted in time according to the development of emerging industries, which is its advantage. However, the characteristics of normative documents that are changeable and unstable are also its problems. In particular, through the normative documents, the addition of civil obligations and derogation of civil rights, that is, the issuance of normative documents with the nature of legislation, undoubtedly facing the legitimacy of interrogation.[31] In fact, now around the release of automatic driving road test management specification, this normative document is basically the use of legislative style (including chapters and articles), which for the test subject qualification requirements, test vehicle performance requirements and test personnel qualification

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[30] *See* Feng Lixia(封丽霞), *Zhongyang yu Difang Lifa Shiquan Huafen de Linian, Biaozhun yu Zhongguo Shijian - Jianxi Woguo Yang Di Lifa Shiquan Fazhihua de Jiben Silu* (中央与地方立法事权划分的理念、标准与中国实践—兼析我国央地立法事权法治化的基本思路) [*Concepts, Standards, and Practices of Dividing Legislative Authority Between Central and Local Governments - Also Analyzing the Basic Ideas for Legalizing Legislative Authority in China*], 6 ZHENGZHI YU FALÜ (政治与法律) [Political Science and Law] 27 (2017).

[31] *See* Qin Xiao Jian(秦小建), *Lifa Fuzhi, Juece Kongzhi yu Difang Zhili de Fazhi Zhuanxing* (立法赋权、决策控制与地方治理的法治转型) [*Legislative Empowerment, Decision Control, and the Legal Transformation of Local Governance*], 6 FAXUE (法学) [Law Science] 79-91 (2017).

requirements, has been suspected of obligation to add, with the nature of legislation. Rather than through the provisions of the normative documents, it would be better to further specify the relevant requirements through the form of local legislation first, after all, compared with the normative documents, local legislation first can "rightfully" set up the obligations of citizens, has a higher legal status and legal effect, can be used as a basis for judicial remedies or reference.

On the other hand, local legislation has a flexible process of enactment and a low cost of trial and error compared to centralized legislation. The rationale for choosing state legislation first in the U.S. lies in the fact that state legislation has a more flexible process than federal legislation, states are not necessarily bound by standards of practice, and there is a faster rule-making process.[32] Autonomous driving technology changes rapidly, and a great deal of trial and potentially error is required before figuring out the best way to regulate it.[33] The cost of legislative trial and error is lower at the state level, and the federal level can learn from the state legislative experience by learning from it and eventually reflecting it in federal legislation. The same lesson applies in this country. Autonomous driving local first legislation, whether it is to amend the local regulations for the implementation of the Road Traffic Law, or to introduce specific legislation on autonomous driving, the legislative cycle is relatively short, and the introduction of regulations is more rapid. In particular, the "small and quick" legislative approach advocated in local legislation nowadays provides a possibility for the rapid introduction of high-quality local legislation on automated driving. In addition, the unified legislation of the central government will affect the whole body, and the cost of trial and error is high. Autonomous driving technology is developing rapidly, and legal adjustments need to" cross the river by feeling the stones". Local legislation can reduce the cost of reform. Even if there is a mistake, it can be adjusted in time to minimize the loss.

2. Local Rule of Law Competition to Boost Industry

"The rule of law is the best business environment." By fostering local legal competition,[34] it is possible to dismantle the legal barriers hindering the development of autonomous driving, thereby seizing opportunities for the growth of the autonomous driving industry. The improvement of local legislation on AVs is essential for implementing the top-level design of the autonomous driving industry as outlined by the Central Committee of the

[32] Browne, Brian A, *Self-Driving Cars: On the Road to a New Regulatory Era*, 8Case Western Reserve Journal of Law, Technology and the Internet1, 12-17 (2017).
[33] Brodsky, Jessica S, *Autonomous Vehicle Regulation: How an Uncertain Legal Landscape May Hit the Brakes on Self-Driving Cars*, 31 Berkeley Technology Law Journal 851, 877 (2016).
[34] *See Zhou* Shangjun (周尚君), *Difang Fazhi Jingzheng Fanshi ji Qi Zhidu Yue Shu* (地方法治竞争范式及其制度约束) [*Local Rule of Law Competition Paradigms and Their Institutional Constraints*], 3 ZHONGGUO FAXUE (中国法学) [CHINA LEGAL SCIENCE] 93 (2017).

Communist Party of China and the State Council. It also serves as a guarantee for the maturation of autonomous driving technology and the realization of its commercial value.

Firstly, granting legal operational status to autonomous driving is crucial. The inability of AVs to achieve large-scale commercial operations across various regions is primarily due to the absence of explicit legal provisions. For this emerging industry, the lack of legal supply means that local regulatory authorities are hesitant to give the "green light" for autonomous driving operations. If a region enacts local legislation to provide regulatory support for autonomous driving operations, thereby granting them legal operational status, it will inevitably attract numerous automotive companies and related businesses to register and operate there. Regions that legislate first will naturally seize the opportunity for the development of the autonomous driving industry. The U.S. has been conducting legislative trials at the state level to establish the legal status of autonomous driving.[35] Since 2012, states such as Nevada, Florida, California, the District of Columbia, and Michigan have enacted autonomous driving legislation at the state level.[36] The introduction of state legislation has led to the legitimacy of autonomous driving tests in the U.S. A large number of Internet companies and traditional car companies have promoted the prosperity of the U.S. autonomous driving industry by choosing the suitable state for testing.

Secondly, the government should relax regulations on AVs. A key aspect of local legal competition is the relaxation of government regulations, which, through efficient and convenient administrative services, enables regions to outcompete others in attracting investment.[37] Imagine if local legislation were to first promote the development of the autonomous driving industry, and law enforcement agencies cooperated with legislative bodies to adopt relatively lenient regulatory approaches for autonomous driving operations, providing a market with ample free competition. This would undoubtedly attract companies to invest in the autonomous driving industry locally, thereby driving regional economic development.

Finally, to protect the property rights of autonomous driving enterprises. In the context of the autonomous driving industry, reliance solely on local normative documents, often referred to as "red-tip documents", results in a cautious approach by enterprises, particularly

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[35] Bryant Walker Smith, *Automated Vehicles Are Probably Legal in the United States*, 1TEX. A&M L. REV. 411, 500-508 (2014).

