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Research on the Development of New Energy Public Transportation in Linyi City under the Background of Carbon Peaking and Carbon Neutrality

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Abstract

In response to global climate change, China proposed the "3060" target in 2020, which will lead urban transportation towards energy conservation, emission reduction, and green and low-carbon development. Public transportation is a mode of transportation that reduces air pollution, alleviates traffic congestion, and reduces energy consumption. In order to alleviate traffic congestion in Linyi City, ensure high-quality travel for citizens, and realize the green and low-carbon development of public transportation in Linyi City, it is necessary to study the development of public transportation in Linyi City. This article uses PEST analysis method to conduct macro environmental analysis on the current situation of public transportation in Linyi City under the background of carbon peaking and carbon neutrality, and then establishes a Hall three-dimensional structural model of new energy public transportation in Linyi City. It conducts a comprehensive and systematic in-depth analysis of public transportation in Linyi City, proposes development strategies for public transportation in Linyi City, and comprehensively improves the quality of public transportation services from four aspects: new power, new technology, new layout, and new mode. The research results provide a reference for promoting the high-quality development of public transportation in Linyi and realizing green, low-carbon and sustainable urban public transportation.

Subject Areas

Transportation

Keywords

Public Transport, Sustainable Development, Hall Three-Dimensional Structural Model, PEST (Political-Economic-Social-Technological Analysis)

1. Introduction

Global climate change has led an increasing number of countries to put forward the vision of a carbon-free future, advance "carbon neutrality" [1], and achieve energy conservation, emission reduction, and green development in cities [2]. In 2020, driven by the inherent need to promote sustainable development and the responsibility to build a Community with a Shared Future for Mankind, China made a solemn commitment to the world regarding "carbon peaking" and "carbon neutrality" [3]. Against the backdrop of the "dual carbon goals", the urban public transport system is currently facing transformation and upgrading. For large cities that have built urban rail transit, transportation means represented by subways and light rails can alleviate part of the urban traffic pressure [4]. In contrast, cities that lack the capacity to build rail transit can only start with the transformation of the public transport system. Based on long-term development and moving toward the direction of green, low-carbon, and clean development, these cities need to implement the strategy of giving priority to the development of public transport [5], thereby enabling the public transport system to gain a leading position in the passenger transport structure.

Transport electrification is regarded as one of the most promising approaches to reducing greenhouse gas emissions and realizing a sustainable and low-carbon transportation future [6]. However, in practice, several technical and implementation challenges have hindered the large-scale development of fully electrified transport systems, including high investment costs, incomplete route networks, vehicle scheduling issues, and inadequate charging infrastructure. Meanwhile, there have been few specific, comprehensive, and systematic studies on the development of public transport systems in specific cities, particularly for Type-II large cities without rail transit, which can only develop urban public transport dominated by ground public transport. Type II large cities are one of the classification standards for urban scale in China, referring to cities with a permanent population of 1 million to 3 million in urban areas. Most of these cities do not meet the conditions for building rail transit and can only vigorously develop urban public transportation with ground buses as the main body.

Taking Linyi City as the research object, this study applies PEST analysis (Political-Economic-Social-Technological analysis) to examine the basic conditions of Linyi City, and constructs a Hall Three-Dimensional Model for the new energy public transport system that is compatible with Linyi City's own development. The purpose is to improve the quality of urban public transport services and promote the high-quality and sustainable development of Linyi City's new energy public transport system.

2. Analysis of Linyi City's Basic Conditions Based on PEST

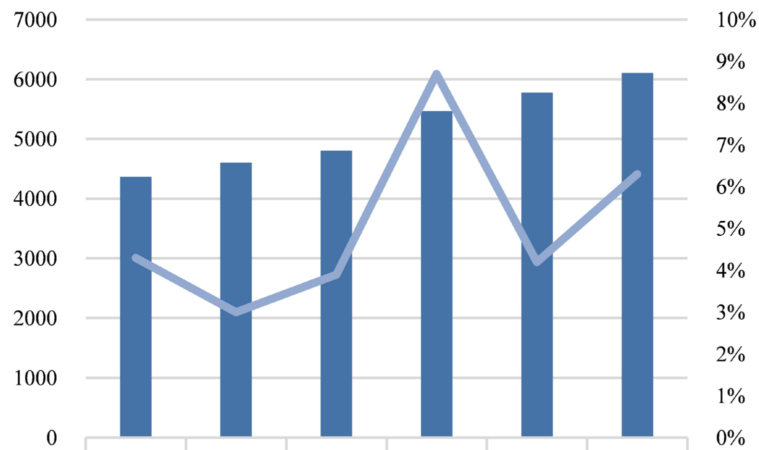
The PEST analysis model refers to the macro-environmental analysis of a development entity, where P stands for Politics, E for Economy, S for Society, and T for Technology. This study employs PEST to conduct a macro-analysis of Linyi City. The PEST analysis method enables a comprehensive understanding of how political, economic, social, and technological factors in the external environment influence the market.

