

IV - 157 Traffic Safety Under Mixed Traffic Condition in Beijing

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Introduction

In Beijing, about 92% of its highway system is under mixed traffic condition, i.e. motor vehicles and non-motorized vehicles travel on the same road. As bicycle population accounts for more than 90% of that of the total non-motorized vehicles, this paper will focus on traffic safety under the mixed traffic condition of bicycles and automobiles in Beijing.

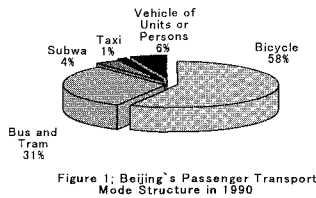


Figure 1 shows that, in 1990, bicycles shared as much as 58% of total passenger transport. That means, in Beijing, people are relying much on bicycles for urban transport. In 1990, bicycle population had reached as much as 8.38 million. The overuse of bicycles has not only contributed much to the deteriorating congestion of urban road network, particularly at road junctions, but also caused serious traffic safety problems. In China, bicycle traffic fatality rate in accidents got to 30.2% in 1987, which ahead the world. Thus traffic safety under mixed traffic condition is worthy of concerning at present.

A Review of Traffic Safety

From figure 2, we can see that before 1970, as the total vehicle amount was still very low, transportation problems were not quite serious. Only after 1970s, especially after 1978, when China started to adopt the Open Door policy, both motorized and non-motorized populations increased staggeringly due to the requirement of economy development. As the increase occurred too sudden, road construction and traffic management technique were far lag behind. From 1970 to 1990, automobile amount increased nearly 17 times, bicycle 5.8 times, while road length only less than 3 times. Thus traffic accident amount was very high around 1980. After 1980, traffic management was somewhat strengthened and many regulations aimed at improving traffic safety, were enacted. For an example, in 1993, automobiles were obliged to equip safety belts.

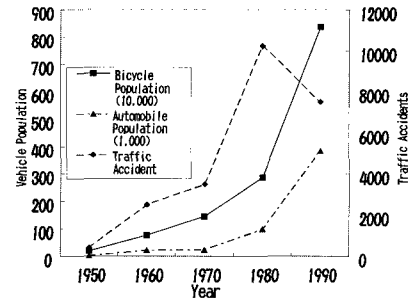


Figure 2: Trend of vehicle populations and traffic accidents (SOURCE:[1][2])

Characteristics of Mixed Traffic and Their Influence on Traffic Safety

Figure 3 is a typical schematic diagram of mixed traffic flow at an intersection in Beijing (to simplify the condition, pedestrian flows are not shown). It can be seen that, conflict points of bicycles and automobiles are as much as 10. During rush hours, so many bicycles were in using that about 76% of arteries was under saturated bicycle flow in 1988. For lacking of efficient means of bicycle traffic management, many bicyclists do not obey traffic regulations while passing through intersections and their abrupt behavior is likely to cause traffic accidents and lead the intersections to snarl up. Rough estimates in 1987 worked out that problems of mixed traffic at road junctions had contributed a 30-40% reduction in flow capacity of the roads [6]. The extension of waiting time to pass through intersections is both remarkable and inevitable. Drivers, especially those for commercial purpose like taxi drivers, are easily to get upset and finally lose their patience. The aforementioned factors may be the main reasons that lead the distribution of fatalities in traffic accidents as high as 21.5% at intersections (see figure 4).

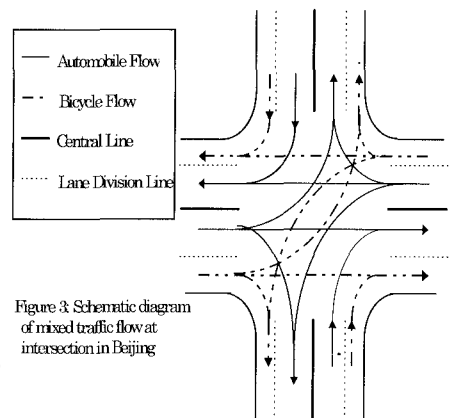


Figure 3: Schematic diagram of mixed traffic flow at intersection in Beijing

Another characteristic of mixed traffic closely related to traffic safety is that, bicycle riders often invade motor

