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# CHAPTER 05

## Analyzing National Policy Impact on China's Smart Transportation: Trends, Strategies, and AI-Driven Innovations

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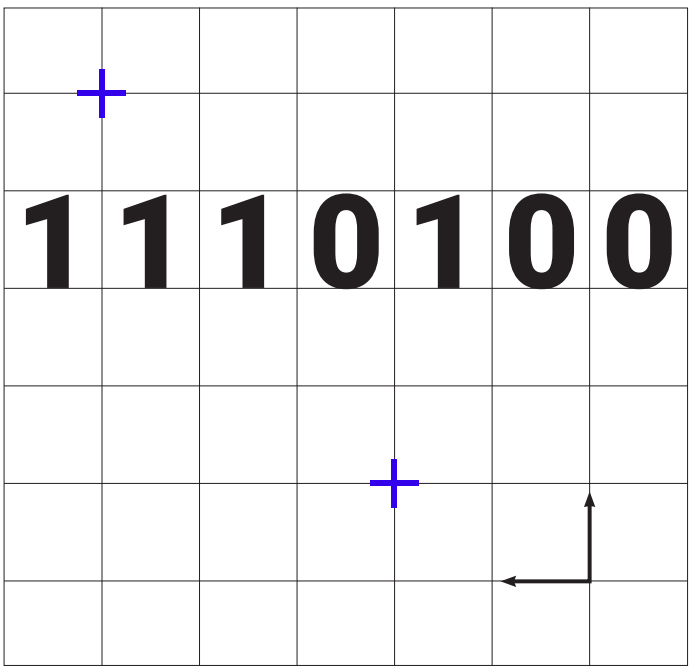

# Introduction

As the global landscape continues to urbanize at an unprecedented rate, cities face multifaceted economic and social challenges that demand innovative, sustainable solutions ***(Bibri, 2021).*** In this transformative era, the integration of Artificial Intelligence (AI) within urban planning and architectural frameworks has emerged as a key catalyst for urban transformation, enhancing the way they operate and grow ***(He & Chen, 2024)***. Reflecting this progress, smart cities utilize both artificial intelligence and information technologies to improve urban management and services, paving the way for more efficient, safe, and sustainable urban environments ***(Camero & Alba, 2019; Karvonen et al., 2020; Keshvardoost et al., 2019).***

Smart transportation systems, which are at the forefront of this revolution, utilize AI and big data to replace outdated algorithms with dynamic, efficient solutions, thereby revolutionizing the management of transport and infrastructure ***(W. Zhang et al., 2019)***. Many local authorities have used urban data platforms to enhance smart transport, recognizing significant benefits ***(Lv et al., 2018).*** While the narrative around smart transportation has been predominantly shaped by Euro-American experiences, regions like the 'Global South' are making innovative strides ***(Alanazi, 2023)***. As a prominent actor in the 'Global South,' China's advancement in smart transportation is transformative, driven by substantial government support for initiatives that incorporate AI in traffic management, predictive maintenance, and autonomous vehicle technologies ***(Wang et al., 2021).***

This paper seeks to examine the evolution of smart transportation policies in China at the national level, with a particular emphasis on how AI-driven initiatives are potentially enhancing the integration and efficiency of transportation systems within the Chinese context. Utilizing Citespace software to visualize trends and NVivo for comprehensive textual analysis, this study explores the deployment of policy tools specific to China over the past decade. It focuses on examining usage, volume changes, and organizational patterns within the field of smart transportation. This methodological approach not only highlights the dynamic role of AI in transportation planning in China but also adapts the research framework to capture a distinct Chinese perspective. The insights gained from this study aim to contribute meaningfully to the academic discourse on smart transportation and provide valuable guidance for the ongoing development of AI-driven transportation systems.

