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Parking Issues and Management Strategies for Residential Areas: A Case Study of L Community in Chaoyang District of Beijing

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Abstract: Parking supply in an urban built-up area is unbalanced in time and space. The low utilization rate of parking facilities represents huge sharing potential while the illegal on-street parking is severe. This co-existing is common in many large-scale communities. Analyzing the current situation of parking supply and demand in Beijing and project examples, this paper analyzes the causes of on-street parking issues and common difficulties faced by parking management, including policy mechanism limitations, complicated approval procedures, fuzzy economic attributes, low participation of social capital and weak civic engagement. Based on the practice of parking management and planning in Beijing, the paper proposes parking management strategies in two aspects. To alleviate the imbalance between parking supply and demand, we should promote parking sharing and joint governance through renovation, community management, public participation, etc. Resident's self-governance and effective coordination of management departments, community stakeholders, market-oriented investment and operation platforms are also crucial to improving parking problems and management in a new era.

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Keywords: parking management; economic attributes; policies and regulations; community decision-making; public participation

0 Introduction

Urban public space and roadways are not only the important resources for residents' rest activities and transportation, but also key elements reflecting urban living quality. However, on-street parking that occupies public space and road resources has become a common issue in residential areas outside the central urban area of Beijing. It affects the city landscape and threatens the safety of walking and non-motorized transport. This type of residential community has three typical characteristics compared with old ones in the urban central area: 1) relatively new and mostly built after 2000; 2) a large portion of inefficiently used space and renewable land within the community; 3) many vacant parking lots in residential areas or public buildings. Roads and public spaces have usually been occupied by illegal parking due to weak public awareness of paid parking, lack of routine and strict regulatory measures, and inefficient parking management at the local level.

With the L Community (area of 10 km² and population of 0.18 million) in Chaoyang District of Beijing as an example, this paper discusses the causes of the current abundant on-street parking violation and measures for traffic control. Through analysis of the current situation of parking man-

agement, policy guidance and market operation in Beijing, and the practice of local parking management in residential communities, this study also discusses the positive impact of community decision-making and public participation in alleviating parking issues in residential areas. In addition, this paper proposes short-term and long-term development strategies and implementation approaches for planning community parking, reducing on-street parking, and increasing the proportion of sharing parking spaces. Finally, this paper promotes co-construction, co-governance and sharing of community parking, as well as the coordination and integration of parking and urban landscape to achieve a good quality of life in communities.

1 Current dilemma over parking management in residential areas

1.1 Unclear economic attributes of parking facilities

Different views always exist regarding economic attributes of parking facilities. It is difficult to determine whether parking facilities are public or private products due to the lack of specific and clear regulatory explanation. Parking

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facilities are built with reference to the number of residential households or the building scale, so they are expected to meet the required rigid demand of residential or public buildings. Parking facilities have the general characteristics of non-competitiveness and non-exclusiveness of public products [1]. However, the potential charges for sharing make it qualified as quasi-public products. Urban public parking also swings between private products and quasi-public products, because they have different construction subjects and operation methods. In some cities, certain on-street parking lots are part of road space as specified in the existing roadway design policy and guidance [2]. However, Beijing lacks the corresponding standard for on-street parking space. The definition of road width in the design code does not include the exclusive space for vehicle parking [3]. Consequently, on-street parking has strong attributes of public products.

The relatively unclear economic attribute of parking facilities results in the situation that road space is the first to be occupied by illegal parking at a low cost, especially in residential areas with limited travel parking lots and weak regulation enforcement.

1.2 Ineffective auxiliary function of public parking

1) Limited number of public parking lots

Beijing's urban master plan and district plan state that parking supply should be provided mainly through parking lots for buildings, with public parking as the secondary supply and on-street parking as supplement. Some administrative districts have set a target of at least 85% of affiliated parking for buildings, approximately 10% public parking, and less than 5% on-street parking. There is a mismatch in spatial distribution between the parking space supplied by buildings and the actual parking space demand due to different pace of construction and redevelopment in different regions. The forecasted demand of public parking in central Beijing based on land use planning has suggested a gap of over 200,000 parking spaces (i.e., the total public parking demand) in 2020 [4].

