Citation: GONG Dijia. Strategies of Developing Transit Metropolis for Medium Cities [J], Urban Transport of China, 2018 (01): 8–16.

Strategies of Developing Transit Metropolis for Medium Cities

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Abstract: As medium cities bear sharp differences with mega cities in spatial structure, socio-economic development level and transportation characteristics, it is necessary to analyze the paths and strategies of developing transit metropolis for medium cities from the perspectives of transit and metropolis. In terms of the former, this paper proposes an alternative statistical method for the mode share of public transit in these cities. In planning, measures should be taken to allow the regular buses to make timely adjustment according to the high passenger flow trend of BRT to meet residents' travel needs, to improve the travelling environment of bike sharing system, and optimize the layout of rental stations. As for the latter, the paper emphasizes the preparation of regulatory detailed planning for the routes along BRT and the formation of spatial form which is helpful to public transit competitiveness in commercial centers, residential areas and historical blocks. Finally, the paper elaborates the requirements for improving intelligent transit services using Internet technologies. **DOI:** 10.13813/j.cn11-5141/u.2018.0103-en

Keywords: transportation planning; transit metropolis; medium cities; public transit system; spatial structure; intelligent transit

0 Introduction

Since the beginning of 21st century, cities in China have been experiencing high-speed motorization in transportation. The growth of infrastructure supply has not been able to keep up with the growth of private passenger cars. Thus, traffic congestion problems have been spread from mega cities with a total population in excess of ten million to medium cities with about one million population in urban area (mainly prefecture-level cities), together with the problems of environment pollution as well as energy over-consumption. The high density of urban population in Chinese cities determines that public transit must be the priority of urban development. Six ministries of the People's Republic of China including the Ministry of Housing and Urban-Rural Development, together with the State Council, twice issued the documents to emphasize that prioritizing public transit development is the strategic choice of constructing a resource-saving and environment-friendly society [1–2], in 2005 and 2012 respectively.

In 2012, the Ministry of Transportation of the People's Republic of China started the demonstration project of transit metropolis to deploy and operationalize public transit oriented city development in 37 pilot cities, among which only a few cities like Baoding and Zhuzhou are medium sized. Due to the differences in city size, socio-economic development level, spatial structure, traffic characteristics, etc., the experience in mega cities, though providing some lessons, cannot be directly applied to medium cities.

The current car ownership per capita in medium cities is still lower than that in mega cities, while the pace of traffic deterioration is much faster. Thus, transportation structure needs to be modified to respond to the gradually increasing traffic demand. Medium cities, whose urban spatial forms have not been finalized, are still in the time window of low cost in terms of transportation structure transformation and management. They should seek the paths and strategies of developing transit metropolis in accordance with their own spatial structure and traffic characteristics.

1 Connotation of transit metropolis

1.1 Research on transit metropolis in China and abroad

Reference [3] classified 12 transit metropolises into 4 categories—adaptive cities, adaptive transit, strong-core cities and hybrid cities (adaptive cities and adaptive transit).

Received: 2016-10-20
Supported by: General Project of "Paths and Strategies of Developing Transit Metropolis for Medium Cities" of Allied Social Science Association of Jinhua City in 2016 (Y45)
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The share ratio of public transit in motorization trip (hereinafter referred to as "public transit share ratio") varies greatly among the four categories, but there exists one common feature: the harmony, mutual support and promotion between public transit and urban form in the development process.

Reference [4] discussed the complicated process of collaborative development between public transit and land use during the rapid urbanization in the cities of developing countries like Ahmedabad in India, Bogota in Columbia, Ho Chi Minh City in Vietnam. It proposed that the integration of urban public transit system and land use is the most effective means to reverse the sprawl trend caused by motorization, and that developing countries should, at the proper timing, selectively and purposely plan the land use for the surrounding areas of public transit stations.

