

ANALYSIS OF THE TRAFFIC PROBLEMS AND RESEARCH ON THE TRAFFIC STRATEGY IN GROUP URBAN DEVELOPMENT

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ABSTRACT

Considering the number of traffic problems in group urban development at present, such as the increase in pressure on urban roads, the decrease in vehicle speed, traffic delays, and serious traffic pollution, etc, this paper presents an integrated green traffic strategy for group urban development. The integrated green traffic strategy has four basic design characteristics, namely safety, convenience, information access and protection of the urban environment. The target of this development strategy is to provide an “efficient, safe, comfortable and clean” transportation service. It embodies the principle of “people first” in sustainable urban transportation development. Consequently, it effectively solves a variety of current traffic problems in group urban development, and it provides validity with extensive applications.

1. INTRODUCTION

Group urban configuration is described as urban areas made up of two or more relatively dependent main groups and a certain number of basic groups (Bai Yu et al, 2004). Each group with its definite space has its own centre and roadway system, combined with a comparatively convenient relation, which amounts to a city entity. The Group is regarded as an ideal urban structure, which not only is highly efficient but maintains a favourable natural environment. The so-called *Group* urban pattern indicates that a series of city areas with turning zones have been formed, as well as preliminary structure-purpose fields to a certain extent. Compared with other cities, the group city prevents traffic jams and deterioration of the environment caused by the excessive scale of cities.

However, accompanied by the growth of the urban economic society, extensive city scale and increasing population, unsolved traffic problems gradually become vitally important. New traffic problems are constantly arising, for example, the increase of pressure on urban roads, the decrease of vehicle speed, traffic delays, and serious traffic pollution, etc. This paper uses Foshan City as an example to discuss the solution to the problems by group urban development.

2. RESEARCH BACKGROUND

Foshan City is an intermediate station located in the west of the Pearl River Delta and its surroundings. From the aspect of the Guangdong provincial economical development gradient, Foshan City is a crucial city that boosts the development of the western part of Guangdong province (He Sufang et al, 2004). Foshan City will gradually become an essential pivot for areas of the Pearl River Delta to the western parts of Guangdong province and the West River basin.

The most important point is that in future Foshan, according to the pattern of a modern city, will have the structure of a group city. In other words, Foshan will have two central cities with a population of 1 000 000 and five adjacent towns with populations of 300000 to 500 000.

The present research involves the whole of Foshan City, i.e. the '2+5' group city, including two cities with a population of 2 000 000 or more: the centre group, the Daliang-Ronggui-Lunjiao group, and five other city zones populations of 500 000. These are the Shishan-Xiaotang group, Xinan group, Xijiang group, Huangqi-Yanbu-Dali-Songgang group and the Longjiang-Jiujiang-Shatou group. The overall area is 3 848.49 square kilometers. This paper researches and analyses the contemporary state and existing problem of transportation in Foshan under conditions of accelerated development of industrialisation and urbanisation, and investigates the influence on facilities, management and circulation of urban transportation caused by expansion of the city, growing population increasing private car ownership by families.

3. ANALYSIS OF THE TRAFFIC PROBLEMS OF FOSHAN

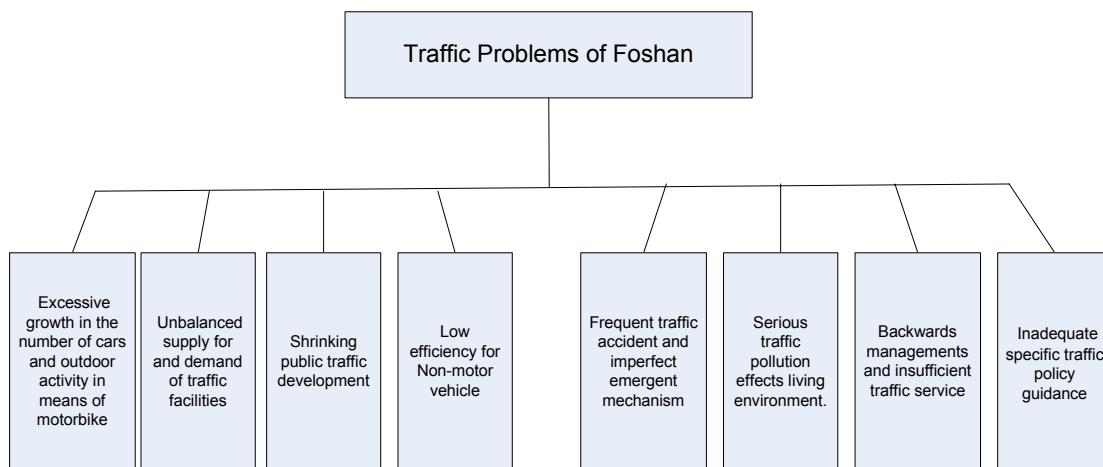


Figure 1. Foshan traffic problem analysis.