There are 6.365 million motor vehicles in Beijing, including 5.13 million private motor vehicles. Data from the 2020 Beijing Transport Development Annual Report have suggested that during weekdays, 77% of private cars travel on roads, accounting for 23% of all travel modes [5]. In the same period, there are a total of 1.70 million registered parking spaces in the city and a total number of 378,000 off-road parking lots. Given the large number of vehicles, it is difficult to meet the parking demand.

2) Low standards for affiliated parking in residential areas

There was a large deficiency in the construction of parking facilities for large residential communities in the suburban area. Residential areas within and out of the third Ring Road in Beijing were built with 0.3 and 0.5 parking space per household, respectively, before the introduction of the Standard for Affiliated Parking for Residential Areas in 2013.

A big gap was created between parking availability and the fast growth of residents' car ownership. The historical problem of time-consuming construction and limited profit of parking facilities becomes an important factor, which makes it difficult to quickly alleviate the contradiction between parking supply and demand.

3) Larger benefit from increased efficiency of shared-parking

According to the Beijing Parking Resources Census Report released in 2017, there was a surplus of more than 890,000 public parking lots despite a shortfall of approximately 490,000 night-time demanded parking lots in residential areas. The total supply of parking allocation and construction is sufficient, but the low efficiency of shared parking is a key problem; for example, the proportion of on-street parking at night is more than 13% (Fig. 1). As a result, addressing parking problems in large residential communities are heavily dependent on the promotion of shared parking, while the demand for new independent land-occupying public parking is not as urgent.

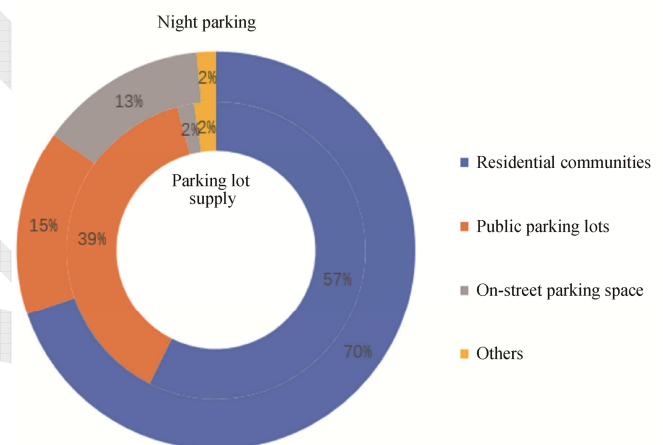


Fig. 1 Demand distribution of different parking lots and night parking

Source: Reference [6].

1.3 Disconnection between policy guidance and practice

The Ministry of Housing and Urban-Rural Development, the Ministry of Public Security, and the National Development and Reform Commission of China jointly issued the Guidance on the Planning, Construction and Management of Urban Parking Facilities (MOHURD (2010) No. 74) in 2010. The National Development and Reform Commission issued the Guidelines on the Issuance of Special Bonds for the Construction of Urban Parking Lots (NDRC (2015) No. 818) in April 2015. Seven departments, including the National Development and Reform Commission, promulgated the Guidance on Strengthening the Construction of Urban Parking Facilities (NDRC (2015) No. 1788) in August 2015. The Ministry of Housing and Urban-Rural Development and

the Ministry of Land and Resources issued the Circular on Further Improving the Planning, Construction, and Use Policy of Urban Parking Lots in 2016. These policies have promoted the construction of public parking spaces through social participation, relaxation of market access, simplification of examination and approval procedures, and invigoration of stock land resources. However, different ownership and types of parking facilities are associated with substantial difficulty in sharing and tapping the potential new parking construction in practice, as summarized in the following:

1) Complicated application procedures and business classifications for sharing parking lots in public buildings

The procedure of operating permit application and operation management for sharing public building parking facilities requires coordination among multiple regulatory authorities. In addition, specific operational issues, such as calculation of subsequent tax and operating income as well as availability of tax incentives also require coordination among multiple administrative departments. For example, the Beijing Municipal Regulations on Vehicle Parking clearly stated that “the transportation and administration agencies are in charge of the overall parking planning. The commissions of traffic management, urban management, and comprehensive law enforcement and the supervisory authorities of housing and urban-rural development, planning and natural resources, development and reform, finance, quality and technology shall be responsible for vehicle parking management in accordance with their respective responsibilities.” At this stage, the lack of procedural guidelines for shared parking in terms of permit application and operational supervision has affected the efficiency of promoting the sharing of facilities.

