

Exploration on Urban Public Transport Planning and Development for Small and Medium-sized Cities

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Abstract: This paper analyzes the characteristics of small and medium-sized city traffic from four aspects: the space layout features, road traffic facilities, traffic, and residents travel characteristics, and analyzes current bus adverse factors from bus operation and public transport, finally find that the lack of customers and inadequate attraction were the major factors affecting the development of bus in small and medium-sized cities. Based on the above analysis, this paper studies how to improve the bus attractiveness in small and medium-sized city, and combining theory and practice, puts forward to take passenger flow cultivation as the core of planning objectives and positioning the transit planning and development of small and medium-sized cities; Then based on the appropriate line network layout model in the development of small and medium-sized cities, this paper introduces the “two core” layout and multi-level network layout planning strategy; Finally, according to the operation indicators, each bus line network is adjusted in order to improve the coverage, comfort, and convenience degree, and achieve the enhancement purpose to the bus attraction and cultivating customers, and finally realizes the bus rapid development in small and medium-sized cities.

Keywords: Public transport planning; Small and medium-sized cities; Traffic characteristics; Development model

1. Introduction

With rapid urbanization and the rapid development of small and medium-sized cities, in the process of the city grows, the amount of residents and the increasing car ownership, small and medium-sized city traffic problem gradually becomes an important factor restricting the development of small and medium-sized cities. Experience has shown that promoting public transport development and use is beneficial to improve the efficiency of road use, reducing vehicle development demand for road space part [1], can effectively alleviate the traffic problems in the development of small and medium-sized cities. But in the process of promoting public transportation development, small and medium-sized cities is faced with some problems. That how to develop public transportation, for small and medium-sized cities, urban public transportation inadequate infrastructure, poor road conditions, lack of in-depth understanding the idea of bus priority, all these problems affect the development of small and medium-sized city bus. And city bus is still in its initial stage, there is no suitable for small and medium-sized cities public transportation planning.

Existing public transport planning theory is based on the research of big cities development extension, and the difference between big cities and small city, after all, it is clear that demographic factors, land use, road conditions

and economic development level, and so on factors affecting the urban public transport development. So blindly to the existing public transport planning theory, from the developing mode of city bus and ignore the small and medium-sized city itself is obviously unreasonable conditions, development of small and medium-sized city bus to little effect.

Based on the above background, the development of small and medium-sized city public transport, developing small and medium-sized urban transit planning research, explore the small and medium-sized urban public transport planning and development model, building layout is reasonable, convenient and applicable multilevel theory-oriented, and combining the resources of the local small and medium-sized cities, the maximum to meet the demand of residents, etc., has important practical significance.

2. Small and Medium-sized City Traffic Development

2.1. Small and medium-sized city traffic characteristics

Small and medium-sized city traffic laws there are many different for larger cities, this article from the small and medium-sized city space layout, road traffic facilities,

traffic, residents travel characteristics for small and medium-sized city traffic characteristics summarized below.

(1) The small and medium-sized city space layout characteristics. Small and medium-sized city space layout is generally a single center type layout, land development and traffic many disharmonious factors. The urban spatial structure and urban economy, population and geographical conditions, tend to develop the author mode. So the bus lines extending layout has the certain difficulty. Land for industrial, residential and other mixed degree of larger cities. The characteristics of the direct impact on bus lines planning layout [2].

(2) Road traffic facilities. The overall scale of small and medium-sized city road network is low. Status of road network distribution imbalance, one with lower branch scale, road network accessibility. Uneven development of roads, road network is relatively concentrated in the old city, road and only some bus lanes, and preference to import, not into the net. As a result, bus run at road intersection are greatly influenced by the bus [3].

(3) The traffic. Human traffic serious motorized. On the one hand, small and medium-sized city road management, urban road parking at random, motor vehicles and the locomotive to encroach on mutual way; On the other hand, the masses of public traffic concept is yet to be improved, the daily traffic behavior are larger cities lag behind.

