Current Situation and Analysis of Parking Problem in Beijing

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Abstract

The sharp contradiction between the rapidly growing number of vehicles and limited parking lots in Beijing results in the phenomenon of “difficult parking and disorderly parking”, which has serious impacts on citizens’ quality of life and the running of urban roads. Firstly, the current situation and problems of parking in Beijing are analyzed systematically and thoroughly. Then, the reasons of these problems are find out. Finally, solutions and suggestions are put forward. This research is of great importance in ensuring the fluency of roads, promoting the positive development of parking industry and improving the image of the city.

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Peer-review under responsibility of the Department of Transportation Engineering, Beijing Institute of Technology

Keywords: Beijing; Parking Problems; Road Traffic; Vehicles

1. Introduction

Beijing is a fast-growing city, especially in the perspective of transportation. The number of vehicles is growing year by year and reached 5.591 million by the end of 2014. The acceleration of urban motorization leads to worsen urban traffic environment.

Now, there are more than 5 million vehicles in Beijing with only 2 million parking lots. The cars without parking lots are parked on roads or in residential area, which makes the already vulnerable ‘capillaries’ of roads weaker, even makes fire control passageways blocked in some places [1].

Fast-growing vehicles and limited parking lots formed a sharp contradiction and caused the phenomenon of “parking difficulty and parking disorderly”. Especially in the key areas of the city center, the phenomenon of parking disorderly is very serious and a large number of bicycles’ paths, walking and living leisure space are used

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for parking motor vehicles. The problem of parking disorderly not only brings inconvenience to the city residents’ daily travel and influences the life quality of residents, but also has a negative impact on the image of the city [2].

2. Analysis of the current situation of the parking problems

2.1. Outline

2.1.1 Types of parking lots [3]

According to location, service targets, types of construction and managing patterns, parking lots can be divided into following types:

According to location, there are on-road and off-street parking lots. In on-road parking lots, vehicles are parked within the red lines of roads. On-road can be further divided into road and road-side parking lots. Off-street parking lots refer to special parking lots, parking garage or parking building outside the red line. Off-street parking lots can also be divided into outdoor parking lots and indoor parking lots.

According to service targets, there are public, accessorierial and private parking lots.

According to types of construction, there are parking structure, over-ground parking lots and under-ground parking lots.

According to managing patterns, there are free, limited time (free) and charging parking lots.

2.1.2 Layout principles of parking facilities [4]

- Combine with the city location, topography and so on to choose a proper parking mode based on certain environment.
- Layout of parking lots and parking modes should be chosen based on direct economic benefits, social benefits, indirect economic benefits, environmental effect and sustainability etc. Comprehensive benefit should be primarily concerned.
- The layout of parking lots should meet parking needs.
- Select location and arrange layout properly. Serving radius should be within 300m from the service centre.

2.1.3 Division of charging areas and charging standards in Beijing [3]

Commercial parking areas in Beijing are divided into three charging standard regions: regions of Class I, regions of Class II and regions of Class III. Regions of Class I contain areas inside 3rd Ring Road, the regions of CBD, Yansha, core area of Zhongguancun and Cuiwei Business District. Regions of Class II refer to the areas not included in Class I and inside 5th Ring Road. Regions of Class III refer to the areas outside 5th Ring Road.

The differences among the charging standards of these three regions are obvious and can be reflected in parking location, parking patterns and parking time. Details are shown in Table 1.

<table>
<thead>
<tr>
<th>Charging standards of Class</th>
<th>types of parking areas</th>
<th>on-road within the first hour</th>
<th>beyond the first hour</th>
<th>off-street and outdoors</th>
<th>off-street and Indoors</th>
</tr>
</thead>
<tbody>
<tr>
<td>regions of Class I</td>
<td></td>
<td>2.5</td>
<td>3.75</td>
<td>2</td>
<td>no higher than 1.5</td>
</tr>
<tr>
<td>regions of Class II</td>
<td></td>
<td>1.5</td>
<td>2.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>regions of Class III</td>
<td></td>
<td>0.5</td>
<td>0.75</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>
2.2 Analysis of the current situation of parking problems

2.2.1 Shortage of legit parking lots and over high percentage of off-street parking

The construction of the parking area is far behind the growth of motor vehicles. Parking contradiction between supply and demand is becoming increasingly prominent. Based on the intensity of used cars in Beijing currently, when one million cars are added, the road network capacity will need to increase 2.82 million vehicle kilometers (equivalent to the capacity of the road network within the 3rd Ring Road) and 30 square kilometers of parking area (equivalent to half of the area within the 2nd Ring Road) [5]. Now there are more than 5 million vehicles and only more than 2 million parking lots in Beijing [1], which indicate the shortage of legal parking lots obviously.