[36] William J. Kohler & Alex Colbert-Taylor, *Current Law and Potential Legal Issues Pertaining to Automated, Autonomous and Connected Vehicles*, 31 Santa Clara High Technology Law Journal99, 112-118 (2014).

[37] *See* Wan Jiang (万江), *Zhongguo de Difang Fazhi Jianshe Jingzheng* (中国的地方法治建设竞争) [*The Competition of Local Rule of Law Construction in China*], 4 ZHONGWAI FAXUE (中外法学) [PEKING UNIVERSITY LAW JOURNAL] 817 (2013).

foreign investors. This caution stems from the fact that in the event of a judicial dispute, these local "red-tip documents" fail to offer property rights protection during legal proceedings. On the contrary, if the local government promotes the development of the autonomous driving industry through legislation, even if a dispute arises, the parties concerned can seek judicial remedies to protect property rights through local regulations. In addition, a fairer and more equitable judicial environment can also enhance investor confidence.[38]

3. Beijing's automatic driving management experience is sufficient

First of all, from a regulatory effectiveness perspective, the current Beijing autonomous vehicle testing framework, comprising the Implementing Rules and associated Pioneer Zone policy documents, exhibits limited efficacy as lower-tier normative instruments. These documents demonstrate insufficient capacity to catalyze industrial advancement and inadequately fulfill their intended function of legally steering technological innovation. The establishment of dedicated local regulations governing AVs would therefore enhance the juridical framework governing Beijing's autonomous vehicle sector and foster a more conducive ecosystem for industry development.

As a pioneering municipality in China, Beijing established the inaugural regulatory framework for autonomous vehicle testing on public roads. The regulatory guidelines have undergone three significant iterations, implementing a systematic progression from controlled environments to open-road testing scenarios, facilitating structured advancement in autonomous driving applications. Since 2017, Beijing has demonstrated substantial commitment to autonomous vehicle development through progressive policy innovation and regulatory frameworks. The municipality has achieved significant milestones in several key areas: streamlining autonomous vehicle road testing protocols, establishing reciprocal recognition mechanisms for test outcomes, optimizing testing management procedures, and investigating commercial deployment possibilities. The implementation of comprehensive supporting documentation and systematic oversight has fostered a controlled environment for safe autonomous vehicle testing and applications.

By the end of 2023, Beijing had designated a cumulative total of 2,238.43 kilometers of autonomous driving test roads. Specifically, following the "Beijing Autonomous Vehicle Test Road Requirements (Trial)," the city has opened 336 test roads totaling 1,160.89 kilometers. These test routes span seven districts: Beijing Economic-Technological

[38] *See* Han Yebin (韩业斌), *Dangdai Zhongguo Difang Fazhi Jingzheng de Xianzhuang yu Dongli* (当代中国地方法治竞争的现状与动力) [*The Current Situation and Dynamics of Local Rule of Law Competition in Contemporary China*], 10 FAXUE (法学) [LAW SCIENCE] 129 (2017).

Development Area, Daxing, Fangshan, Haidian, Shunyi, Tongzhou, and Shijingshan. The testing infrastructure supports both unmanned specialized technical testing and nighttime adverse weather condition testing. A total of 38 companies have conducted autonomous vehicle road testing in Beijing, accumulating over 38.93 million kilometers in test mileage.[39]

These methodological approaches and investigative initiatives have established a robust empirical foundation and administrative precedent for subsequent legislative frameworks governing AVs at the local level.

IV. THE CHOICE OF LEGISLATIVE MODEL

The Chinese legislative framework operates through a hierarchical structure that maintains centralized authority while simultaneously accommodating regional legislative discretion. This dual-track system enables the central government to exercise paramount oversight while permitting subordinate jurisdictions to enact region-specific legislation that addresses their unique developmental trajectories and contextual requirements.[40] The resultant legislative architecture, characterized by its multi-tiered and concurrent nature, effectively balances the imperative of maintaining legal uniformity at the national level with the necessity of preserving sufficient legislative latitude to address diverse local conditions and developmental imperatives. Local legislation for autonomous driving exhibits multiple patterns, which can be distilled into three distinct pathways. What legislative approach would be most appropriate for Beijing's regulatory framework? This critical question warrants careful examination within the context of autonomous vehicle governance and regulatory development.

A. Comparison of existing local legislative models

1. Special Economic Zone Legislation

The legislative power of special zones refers to the legislative power exercised in specific special economic zones or special administrative regions of China by the legislative organs of those regions, as authorized by national laws and policies. This legislative power is characterized by a certain degree of autonomy and flexibility, and is aimed at promoting economic development and innovation in social management in special economic zones or special administrative regions. The legislative power of special economic zones is part of China's reform and opening-up policy, which aims to promote the rapid development and institutional innovation

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[39] *See* Beijing Shi Zhineng Chelian Chanye Chuangxin Zhognxin (北京市智能车联产业创新中心) [Beijing Intelligent Connected Vehicle Industry Innovation Center], *Beijing Zidong Jiashi Cheliang Daolu Ceshi Baogao* (北京自动驾驶车辆道路测试报告(2023))[*Beijing Autonomous Vehicle Road Testing Report (2023)*].

[40] *See* Zhou Shangjun (周尚君), *Zhongguo Lifa Tizhi Zuzhi Shengcheng yu Zhidu Luoji* (中国立法体制的组织生成与制度逻辑) [*The Organizational Formation and System Logic of China's Legislative System*], 11 XUESHU YUEKAN (学术月刊) [ACADEMIC MONTHLY] (2020).

of special economic zones by granting them a certain degree of legislative autonomy.[41] Shenzhen, as one of the first special economic zones in China, was granted legislative power to support its role as a "testing ground" for reform and opening up. At the same time, the exercise of the legislative power of special zones usually needs to be carried out within the framework of national laws to ensure that it does not conflict with national laws, and the exercise of the legislative power of special zones needs to comply with the basic principles and policy directions of national laws.[42] In the case of special economic zones, their legislative power is primarily governed by the Legislative Law. The Legislation Law sets out the forms of authorized legislation for special economic zones and was amended in 2023 to include the Pudong New Area regulations and the Hainan Free Trade Port regulations in the new category. Shenzhen, as a pioneering SEZ, exemplifies this model, having been endowed with legislative authority to function as an experimental jurisdiction for reform initiatives.