## Literature review

The evolution of smart cities is marked by an increasing global emphasis on strengthening scientific and technological infrastructure, fostering environments conducive to innovation, and significant investments in essential infrastructure ***(Lima et al., 2017).*** Within this thriving field, the development of smart transportation systems, powered by advancements in AI, has become instrumental for the practical realization of smart urban spaces ***(Tomaszewska, 2021)***. These systems not only support efficient urban mobility but also enable cities to respond dynamically to challenges such as rapid urban growth and pandemics, underscoring the importance of robust governmental support for integrated technological solutions and intelligent policy frameworks that ensure urban resilience and adaptability ***(Joshi et al., 2018; Trivedi & Zulkernine, 2020).***

For instance, the launch of initiatives such as the Intelligent Transport Systems (ITS) in the United States of America and the European Commission's ITS programme signalled the key role of national policies in harnessing advanced technologies to improve the efficiency, safety and sustainability of transport. These governmental efforts highlight the critical importance of policy-driven frameworks in managing crises and integrating AI and data analytics into the operational fabric of urban transportation systems ***(Calderón Peralvo et al., 2022).***

Furthermore, the contrasting surveillance strategies in smart transportation systems employed during health crises, ranging from China's comprehensive measures to the privacy-focused approaches of Western countries, illustrate varied effectiveness in managing public health emergencies. These differences not only highlight significant disparities in crisis management outcomes but also bring to light crucial ethical and theoretical issues concerning individual privacy and the role of AI in public governance within the realm of smart transport ***(Kummitha, 2020).***

National governments have significantly contributed to shaping smart transport by introducing specific policies, thereby creating a robust foundation for the evolution of smart transport systems ***(Chatfield & Reddick, 2019; Haque et al., 2013).*** The rapid progress in electronic information technology since the 1980s has further expedited this development, leading key global entities such as the European Commission, the United States Department of Transportation, and Japan's Ministry of Construction to spearhead the release of vital policy documents ***(Wootton et al., 1995).***

For example, In the United States, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) provided the legislative backing to foster the adoption of advanced technologies within the ITS. In parallel, the European automotive industry initiated the Eureka PROMETHEUS Project in 1994, with the goal of employing information technology to enhance the safety and efficiency of European road traffic comprehensively.

In the same vein, the Japanese Ministry of Construction in 1994 launched the Advanced Road Transportation System (ARTS) project, aimed at establishing a foundation for intelligent, interconnected transport infrastructures, demonstrating the transformative potential of AI in improving transportation safety, efficiency, and systemic integration.

China's approach to integrating AI into transportation policies began to take shape in the early 1990s. Chinese policymakers closely monitored the international advancements in Intelligent Vehicle Highway Systems (IVHS) and ITS, which led to significant policy innovations. One of the landmark policy frameworks was the 'Ninth Five-Year Plan for the Development of Transportation Science and Technology and Long-Term Planning for 2010,' introduced by the Chinese Ministry of Transport in 1995. This strategic document explicitly positioned ITS as the cornerstone for modernizing China's transportation systems, marking a key shift towards AI-driven solutions.

Over subsequent years, the focus expanded from mere technological upgrades to a broader emphasis on enhancing traveler convenience, safety, and efficiency, thereby facilitating the development of a transport system that is not only faster and more efficient but also more environmentally friendly. However, despite these advancements, a comprehensive evaluation of the effectiveness of these policies and the key factors sustaining the progress of smart transportation in China remains lacking.

This study addresses this gap by analyzing the disruptive trends in smart transportation within China, specifically through the lens of national policy. It aims to provide a deeper understanding of how AI-driven strategies are reshaping the landscape of smart transportation, highlighting the key role of policy in guiding these technological advancements.

## Material and Methods

This study employs quantitative text analysis to investigate the evolution of national policies on smart transportation within China over the past decade, with a specific focus on the role and implications of AI technologies. In the initial phase of the text analysis, involving Citespace software for visualization ***(Zhao et al., 2017),*** emergence maps were generated through co-occurrence and cluster analyses, based on the frequency of key emergent words ***(Liu et al., 2015),*** aiming to highlight vibrant research topics and the evolution of AI-driven approaches within the policy domain ***(D. Zhang et al., 2020).*** Following this, the study employs thematic mapping with NVivo Plus 12 software, enabling a detailed, multi-level analysis that visually represents these findings through statistical indices and graphs. This method illuminates the interconnections among AI-related policy measures and their broader thematic implications within smart urban spaces.