According to a survey conducted by Beijing Transportation Research Center, current underground parking lots offered by communities could only meet 30% of the parking needs and the rest 70% are met by roads inside communities (42%) and surrounding roads (28%) [3].

Besides the serious shortage of parking lots, the road-side parking lots take a huge percentage of parking lots, which makes some parking lots outside roads be left unused [1]. The existing parking lots are not enough and not fully utilized. This makes traffic order more terrible and influences traffic efficiency and city image.

2.2.2 Public facilities equipped with parking facilities seriously lagging behind

In China, the construction of public facilities with parking lots started late and the systematic study began in the 1990s. Parking lots provided by public facilities such as hospitals built in the early are of low standards and mostly on the ground. Though the standards of parking lots of newly built hospital have been improved, the rapid-growth of parking needs couldn't be met, especially in those large hospitals built in the center of the city [6].

In Grade 3 and First-class hospitals, poor traffic conditions and lack of parking lots around hospitals have become the main causes of long treatment time, disordered environment, high fire risk and doctor-patient conflicts. Table 2 is parking conditions of five Grade 3 and First-class hospitals in Beijing [7]. It showed the terrible traffic order around the 5 hospitals. The growing negative impacts caused by lack of parking lots made it more urgent to solve the parking problem.

<table>
<thead>
<tr>
<th>organization name</th>
<th>total number of people (individual)</th>
<th>number of employees having cars (individual)</th>
<th>total construction area (m²)</th>
<th>theoretic number of parking lots</th>
<th>actual number of parking lots</th>
<th>difference between theory and reality (m²)</th>
<th>Parking area demand (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing Friendship Hospital</td>
<td>2667</td>
<td>1032</td>
<td>197052.33</td>
<td>1280</td>
<td>510</td>
<td>770</td>
<td>16000.0</td>
</tr>
<tr>
<td>Beijing Chaoyang Hospital</td>
<td>3006</td>
<td>860</td>
<td>153382.40</td>
<td>994</td>
<td>365</td>
<td>629</td>
<td>12425.0</td>
</tr>
<tr>
<td>Beijing Anzhen Hospital</td>
<td>3645</td>
<td>1123</td>
<td>293200.00</td>
<td>1905</td>
<td>790</td>
<td>1115</td>
<td>23812.5</td>
</tr>
<tr>
<td>Beijing Children Hospital</td>
<td>2221</td>
<td>756</td>
<td>13537.45</td>
<td>877</td>
<td>391</td>
<td>486</td>
<td>10962.5</td>
</tr>
<tr>
<td>Capital Pediatric Institute</td>
<td>1176</td>
<td>563</td>
<td>87290.37</td>
<td>566</td>
<td>218</td>
<td>348</td>
<td>7075.0</td>
</tr>
</tbody>
</table>
2.2.3 Low fulfilling rate of the micro-cycle roads planning

Over the past few years, Beijing’s government focuses on building main roads, expressway and so on. The efficiency of these constructions is comparatively high, but the fulfilling rate of secondary roads which are 20 to 30 meter wide and some micro-cycle roads is as low as 30% at present. With the growth of the number of vehicles, if the fulfilling rate of the planned micro-cycle roads is low, road resources will not be fully used and congestion is bound to exacerbate. Coupled with the legal and illegal vehicles parking on micro-cycle roads, which will exacerbate the road congestion, increased exhaust emissions will make air pollution more serious.

There are various reasons for the low fulfilling rate of micro-cycle roads. Firstly, the government tends to spend more time and funds in planning and building main roads. Secondly, the regions and their benefits involved in micro-cycle roads are more specific and complicated. Sometimes, plans are finished, but nobody knows who should pay for them, which makes time spent on building micro-cycle roads longer than on main roads.

