ISSN: 2710-0723

Goal-oriented Urban Integrated Transportation Planning under the Concept of Green Mobility

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Abstract

With the development of urban motorization, urban traffic congestion and traffic pollution problems are becoming more and more serious, and the new era of "double carbon" strategic goals have also made important requirements for the transportation sector. The traditional integrated transportation planning has the limitation of being established only to meet the transportation demand, and it also takes less account of the importance of sustainable development. Therefore, this paper reflects on the traditional comprehensive transportation planning from the perspective of the "double carbon" strategic goal, and identifies the problems, combines the current characteristics that there are many green travel modes in the city but not in an orderly way, builds a green travel system in the comprehensive urban transportation planning, integrates the green travel concept into the urban development, and creates a green travel transportation planning system in the urban area. The research results are in line with the requirements of the "double carbon" strategy and the sustainable development of resources, environment and transportation. The research results of this study are in line with the realistic needs and have certain theoretical reference value and practical guidance for urban transportation managers in terms of theory, methodology and practical application.

Keywords

Green Travel Concept; Goal-Oriented; Integrated Transportation Planning; Urban Traffic.

1. Introduction

In recent years, the development of urban transportation has become faster and faster, and the number of motor vehicles has been rising year by year. The latest data as of September 2021 shows that the number of motor vehicles in China has reached 390 million, including 297 million cars. There are 76 cities with more than 1 million cars, an increase of 7 compared to the same period last year; 34 cities with more than 2 million cars; 18 cities with more than 3 million cars, in the order of Beijing, Chengdu, Chongqing, Suzhou, Shanghai, Zhengzhou, Xi'an, Wuhan, Shenzhen, Dongguan, Tianjin, Hangzhou, Qingdao, Guangzhou, Shijiazhuang, Ningbo, Foshan, Linyi; Beijing car The number of cars kept in Beijing exceeds 6 million; the number of cars kept in Chengdu and Chongqing exceeds 5 million; the number of cars kept in Suzhou, Shanghai, Zhengzhou and Xi'an exceeds 4 million, behind the growth of these figures represents the emergence of traffic congestion, traffic pollution and other problems are becoming increasingly serious. With the improvement of people's living standard, more and more people choose to travel by private cars with convenience, comfort and speed, which makes the pressure on urban transportation system become more. The consequence of traffic congestion is the reduction of people's travel efficiency, and excessive traffic congestion also has the potential to reduce the number of trips made by travelers. Meanwhile, among the emissions from vehicle exhaust, hydrocarbons, carbon monoxide and nitrogen oxides are the sources of pollution that cause

ISSN: 2710-0723

deterioration of air quality. The carbon monoxide, nitrogen dioxide and hydrocarbons emitted by engines burning gasoline and diesel account for 50% of such pollutants in the atmosphere, and the harmful gases released by the combustion of leaded gasoline have a huge impact on the atmospheric environment. A considerable number of scholars have conducted research related to green transportation and comprehensive transportation planning. Du Shengpin et al[1] established a comprehensive evaluation index system for green transportation, and conducted a study on the optimal solution of combining green transportation and urban planning by using hierarchical analysis and an optimization algorithm of synthetic weights and the concept of green transportation planning; Yao Xiaxia et al[2] scholars conducted a green transportation system for Changsha city. Yao Xiaxia et al[2] advocated mass transit as the guide for developing public transportation and used a new "green" management technology to build a comprehensive and harmonious green transportation system in Changsha City; Wang Na[3] studied the rational division of labor and orderly connection of various transportation modes based on the green transportation concept from the aspects of factors affecting the selection of transportation modes.

While pursuing comfortable, convenient and fast travel, we ignore the pressure on urban transportation system and living environment, which is obviously not in line with the important requirements of the strategic goal of "carbon peak and carbon neutral" in the new era, so we should deeply reflect on the relationship between transportation and environmental protection, and establish an urban Therefore, we should deeply reflect on the relationship between transportation and environmental protection, and establish a "green" integrated transportation planning system to realize the sustainable development of resources, environment and transportation, which is of great significance from the theoretical and practical aspects of integrated transportation planning development.

