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[기본연구] 중국 베이징 대중교통 분담률 증진에 대한 고찰

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Thoughts on promoting the public transport share in Beijing

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ABSTRACT

Beijing has been promoting the development of high-capacity public transportation for nearly 30 years. Over the years, the mileage of subways and buses has been increasing year by year. However, with the rapid development of urbanization and motorization, citizens' car ownership rate has increased, and the proportion of private car travel remains high. Seoul's reform in the field of urban public transportation has been successful, and it has achieved remarkable results in promoting the active use of public transportation by citizens. By comparing and analyzing a series of reform measures in Seoul with Beijing's public transportation development strategy, combined with Beijing's characteristics and practical needs, this paper proposes measures to promote the urban development strategy oriented by public transportation, promote the optimal integration of urban transportation and land use, and integrate the development of multiple transportation modes to improve the convenience of public transportation, so as to further promote the increase of public transportation share rate.

베이징은 거의 30년 동안 대용량 대중교통의 발전을 추진해왔다. 수년에 걸쳐 지하철과 버스의 운행 거리는 매년 증가해왔다. 그러나 도시화와 자동차 보급률의 급속한 발전으로 인해 시민들의 자가용 소유율이 증가했고, 자가용 통행 분담률은 여전히 높은 수준을 유지하고 있다. 서울은 도시 대중교통 분야에서 성공적인 개혁을 이루었으며, 시민들의 대중교통 이용 활성화에 있어 놀라운 성과를 달성했다. 본 논문은 서울의 일련의 개혁 조치들을 베이징의 대중교통 발전 전략과 비교 및 분석하고, 베이징의 특성과 실제 수요를 고려하여, 대중교통 중심의 도시 개발 전략을 추진하며 도시 교통과 토지 이용의 최적 통합을 촉진하고, 대중교통의 편의성을 높이기 위한 다양한 교통수단의 개발을 통합하는 방안들을 제안하며 이를 통해 대중교통 분담률 증가를 더욱 촉진하고자 한다.

I Introduction

As China's urbanization process continues to accelerate, the size and population of large cities continue to expand, the total number of trips taken by urban residents continues to increase, travel distances continue to extend, and the proportion of motorized travel increases rapidly, making traffic congestion in urban central areas increasingly serious. The pressure on environmental pollution and energy consumption continues to intensify. Against this background, in 1995, the "Beijing Declaration: China's Urban Transport Development Strategy" clearly proposed for the first time the development of a large-capacity public transport strategy action plan, which aimed to provide urban residents with the necessary resources under the constraints of resource and environmental conditions. More efficient, economical and fair basic travel service guarantee. In 2012, the State Council issued the "Guiding Opinions of the State Council on Prioritizing the Development of Public Transport in Cities", which requires the construction of an urban motorized travel system with public transport as the mainstay, and clearly states that public transportation in large cities should account for about 60% of motorized travel. As the capital of China and a megacity with a population of more than 20 million, Beijing should take the lead in realizing urban low-carbon, healthy and sustainable development. In recent years, Beijing has done a lot of work in implementing public transportation priority. As of the end of 2022, Beijing operates 27 subway lines with an operating mileage of 807 kilometers, 1,291 bus lines with an operating mileage of 30,174 kilometers, and the annual public transportation passenger volume is approximately 40 billion people. However, in the composition of travel modes in the central urban area of Beijing in 2022, rail transit accounts for 14.2%, ground buses account for 10.2%, cars account for 23.9%, bicycles account for 17.3%, walking accounts for 31.7%, and others account for 2.7%.

Overall, Beijing's public transportation sharing rate is lower than that of outstanding foreign cities. Beijing's public transportation sharing rate in 2022 is 24.4%, which is far behind foreign cities such as Seoul (63%), Stockholm (55%), and Tokyo (51%). The low share of public transportation is still the main reason for urban traffic congestion and the inability to effectively cope with urban population pressure. Urban development urgently needs to shift to a more intensive and sustainable model, especially the adoption of highly connected public transportation networks, thereby promoting the transition from private travel to public transportation.