3.1 Excessive Growth in the Number of Cars and Outdoor Activity by Motorbike

The Foshan motor vehicle population has an unbalanced ratio with an enormous motorbike ownership figure of 1.246 million up to the end of 2004. In the last three years, on average it accounts for more than three-quarters of the whole city's vehicle ownership rates, and the trend is growing. Due to the great motorbike ownership figure, motorbikes are almost always within the means of people. Fewer people use the public transport system, resulting

in an underdeveloped public transport system. The percentage of Foshan civilian motorcycle trips is 40% while public transport usage is less than 4%, which is one tenth of the former. There are data showing that that 60% of traffic accidents involve motorcycles. That, to a large degree, affects the safety of road traffic, increases the difficulties of road traffic management, and increase environmental pollution.

3.2 Unbalanced Supply and Demand of Traffic Facilities

In general, there is an unbalanced supply and demand in road traffic facilities due to a lack of an integrated and rational plan. Every town was relatively independent before Foshan merged. They decided on their own plans and construction, which caused the present road network to appear structurally conflicting. A good branch road network has still not been built, so there is inadequate connection of regions and a weak transport capability. The imperfect urban road network structure and uncertain road function and transit have a negative impact on the urban traffic. Non-standard intersections accompanied by a high-density branch road, weak transport capability and a low-service-level limits the road network's function. Moreover, demand for parking facilities exceeds supply in Foshan. The lack of pedestrian ways isolated from non-motor and motor transport is a serious problem. Furthermore, unsound, incoherent and non-systemic traffic signs exist within the city. All in all, the problem in Foshan is an irrational and unsystematic road traffic facility with an unbalanced demand and supply that have resulted in constraints on urban traffic.

3.3 Shrinking Public Transport Development

The mass transportation system is extremely weak in Foshan. Because of a poor linking arrangement, insufficient public transport vehicles and irrational car design, there is no guarantee of priority for public transport, and the lowering service standards, public transport less attractive to citizens (Hu Qinyong et al, 2003). The relatively high ownership of motorbikes with no limitations and restriction allows people to take use motorbike for outings. As a result, the traffic system is very irrational.

3.4 Low Efficiency of Non-Motorised Vehicles

Generally, there is a downward trend in the use of bicycles and public transport whilst motorbikes have become the mainstream transport. Motorbikes have replaced bicycles, which are now the main means of trips. Firstly, there has been a significant fall in the proportion of bicycles, which is dropping continually. Secondly, fewer cars and even non-motorised vehicles are being driven on non-motor roads. The small number of non-motorised vehicles in the section causes less interruption to motor vehicles in intersections. However, a great many motorbikes are bringing new challenges to urban traffic, e.g. it is very difficult to find a parking place, etc.

3.5 Frequent Traffic Accidents and Imperfect Emergency Service

Along with the development of the motor vehicle industry, there has been a great increase in the number of cars. Poor ratios of vehicles to roads and irrational management has resulted in frequent accidents and a growing number of fatalities. According to a survey of the traffic accidents, there were 9 499 accidents in Foshan in 2004, in which 934 people died.

3.6 Serious Traffic Pollution Affects the Living Environment

According to data from the Environmental Protection Bureau, Foshan's environmental noise is equal to the fourth standard. In some sections the noise even exceeds this figure. The main reason, however, is the traffic congestions, especially motorbikes (Mo Shixiang, 2004). There are 87 inspectors in the functioning areas. The pass rate is 64.4%. Concerning variations over the past few years, noise of the third standard drops below the standard value on average, without noticeable upward or downward trends. In the first standard, excessive noise is found in the daytime, but is basically within the standard value at night. As for the fourth standard, it has in recent times been exceeded all year round. Although there has been a decreasing tendency, far greater efforts should be made to achieve standard levels. Owing to much night traffic in heavily trafficked areas, there is no great difference in noise at night and during the day. The standard of urban air quality influences not only living standards, therefore environmental investment and sustainable development are required.