2.1. Political Environment

Building a strong transportation country is a major strategic decision made by the Communist Party of China (CPC) Central Committee with Comrade Xi at its core. General Secretary Xi has issued important instructions on the development of a strong transportation country on multiple occasions, laying out a grand blueprint for advancing China's transportation sector. The Report to the 20th National Congress of the CPC further emphasizes the need to "accelerate the development of a strong transportation country". The Ministry of Transport, the National Railway Administration, the Civil Aviation Administration of China, the State Post Bureau, and China State Railway Group Co., Ltd. have jointly issued the Five-Year Action Plan for Accelerating the Development of a Strong Transportation Country (2023-2027). This plan clarifies the ideological goals and action tasks for accelerating the development of a strong transportation country in the next five years, solidly advances the implementation of the "two outlines", and carefully coordinates the alignment between the 14th Five-Year Plan and the 15th Five-Year Plan. To accelerate the construction of a city with strong transportation capabilities, achieve the leap from a "large transportation city" to a "strong transportation city", and build a modern comprehensive transportation system, a series of policy documents have been successively issued at the national, provincial, and municipal levels. Linyi City has released documents such as the 14th Five-Year Plan for the Development of Comprehensive Transportation in Linyi City and the Special Plan for Public Transportation in the Central Urban Area of Linyi (2021-2035) (Draft for Public Comment). Based on its own advantages, Linyi City is committed to building a public transportation system suitable for the city and promoting the prioritized development of urban public transport.

2.2. Economic Environment

As shown in **Figure 1**, the growth rate of Linyi City's Gross Regional Product (GRP) fell to 3.9% in 2019, and has remained above 4% since then. It took only two years for Linyi's GRP to grow from over RMB 400 billion to over RMB 600 billion. During the 14th Five-Year Plan period (2021-2025), Linyi achieved a GRP of RMB 546.55 billion in 2021, RMB 577.85 billion in 2022, and RMB 610.5 billion in 2023. After the pandemic, the overall environment has become more complex and severe, and the foundation for economic recovery remains unstable. Faced with the intricate macroeconomic situation, Linyi City has anchored the development orientation of “striving to be at the forefront, advancing in ranking, and raising the development level”. It has made all-out efforts to boost the economy, spared no energy to promote development, and taken the lead in shouldering key responsibilities. As a result, the city’s economy has maintained a steady recovery and consolidated its positive momentum: breakthrough progress has been made in fields such as modern industries and financial credit, and solid strides have been taken in building a modern and powerful city.



	2018	2019	2020	2021	2022	2023
Gross Regional Product (GRP) of Linyi City（RMB billion）	4367.8	4600.3	4805.3	5465.5	5778.5	6105
GRP Growth Rate（%）	4.30%	3.00%	3.90%	8.70%	4.20%	6.30%

Figure 1. Gross Regional Product (GRP) of Linyi City (2018-2023).

2.3. Social Environment

Linyi City is located in southern Shandong Province, with a maximum north-south length of 228 kilometers and a maximum east-west width of 161 kilometers. The total administrative area of the city is 17,191.21 square kilometers, accounting for 10.98% of Shandong Province’s total area, making it the prefecture-level city with the largest area and the largest population in Shandong. As shown in Figure 2, Linyi City comprises three districts and nine counties; in 2024, its total population exceeded 11.9 million, among which the urban resident population reached 2.2324 million, qualifying it as a Type-II large city.

