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## Urban Transportation Countermeasures During the Recovery Period of the COVID-19 Pandemic in Wuhan

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**Abstract:** Wuhan began to resume its urban transportation service gradually at the end of March 2020 two months after its lockdown caused by the COVID-19 outbreak. Looking back at what happened during this special time period in Wuhan and analyzing the characteristics of traffic operation in other Chinese cities that have resumed normal functions, this paper predicts that Wuhan will experience a decline in public transit and a rise in car travel during the recovery period, which will impose a greater pressure on urban roadway network and parking. The paper proposes the countermeasures in terms of supply, demand, and dynamic and static management of urban transportation, which can be referenced by the traffic management and policy making in Wuhan during this special time period. **DOI:** 10.13813/j.cn11-5141/u.2020.0022-en

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In January 2020, the outbreak of Coronavirus Disease (hereinafter referred to as COVID-19) occurred in Wuhan Province of China. As an unprecedented approach to prevent the spread of the COVID-19, the city lockdown basically shut down Wuhan's urban traffic. After the fight against the pandemic for nearly two months, Wuhan achieved a progressive success at the end of March 2020. The city lockdown was lifted and the resumption of business progressed quickly, which were based on the recovery of urban traffic. How to maintain a stable and smooth "circulatory system" of the city has become an important issue for city managers to address.

### 1 Urban traffic operation during the post-pandemic recovery

An outlook across China has suggested a wide range of characteristics in urban dynamic and static traffic during the recovery period, given the impacts from the COVID-19 pandemic. All major cities in China, except for Wuhan, started resumption in mid-February 2020. Statistics from local government authorities indicated that, by the end of February 2020, the resumption rate of large-scale enterprises in Shanghai, Jiangsu, Zhejiang, Fujian, Liaoning, Jiangxi, Guangdong, and other places had exceeded 70% [2]. However, in contrast to the rate of resumption, the use of urban public transportation only recovered to 20% of the level during the same period of last year (Fig. 1).

Urban traffic volume of roadways has shown a faster recovery. For example, after the first week of resumption in Shenzhen, roadway traffic volume reached 38.6% of the normal level for the same period before the pandemic [3]; Shanghai's roadway traffic volume recovered to nearly the normal level in the fourth week after resumption [4]; in Changsha, during the fourth week of resumption, the traffic volume during the morning rush hour had reached 97.3% of the peak value in January [5].

### 2 Problems of urban traffic in Wuhan

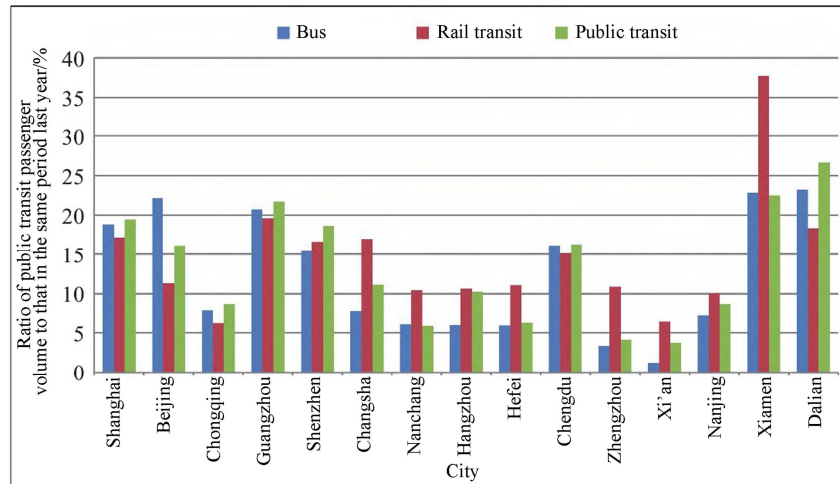
Based on the observations of traffic operation from other cities, it is anticipated that urban traffic in Wuhan has been facing the following challenges and issues during the early stage of balancing pandemic control and business resumption:

1) In the short term, the service capacity and passenger volume of public transportation have substantial reduction.

Many factors, such as prevention and control measures, transportation capacity change, and pandemic cautiousness of residents, have contributed to a significantly dropped service share from public transportation. Given the severity of the early pandemic in Wuhan, the volume of public transit riders could decrease by approximately 70% in the early period of resumption. Also, it would take longer time for public transportation service in Wuhan to recover to its normal pre-pandemic level.

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**Fig. 1** Public transit passenger volumes in major cities in China in Feb. 2020

Source: Reference [1].

2) With the significantly increased use of passenger cars, urban roadway operation bears great pressure.

Due to the limited service of public transit and people's being cautious for pandemic control, substantial use of passenger cars is expected. Observations from other cities have indicated that roadway traffic volume typically approached to the pre-pandemic level within 3 to 4 weeks after the resumption. With the possible continuous growth of traffic, road traffic facilities in Wuhan could experience huge challenges.

3) Issues of parking near residential and reopened business areas become significant.

The reduction of public transportation with growth of passenger cars will inevitably lead to a sharp increase in parking demand. In a short term, this demand can hardly be met, especially around the business resumption areas. Lack of traffic organization due to parking violations may also result in additional pressure on roadway traffic.

4) With the increased application of shared bicycles and electric bicycles, the management of traffic safety needs special attention.

As the weather is getting warmer before the end of the pandemic, short-distance commute trips using shared bicycles, e-bikes, and other transportation modes will continue to rise. With the growth of using passenger cars and worsening traffic congestion at the same time, the risk of traffic accidents in the operation of roadway system may rise.