To analyze China's smart transportation policies from a theoretical framework, this study adopts Rothwell and Zegveld's (1981) classification system, which categorizes policies according to supply, demand, and environmental factors. This classification approach effectively illustrates the impact of policies on technological development, representing the most widely recognized and utilized classification tool in contemporary academic discourse ***(Yue et al., 2020).*** Accordingly, the policies within China's smart transportation sector are categorized and analyzed. Each policy is meticulously analyzed through word-by-word coding in Nvivo, ensuring a thorough exploration of the policy content.

The study conducts an extensive review of policy literature from various authoritative sources, including the Ministry of Transportation and Communications, the Chinese government portal, the Ministry of Industry and Information Technology, and the legal database "Pkulaw." Focusing on the period from 2014 to 2023, a decisive era that marks a major step toward China's goal of becoming a "Transportation Power.

This research aims to uncover the disruptive changes influenced by AI in this sector and identify the fundamental drivers behind these developments. The selected policies involved a variety of official documents, such as laws, regulations, national frameworks, strategic plans, and directives issued by relevant government agencies. In total, 72 national policies from this period were gathered, which were then screened for relevance and duplication, resulting in a final dataset of 64 policies (Appendix A), which were reviewed, categorized and analyzed.

## Findings and Result

### *China's Smart Transportation Policy Trends*

Smart transportation technology has been evolving progressively, with policies related to smart transport exhibiting an upward trend. Utilizing Citespace software for data visualization, ***Figure 1*** illustrates the evolution of national policy issuance in China related to smart transportation across ten years, starting from 2014.

From that year, a steady increase in policy issuance illustrates the government's escalating commitment to integrating AI technologies into transportation infrastructure. Prior to 2019, 23 policies were introduced, with an annual average of four. Notably, the period of 2020-2021, marked by the COVID-19 pandemic and the launch of the 14th Five-Year Plan, saw a sharp rise in policy activity, with 23 new policies issued, indicating a doubled annual average of 11.

This growth underscores the strategic focus on strengthening AI-driven smart transportation capabilities to address emerging challenges. In the post-pandemic period of 2022 to 2023, there was a slight decrease in policy issuance, with 18 policies documented, or an average of nine policies per year, suggesting that the pandemic has indeed impacted the momentum of China's smart transport policy to some extent. Despite these fluctuations, the general trend points to a steady enhancement and considerable progress in formulating China's smart transportation policies, with the pandemic causing only temporary deviations.

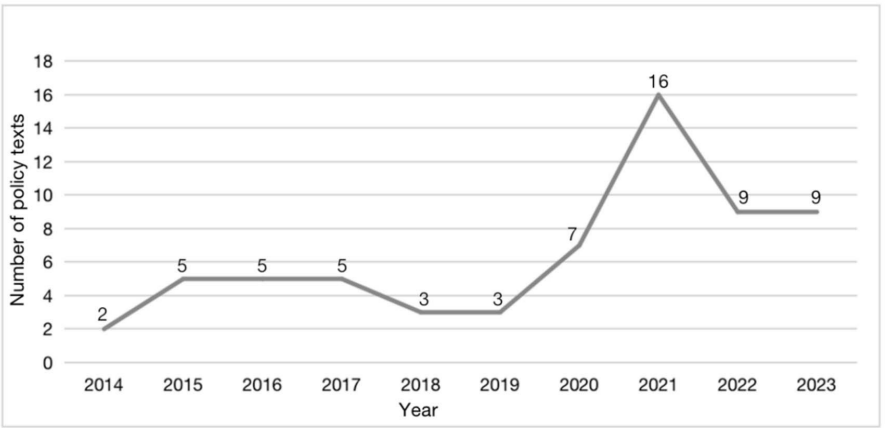


***Figure 1:*** Number of Smart Transportation Policies, 2014-2023 ***(Developed by Author).***

Further analysis using Citespace to map co-cited keyword clusters ***(Figure 2)*** reveals a temporal distribution and evolution of themes central to AI-driven transformations in transportation. The network modularity Q value of 0.711 significantly exceeds the 0.3 threshold, suggesting robust clustering of themes relevant to AI applications in smart transportation. An average silhouette value of 0.9203, well above the 0.7 standard, confirms the strong internal consistency of these clusters, validating the thematic analyses. The study identifies nine distinct clusters, with each cluster visualized through nodes and interconnecting lines that map the evolutionary trajectory of the themes. Specifically, Clusters #0 (Technology Innovation) and #3 (Information Innovation) highlight persistent research interests, particularly evident between 2015 and 2017, reflecting ongoing governmental initiatives to foster AI innovation and develop supportive information infrastructures.