2. Problems with Traditional Integrated Transportation Planning Section Headings

2.1. Limitations of the Four-Stage Method

Traffic demand forecasting occupies a central position in transportation planning, and is an indispensable part of planning and an important condition to ensure that transportation planning can adapt to future development conditions. The most widely used four-stage method in this loop was born in the Chicago Area Transportation Study published by the City of Chicago in 1962. However, as urbanization continues to accelerate and urban road networks and transportation systems become more and more complex, the four-stage approach is no longer particularly well suited to the current stage of transportation development. First of all, there is a part of controversy about the division of transportation modes in it. In urban traffic planning, traffic mode division curves such as time difference and time ratio are established based on existing data, and it is assumed that the future traffic mode division remains unchanged, and then the traffic mode division is carried out based on these curves, while in the actual situation, the future traffic mode may change, which also generates some errors and thus is questioned and disputed; secondly, since the four-stage method requires an initial OD table Secondly, since the four-stage method requires an initial OD table, and the acquisition of the OD table requires a large number of traffic surveys, which also leads to a large amount of time and financial resources for processing the survey data, the forecast data in the four-stage method is large and time-consuming; once again, it is generally believed that traffic demand is a derivative demand, which is derived from people carrying out social, economic or other activities. However, the four-stage forecasting method generally does not include variables reflecting the traffic service level, so the interrelationship between traffic service level and traffic demand cannot be discussed using these models; finally, the division of traffic cells is subjective, and the obtained

ISSN: 2710-0723

forecasting models as well as the forecasting results will also be changed by the subjective will of the planners, thus making the forecasting results lose objectivity.

2.2. Deviations in Planning Priorities

Transportation planning is the basis of transportation construction and development. The increasing number of motor vehicles has brought people convenient travel and transportation, but also brought more and more prominent traffic congestion and environmental pollution problems, and traffic planning as an important means to solve these problems should be seized to focus on, but precisely because of the increasing number of cars in the city, in most of the urban traffic planning, the planner's focus is increasingly on solving traffic congestion problems and The increasing environmental pollution in cities has been neglected. Most of the current strategies to solve traffic congestion in cities are to speed up the construction of road infrastructures within the scope of permitted expansions, which will attract more trips, including intra-city trips and urban traffic, and after a period of time, congestion will form again, which will form a vicious circle in the long run and will aggravate traffic congestion and environmental pollution in cities. The road congestion will also have a certain degree of impact on the operation of public transportation, making public transportation less efficient and discouraging more people from taking public transportation, so that urban traffic problems are not fundamentally improved.

2.3. The Green Concept In Planning is not Deep Enough

Transportation planning should adapt to the development needs of social economy and people's life, and improve the scientific basis for decision making of transportation development and construction, so it should make transportation development and construction more comprehensive and systematic when planning. However, due to the development of motorization and urbanization, urban transportation is becoming more and more diversified, so the concern for the coordination of urban road access and economic development takes up most of the attention, which leads to the lack of development of comprehensive transportation planning centered on green travel, and the urban pollution problem is becoming more and more serious. At present, some scholars use the relevant traffic environment impact evaluation index system to measure the implementation effect of the relevant planning scheme, and then summarize the shortcomings in the planning, most of which are not deep enough for the comprehensive transportation planning of green travel, so as to use it as the basis for the improvement of the planning scheme. The traditional integrated transportation planning is generally based on the traffic demand forecast in the four-stage method to carry out a certain stage of comprehensive planning, in order to meet the larger transportation demand in the later stage, but less consideration for the whole integrated transportation system as a whole. Besides, the planning which only aims to improve the transportation supply capacity does not well reflect the green concept in planning, which often leads to environmental pollution and waste of resources, and then leads to unsustainable development of transportation and a vicious circle.

3. Integrated Urban Transportation Planning under the Concept of Green Mobility

Under the concept of green mobility, urban integrated transportation planning will no longer take meeting urban transportation demand as the first goal, but focus on the rational use of resources and control environmental pollution to a low level while meeting transportation demand. In addition, resource integration, energy consumption reduction and environmental protection should be included as a series of indicators in the transportation planning and control of the planning and design. The green travel concept should be integrated into the comprehensive transportation planning of the city to realize the rational allocation and

ISSN: 2710-0723

effective use of resources, and to build a comprehensive urban transportation planning theory and method that can reflect the green travel concept. Different cities have different travel characteristics and traffic layouts, so we should explore more deeply the micro-level of each city in order to obtain the best performance of the application of green mobility concept.