(4) Residents travel characteristics. Small and medium-sized cities due to the space is lesser, the residents travel concept difference. Non-motor vehicle travel percentage accounted for the main part, low proportion of transit mode [4]. As shown in figure 1. Bus 9%; Private car 2%; Bicycle 27%; Walk 62%.

2.2. The current situation of the development of small and medium-sized city bus

(1) Bus operation (ticket price, services). Know a city bus we have to understand a city bus service and ticket prices, the two problems directly affect the bus appeals to people. Bus service including operation time, departure interval, and the average spacing of bus, running speed, etc. [5].

(2) Public transport (vehicles, line network, terminal). From the perspective of the development of public transport vehicles, small and medium-sized city bus is too little, car ownership is too low. Ten thousand people from the perspective of theory-oriented, theory-oriented and unreasonable layout, inadequate wire mesh size, bus blind area. Wire mesh in single center radiation, low density general line network; Small and medium-sized city line network density distribution unevenly, the old line network density is too high and low density of the surrounding area. Part road repeat coefficient is too high, cause traffic pressure. From the perspective of terminal: at the end of the city's first station land use restrictions, part of the line without special station at the end of the

first, and temporary presence; Most intermediate stops with direct type is given priority to, little bus bay, the platform and the platform is too humble, without rest area of passengers and facilities of the wind and rain.

2.3. The crux of small and medium-sized cities

(1) The total amount is less, small dishes, and bus is less attractive. The development of public transport problems long departure intervals, site coverage rate lower, bus passenger station on foot and waiting for the bus for a long time, bus service level is low; Bus lines operating time is short, the residents at night can only choose to rent or other way, the travel cost is high. These problems seriously affect the residents' travel choice, make the bus less attractive.

(2) The theory-oriented and function level is not clear, reasonable layout pattern owed. Most current bus routes for linking lines, service functions and objects not clear, lead to problems such as high repetition coefficient, small coverage; Line network layout model is a single center (bus station or central) radiant, though accustomed to the status quo of urban traffic overall direction, but not clear on the strong, with the expansion of urban space needs adjustment.

(3) The urban and rural public transport need to reposition. The entry section of the current urban and rural bus to assume the function of part of the city bus, while on the one hand can make up for the inadequacy of city bus online, but the nature of the cause of urban and rural bus contract management with the city's bus into competition, and random fluctuation phenomenon such as guest, even parking guest, increased the difficulty of the urban traffic management and brought negative influence to the city bus.

3. Bus Planning Model

3.1. The principle of developing small and medium-sized city bus

Due to the small and medium-sized city bus development problem, small and medium-sized city bus line network generally small scale, low line network function disorder, vehicle ownership, scarce, township bus and city bus passenger flow vicious competition, small and medium-sized city bus to get a full development, must firmly grasp the following principles:

(1) The primary cultivation principle of passenger flow. By increasing the bus convenience, comfort, reduce the waiting time and ticket price discount to enhance bus attraction.

(2) The line network layout arrangement is reasonable. Clear line network function, the level is clear. On the development of small and medium-sized city industrial park, economic development zone.

(3) The city bus and the villages and towns public transport overall consideration. Comprehensive enhancement of urban cohesion on surrounding villages and towns, promote urban-rural integration construction.

(4) Public transport planning focus on combining with the characteristics of small and medium-sized cities landscape, tourism.

3.2. Line network planning strategy

In this paper, small and medium-sized cities in central and double or more center bus station (supplemented, bus station, railway station) at the center of the city net radiation pattern, form the multi-level theory-oriented and layout. Planning to build the "mainline + feeder line (travel) + interval" three levels of urban public transport line network and auxiliary line network of township bus into the city.

(1) "Two centers" radiation pattern. The city center, face the inner cities, the center outward radiation, ensure that can reach the city within the scope of position, can be convenient to the city center to the citizens.