Since the start of the demonstration project of transit metropolis, the amount of research in China on transit metropolis has been growing, mainly on the following 4 areas: 1) definitions of transit metropolis and analysis of its connotation and extension [5–8]; 2) research on key issues, strategies and methods of transit metropolis planning and construction, from the macro- and micro-perspectives and in terms of land use and transportation planning and management [9–11]; 3) discussions on the evaluation index system of transit metropolis [5,12–13]; 4) case studies on problems and countermeasures during the construction of transit metropolis in specific cities [14–18]. It is not difficult to find that the current research on the transit metropolis topic mainly focuses on mega cities, and the research on policies targeted for medium cities is rare.

1.2 Two strategies to improve public transit share ratio

The critical index to evaluate transit metropolis construction in China is the public transit share ratio. A series of strategies are proposed by various cities in response to the index, which can be divided into passive strategies and active strategies. The passive strategies mean that the government invests large amount of money to purchase new buses and open new routes to increase public transit share ratio, or even invests heavily in financial subsidies to enable lower fares. Such strategies belong to the category of considering public transit problem as it stands. For instance, public transit fare in Beijing was once reduced to CNY 0.4 per trip. However, subsequent research shows that the increase of public transit share ratio due to this strategy is mainly derived from the conversion of bike traffic, and that the number of people who shifted from private cars to public transit is very limited. With the increase of constraints on transportation and environmental resource, more and more cities have realized the limited marginal effects and inefficiency resulting from investment in public transit system itself [19].

The active strategies, however, focus on the core problem of transit metropolis——shaping the urban spatial form in the way that favors the advantages of public transit. Such cities adjust urban spatial structure, improve the land use intensity and mixing degree along the public transit corridor, and actively optimize the relationship between land use and public transit to match heavy passenger flow with large capacity, which fundamentally attracts urban residents to take the initiative to choose public transit in their travel.

2 Extension of "public transit" in medium cities and key point in public transit planning

2.1 Recommendatory statistical methods to estimate the share ratio of public transit in all modes except walking based on the trip feature of medium cities

Since the average trip distance in mega cities is long, rail transit should be the dominant transportation mode to support significant passenger corridor and guide urban development, with regular bus service seamlessly connected to extend the coverage of rail transit. By contrast, it is difficult to support rail transit for medium cities considering the population, land size and budget available. Moreover, the trip distances of over 50% of the residents are less than 5 km, which is the optimum travel distance for bikes. The proportion of bike mode in a trip chain is higher than that of connection bus. As the quasi-public transit mode, the public bike system vigorously growing in recent years and the Internet bike-sharing system rising from 2016 are effectively taking on this part of trip demand. In this regard, the mere use of public transit share ratio in evaluating medium cities does not reflect the share of public bikes. This article suggests that the share ratio of public transit in all modes except walking should be adopted, and the calculation method is as follows. The share ratio of public transit in all modes except walking = (trip volumes of bus rapid transit (BRT) + regular bus trip volumes + public bike trip volumes)/trip volumes of all modes except walking × 100%. Here public bikes refer to both public bikes with piles and Internet-sharing bikes.

2.2 Key points in public transit planning in medium cities

A multimodal public transit system with BRT as the backbone, regular buses and public bikes as the main connection part, and taxis as the supplementation should be formed in medium cities.

2.2.1 Operation of BRT and adjustment of regular bus routes

BRT corridors should be opened or reserved on current high-volume passenger corridors and future developing axes determined by a master plan in medium cities. Compared with those in mega cities, the regular bus routes in medium cities have the characteristics of small quantity, short length, low departure frequency, and limited operating time. However, BRT, with high capacity, special right-of-way and high departure frequency, attracts passengers along the corridor and is competitive over other modes like private cars. Hence, the route lines and station locations of regular buses operating on passenger corridors with BRT should be adjusted. One optimization method is to truncate the original line to make it a connection line to BRT (see Fig. 1). Another is to move the original line onto the road parallel to the BRT corridor (see Fig. 2). The third is to cancel the lines having over 70% repetition rate with a BRT line. In terms of the inconvenience for the original passenger flow caused by line adjustments, the policy of free transfer on the same platform between BRT and regular buses may be applied. One of the stations of the regular bus line that has been truncated may be incorporated into a BRT station, and passengers transferring on the same platform will not pay any additional cost. Meanwhile, the occupation of road resource is also reduced. The service quality of the adjusted regular bus lines will be greatly improved through a higher departure frequency caused by the reduction of operating mileage with the same number of buses and crew members.