2.2.4 Low parking cost

At present, parking fee, as a tool to keep economy balance, has not functioned as it should be in limiting the growing speed of vehicles and improving traffic order. One of the more important reasons is comparatively low parking cost. Both the rate of parking fees and parking fines are much lower.

Although the government of Beijing has done a lot of research on the rate of parking fees and has also adjusted it, there is still much to do when compared with other countries. The construction of parking facilities need to consume huge social costs and the average cost of each parking lot is up to 330 thousand RMB. However, under the current land supply system and pricing system, users of parking facilities only pay one third of the cost. The payback period is too long (32 years) and has little attraction to social investment.

According to the current policy conditions, the payback period of investment of different types of parking lots are shown in Table 3 [3].

<table>
<thead>
<tr>
<th>Payback period of parking lots</th>
<th>over-ground parking lots</th>
<th>under-ground parking lots</th>
<th>Intelligent parking building</th>
<th>easy parking facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Considering land funds</td>
<td>32</td>
<td>32</td>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>

What’s more, the cost paid for parking in wrong place is low and there is not adequate punishment for illegal parking. A number of illegal cars pay almost nothing for parking in the wrong place. Inadequate punishment is one of the main reasons for illegal parking.

2.2.5 Low parking cost

As the capital, Beijing is a fast growing city, especially in transportation. The number of cars increases year by year. Due to the complexity of the development of Beijing road parking management companies, there are many problems in the system, internal management and the direction of future development. This has seriously influenced the companies’ efficiency and profitability.

- Problems in land supply mode
  
Beijing’s land resources are very tight and parking facilities are often built on urban green space, corner space and underground space. However, under the current legal conditions, it is extremely difficult to acquire the rights to develop and use these kinds of land through regular channels [3].

In addition, the financing difficulty caused by property right problem is also an important factor that hinders the construction of parking facilities from going into a positive cycle. Under the current system, the investor cannot
have the property of parking lots and it is difficult to form a business model which integrates the investment, construction, function and management. This can bring difficulties to loan guarantees.

- Opaque management of parking managing companies and lack of supervision from government
  
  Since the establishment and running of parking managing companies in market, most parking lots have been controlled by a small number of parking managing companies and the monopoly position of them was formed. Because of no sufficient supervision from government, there are opaque operation and management in the process of company’s running. Parking managing companies often increase parking lots and adjust parking fees without the authorization from government [8]. Every Parking managing company runs separately from each other and takes no care of others, it is difficult to give full play to the market mechanism to optimize the allocation of resources and choose the fittest.

3. Measures and suggestions

3.1. Implementation of more strict restrictions purchase policy

For a long time, urban traffic congestion, traffic disorder has been troubling urban economic and social development. To solve these problems, we need to take two kinds of measures. On the one hand, increase the supply of transportation facilities. On the other hand, strengthen the demand management to guide properly and control the transportation demand. Beijing need to implement strict vehicle-purchasing restriction policy in order to control the growth rate of car ownership and parking demand and prevent further deterioration of supply-demand contradiction. Under existing conditions, it is impossible to supply sufficient parking facilities in a short period of time, so it is necessary to implement the "hard constraint" [5].

Vehicle-purchasing restriction in Beijing was started in 2011. In 2011, 240,000 license plates were issued. Because vehicle purchases were later, the growth rate of motor vehicles in 2011 has dramatically decreased compared to 2010 and the drop is 78%. Number of new motor vehicles in Beijing was 216,000 in 2012 and 237,000 in 2013. By the end of 2014, there were 5.591 million motor vehicles in Beijing, 154,000 more than the previous year.

According to “A Decomposition of Major Tasks in Beijing’s 2013-2017 Clean Air Action Plan”, by the year of 2017, the number of motor vehicles cannot be more than 6 million, which means that from 2015 to 2017, the total increase of the number of motor vehicles in Beijing cannot be more than 409,000--an average annual target of 136,000 [9]. Beijing must implements more strict restriction policies in order to ensure air quality and the life quality of residents.

In addition, the implementation of purchase restriction has a positive effect to develop automobile industry and ease traffic jam.