Meanwhile, Clusters #2 (Road Transportation) and #3 (Intelligent Network) have experienced rapid advancements recently, spurred by increased investments aimed at accelerating the digital transformation of roadways. This progress supports the objectives of the 2023-2027 Five-Year Action Plan, which seeks to integrate transportation networks with smart grids. This integration is designed to meet emerging energy demands and improve urban mobility, aligning closely with the broader goals of the "National Comprehensive Three-Dimensional Transport Network Planning Programme." This programme advocates for the fusion of transport networks with smart grids to advance the development of intelligent transportation solutions, thereby addressing new energy requirements and enhancing system efficiencies. Contrastingly, Cluster #5 (Innovative Application) saw an initial surge in interest that appears to be stalled in 2020, and Cluster #4 (Public Transport) began recovering from 2022, indicating a governmental pivot towards enhancing public transport systems with intelligent solutions to prioritize sustainable urban mobility.

Notably, Cluster #9 (Rural) exhibits the least activity, which suggests that the government needs to step up its efforts to extend smart transport solutions to rural areas, thereby ensuring equitable access to modern, efficient transport systems across all regions. This comprehensive analysis not only paints a dynamic picture of policy developments in China's transport sector, but also highlights the integral role of AI in driving these changes, pointing towards future directions for creating a cohesive, sustainable, and advanced transportation network in both urban and rural settings.

### *Analytical Framework for China's Smart Transportation Policies*

Utilizing the classification of policy instruments proposed by Rothwell and Zegveld (1981), this study constructs an analytical framework to examine smart transportation policies through the prism of policy tools. This framework organizes China's smart transportation policies into three principal categories based on their relevant priorities.

First, supply-oriented tools focus on direct government actions to stimulate the innovation and expansion of the national smart transportation systems, including areas such as financial support, innovative technology support, transport infrastructure development, brand building, platform construction, talent cultivation, demonstration application, pilot construction, information infrastructure construction, organizational leadership.

Second, demand-oriented tools focus on enhancing the smart transportation system by tackling barriers and mitigating adverse effects, primarily through regulatory measures and market guidance. This encompasses a wide range of activities from public services to government procurement and smart construction, all aimed at fostering environments where AI can effectively improve urban mobility. Third, environment-oriented tools provide indirect support by establishing broader measures that facilitate the seamless integration of AI technologies, such as establishing standards and norms, legal regulation, supervision and monitoring, mechanism improvement, target planning, and digital transportation.


***Figure 2:*** Visualization of the timeline ***(Developed by Author).***

***Table 1*** presents a detailed application of these policy tools, offering insights into each category and illustrating how these policies facilitate the theoretical and practical integration of AI into China's transportation planning and infrastructure, thereby driving transformative changes across the transportation sector.

***Table 1:*** Dimensional Classification and Operationalization of Policy Tools for Smart Transportation in China ***(Developed by Author).***

| Category | Policy Tools |
|---|---|
| Supply Oriented | Financial Support<br>Innovative Technology Support<br>Transport Infrastructure Development<br>Brand Building<br>Platform Construction<br>Talent Cultivation<br>Demonstration Application<br>Pilot Construction<br>Information Infrastructure Construction<br>Organizational Leadership |
| Environmental Oriented | Standards and Norms<br>Legal Regulation<br>Supervision and Monitoring<br>Mechanism Improvement<br>Target Planning<br>Digital Transportation |
| Demand Oriented | Public Services<br>International Exchange and Cooperation<br>Training and Education<br>Social Participation<br>Market Participation<br>Tax Incentives<br>Collaborative Cooperation<br>Information Disclosure<br>Publicity Promotion<br>Government Procurement<br>Government-Enterprise Cooperation<br>Smart Construction<br>Resource Sharing |

