Leading Xi'an's Urban Development: Challenges and Suggestions for Xi'an's Urban Infrastructures

Ayuan Zhang[1,2,a*], Zurinawati Mohi[2,b], Mohd Hafiz Hanafiah[3,c], Hafizah Che Hassan[2,d]

[1]Henan Institute of Technology, Xinxiang, 453003, Henan
[2]Lincoln University College, Kuala Lumpur, Malaysia
[3]Universiti Teknologi MARA, Selangor 42300, Malaysia

[a*]ayuan@lincoln.edu.my; [b]zurin979@gmail.com
[c]hafizhanafiah@uitm.edu.my; [d]dvc@lincoln.edu.my

Abstract. Xi'an, the starting point of the "Silk Road", is one of the most popular tourist destinations in China with the world famous Qin Terracotta Army, Han and Tang Dynasty tombs and other cultural relics. In 2008, there were 32.3 million tourists to Xi'an. Xi'an has experienced rapid growth in recent years. However, the rapid urbanization has also put great pressure on its infrastructure. Transport demand, in particular, has grown much faster than economic growth.

Keywords: Xi'an; ancient civilization; city image, Urban infrastructure

1 Introduction

Xi'an transcends its economic role by boasting a rich cultural heritage that spans centuries. As the starting point of the Silk Road, this ancient city occupies a special place in history. The Silk Road was more than a trade route; it was a bridge that connected East and West, facilitating the exchange of goods, ideas, and cultures. Xi'an's historical significance shines through its well-preserved relics, including the Terracotta Army, ancient city walls, and numerous temples and pagodas [1].

Professor J.D. Hunt's (1971) doctoral thesis: 'Image - a factor in tourism development', which discussed the significance of the image factor in the development of tourist destinations and led to the study of the image of tourist cities [2]. In response to the challenges of a slowing economy and a changing demographic landscape, China embarked on a path of economic diversification. Xi'an, with its strategic location and robust infrastructure, serves as a prime example of this transformation. However, the rapid urbanization has also put great pressure on its infrastructure.

1.1 Background of Xi'an

Xi'an is one of China's historically rich cities, currently facing challenges due to rapid urbanization. With population growth and economic development, issues such as

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traffic congestion, water resource management, and environmental pollution have become pressing concerns. As the capital of Shaanxi Province, Xi'an grapples with the challenge of balancing the preservation of its historical and cultural heritage with the demands of modern development. To address these challenges, comprehensive and effective measures are necessary in urban planning and infrastructure development.

Meantime Xi'an is a transport and logistics hub for the western PRC. The city is located at major highway and railway junctions. Around this transport hub, the city has developed into an important industrial and commercial center with many high-tech industries including electronics, machinery, pharmaceuticals, and service sector industries such as information technology, finance, and insurance.

2 Major factors affecting urban development in Xi'an

2.1 Environmental Pollution Problems

Due to the industrialization and urbanization processes, Xi'an is experiencing severe air pollution issues. Air quality has declined as a result of industrial pollutants, traffic exhaust, and other causes, endangering the health of locals. In actuality, Xi'an's pollution is also influenced by its topography. Although Xi'an is a plain, it actually resembles a basin. In winter, the cold air mixes with pollutants and sinks; additionally, because of the Loess Plateau to the north and the Qinling Mountains to the south, it is difficult for the pollutants to dissipate. This is one of the reasons why there is more haze in the winter.

2.2 Traffic Congestion

Xi'an currently grapples with significant urban traffic congestion issues. The rapid increase in population and the surge in the number of vehicles contribute to gridlock on roads. The existing transportation infrastructure faces challenges in handling the growing demand, leading to prolonged commuting times, increased air pollution, and a strain on overall urban mobility. Addressing these traffic congestion problems requires strategic planning and investment in efficient and sustainable transportation solutions. Although Xi'an is a sizable city, its transportation infrastructure is outdated, which contributes to severe traffic congestion. Traffic jams are frequently caused by narrow roads and high traffic volume, which is bad for people's quality of life and ability to move. Particularly certain well-known tourist destinations, including the Great Tang Nocturnal City, snack street, etc., are so packed that locals cannot exit the building.

2.3 Urban Planning Issues

There are several metropolitan districts with very haphazard layout, an aging historic city center, and narrow highways. When compared to the rest of the city, Qujiang and

Gaoxin appear to be two distinct planets. Xi'an faces urban planning challenges stemming from the need to balance historical preservation and modern development. The city's rich cultural heritage requires careful consideration in urban planning to avoid compromising its historical identity. Rapid urbanization has led to issues such as haphazard construction, inadequate green spaces, and the potential loss of historical sites. A comprehensive and sustainable urban planning approach is essential to harmonize the city's growth with the preservation of its.

2.4 Inadequate social service facilities

Xi'an faces a shortage of social service facilities, unable to keep up with the demands of its growing urban population. In areas such as healthcare, education, and social welfare, there is a noticeable deficiency, making it challenging for residents to access essential services. Unequal distribution of medical resources, limited school seats, and insufficient coverage of social welfare create inconveniences for the community. Addressing this issue requires enhanced construction of social service facilities and an improvement in service quality. The government should increase investment, enhance the public service system, ensuring that residents can conveniently and efficiently access social services.

2.5 Transport demand

Xi'an, the starting point of the “Silk Road”, is one of the most popular tourist destinations in China with the world famous Qin Terracotta Army, Han and Tang Dynasty tombs and other cultural relics. In 2008, there were 32.3 million tourists to Xi’an. Xi’an has experienced rapid growth in recent years. However, the rapid urbanization has also put great pressure on its infrastructure. Transport demand, in particular, has grown much faster than economic growth.