To advance the priority development of urban public transport and encourage more citizens to choose public transport for travel, Linyi City has implemented a time-period-based free bus ride policy as well as a policy of free bus rides on national statutory holidays and weekends. These measures aim to promote green travel among the public, alleviate traffic congestion in urban areas, and facilitate energy conservation and emission reduction. The free bus ride policies not only reflect the determination and confidence of the CPC Linyi Municipal Committee and Linyi Municipal Government in continuously safeguarding and improving people's wellbeing but also contribute to advancing the priority development of urban public transport, easing traffic congestion in urban areas, and enhancing road traffic efficiency. Meanwhile, Linyi has actively built public government platforms to encourage the public to offer suggestions and advice and to listen to the genuine needs of the people. "12345·Linyi First Launch"—a government service platform for the public—has, since its inception, set the goal of becoming "an authority for handling public affairs, a tool for improving work styles, and a model for practicing the Yimeng Spirit" through "efficient and practical" means. Based on the concept of "all-elements, all-time, all-platform", the platform integrates all-element resources of government services through the "12345 + First Launch" model, connects interfaces of multiple government departments, and enables one-click access between clients at the municipal and county/district levels, thus truly realizing "direct access via a single hotline". At the same time, it adheres to a 24/7 service model and integrates online and offline channels to achieve full-network handling of services, effectively improving the rate and effectiveness of public service delivery.

Figure 2. Distribution map of counties and districts in Linyi City.

2.4. Technological Environment

With the application of new technologies, Linyi City has begun to build a technology application system led by smart innovation, promoting the integrated development of new technologies, Artificial Intelligence (AI), and transportation. It is advancing the digital upgrading of industry governance, comprehensively enhancing the intelligent supervision of transportation services, and constructing a full-element, full-field, all-dimensional, and full-chain intelligent transportation system. Linyi City is fully advancing the construction of the intelligent transportation system to continuously improve the level of intelligent services, with specific measures as follows:

First, a comprehensive transportation big data center should be built. In accordance with the overall framework of "1 + 4 + N" (1 core platform, 4 functional modules, and N application scenarios), Linyi has upgraded and transformed its Transportation Public Service Information Platform. Through data monitoring and analysis, this center enables real-time dynamic monitoring of the operation of key areas in the city's transportation industry.

Second, build an industry technical support center. By applying technologies such as the Beidou Global Navigation Satellite System (BDS), Geographic Information System (GIS), and video surveillance, the center realizes real-time dynamic monitoring of commercial vehicles in the city, including long-distance buses, tourist buses, dangerous goods transport vehicles, public buses, and taxis.

Third, build an integrated development center. As shown in Figure 3, Linyi is accelerating the construction of a new "1137" development pattern for digital and intelligent transportation. Specifically, this pattern involves relying on 1 platform, establishing 1 joint innovation laboratory for digital and intelligent transportation, focusing on 3 key fields, and building 7 application scenarios—thereby further expanding the breadth and depth of information technology application in the transportation industry.

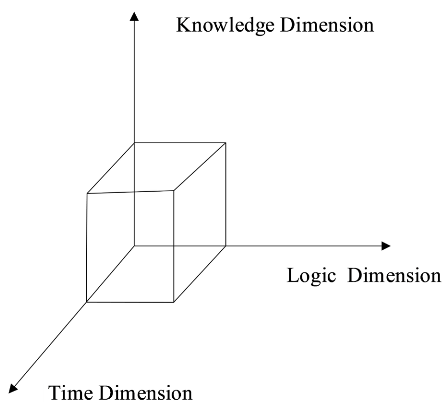


Figure 3. Hall's three-dimensional model.

3. Establishment of the New Energy Public Transportation System Model

3.1. Introduction to the Hall Three-Dimensional Structure

As shown in Figure 3, the Hall Three-Dimensional Structure Model, also known as "Hall's System Engineering", is a system engineering methodology proposed by the American system engineering expert Hall in 1969. It mainly constructs a three-dimensional spatial system based on three dimensions: the Time Dimension, Logic Dimension, and Knowledge Dimension [7]. The Hall Three-Dimensional Model divides system engineering into seven closely connected phases and seven steps; meanwhile, it also takes into account various professional knowledge and skills required to complete these phases and steps [8].