(2) Urban transit. The main line is given priority to with the status quo of passenger corridor and combined with the city of the future development direction, guide urban development, determine the bus line, mainly undertakes the main passenger corridor, routes throughout the city, north and south, east-west; And along the large and medium-sized the hubs, large and medium-sized residential setting.

(3) The villages and towns theory-oriented. Township bus thrust deep into the city, mainly to undertake key contact between the town and city, city bus, reduce bus blind area in urban areas. Stimulate the township resident travel demand driving the development of cities.

3.3 Bus improvement measures

For small and medium-sized cities with "passenger" as the core goal, encryption urban transit, gradual adjustment line network layout mode, transformation of urban and rural passenger transport line, expanding the coverage of public transport, to ensure that the public traffic planning goals, achieve the targets put forward the following requirements:

(1) The main line. Given priority to with the status quo of passenger corridor and combined with the city of the future development direction, it can be appropriately extended lines at the end of the first station to the neighboring towns.

(2) Side. With different land for urban public service facilities set transit feeder for guidelines. It can circuitous set appropriately, non linear coefficient can be greater than 1.4 to meet the demands of the development of small and medium-sized cities.

(3) The small and medium-sized cities within the old station distance shortened. General bus station is set to 500 m, and according to the small and medium-sized

cities urban areas, the old station spacing can be reduced to 300 m, local area can be below 300 m. Advice about 400 m, new city development zone can be set up around 500 m.

(4) Set up the platform. Platform of small and medium-sized cities set up more in order to direct type is given priority to, and facilities are too humble. And the road condition is poor old road, easy to cause traffic jams. Suggestions according to road sections, traffic conditions into a bus bay bus stop. The platform set up also can be combined with local characteristics. For instance, the bus lines plan of Suzhou. As shown in Figure 1.



Figure 1. Bus lines plan of Suzhou

(5) Models to choose. Settings can be combined with small and medium-sized city road conditions, it is recommended that the feeder can use small cars. Can be run on the road conditions limited within the old city.

4. Conclusion

Through a lot of investigation and study, analyze the key point of the development of the small and medium-sized city bus enhanced bus attraction. So the early bus planning scheme should be small and medium-sized cities is how to improve the attraction of the bus, cultivating a stage of passenger flow. And the main points of the traditional public transport planning theory to improve attraction is to improve the convenience and comfort, it is applicable to big cities. But for small and medium-sized cities, increase the source point is should try to combine the characteristics of the city and residents travel mode, flexible bus routes and departure intervals, models and prices. This article focuses on the development problem of small and medium-sized city bus, bus planning principles and strategies and Suggestions to line network planning measures. Bus operation in the development of public transportation is a very important part of remains to be further research. In short, medium and small urban public transport planning is different from the general city public transportation planning, needs to be studied for its unique cities to carry out.

References

- [1] Hong-bing Chen, Yang tao. Small and medium-sized cities across the century road traffic planning and design problems [J]. Journal of urban research, 1998 (3) : 29-33.

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- [2] Han Baorui, Yang tao, guo-hua xia. Small and medium-sized city public traffic planning research in gaoyou city as an example [J]. *Forest engineering*, 2011 (27) : 80-83.
- [3] Qu He Zhou, Yang jing handsome. The city of chengdu theory-oriented and hierarchical planning thinking [J]. *Journal of transportation engineering and information technology*, 2006, 4 (1) : 64-72. Barstis, W. F. and A. B. Crawley. 2000. *The Use of Fly Ash in Highway Construction U.S. 84/98 Adams County*. Final Report No. 84-DP59-MS-05, Federal Highway Administration(May).
- [4] Zhong Guiyuan. *Small urban transit planning study* [D]. Xi 'an: chang 'an university, 2011.
- [5] The king Hui, xin-miao Yang, xue-wu Chen. *Urban public transportation systems planning method and management skills art* [M]. Beijing: science press, 2008.