2.2.2 Flexible control of the non-linear coefficient of bus

Article 3.1.4 in the "Code for transport planning on urban road" (GB50220-95) states that the non-linear coefficient of bus routes should not exceed 1.4 [20]. In fact, many bus routes in medium cities detour around residential blocks and bus stations are set near the community entrance when the bus passes through residential areas. The non-linear coefficient in bus routes designed as such cannot meet the demand of national standard.

It is without doubt that as the backbone line, BRT pursues directness and operation efficiency. However, it is not realistic for all bus routes to conform to the non-linear coefficient index in the code. Residents' short-distance travel in medium cities can be undertaken by bikes and the total amount of long-distance travel is limited, so whether to detour should be determined by the demand from the residents along the bus routes. The excessive pursuit of efficiency and directness deviates from the fundamental purpose of public transit serving passenger flow. For the bus routes whose demand of passenger flow in the detour section surpasses 20% of the entire journey, the restriction on non-linear coefficient should be relaxed.

2.2.3 Public bikes as the supplementation and connection modes of public transit

By the end of 2016, over 400 cities (including cities and counties) in China had developed public bike systems, and the number of cities is still rapidly increasing [21]. Public bikes in medium cities not only support the medium- and short-distance travel but also connect BRT and regular bus service. The Internet-sharing bikes, due to their flexibility, have been expanding in a large scale in mega cities since 2016, and some enterprises have extended their bike sharing service to medium cities since 2017. However, complete public bike facilities do not necessarily mean that bikes have played a successful role in alleviating traffic congestion and promoting low-carbon trips. Quality of trip environment, as well as a comprehensive design of layout of rental stations or parking lots for public bikes, needs more attention.

Car-oriented planning continues to dominate in the transportation planning of some medium cities, with common practice of narrowing bike lanes or tearing down separation belt to widen the lanes for motor vehicles or occupying bike lanes for parking cars. The increasing deterioration of trip environment, doubtlessly, becomes the chief culprit of the decline of bike trips' share ratio. Research shows that safety is the first index that affects the overall quality of bike trips, and the separation form between motorized and non-motorized vehicles is the first index that affects the feeling of safety. Hence, measures to separate motorized and non-motorized vehicles should be restored on major and minor arterials, with green belts if permitted; otherwise, hard separation fence should be set. Pedestrian- and bike-oriented development is highly recommended on minor arterials and collectors, with narrowing bike lanes or paving colored bike lanes at intersections to improve the quality of bikes' trip environment (see Fig. 3a), to achieve road network separation between motorized and non-motorized vehicles (see Fig. 3b). Only if bike trips' environment gets an overall improvement and cyclists do not have to worry about safety issues and get the freedom and dignity during the trip, will the bike trips' share ratio be improved fundamentally.

One disadvantage of BRT and regular buses is they cannot provide door-to-door service. Therefore, the task of the last 1 km connection falls on public bikes that can seamlessly connect the trip by BRT and regular buses to the destination. The essence of the connection lies in the layout of public bike rental stations. In medium cities, BRT corridors should collect the highest demand of passenger flow, and therefore, seamless connection between BRT and public bikes should be given priority to. At least one public bike rental station must be set within 50 m from the entrance of BRT stations, with no less than 30 piles in principle (see Fig. 4a). Public bike rental stations are recommended to be set within 50 m from regular bus stations if conditions permit (see Fig. 4b), with the number of piles determined by the passenger volume of the buses. With the introduction of Internet-sharing bikes into medium cities, specific parking lots should be appropriately reserved during the construction of BRT and regular bus stations.