The implementation of such legislative powers operates within carefully defined parameters of national legislation, ensuring alignment with overarching legal frameworks and policy objectives. The Legislative Law serves as the primary governing instrument for SEZ legislative authority. Notable amendments to this law in 2023 expanded its scope to incorporate regulations for the Pudong New Area and the Hainan Free Trade Port, representing an evolution in the legislative framework for special economic zones. This legislative architecture maintains a delicate balance between regional autonomy and national sovereignty, requiring adherence to fundamental legal principles and policy directives while allowing for localized innovation in economic and social governance. The system exemplifies China's approach to controlled decentralization in pursuit of economic modernization and institutional reform.

Through the exercise of adaptive legislative authority, Shenzhen and Shanghai's Pudong New Area have implemented pioneering regulatory frameworks for AVs. Pursuant to Article 84(1) of the Legislative Law, provincial and municipal legislatures overseeing special economic zones are empowered to enact implementing regulations within their jurisdictions, as authorized by the National People's Congress.

Regulations of the Shenzhen Special Economic Zone on Intelligent Connected Vehicles exemplifies institutional innovation across multiple

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[41] *See* Wang Chengyi (王成义), *Shenzhen Jingji Tequ Lifa Quan: Lishi, Xue Li he Shijian* (深圳经济特区立法权: 历史、学理和实践) [*An Analysis on the Delegated Legislative Power in Shenzhen Special Economic Zone: History, Theory and Practice*], 1 DIFANG LIFABA YANJIU (地方立法研究) [LOCAL LEGISLATION JOURNAL] (2019).

[42] *See* Huang Jinrong (黄金荣), *Da Wanqu Jianshe Beijing Xia Jingji Tequ Lifa Biantong Quan de Xingshi* (大湾区建设背景下经济特区立法变通权的行使) [*Exercise of the Flexible Power of Legislation for Special Economic Zones under the Background of Construction of the Great Bay Area*], 21 FALÜ SHIYONG (法律适用) [JOURNAL OF LAW APPLICATION] (2019).

domains. Notable among these is the establishment of the "Shenzhen Intelligent Connected Vehicle Product Catalog" and its derivative "Temporary Vehicle Registration System".

Similarly, under Article 84(2), the Shanghai Municipal People's Congress and its Standing Committee are authorized to formulate regulations specific to the Pudong New Area. This authority resulted in the Regulations on Promoting Innovation and Application of Autonomous Intelligent Connected Vehicles in Shanghai Pudong New Area, representing a targeted legislative framework for autonomous vehicle governance.

Significantly, both jurisdictions have adopted a unified approach to liability in traffic incidents, designating the "owner or manager" of AVs as the responsible party—a departure from conventional Road Traffic Law provisions. This alignment demonstrates regulatory convergence in addressing novel challenges posed by autonomous vehicle technology.

2. Promotional Legislation

Promotional legislation represents a distinct paradigm from conventional regulatory frameworks, characterized by its emphasis on achieving state objectives and societal development through facilitative mechanisms rather than prescriptive controls.[43] The fundamental distinction lies in its employment of incentivization, guidance, and promotional strategies as primary instruments of policy implementation. The distinguishing feature of promotional legislation resides in its rights-centric adjustment mechanism, which prioritizes incentivization and reward systems to pursue enhanced value outcomes, underpinned by governmental accountability.[44] This legislative approach typically manifests in government-initiated programs targeting specific sectors or objectives. Significantly, the government assumes the principal legal agency in promotional legislation, resulting in a structural framework that amplifies governmental responsibilities while correspondingly diminishing the legal obligations of other stakeholders. This creates a distinctive legal architecture where the state apparatus serves as both the primary facilitator and guarantor of intended outcomes. This legislative methodology represents a paradigm shift from traditional regulatory approaches, emphasizing positive reinforcement and strategic guidance over punitive

[43] *See* Jiang Guohua (江国华) & Tong Li (童丽), *Cujin Xing Difang Lifa Shizheng Yanjiu* (促进型地方立法实证研究) [*Empirical Research on Promotional Local Legislation*], 3 SHEHUI KEXUE YANJIU (社会科学研究) [SOCIAL SCIENCE RESEARCH] (2021).

[44] *See* Liu Fengjing (刘风景), *Cujin Xing Lifa de Shijian Yangtai yu Lilun Shengsi* (促进型立法的实践样态与理论省思) [*The Practical Pattern and Theoretical Reflection on Promotional Legislation*], 6 FALÜ KEXUE (法律科学) [SCIENCE OF LAW] (2022).

measures and restrictive controls.[45]

The legislation concerning intelligent connected vehicles in cities such as Suzhou, Wuxi, and Hangzhou, while promotional in nature, has not effectively addressed legislative barriers or accumulated substantial legislative experience. On August 29, 2023, the Suzhou Municipal People's Congress Standing Committee passed the "Suzhou Intelligent Vehicle Network Development Promotion Regulations." On January 31, 2023, the Wuxi Municipal People's Congress Standing Committee promulgated the "Wuxi Vehicle Network Development Promotion Regulations," which addresses infrastructure construction, application promotion, technological innovation, industrial development, security assurance, and promotional measures for AVs. The "Hangzhou Intelligent Connected Vehicle Testing and Application Promotion Regulations," effective from May 1, 2024, establishes provisions for regulatory supervision systems, testing and application zone designation, qualification requirements for testing and application entities, operational management, safety and emergency management, and cybersecurity and data security protocols.

In general, these promotional legislations predominantly contain generalized content focused on encouragement, support, and promotion, with limited operational and enforcement practicability. Consequently, they have generated significantly less public discourse compared to the autonomous driving legislation implemented in Hangzhou and Shanghai's Pudong district.