The Hall Three-Dimensional Structure Model provides a systematic analysis approach for the planning, organization, and management of large and complex systems [9]. It decomposes and implements complex system engineering activities, simplifying them into highly operational activities. This method is widely used in various fields such as engineering design and system management [10]. Therefore, this article uses a Hall three-dimensional structural model to analyze the development issues of new energy public transportation systems in Class II-large cities, promote the transformation and upgrading of the public transportation systems in Class II-large cities, and provide a solid foundation for reducing carbon emissions in urban transportation systems.

3.2. Establishment of the Hall Three-Dimensional Model for the New Energy Public Transportation System

The research on the development path of the new energy public transportation system in Type-II large cities is essentially a complex system engineering with multiple objectives and multiple stages, which requires holistic, comprehensive, and systematic analysis. By reviewing domestic and foreign scholars' research on new energy public transportation systems and based on the Hall Three-Dimensional Structure theory, this paper constructs a Hall Three-Dimensional Structure Model for the new energy public transportation system in Type-II large cities, aiming to explore systematic and holistic strategies for the development of this system.

Based on the development of new energy and the factors affecting the development of public transportation systems in Type-II large cities, the Hall Three-Dimensional Structure is introduced to conduct dynamic analysis on the new energy public transportation system in Type-II large cities. The Hall Three-Dimensional Model is established with three dimensions: the Time Dimension (development stages of the new energy public transportation system), the Logic Dimension (development strategies for Type-II large cities), and the Knowledge Dimension (relevant technologies and disciplinary knowledge), as shown in **Figure 4**.

3.2.1. Time Dimension

The Time Dimension refers to the development stages of the new energy public transportation system, with a primary focus on the progression phases. This dimension takes the stage points in the entire life cycle of the new energy public transportation system in Type-II large cities as its basis, and is specifically divided into three stages: the Early Development Stage, Mid-Development Stage, and Late Development Stage.

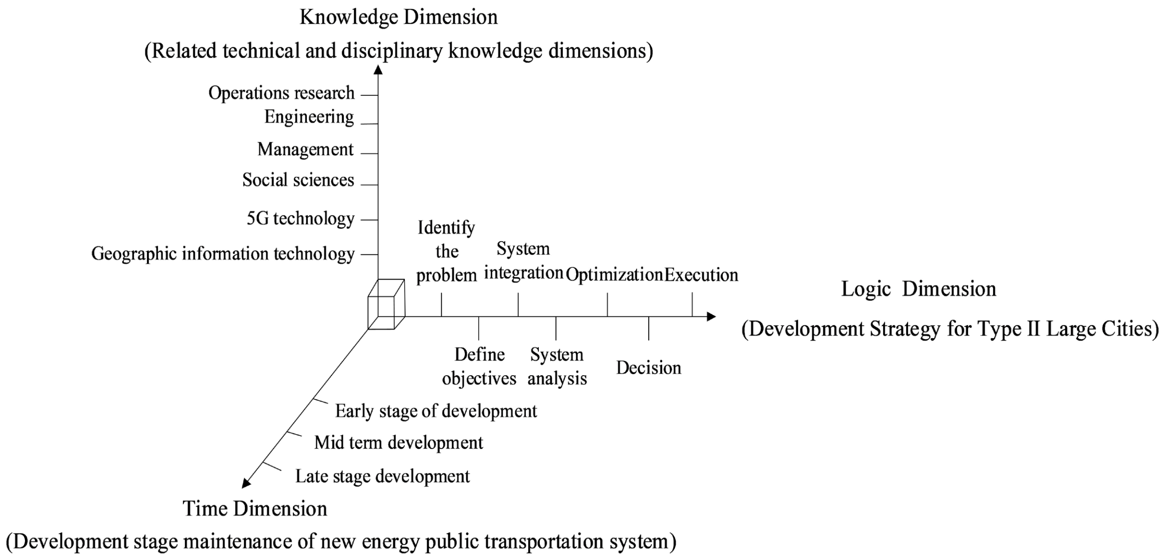


Figure 4. The three-dimensional model of the new energy public transportation system in Type-II large cities.

The first stage is the Early Development Stage. During this stage, the public transportation system in Type-II large cities begins to transform from the traditional model to the new energy model. Firstly, there is a conversion of bus fuels—shifting from traditional fuel-powered buses to gas-fueled (LNG) buses and electric buses. Secondly, the construction of relevant supporting infrastructure is initiated, realizing the process of building new infrastructure “from scratch”.