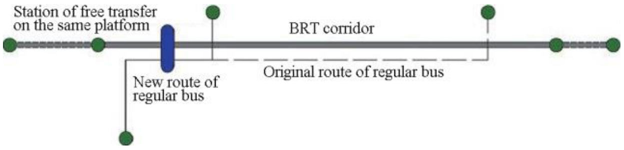

Fig. 1 Regular bus line is adjusted to BRT connection line

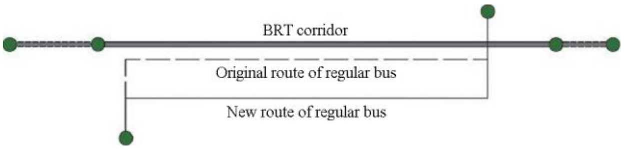

Fig. 2 Regular bus line is adjusted to be in parallel with BRT corridor

a Continuously paved colored bike lanes at intersections

b Bike-only lane in combination with greenway

Fig. 3 Measures for improving bicycle lanes

a BRT station

b Regular bus station

Fig. 4 Seamless connection of bike sharing system with public transit stations

3 Interpretation of "metropolis" and planning strategies

The key of transit metropolis is the "metropolis" which is to form a spatial structure conducive to make the most of the advantage of public transit through urban land use planning and design.

3.1 The macro perspective: compilation of detailed and specific regulatory plans along a BRT corridor

The BRT, as the major transportation mode in medium cities, can both alleviate traffic congestion and guide urban development direction. Guangzhou adhered to the idea of prioritizing public transit development to alleviate traffic congestion, even under controversy, and initiated the BRT service along Zhongshan Avenue in February, 2010. The two BRT-only lanes in the road center served 26.9 thousand passengers per hour per direction as its highest record. The velocities of regular buses and private cars alongside have risen by 84% and 28%, respectively [22]. The BRT in Guangzhou was awarded with the Sustainable Transportation Development Award in 2011, the Lighthouse Award for Climate Change from the United Nations in 2012, and the BRT Gold Medal Standard in 2013. According to the survey from Institute of Transportation and Development Policy (ITDP), the average price of residential and business real estate along the BRT corridor in Tianhe District has risen by 30% during the two years after the opening of BRT service, and the surrounding land use has become more diversified and modernized with service-oriented business facilities and other high-rising buildings which replaced outdated factories, logistics and agricultural land-use types [4]. The BRT-oriented urban redevelopment as well as the upgrading and reconstruction of public spaces, makes it the model of BRT Oriented Development (BRTOD) in China. Currently, traffic congestion has not fully broken out in medium cities in China. If we can take precautions by constructing or planning BRT for high-volume passenger corridors and reviewing the development and regeneration of land and public spaces, the controversy will be minimized and the land use efficiency will be improved.

Curitiba, with the urban population of 1 590 thousand in 2000, is a well-known transit metropolis with BRT-oriented development. The government sets the rule that all large and medium urban development projects must locate along the BRT corridors, and now the urban spatial form based on the integration of BRT and land use has been well shaped through high-intensity and mixed development along the 5 BRT corridors (see Fig.5). 75% of the commute trips in working days take public transit, and the number of average public transit trips per person is 350 per year [24].