3. Revision of Local Road Traffic Regulations

In contrast to the sweeping legislative reforms implemented in Shenzhen and Shanghai, Jiangsu Province opted for a more conservative approach by modifying its existing province-wide road traffic safety regulations, essentially performing "minor surgery" to integrate autonomous driving provisions into the established legal framework.

The "Jiangsu Provincial Road Traffic Safety Regulations", which was revised in August 2023, added the "self-driving provisions", of which Article 59 provides for the concept and type of self-driving cars, Article 60 requires the recording and storage of driving data of self-driving cars, and Article 85 adds the handling of road traffic violations committed by self-driving cars. Article 85 adds ways to deal with road traffic violations committed by self-driving cars. However, for self-driving cars, "road testing and demonstration applications, access and registration, use management, etc., shall be implemented in accordance with relevant national and provincial regulations". Under the premise of this article,

[45] *See* Li Yanfang (李艳芳), *"Cujin Xing Lifa" Yanjiu* ("促进型立法"研究) [*Study on the Legislation of the Promotion Model*], 3 FAXUE PINGLUN (法学评论) [LAW REVIEW] 105 (2005).

Jiangsu Province has not achieved a breakthrough in the commercialization of self-driving cars at the level of local legislation, and the boost to the development of the self-driving industry is limited.

B. Common Focus in Local Legislation

Upon examining existing local legislation, several common focus areas regarding autonomous driving can be identified:

Firstly, the problem of market entry, registration, and verification. Following the accumulation of sufficient test mileage, AVs will enter mass market circulation as commercial products. This necessitates clear standards for product entry, registration, and verification, including safety and traffic regulation compliance assessments of autonomous driving systems. Product entry certification is crucial for ensuring technological maturity and reliability. The entry process typically encompasses enterprise qualification, product testing and safety evaluation, and application review procedures. Vehicle registration is essential for legal road operation, involving vehicle information documentation, operator registration, and licensing/identification. Product verification ensures continued compliance with safety and regulatory requirements through periodic inspections, random checks, and violation management. AVs also require timely system updates.

Secondly, the problem of subject responsibility. Legal entity status and liability are paramount concerns for AVs. Unlike traditional vehicles that are purely tools reflecting their operators' volition and autonomous actions, AVs possess characteristics of autonomy, self-learning capability, and algorithmic opacity, complicating product defect determinations. It is necessary to establish primarily responsible entities for AVs, encompassing responsibility for the entire vehicle system rather than merely the autonomous driving system. Currently, safety operators remain an essential component in China's autonomous driving operations. Based on domestic autonomous vehicle testing and trial operations, most vehicles operate at L3 automation (requiring in-vehicle safety operators). Select regions, such as Beijing and Wuhan, have progressed to L4 trials (without in-vehicle operators but with remote safety monitoring) for commercial pilot programs. L5 fully autonomous driving has not yet entered the testing phase. The complete elimination of safety operators in pursuit of full autonomy remains impractical at this stage. It is important to note that safety operators should not be equated with traditional drivers, nor can they be fully encompassed within the conventional "owner/manager" framework. Rather, they should be defined as personnel who, during autonomous vehicle testing and operations, are responsible for either in-vehicle or remote intervention and emergency response when vehicles encounter exceptional or urgent situations.

Thirdly, the problem of data governance. China has established a comprehensive data and network security legal framework through legislation including the Cybersecurity Law, Data Security Law, Personal Information Protection Law, Critical Information Infrastructure Security Protection Regulations, and Several Provisions on the Management of Automobile Data Security (Trial). Autonomous vehicle data governance encompasses data security, privacy protection, and data sharing/trading. Data security requires lifecycle management across collection, transmission, storage, processing, and utilization. Privacy protection measures are essential given the personal information collected. Additionally, autonomous driving development requires extensive data support for road information, traffic conditions, and vehicle status, necessitating system interoperability and efficient data exchange mechanisms.

Finally, the problem of multiple application scenarios. Autonomous driving encompasses various applications including unmanned delivery, cleaning, vending, and inspection vehicles, raising questions about their classification as motor or non-motor vehicles. Motor vehicle classification requires testing and strict entry/licensing requirements, while non-motor vehicle classification must comply with national standards for maximum speed, unladen mass, and dimensional specifications.

C. Beijing: Specialized Legislation for AVs

Beijing lacks the legislative flexibility afforded to regions like Shenzhen or Shanghai's Pudong New Area, making it impossible to replicate their legislative models. As a municipality directly under the central government, Beijing holds administrative parity with provinces like Jiangsu. Merely amending local road traffic safety regulations would present similar legislative constraints as experienced in Jiangsu Province, limiting innovation potential and offering minimal promotional effect for autonomous driving development. Such regulatory approaches are insufficient given Beijing's growing autonomous driving industry volume and application leadership.

Furthermore, implementing local government regulations does not align with Beijing's current autonomous driving legal framework. Article 93, Clause 5 of the Legislation Law stipulates that in cases where conditions are not yet mature for formulating local regulations, temporary administrative rules with a two-year validity period may be established by local governments, thereby providing an interim legal framework for the development of autonomous driving technology and industry. Beijing has already introduced trial management measures and implementation rules for autonomous vehicle testing. While these do not constitute formal local government regulations, they have demonstrated practical effectiveness. A

local legislative framework for autonomous driving would carry greater legal authority than local government regulations, more effectively advancing autonomous driving development.

AVs as an emerging technology, disrupt the current human driver-centric road traffic safety management system, facing multiple legal challenges including market entry restrictions, vehicle registration limitations, and transportation service constraints. China's existing road traffic management system centers on human drivers, mandating licensed operators and human-centric traffic rules. This traditional person-centered traffic management model is incompatible with Leval 4 and Leval 5 AVs where driving tasks are executed by automated driving systems.[46] These legal restrictions have significantly impeded the commercialization of AVs. Moreover, the current regional management framework, primarily focused on "road testing and demonstration applications," increasingly fails to meet the demands of autonomous driving industry commercialization.

To achieve comprehensive regulatory effectiveness, local legislation for autonomous driving must boldly pioneer new approaches, operating within local legislative authority constraints while implementing specialized regulatory legislation.

