

THE TRAFFIC CHARACTERISTICS IN CBD OF MAJOR CITIES IN CHINA

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Abstract: In recent years, due to the prevailing economic development in China, Central Business Districts (CBDs) are established in many major cities in China playing as the centers of the commerce, finance and business activities of the cities. However, the efficiency and accessibility of the traffic infrastructure system in CBD are very important to the success of a CBD in term of prosperity of economic development. This paper, based on the traffic studies of major cities in China, outlines the general traffic characteristics and illustrates the specific traffic problems in the CBDs of these cities.

1. INTRODUCTION

Since 1980s, after the introduction of economic reform in China, the Chinese economy and urban development are moving in a very fast pace. This elevates the needs of urban transport demand. Many major cities have been transformed and become the economic and social centers of the country. By 1994, there are 32 major cities with population of over one million in China and the total population of these cities reaches 90.54 million. The transport systems in these cities are very important and are playing important role in the whole transport system of the country. In 1994, the accumulated passenger travel volume in these cities accounts one seventh of the whole volume and the freight movement takes one fifth of the total freight movement in the country.

In western developed countries, such as USA, UK etc., Central Business District (CBD) is usually formulated in major cities to provide central area for activities of business, commerce and finance within the city or areas. The Manhattan Area in New York city and the Central in Hong Kong are the famous CBDs in the world. Since CBD is the center of a city, the efficiency and accessibility of the traffic infrastructure system in it have a great effect on the prosperity and development of the city.

In recent years, the municipal governments of major cities in China start to pay more attention to the planning and construction of CBD in their cities. With a well planned CBD, more investment and business activities can be stimulated and that helps to benefit the development in other parts of the city. Pudong in Shanghai and Futian in Shenzhen are the two good examples showing the importance of a CBD on the development of a city.

Traffic system in CBD is very important to enhance the city prosperity. However, traffic problem in such a busy area is very difficult to be tackled. Thus during the planning and construction process of a CBD, the understanding of the traffic characteristics in CBD will be very helpful for the purposes of transport system and urban planning.

This paper is trying to outline and compare the general traffic characteristics of CBDs in major cities of China and other developed countries. Based on the traffic characteristics and CBD development in China, some specific traffic problems encountered now in the major cities of China are also discussed.

2. TRAFFIC CHARACTERISTICS

2.1 The Scale and the Role of CBD

As described above, CBD is the center of a city. The planning for the supply of land and transport infrastructure meeting the demand of space and travel for the activities of business, commerce and finance is very important. Thus in order to optimize the economic benefit of a CBD, determining the scale of development of a CBD is very essential during the planning process.

The following Table 1 shows the development scale of the CBDs of some North American cities and Table 2 shows the typical development scale standard of the CBD in North America.

Table 1. The Development Scale of the CBDs of some North American Cities

City	Population (thousand)	Year	Scale (km ²)	Non-living Space (thousand m ²)			Living Space (thousand m ²)	Total Space (thousand m ²)
				Total	Business	Commerce		
New York	7072(1980)	1975	14.5	54625	26941	3344	19230	73855
Los Angeles	2967(1980)	1975	5.6	7360	3818	1245	-	-
Montreal	2829(1980)	1970	3.4	7580	3056	901	1923	9503
Houston	1595(1980)	1975	2.4	5639	3400	687	-	-

Table 2. The Typical Development Scale Standard of the CBD in North America

Population (thousand)	No. of Cities	Whole CBD Area			Core Area of CBD		
		Area(km ²)	Blocks	Average Block Size(m×m)	Area(km ²)	Blocks	Average Block Size(m×m)
250-500	8	1.24	99	112×112	0.31	20	124×124
500-1000	5	2.30	115	141×141	0.75	36	144×144
>1000	3	4.50	224	142×142	1.16	62	137×137

The above data are from the CBDs of major cities in North America. These data are very useful and reliable as a reference to the planning of a CBD. The typical size of a CBD in North America is ranging from 1.24 km² to 4.5 km² with respect to the population. It is considered to be beneficial when the total non-living space is put under 7.5 million square meter in the CBD for a city with 3 million people and is under 5.5 million square meter in the CBD for a city with 1.5-2 million people.

