Comprehensive Transportation System Planning under the Green Concept

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Abstract. With the continuous acceleration of urbanization in China and the rapid increase in the number of private cars, the pressure on the traffic network is increasing and the environment is deteriorating. Establishing a new comprehensive transportation system has become an urgent problem to be solved. This paper mainly expounds the problem of comprehensive transportation system planning under the concept of green transportation, puts forward the problems currently faced by China's comprehensive transportation system, and gives some suggestions to China's comprehensive transportation system.

1. Introduction
In 2018, China's per-capita GDP increased to 64,644 yuan, an increase of 6.1% year-on-year. China's economy has been growing steadily, and the construction of infrastructure has been comprehensively improved. During the "Twelfth Five-Year Plan" period, the investment of transportation infrastructure is 13.4 trillion yuan totally, 1.6 times that of the "11th Five-Year Plan" period. With the continuous development of the urban economy and the infrastructure construction, more and more private cars have entered the families. According to the latest data released by the Ministry of Public Security, as of June 2019, the number of motor vehicles in China reached 340 million. In the first half of 2019, the number of private cars in the country reached 198 million. At the same time, the issues of traffic congestion and environmental pollution have arisen. Building a comprehensive green transportation system that is efficient, convenient, orderly, accessible, safe and comfortable has become an issue that must be taken seriously in development. The concept of green transportation is produced.

2. Green traffic
2.1. Green transportation concept
There is currently no clear definition of green transportation. From a foreign perspective, in 1994 Chris Bradshaw took the lead in proposing the "green transportation" concept. He believes that green transportation refers to a coordinated transportation system that uses a variety of urban vehicles with low carbon and environmental protection or a combination of them to complete a series of social and economic activities about people's production and life. At the same time, Chris Bradshaw ranked the green transportation vehicles according to the relevant principles, followed by slow-moving systems (walking, bicycles), public transportation (bus, shared car, etc.), and private cars [1]. Taiwanese scholar Tiancai Shen took the lead in introducing the green transportation concept proposed by Chris Bradshaw into China. He pointed out in his related research that the application of green transportation refers to reduce the use of private cars as much as possible, and encourage people to walk, use bicycles and take buses. Green transportation minimizes or stops the use of motor vehicles with high pollution...
emissions, and actively guides people to use environmentally friendly and clean vehicles in the process of travel [2].

2.2. The principles of green transportation planning

2.2.1. Sustainable development principle. The connotation of sustainable comprehensive transportation system is to meet people’s growing traffic demand on the basis of maximizing the harmonious development between ecological environment and social economy. The development of comprehensive green transportation should be green, intensive, safe, efficient, low-pollution and low-energy, which implement the sustainable development principle.

2.2.2. People-oriented principle. Comprehensive transportation planning should be “people-centered”. The goal of comprehensive green transportation is to meet people's travel needs, improve people's travel quality, improve the existing urban road system, provide comfortable, safe, efficient and convenient transportation modes, and improve people's quality of life.

2.2.3. Ecological civilization principle. The comprehensive green transportation is mainly to meet the rapid development of current transportation, and reduce the consumption of natural resources on the basis of public transportation. The comprehensive green transportation leads the city's transportation mode to public transportation, forming a comprehensive transportation system that takes social, economic and environmental conditions into consideration, and realizes the sustainable development of urban transportation.

3. The current situation of comprehensive transportation planning

3.1. Traffic structure ratio imbalance
Recently, the bus and bicycle travel structure has shown a downward trend. In development of many cities, urbanization and motorization are pursued excessively, while the development of slow traffic is ignored, resulting in the prevalence of motor vehicles and non-motor vehicles running together in urban road traffic [3]; at the same time, most urban roads lack the necessary isolation facilities which have caused road traffic confusion and even frequent traffic accidents. This issue has brought great security risks to residents.

3.2. Separation of workplace and residence is obvious
Many urban employees in China commute to and from the city for long distances, causing tidal traffic peaks, which lead to a major burden on the operation of the transportation system. It can also affect the functional transformation of the central city and the expansion of urban space, and increase the cost of transportation operations. In the process of urban construction, China often starts from the expansion of single functions, such as industrial areas, residential areas and educational areas. The commercial and hospital facilities are rarely considered. Therefore, the park has a single function and the space is isolated. The separation of workplace and residence is serious [4].