3.1. Road Network Planning under the Concept of Green Mobility

Road network planning, as the core part of transportation planning, plays a role in coordinating the overall planning. In the traditional planning, the motor vehicle road network planning occupies the main position of the road network planning, for traffic congestion and other problems is the first road network expansion, and most of the motor vehicle lane expansion, for bus lanes and non-motorized lane optimization is rarely reflected, so in the green travel concept of road network planning should focus on other than motor vehicle road network planning, improve public transport Therefore, the road network planning under the concept of green mobility should focus on other planning besides the motor vehicle road network to improve the accessibility and comfort of public transportation and slow traffic, so that the planning focus is shifted from the motor vehicle road network to the public transportation road network and slow traffic road network. The specific embodiment of the expansion of the lane gives priority to public transport lanes and non-motorized lanes, to improve their access density, in some cities with high road network density can also be widened lane width, or actively build a separation zone, the non-motorized lanes and motor vehicle lanes away, so that non-motorized vehicles get a more smooth and safe travel environment.

The current advocacy of the road network "high-density narrow channel" will also be reflected in the road network planning under the concept of green travel. Generally speaking, the higher the density of the road network, the greater the overall capacity and service capacity of the road network, and when the road network density is high is also conducive to the formation of a continuous pedestrian, non-motorized, motorized traffic diversion system, can create a peaceful and safe walking atmosphere and help the concept of green travel is reflected.

In the adjustment of the proportion of each road level, it is recommended that the length ratio of expressway, trunk road, secondary road and branch road is formulated as 1:2:3:6, the current problem of China's urban road network is the serious lack of urban branch roads, secondary roads are not fully developed, and the branch roads and secondary roads can be more appropriate to reflect the concept of green travel.

Table 1. Overview of the length ratio and function of each grade of road

Road grade	Recommended length ratio	Functional role
Expressway	1	Carrying long, fast-moving traffic and connecting major areas of the city
Main roads	2	Undertake medium and long distance traffic and transmit large, high-speed traffic flow
Secondary roads	3	Transferring traffic from feeder roads to main roads for short, slow traffic flows
Branch road	6	Life style roads, linking daily activities and traffic trips

3.2. Public Transportation Planning under the Concept of Green Mobility

As a representative of green travel, public transportation has the advantages of high capacity, low energy consumption, low cost and environmental protection, and is one of the basic industries that the state supports and prioritizes in the basic fields in the process of urban development, and is an important urban infrastructure that plays an indispensable and critical role in promoting green travel, so the planning of public transportation is very important. Urban public transportation system generally contains rapid transit system, conventional bus

ISSN: 2710-0723

system, cab system, etc. Large cities also have rail transit system, no matter which system, it can reflect the application of green travel concept in the urban transportation system.

However, public transportation has not become the first choice of the public in China, so its role should be much more than that, which is largely due to the fact that the comfort level of taking public transportation is not high. First, the ground bus system is cheaper, so its ride comfort will be partly reduced, as the road is uneven when the bumpy, crowded feeling when too many passengers and the current appear more contradictions in giving up the seat; Second, the development of the rail transit system in recent years, although more passengers than the ground bus system to bear the transport, but there are still some problems, such as the morning and evening rush hour congestion, after leaving the station still The rail system has been developed in recent years, but there are still some problems, such as congestion in the morning and evening rush hours, long walking distance after leaving the station.

Solutions to these problems should be proposed in order to achieve a better public transportation travel experience. The ground bus system should improve the comfort of the ride, for different needs of different travel days, the bus company should focus on the frequency and interval adjustment, shorten the frequency of the morning and evening peak, as far as possible to achieve a balance between supply and demand; with the road network planning, the construction of bus lane optimization can also increase the attractiveness of public transport; public transport as far as possible to use new energy system, while paying attention to Regular maintenance to improve the safety of public transport travel, the policy should reflect the priority of public transport, increase the coverage of the bus network, improve the bus road network. For the cab system, the cab market should be opened up to increase the competitiveness of the cab market, while improving the service level of cabs, which can serve as an effective supplement to the public transportation system due to their strong flexibility, and introducing environmentally friendly cab vehicles, such as electric cabs. In addition, we should pay attention to the effective connection between the rail transit system and the ground bus system or the cab system, which is still a big problem in this area. Passengers can't get a bus after leaving the station, and it takes a long time to wait for a taxi. In the subsequent development, an intelligent interconnection system between rail and bus or cab can be developed, so that the bus driver or cab driver can be the first to know the arrival and stopping time of the nearby rail transit station and go to the station after internal coordination, accordingly, passengers can be the first to take a bus or cab after leaving the station, which can also improve the operation efficiency of these transportation systems.