2) Long timeline for parking facilities surveying, approval procedure, and coordination

The classification and ownership determination of parking facilities are usually unclear. There are many regulatory restrictions from different departments when local community managers arrange parking resources in the area as a whole and apply for shared parking with external operation based on parking types. For example, according to the Guidance on the Planning, Construction and Management of Urban Parking Facilities (MOHURD (2010) No. 74), the construction of temporary parking facilities in existing communities with their own land or unused spaces in the surrounding area requires permission from the parking supervisory authorities; in addition, guidance from the afforestation authorities is needed for optimizing the landscaping pattern in residential areas to avoid use of urban afforestation land. The opening of underground parking for properties requires coordination with the civil air defense departments and street sub-district offices. After the preparation of the mechanical parking equipment is completed, an application for inspection needs to be submitted to the quality and technical supervision department. Therefore, the coordination cycle for the operation of parking facilities is relatively long.

3) Delayed industrialization of public parking

In 2010, the Guidance on the Planning, Construction and Management of Urban Parking Facilities (MOHURD (2010) No. 74) proposed to optimize public parking lots as urban municipal public infrastructure in terms of land supply, financial and policy support, and other measures. However, the Ministry of Land and Resources’ Catalogue of Allocated Land for Urban Infrastructure does not include public parking land yet. The Beijing Regulations on the Management of Vehicle Parking (implemented in May 2018) clearly states that “independently installed public parking facilities in central urban areas, such as various types of parking facilities, transportation hub parking, and bus and tramcar yards, may be allocated or approved based on land transfer agreement,” which is applied in many Chinese cities. In the short term, most public parking land is still sold through request for proposal, auction, or regular sale. However, the current investment policy and environment in terms of tax incentives, plot ratio incentives, pricing mechanisms, and the processing of property certificates for parking spaces are unclear. It is difficult to attract social capital to invest in the construction of public parking lots^[7]. In Beijing, for example, after the electronic parking reform in 2019, parking fees with government-guided price management are still implemented according to the 2011 standards. Parking fees for passenger cars during the daytime and night are CNY 0.5–2.5 per 15 minutes and CNY 1 per 2 hours, respectively; the fees for off-street open parking are CNY 0.5–2.0 per 15 minutes in daytime and CNY 1 per 2 hours at night. According to the average parking time of 12 hours for a parking space, it takes approximately 11.6 years for a parking lot with a construction cost of CNY 150,000 to CNY 250,000 to achieve break-even. The parking price charged in Beijing is relatively low among primary cities in China; the limited penalty on parking violation also makes it difficult for parking facilities with market-regulated prices to make a profit.

The typical problems discussed above reflect a dilemma over parking management in residential areas in cities such as Beijing. The Beijing Municipal Government organized several state-owned enterprises to jointly fund the establishment of Beijing Static Traffic Investment Operation Co., Ltd. in 2017 and focused on investment and financing, construction, and operation management. In addition, the reform of electronic charging of on-street parking in the central city and surrounding new towns was implemented in 2019, with enforced parking monitoring, verification, and violation notification; authorities of parking management have been given to local agencies in the city to lead planning and management of parking in residential areas.

2 Parking management in residential communities

An investigation was conducted in early 2019 on on-street parking, public parking, and residential parking around the L

Community in Chaoyang District, Beijing. As an important outlying community in Beijing, this area has substantial parking violations on roadways and in non-motorized traffic space, as well as public activity space on collectors, road ends and local roads. Such violations are inconsistent with the goal of developing an eco-friendly area and a harmoniously livable satellite city.

2.1 Assessment of current parking problems

1) Massive and chaotic on-street parking

More than 9,900 vehicles were involved in on-street parking in the survey area, with various parking forms such as horizontal, vertical, and diagonal rows (Fig. 2), which occupied much walking and cycling space.

2) Large proportion of road area occupied by illegal on-street parking

To quantify the severity of on-street parking violation, we introduced the proportion of road area occupied by vehicle parking as an assessment parameter. The daytime and nighttime distributions of on-street parking were quantified by estimating ratios of the number of parked vehicles and the area of parking spaces to the road area for each roadway segment. A large number of fixed parking spaces existed during daytime and nighttime, with the proportion of occupied road area exceeding 40% in many road sections (Fig. 3), which has a negative impact on normal vehicle traffic as well as pedestrians' safety.

