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## Solving the Last Mile Problem: Ensure the Success of Public Bicycle System in Beijing

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### Abstract

Bicycle sharing systems have frequently been cited as a way to solve the "last mile" problem and connect users to public transit networks. The public bicycle system in Beijing suffered a decline after the 2008 Olympic Games. This paper analyzes the causes for failure of the first generation of public bicycle system in Beijing. How to re-establish it? A new scheme for Beijing public bicycle system is introduced based on the worldwide experiences on the implementation of public bicycle plans.

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### 1. Introduction

Public bicycle has become a kind of short-distance means of transport which is viewed as a low-carbon environment-friendly, economical and convenient, healthy fashion to overcome the influence of global warming. Public bicycle systems have grown in Europe, North America, South America, Asia, and Australia. In 2010, Odense, Denmark demonstrated in the Shanghai World Expo its contributions in promoting bicycle riding with the UBPA case - the Revival of the Bicycle.

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There are at least four prototypes of Public Bicycle System (PBS, abbr.) in the worldwide practices. Bouke (2010) referred to bicycle sharing system as a system offering short-term urban rental bicycles available at a network of unattended locations, when he studied the feasibility of public bicycle in Plymouth, which is a medium size city with a population of 256,700 in the UK. A second mode of PBS is called bike-and-ride scheme, which provides rental bicycles at railway stations, such as the OV Fiets scheme in the Netherlands. It is a unique supplement to public transport. It is available at almost all important train stations (180 stations) in the Netherlands. The third prototype is a city or rural tourism-oriented scheme, which can provide more than one day bicycle rental service, especially popular in Europe. The website of *travel Europe by bicycle* introduces the bike travel routes for city or mountain tours and also provides the online interactive links to the official websites of particular bicycle rental services. The last mode focuses on the community-based scheme, which can be found in a range of North American cities, such as Bike Share in Toronto. In terms of the characteristics of PBS operation, university-based bicycle sharing systems follow into the fourth mode. Meanwhile, community-based PBS has two different types: one designed for community use and the other for residential use (Matsuura 2003). In the community bike-sharing model, an individual checks out a bike from one of many locations and returns it to another location. The residential bike-sharing model requires bikes to be returned at the same location from where they were checked out (usually apartment buildings). The residential model, which is used in Japan, is designed for denser cities where living and bike parking spaces are at a premium.

It is in the year of 2005 that the first public bicycle system emerged in Beijing. Some companies are touring-related firms which started the bicycle rental operation to meet the needs of tourists, especially the overseas visitors who want to rent a bicycle to travel around Beijing. Others deal with public bicycle rental only and survive on their own resources. During the 2008 Beijing Olympic Games, the public bicycle rental market has reached a peak. Beikelantu, Lvchuang, Jiayimu, and Fangzhouzi are all bicycle rental brand enterprises in Beijing PBS market. However, after one year, the public bicycle rental market has encountered many problems. Some companies declared bankruptcy and were closed, others closed dozens of bicycle stations to reduce the operational costs, for example, Beikelantu Bicycle Rental Company alone closed 50 stations in 2009.

This paper consists of two parts. The first part focuses on the causes of the failure of PBS in Beijing which leads us to identify which aspects in the development of PBS need to improve. The second part introduces the development of a new pilot program of Beijing's PBS. Finally, this article concludes with a discussion of what else aspects should be done to achieve the success of this plan.

## 2. Problems of the current PBS operation in Beijing

During the 2008 Olympic Games, Beijing drove half of its 3 million private vehicles off the roads to ease traffic for the Games. Cars were banned from the roads on alternate days, according to the odd or even number of their license plates, from July 20 to Sept. 20. According to the Transportation Bureau of Beijing, more than 4 million people switched from driving vehicles to taking the public transport during the two-month restriction period. Meanwhile, the government encouraged citizens to conduct trips using bicycles. Beijing Bicycle Rentals Company once planned to expand the scheme from 31 bicycle stations and 5,000 bikes to over 200 locations offering 50,000 bicycles for rent by the start of the Olympic Games in July 2008. It is unclear whether these plans were implemented or not as no relevant information is available on the scheme post the Olympics. One known thing is that the public bicycle can be used 4 times a day on average, and there are no more public bicycles available for rent in some stop station. But it is a pity that the big boost didn't last long. One year after the Olympic Games in Beijing the bike rental

industries were put in a tight spot. We summarize the reasons of decline in public bicycle system from the investigation of several bike stations, which is shown as below.