3.3. Slow Traffic Planning under the Concept of Green Mobility

As an auxiliary transportation mode, slow traffic can enrich the daily recreational life of urban residents, and of course, some urban residents use it as a commuting mode of transportation, and slow traffic is also the centralized embodiment of the concept of green travel.

For small and medium-sized cities, the non-motorized transportation system accounts for most of the urban traffic trips, and therefore there are many traffic accidents between non-motorized vehicles and motor vehicles. On the one hand, this is because the planning of non-motorized system is not detailed enough in the comprehensive traffic planning of the city, and the signal timing of some intersections is not reasonable, and there are few special non-motorized lanes, so non-motorized vehicles usually occupy the motor vehicle lanes directly, which not only reduces the efficiency of motor vehicles and non-motorized vehicles, but also affects the traffic safety of the city to some extent. For pedestrian traffic system, as the traditional comprehensive traffic planning is to meet the traffic demand as the core, in some cities where parking land is tight, there are even parking spaces painted on the sidewalk. The pedestrian transportation system, as a green travel representative of a city, should aim to build a safe, comfortable and environmentally beautiful slow corridor walkway to bring out the advantages of the slow

ISSN: 2710-0723

transportation system. In addition, we should change the concept of "car-oriented" to "people-oriented" in comprehensive transportation planning, and build some slow commuting corridors, slow leisure corridors, slow living corridors and other slow walking representative slow transportation systems, and according to the characteristics of different terrains The facilities such as disabled access and pedestrian recreation areas will be built.

At the micro level, different levels of planning should be carried out for the different amounts of non-motorized travel in each area of the city. The planning and construction of non-motorized corridors should be strengthened in large residential areas, interchange hubs, commercial plazas, schools, etc. Non-motorized parking spaces, non-motorized lanes and other related facilities should be improved and optimized. The pedestrian transportation system, as the main transportation mode connecting short distance areas, should pay attention to the integrity of pedestrian walkways and pedestrian crossing facilities when planning, and can also strengthen the arrangement of green landscape around the walkways, so that pedestrians can get a better walking travel experience. In addition, a certain traffic area of the city can be divided into a number of small blocks according to the functional nature, and each block will be named, and the connection between the small blocks will be built by the pedestrian traffic system, and the guidance signs on the regional channel will be done well to strengthen the connectivity and finally form a regional pedestrian road network.