First of all, the implementation of purchase restriction can help adjust automobile products’ demand structure. This can promote the upgrade of vehicles technology and so on. After the purchase restriction, the demand for vehicles with good performance will increase. Obtaining a license-plate is not easy, so people prefer to buy cars with good performance. Furthermore, consumers will request higher-quality cars, which make automobile industry study new automobile and upgrade automotive technology under demand driven. Therefore, Beijing’s automobile market will go into maturity under the encouragement of purchase restriction [5].

Secondly, the purchase restriction policy made some people change their trip mode from driving car to taking public transportation. Since 2011 when Beijing increased the parking price, the cost of using vehicle has increased. Partial drivers give up driving plan. According to “Report on Development of Chinese Eco City Construction (2014)”[10], the properties of Beijing public transportation trip raised from 44% in 2012 to 46% in 2013, and the number of daily delivered passengers has reached 13.2 million. In 2014, the property of Beijing public transportation trip raised to 48%. It means that Beijing will step into the time when city transport is dominated by public transportation. Controlling the increase speed of vehicles could control the increase speed of parking demand and the total demand effectively.
3.2. Further development of public transportation

The city cannot lead more drivers to take public transportation until it has efficient and convenient public transportation system. Restriction of buying vehicle can boost public transportation. Public transportation is a more intensive and efficient transportation way. To relieve disorder transportation and traffic jam in big cities, developed countries strive to develop public transportation. At present, the number of passengers delivered by Beijing’s ground public transportation system has reached to 10 million one day. By the end of 2014, urban rail transit in Beijing has 18 routes and operation mileage of 527 kilometers, the number of daily passengers has reached to 10 million. Besides, by the end of 2014, Beijing has increased the public transport price to realize the sustainable operation of public transport, which created conditions for building perfect public transportation system. Striving to develop public transportation, improving the attraction of public transportation and making more citizens choose public transportation are effective ways to control and reduce the parking vehicles.

3.3. Controlling total parking demand and parking order according to economic levers

Charging congestion fee to the vehicles and raising vehicle usage cost can ease the traffic jam in Beijing and reduce the parking demands in peak hours.

Economic levers are an unavoidable selection to solve congestion problem. Traffic Committee of Beijing will introduce “Overall Plan of Relieving Traffic Jam in Beijing (2015-2020)” in 2015, and in the next 5 years, the commuting time of taking public transportation will be less than one hour in central urban area. The plan of congestion fee should have a good effect on limiting the number of vehicles, improving transportation order, leading more citizens to choose public transportation.

3.4. Increasing the parking supply of residential areas

On the one hand, the government should strengthen the plan and construction of parking lots in residential area and take full usage of the corner and idle land of residential area. Based on the green space, square and etc., the construction of underground parking should be encouraged suiting local conditions. Besides, government should improve the construction standards of residential parking facilities to prevent the gap of parking facilities from expanding.

On the other hand, under the premise of not affecting the surrounding road traffic conditions, increasing the road utilization rate at night can increase parking supply to a certain extent.

3.5. Strengthen the construction of public parking facilities like hospitals

3.5.1 Construction of parking lots

In the planning stages, a hospital should pay attention to the construction problem of parking facilities. At first, we should scientifically and comprehensively predict the parking demand. Then, according to the demand, design a number of viable plans and design programs. Thirdly, analyze and evaluate the overall plan. The selected program should not only satisfy the current demands, but also provide development space for the future.

3.5.2 Unblocking the traffic around hospitals

When building a hospital and its matched parking lots, we should consider its harmony with surrounding facilities and traffic. When putting into function, the hospital should communicate with the departments like traffic, city construction and city management timely and fully, so that it can be supported by related departments and can solve traffic problems timely.
3.5.3 Increasing the parking space’s utilization rate

The parking in hospital has very obvious periodicity. The peak hours of parking time are usually in the morning, so it is vital to increase the utilization efficiency of parking lots in the peak hours. Increasing the service efficiency is equivalent to the increase of parking lots. The hospital could use computer, information, communication technology and so on, as well as introduce Parking Guidance System. People who drive to the hospital can get the guidance and prompt from Parking Guidance System to find the designated parking lots quickly. In this way, they can save lots of time in looking for parking lots. The system can integrate the scattered parking resources, make full use of parking resources, which create better social and economic benefits.