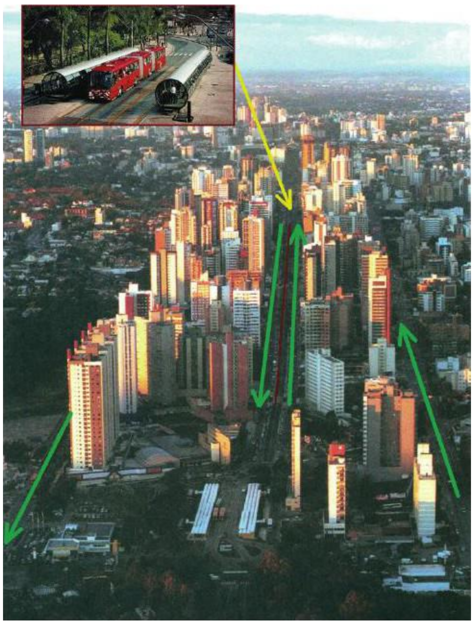

Fig. 5 Coordinated development of BRT and land use in Curitiba

Data source: Reference [23].

High-intensity development should be implemented along the BRT corridors, where the spatial form should be different from that of other areas. The areas within 1 km of the BRT corridors in medium cities should be designated as key urban areas under control, and a detailed specific regulatory plan should be compiled. The main functions of the large and medium development projects include business, large commerce, entertainment, exhibition and so on, highly mixed with hotel or residence, and the intensity should be significantly higher than that of the projects far away from the BRT corridors. The index of car parking lot construction is recommended to take the lower limit of local codes, if not below. The highest parking fee is to be implemented along BRT corridors in urban central district to encourage public transit dominated trip mode.

The Guidelines for Planning and Design of Urban Rail Transit Areas issued in 2015 proposes the target that "more than 50% of the urban population and commuting needs are distributed within the walking distance of 800–1 000 m from rail transit stations in new urban areas with more than 5 000 thousand population" [25]. Considering that medium cities are still in the incrementally constructing phase, traditional homogenous urban sprawl development mode must be abandoned in urban growth. Meanwhile, BRT corridors on urban development axes should be reserved in advance and high-intensity mixed development is strongly recommended to collect more than 40% of the residents and working population within the walking distance of 1 km from BRT stations. All of these will change the car dependence from the origin and form an axis-oriented urban growth mode with the guidance of public transit. For the developed urban areas along BRT corridors, the construction of BRT may promote regeneration and redevelopment by increasing large and medium public development projects to improve development diversity and intensity of the land along BRT corridors.

3.2 The medium and micro perspective: the design of urban space promoting public transit development

3.2.1 Commercial and business center

A common structure of medium cities is single centered, with the commercial center essentially overlapping with the business center geographically. In the commercial center, bus stations are mainly scattered in peripheral areas and buses stop along the road (even without harbor-shaped bus stops) (see Fig. 6), which not only reduces road capacity but also causes the chaos of public transit transfer and long walking distance.

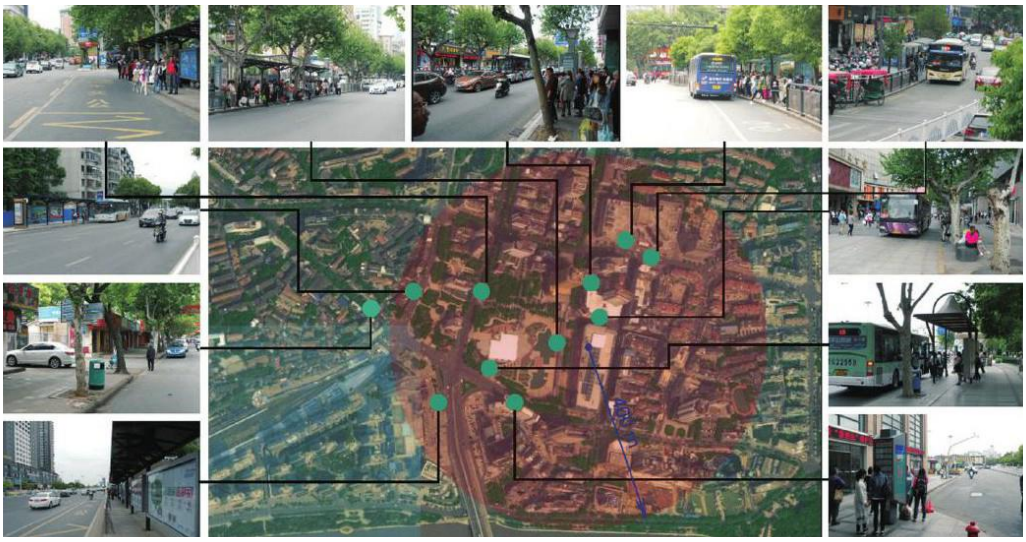

Fig. 6 Distribution of bus stations within 400 m distance from a city-level commercial center in a medium city