Statistics indicates that motor vehicle exhausts make a great contribution to air pollution as motor transport, particularly motorbikes, increase. For example, the ratio of fixed pollution sources to motor vehicles for the three main exhaust gases are CO 67% to 33%, NO_x 86% to 14% and HC 22% to 78% respectively. After 1996, ratio changed to CO 39% to 61%, NO_x 76% to 24%, HC 11% to 89%. As can be seen, pollution from vehicles has already overtaken fixed pollution sources, and the former has replaced the latter as the primary pollution source. As a result, improving control is being emphasised by all levels of government in terms of air quality and noise pollution, for which motorbikes are responsible for 90% and 70% respectively.

3.7 Backwards Management and Inadequate Traffic Service

Chan District has the disadvantages of high density and a weak transport capacity at intersections, most of which use single-point control. Unsound traffic management, less attention to traffic education for citizens, and oversized bureaucracy are regarded as the main sources of the bad traffic situation in Foshan. The greatest problem is poor compliance with traffic rules and passive obedience. In addition, weak management by the relevant departments is evident. Action needs to be taken to cope with all these problems.

Foshan's present traffic information scarcity has led to backwards traffic management. This is extremely inappropriate as Guangdong province's third biggest city. Traffic jams always occurs when there is construction work due to the huge number of motorbikes and cars along with inadequate narrow roads. Apart from the methods of improving traffic conditions e.g. widening and extending roads, it is important for drivers to pay attention to the traffic conditions. In particular, there are terrible traffic obstacles at peak times when people rush to work. Drivers in a hurry tend to overtake, and this leads to frequent accidents. Drivers at the back who do not know what has happened at the front will follow the line of vehicles, so that the long line of cars is delayed which can not change their route.

3.8 Inadequate Traffic Policy Guidelines

As the Foshan urban group is still forming, numerous plans are being made. However, there is no uniform idea. The traffic department and roads departments make independent decisions. Therefore a scientific integrated developed scheme has still not yet been produced. Nowadays traffic management has been taken over by a combination of police, construction, transportation and public services, etc. and they lack a lead group to harmonise the departments' activities and deal assume overall responsibility.

4. FOSHAN'S INTEGRATED GREEN TRAFFIC DEVELOPMENT SCHEME

4.1 Integrated Traffic Development Scheme

Integrated traffic has the basic characteristics of humanity, convenience, information and ecology (Yi Zheng, 2004). Humanity means to satisfy people's needs for transport. Convenience means faster and higher-capacity public transport as the main transport. Information implies wide application of traffic information technology. Ecology refers to creating suitable traffic space for people.

An integrated traffic scheme aims at providing "unimpeded, safe, comfortable and clean" traffic service. "Unimpeded" means to allow people to choose the simplest manner to make a trip. Most trips can be done within one hour. "Safe" emphasises lowering the accident rate to 0.5%. "Comfortable" refers to a flexible and good transport service. "Clean" implies the reduction of traffic pollution should be cut down to 35 thousand tons.

4.2 Green Traffic Development Scheme

"Green traffic" is a systematic project concerning every key link in transportation from vehicles, roads (facilities), traffic environment and traffic organisations to the whole social system. We suggest the traffic system can be improved with "eco-friendly, healthy, safety, efficient" acts in the construction of "green traffic". "Green traffic", to a larger extent, gives consumers safety, comfort and a pleasant environment.

"Green traffic" is a new concept and a practical goal. In general, "green traffic" reduces traffic congestion, lowers traffic pollution, increases social equality and switches to eco-friendly beneficial multi-transport facilities. The aim is to achieve urban traffic convenience and order, comfort and safety, low energy consumption and low traffic pollution. It can be thought as a modern traffic concept today where sustainable development has become the mainstream worldwide. "Green traffic" is replacing the traditional traffic concept. The aspects discussed below explain the "green traffic" concept.