### 3 General principles to address urban traffic issues

After the pandemic, people's confidence in safe travel as well as reopened industries need time to recovery. To address the challenges during recovery, on the one hand, government agencies need to properly implement and adjust traffic

management strategies in a timely manner; on the other hand, public's and industries' understanding, tolerance, and cooperation are also needed. Therefore, developing transportation strategies within such a special period should follow several principles:

1) Match supply and demand to ensure that the growth of travel demand during resumption meets the recovery scale of the transportation capacity.

2) Balance high- and low-occupancy vehicles travel to support both public transportation and passenger car traffic.

3) Coordinate pandemic prevention and traffic operation to efficiently maintain the urban traffic organization.

4) Address both dynamic and static traffic to avoid unbalance in traffic management.

## 4 Specific strategies and measures

### 4.1 Classified and customized travel supply strategy

Addressing commute traffic demand is the first priority for resumption of business after the pandemic. Policies that support customized and privatized travel supply should be developed to ensure the transition to normal traffic conditions, given the progress of pandemic prevention and improvement of public transportation capacity. Classified and customized travel supply strategy needs to be developed based on enterprise types and commute travel distance.

1) Meeting commute traffic demand of front-line manufacturing enterprises should be the focus, including coordination and arrangement of bus transit and taxis (online car hailing) service capacity. For long-distance commute trips, customized commute transit or shuttle bus, as well as "one enterprise, one policy" with point-to-point service can be considered to meet specific needs of manufacturing enterprises.

2) Ride-sharing in routine commute among colleagues and neighbors should be encouraged. Relying on residential street communities and using the Wechat platforms established during the pandemic for transportation and group purchase is an effective strategy to exchange ride-sharing information and support effective and safe ride-sharing.

3) It is also needed to enforce the disinfection of shared and public bicycles and encourage people to use bicycles for short-distance commute.

#### **4.2 Demand management strategy with proper control**

During the recovery period from the pandemic, uncontrolled mass gathering should be avoided as much as possible. Meeting basic travel needs for daily business and life should be given priorities. Reducing the frequency and scale of peak traffic through shift work hours can be useful to properly control the growth of travel demand.

1) If critical business or certain critical positions in enterprises can offer online work options, this remote working mode should be recommended for employees.

2) The implementation of online public services should be promoted.

3) Large enterprise parks and centralized public service centers are encouraged to adopt shift work hours and offer other shift services. If appropriate, enterprises can explore approaches such as shift work hours and two-day weekend shift to reduce people gathering.

4) After meeting the needs for supporting pandemic prevention, public transportation should adjust service capacity by phase to respond to the changing passenger flow. At the same time, public awareness should be strengthened and transit crowdedness should be reduced when meeting the rigid travel demand.

#### **4.3 Scientific and organized parking strategy**

In the principle of ensuring existing parking capacity, supplying additional parking, reducing fees, limiting contact, and strengthening prevention, parking strategies should be developed to ensure parking availability, streamline fee charging procedures, improve management, and sustainably coordinate parking and pandemic prevention.

1) Adding temporary parking spots can help balance parking supply and demand. Without affecting normal roadway traffic, temporary parking spots can be added to the regional secondary and branch roads with large parking demand and insufficient supply. The traffic enforcement agencies should effectively communicate with the public regarding road sections and traffic signs of temporary parking to guide vehicles in organized parking. The temporarily added parking lots can be either managed by local government agencies or proposed by reopened enterprises and approved by traffic enforcement agencies; these temporary parking spots are used for the reopened enterprises and can be removed after the pandemic.

2) Opening the existing parking lots in an orderly manner

can effectively support parking supply. Given that schools in Wuhan reopened later than those in other cities, education departments can coordinate with the schools to open parking spots to the surrounding reopened enterprises. This approach can be used in certain areas where parking is available. Disinfection measures can be implemented, and no negative healthy impacts are expected on students and staff. Business enterprises such as shopping malls, restaurants, and theaters should be encouraged to open parking to the surrounding areas before their own resumption. Also, the enterprises or agencies that cannot open yet during the pandemic can offer their parking spots to address the parking shortage issue during the transition period.

3) Reducing or waiving parking fees is needed during the pandemic prevention and control. Local governments can provide private parking facilities with appropriate subsidies, so that they can afford opening to public with low or free of charge. Wuhan suspended the roadway parking charges, which contributed to the pandemic control. In the recovery phase, communicating with the public to extend the parking polices for certain time is suggested as a good approach. Based on assessment of public transit growth, charging parking fees can be implemented again through online payment to ensure public safety before the pandemic concern is completely addressed.

4) Improving technology and information-based management of parking is important to facilitate pandemic prevention and control. It should be encouraged for parking facilities to adopt barrier-free, automatic, and smart parking management technology, which can reduce contact between vehicle owners and parking facility managers.

#### **4.4 Flexible and efficient emergency management strategy**

Given the special needs of emergency transportation and material logistics during the pandemic, traffic management should maintain flexibility and appropriately adopt special strategies.

1) One strategy is to implement differentiated traffic management measures. Based on pandemic risk levels and distribution of reopened enterprises, freight transportation and traffic enforcement in key areas should be coordinated. Green channels and flexible traffic enforcement can be properly implemented. Meanwhile, prevention approaches are needed in business resumption to address illegal transportation operations and truck overloading.

2) When optimizing traffic signal timing, management agencies should pay special attention to arrange refined roadway service. Recognizing the decreased activities from pedestrians, private vehicles, and non-automobiles, traffic signal timing should be adjusted in a timely manner to adapt to traffic flow and improve efficiency. In addition, managing and streamlining intersections and roadways with large traffic flow should be strengthened with the consideration of surrounding reopened enterprises.

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