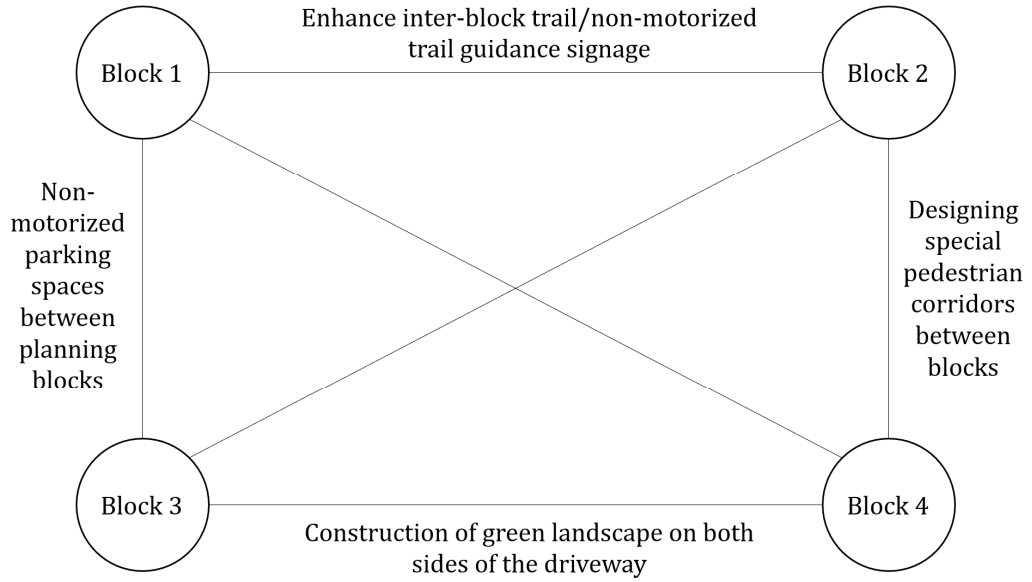

Figure 1. Slow traffic system block division and improvement measures

3.4. Parking System Planning under the Concept of Green Mobility

The planning of parking system plays an important role in the comprehensive traffic planning of the city, and the current shortage of motor vehicle parking spaces and indiscriminate parking are mostly due to the failure of parking planning to meet the later parking demand, which leads to motor vehicles occupying the parking lanes and aggravating the formation of urban traffic congestion. In addition, the carbon emission of the slow moving process before parking is higher than the carbon emission when driving at a constant speed, and the high carbon emission of parking and traffic congestion will be contrary to the "double carbon" strategy.

The current parking system, whether on-street or underground, mainly serves motor vehicles and is not conducive to guiding residents to use non-motorized vehicles. Therefore, in the planning of the parking system, it is recommended that a part of the area should be allocated for non-motorized parking under the condition of meeting the basic parking needs of motor vehicles, so that the parking space can be effectively used on the one hand, and guiding

ISSN: 2710-0723

residents to use non-motorized vehicles on the other. At the same time, the parking system should coordinate the road network layout, population distribution, land use nature of different cities as well as the connection between various modes of transportation, predict the parking demand scientifically and reasonably, realize the differentiated parking supply, and improve the efficiency of motor vehicle and non-motor vehicle use. In the planning of parking lot, it can be combined with the planning of slow traffic block division to shorten two distances as much as possible: one is the distance between the residence and the parking lot; the other is the distance between the travel destination and the parking lot, which can encourage residents to use motor vehicles less to travel on the one hand, and improve the parking efficiency of the parking lot on the other hand.

The parking system should be planned from the perspective of people, to meet people's travel needs and improve parking efficiency. The development of the parking system should be "people-oriented" rather than "car-oriented", so the parking system planning under the concept of green travel should not affect green travel but should ensure the efficiency of public transportation and slow traffic, especially the setting of road parking should not In particular, on-street parking should not affect public transportation and slow-moving traffic. In the construction of parking facilities, the parking facilities in large commercial areas, transportation hubs and central areas that attract large traffic should be mainly three-dimensional parking buildings, supplemented by parking spaces on the road, which can effectively reduce the space occupied by road parking lanes on the one hand, and save the land use space in the city. In terms of parking management, information technology and intelligent parking management should be used as much as possible to improve the efficiency of parking in the city, which will help the green development of traffic management, and will also promote the achievement of the "double carbon" strategy.

4. Conclusion

China's economic development has entered a period of high speed and high quality rise, the scale of cities and the level of motorization and urbanization are also increasing, and the demand for intra-city transportation is rising year by year. The traditional integrated transportation planning mode is more to meet the city's traffic travel demand as the main goal, ignoring the development of green and sustainable development concept, public transportation, slow traffic, etc. in the traditional integrated transportation planning does not get attention, so it is not conducive to the development of integrated transportation planning under the concept of green travel. This paper focuses comprehensive transportation planning on green development under the condition of meeting travel demand, and puts forward a series of suggestions and related optimization for road network planning, public transportation planning, slow-moving transportation planning and parking system planning under the goal guidance of green travel concept, aiming to promote more sustainable development in urban comprehensive transportation planning, and guide urban residents to choose high-capacity, low-energy, low-pollution, and We aim to promote the concept of green travel by guiding urban residents to choose high-capacity, low-energy, low-pollution and efficient public transportation and non-polluting slow-moving transportation, so as to realize green transportation, friendly transportation environment and efficient transportation management, and to add bricks to the achievement of the "double carbon" strategy.

