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The Management of Current Traffic Congestion Status During the Urbanization Development in Guiyang

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Abstract

With the development of urbanization and motorization, the imbalanced contradiction of urban traffic between supply and demand becomes increasingly sharp. Traffic congestion has become a serious "urban illness" in China, and it results in problems such as travel time delay, increase of traffic accidents, rise of fuel depletion, survival environmental degradation and so on. It severely affects the city's normal function and its sustainable development. This paper first leads to important impact of traffic on urbanization development from the concept of urbanization, it then states the current traffic congestion status in the process of urbanization in Guiyang after introducing the research of domestic and overseas traffic status, finally, it puts forward some suggestions of countermeasures of traffic management in Guiyang. These aim to improve the traffic congestion problem in the city, and make Guiyang's urbanization development to be more perfect.

Key words: Urbanization; Traffic congestion; Sustainable development; Traffic management

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This concept of urbanization was early put forward by Spanish engineer A. Serda in *Basic Theory for Urbanization* in 1867, and now is widely applied in the world. The urbanization process which characterized as the population gathering to the town and the city continuously is the necessary historical stage for every country during its industrialization. At present, the urbanization level of the world is more than 50 percent and a half of population live in the city resulting in its rapid development. Meanwhile, the excessive consumption of energy, the increasing supply pressure for traffic, water, electric, gas and the quantity of heat plus the excessive population in the city can result in "urban illness". The traffic in the city can be in trouble to restrict the better development of the city with the population centered in the city. The researching task group of the State Council Development Researching Center indicates that the pattern of the traffic is one of the substantial core problems. The future shall rely on the advanced traffic technology to new urbanization pattern with the characteristics of better function, centered development, ecological friendship and harmonious live. About one third of the traffics combined cities and towns in 655 cities are congested during the rush hour under the rapid development of the urbanization according to the sixth Chinese Living Environment Forum. The traffic condition of large cities in developed countries analyzed by Britain SYSTRA Company indicates that the traffic congestion, traffic accident, noise pollution and automobile gas pollution make the cost in paid economy respectively take 2%, 1.5 to 2 %, 0.3 %, and 0.4% of GDP. The influence of the city economy caused by the health cost and the loss of the productive forces resulted from the above factors take 1% to 5% in GDP. And the GDP is the important index for urbanization, so the traffic problems are representative and significant in the process of urbanization. Guizhou province is located in the southwest of plateau and though its capital Guiyang city isn't a largely developed

economic center, with the population congregating in the city and increasing of motor vehicles, as the infrastructure in relative poor with the lack of good management means and manners, the terrible traffic congestion here brings much negative influence to Guiyang city, which restrict the urbanization process of the city.

1. TRAFFIC RESEARCH SUMMARIZE AT HOME AND ABROAD

The traffic congestion shall be that when the traffic demands surpass the traffic capability on the roads, the surpassing parts stayed on the roads is called traffic congestion (LU Huapu, 2001). The rapid increase of private automobiles and roads traffic with the highly development of national economy and the rapid urbanization, especially in big city, the traffic congestion, the traffic energy consumption and environment pollution increase rapidly which have been the bottle neck for the development of national economy (LIN Fei, 2006). Each country has enhanced their transportation demand management to use the traffic policy function and certain technology which affect the participator of traffic to choose their traffic patterns, time, address and route, etc. and at the same time, the developed countries such as Europe, America and Japan research and use the intellectual traffic system (ITS) technology in different degrees. The strategy of TOD put forward by Peter Caruso is the important method for the city traffic system intellectual increase indicates that the traffic cannot rely on the automobile excessively and the public bus is the main traffic means in the city. Anthony Downs from America put forward the concept of congestion charging through the triple convergence indicates that an additional charge shall be charged to automobiles on the congestion roads or rush hour. This method is used to adjust the automobile distribution on the city roads net and rush hours to reduce the congestions. Ferrol O. Robinson suggested that the purpose of the congestion charging shows in two aspects: 1) Lighten the congestion, improve the traffic conditions, and debase the environmental influence; 2) Increase the financial income through the charging to launch into the public bus. From the practice at home and abroad, the main method and measure for development low carbon ecological city include develop public traffic and rail traffic, and establish the solid city traffic net with high efficiency and low pollution to improve the city's traffic efficiency. The ground, under ground and air traffic net in three urban circles of Japan set a good example for this kind of traffic. The experience of urbanization all over the world shows that the infrastructure, especial for the establishment of the integration and network, public traffic shall be highly regarded. For example, the rapid urbanization in Japan and Korea benefited from the leading development of their infrastructure and carrying function.