V. PRIMARY LEGISLATIVE CHALLENGES

As China is a unitary form of state structure, local power comes from central authorization, and many management matters in the field of transportation belong to the central authority, the local creation of legislation will face the risk of contradicting the higher law. Especially for the economically developed regions that do not have the power to adopt local legislation, they do face the constraints of the higher law in terms of mandatory vehicle standards, mandatory insurance, and no-fault liability for automated driving.

A. **Vehicle Access Restrictions**

In China, vehicle standards are numerous and primarily established at the national level. Article 10 of the Standardization Law stipulates: "Mandatory national standards shall be formulated for technical requirements that safeguard personal health, life and property safety, national security, ecological environmental security, and meet basic economic and social management needs." Since automobile safety directly impacts road traffic safety and public safety, and vehicle emissions are intrinsically linked to atmospheric pollution prevention and environmental protection, these automotive standards necessitate mandatory national standardization.

[46] *See Yu* Lingyun (余凌云), *Wuren Jiashi de Daojiao Fa Guifan Goujian* (无人驾驶的道交法规范构建) [*Construction of Legal Norms for Autonomous Driving*], 5 JINGCHU FAXUE (荆楚法学) [JINGCHU LAW REVIEW] 95 (2023).

Furthermore, automobiles are not static commodities; they require nationwide distribution and circulation. Drivers operate vehicles across provincial and regional boundaries. To ensure uniformity in vehicle standards across regions and facilitate law enforcement and supervision, besides mandatory standards, there exists a substantial body of national recommended standards and industry standards to maintain nationwide uniformity in application.

For AVs, product quality and safety, data and network security of self-driving vehicles need to develop national mandatory standards. Vehicle standards for self-driving vehicles can only enter the automotive bulletin catalog of the Ministry of Industry and Information Technology if they meet the national mandatory standards.[47] Regarding standards for AVs, numerous guidance documents have been issued at the national level, including the "National Vehicle Network Industry Standard System Construction Guide (Intelligent Connected Vehicles)," "National Vehicle Network Industry Standard System Construction Guide (Vehicle Intelligent Management)," "National Vehicle Network Industry Standard System Construction Guide (Intelligent Transportation Related)," and "Vehicle Network Cyber Security and Data Security Standard System Construction Guide." While some mandatory standards mentioned in these documents have been established, many are still under development. The technical standards for AVs encompass two complex aspects: vehicle mechanics and autonomous driving systems. However, the current absence of dual-entry standards - both for overall vehicle safety and system safety - presents a significant barrier to the market deployment of AVs.[48] The authority to formulate these mandatory standards generally belongs to the national industry and information department and the National Standardization Administration Committee, which is difficult for localities to involve.

Given its status as a Special Economic Zone with legislative autonomy, Shenzhen possesses the authority to enact adaptive legislation. Shenzhen has implemented relevant local standards and is exploring the establishment of a local catalog for AVs. The formulation of these local standards primarily derives from the authorization granted by the

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[47] *See Zheng* Lin (郑琳) & Li Mingyu (李明雨), *Lun Zidong Jiashi Qiche Zhunru de Shuangceng Falü Zhang'ai ji Qi Kefu* (论自动驾驶汽车准入的双层法律障碍及其克服) [*On the Dual Legal Barriers to the Admission of Autonomous Vehicles and Their Overcoming*], 4 ZHONGGUO HAIYANG DAXUE XUEBAO (SHEHUI KEXUE BAN) (中国海洋大学学报（社会科学版）) [JOURNAL OF OCEAN UNIVERSITY OF CHINA (SOCIAL SCIENCES EDITION)] 63 (2023).

[48] *See Yu* Lingyun (余凌云), *Wuren Jiashi de Daojiao Fa Guifan Goujian* (无人驾驶的道交法规范构建) [*Construction of Legal Norms for Autonomous Driving*], 5 JINGCHU FAXUE (荆楚法学) [JINGCHU LAW REVIEW] 98 (2023).

"Shenzhen Special Economic Zone ICV Management Regulations."

According to the current public consultation draft of Beijing's AVs regulation, Beijing has opted to develop localized standards in key areas including intelligent roadside infrastructure, testing and verification protocols, and autonomous driving maps, as necessitated by the industry's development. And the regulation actively encourages participation from enterprises, research institutions, universities, and industry associations in the formulation of relevant international, national, industry, and local standards. However, regarding the crucial vehicle and system standards that would enable large-scale deployment of AVs on public roads, the municipality will defer to forthcoming national standards.

B. **Insurance Issues**

Insurance serves a crucial function in risk distribution. In traditional vehicle insurance, the primary coverage types include Compulsory Motor Vehicle Traffic Accident Liability Insurance (CMVTALI) and Third Party Liability Insurance (TPLI). The former is mandatory for all vehicles operating on public roads, as stipulated in detail by the "Regulations on Compulsory Motor Vehicle Traffic Accident Liability Insurance." The latter is a form of commercial insurance that remains voluntary.

For AVs, insurance plays a vital role in "enhancing the capacity and efficiency of liability assumption by responsible parties and ensuring compensation for victims".[49] It is particularly crucial in mitigating manufacturers' liability and promoting healthy development of the autonomous driving industry.

However, Article 11 of the Insurance Law states: "Insurance contracts shall be established through mutual agreement, determining the rights and obligations of all parties following principles of fairness. Except for insurance mandated by laws and administrative regulations, insurance contracts are voluntary." Under the current motor vehicle insurance framework, AVs must obtain CMVTALI for road operation. Yet, AVs differ fundamentally from traditional motor vehicles, and the existing CMVTALI framework cannot be directly applied. For instance, according to Articles 3 and 21 of the current CMVTALI Regulations, the insurance primarily covers victims outside the insured vehicle, typically excluding vehicle occupants. However, in higher-level AVs where systems replace human drivers, vehicle occupants require equal protection as external parties.[50] In fact, the occupants may be purely victims. Even if new CMVTALI

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[49] *See* Ma Ning (马宁) *Yinying Zidong Jiashi Qiche Zhisun Fengxian De Baoxian Jizhi* (因应自动驾驶汽车致损风险的保险机制) [*On the Insurance Mechanism Responding to the Damage-risk of Auto Driving*] 1 HUADONG ZHEGNFA DAXUE XUEBAO(华东政法大学学报) [ECUPL Journal](2022).