In China, with reference to the above standard during the planning and construction process of CBDs, the indexes of the development target sound more reasonable and practical. (See Table 3)

Table 3. The Development Scale of the CBDs in China

City	Population (thousand)	Year	Scale (km ²)	Non-living Space (thousand m ²)	Living Space (thousand m ²)	Total Space (thousand m ²)
Shanghai Pudong	-	under planning	1.7	4279	250	4529
Shenzhen Futian (south part)	4300 (2000)	under planning	2.3	5562	1527	7089
Shenzhen Baoan (phase I)	-	under planning	2.79	3618	1406	5024

The reason for a CBD to be considered as the center of the business, commerce and finance activities of a city is because that the most enterprises and offices related to business, commerce and finance are located at the CBD area in which most of the business activities are taken place. The following Figure 1 shows the occupied percentage of different kinds of space in the Central District of Hong Kong and Table 4 shows the business activities statistical data.

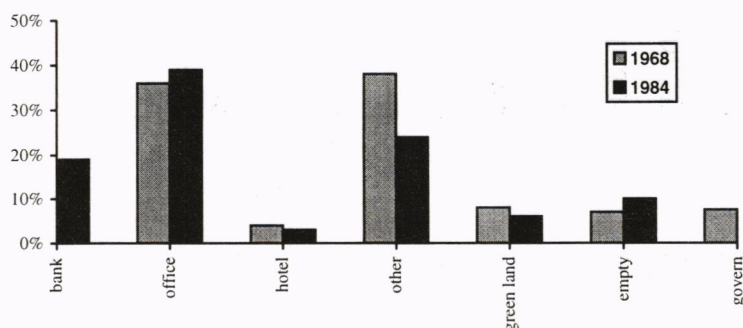


Figure 1. The Occupied Percentage of Different Kinds of the Space in Central of Hong Kong

Table 4. The Statistical Data of the Business Activities in Central of HK

Items	No. of the Enterprises				No. of the Employment			
	1978		1983		1978		1983	
	No.	%	No.	%	No.	%	No.	%
Business Activities								
Bank	175	2.1	234	2.7	14995	14.8	21845	17.5
Finance	812	10.0	1063	12.4	8079	8.0	14123	11.4
Office	1779	21.8	1038	12.1	22064	-	12702	10.2
Export/Import	2859	35.1	2271	26.4	24142	23.9	16685	13.3
Sale	1135	13.9	1369	15.9	8292	8.2	8028	6.4
Hotel & Restaurant	110	1.4	144	1.7	7088	7.0	8199	6.6
Non-Business Activities								
Wholesale	271	3.3	338	3.9	2314	2.3	1891	1.5
Transport & Communication	522	6.4	508	5.9	9814	9.7	23927	19.1
Other Services	480	5.9	1629	19.0	4217	4.2	17636	14.1
Total	8143	100.0	8594	100.0	101038	100.0	125126	100.0

Same as the Central District in Hong Kong, projected occupied percentages of different kinds of space in Baoan Central District in Shenzhen also has this obvious land use characteristic. (See Figure 2)

These occupied percentages of different kinds of space are the basic information to grasp the traffic characteristics in CBD and are necessary for determining the travel demand in present and in the future. The occupied percentages in CBD area have great difference with the other areas.