At this initial stage, the new energy public transportation system in Type-II large cities is in its infancy. It is necessary to focus on long-term development, integrate the city’s own characteristics, and proactively explore a green, low-carbon, and sustainable development model for the new energy public transportation system that suits the city itself in a holistic and systematic manner.

The second stage is the Mid-Development Stage. During this phase, the electrification of public buses in Type-II large cities is basically completed. While the construction of relevant supporting infrastructure has made some progress, it still cannot keep up with the pace of the bus model transformation and thus requires further development. Meanwhile, in the Mid-Development Stage, the framework of the new energy public transportation system is basically established. Efforts are made to advance the intelligent construction of relevant infrastructure, public transport route planning, and vehicle dispatching. These measures aim to achieve the intelligentization of bus operation and dispatching, as well as the informatization and visualization of bus operations. The ultimate goals are to provide improved information services for passengers, enhance residents’ travel satisfaction and convenience, and realize the high-quality development of public transportation services.

The third stage is the Late Development Stage. In this stage, the new energy public transportation system in Type-II large cities maintains high-quality development. The construction of relevant supporting infrastructure is fully completed, and key aspects of intelligentization and connectivity have been largely achieved.

This provides residents with increasingly convenient and efficient public transportation services—residents' travel modes basically shift to public transportation, enabling green and low-carbon travel.

By the Late Development Stage, the construction of the new energy public transportation system in Type-II large cities was completed, and the passenger volume carried by the public transportation system had generally reached its peak. At this point, it is necessary to provide residents with new types of transportation, such as urban rail transit.

3.2.2. Logic Dimension

The Logic Dimension, also referred to as the Development Strategy Dimension for Type-II Large Cities, primarily focuses on work content. It represents the logic of how Type-II large cities should develop their new energy public transportation systems at each stage. Specifically, the research on the development of the new energy public transportation system in Type-II large cities is conducted through seven steps, with the ultimate goal of identifying and implementing specific development strategies for each period.

Based on the problems existing in each stage, phased goals are defined, followed by system synthesis and system analysis. Further steps include optimization, decision-making, and strategy implementation. This dimension designs an overall logical framework for the development of the new energy public transportation system in large cities in Type-II, enabling a holistic analysis of the new energy public transportation system in Linyi City and coordination of the entire system.

3.2.3. Knowledge Dimension

The Knowledge Dimension, also known as the Relevant Technology and Disciplinary Knowledge Dimension, mainly covers the relevant knowledge required to carry out different work tasks at different stages. It encompasses the essential technologies and disciplinary knowledge needed throughout the development process of the new energy public transportation system in Type-II large cities. By closely integrating this knowledge with the development of the new energy public transportation system, a scientific and systematic new energy public transportation system for Type-II large cities is formed.

This dimension includes disciplinary knowledge such as operations research, systems science, management science, and social sciences, as well as emerging technologies like 5G technology, big data, and vehicle-road collaboration. Based on this knowledge and technical foundations, a development framework for the new energy public transportation system in Type-II large cities is established, ultimately making the system more comprehensive and systematic.

3.3. Analysis of the Development Stages of Linyi City's New Energy Public Transportation System

3.3.1. Time Dimension

Based on the aforementioned Hall Three-Dimensional Model of the new energy public transportation system for Type-II large cities, an analysis from the perspective of the Time Dimension shows that Linyi City is currently in the Mid-Development Stage. The number of bus routes in Linyi City (excluding intercity buses) will increase from 112 in 2021 to 134 in 2023, continuously increasing the density of the network and carrying out route optimization. Linyi City is also continuously purchasing new energy buses, and the number of buses is also increasing, reaching 2334 by 2023. At present, Linyi is actively increasing the use of electric buses, constructing intelligent charging piles, and planning intelligent stations, accelerating its development toward intelligentization and connectivity.

At this stage, efforts should be made to integrate emerging technologies such as the "intelligent supervision of operating vehicles for 'two types of passenger transport and one type of dangerous goods transport' ", 5G technology, and big data. It is necessary to accelerate the promotion of flexible charging piles and the application of coordination and control systems, as well as build an energy internet composed of a distribution network system, charging pile equipment, and new energy vehicles.

Meanwhile, in line with the "people-oriented" requirement, Linyi should speed up the construction of a vehicle-road collaboration environment for public transportation facilities. By providing a better travel experience, it will encourage more low-carbon transportation choices—essentially driving the transformation of low-carbon travel modes through the intelligentization of public transportation facilities.