This research proceeds with the analysis of 64 selected policy documents, which were coded using NVivo 12 Plus software to identify 720 reference points for 29 specific policy tools across these three categories. It introduces a novel theoretical approach that focuses on the integration of AI with smart transportation policy tools across different epidemic stages (pre-, during, and post-epidemic).

| **Operationalisation**<br>**Connotations** |
| --- |
| • Special funds for developing smart transportation systems, including AI-based projects to improve urban mobility and architecture.<br>• Financial funds or other resources provided to promote AI innovation and industrial development.<br>• Facilities for public travel and goods transportation.<br>• Promoting the image of smart transport products, emphasizing AI solutions that transform urban spaces.<br>• Creating secure digital platforms for government services, using AI to improve urban planning and integration in transportation.<br>• Training officials and technicians for future smart transport projects.<br>• Showcasing cities with advanced AI-driven smart transport systems to highlight urban and architectural improvements.<br>• Testing new smart transport models in selected cities for demonstration purposes.<br>• Advancing infrastructure like 5G, IoT, and AI to support smart transport.<br>• Establishing leadership to drive AI-based smart transport and urban transformation. |
| • Defining clear objectives and plans for smart transport.<br>• Regulating smart transport with rules focusing on AI-driven urban and architectural compliance.<br>• Using AI for system monitoring and risk alerts in urban and architectural contexts.<br>• Establishing administrative methods to improve management.<br>• Creating policies to promote smart transport with AI to optimize urban growth.<br>• Focusing on digital and informative smart Transport Construction. |
| • Providing smart transport services with AI to improve urban mobility and integration.<br>• Collaborating internationally to enhance smart transport.<br>• Educating the public on smart transport.<br>• Encouraging public involvement in smart transport projects using AI to improve urban spaces.<br>• Promoting AI technologies in the smart transport market to transform urban landscapes.<br>• Offering tax benefits for AI projects in smart transport, especially in underdeveloped areas.<br>• Encouraging cooperation for AI-driven smart transport solutions.<br>• Ensuring open access to government smart transport information.<br>• Effectively communicating smart transport policies and services.<br>• Buying innovative AI-based smart transport products.<br>• Facilitating collaboration between government and industry for progress.<br>• Using AI technologies to improve urban spaces and architecture.<br>• Sharing AI-based smart transport resources for better efficiency. |

This approach employs NVivo's matrix coding feature to link policy tools with various stages of China's smart transportation development. The resulting two-dimensional matrix, detailed in ***Table 2,*** systematically tracks the implementation and impact of AI-driven smart transportation policies from 2014 to 2023. The table categorizes policies into supply-oriented, environmental-oriented, and demand-oriented tools, detailing their frequency over three distinct time periods. It illustrates how these policies contribute to the development and enhancement of smart transportation systems within urban environments, highlighting shifts in focus and strategy over time.

***Table 2:*** Two-Dimensional Analysis of National Policy Texts on Smart Transport in China ***(Developed by Author).***

| Category | Policy Tools |
|---|---|
| Supply Oriented | Financial Support<br>Innovative Technology Support<br>Transport Infrastructure Development<br>Brand Building<br>Platform Construction<br>Talent Cultivation<br>Demonstration Application<br>Pilot Construction<br>Information Infrastructure Construction<br>Organizational Leadership |
| Environmental Oriented | Standards and Norms<br>Legal Regulation<br>Supervision and Monitoring<br>Mechanism Improvement<br>Target Planning<br>Digital Transportation |
| Demand Oriented | Public Services<br>International Exchange and Cooperation<br>Training and Education<br>Social Participation<br>Market Participation<br>Tax Incentives<br>Collaborative Cooperation<br>Information Disclosure<br>Publicity Promotion<br>Government Procurement<br>Government-Enterprise Cooperation<br>Smart Construction<br>Resource Sharing |
| Total | |