2. THE CURRENT TRAFFIC CONGESTION STATUS DURING THE URBANIZATION OF GUIYANG

2.1 The Urbanization Development Status in Guiyang City

From 2000 to 2009 year, the urbanization rate in Guizhou is 23.9%, 24%, 24.8%, 26.3%, 26.9%, 27.5%, 28.24%, 29.11% and 30.1%. In year 2000, the average urbanization rate is 36.2% in China, but in Guizhou it is 23.9%. The average urbanization rate was up to 44.9% while Guizhou's is 28.3% in 2007. In year 2008, Guizhou was the only province whose urbanization rate couldn't reach to 30%. From year 2000 to 2007, the average increase of the urbanization rate in Guizhou was 61%, while in the whole country, the east, middle and the west areas, the average increase of the urbanization rate was 1.24%, 1.33%, 1.23%, and 1.19% respectively. In comparison with the nearby provinces, the urbanization rate of Guizhou in year 2000 was a little higher than Yunnan province, but it was less than other provinces and cities, and it was 11.7 percent points less than Chongqing whose urbanization rate was the highest in the nation. The urbanization rate in Guizhou was put in the last order in the near provinces in year 2007 and it was 20.1 percent points less than Chongqing city, 3.4 percent points less than Yunnan province. The urbanization speed in Guizhou was the slowest among the nearby provinces, and 2.09 percent points slower than the fastest Hunan province. The urbanization level in Guizhou is lower than the average level of the nation, but its urbanization rate speeds up obviously in recent years. We can see that the urbanization rate in Guizhou appears increase trend year by year. The urbanization is a process with its own rule and stage, and in comparison with the S-curve theory cited from American city geographer Raym. Northam, the urbanization development process in Guizhou comply with the common rule of the urbanization in the world. When the urbanization level in an area is above 30 percent, the urbanization enters into a rapid development stage in accordance with the experience from other country from other countries. From the above analysis, the urbanization in Guizhou will be in a rapid development stage during the twelfth five-year period.

The Table 1 shows us that the urbanization rate in Guiyang is 63.07 percent in 2007. This rate is the highest among the nine cities in Guizhou and it is 44.13 percent points higher than the lowest urbanization rate in Tongren Area. Guiyang sets an example for its rapid urbanization development in Guizhou, whose urbanization level is lower and its experience and problems encountered can be referred by other cities in Guizhou for their urbanization

sound development. Guiyang shall be developed into one of the important traffic hinges, the important center cities, and the ecological tourism cities with international influence in the southwest of China in accordance with the twelfth five-year development planning. The development of urbanization in Guiyang is especially important, and it can bring excellence to the city.

Table 1
Urbanization Rate Compare for Each City in Guizhou (Units: %)

Areas	In Year 2000(%)	In Year 2007(%)	Average Increase rate annually(%)
Guiyang City	58.2	63.07	0.7
Zunyi City	22.9	28.05	0.74
Liupanshui City	23.1	30.34	1.03
Anshun City	25.9	26.63	0.11
Autonomous Prefecture of South Guizhou	22.8	26.37	0.51
Autonomous Prefecture of Southeast Guizhou	18.0	20.36	0.34
Autonomous Prefecture of Southwest Guizhou	20.9	25.66	0.68
Bijie Area	12.6	23.18	1.6
Tongren Area	16.1	18.94	0.41

Material from: The researching task group in the Guizhou Province Government Development Researching Center. Research of boosting the urbanization development of Guizhou province during the twelfth Five-Year

2.2 Traffic Congestion Status of Guiyang City

Guiyang city is located in the east of Yunnan- Guizhou Plateau in southwest China. Thanks to the high altitude terrain constraints, Guiyang city is small but with high population density. There are above 1.1 million people in downtown covered only 40 square kilometers. More than 600 thousand vehicles gather in this area and the traffic cannot form an effective internal and external loop because of the irrational structure of the road network resulted in the serious traffic congestion. Now, traffic congestion in Guiyang is the biggest issue in the social and economic developments, so it is important to face and deal with the traffic problem at the moment.

From Table 2, we can see the continuous increases of the cars in recent years and in year 09 there are evident increases of the cars. From June 30, 2006 to the end of 2007, vehicles magnitudes in Guiyang city increased from 240,000 to nearly 340,000.There are 100 thousand vehicles increasing in only one and a half year, of which 80% are private cars. Since 2007, the daily average vehicle increase reached to 140. In 2008, 64,303 new drivers were added and 61,354 new cars and vehicles increased. At the end of December 2009, vehicles magnitudes in Guiyang city had reached 480,000, with an average increase of more than 300 motor vehicles per day and sometimes these increasing magnitudes are up to 400, far more than 400,000over the same period in 2008. By the end of 2010, the number of the vehicles and cars reached more than 600,000. One of the statistics done by Guiyang Team of the National Bureau indicated: The data of July 2008 showed that for every one hundred families there were 4.33 cars; at the end of the first quarter of 2009, there were 8.67 cars per one hundred household. These show the rapid increase of the cars in recent years. In addition, Guiyang's public licenses are owned by 857,000 people up to September 2009 while the number of new drivers is only half the number of new motor vehicles. There were 870,000 people with driving licenses in the city up to March 2010.