3.3.2. Logic Dimension

According to the special plan for public transportation in the central urban area of Linyi City from 2021 to 2035, public transportation will be centered around People's Square. The current length of bus routes is 3096.8 km, with a recent increase of 3790.4 km, an increase of 22.6%, and a long-term increase of 4807.5 km, an increase of 55.4%. At the same time, in accordance with the principle of "strengthening group connections, increasing coverage of old cities, filling gaps in new cities, reducing route detours, and reducing duplication and improving efficiency", Linyi City plans to form 254 bus routes in the long term, including 129 new routes, 28 optimized and adjusted routes, and 97 retained routes, comprehensively building a "clear functional hierarchy, strong regional development support, and fully meeting passenger demand" urban bus network system.

From the perspective of the Logic Dimension (based on the Hall Three-Dimensional Model of the new energy public transportation system for Type-II large cities), Linyi's new energy public transportation system is also in the Mid-Development Stage. First, the key issues identified at this stage are: 1) the imbalance between the number of new energy buses and the relevant new supporting infrastructure; and 2) the mismatch between the service quality of the new energy public transportation system and residents' travel needs. To address these, in-depth surveys of residents' travel needs should be conducted to improve the efficiency of public transportation services. Subsequently, the goals for this stage are defined as: accelerating the construction of the new energy public transportation system framework and enhancing the alignment with residents' travel needs. After setting the goals, "system synthesis" and "system analysis" of Linyi's new energy public transportation system are carried out—adopting a holistic approach to coordinate resources, identifying feasible development strategies for Linyi, then improving these strategies, formulating new decisions, and finally implementing the decisions. This process of optimization is repeated continuously.

3.3.3. Knowledge Dimension

From the perspective of the Knowledge Dimension (based on the Hall Three-Dimensional Model of the new energy public transportation system for Type-II large cities), at each stage of the development of Linyi's new energy public transportation system, specific knowledge and technologies are applied as follows:

Disciplines such as operations research and big data are used for intelligent vehicle dispatching and traffic route planning.

Systems science, management science, and social sciences provide support for the overall planning and coordination of the new energy public transportation system.

Technologies including 5G and vehicle-road collaboration are employed for real-time vehicle monitoring and tracking, as well as the construction of an integrated smart facility network.

These applications enable two-way information connection and reduce information asymmetry, thereby improving the service quality of Linyi's public transportation, addressing the practical travel needs of residents, and enhancing the convenience of residents' travel.

4. Development Strategies for Linyi City's New Energy Public Transportation System

4.1. Construction of Scientific Public Transportation Routes with Comprehensive Coverage and Extensive Network Layout

On the basis of the rapid expansion of urban and rural roads and the continuous increase in road area, relying on the planned bus-only lane network, efforts should be made to build express skeleton public transportation corridors, establish scientific public transportation routes with broader coverage and higher network density, and realize a multi-level integrated public transportation network system consisting of express, trunk, feeder, and micro lines—featuring full regional coverage and efficient connection.

The road network in the main urban area of Linyi City is relatively complete. However, it is necessary to increase the road network density in other districts and counties, identify weak points in the transportation network between urban and rural areas, and develop urban-rural integrated public transportation (*i.e.*, the traffic integration of the three districts and nine counties). This will shorten the travel time between urban and rural areas, address the practical issue of inconvenient transportation between urban and rural areas, and enable more residents to enjoy the convenience of public transportation.

The scientific and rational planning of new energy public transportation routes can better align with residents' travel needs. A new energy public transportation system with wide route coverage and high network density can expand the radiation range of the main urban area, which contributes to the coordinated development of Linyi City's overall economy.

4.2. Construction of an Energy-Saving, Environmentally Friendly and Ecologically Intensive Green Public Transportation System

Based on the network layout and corridor construction, it is necessary to strengthen the land use guarantee for hub facilities to support the connected layout of multi-level networks. Efforts should be made to renovate and upgrade high-energy-consuming equipment and facilities, promote the recycling and comprehensive utilization of construction materials and waste materials, and establish a green, circular and low-carbon new energy public transportation system.