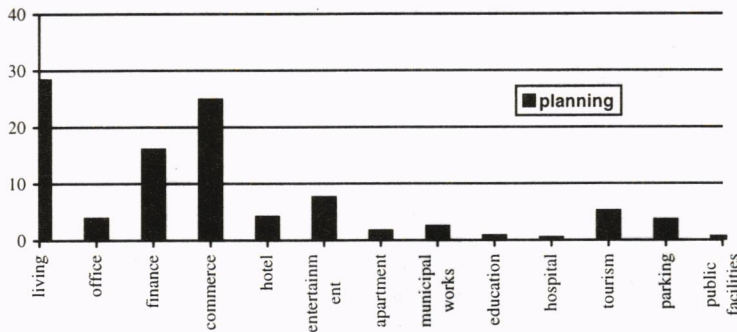


Figure 2. The Occupied Percentage of Different Kinds of the Space in Baoan Central District of Shenzhen

2.2 Travel Demand Characteristics

2.2.1 Trip Attractive Characteristic of Employment

The trip attractive volume of the employment in CBD is much bigger than other areas of the city, especially relating to the business, office and commerce employment. The most trip attractive volume of the business and office employment is HBW* and NHB* and the most of the commerce employment is HBW* and HBO*¹. Generally, the average trip attractive volume of the employment in CBD per day reaches 5 to 6 times.

2.2.2 Trip Volume of CBD in Peak Hour

Because the large trip attractive volume and large number of the employment in CBD, the total trip volume per day and during the peak hour are much bigger and specially concentrates during the P.M. peak hour. Generally, the trip volume during the P.M. peak hour counts to 12% to 15% of the total volume and counts to about 80% of the number of the employment. The following Table 5 is the survey data of the peak hour trip volume in CBDs of some North American cities.

Table 5. The Survey Data of Peak Hour Trip Volume in CBDs of some North American Cities

Cities	Trip Volume (thousand)	Average Volume along the Corridor (thousand)
New York	738	>60
Chicago	200-250	30-40
Philadelphia, Boston, Washington	150-200	23-30
Los Angeles, San Francisco	100-150	13-20

2.3 Public Transport in CBD

In CBDs, the most popularly used transport mode is the public transport which includes the mass railway, buses and other types such as tram, ferry, taxi and so on. Among the total trips, most of the in and out CBD trips are using the public transport modes. The total percentage of using public transport accounts over 75%. From the following Table 6 and Table 7, it indicates that nearly every CBD area has a high percentage of trip volume using public transport since the public transport is the very effective transport mode which helps to minimize traffic congestion in CBDs.

* HBW: The trip from home to office for working

* HBO: The trip from home to other places not for working

* NHB: The original of the trip is not home

Table 6. The Transport Modes in CBDs of some major cities

City	Population (thousand)	Percentage of Public Transport(%)	Percentage of Private Car(%)	Time
Hong Kong	5860(1990)	74	26	1981
London	6790(1975)	75	25	1991
New York	7072(1980)	88	22	1982
Chicago	3005(1980)	77	23	1983
Toronto	2999(1980)	75	25	1980
Montreal	2829(1980)	67	33	1980
Los Angeles	2967(1980)	36	64	1980

Table 7. The Percentage of Mass Railway in CBDs

City	Year	Volume (thousand)	Percentage of CBD	Percentage of Non-CBD
New York	1974	3740	82	18
Chicago	1972	530	72	28
Boston	1973	412	84	16
Toronto	1976	685	72	28

Following this principle, while working on the planning of Shanghai Pudong Central District, the transport mode split has been restrictedly concentrated on the public transport. But according to the present situation of the public transport in China, the percentage of using public transport is assumed to be 50% which is considered to be much more reliable and realistic. (See Table 8)

Table 8. The Transport Mode Split in Shanghai Pudong Central District

Destination	Private Car	Special Car	Public Transport	Bicycle	Walking
HBW	8	10	52	9	21
HBO	22	10	38	9	21
NHB	30	10	49	1	10

2.4 Parking Problem in CBDs

Parking problem in CBDs can be alleviated by the following methods:

- ① To supply parking facilities to meet the parking demand;
- ② To control the vehicles entering the CBD.

2.4.1 The Supply of the Parking Facilities

The basic target of supplying parking facilities in CBDs is to supply enough parking space for normal business activities but definitely it is not practical to meet all the demand in CBD. In most cases, the standard of parking space provided can be referred to some examples or experiences of other CBDs. The following Table 9 gives some parking facilities supply standards in CBDs of some European cities.

