

## CASE STUDY

# Bringing Innovation to Bus Rapid Transit



Photo credit: Lloyd Wright/ADB.

*Lanzhou, in the People's Republic of China, has the world's first bus rapid transit with a split station design allowing buses in the same direction to stop on both sides of the platform, easing travel time.*

## Overview

Lanzhou, a three million-strong city in the northwestern region of the People's Republic of China (PRC), opened its bus rapid transit (BRT) system in late December 2012. Inspired by the gold standard BRT of Guangzhou, Lanzhou built the country's second high-capacity BRT, carrying 290,000 passengers per day and with a daily peak demand of 6,200 passengers per hour per direction.

Initially, Lanzhou intended to build more roads and utility tunnels to improve access. But through the intervention of key organizations, the infrastructure project morphed into a plan pioneering high quality public transportation with modal integration and urban development. Lanzhou reimagined the city and mobility to cater to high passenger traffic, instead of more private vehicle use. The BRT system developed comprises the world's first split station concept. By customizing to local spatial conditions and operational requirements, the design is only half the usual length and only about one meter in additional width, yet enabling buses going on the same direction to stop on both sides of the platform. As a result, capacity is high and travel time is quick.

Lanzhou BRT is also a certified project under the Clean Development Mechanism of the Kyoto Protocol and exemplifies the use of an innovative financing model.

## Project snapshot

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|--------------------------------------|---|
| <b>Dates</b>                         | <ul style="list-style-type: none"> <li>• <b>March 2010:</b> Constructed</li> <li>• <b>December 2012:</b> Operation</li> </ul>   |
| <b>Cost</b>                          | <ul style="list-style-type: none"> <li>• <b>CNY24 million:</b> Infrastructure cost per kilometer</li> </ul>   |
| <b>Institutions and Stakeholders</b> | <p><b>Financing</b></p> <ul style="list-style-type: none"> <li>• Lanzhou Municipal Government</li> <li>• Asian Development Bank (ADB)</li> <li>• Bank of Lanzhou</li> </ul> <p><b>Planning and design</b></p> <ul style="list-style-type: none"> <li>• Institute for Transportation and Development Policy-China (ITDP-China)</li> <li>• Guangzhou Municipal Engineering Design and Research Institute (GMEDRI)</li> </ul> <p><b>Executing agency</b></p> <ul style="list-style-type: none"> <li>• Lanzhou Municipal Government</li> </ul> <p><b>Operating agency</b></p> <ul style="list-style-type: none"> <li>• Lanzhou No. 3 Bus Company</li> </ul> <p><b>Management</b></p> <ul style="list-style-type: none"> <li>• Lanzhou BRT Management Company</li> </ul> |

# Context

Lanzhou, capital of Gansu Province, is a growing regional hub between the eastern and the western sections of the country. Heavily populated and bearing most of the economic activity in the area, Lanzhou developed an urban master plan in 2009 that would optimize land use and enhance economic and social conditions in the city.



Lanzhou, the capital of Gansu Province, serves as a transportation hub between the eastern and western regions of the People's Republic of China (PRC). It was one of the major points on the ancient Silk Road. Photo credit: Lloyd Wright/ADB.

# Challenge

## Rapid urbanization and congestion

Similar to industrial and expanding cities, Lanzhou struggles with rapid urbanization, congestion, pollution and pedestrian safety concerns. Building more roads and utility tunnels was seen as a solution in the beginning, as well as constructing a low-grade median bus lane concept. Given the geographical area of Lanzhou, space for transport infrastructure is also limited.



Lanzhou is experiencing the ill effects of rapid urbanization, including traffic congestion and pollution. Photo credit: Lloyd Wright/ADB.

## Preliminary operational issues

The Lanzhou BRT system experienced some initial teething problems. BRT operations were not yet sufficiently connected to the downtown area. There was also a lack of continuity with the bike lanes, a component of the project, and there were parking intrusion on walkways along the BRT corridor. Some passenger information and station architecture issues were likewise noted and, most problematically, the BRT operator preferred to use the line primarily as a trunk-only corridor with insufficient route operation outside the corridor.

## Solutions

### Decongest the city with quality mass transit

A high capacity, high quality BRT system was introduced as the right intervention to address the city's needs. Through the collaboration of the Asian Development Bank (ADB), Institute for Transportation and Development Policy (ITDP), and Guangzhou Municipal Engineering Design and Research Institute (GMEDRI), the BRT corridor runs through the heart of Lanzhou's Anning district and extends to the major demand concentration at Xi Zhan, which is the west railway station and one of the two biggest stations. Providing an affordable, convenient, direct-service system that covers more than 100 kilometers (km) of roadway encourages public transport use.