II Literature review

In recent years, many scholars have conducted research on public transportation sharing rates. Ling Xiaojing Ling proposed that more attention should be paid to the public transportation travel sharing rate indicators for specific periods, specific regions, and specific purposes. Cao Hui believes that we must work hard on ideological concepts, system construction, design concepts, and utilize modern science and technology to create a new public transportation development model. Jin Jiyun compared and analyzed the traffic system, traffic infrastructures, intelligent transportation in both Beijing and Seoul, in order to come up to solutions on the traffic problems for both cities.

However, most of the current research objects are research on promoting the development of public transportation in a broad sense. There are few studies based on comparing two cities, analyzing effective experiences, and then proposing improvement measures.

III Methodology

3.1. Historical research methods

This article will sort out and summarize what reform measures were implemented in Seoul's 2004 public transportation reform, and what changes and progress these measures have compared with the past.

3.2. Comparative research methods

This article compares the various measures taken by Seoul's public transportation reform in 2004 with the measures taken by Beijing to develop public transportation in recent years, and provides an in-depth analysis of what measures Beijing can still take to promote public transportation sharing in the future.

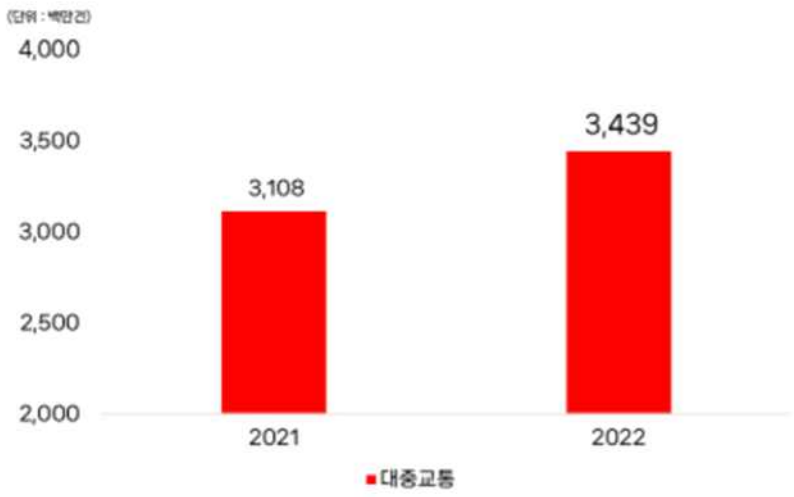
Also, this article will combine the current development status of Beijing's transportation, analyze the current shortcomings in Beijing's promotion of bus priority, draw on the successful experience of Seoul's public transportation reform, and put forward specific and feasible suggestions to promote the improvement of Beijing's public transportation sharing rate.

Ⅳ Analysis

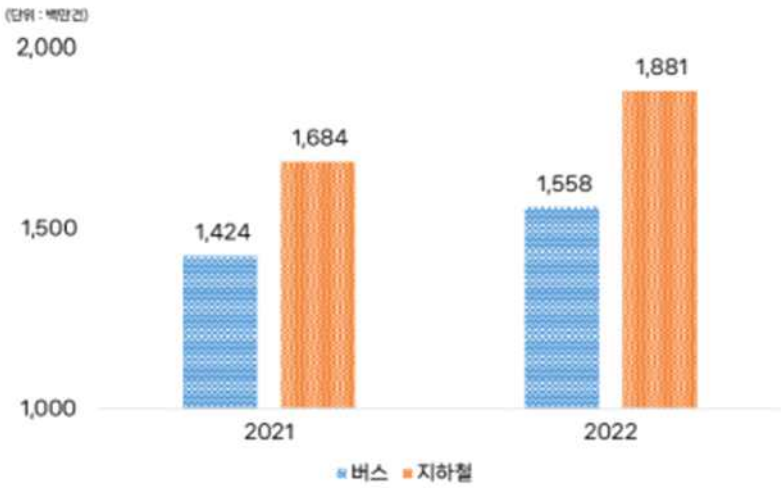
4.1. Analysis of basic traffic conditions in Beijing and Seoul