[50] *See* Zheng Zhifeng (郑志峰), *Lun Zidong Jiashi Qiche de Zeren Baoxian* (论自动驾驶汽车的责任保险) [*On the Liability Insurance for Autonomous Vehicles*], 5 JINGCHU FAXUE (荆楚法学) [JINGCHU LAW REVIEW] 52 (2022).

regulations were specifically designed for AVs to include vehicle occupants as insured parties, the compulsory nature of CMVTALI falls under central government jurisdiction and requires unified national legislation,[51] preventing local legislative solutions.

Based on such situation, the AVs Regulation in Beijing maintains consistency with national insurance requirements rather than implementing significant innovations in insurance policies. Concurrently, the regulation encourages insurance institutions to collaborate with autonomous vehicle companies in developing novel commercial insurance products.

C. **Subject of Liability in Traffic Accidents**

As a cutting-edge technological domain, autonomous vehicle technology inherently encompasses elements of unpredictability and risk. Consequently, the development of the autonomous vehicle industry necessitates a careful balance between economic value and social safety, with due consideration given to potential legal implications arising during technological advancement. Among these considerations, the allocation of liability in autonomous vehicle traffic accidents represents a particularly complex legal challenge. This issue not only affects the interests of various stakeholders, but also influences their level of engagement in the industry. Notably, AVs, compared to traditional vehicles, involve a more extensive supply chain and a broader range of industry participants.

When a traditional motor vehicle is involved in a traffic accident, the determination of civil tort liability is based on Article 76 of the Road Traffic Safety Law. Traffic accidents between motor vehicles adopt the principle of fault attribution.[52] When AVs are widely integrated into real-world traffic environments, they will establish complex traffic relationships with conventional motor vehicles, non-motorized vehicles, and pedestrians, creating a "mixed traffic" environment that inevitably increases the complexity of road traffic conditions. Autonomous driving technology introduces a paradigm shift in traditional road traffic accident liability determination, as autonomous driving systems can perform dynamic driving tasks under designed operating conditions. The conventional driver-centric accident liability determination mechanism is

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[51] *See* Yu Lingyun (余凌云), *Lun Daolu Jiaotong Anquan Fa Shang de Difang Shiquan* (论道路交通安全法上的地方事权) [*On Local Powers under the Road Traffic Safety Law*], 2 XINGZHENG FAXUE YANJIU (行政法学研究) [ADMINISTRATIVE LAW REVIEW] 28 (2019).

[52] For related discussions, see Liu Jiaan (刘家安), *Jidongche Jiaotong Shigu Zeren de Guizhe Yuanzhi ji Zeren Guishu* (机动车交通事故责任的归责原则及责任归属) [*Principles of Liability and Attribution for Motor Vehicle Traffic Accidents*], 5 ZHENGZHI YU FALÜ (政治与法律) [Political Science and Law] 10 (2010); Yang Lixin (杨立新), *Woguo Daolu Jiaotong Shigu Zeren Guizhe Yuanzhi Yanjiu* (我国道路交通事故责任归责原则研究) [*Research on Principles of Liability for Traffic Accidents in China*], 10 FALÜ XUE (法学) [Law Science] 109 (2008).

no longer fully applicable, particularly in driverless scenarios. The civil tort liability associated with autonomous driving extends beyond traffic tort liability and is inextricably linked to product liability of AVs. Traffic accidents may occur due to design or manufacturing defects in the autonomous driving system.[53] Therefore, the allocation of road traffic accident liability for autonomous driving is a legal obstacle that the development of technology urgently needs to address.

The current academic discourse on tort liability for traffic accidents involving AVs encompasses several primary perspectives:

First, liability rests with the vehicle user. In this context, the "user" is not necessarily the traditional driver but rather the individual who activates the autonomous driving mode.

Second, liability is attributed to the vehicle manufacturer. As autonomous driving technology advances, users essentially become passengers, and should not bear responsibility when trusting a legally approved transportation device that subsequently experiences an accident. AVs, as qualified products, operate through system-controlled driving behaviors, with system malfunctions being the more probable cause of accidents. Among various stakeholders in the autonomous vehicle industry chain, manufacturers serve as the de facto technology integrators, direct providers of goods and services, and concentrated holders of substantial social capital, making them the most readily identifiable liable entity.[54]

Third, liability falls to the vehicle owner or manager. The current Road Traffic Safety Law, Article 114, regarding "non-site law enforcement," has already introduced and explored the concepts of vehicle owner and manager. These concepts possess interpretative flexibility, accommodating various future commercial manifestations of AVs while facilitating the determination of primary responsible parties in traffic accidents and violations.[55] Considering potential operational models of AVs, under the "unified operation model," the operating entity of AVs may be the manufacturer, who remains responsible for the product's operational applicability after sale, effectively serving as the "administrator." Alternatively, the operating entity could be a third party, where the vehicle

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[53] *See* Wang Lebing (王乐兵), *Zidong Jiashi Qiche de Quexian ji Qi Chanpin Zeren* (自动驾驶汽车的缺陷及其产品责任) [*Defects of Autonomous Vehicles and Their Product Liability*], 2 QINGHUA FAXUE (清华法学) [Tsinghua University Law Journal] 93 (2020).

[54] *See* Yuan Zeng(袁曾), *Wuren Jiashi Qiche Qinquan Zeren De Lianshi Fenpei Jizhi——Yi Suanfa Yingyong Wei Qierudian* (无人驾驶汽车侵权责任的链式分配机制——以算法应用为切入点) [*Chaining Mechanisms for Allocating Tort Liability for Driverless Cars -Taking algorithmic applications as an entry point*], 5 DONGFANG FAXUE (东方法学) [Oriental Law] 28 (2019).

