Study on the Present Situation of Urban Traffic Congestion in Beijing and Suggestions for Countermeasures

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ABSTRACT

This paper makes a description based on Traffic Analysis Report of China Major Cities. It also presents a brief summary on four major factors for the traffic congestions in Beijing City including: the imbalance of workplace and residence resulted from the single center city pattern, the scarcity of road network owing to the state land-ownership, the extremely unfriendly road network pattern for non-motor vehicle travel as well as the superficial solution for traffic problems. Based on the current situation of urban traffic congestion in Beijing, this paper also puts forward some suggestions for countermeasures, such as building sub-centers, breaking the enclosed compound pattern and continuing improving the public transport system with the hope of improving the serious urban transport congestion problems in Beijing.

THE PRESENT TRAFFIC SITUATION OF BEIJING CITY

According to the Traffic Analysis Report of China Major Cities 2015 (hereinafter referred to as "the Report") jointed released by Academy of Science of the Ministry of Transport, AutoNavi, Tsinghua-Daimler Center for Sustainable Transportation Research, Aliyun, Tsinghua Tongheng Planning & Design Institute, Bitauto and other data institutions, Beijing is the on the top list of the most congested cities in the country in 2015. The average driving speed is 22.61 km/h in peak times in Beijing City; the congestion delay index is 2.06, namely, the commuting time for car-driving commuters in Beijing is twice as much to reach their destinations and the congestion cost ranks the highest in the country.

It is also stated in the Report, Beijing ranks the third among the cities with the highest risk of aggravated congestion in 2016. That is to say, the urban traffic congestion in Beijing will continue to increase in the coming years, therefore, more traffic relief strategies and infrastructure improvements and other measures are expected to come along to improve urban congestion growth.

Base on the summary of the transportation data, it is found that the following situations are closely related to traffic congestion:
(1) Ring road preference: as there is no restriction of traffic lights, Beijing public generally thinks that the ring road is more efficient than ordinary roads, thus they usually commute by driving on ring roads. This kind of ring road preference is a factor for the serious imbalanced road utilization rate. The data shows, the express ring accounting for less than 6% of the city has assumed nearly 50% of the vehicle mileage of Beijing. Compared to Shanghai, Guangzhou, Shenzhen, the express way in Beijing is the shortest yet with the most traffic load. As a result, the average driving speed in the ring roads in Beijing can be 29 km per hour at the slowest.

(2) The imbalance of workplace and residence: the serious imbalance of workplace and residence makes Beijing a tidal city. Many main trunks have the serious single-side congestion. The cause of such imbalance is primarily associated with the uneven distribution of resources in Beijing City. In Beijing, the health-care services, corporate business and financial and insurance services and other institutions are mainly distributed between the 2nd to the 4th rings. The uneven distribution of resources forces a large number of Beijingers living outside the 5th ring to have strong needs to get into the city.

(3) Road network sparsity: By comparing Beijing Financial Street District Office, and Mong Kok of Hong Kong, for example, on the same scale, Beijing's average number of lanes is 1.76, while Hong Kong is 2.1. The low density of lanes makes the lanes have to bear more traffic, resulting in congestion.

Further explanation will be given in the following sections in respect to the two phenomena of imbalance of workplace and residence and sparsity of road network.

ANALYSIS OF THE CAUSES OF URBAN TRAFFIC CONGESTION IN BEIJING

Based on the above data, it is believed that Beijing has become the most congested city across the country. The reason of which is not the result of the simple urban planning or housing prices, but a manifestation of the accumulated complex problems after years of social development on the traffic level. The current causes of traffic congestion in Beijing mainly focus on the following areas:

The Imbalance of Workplace and Residence Caused by Single Center Pattern

Beijing City has always been the single center radiating pattern ever since it was built into a capital city in the Yuan Dynasty, especially after the construction of the Forbidden City in the Ming Dynasty. In the spring of 1953, Beijing Municipal Commission of City Planning put forward a new town planning scheme in accordance with the principle of the "administration center in the old town". In the discussion process of the new planning, the central authorities had marked their territories on the drawing of Beijing Municipal City Plan, which became the prototype of the current single center pattern of Beijing City.

At the same time, due to the office sites for authorities were relatively concentrated and the dependents’ areas were built in the neighborhoods of the office sites, in order to meet the housing needs, hospitals, schools, theatres, museums and other functional facilities were all built in the nearby areas.

After decades of construction, Beijing now has almost concentrated the country's best hospitals, the best primary and secondary schools and other quality
resources. And owing to the single center planning structure, these quality resources almost all locate exclusively inside the 3rd ring and its surrounding areas. Attracted by this concentration of the urban quality resources, the developers had developed a large number of residential and office buildings within the 3rd ring. With the shortage of developable plots, rents and housing prices soared inside the 3rd ring areas.

Meanwhile, with the sharp increase of the registered population and the unceasing influx of immigrants, choosing to live in the perimeter farther away from the center became inevitable in the face of high housing prices. At this point, Beijing, having lost the capacity of forming a sub-center, began to proceed with the "spreading the cake" type of city planning, leading to the emergences of Huilongguan, Tiantongyuan and other sleepers' towns and the serious congestion problems in the rush hours in Beijing.

In short, it is the imbalance of workplace and residence, that is, the people far away from the center are compelled to concentrate to resources for work and for accessing quality resources. Beijing's road network, however, cannot support the traffic pressure out of this concentration, which is the main cause of urban road congestion in Beijing. Coupled with the vicious cycle of the increased resident population, the increased residential demand and the new outlying residential areas, the traffic situation grew deteriorated.