As the capital of China, Beijing is a megacity with a population of 21 million, an administrative area of 16,410km2, and a central urban area of 1,378km2. The number of motor vehicles has exceeded 7 million, and the urban road mileage is 6,209 km. Beijing operates 27 subway lines with an operating mileage of 807 kilometers, 1,291 bus lines with an operating mileage of 30,174 kilometers, and the annual public transportation passenger volume is approximately 4 billion.

As the capital of South Korea, Seoul has a population of 25 million in the capital area, a population of 9.65 million in Seoul City, and an urban area of 605 km2. The number of motor vehicles exceeds 3 million, and the urban road mileage is 8,214 kilometers. Seoul operates 9 subway lines with an operating mileage of 336.1 kilometers, 629 bus lines, and 6,064 bus stations. The annual public transportation passenger volume is approximately 3.4 billion.



[Fig.1]The annual public transport volume of Seoul

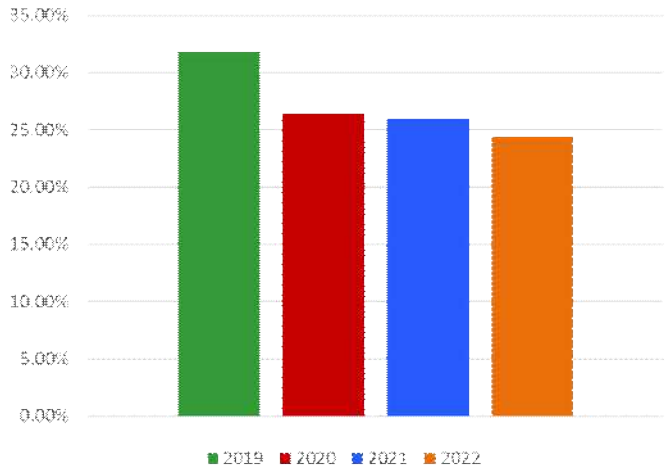


[Fig.2]Bus and subway annual volume of Seoul

Data from: SMG (https://seoul.go.kr/)

Although Beijing's central urban area and population are twice that of Seoul, the annual public transportation passenger volume is not much different. Therefore, it is not difficult to draw the conclusion that Seoul's public transportation utilization rate is much higher than that of Beijing.

After the reforms in public transportation system in 2004, modal share of public transport in Seoul reached 65.1% as of 2011 (with bus and subway accounting for 28% and 37.1%, respectively); 65.9% of public transport in 2018; and 63% in 2019. While the share of public transportation in Beijing showing a downward trend in recent years : 31.8% in 2019; 26.4% in 2020; 26% in 2021; and 24.4% in 2022.



[Fig.3]The trend of Beijing public transportation sharing rate(2019-2022)

Data from:BMCT (https://jtw.beijing.gov.cn/)

4.2. Analysis of the public transportation reform in Seoul(2004)

In order to reduce the usage rate of motor vehicles, reduce traffic congestion, and promote the development of public transportation, Seoul Metropolitan Government (SMG) made some significant reforms in its transport policies in 2004, which shows a significant results.

4.2.1. Measures of the public transportation reform in Seoul

1. A quasi-public bus operation system.The SMG laid the foundation for efficient and reasonable operation of public transportation by jointly managing the operating revenues and transferring the rights to route decisions to citizens with the introduction of a quasi-public bus operation system. Also, the SMG prepared institutional arrangements to improve the environment in which the bus companies operate in order to boost the overall quality of the bus service in Seoul.

2. Reorganized bus routes and numbering system. The SMG replaced the previous unreasonable bus routes with a Hub-and-Spoke based dual system of trunk and feeder lines. And use four different colors, the bule bus, red bus, green bus and yellow bus, so that citizens can easily distinguish them.