[55] *See Yu* Lingyun (余凌云), *Wuren Jiashi de Daojiao Fa Guifan Goujian* (无人驾驶的道交法规范构建) [*Construction of Legal Norms for Autonomous Driving*], 5 JINGCHU FAXUE (荆楚法学) [JINGCHU LAW REVIEW] 99 (2023).

owner or manufacturer authorizes operational control to this third party, making them the de facto "administrator." Under the "regular user" model, users are the "owners" of AVs, and in the event of traffic accidents, liability determination and civil recovery procedures align with existing legal frameworks. Indeed, the concepts of "owner" and "administrator" are not only defined in the Road Traffic Safety Law but are also addressed in Article 1209 of the Civil Code, which stipulates liability allocation for traffic accident compensation when ownership, administration, and usage rights are separated among different entities. Furthermore, the Supreme People's Court's Interpretation on Several Issues Concerning the Application of Law in Road Traffic Accident Damage Compensation Cases (2020) specifically outlines circumstances where owners and administrators must assume compensation liability when found at fault.

As regions with special legislative authority, Shenzhen and Shanghai's Pudong New Area have taken the initiative in establishing regulations regarding liability in autonomous driving, albeit with notable differences that may impact national legal uniformity. For instance, there are distinct variations in accident liability provisions between the "Shanghai Pudong New Area Regulations on Promoting Innovation and Application of Driverless Intelligent Connected Vehicles" and the "Shenzhen Special Economic Zone Intelligent Connected Vehicle Management Regulations."[56] This is detrimental to the uniformity of the legal system.

Currently, Beijing's Draft Regulation stipulates that "In incidents where traffic accidents occur while the autonomous driving system is inactive, liability shall be determined according to existing regulations. When accidents resulting in personal injury or property damage occur with the autonomous driving system activated, the vehicle owner or manager shall bear compensatory liability for damages attributable to the autonomous vehicle. Following compensation to victims under the preceding provision, vehicle owners or managers may pursue legal recourse against responsible manufacturers, sellers, or other liable parties. In cases constituting criminal offenses, relevant parties shall be subject to criminal prosecution according to law." Notably, Beijing's regulation is more comprehensive, adopting the owner/manager liability principle and differentiating scenarios based on the activation status of the autonomous driving system, thereby directing liability to distinct responsible entities.

[56] The "Shenzhen Special Economic Zone Intelligent Connected Vehicle Management Regulations" distinguishes between scenarios with and without human drivers. In cases involving human drivers, liability is exclusively attributed to the driver. For driverless, fully autonomous vehicles, liability rests with the vehicle owner or manager. However, when vehicle defects are the cause of incidents, compensation claims can be pursued against manufacturers and sellers. The "Shanghai Pudong New Area Regulations on Promoting Innovation and Application of Driverless Intelligent Connected Vehicles" specifically addresses autonomous driving (full automation), designating the enterprise owning the driverless intelligent connected vehicle as the primary liable entity. Subsequently, the enterprise retains the right to seek recourse from responsible parties, including autonomous driving system developers, vehicle manufacturers, and equipment providers.

VI. HIGHLIGHTS AND INNOVATIONS

A. Clarification of Administrative Authorities

The implementation subject clause effectively delineates the regulatory authorities and jurisdictional provisions within our legal framework. Autonomous driving legislation involves multiple complex administrative departments, as China's transportation management, infrastructure development, product quality supervision, communications equipment and network security, and traffic law enforcement are distributed across various governmental bodies.[57]

Drawing from Beijing's current administrative mechanism and experiences from other cities, Beijing's AV legislation mandates the establishment of a joint working mechanism primarily led by the Municipal Bureau of Economy and Information Technology, Municipal Transportation Commission, and Municipal Public Security Traffic Management Bureau. Other relevant departments shall fulfill their respective responsibilities according to their designated functions.

B. Beijing-Tianjin-Hebei Coordination

The developmental trajectory of autonomous driving in Beijing demonstrates the city's consistent emphasis on the Beijing-Tianjin-Hebei coordinated development strategy. As AVs become mainstream transportation tools, cross-jurisdictional operation is an inevitable trend. Consequently, Beijing's local legislation on autonomous driving not only emphasizes collaborative innovation with Tianjin and Hebei Province in the autonomous vehicle sector, but also incorporates the phrase "other regions", establishing legal framework for future inter-provincial autonomous vehicle operations.

Strengthening legislative communication and collaboration between localities through regional synergistic legislation can effectively prevent conflicts and disharmony between local legislations and contribute to the formation of market integration within the region.[58] The Beijing Autonomous Vehicles Regulation aligns test operation zones with capital development planning, strategically positioning itself within the Beijing-Tianjin-Hebei coordinated development framework. By leveraging Beijing's advantages as a driving force, the regulation has strengthen coordination with Tianjin and Hebei in areas such as "policy recognition, standard compatibility, scenario connectivity, and industrial collaboration." This approach facilitates the formation of a complementary pattern that

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[57] *See* Zheng Ge (郑戈), *supra* note 10.

[58] *See* Chen Jun (陈俊), *Woguo Quyu Xietiao Fazhan Zhong De Difang Lifa Xietiao: Yangben Tansuo Ji Fazhan Kongjian* (我国区域协调发展中的地方立法协调：样本探索及发展空间) [*On the Coordination of Local Legislation in Coordinated Regional Development: Sample Exploraion and Development Potential*], 3 ZHENGZHI YU FALÜ (政治与法律) [Political Science and Law] 27 (2021).

maintains regional distinctiveness while promoting integration and collectively advancing the autonomous vehicle industry's development.

C. **Technical Innovation Chapter**

The autonomous vehicle industry in Beijing faces several challenges, including weak foundational technological support, insufficient industry-academia collaboration, and limited practical applications, which collectively impede rapid industrial development. These challenges necessitate strengthened technological innovation and expanded implementation to secure a leading position in the autonomous vehicle sector. Nevertheless, Beijing has established a substantial industrial foundation in vehicle manufacturing, intelligent connected infrastructure, critical component research and development, and smart mobility services, with emerging cluster effects in the intelligent connected industry. By the end of 2023, Beijing's intelligent connected vehicle industry generated revenue exceeding 200 billion yuan, representing more than half of the city's total automotive industry output (365 billion yuan),[59] effectively supporting the intelligent, connected, and green development of the automotive sector.