Top-head estate upon public transit stations provides the way of integration between transportation and urban space for the central district with limited land. In the redevelopment of future medium cities in terms of city-level commercial and business center, site selection of public transit transfer hubs should be validated in advance. It should be clearly defined in the planning conditions that the ground level of the block is used as public transit hub, with public buildings constructed above it. The pedestrian sidewalks which connect the hub with adjacent public buildings need to be planned at the same time. The accessibility of public transit will also be improved by limiting parking space to private cars.

The community-level commercial center should be planned simultaneously with bus stations, public bike rental stations and Internet-sharing bike parking lots, and the walking distance between the commercial center and transit facilities should be within 150 m.

3.2.2 Residential areas

Impacted by the neighborhood unit theory, a large number of closed/dated residential communities with the size of 20–25 hm^2 have been built in China (the length of a plot is about 400–500 m). This development mode leads to the serious lack of collector density, so that public transit buses have no choice but to run on peripheral arterials. Even if the bus station is set near the entrance to a residential community, the residents still have to walk 200–250 m on average to get from the residential building to the station. The accessibility and convenience of public transit are not comparable to private cars which can provide door-to-door transportation. Residential area developed with single function (residence land use only) forces public service facilities of the community to be located along major or minor arterials, thus jeopardizing the accessibility function of different road categories and causing traffic congestion and low-efficiency operation on arterials.

A foreign study shows that a road network with high density fits better to the development of urban public transit [26]. In San Francisco bay area, when the intersection density (proportional to road network density) increases by 25%, the probability of walking increases by 45% and the use of public transit increases by 26% [27]. Chinese studies have also drawn similar conclusions. The section of optimization of road network structure in the "Suggestions on Further Strengthening the Management of Urban Planning and Construction by the State Council of the Central Committee of the Communist Party of China" in 2016 proposed that the block system should be promoted in newly planned residence communities and no more construction of closed residential areas is allowed in most of the cases. Moreover, existing closed residential communities should be gradually opened to realize the publicity of internal roads and to solve the problems of road network layout [28].

In contrast, some old residential areas built in the 1980s have narrow roads and dense road network to accommodate non-motorized transportation, which matches well with the central government's concept of urban road layout. Currently, bus routes and one-way traffic are incorporated into the residential areas, which improves traffic micro-circulation and the public transit share ratio. For instance, a redistribution of right-of-way was carried out in Qingchun community and Yangsiling community in Jinhua City, Zhejiang Province. Several bus routes were routed through the community and bus stations were set near the entrance of the residential community or significant public service facilities of the community, with public bike rental stations located next to them (see Fig. 7). The walking distance to the bus stations reduced to less than 100 m, and a seamless connection between bikes and buses became possible. This article compares the above mentioned communities with a newly-built (after the year of 2010) closed residential area that has the same land size and the same distance to the city-level commercial and business center, and finds out that the former has a 6% higher public transit share ratio.

New residential areas are recommended to be open in groups, the size of which is no larger than 5 hm^2, preferably. Collector network density should be increased to allow bus routes inside the residential area. Bus stations and public bike rental stations or Internet-sharing bike parking lots are set near the intersection of collectors, and multi-functional public service facilities are close to the bus stations, which will improve the competitiveness of public transit (see Tab. 1 and Fig. 8). For the cities with more high-temperature days or longer rainy seasons, covered corridors may be built to provide a barrier-free walkway with sun or rain shelters between the residential building group and bus stations. Special traffic regulations may be enforced on the collectors when necessary. For instance, only public transit, walking and non-motorized transportation modes are allowed in morning and evening peak hours (except emergency vehicles).