3. Smart card(T-money)&transfer system. The SMG integrated all the public transport charging systems into one, and charges based on the total travel distance of passengers instead of the number of trips, which has reduced citizens' burden of transportation costs considerably. Also, citizens can use an integrated transit fare card systems which is called T-money, it can be used for the bus, subway, taxi, even for shopping.

4. Transfer center. More and more transfer centers were constructed or optimized at key locations throughout the city, in order to facilitate citizens' transfer between different modes of transportation.

5. Median bus lane system with median bus stops. In order to give buses the propriety on the roads, the SMG introduced the exclusive median bus lane system, as well as the median bus stops, which have reinforced passengers' convenience and safety.

6. Improvements in bus vehicles. The SMG replaced its buses with those powered by CNG (compressed natural gas) or electricity. It has also increased the number of low-floor buses for the transportation-vulnerable.

7. TOPIS, the integrated control center system. It collects information from and provides information to the city's Road Traffic Management System, Bus Operation Management System, Unmanned Enforcement Systems, Traffic Broadcasting System and Seoul Metropolitan Police Agency and exerts comprehensive control and management of traffic situations in Seoul.

[Table 1] Measures to promote public transport in Seoul & Beijing

Seoul	Beijing	Notes
A quasi-public bus operation system	Public bus operation system	Service evaluation and Punctuality rate need improvement
Reorganized bus routes and numbering system	Mainline, regular line, micro loop line + customized bus (3+1)	Adequate trunk lines, microcirculation needs further improvement
Smart card (T-money) & Transfer system	Beijing Public transportation card; 2015, NFC; 2017, QR code;	—
Exclusive median bus lane system, Median bus stops (the delay time of buses is usually within 2 minutes)	Bus lanes cover 65% of the city's bus routes	Lack of continuous network of bus lanes, fewer median bus lanes, the advantage of bus lanes over private car travel is not obvious enough
4 main transfer center-Seoul station, Cheongnyangni station, Yeouido, Guro-digital station	7 main transfer hub-Beijing west station, Beijing south station……	The transfer distance and transfer time are generally longer, convenience of transfer needs to be improved
TOPIS-integrated control center system	Tocc-Beijing Municipal Transportation Operations Coordination Center	Functions of smart transportation systems need to be increased; electronic bus stop signs need to be further utilized

V Conclusion

On the basis of comparative research and taking into account the actual situation in Beijing, the following development strategies and measures are recommended to promote public transportation sharing.

Firstly, in terms of transportation development strategies, it is necessary to persist in promoting the strategy of "Giving priority to Active Mobility, Public Transport and Green Travel". Under this general strategy, to provide convenient and reliable public transport; to build friendly city to walking and bikes; and to implement differentiated travel demand management (TDM).

Secondly, at the urban planning level, adhere totransit-oriented development. We should promote rail transit lead in urban growth; Increase the accessibility to rail transit stations via walk, and increase the coverage rate of population and jobs within 500 meters around rail transit stations; And build moremicro rail centers.

Thirdly, committed to improving the level and competitiveness of public transport services. We need to constructed more rail transit fast line and connecting line; Promoting the integration of rail transit and station-surrounding bus; As well as the integration of rail transit and non-motorized traffic; And continue to develop customized buses.

Last but not the least, it is very necessary to integrate multiple modes of transportation to further facilitate public transport. We should continue to improve bus lanes and increase bus advantages; Better leverage the role of sharing economy (bicycles, shuttle buses) to solve the last mile commuting problem; Coordinate traffic lights to improve the efficiency of bus; Promote P+R parking lots to encourage the use of subway.

In summary, during the "14th Five-Year Plan" period, Beijing needs to further learn from the effective experience of other megacities, continue to promote public transportation priority, and promote the transformation of private car travel to public transportation, so as to achieve the comprehensive management effect of alleviating traffic congestion and reducing environmental pollution.

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