### *2.1 Unreasonable distribution of bicycle stations*

Data from the Beijing Travel Survey 2005 illustrate that 71.6% of all bicycle trips in Beijing cover less than five kilometers. Therefore, public bicycle is suitable for core areas of towns and cities or other dense areas. The average station spacing distance is between 300 to 400 meters. But the actual spacing distance between bicycle stations owned by the same company reaches more than 800 meters. Even if there is another enterprise-owned station near the cyclist's destination, the cyclist has to keep going to find the same rental company's bicycle station, where he or she borrowed public bicycle, because there isn't a cooperation mechanism between the rental companies in Beijing. This situation increases the waste of non-essential time and cost of the users. Lack of clear identity for public bicycle station leads to further loss of users. The location of bicycle station is a second problem. Public bicycle stations usually are located on the sidewalk near to the bus stops or transit stations. But during our investigation, we found three bicycle stations near Xuanwumen Blvd were located on the green areas between motorized vehicle lanes and non-motorized vehicle lanes, which require the users to pass through the non-motorized vehicle lanes when picking up or returning the bicycles. It decreases users' safety. Lack of unified identity further increases the difficulty of returning bicycles.

### *2.2 Potential user's safety concerns*

In fact, when people talk about traffic safety, there are two meanings in their words, actual safety and perceived safety. Actual safety is based on number of accidents, while perceived safety represents a person's subjective feeling of safety and it is not necessarily equal to actual safety. For example, providing separate bicycle infrastructure increases perceived safety, even if it is not clear whether actual safety is improved. But potential users prefer to have separate bicycle infrastructure. "A lack of bike lanes is the reason why I refuse to ride a bike. Bikes and vehicles are using the same lanes, and that frightens me and makes me feel unsafe," said Beijing resident Song Tao. Although both sides of each road would have to build non-motorized vehicle lanes in accordance with the Code for Transport Planning on Urban Road of China, the current situation of non-motorized vehicle lane usage scares many potential cyclists, such as people who often parks cars on the city's existing bike lanes, pushing cyclists onto the vehicles' lanes. Therefore the bicycle use is dropping fast due to the potential conflict with the vehicles.

### *2.3 Conditions of public bicycle equipments getting worse*

The public bicycles can't attract users any more partly because the associated equipments are in bad conditions, such as loss of a brake or a bell, bad lamp, a flat tire, signs of rust, loss of handlebar grips, or a crooked handlebar. In this regards, the type of public bicycles used in Beijing has no significant difference in technique design to that of typical private bicycles. A rapid deterioration of conditions of public bicycle is due to less protection from storm, wind and untimely maintenance.

### *2.4 NOT attractive fare*

The construction foundation for the PBS of this stage is called as "self financing, voluntary integration, independent management and sole responsibility for profits and losses". It results in the situation that the

rental cost is relatively high and deposits are often more than the cost of a new bike. Using Beijing Bicycle Rentals Company as an example, the public bike hire scheme requires users to pay a 400 yuan deposit on a credit card to gain access to a bike. The bikes cost 5 yuan an hour, 20 yuan a day or 100 yuan for a yearlong VIP card. Expensive deposits make the scheme unavailable to many citizens in the city who do not own a credit card.

### 2.5 Inexplicit policy orientation

We have mentioned four modes of public bicycle system in the world in the introduction section. The question of governmental function of public bicycle system in Beijing has not been directly answered by the government. As we have mentioned, during the 2008 Olympic Games, the attitude of the government toward the PBS is positive. But with deep measurement, you can imagine this support is more by words than by deeds. The post-Olympics decline of PBS in Beijing illustrates that PBS as a supplement of public transport has a natural indivisible relationship with policy. That means it is difficult to develop the PBS without policy support. In fact, Heinen and colleagues (2010) have realized this relationship earlier. They cataloged the determinants of bicycle use in term of policy-orientation (seeing in Table 1).

From Table 1, we can conclude that policy has deep influence on public bicycle use from aspects of planning, funding, urban culture, residents' ideological and moral qualities. Therefore, if we want to witness the revival of public bicycles in Beijing, the government needs to be involved.

Table 1. Overview of factors related to bicycle use

Policy-influenced	Non policy-influenced
Physical infrastructure	-Hilliness
-Urban form (trip distance, density, mixture of functions)	-Weather / Climate (wind, rain, temperature)
-Cycling infrastructure	-Seasons
-Design of infrastructure (continuity, number of stops, cyclist priority, etc.)	-Gender
-Bicycle parking	-Age
-Bicycle sharing system	-Income
Non-physical context	-Employment status
-Social norms	-Household structure
-Costs ( of both cycling and its alternatives)	
-Safety (both perceived and actual)	
-Giving cyclists protection in law	
-Education (training cyclists, informing car-users, etc.)	
Individual characteristics	
-Bicycle and car ownership	
-Frequency of physical activity	
-Level of education	
-Attitudes	
-Deeply held environmental beliefs	
-Habits	
-Identity	

Source: Eva Heinen, Bert van Weeb & Kees Maatc. *Commuting by Bicycle: An Overview of the Literature*.