4.2.1 Prediction and analysis of scientific traffic

Traffic macro prediction aims to predict and analyse future traffic space arrangements in Foshan. Simultaneously, it lays a foundation for following prediction and analysis, which is one of the key preconditions to guarantee sustainable development and long-term achievement of green traffic. Urban traffic programming uses the green traffic concept. Traffic prediction is based on a great quantity of accurate integrated survey information and uses scientifically sound traffic modes to predict traffic flow and development. In the forecast of the road network demand and supply, one considers road network loading abilities, environment tolerance capacity, and limitation of space utilisation to ensure the rational arrangement and scale of the city centre road network in the Foshan group.

4.2.2 Rationally confirm passenger transport structure

Passenger transport development involves three main issues:

- (1) cars, especially private cars
- (2) bicycle development
- (3) general public and railway traffic.

According to the priority of freedom from pollution in green traffic systems, this can be ranked as walking, cycling, use of public traffic, shared transport, taxis, private vehicles, trucks, air transport and motorcycles. The total prediction for each kind of transport and its ranking order, one must consider efficiency, justice, cooperation, etc. taking account of the national economy and macro objectives.

4.2.3 Plan for each single item of transport development stratagem

So as to transform passenger transport into a rational structure, we plan each traffic stratagem and policy item, which not only organically connects and reciprocally cooperates, but is relatively independent. The green traffic concept runs through it as the main theme.

(1) Passengers transport development strategy

Passenger transport development aims at using the high-speed railway as the backbone and to achieve cooperative development in various types of passenger transport. The aim is to construct a passenger transport network system with a rational structure. In order to achieve the development goal, the strategy generally includes:

1. Building public transport guidance with road network programming and construction, completing a public network arrangement and structure to improve public network density, developing a public transport operational environment by applying a public-first strategy and guaranteed policy.
2. Employing general control of urban public transport by constructing a modern urban transport governing, control, and integrated traffic information system.

(2) Bicycle development strategy

Nowadays, bicycles play a major role in Foshan passenger transport, which decreases urban general trip efficiency to a certain extent. How to transfer from bicycle transport to public transport is the key to realising urban green traffic. The main strategy says that bicycles should be prohibited in traffic on main roads. Bicycle traffic is advocated in branch roads serving certain areas. A “bike-bus-bike” system should be implemented to link public transport. A combination of transport is our ideal green traffic.

(1) Car development strategy

Foshan has already entered a “private car guideline” period. From now to around 2010, according to relevant national policy and Foshan's actual situation, cars are limited to families. After 2010, it will adopt the measure of ‘no limitation on car possession and use’ →‘no limitation on car possession but limitation on use’ →‘limitation on car possession and use’. The above policy does not restrict road capacity (dynamic capacity) and parking

facility capacity (static capacity) for cars in use and the purchase and possession of cars. Private car speed should be limited on urban roads and parking management should be subject to effective inspection and guidelines. A policy guide to the purchase and use of private cars should be developed.

5. CONCLUSIONS

Urban group development is aimed at avoiding blind urban extension. It is a system of ordered structure, supplementary function, optimised integration and shared construction that allows harmonisation of different city mode levels horizontally and vertically. It supports and enhances development upgrade of industrial areas to achieve the outcome that "(1+1)>2". Group city functional space lowers development costs and increases creative ability. However, extending the city group space leads to increased distances between cities. In this case, it is necessary to construct high-speed access and networks. The idea of an "integrated green traffic" strategy is an sustainable urban development traffic system with 'human priority', and is proposed for the present Group city which is facing various traffic situations.

6. REFERENCES

- [1] Bai Yu, Wu Jing, Zhu Tan, 2004. Theories and Practices on Strategic Environmental Assessment of Urban Transportation Plan in the Euramerican Countries. *Traffic Ecology*, 1 p.40.
- [2] He Sufang, Huang Weixiong, Li Fan, 2004. A study on spatial framework of an urban system in Foshan. *Journal of Foshan University*, 2 p.45.
- [3] Hu Qinyong, Zhong Tianlei, Zhao Yumin, 2003. Enlargement of new urban development space for Lanzhou. *Journal of Gansu University of Technology*, 4 p.115.
- [4] Mo Shixiang, 2004. On the Pearl River Delta Strategies and the Integration of Cities in the Region. *Journal of Shenzhen University*, 3 p.5.
- [5] Yi Zheng, 2004. The Evolution and Development of Clusters of Urban Structure of Chongqing. *Planners*, 9 p.33.