3) Sufficient affiliated parking lots in residential communities and public buildings

The total number of registered vehicles in the area is ap-

proximately 39,600 and that of allocated residential parking spaces is approximately 34,200, reflecting a 1:1.16 ratio of parking spaces to car ownership in this residential area. This ratio compares favorably with the overall ratio in Beijing. There are currently more than 3,800 underground parking spaces left in the residential area; many of them are available at night in the surrounding commercial and office buildings and other public buildings. The issue of having both substantial on-street parking and excess internal parking spaces becomes more prominent in the newly constructed northern area of the community (Fig. 4).

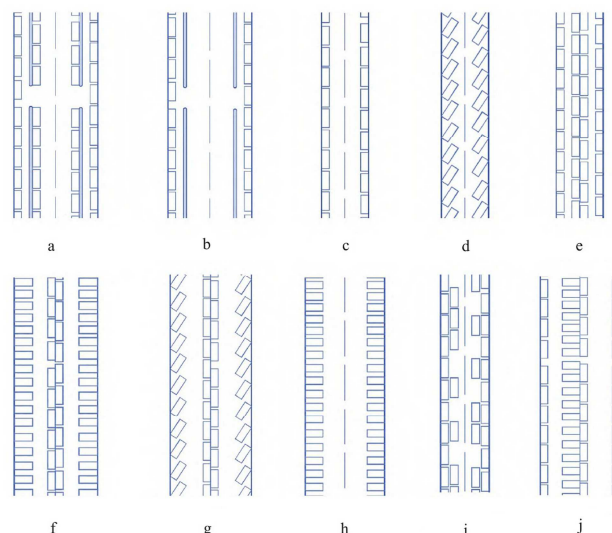


Fig. 2 Different forms of on-street parking near residential areas



Fig. 3 Proportion of road area occupied by on-street parking



Fig. 4 The number of on-street parking lots and the distribution of remaining parking lots in residential areas



Fig. 5 On-street parking before and after parking management

4) Limited supervision of on-street parking and low violation penalty

Parking fees in the area are charged consistently with the standard fees in Beijing's Class III areas, with the range of CNY 600 to CNY 1,000 per month; public parking fees in this area are also relatively low. However, at this stage, the regulation of on-street parking on urban collectors and local roads largely relies on warning notice from supervisors and managers from local management office. The frequency of enforcement by traffic management authorities is relatively low. In addition, low cost of parking violation has contributed to a high volume of on-street parking.

2.2 Parking planning and management strategy

1) Pursue community development goals and clarify parking strategies

Representatives of community residents should be organized to jointly contribute to the improvement and promotion of on-street parking; the priority of parking supply for community residents should be assigned to remaining under-

ground parking space, space sharing, and on-street parking in the order. The fee charged for "white dotted line parking," which is managed and identified by residents themselves, should be appropriately increased in conjunction with the on-street parking reform in Chaoyang District to match the price of on-street and underground parking within the residential area. In addition, the self-managed charging mechanism of "on-street parking over off-street parking and ground parking over underground parking" should be promoted.

2) Strengthen parking management measures and increase cost of parking violations.

Management measures on both sides of traffic roads and scenic roads should be enhanced through delineating no-parking lines and temporary parking lines and signs, as well as setting temporary railings in some sections to construct non-motorized traffic lanes (Fig. 5). After unused land resources in the residential area are tapped, multiple rows of on-street parking can be greatly reduced; for example, some roadway segments in the area have witnessed 55% less on-street parking (Fig. 6).

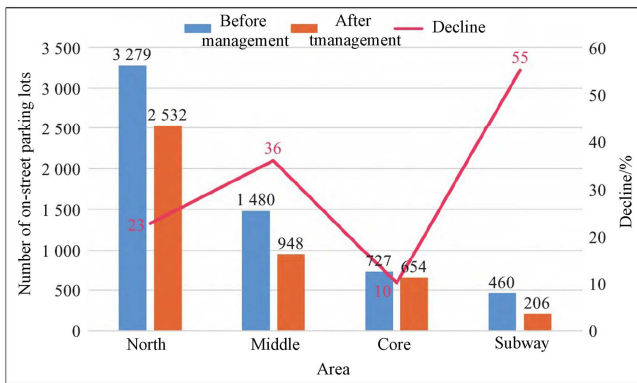


Fig. 6 The number of reduced on-street parking lots through parking management for each area

3) Utilize inefficiently-used space to build composite and high-quality shared community centers

A medium- to long-term strategy is to redevelop and renovate inefficiently-used land to build a community activity center that integrates community services and public parking. Intelligent and shared parking facilities can coordinate with construction of parking buildings to effectively renovate land resources. For example, Raadhuisplein in the Netherlands has transformed the original parking space into a community activity plaza by constructing standardized

parking building (Fig. 7). While meeting the parking demand, it provides a more dynamic space for public activities and greatly improves the community landscape quality.