Vigorously promote the application of new energy and clean energy to advance the optimization and upgrading of the transportation energy structure. Electric vehicle charging reduces fuel consumption, while orderly, flexible and intelligent charging improves the resource utilization efficiency of the power system. The power system will continue to maintain an overall stable development trend, with further optimization of the energy structure.

With the development of new energy applications, renewable energy sources and various types of clean energy are used for power generation, leading to a continuous increase in the proportion of clean electricity in the energy structure. Electric vehicles use clean electricity, which promotes the improvement of system energy efficiency and the reduction of carbon emissions. Charging infrastructure supports the low-carbon development of electric vehicles and will continue to play a positive role in environmental protection.

4.3. Construction of an Innovative, Collaborative, Integrated and Open Smart Public Transportation System

Focus on making breakthroughs in key technologies such as the intelligent supervision of operating vehicles for "two types of passenger transport and one type of dangerous goods transport" and vehicle-road collaboration, and build a smart new energy public transportation system featuring all-weather operation, full-road-section perception, and whole-process management and control.

Promote the application of new technologies such as self-perception technology for transportation infrastructure, 5G, and Internet of Vehicles (IoV), construct a smart big data application platform, improve intelligent station facilities and smart charging technologies, and promote the integration of urban and rural route information and data to enhance the service level of public transportation.

Advancing the intelligentization of public transportation facilities is a key means to improve the operational efficiency and service level of the public transportation system. Linyi City should implement the strategy of giving priority to public transportation development, accelerate the construction of an integrated smart facility network covering public transportation depots (charging stations), intermediate stops, and smart roads, and realize the transformation from the construction of traditional public transportation infrastructure to new-type public transportation facilities characterized by digitalization and intelligentization.

Linyi City should improve its operation organization and management: supported by intelligent dispatching, it should achieve "refined" deployment of shifts and "diversified" organizational forms, and scientifically formulate departure intervals, vehicle capacity, and operation organization modes.

4.4. Construction of a Reliable, Comprehensive and Responsive Safe Public Transportation System

In recent years, various safety accidents involving electric vehicles have occurred frequently in society, so potential safety hazards of new-type public buses need to be eliminated. It is necessary to improve the safety management and technical standard system for new energy-related facilities, continuously increase investment in safety prevention and control, advance the construction of a technology support system, and build a reliable, comprehensive and responsive safe new energy public transportation system.

In the process of transportation electrification, the demand for electric vehicle charging continues to grow. The construction of charging infrastructure needs to intensively integrate resources to improve charging service capacity and efficiency, continuously strengthen the construction of smart grids, ensure urban electricity safety, and create conditions for low-carbon development.

At the same time, it is necessary to implement the construction of charging infrastructure: gradually reduce the use of single distributed charging piles, incorporate charging infrastructure into whole-life cycle and whole-process management, strengthen safety certification and safety supervision, and initially establish an intelligent joint control and dispatching system for urban flexible charging pile clusters and energy Internet of Things (IoT) data chains, so as to improve the operation efficiency of public charging resources in the city. Practical measures should be taken to ensure facility safety and information security, as well as to eliminate various potential safety hazards from the source.

5. Conclusions

This paper combines the development of the new energy public transportation system in Type-II large cities with the Hall Three-Dimensional Structure Model to construct a three-dimensional structure model for Linyi City's new energy public transportation system. It also conducts a specific analysis of Linyi's current public transportation system, promotes the transformation of Linyi's public transportation system toward new energy, improves the service quality of Linyi's public transportation, and enhances the convenience of residents' public transportation travel. Finally, the paper proposes the development strategies for Linyi's new energy public transportation system in the next five years: constructing a scientific public transportation network with comprehensive coverage; building an energy-saving, environmental-friendly and ecologically intensive green public transportation system; establishing an innovative, collaborative, integrated and open smart public transportation system; and developing a reliable, comprehensive and responsive safe public transportation system.

This research has theoretical guiding significance for how Type-II large cities construct new energy public transportation systems at the current stage. It promotes the achievement of the "dual carbon goals", realizes the high-quality and sustainable development of urban public transportation systems, and lays a solid foundation for Linyi to develop other forms of public transportation. However, this study lacks actual cost analysis, user survey data, and actual scenario simulation for the research on public transportation strategies in Linyi City. Further investigation and research are needed to effectively promote the implementation of urban public transportation strategies.

Conflicts of Interest

The author declares no conflicts of interest.

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