**Figure 1.** 

Ownership of motor vehicles in Beijing
The Sparsity of Road Network Resulted from the State-ownership of Land

People were permitted to buy private cars after 1984 in China. Prior to this, the single-center layout did not create enormous pressure on Beijing traffic. But with the unrestrained car marketing to individuals, the ownership of motor vehicles in Beijing has increased exponentially in recent years. Motor vehicles can help expand the range of people's travel and allow them to choose to live places other than the resource center. But this advantage is difficult to achieve in Beijing.

In Beijing, when the authorities or developers had acquired plots, they would first build the fences to indicate the land ownership. Over time, it gave rise to the compound culture unique in Beijing, such as military region compound, ministry department compound, university compound, and community compound. After the construction of enclosure, more often than not, there would be sentries or guards at the entrance to restrict the access of external personnel and vehicles. This construction mode is extremely friendly to the internal staff but quite unfriendly to external motor traffic, causing great inconvenience to city traffic.
For example, an urban space about 700 m x 500 m was encircled by the four roads of Shouti South Rad, Chegongzhuang West Road, Sanlihe Road and Zenguang Road, where Ministry of Construction compound, China Textile Industrial Engineering Institute and a number of communities are located. These few units take full ownership of this block. Sentry boxes are found in each gate in the surrounding areas. As a result, if a car wants to drive to the other parallel road, it has to choose the other two intersected roads. Except a few communities that charged fees, the roads in between are prohibited to access by external vehicles.

In contrast to the same size plot of the capital city Tokyo of Japan which is under the private land-ownership system, the roads in Tokyo are not fully arranged and organized due to the private land-ownership, but between the fragmented land ownership, there are the roads for public access. In the same space of 700 m x 500 m, there are dozens of roads for public use. What the urban management needs to do is to specify the one-way streets and No U-turn signs and so on to further improve the city traffic efficiency.
Take another example of a larger urban space, in the city space of 3 km x 2 km enclosed by Hangtian Bridge, Dinghui Bridge, Wuksong Bridge and Xinxing Bridge, it is also found with a number of compounds where there are only five passable roads.

And while, in Manhattan, New York, there are fifty or sixty cross-cress passable roads. Evidently, the low-density road network structure has greatly reduced the travel efficiency of motor vehicles, in particular, the roads around the large public facilities where extreme congestion conditions are seen almost the whole day.

In addition, this low-density structure also makes the evacuation a problem when the city is stricken by big disasters. The “July 21 Storm” in 2012 not only exposed the drawbacks of the urban drainage system, the unreasonable road network structure also had an unshirkable responsibility.

Extremely Unfriendly Road Network Pattern to Non-motorized Travelling

As mentioned previously, Beijing's road network structure is extremely unfriendly for motor vehicles. But in the transport planning and construction of Beijing, this unfriendliness was being made up with great endeavor. And the main measures taken were the construction of major ring roads and constantly lane widening. However, due to the increasingly widening of the lanes, the non-motorized travelling people have to rely on traffic lights and footbridges. The pedestrians have to cross the hundred-meter-wide road in less than 30 seconds of the green light. Footbridge can be an option for the normal people, but for the disabled and those riding bicycles, it can be very challenging. It can be said that these initiatives provided little help for the vehicles, yet left serious damage to the travel environment for bicycles and pedestrians.

Superficial Solutions for Traffic Problems

Beijing has issued a number of policies to improve the traffic conditions, which can be summed up in three aspects: first, limit the growth of vehicle ownership. The concrete manifestation is to limit the purchase of automobiles and reduce buses and so on. Second, restrict the motor vehicle travel. To be specific, it is to limit the
Third, vigorously improve public transport. The first two measures have been in operation for a period of time, but on the whole, their contributions to improving road traffic condition were limited. Compared with the previous two policies, Beijing's effort in improving public transport is obvious and generally satisfactory. For example, the buses are replaced with comfortable air conditioned buses; the subway network is gradually becoming dense and perfected; the introduction of congestion charges of taxis have raised the cost of travel to a certain extent, but it has also improved the taxiing experience.

But these are still just superficial. The extremely unreasonable urban structure made these efforts completely insignificant. No matter what improvements are made to the buses, they still run on the roads of Beijing; no matter how subway gets improved, the people in Tiantongyuan still have to fight to squeeze in and out of the train.

SUGGESTIONS FOR COUNTERMEASURES

The author believes the above four points are the major causes of the serious traffic congestion in today’s Beijing and thus proposes the following solutions believed to be feasible to ease Beijing’s traffic.

First of all, establish at least two sub-centers popular enough to ease the stress of main city functions and relieve the pressure of main city. The two sub-centers must locate sufficient numbers of major powerful sectors so as to have enough appeal. After the relocation of the authoritative departments, the sub-centers must build supporting public service facilities in time and ensure the connection of trunk roads between the several city centers.

Second, break the enclosed compound pattern and allow the external vehicles to access. Regulate the internal roads and increase the efficiency of commuting. And finally make efforts to achieve city group layout and build high density one-way street system in the internal construction of communities and organizations and link them with urban express ways and ring roads. Lastly, continue improving public transport. Improve the density of subway stations and bus stops; plan bus-only roads and bus rapid transit.

REFERENCE