4) Streamline approval procedures of parking facility construction and enhance participation of local management departments

It is critical to strengthen the participation of local management in parking enforcement, coordinate with various administrative departments, and improve the approval process and operation management of parking facilities. In light of the regulations and policies in Beijing, the project team has sorted out the construction approval process for parking facilities, such as general parking lots, residential self-owned land, temporary public parking lots, and mechanical three-dimensional parking garages (Fig. 8).

The approval process for the construction of parking garages, such as internal renovation projects, expansion projects, as well as the construction of public parking lots with the inefficiently-used parking land and unused land, has also been summarized (Fig. 9). The types of mechanical three-dimensional parking garages that can be built in this area have been clarified by the project team, in accordance to the special equipment registration and approval, notification of construction, and supervision and inspection processes issued by the quality assurance agency.

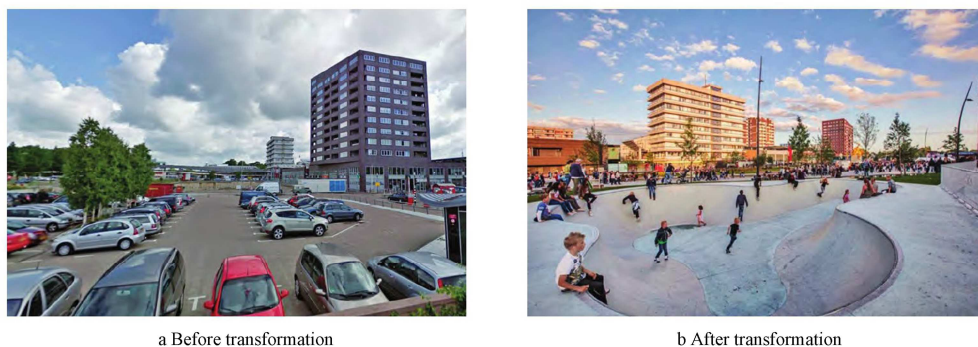


Fig. 7 Transforming parking lots into public activity space in Raadhuisplein, Netherland

Source: Fig. a from Google Map; Fig. b from Latz + Partner (<https://www.latzundpartner.de/de/projekte/urbane-transformation/centrumplein-emmen-nl/>)

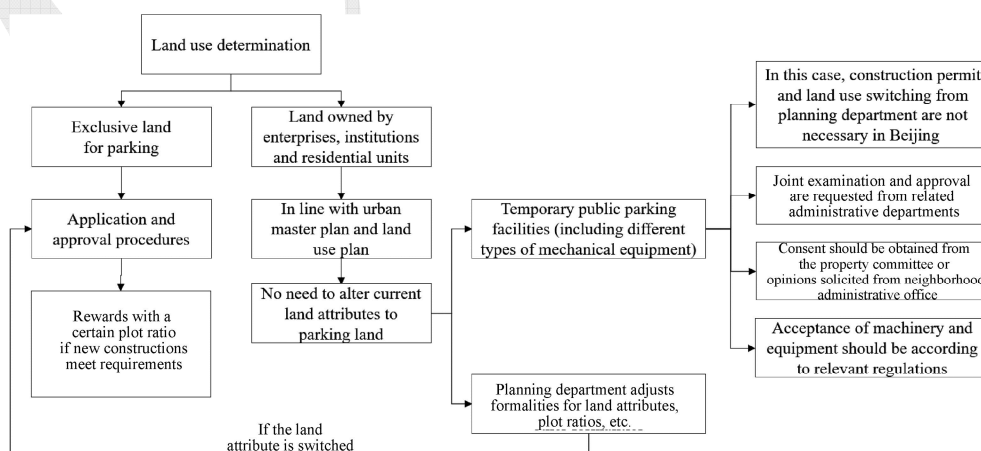


Fig. 8 Approval procedures of parking facility construction by different land types in Beijing