Fig. 7 Access of buses and bike sharing system to an old residential area in Jinhua City

Tab. 1 Characteristics of large-scale enclosed residential areas and grouped open-residential areas

Evaluation item	Large-scale enclosed residential areas	Grouped open-residential areas
Land size/hm²	20–25	4–5
Walking distance to bus stations/m	200–250	<150
Public service facilities	Set along arterials	Set close to the intersection of collectors, bus stations or public bike rental stations

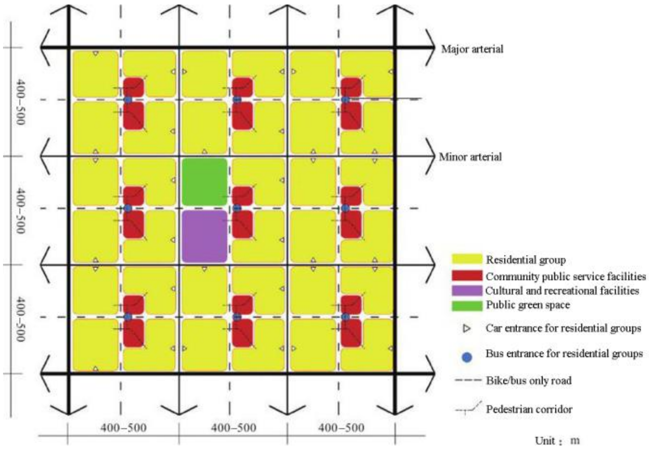

Fig. 8 Layout pattern of grouped open-residential areas with transit-oriented design

For the large-scale closed/gated residential area where feasible, on the premise of maintaining the residential area as closed, special bike lanes in the form of roadside cuts or tunnels of 3 m wide and 2.5 m high may be built, in addition to green space and public bike rental stations. Pedestrian entrances and bike rental stations may be set close to the central green space, in adjacent to houses to maximize accessibility (see Fig. 9). Also, when the terrain elevation allows, underground bus-only lanes can be considered in terms of a tunnel of 7 m wide and 4.5 m high, and a bus station under the geometric center of the residential area is set.

3.2.3 Historical blocks

The roads in historical blocks are mainly for pedestrians and bikes. Despite of the high density of buildings, narrow roads, and lack of car parking spaces, most streets in historical blocks have good humanistic environment which is not only the exclusive characteristics of the city, but also the vivid place of culture inheritance and education. Different from newly built districts, the problems of "fast-outside and slow-inside", "static-outside and dynamic-inside" should be well addressed in historical blocks. "Fast-outside and slow-inside" means that bus-only lanes and non-motorized vehicles with barrier separation from motorized vehicles should be set to the greatest extent on urban major and minor arterials outside historical blocks in order to achieve the goal of maximizing throughput capacity in terms of persons instead of cars. Bus stations, public bike rental stations and Internet-sharing bike parking lots, as the transfer node of "fast" and "slow" transportation modes, should be set close to the main entrances of historical blocks. Refined design inside the historical blocks (e.g., Woonerf) is required to shape the space comfortable for walking and cycling. The theory of "static-outside and dynamic-inside" is based on traffic free zones and traffic demand management. Parking spaces for the proprietors' private cars and unloading spaces for freight vehicles are set on alleys only. Other motorized vehicles need to be parked in the garages over 200 m away from the core area of the historical blocks, and car owners need to walk into the historical blocks. No car parking space is allowed to be set within 200 m of the edge of the core area to completely avoid the phenomenon that historical blocks are surrounded by car parking lots, although a certain amount of bike parking space is allowed next to the entrance of the blocks.

