CASE STUDY
An Integrated Urban Transport Solution for a Rapidly Growing City

Overview

An Asian Development Bank-funded project in the People’s Republic of China (PRC) demonstrated a comprehensive urban transport solution for a growing metropolis by providing better-connected road networks, well-equipped nonmotorized transport facilities, an intelligent transport system, an effective vehicle emission monitoring and control system, and road safety education. The pilot project helped deliver more efficient, safer, and greener transport services to the nearly 13 million residents of Xi’an city in Shaanxi province.
Project snapshot

| Dates          | 08 Nov 2011: Approval Date  
|               | 08 Feb 2021: Closing Date   |
| Cost          | $558.06 million: Total Project Cost |
| Institutions and Stakeholders | Financing  
|               | Asian Development Bank: $150 million  
|               | Government fund: $408.06 million |
| Executing agency | Xi’an Municipal Urban & Rural Construction Commission |

Context

Xi’an, the capital of Shaanxi Province, is expanding and developing rapidly, and it has become the most important growth pole in the northwestern region of the PRC. From 2011 to 2020, the city population grew 50% from 8.5 million, while the number of registered motor vehicles more than doubled to 3.7 million from 1.4 million.

Challenge

Rapid economic and population growth have led to overcrowding in the historic walled city. There is increased demand for new offices, commercial space, and social infrastructure in the area between the Second Ring Road and the Third Ring Road on the city’s periphery. The change in traffic patterns and surging transport requirements combined with limited connectivity created bottlenecks that could constrain economic growth and development.

The city’s traffic control center primarily covered areas inside the Second Ring Road and lacks equipment in the new areas of urban growth. This resulted in poor system management, policing and enforcement issues, conflict between vehicles and pedestrians, and a system that failed to give proper priority to public transport and emergency vehicles.

A lack of suitable equipment, capacity, and enforcement also left Xi’an struggling to regulate vehicle standards, driver behavior, and emissions in the face of mounting traffic congestion.

Weak interagency coordination compounded the city’s transport woes. It also contributed to the lack of integration between various modes of travel, especially between public transport and nonmotorized...
modes used by the poor, who walk or use bicycles for most of their trips.

In addition, the involuntary resettlement impact of the project was significant. Over 230,000 square meter (m²) residential and commercial buildings had to be demolished to give way to road network improvements and multimodal interchanges. About 1,000 residents and over 8,500 employees of 25 enterprises were affected.

Solution

The Xi'an Urban Road Network Improvement Project was designed in close consultation with transport authorities to provide a sustainable and integrated solution to urban transport problems. Efforts focused on improving road network efficiency and road safety, fostering multimodal transport, and bringing in intelligent technologies in traffic management and vehicle emission control.

Improve the operational efficiency of the road network

The project provided three missing road links with a total length of 8 kilometers between the Second Ring Road and the Third Ring Road and improved the connection of the arterial road network. It also rehabilitated five interchanges along with about 17 km of bus priority lanes and 16 km of nonmotorized lanes. This improved the efficiency of the transport system for all road users in the city.

Enhance road safety, particularly for pedestrians

The project rehabilitated 125 intersections or mid-blocks, including upgrading pedestrian traffic signals, markings, and signage. A road safety education program was conducted for more than 94,000 people, including students, residents, couriers, and drivers. In addition, the project provided 436,000 reflective stickers to nonmotorized road users and established a coordination mechanism between schools and traffic police on traffic safety education in the vicinity of schools.

Foster multimodal transport and upgrade bus service

Three bus hubs were developed, and 100 electric buses were purchased and services were improved to promote public transit. To address parking space shortages, four automatic multi-level parking lots, including one in the North Railway Station bus hub and one underground parking lot were built.

Improve the effectiveness of traffic management

The project installed intelligent transport system equipment, including variable message signs, microwave detectors, close circuit televisions, red light running cameras, and speed violation cameras. It also incorporated new technology, such as green wave traffic controls, which synchronize traffic lights on the busiest streets to allow vehicles to drive through a sequence of green traffic lights.
Enhance vehicle monitoring and law enforcement

Vehicle emission detecting systems, air quality and noise monitoring devices, and control centers were established, and law enforcement vehicles were deployed. These measures were supported by the development of a coordination mechanism between environmental authorities and traffic police on vehicle emissions control.

Coordinate implementation of resettlement activities

A special task force for land acquisition and resettlement implementation was established at the early stage of the project implementation. It consisted of 77 officials from municipal governments and the concerned district governments. The resettlement task force worked closely with subdistrict offices and affected villages engaged in resettlement activities. Regular meetings and close coordination at all levels ensured successful implementation of resettlement efforts.

Results

The project demonstrated sustainable urban transport solutions not only for other large cities in the PRC but also for the region. It reduced traffic congestion and accidents as well as vehicle emissions.

More efficient urban transport

The effective implementation of the project reduced traffic congestion. The average vehicle speed reached 27.1 km/hour at the project corridors, compared to only 14.5 km/hour before the project. Designating bus priority corridors also increased average speed to 25.4 km/hour from 14.0 km/hour.

A safer urban transport system, particularly for pedestrians

At project completion, the annual traffic accident rate dropped by 48% to about eight cases per 10,000 vehicles in 2019 from the 2011 baseline of 15.7. Moreover, the annual fatality rate in traffic accidents was reduced to 1 person per 10,000 vehicles in 2019 from the 2011 baseline of 3.7. Overall, the concept of giving pedestrians priority gained prominence and wider understanding after the implementation of the project.

Lower vehicle emissions

The annual average nitrogen oxide emission dropped by 59.3% to about 116 tons per 10,000 vehicles in 2019 from the 2011 baseline of 287.2. The passing rate of fix-spot vehicle emission tests was above 95%, and that of random on-road tests was 94.3% in 2019, above the 80% target.

Better and greener bus system and transferring services

The project supported 40 new bus routes after the construction of three bus hubs and the provision of 100 new electric buses that strengthened the efficiency of a more environmentally friendly public transportation system. City residents, particularly those living in peripheral areas, have substantially
benefited from the project.

Minimized resettlement impact

A total of 117,925 m$^2$ residential house were demolished, 3.6% less than 122,354 m$^2$ in the updated resettlement plans (URPs). A total of 114,900 m$^2$ enterprise buildings were demolished, 8.6% more than 105,828 m$^2$ in URPs. Consequently, 999 residents and 8,549 employees were affected during project implementation, decreased by 22% and increased by 24% than those in the URPs, respectively. The average growth in per capita net income of the affected households increased by 38.1% from 2013 to 2020, higher than the average growth in Xi’an.

Lessons

It is important to carefully plan for potential difficulties in land acquisitions and demolitions when projects target urbanized central or peripheral areas of densely populated cities. Through due diligence during project preparation with a focus on on-ground and underground structures, including housing property rights, land ownership and pipes networks are essential for the timely delivery of the project’s development impact.

Despite its modest budget ($300,000), the success and outreach of the road safety education program showed that important social impacts can be achieved even with limited resources if designed and implemented wisely. Education programs have the potential to trigger similar campaigns in other areas of the city. For instance, following ADB’s successful pilot, traffic police conducted additional education programs that significantly contributed to the improvement of road safety in Xi’an. This experience also highlights the relevance of including soft components in infrastructure projects, which result in social benefits for a greater number of individuals beyond the project area. In this process, active dialogue and involvement of local authorities are key.

Resources


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Asian Development Bank (ADB)

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