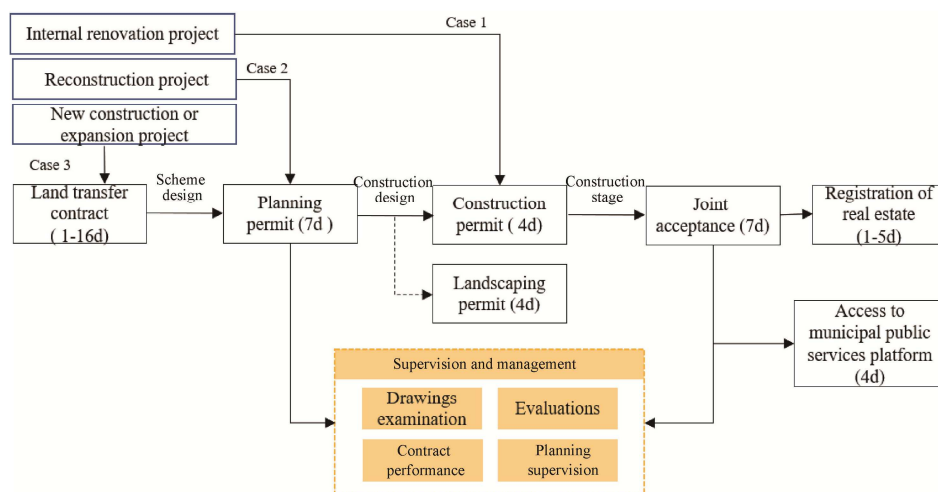


Fig. 9 Administrative approval procedures of construction projects by Beijing Municipal Commission of Planning and Natural Resources

Source: Official website of Beijing Municipal Commission of Planning and Natural Resources (http://ghzrzyw.beijing.gov.cn/zhengwuxinxi/zcfg/gfxwj/202001/t20200117_1616648.html).

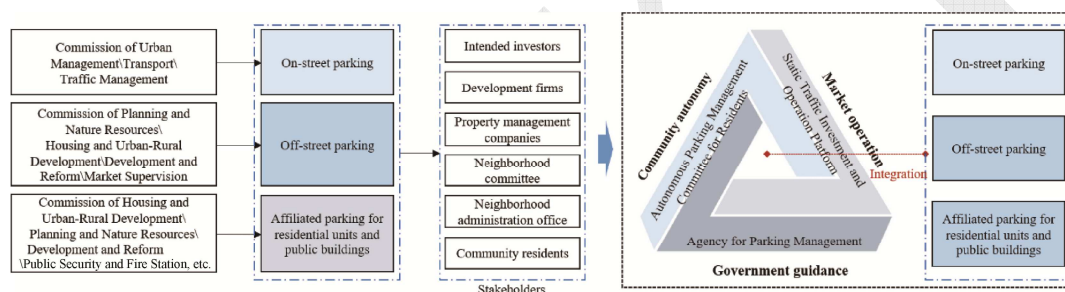


Fig. 10 Multi-stakeholder involvement mechanism for communities parking management

5) Innovate system of community management and co-governance and develop community vision

The L community has residential areas from different age groups, including a variety of traditional and new property management modes led by housing management offices, neighborhood administrative offices, management committees established by neighborhood developers and police departments, and market-oriented professional management. In addition, it becomes necessary to explore and innovate a system of community management and co-governance, plan for multiagency participation in decision-making and parking management, and maximize the application of community units in using the potential parking resources inside and outside the area.

We proposed to build a community co-governance platform with multi-subject, multi-facility, and multi-service features to provide relatively generic autonomy. Such platform can benefit different developers, property management companies, neighborhood committees, community management offices, community residents, intended investors for parking facilities, and regulatory authorities through coordinating and balancing their parking demands. The planning team has also explored the means of entrusting professional parking management agencies to exercise part of the approval authority, and coordinate the management of parking

facilities with the resident parking management committee and static traffic investment operation platform created by the public. In addition, it is essential to improve the communication efficiency between direct interest subjects and regulatory authorities, so that efficiently sharing and using parking facilities can be achieved (Fig. 10).

6) Enhance community participation and form a bottom-up feedback mechanism

The L Community launched a WeChat APP called “Juli Chaolai” in December 2019, which has effectively motivated the public to participate in community management and public space construction, resulting in a good feedback mechanism for solving problems. The improved public recognition of the concept of “people-oriented and green behavior first” and vision of community development, as well as the community’s full awareness of the special economic attributes of parking facilities, greatly contributing to the enhancement of parking management.