This study reveals a significant variation in the utilization of different policy instruments by the Chinese Government, with a predominant reliance on supply-oriented policy tools, which constituted 42.9%. Notably, demonstration and pilot initiatives were highlighted, comprising 14.2% of total initiatives, reflecting the government's commitment to showcasing industrial applications and scientific and technological advancements. This effort aims to achieve the full integration of modern information technologies with transportation management and services, thereby enhancing the quality of transport services.

| 2014-2019 | 2020-2021 | 2022-2023 | Total | Proportion | Total Proportion |
|---|---|---|---|---|---|
| 9 | 4 | 2 | 15 | 2.1% | |
| 8 | 12 | 9 | 29 | 4.0% | |
| 15 | 18 | 14 | 47 | 6.5% | |
| 2 | 1 | 1 | 4 | 0.6% | |
| 8 | 6 | 5 | 19 | 2.6% | |
| 12 | 9 | 12 | 33 | 4.6% | 42.9% |
| 36 | 12 | 18 | 66 | 9.2% | |
| 14 | 13 | 9 | 36 | 5.0% | |
| 1 | 7 | 1 | 9 | 1.3% | |
| 11 | 18 | 22 | 51 | 7.1% | |
| 15 | 10 | 17 | 42 | 5.8% | |
| 25 | 9 | 8 | 42 | 5.8% | |
| 31 | 12 | 22 | 65 | 9.0% | |
| 9 | 5 | 14 | 28 | 3.9% | 28.6% |
| 2 | 3 | 9 | 14 | 1.9% | |
| 3 | 8 | 4 | 15 | 2.1% | |
| 11 | 1 | 4 | 16 | 2.2% | |
| 15 | 11 | 12 | 38 | 5.3% | |
| 0 | 1 | 2 | 3 | 0.4% | |
| 5 | 3 | 2 | 10 | 1.4% | |
| 12 | 5 | 2 | 19 | 2.6% | |
| 2 | 1 | 2 | 5 | 0.7% | |
| 7 | 11 | 4 | 22 | 3.1% | 28.5% |
| 5 | 2 | 0 | 7 | 1.0% | |
| 1 | 5 | 11 | 17 | 2.4% | |
| 4 | 4 | 1 | 9 | 1.3% | |
| 6 | 2 | 1 | 9 | 1.3% | |
| 19 | 20 | 9 | 48 | 6.7% | |
| 1 | 0 | 1 | 2 | 0.3% | |
| 289 | 213 | 218 | 720 | - | - |

For example, in 2020, the white paper titled "Sustainable Development of China's Transportation" advocated for the establishment of demonstration applications using drones within the transport sector. Similarly, the '14th Five-Year Plan for the Development of Highways,' issued in 2022, emphasizes the development of smart transportation pilots. It advocates for the phased introduction of new-generation information technologies aimed at fostering the use of artificial intelligence-driven solutions. These initiatives are designed to facilitate the adoption of advanced transport innovations, promoting the development of smart transport systems across various regions and industries, thus supporting the strategic objective of comprehensive smart transportation development. Furthermore, organizational leadership and transportation infrastructure construction emerged as crucial in advancing smart transportation.

This highlights the necessity for strong leadership and the execution of principal directives issued by the Central Urban Work Conference, a key event focused on outlining urban development strategies within China. The conference plays a critical role in shaping the national agenda for urban planning and infrastructure, emphasizing adherence to established guidelines and recommendations to ensure the success of AI-enhanced smart transportation initiatives. Integrating AI into smart transportation initiatives is expected to revolutionize urban mobility, making transportation systems more adaptive, efficient, and interconnected. This enhances the capability of cities to manage traffic flow and optimize routes, leading to improved urban planning outcomes.

The analysis also indicates a post-pandemic adjustment in the government's focus on smart transportation development. Although the overall proportion of focus areas saw a decline from 2022 to 2023, there was an increased emphasis on talent cultivation, reflecting a greater investment in human capital to drive the evolution of AI-driven smart transportation. This shift underscores the theoretical approach that emphasizes the role of skilled professionals in realizing the full potential of AI in transforming urban transportation and architectural environments.