lanes. In 1993, ZHOU made a site survey in Beijing and reported that, within 7:00 - 8:00 in the morning, 676 out of 2969 bicyclists invaded motor lanes, which accounted for 23%. While in other survey periods, 12:12 - 13:12 pm and 17:00 - 18:00 pm, bicycle invasion rate was 8% and 28% respectively. We can see that, the surveyed invasion rates in rush hours are much higher than off-peak hours. This can be attributed to the insufficient road area for bicycles during rush hours. Automobile travel speed has decreased from 18.2 km/h to 13.9 km/h by the influence of bicycle invasion, since the average speed of bicycles is only 12 km/h [4].

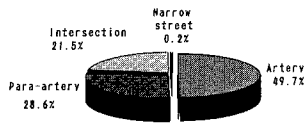


Figure 4: Distribution of Fatalities in traffic accidents

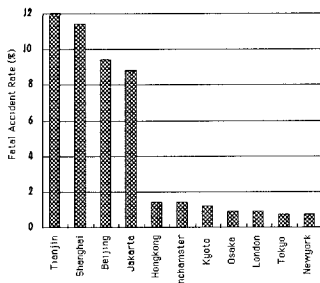


Figure 5: A comparison of fatal accident rate (SOURCE: [1])

In spite of the reductions of automobile speed and road capacity, bicycle invading motor lanes will remarkably enlarge the collision probability with automobiles. Due to the poor brake system and deficient stability, it is much more dangerous for bicyclists to ride on motor lanes. Moreover, bicycle riders are easily to be injured in accidents involving motor vehicles because they are poor in protection. The fact that three largest Chinese cities, Tianjin, Shanghai and Beijing, whose traffic condition are similar, head the first three while comparing fatal accident rate (fatal accidents/ total accidents) with some foreign cities in figure 5 is a persuasive evidence.

In 1987, 30.2% of fatalities in traffic accidents, 53493 persons, were bicyclists in China. Both the rate and number were the highest in the world. Although automobile population in China was only 2% of the total amount in the world, fatalities in traffic accidents accounted for as high as one seventh [4]. In Beijing, traffic accidents involving bicycles made up 49% percent of the total number of accidents in 1988: collisions between bicycles and motor vehicles accounted for 25% of the total; bicycles alone, 23.26%; and mishaps between bicycles and pedestrians only 1.02% [3].

Conclusion and Prospects

From the above analyses, we can see that traffic safety in Beijing is still far from satisfaction. Comparing with many cities of both developed and developing countries, the fatal accident rate is obviously high. The main reasons for that lie in: (1) the overpopulated bicycles, which have far exceeded the urban highway network capacity; (2) the negligence of bicycle traffic management. Due to the bias of traffic management, only motor vehicle management has been emphasized for decades. Even at present, there are still not any efficient approaches for bicycle management; (3) deficient traffic safety consciousness of bicycle riders. This is the direct reason causing their invading motor vehicle lanes. Therefore, to improve the condition of traffic safety needs the efforts of the following two aspects: (1) reducing the volume of bicycle traffic, and (2) strengthening both bicycle traffic management and traffic safety education. Those might be a key of both efficient and economical to tackle Beijing's traffic safety problems.

As bicycle traffic occupies more road area per capita and more dangerous comparing with public passenger transport, some regulations for limiting the use of bicycles and strengthening their management have been taking into consideration. Measures proposed include a restriction on the use of main arteries by bicycles as in Shanghai, imposing a bicycle license fee and etc. Although mixed traffic with overpopulated bicycles is the only choice in Beijing at present, city government has a prospective plan to reduce the share of bicycle traffic in total passenger traffic gradually, from 57.8% in 1990 to 44.2% in 2000, 20.3% in 2050. By constructing new subway lines and improving bus services, public transport share will be increased from 35% in 1990 to 45.5% in 2000 and 60.8% in 2050. With the improvement of traffic condition, traffic accident fatalities per 10,000 motor vehicles will be expected to decrease from 9.57 persons in 1990 to 6.6 in 2000. Predicted fatalities in traffic accidents, however, will increase from 447 in 1990 to 792 in 2000 as the automobile population will reach 1.2 million in 2000, which is 2.4-fold of that in 1990 [2].

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