3 Parking planning and regulation measures in residential areas

1) Innovation of market management mechanism

The public product attributes and operation management

of urban parking facilities should be assessed through pilot projects. Clarification is needed for public parking regarding its loans, land acquisition, demolition, and taxation. In addition, considering special economic attributes of parking, the government-guided price restrictions within the demonstration area should be appropriately relaxed; market-based pricing mechanism should be introduced; the principle of “higher price for on-street parking than off-street parking and higher price for above-ground parking than underground parking” should be implemented; and a price system reflecting differentiated regions and time periods should be developed to increase the cost of parking violation. For example, the inefficient stock of land around residential and commercial central areas can be combined with the construction of public parking lots under green squares and stadiums, allowing the installation of certain commercial, cultural and sports facilities and other business spaces; the construction area of parking lots within the scope of its own land can be exempt from the plot ratio requirement and qualified for capital incentives.

For residential communities with substantially unbalanced parking supply and demand, a certain amount of public construction incentives can be introduced on the basis of the four-level public parking classification. According to the upper and lower limits specified in the Vehicle Parking Allocation Index for Public Buildings, new public buildings are promoted in terms of adding a small number of shared parking spaces to enhance the market enthusiasm for parking sharing.

2) Continuous simplification of permit and approval process of parking facilities

Application of new technologies, online approval management, neighborhood self-monitoring system and other measures can be used to reduce the regulatory redundancy and achieve transparency of the approval progress. This work could be systematically coordinated by professional parking management agencies with an overall management leadership. The introduction of a third party in the market for compliance supervision is essential, which can substantially eliminate monopoly in owning parking spaces, avoid virulent price competition, and improve the comprehensive management of parking facilities.

Social capital can be attracted in the market operation of parking facility construction and operation through the existing platform of static transportation investment and operational companies. After the government agencies consider the goal of sustainable urban development and green transportation development and recommend an upper limit of parking supply, the approval authority such as the approval of construction and operation of certain small parking facilities can be properly delegated. Local offices should be given the right and obligation of self-management and self-responsibility to enhance parking management.

3) Innovation in community parking autonomy and supervision system

Improving self-governance of community parking needs to rely on efficient bottom-up feedback mechanism, coordinated vehicle parking management by township government and sub-district offices within their jurisdictions, and active management collaboration between district administration and municipal regulatory departments. For example, Beijing has explored the establishment of a residential parking certification mechanism to determine on-street designated parking spaces in residential areas, on the basis matching residents’ multiple documents such as vehicle registration, driver’s license, housing title, and household register. In the future, local communities should be encouraged to establish parking management alliances, develop brochures on the distribution of parking resources and management measures within neighborhoods, and clarify the main responsibility for community parking management, implementation, as well as the platform for supervision and management.

4) Diversified and significant public participation

For parking management and community enhancement in the same type of residential communities, planning and design teams and community authorities need to actively develop a mechanism to promote more diversified and significant public participation. They should organize routine roundtable meetings with street responsible planners and community representatives to collect feedback on current problems and consolidate planning ideas for community development. Public awareness of parking management dilemmas and implementation can be enhanced through case interpretations, exhibition-based publicity, etc. Both the immediate transportation needs of residents and long-term goals for high-quality public space should be considered with the development of effective public participation mechanism. The profits obtained from shared parking should be properly reinvested in the community and used to support the improvement of community public service facilities and public participation activities.

4 Conclusion

Addressing the unbalanced parking supply and demand in urban areas is an important long-term task for urban development; reducing the proportion of on-street parking and promoting the development of parking market also represent the future trend of parking supply. During the transitional period, maximizing the parking resources sharing requires not only active and effective policy guidance from management agencies, professional investment, and operation platform coordination, but also long-term and efficient community management system and diversified public engagement. In residential areas, urban redevelopment and community management are of great significance for improving urban traffic and balancing parking supply and demand. The future development of different urban communities requires solutions to address various issues

associated with parking planning, construction, management, and enforcement through enhancing policy guidance, coordinating development goals, and strengthening the effectiveness of public engagement. It is necessary to enhance the social capital involvement in the parking market, strengthen parking regulation and parking management, and promote the healthy and organic integration of parking and urban development.

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