References

[1] S.P. Du, L. Xiong, W.D. Ding: Comprehensive Evaluation of Urban Rail Network Planning Guided by Green Transportation Principles, Journal of Southwest Jiaotong University, Vol. 41 (2006) No.3, p.284-289.

ISSN: 2710-0723

[2] X.X. Yao, Y. Lu, S. Zhang: Build a comprehensive and harmonious green transportation system in Changsha, Hunan Transportation Technology, Vol. 34 (2008), No.3, p.153-156.

[3] N. Wang: Options for sustainable urban transportation models, Shanxi Construction, Vol. 33 (2007), No.17, p.24-25.

[4] D. Yan: On the Sustainable Development of Urban Transportation Systems, Journal of Shanxi University of Finance and Economics, (2004) No. 5, p.80-83.

[5] H.X. Pan: Green Transportation in Chinese Cities - A Fundamental Strategy to Improve Traffic Congestion, Modern Urban Studies, (2010) No.1, p.6-10.

[6] M.J. Koetse, P. Rietveld: The impact of climate change and weather on transport: An overview of empirical findings, Transportation Research Part D Transport & Environment, Vol. 14 (2009), No.3, p.205-221.

[7] A.A. Amekudzi, C.J. Khisty, M. Khayes: Using the sustainability footprint model to assess development impacts of transportation systems, Transportation Research Part A Policy & Practice, Vol. 43 (2009), No.4, p.339-348.

[8] X.C. Guo, Z. Kong, M.Ye: Research on Green Transportation Technology Policy System for Large Cities, Modern Urban Studies, (2010) No.1. p.11-15.

[9] L. M. Jiang: Thinking about green transportation ideas in terms of transportation and road conditions, China Municipal Engineering, (2003) No.2.p.10-12.

[10] X.S. Song: Articulation and coordination between urban green transportation modes, Journal of Pingdingshan Engineering College, Vol. 15 (2009), No.4, p.25-27.

[11] X.Y. Zhao: Green Transportation and Sustainable Urban Development, Urban and Rural Construction, (2002) No.9. p.13-14.

[12] Y. Yang, Y.L. Chen, X.K. Wang: Urban transportation planning under the concept of green transportation, Urban Public Transportation, (2004) No.1. p.6-7.

[13] J. Peng, X.S. Wang: A comparative study of the latest comprehensive transportation planning vision, objectives and countermeasures in international metropolitan areas, Journal of Urban Planning, (2011) No.5, p.19-30.

[14] T. Zhao, L.B. Kong: Some thoughts on the current urban transportation planning in China, Urban Development Research, (2001) No.2. p.27-32.

[15] J. Lu: Theory and Methodology of Sustainable Development Planning of Urban Transportation System (Ph.D., Southeastern University, China 2003).

[16] S.G. Xia, S.S. Wang, G.H. Cao: Green Transportation Planning Concept and Technology - Singapore-Nanjing Jiangxinzhou Eco-Technology Island as an Example, City Traffic, Vol. 09 (2011), No.4. p.66-75.

[17] W. Liu: Research on the influencing factors and guiding strategies of low-carbon travel of urban residents (Ph.D., Beijing Institute of Technology, China 2014).

[18] H.A. Swanson: The influence of central business district employment and parking supply on parking rates, Institute of Transportation Engineers. ITE Journal, Vol. 74 (2004) No.8. p.28.

[19] M.A. Kazemi, M. Sedighizadeh, M.J. Mirzaei, et al: Optimal siting and sizing of distribution system operator owned EV parking lots, Applied energy, Vol. 179 (2016), p.1176-1184.

[20] L. Guo, B. Huang. G. Wang: Research on the impact mechanism and layout model of urban neighborhoods based on green travel, Planners, Vol. 33 (2017) No.10. p.115-122.

[21] B.H. Li: Study on Urban Spatial Layout Patterns and Optimization Strategies Guided by Low Carbon Transportation (Ph.D., Xi'an University of Architecture and Technology, China 2013).

[22] Housing and Urban-Rural Development Department of Jiangsu Province: Planning Guidelines for Urban Pedestrian and Bicycle Traffic in Jiangsu Province (Jiangsu People's Publishing House, China 2013).