The Beijing Autonomous Vehicles Regulation dedicates a specific chapter to innovation and development, emphasizing three key aspects: First, it highlights the synchronized and integrated development of the industry, encompassing not only the manufacturing of complete AVs but also core component production, facilitating the establishment of a comprehensive autonomous vehicle industrial chain in Beijing. Second, it strengthens research and development of critical core technologies. This is achieved through enhanced collaboration between government, industry, academia, research institutions, and end-users, encouraging industry leaders and academic institutions to accelerate fundamental technology development and overcome technological bottlenecks. Third, it emphasizes the systematic opening, authorized utilization, and circulation of autonomous vehicle data.

D. **Building supporting infrastructure**

AVs impose heightened requirements on infrastructure development, encompassing roads, communication equipment, and network base stations, etc. The modernization and upgrade of such infrastructure falls within governmental jurisdiction. Beijing's autonomous driving legislation specifically addresses roadside service capabilities and cloud-based management platforms.

The regulation accelerates the development of roadside service

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[59] *See* Cao Zheng (曹政)，*2025 Nian Beijing Xinnengyuan Qiche Chanliang Jiang Chao 30 wan Liang,* (2025 年北京新能源汽车产量将超 30 万辆) [*Beijing's new energy vehicle production will exceed 300,000 units in 2025*], BEIJING RIBAO (北京日报)[BEIJING DAILY]，Sep. 25, 2023, at A2.

capabilities. Based on the integration of vehicle-road perception in the demonstration zone and the involvement of roadside information in decision-making, the collision risk can be reduced. Therefore, Beijing's autonomous vehicle legislation stipulates that "newly constructed, reconstructed, and expanded roads within the municipality shall reserve space for intelligent roadside infrastructure installations."

Meanwhile, Beijing has implemented a groundbreaking legislative initiative to establish a unified autonomous vehicle service management platform, also known as a cloud control management system. The metropolitan infrastructure incorporates an advanced multi-network architecture, seamlessly integrating 4G/5G and Vehicle-to-Everything (V2X) communication protocols. This comprehensive network integration has facilitated the development and operationalization of a centralized municipal cloud platform, enhancing the service capabilities for autonomous vehicle systems.

The cloud-based infrastructure demonstrates remarkable versatility in supporting various autonomous vehicle operations, encompassing real-time traffic management data transmission, vehicle telemetry monitoring, and remote cloud-based vehicle control systems. Through the implementation of this digital supervision mechanism, Beijing aims to create a synergistic relationship between regulatory oversight and operational functionalities in autonomous driving. This integration is designed to augment analytical capabilities and early warning systems, ultimately achieving a more scientific, precise, and efficient regulatory framework for autonomous vehicle operations.

E. **High Priority on Data Security**

Beijing's legislation exemplifies the principle that "there are no minor issues in capital security" by establishing a comprehensive regulatory framework encompassing "access control, supervision, and incident response" mechanisms. This framework implements both online cloud-based monitoring platforms and offline enterprise management methods to achieve closed-loop supervision and management throughout the autonomous vehicle lifecycle.

Regarding security assurance, Beijing's autonomous driving legislation places significant emphasis on data security concerns. The legislation explicitly defines network and data security responsibilities and obligations for relevant stakeholders. It mandates that autonomous vehicle companies, vehicle-to-network software providers, telecommunications operators, and other relevant enterprises establish data security and personal information protection management systems in accordance with pertinent laws and regulations. Furthermore, it implements cross-border data transfer requirements as stipulated by higher-level legislation. The

legislation also particularly emphasizes the "mapping security" aspects of autonomous driving.

Additionally, Beijing's autonomous driving legislation further clarifies traffic accident handling protocols. It requires autonomous vehicle-related enterprises to maintain comprehensive records of vehicle accident and malfunction-related data and information, ensuring accessibility for vehicle owners and administrators.

VII. CONCLUSION

The promulgation of the "Beijing Autonomous Vehicles Regulation" marks a significant legislative milestone in Beijing's autonomous driving sector. This legislation not only reflects Beijing's emphasis on autonomous driving technology development, but also demonstrates its proactive response to national strategies and commitment to public safety. Through local legislation, Beijing can pioneer and accumulate experience in the absence of mature national legislation, providing valuable reference for future national legislative frameworks.

Beijing, not being a special economic zone, lacks flexible legislative authority. The legislative model of Jiangsu Province's revised road traffic safety regulations is not suitable for Beijing's autonomous driving development context. Beijing's specialized legislation addresses critical issues including autonomous vehicle admission standards, vehicle insurance, and traffic accident liability determination. The city's legislation strives to achieve optimal legal outcomes within the existing legal framework.

The "Beijing Autonomous Vehicles Regulation" provides legal assurance and policy support for autonomous vehicle testing, operation, and commercialization through several key measures: clarifying departmental responsibilities, strengthening Beijing-Tianjin-Hebei collaborative development, leveraging technological advantages, and developing supporting infrastructure. This not only promotes technological innovation and industrial upgrading, but also enhances public trust and acceptance of autonomous driving technology. Moreover, the legislation provides clear guidance on autonomous vehicle accident liability by distinguishing scenarios based on whether the autonomous driving system is activated, thereby clarifying the responsibilities of vehicle owners and managers. Regarding safety assurance, Beijing's autonomous driving legislation emphasizes data security and privacy protection. It specifies corporate responsibilities for network and data security, requiring establishments of data security and personal information protection management systems to ensure autonomous vehicle data security and user privacy protection.

Beijing's autonomous driving legislation serves as a legislative

reference and experience for other cities and regions. As autonomous driving technology continues to develop and apply, more cities will face similar legislative needs. Beijing's legislative practice provides valuable experience and insights, promoting the nationwide progress of autonomous driving legislation. With the implementation and refinement of these regulations, Beijing is poised to maintain its leading position in the autonomous driving field, providing safer, more convenient, and smarter transportation services to the public.