4 Internet technology that boosts the construction of transit metropolis: intelligent public transit

On the basis of Internet technologies, various intelligent public transit applications have been developed in China. A resident can input the origin and destination of a trip to inquire a scheme of public transit, or check the time of the first and the last buses, departure interval and arrival time. Real-time query of the number of in-pile bikes and empty piles is also accessible in the cities with public bike rental service.

The model for public transit competitiveness [29] shows that shortening the waiting time may effectively promote the competitiveness of public transit. The departure interval of urban lines in medium cities is usually 10–15 min, and the departure interval of suburban lines is usually 20–60 min or on fixed time. If residents do not know the timetable, the average waiting time is about half of the departure interval. However, residents may calculate the bus arrival time at the station using the information query on intelligent public transit applications, and the waiting time can be reduced to 1–2 min, which greatly improves the public transit competitiveness.

Fig. 9 Bike sharing exclusive lanes and rental stations by means of tunnel

Data source: www.heysome.com

In fact, intelligent public transit applications in medium cities also have much room for improvement, especially in terms of the integration between public transit and public bike systems. For instance, when a resident is searching for the bus route from origin to destination and there is no direct route, the application may additionally give the compound mode of "bus + public bikes" as the alternative scheme besides the bus transfer scheme. When someone transfers to a bus route with low departure frequency, the waiting time may last for more than 15 min (even if he knows the bus arrival time in advance). If he needs to ride for only 2 or 3 stops, he may save time and money by riding public bikes instead.

For residents who travel by the compound mode of "bus + public bikes", the application, when receiving the query for bus routes, may have a real-time display of the number of in-pile bikes or empty piles at the public bike rental stations within 150 m of the bus stations along the route. In that case, residents can choose where to get off the bus and rent public bikes, or where to return public bikes and conveniently transfer to a bus.

At the intercity transportation hub, mobile operators may recommend the city's intelligent public transit service application to passengers from other cities free of charge when receiving their cell phone signals, which will help to reduce the probability of having no choice but to travel by a car because of the difficulty in obtaining information.

5 Conclusion

Medium cities should form a public transit system with BRT as the backbone, regular bus and public bikes as the main connection part according to their own characteristics of spatial structure, population size, socio-economic development level, and trip characteristics. The trip volume of BRT, regular bus and public bikes should all be considered in the evaluation index for the share ratio of public transit in all modes except walking.

In terms of transportation planning, BRT should be constructed or planned along the main passenger corridors, with the adjustment of regular bus routes and station locations in the meantime. The design of regular bus routes should not excessively pursue directness and may allow detour to some extent according to the demand of passenger flow. The improvement in the quality of trip environment for public bikes and reasonable layout of rental stations and parking spaces are necessary in order to achieve the low-carbon transportation development in medium cities.

In terms of spatial planning, detailed and specific regulatory plans for areas along BRT corridors should be complied as early as possible to build a spatial form different from other areas in land use function, mixing degree and development intensity, so that public transit oriented urban development strategies can be practically implemented. The development plan supports the operation of city-level commercial and business center by public transit transfer hubs and supports the operation of community-level commercial centers by bus stations, public bike rental stations and Internet-sharing bike parking lots. The pattern of narrow roads and high-density road network with sufficient incorporation of public transit is to be adopted in residential areas to form the urban block development mode with the center of bus stations and public service facilities. Separation of "fast" and "slow", "static" and "dynamic" should be assured in historical blocks to build a spatial form conducive to make the most use of the advantage of walking and biking. The optimization of intelligent public transit application can also help to promote the competitiveness of public transit.

The Ministry of Transport has confirmed the 3rd set of 50 cities to construct transit metropolis in August 2017, most of which are medium cities. Combining their own characteristics, the constructing path of medium cities should be customized, with public transit as the catalytic agent to restore cities' spatial forms in the future urban regeneration and as the foundation of leading the city growth in an axis-oriented mode and supporting high-intensity land use in newly-built areas. Only when the medium cities are built into excellent transit metropolises will they have the solid foundation for healthy growth.

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