3.3. The multi-modal system has not been perfected
China's comprehensive transportation system lacks planning, and the comprehensive transportation network has not yet formed a smooth public transportation system. Road traffic between the main urban area and surrounding areas still does not form a road system, resulting in fewer links between them. The bus lines generally have problems such as longer distances, longer departure intervals, fewer shifts, and too early end of the last bus. At the same time, the city's external traffic is inconvenient. Many high-speed railway stations and airports are far away from the populous areas such as the main city and university campuses, resulting in higher travel costs for citizens.
3.4. Lack of comprehensive transportation management system
For a long time, China's urban planning, road construction, bus operation, and traffic management
functions belong to different departments, and the contradiction between traffic management system
and transportation development needs has become increasingly prominent [5]. First of all, under the
government management system, the competent authorities only consider the scope of responsibility
of their department in the process of formulation, enforcement and implementation of comprehensive
traffic regulations. And there is a lack of a multi-angle and all-round management mechanism among
various departments. Secondly, many transportation functions are spread across many parallel sectors.
Therefore, the comprehensive urban transport planning lacks a sound management system in the
implementation process.

4. The comprehensive transportation mode under the green transportation concept

4.1. Design a slow traffic system
The urban slow-moving system is the main component of the urban green transportation system and
the basis of the urban comprehensive transportation system. The city's slow-moving system is usually
divided into walking lanes, bicycle lanes and comprehensive slow-moving lanes. The slow-moving
system should fully follow the "people-oriented" principle to meet the travel needs of different people.
The slow-moving system not only includes the lanes, but also needs to provide certain space for
pedestrians, such as setting up entertainment venues, to form a complete system. Therefore, in the
planning, the purpose of the slow traffic system is to build a continuous, comfortable and safe travel
environment, and to take advantage of the potentials of slow-moving traffic by improving the slow
traffic network, establishing a slow traffic system, incorporating people-oriented ideas, and building
facilities for disabled people and pedestrians.

4.2. Promote the integration of production and city
The integration of production and city based on promoting the industrial space and developing the
industrial economy is driven by the industry, and finally becomes a sustainable balance pattern among
people, industry and city. The key to the integration of the production and city is the balance of
workplace and residence, which means the number of people living in the new city should be basically
coordinated with the number of jobs available[4]. People are the core of industry and city, and the
primary factor in the integration of production and city is population concentration. On the one hand,
the convenient comprehensive transportation system can greatly strengthen the connection between
the remote areas and the urban centers, change the time and space disadvantages of the regions, and
attract the population; on the other hand, the perfect supporting facilities have greatly improved the
intensive utilization rate of urban land so that much cost of living is saved. With the development of
the new city, a comprehensive area integrating business, office and leisure will enhance people's
convenience and comfort, which will help to alleviate the separation of workplace and residence.

4.3. Build a multi-modal transport network
China can fully integrate and utilize existing resources, accelerate the planning and construction of
comprehensive transportation, and further deepen multi-modal transport so that China realize the
seamless transition of integrated transportation, and improve the comprehensive transportation system.
At the same time, we can construct intercity high-speed rail to further enhance the accessibility and
convenience between the central city and surrounding cities. By increasing the speed of trains, the
number of trains, and the number of stations along the line, accessibility and connectivity between
neighbour cities will be improved.

5. The conclusion
Along with the increase in the number of motor vehicles in China and the acceleration of urbanization,
the environmental and resource problems have been increasingly concerned by the government and
residents. Therefore, the practice of simply accelerating the construction of transportation infrastructure to meet the traffic demand in transportation planning needs to be changed. And, for comprehensive transportation planning, planners need to change their planning concepts. They can control traffic demand from the roots, and guide residents to choose public transportation or slow traffic by improving the service level and commute quality of public transportation and slow traffic. So, integrating the green transportation concept into comprehensive transportation planning can guide the sustainable development of urban transportation.

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