Moreover, the analysis reveals that the use of environment-oriented and demand-demanded policy tools is comparably distributed, with supervision and monitoring tools dominating among environment-oriented tools. This strength emphasizes the government's commitment to developing laws and regulations and establishing a monitoring and evaluation framework aimed at fostering a comprehensive and effective risk detection system. This measure is designed to ensure a controlled environment conducive to the development of AI-driven smart transportation, thereby removing barriers and facilitating smoother progress in this domain.

Within the category of demand-oriented policy tools, smart construction was prioritized at 6.7%, international exchanges and cooperation at 5.3%, and market participation along with publicity promotion followed at 2.6% and 2.4%, respectively, ranking as the top three focuses.

This indicates that current policies emphasize empowering leading domestic smart transportation enterprises to overcome geographical limitations, extending their products and services to a wider market, enhancing promotional efforts, and fostering collaboration with international peers. Such strategies are crucial for the theoretical framework that posits global collaboration as essential for the adoption and diffusion of advanced AI technologies in smart transportation, ultimately benefiting the growth of intelligent transportation. In the meantime, comparing the distribution of policy priorities across three distinct periods reveals that the proportion of international exchanges and cooperation has increased post-epidemic, surpassing pre-pandemic levels.

This indicates the government's efforts to overcome the challenges posed by the epidemic, reactivating interactions with various countries and actively seeking opportunities for global cooperation. These efforts highlight the importance of international collaboration and knowledge exchange in advancing AI-driven smart transportation systems. This strategic approach contributes to the integration of technological innovations to improve the efficiency and connectivity of urban transportation.

## Discussion

Textual analysis of China's national smart transportation policies from the past decade reveals a period of accelerated development in the smart transportation sector. Despite a slowdown due to the pandemic, the overall trajectory indicates positive growth. Initially, efforts were concentrated on creating an integrated information service platform for smart transport, primarily developed and supported by government administration. This platform is designed to promote innovative smart transportation technologies while incorporating oversight, testing, and early warning functions. Such initiatives are essential for facilitating AI-driven improvements in smart transportation systems, aimed at optimizing operational efficacy and aligning these systems effectively with urban settings.

## Analyzing National Policy Impact on China's Smart Transportation: Trends, Strategies, and AI-Driven Innovations

With advancements in transportation infrastructure, there was a notable shift towards using information technology in transportation management, including the deep integration of big data, artificial intelligence, and 5G technologies. The "14th Five-Year Plan for Digital Transportation" (2021) highlights this shift, aiming to enhance transportation with advanced information technologies and strengthen digital governance. Furthermore, the government expanded its focus to include the smart development of public transportation, introducing policies such as the "National Public Transport City Construction Demonstration Project Management Measures (2022)" have been introduced to encourage the adoption of advanced technologies in urban public transport.

Key efforts include enabling seamless connection of intercity rail transit and simplifying urban travel with a unified digital code system, exemplified by "SH MaaS" in Shanghai, China. These measures align with China's strategic objectives in energy conservation, environmental protection, and urban development, indicating a comprehensive approach to integrating modern technological solutions in public transportation.

Additionally, utilizing NVivo to analyze the deployment of smart transportation policy tools during various periods reveals distinct governmental priorities at those times. For instance, in response to the pandemic, the Chinese government realigned its smart transport policy focus. A notable example is the 2021 publication of Outline of the National Comprehensive Three-dimensional Transportation Network Plan, which underscored the importance of robustly executing the Central Committee's guidelines on epidemic prevention and control, along with fostering strategic communication and cooperation with regional transportation authorities. This strategy demonstrates the government's focus on using the policy tools of organizational leadership and Collaborative Cooperation and effectively integrating these strategies into the transport infrastructure development. Such measures illustrate the Chinese Government's dedication to refining policy alignment, ensuring that policy tools are adeptly matched to the evolving objectives of smart transport development.

Despite advancements, China's smart transport sector faces a notable gap compared to Western counterparts, attributed to technological disparities and a later start. Analysis of smart transport policies in China shows an insufficient focus on collaborative cooperation and Government-Enterprise Cooperation, highlighting a lack of interdepartmental collaboration. The absence of cohesive planning between departments and inadequate information sharing, as indicated by the zero frequency of Information Disclosure policy tools during 2022-2023, leads to informational redundancy and connectivity gaps.