Table 2
Guiyang City's Motorcycle Quantity in 07 Year - 09 Year

Year	The cars owned (ten thousand)	The growth rate of cars owned compared with last year	The private cars owned (ten thousand)	The growth rate of private cars owned compared with last year	The vehicles owned quantities (ten thousand)	The growth rate of vehicles owned compared with last year
2007	33.28	22.0%	16.66	26.3%	22.71	———
2008	39.40	21.3%	20.78	24.6%	27.32	20.3%
2009	48.92	24.2%	27.49	32.5%	34.61	26.7%

Sources of Date: Prepared according to "Guiyang City Statistics Bureau" website

The traffic congestion issue last a long time in Guiyang downtown. Totally, the crossroads and commerce zones are easy to be traffic congestion, such as each crossroad of Yan'an Road which cross the middle of the downtown from west to east, include Zilin'an, Fountain Pool, Baoshan Road, Dusi Road, Shachong Road, Wulichong and Huaxi Road under repaired in the downtown. The unreasonable traffic construction in the downtown resulted in the traffic pressure. As running vehicles increased day by day, the slower speed at rush hour, parking difficult, indiscriminate stop and park, violation the downtown traffic regulations and the ban of drive in the downtown make the traffic order and the traffic environment have been influenced seriously. Thus, the relevant departments and the government of Guiyang took various measures to widen roads, close parts of street corners and tear down some "roundabout "in streets, but it can't work and the traffic policeman had to deal with the traffic jam working day. The construction of infrastructure in Guiyang can not step up with the increasingly social economic development because of the narrow and small downtown. And in recent years, the increases of the vehicles, especially, the increases of the private vehicles make the contradiction between supply and demand of traffic management in Guiyang city more and more outstanding and the higher requirements of traffic control and management shall be needed in this city.

3. CONGESTION MANAGEMENT STRATEGIES IN GUIYANG

In addition to its geographical objective factors resulting in Guiyang's congestion, the reasons can be summarized as: 1. Imbalances between road infrastructure and road development of the growth in demand; 2. The structure of transportation tool is irrational; 3. The overall imbalances in urban and transportation development strategies; 4. Laggard traffic management level and the civilians' sense of transportation. From a macro perspective, the conflict between rapidly growing traffic demand and limited supply is the internal causes leading to traffic congestion; from the micro perspective, the traffic management level is not so high, the city is inability to reasonably and effectively ease the traffic flow is the direct cause of traffic congestion.

Table 3
Comparisons on the Various of Urban Communication Methods to the Using Efficiency of Land Resource

Communication methods	Index						
	Walk	By bicycle	Car	Motorcycle	Track communication	Rapid communication	Routine communication
Dynamic consumption of Spatio-temporal per capita (square meter. Hour/person)	0.167	0.833	2.094	1.389	——	0.076	0.102
Dynamic area of owned land per capita (square meter/person)	0.75	6.5	20	16	3.75	3.15	2.81

Sources of Date: The researching task group in the State Council Development Researching Center. Chinese Urbanization: Prospect, Strategy and Policy

Table 3 shows walking and general traffic, bicycle vehicles conserve area mostly, walking and bicycle vehicles and rapid communication save time and space mostly. The advantages of public transportation are big passenger volume, the number of people in per unit occupy a small area of land. Traffic apartment guide the people "to abandon using the motor vehicle and to take public transportation" through the implementation of priority development of public traffic policies, resulting in expand service capabilities while reducing traffic flow, making it an effective means to solve the traffic congestion. Rail transportation has more obvious advantages than the general traffic tools in single-channel width, capacity, delivery speed, and dynamic occupied area measured in the unit. So we should vigorously promote rapid communication and bicycle vehicles, bus priority and walk oriented development, and promote the construction and development of rail transportation. Urban road construction is limited, but management is unlimited. Alleviating difficult traveling in roads, it is the most important to dig to the management potential at the base of continuous improvement of transport facilities. In comparison to the research status at home and abroad and Guiyang's traffic situation and policies, summarized the following management measures:

1. Intensifying traffic supply management. It includes the improvement and supervision of roads infrastructure and traffic tools; reconstructing traffic vital point, passenger transportation station and large parking lot and so on related servicing facilities in city and trunk highway network in city; gradually set up and perfect road layout, like expand way area, remove some roundabout island of crossing center; build viaduct, interchange, underground driveway, walking trail and walking overpass, raise way network capacity, accessibility, and speed, and adjust the structure and layout of transportation tools reasonably; perfect kit facility of traffic in roads, improve important nodal point, environment in changing traffic tool and recreational facility in the public region of station, strengthen the service function of communication facility;

intensify construction, maintenance and supervision of the parking lot, appoint a specialized parking intendant, improve facilities to park the car, use some new parking methods to work out cars parking problems. The track communication is a kind of important mean to significantly improve the urban traffic supply capacity in city and to alleviate traffic congestion, so intensifying the management and supervision of quality and speed to build light rail loop wire in downtown is necessary. And it's important to raise public transportation control. Certain urban transportation development strategy in *Transportation Layout in Guiyang City* just is to strongly develop the public transportation in the city, developing public transportation in priority have become government's and the citizens' consensus in Guiyang. To truly embody public transportation priority, one way is to increase wire ways of buses; the second is to increase quantity of buses, improve the density of public buses in rush hour; the third is to optimize the environment of buses and bus stops, expand the service function; the last is to understand the public benefit property, give appropriate subsidies or preferential price financially, encourage citizens to take buses.

2. Improve traffic demand management(TDM). The main reason results in traffic congestion is that the transportation service price is far below the true costs, it not only led to overload road system, but also the budget deficit increase. Therefore, it is very necessary to create fair traffic price mechanism to manage an excessive demand. Adopted measures include: vehicle owned control policy, such as vehicle tax, vehicle supply in ration, parking garage approbation system and vehicle standard limits, etc. And the vehicle used controls policy, such as the road congestion charging, parking charges and license plate restrictions in traffic, and encourages taking one vehicle collectively and commute avoiding rush hour, etc. License plate restrictions in traffic means to ban certain type of vehicle license plate number passing the specified time and area, its purpose is to limit vehicle use by adopting the administrative means, thus reduce traffic flow, ease traffic congestion. To provide timely information to people in travel is an important measure of TDM as well, like through providing the accurate information concerning traffic situation on road and the information of weather conditioning in time to select traffic means and traffic time.

3. Perfect intelligent traffic system (ITS) management. Intelligent traffic system means that use technologies like advanced information, electronic communication, automatic control, computer and network effectively and comprehensively in the whole transportation management system, build comprehensive management of transportation and control system of real-time, accurate and efficient to play a role at all aspects in a large scale. Develop intelligent traffic system to adjust traffic volume status, such as via establishing and improving GPS, GIS and collecting system of traffic flow, semaphore control system and supervision system of traffic television, obtain evidence system of traffic violation (electronic police), system of monitoring on highway point methods etc. , to carry out a supervision of intelligent road traffic in network, and timely adjust and optimize signal lights in trunk road, revise perfect traffic regulations, in terms of knowing road traffic volume, to improve traffic control level and relieve urban traffic difficulties.

4. Strengthening the management of lanes and vehicles in road surface, and different departments should be cooperating in management. Working out traffic problems which in the city should intensify management of pedestrians and vehicles in each exclusive lane, regulate distribution of driving rights on various vehicles, plan rational roadway and sidewalks lanes. City traffic research institutes think that it is necessary to control the quantity of taxis reasonably and the quantity of cars which used in public affairs moderately, guide abstinent use of private cars and implement region control on motorcycles, carry out public bus priority strategy to further, Solve problems of stand situation at bus stops, give public transportation exclusive signal and lane. Too many motor vehicles in Guiyang is the main reason that results in traffic congestion. Only buses, taxis and authorized vehicles can be allowed to drive in the downtown section. Besides, implement substantial measures such as going to work and getting off work at different time for people, and set specific time into the city on foreign urban non-emergency vehicles which used in public affairs, single and double license plate number of non-public affairs passenger cars and small cars drive on alternate days, include strike' vehicles which carry passengers and occupy roads illegally" sternly, control vehicles which are banned to go to city, and which violate traffic regulations, limit using the private car as traffic mean to work and get off work, encourage taking common commuting bus collectively in group to control traffic vehicles. Construction of roads can cure appearance but cannot cure essence. So control the quantity and consumption of motor vehicles is the real management means to improve road conditions effectively. However, traffic in the city involves the correct decision-making, rational traffic planning and scientific road design, high-efficient construction and strict enforcement of the law and so on aspects, each traffic control segment of city should be collected together in a centralized management, and traffic police should appear on roads to be in charge of appeasing traffic congestion in segmentations.

5. Enhancing citizens' traffic consciousness. The traffic management is a social system engineering to alleviate urban traffic congestion effectively and practically has to depend on whole social participation and support extensively. No matter for vehicles or pedestrians, they all should drive in their own lanes and not interfere with each other. Reducing illegal phenomena on people and

vehicles should Strengthen the "road right" concept, increase publicity extent to further, strengthen citizens' traffic consciousness, punish and manage them strictly. And propagandize walking and taking public buses more with devoting the most efforts, execute "no motor vehicle day" etc. activities, advocate using less motor vehicles and more bicycles or storage battery bikes in the public area and residential area.

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