Table 9. The Parking Facilities Supply Standards in CBDs of Some European Cities

City	Population (thousand)	Area(km ²)	Parking Facilities		Total	Average per thousand person	Average per 10000m ²
			On-street	Off-street			
Copenhagen	1400	5.88	17141	2025	19166	13.7	32.6
Hamburg	1860	2.40	4272	10116	14388	7.7	60.0
Rome	2489	20	25252	9582	34834	14.0	17.4
Barcelona	1696	2.05	6130	883	7013	4.1	34.2
Madrid	2700	2.21	8250	12500	20750	7.7	94.0

2.4.2 Traffic Management Policy

Due to a large number of the trip volume in CBD, to control the number of vehicle entering and to encourage the usage of the public transport in CBD are the effective transport management policy to reduce the traffic congestion. Supply of the parking facilities at an adequate level but not excessive can help to discourage vehicles from entering the CBD area. Experience in Hong Kong and Singapore show the success of this policy.

3. SOME SPECIFIC TRAFFIC PROBLEMS IN CHINA

Accompanied with the prevailing economic development in China, the urbanization and the urban transport system have been developed sharply. Many traffic problems are encountered in the major cities particularly in those with higher travel demand and larger transport system. Traffic problems in some cities are very serious and are threatening the continual development of the city.

Traffic problems are normally caused by the following reasons:

- i. The road capacity is far from enough
- ii. The number of vehicles increases too fast
- iii. The public transport sector declines day by day

3.1 Road Capacity

The road space per capita increases from 2.8 to 6.6 square meters in recent years but the rate is much lower than the rate of traffic growing. Shanghai, the biggest city in China, the road space per capita is only 3.5 square meters and it is reported that the traffic conditions on half of its road in the central area is almost 95% saturation during peak hour.

The shortage of road space is due to the limited resource allocated on the urban road construction. This results not only the disruption of road traffic and lower the efficiency of the road network, but also causes longer delay and higher operation costs.

3.2 Increase of the Amount of Automobiles

In the past several years, there has been a sharp increase of various kinds of automobiles at the rate of 15%. According to a research report, when the annual increase rate of the automobiles exceeds 20%, the transport condition will be greatly worsened. Since 1980, China has crossed this threshold twice. The first is in the successive three years from 1985 (+33.%) to 1987 (+27.0%) and the second is in 1992 (+31.9%) and 1993 (+55.6%). These two periods have been proved to be the hardest time for urban transport because the demand for roads is much more than that can be supplied.

3.3 Public Transport Sector

Since 1990s, the proportion of public transport has dropped from 30% to less than 10%. The reasons are the low price and the failure to fully carry out the policy of giving priority to the public transport. The public transport enterprises mainly rely on the subsidies from the government. The operating efficiency is not linked up with the economic benefit, and the existence of the enterprises is also not tied with their service performance.

4. CONCLUSION

Since 1980, with the prevailing economic development, the city and the urban transport system has been developing rapidly in many major cities of China. The Central Business District (CBD), the center of a city, has to be highly accessible and with efficient transport infrastructure system. To achieve this, the traffic characteristics of CBD has to be well understood during the planning and construction process of CBDs in major cities of China.

In western developed countries, many CBDs are well established and the experience of success is very useful as the reference for the planning and construction of CBDs in China.

The first basic characteristic of a CBD is that the supply and demand of space and traffic infrastructure have to strike a balance. It is important to determine a most reasonable and realistic development scale and role of the CBD for achieving the optimum benefit during

the planning process.

The second finding is that the public transport will always be the main transport mode in CBD and is the only effective transport system to minimize traffic problems in the city. In some CBDs with large development scale and population, mass transit railway should be the best transport mode to be introduced.

The third point is that the provision of parking facilities in CBD can be an effective traffic management measure to limit large number of vehicles entering the CBD. Thus the supply of parking space should meet the necessity for business activities only.

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