### 3. New Scheme for Beijing public bicycle system

The new scheme follows the failure of a scheme launched in 2005-2006 (ahead of Velib) and in light

of a 2011 announcement by the Beijing Municipal Commission of Transport that it expects to raise the bike share of urban commuter journeys from 20 to 23 per cent by 2015.

### 3.1 Goal of the Beijing's PBS

In an effort to increase cycling rates, Beijing will implement a public bicycle share system in 2015, with 1,000 bike-hire stations and more than 50,000 bicycles located near metro and bus stations. Cycling infrastructure previously removed to give space for automobiles will be restored, and the city aims to have 23% of commuters cycling to work by 2015, which are documented by *Beijing's Action Plan for Building Human Transportation, Technological Transportation, Green Transportation (2009-2015)*. The first stage is scheduled to launch in Beijing in 2012, comprising 20,000 rental bikes and 500 stations.

### 3.2 Rental station selected

The first set of pilot stations are launched in District of Haidian and Dongcheng, including Metro Line 4 from Yuanmingyuan Station to Guotu Station plus the radius range of 3 kilometers along Line 4 and Metro Line 5 from North Hepingli Station to Chongwenmen Station plus the radius range of 3 kilometers along Line 5, with 274 bike hire station and more than 12,000 bicycles. Fig. 1 shows the selected bike rent stations. Fig. 1-a demonstrates 131 stations in the District of Dongcheng with 4195 bicycles and 6364 locking berths, while Fig. 2-b shows 143 stations in the district of Haidina with 8012 bicycles and 11760 locking berths. It is planned that a unified technique standard will be implemented throughout all six districts and suburbs of Beijing, which makes it possible that a bicycle can be taken out from any station and returned to the same or any other station, provided that there is an available locking berth.

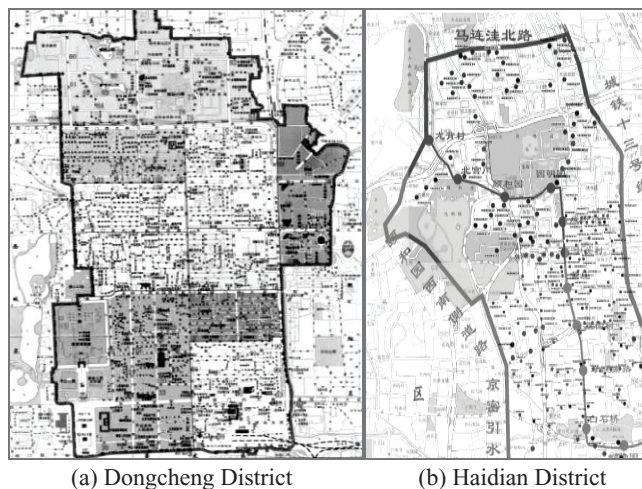


Fig. 1. Selected bike rental stations

### 3.3 Charging mechanism

The scheme requires users to pay a 400 yuan deposit using true name to gain access to a bike. The first hour is free of charge to users like the system in Hangzhou, China. The following hour usage cost users 1 yuan an hour, with a maximum of 20 yuan a day.

### 3.4 Operation mechanism

Public bicycle has been defined as a component of public transit by the authorities of Beijing. As a continuation of the public transit, public bicycle is helpful to implement a new trip mode of "Public Bicycle + Public Transit + Public Bicycle" to improve the accessibility of Public Transit. The new scheme of PBS is operated by professional public bicycle rental company, but funded by a state-owned enterprise under the supervision of the government. The main profit point of private company does not rely on rental fees, but on the sale of maturation of bike rental technological system.

## 4. Conclusions

Bicycle sharing systems have frequently been cited as a way to solving the "last mile" problem and connect users to public transit networks. The public bicycle system in Beijing suffered a decline after the 2008 Olympic Games. This paper analyzes five reasons of failure of the first generation of public bicycle system: Unreasonable distribution of bicycle stations, Lack of safety on cyclist, Deteriorated conditions of public bicycle equipments, Unattractive fare and Inexplicit policy orientation. In consideration of the advantage of public bike sharing programs, the government decides to re-establish them. A new scheme for Beijing public bicycle system is introduced. Besides the encouragement of public bicycle system, it is also important to improve the travel environment of private bicycles.

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