In addition, in order to improve turnover rate of the parking lots, hospitals can optimize the medical process, reduce the dwell time of patients in the hospitals as much as possible, make the dwell time accurate, achieve results query through the network, in order to shorten the time of each link. Therefore, the dwell time is cut down. Then, the time of a car’s staying at parking lots becomes short and the turnover rate of parking lots is raised.

3.5.4 Guiding the patients to the community hospitals while a slight illness

The government should enrich the drug catalogues in community hospitals, upgrade and prepare necessary medical facilities, meanwhile, train the doctors and improve medical service level of community hospitals. The patients would not like to go to the community hospitals until the hospitals could satisfy the patients’ medical demands [6].

3.6. Strengthening the construction of micro-cycle roads

At present, the construction efficiency of main road is high in Beijing, but the realization rate of secondary road plan is just 30%. In the future, more public funds should be invested to the construction of micro-cycle roads, and invested to the ‘blood capillary’ of road network [1].

3.7. Giving full play to the role of market regulation of parking price

Government should play a positive role in building, operating and administrating the transportation infrastructure, such as making related supportive policy. As parking lots belong to transportation infrastructure, so the government should support. But it’s not necessary for the government to undertake all social cost of parking lots. It would be better to make the parking price reflect the marketing principle of 'who uses it, who pays for it'. Otherwise, it will further intensify a series of problem caused by disorder parking.

At present, the parking price in Beijing is much lower, which cannot reflect real social cost. The system of parking price ought to be adjusted further.

As for the situation that low approval rate about the adjustment of parking price from Beijing citizens, the traffic governing department should unite publicity department to increase policy Propaganda, explain the value and meaning of the implementation of policy, popularize related knowledge about civilized transportation, promote citizens’ approval to the policy and modern transportation awareness by internet, TV and so on.

3.8. Strengthening parking management

3.8.1 Strengthening the management and punishment to illegal parking

The disorder phenomena that bicycles’ road and sidewalk are occupied should be managed and the persons occupying bicycles’ road and sidewalk should be punished severely. The government should strengthen maintenance management of bicycles’ road and sidewalk. What’s more, the government should protect road right.

It also should take full usage of technology equipment such as television surveillance and electronic police to monitor illegal acts in traffic closely. Then we should crack down on illegal acts to ensure the purification of traffic environment and the safety of citizens’ travels.
3.8.2 Transforming the modes of land supply

The government should make land property right of parking lots adopt the land subdivision model and the construction needs the help of government’s investment.

When adopting the land subdivision, the land-transferring fees and arrangement cost should be solved by government through balancing land resource. The government should encourage using city’s corner, green place and so on to build underground public parking, distinguish property rights between over-ground and underground parking. The land property right of underground parking could be issued separately.

At the same time, government and relevant authorities should allow public parking build some matched commercial facilities. The operating income could make up the shortage of construction funds or operation funds.

The new public parking facilities program could get preferential policies like exempting from use tax of land and business tax, which could attract more funds and prompt the sustainable development of enterprises.

3.8.3 Strengthening the management and supervision to parking management enterprises

The relevant authority’s obligation is to perform the right of management, taking the place of the public and should be responsible for the public. It should strive to safeguard the interests of the public and ensure the maximization of public resource profits. To change original “Closed-off Management”, all parking lots should be announced and seek operators through open tender, and every parking management company with qualification has the right to participate and compete. The role of government is a rule maker and supervisor to ensure parking management companies are operated in transparency, normalization and modernization. So the degree of resource sharing among the companies can be promoted and the parking companies will be operated transparently. The parking companies will be supervised by all aspects of the society, which is helpful to optimize the allocation of resources.

4. Conclusions

People were caught unprepared due to the fact that the auto society has been developing in a rapid speed. There are sharp contradictions between the numerous parking demands and the limited road traffic system. The phenomenon of difficult parking and disorderly parking is serious, which have had enormous negative effects on the life of public and the development of the city. This research has proposed several effective solutions on the basis of analyzing current parking situation in Beijing, including controlling the total demand of parking, increasing parking space appropriately and coordinating the existing parking facilities resources in order to achieve the maximization of efficiency and benefit. In this way, the traffic situation of Beijing, the living quality of the public and the urban image of Beijing will be improved effectively.

References