Lanzhou designed a sustainable urban transport plan with the bus rapid transit (BRT) system as the centerpiece project. Photo credit: Lloyd Wright/ADB.

## Identify new approaches to fit local scenario

The 9-km, 15-station, and 7-route Lanzhou BRT corridor features a variety of station types based on the corridor conditions, operational design, and passenger demand levels. A key feature of the system is the revolutionary split station design developed by Brazilian expert Pedro Szasz . It offers roughly the same capacity as that of a traditional offset BRT station but with half the station length and only about one meter in extra width. Stations from Peili Guangchang to the east are 'split' and allow use of buses that only have right-side doors. Stations west of Peili Guangchang have a single central platform ("island"), which requires buses to have doors on the left side (new BRT buses).



A key feature of the Lanzhou BRT is the split station design that allows buses going in the same direction to stop on either side of the station platform. Photo credit: Lloyd Wright/ADB.

## Ensure seamless multimodal integration

Despite some operational issues at the start, the Lanzhou city government and other organizations behind the project were keen on having a well-coordinated transportation network. Along with traffic and parking management, greenways and a bike-sharing system were put in place, including double-tier bike parking racks at major BRT stations. Sidewalks likewise improved and pedestrians noted the increased

safety of the walking environment.



To promote the use of nonmotorized transport, the city provided dedicated 3.5- to 5-meter-wide bicycle access lanes between sidewalks and carriage lanes and bicycle parking facilities at the BRT stations. Photo credit: Lloyd Wright/ADB.

Part of this transit-oriented development (TOD) is another notable element of the Lanzhou BRT: a public-private partnership (PPP) financing that led to six underground shopping malls along seven BRT stations. The largest, Fifth Avenue, connects with two BRT stations, Feijiaying and Taohai Shichang. It has 16,000 square meters of operational area that includes retail and public spaces and pedestrian passageways equipped with 24-hour security cameras.



Walkways, underground passageways, and facilities for persons with disabilities were constructed. Photo credit: Lloyd Wright/ADB.

## Numbers and facts

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15 BRT Stations

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650 meters average distance between stations

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9.1 km dedicated busway

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7 bus routes

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7 BRT stations with underground shopping facilities

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Silver BRT standard score

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## Results

The Lanzhou BRT has shown a range of impressive impacts and has inspired other cities to pursue BRT as a transport option. Based on an early impact analysis survey, here is an excerpt:

- Large increase in civic pride, with those agreeing "I am proud of Lanzhou" increasing among bus passengers in the BRT corridor from 40% (before the BRT) to 70%.
- Cheaper trips for passengers: bus passenger trip costs fell by CNY0.9 per trip in the BRT corridor partly due to the free transfers allowed with in stations.
- Greatly improved perceptions of safety, from 35% to 80% after the BRT.



Lanzhao BRT helps improve the quality of life for the city's three million residents. Video credit: ADB.

## Key statistics

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290,000 average daily ridership

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6,550 passengers per hour per direction

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87 buses per hour past peak demand point per direction

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7.1 minutes average waiting time savings per passenger (based on a passengers-self reported survey)

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12,621 tons/year of CO2 reduction

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## Lessons

### More roads is not always the answer

Building more roads is not always the solution for congestion. Assessing the context of the city and by applying transit-oriented development can reveal how integrating and maximizing different modes of transport leads to better mobility for all.

### Identify local needs and characteristics

Bus rapid transit systems can be tailored to suit a specific area's needs. In the case of Lanzhou, while inspired by the Guangzhou BRT, considering local factors led to the innovative design of a split station concept. ITDP is currently applying this design in the planning of other BRT systems, such as Tianjin, Johor Bahru, and Kuala Lumpur.

### Maximize initial operational phase to enhance service

Trial operations are a critical stage in any project. Use the time wisely to identify and iron out technical and service difficulties, whether it is the seamlessness of transfers from BRT to bicycling or the availability of passenger information.

### Venture out to new financing approaches

Explore different financing options, like a public-private partnership or PPP mechanism. The PPP agreement used for constructing the undergrounds hopping malls in some stations was used to offset the BRT corridor construction cost, and the private firm also built and maintains the public facilities, including the passenger tunnels and escalators.

## Resources

Lanzhou BRT and Guangzhou BRT guided study tours



Lanzhou BRT

BRT system map

Lanzhou BRT project

Lanzhou's Bus Rapid Transit System Brings Quick Relief to Busy City



Institute for Transportation and Development Policy

This case study is from a series of virtual study tours created by The Institute for Transportation and Development Policy (ITDP) as part of a South-South Cooperation Project that facilitates the sharing of best practices in sustainable transport.

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