This inefficiency increases the cost of digital infrastructure development and reduces overall efficiency, thereby constraining the growth of smart transport. Additionally, the market mechanism's role in supporting public policy goals has not been fully utilised due to an immature market system and underdeveloped regulations, causing disarray within the market economy. Consequently, market products and services for smart transport fail to meet residents' demands, deviating from a user-oriented development model and leading to superficial growth. Moreover, the inception of smart transport pilot projects in economically advanced areas may not translate effectively to broader applicability across other regions, especially the rural areas, which highlights the need for a more inclusive approach to smart transport development.

For the advancement of smart transportation in China, addressing the gaps in policy tools by tailoring their distribution to fit China's unique national context and adjusting them according to the goals of each development phase is essential. Firstly, the effective promotion and rapid implementation of smart transportation policies depend on maximizing the potential of policy tools designed for collaboration and government-enterprise cooperation. Establishing a platform for seamless information and data exchange is essential in enhancing the connectivity and interaction between various departments and between the government and private sector entities. This approach promotes the interoperability of information, eliminates operational silos, and removes interest barriers across functional departments at every level, thereby amplifying their contribution to the advancement of smart transportation within the industrial sector. Furthermore, refining the configuration of policy tools is crucial for enhancing their impact on achieving various strategic goals within the smart transportation sector. Ensuring the effective deployment of policy tools for smart transportation development necessitates a comprehensive evaluation of the three key types of policy tools. In addition to the solid application of supply-oriented policy tools, there is a need to focus on demand-oriented policy tools, since these policy tools are instrumental in Promoting the growth of smart transportation by enhancing market engagement, building stronger partnerships with social capital, and creating additional platforms for sharing resources. Simultaneously, the refinement of environment-oriented policy instruments is essential, involving the strengthening of legal and regulatory frameworks, prioritizing strategic planning, extending digital transportation and public services, and initiating promotional campaigns to support smart transportation infrastructure. Implementing these comprehensive strategies will significantly contribute to creating a favourable environment for the successful growth of smart transportation in China.

## Conclusion

Given the growing global emphasis on smart transportation systems as a foundational element for promoting sustainable and stable urban growth, it is imperative to explore how AI-driven methodologies can revolutionize these systems. This study delves into 64 national smart transport policies introduced by the Chinese government since 2014, utilizing Citespace software to illustrate the policy distribution and the evolution of key research areas. Further, by employing NVivo's coding and analysis capabilities, a textual analysis framework for China's smart transport policies was developed. This framework, by cross-referencing policy instruments with stages of China's smart transport policy evolution, resulted in a two-dimensional matrix that clearly delineates China's priorities during each critical phase.

However, the analyses presented in this paper are broad, but limited to policies set by national governments and do not include policies implemented at the local level. This limitation restricts our understanding of how national directives are implemented regionally. Moreover, while an emphasis on supply, demand, and environment-oriented policy tools yields valuable insights, the true potential of AI-driven transformations in smart transportation demands a broader theoretical exploration. Specifically, it is crucial to investigate how advanced computational techniques and AI can support and refine the design and implementation of these policies, enhancing their effectiveness in promoting smarter transportation systems.

Despite these limitations, this research contributes a quantitative and theoretical review of China's smart transportation policies, enhancing the understanding of governmental strategies and policy mechanics. A detailed analysis establishes a robust theoretical framework for evaluating how national policies influence urban mobility, particularly focusing on AI-driven smart transportation. The findings highlight the strategic priorities from a policy tool perspective, deepening the grasp of policy mechanisms and facilitating their more effective application in advancing the smart transportation sector. Importantly, this study offers invaluable insights for policymakers, aiming to align policy formulation more closely with the genuine travel requirements of users. This coordination seeks to bridge the gap between theoretical policy analysis and the practical needs of the people, ensuring that policy interventions are both effective and user-centric. The research highlights the essential role of coordinated AI integration within smart transportation systems, proposing innovative policy strategies aligned with technological advancements to significantly enhance the growth and efficiency of urban transportation in China.

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## Conflict of Interests

The author declares no conflict of interest.

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