2.6 Road Improvements

There are 30km of urban roadway at six key locations and one elevated viaduct to complete missing links in the city’s master planned road network. These missing links mainly connect to the third ring road which was partly financed by ADB. The Project also includes four flyover viaducts about 3km in length: two along the second ring road and two along the third ring road to remove traffic bottlenecks.

3 Future Urban Priorities in Xi'an

Fabio Cassia, Vania Vigolo, Marta Maria Ugolini, Rossella Baratta explored city image in 2018, analysing it mainly in terms of the different perceptions that residents and tourists have of the city's image, in their published research 'Exploring city image: residents' versus tourists' perceptions' it was written that the definition of city image needs to meet the needs of the overall development of the city. residents' versus tour-

ists' perceptions", they wrote that the definition of city image needs to meet the overall development needs of the city [3].

3.1 Road Improvements

The Project will improve about 30km of urban roadway at six key locations and one elevated viaduct to complete missing links in the city's master planned road network. These improvements will increase connectivity to the third ring road, provide new access roads to key urban development zones, and expand the capacity of the urban road network generally [4]. These improvements will increase connectivity to the third ring road, provide new access roads to key urban development zones, and expand the capacity of the urban road network generally.

3.2 Intelligent transport system (ITS) and road user safety

program

Responding to the rapidly growing demand for road transport, the PRC Government wishes to increase the capacity and efficiency of road networks by utilizing newly available technology. The Xi'an Municipal Government has installed about 150 CCTVs, 20 variable message signs, and 300 auto police cameras. The Project will strengthen Traffic monitoring and management systems (TMMS) by expanding these systems and improving their capabilities. The system architecture for TISS, TMMS, parking information systems and traffic survey functions will be established.

3.3 Pedestrian Mobility and Safety

The Project will identify and upgrade over 100 pedestrian crossings at major intersections and key mid-block crossing locations citywide. The locations and specific physical upgrades will be determined in a detailed pedestrian mobility and safety study to be.

3.4 Traffic Demand Management

The World Bank (WB) will implement a TDM study on parking management, congestion charges and traffic calming zones through the Global Environment Facility. The study will be completed next year. The results of the study need to be considered in designing the scope of this Project. Besides parking management and congestion charging, park & ride and ride & bike schemes are other popular TDM tools. Park & ride systems improve vehicle/bicycle access to the new subway stations by providing adjacent areas to leave a vehicle/bicycle before riding the subway. A ride & bike system would establish bicycle sharing at major stations to expand the number of destinations accessible to subway riders. The Project is expected to include park & ride and ride & bike schemes that will reduce traffic congestion and promote energy efficiency and reduce CO2 emissions by increasing the share of traffic on public

transport. An additional benefit of the schemes is that they increase the revenue of bus and subway operations by shifting travelers from vehicles to public transport, reducing the subsidies needed from government agencies. The Project will introduce park & ride and ride & bike schemes at several subway stations and bus terminals, and will improve subway station areas.

3.5 Environmental Protection enhancement

The Project will enhance the capacity of the government to collect, analyze, and disseminate emissions and air quality data to policy makers and the public by establishing a vehicle emissions information system, expand the emissions testing and monitoring efforts to buses, trucks and other large fleet vehicles, expand the transport pollution monitoring system, and enhance the ability of the Xi'an Municipal Government to enforce emissions standards through the procurement and utilization of mobile testing vehicles. The Project will also construct new CNG fueling stations in strategic locations to facilitate the efficient access of buses and taxis to CNG [7].

During the PPTA, ADB intends to maintain the flexibility to change or improve the proposed project components as the results of ongoing studies (WB project/feasibility studies), policy dialogue, and other new information becomes available [8].

3.6 Road network improvements

Output 1 will construct and/or rehabilitate 12.92 kilometers (km) of urban roads along Keji 2nd Road (6.2 km), Kunming Road (4.39 km), and Dazhai West Road (2.33 km) in the southwest part of the city. These roads will include 21.57 km of bus priority corridors, 21.57 km of non-motorized transport lanes, and a 4.2 km linear green park along Kunming Road[5]. This output will also include six urban interchanges of suitable sizes and configurations at current critical bottlenecks on the road network. They will provide sufficient access to the new urban growth centers between ring roads 2 and 3. The bus priority corridors will include lanes for the exclusive use of buses, traffic signals that give priority to bus transit, station improvements, and traffic management measures. They will significantly improve travel conditions for bus passengers. The roads will include facilities for cyclists and pedestrians as part of the project's aim to have street design and traffic operations cater to all road users. The road network improvements will provide better links to the Second and Third ring roads, making them more functional, and improve road connections between the city's new growth poles, the commercial business area in the southwest, and the government offices to the north[9].

4 Concluding

In conclusion, China, with its vast territory, profound history, and ongoing transformation, occupies a unique and influential position on the global stage. The management of its substantial population, the transition to a more sustainable economic

growth model, and the preservation of its cultural heritage are pivotal to its continued success. Xi'an, as both a historical treasure trove and a modern economic hub, encapsulates China's ability to adapt and thrive in a dynamic world.

As China forges ahead into the future, the lessons of its past and the challenges of the present guide its path. Its rich cultural legacy, remarkable technological achievements, global engagement, and commitment to environmental sustainability underscore the nation's resilience and enduring significance. China's story is far from complete, and the world continues to watch in anticipation of the next chapter in this remarkable journey.

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