

Learning from HSR in China: a photo essay

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The use of public transport has increased rapidly in the People's Republic of China (PRC), with new infrastructure investment utilised as an important feature in the design of cities and new urban neighbourhoods. The development of the High Speed Rail (HSR) network is a central part of this. The PRC has implemented more high speed rail network than the rest of the world put together – with a length of over 25,000 km by 2017 – with the first route from Beijing-Tianjin only being built in 2008. Over 7 billion passengers used China Rail Highspeed (CRH) in the first 10 years of operation, and patronage has reached 1.7 billion passengers per year (World Bank, 2019a). The HSR network is planned to reach 38,000 km by 2025 (International Railway Journal, 2018).

This has been a response to the rapid urbanisation rate in the PRC. In just 30 years, the urbanisation rate has trebled, from 19% in 1980 to 51% in 2011 and 60% in 2019, as migration to the cities continues (World Bank, 2019b). Six cities have urban populations of over 10 million, and three of them – Shanghai, Beijing and Chongqing – have populations over 15 million; the wider metropolitan populations are even larger.

Though there is increased motorisation in cities in the PRC, public transport is gaining huge levels of investment. The interchange hub is seen a critical element of sustainable city design – linking the city's public transport services, such as the subway (metro), rail, bus rapid transit and bus; and acting as a catalyst to the masterplanning of new areas. There are many lessons that can be transferred internationally, including: the priority given to public transport, the levels of funding, the quality of design and engineering, and the speed of implementation (Chen et al., 2014).

1. SHANGHAI HONGQIAO



The iconic Chinese HSR system – high quality trains and stations, with high speed train sets called Hexie Hao (Harmony) and Fuxing Hao (Rejuvenation).

With high quality vehicle design, HSR runs at speeds from 250 kmph to 350 kmph on upgraded and dedicated high speed track. HSR has been developed with substantial funding from the Chinese government, aiming to provide quick connections between multiple cities and urban conglomerations.

Initially the early high speed trains were built under technology transfer agreements with foreign manufacturers, such as Alstom, Siemens, Bombardier and Kawasaki Heavy Industries. The most recent trains are designed and built by CRRC, the state owned public railway company, and now the largest railway rolling stock manufacturer in the world.

The system aims to provide relatively inexpensive travel between cities, with high and medium income levels using the services. HSR is priced to be much cheaper than short haul air and hence dominates travel even over relatively long distance trips. The longest line in operation is Beijing-Guangzhou at 2,298 km.

We consider some of the lessons from the Chinese HSR experience in terms of the interchange hub, link and surrounding development – in photo essay style.



2. TRAVEL BY CHINA HSR

HUB



The first thing that surprises a visitor to the HSR interchanges is the scale – the stations are like airport terminals in Europe, catering for very large passenger volumes at peak periods. There are large check-in and waiting halls with hundreds of passengers queuing for tickets or waiting to board their trains.

3. SHANGHAI SOUTH



The HSR station is planned as a high quality interchange for large passenger volumes – and used to develop the surrounding neighbourhood with good linkages into the city centre.

4. TIANJIN WEST
(Image: Third Rail Design Institute)



These are huge terminals, offering the interchange for journeys between cities across the country, for links across large metropolitan regions, and onwards into the cities themselves.

5. TIANJIN WEST



The quality of interchange design is often spectacular – with modern, airy spaces and much light.

6. SHANGHAI SOUTH



A high-speed rail station is a gateway to a city. Many of the new stations are built on the edge of the urban area with subway connections into the city centre. The edge of centre locations mean there are quicker journeys between cities and less demolition issues when building HSR, but there is a slower connection into the city centre. Often the new stations can be used to create new neighbourhoods around them.

Some of the older refurbished stations are located in the city centres. A central location can bring people straight into the heart of the city without a further connection by subway – with just a walk into the vibrant centre.

7. SHANGHAI STATION



A new HSR station is classified according to operational volume and facility criteria. There are over 50 super hubs with over 60,000 daily passengers (Chen et al., 2014). Facilities include station buildings, concourse, waiting rooms, ticket halls, plazas, access escalators, retailing and other passenger services.

8. BEIJING SOUTH



The internal space of HSR hubs in China are designed on a grand scale, with the aim of efficient passenger movement and boarding. Interchanges are designed on multiple levels. Waiting areas typically at level one are used to hold people before they access the trains via escalators at ground level. Passengers can only access the platforms approximately 10 minutes before the trains arrive. Egress from trains is usually at sub-surface level.

9. SHANGHAI SOUTH



The user experience can be much improved even in the modern HSR stations – retailing, cafes and free Wi-Fi availability can help to pass the waiting time (Hickman et al., 2015). Information provision can allow easy orientation, including with staff available to respond to queries in person.



10/11. JINAN WEST



12. SHANGHAI



13. BEIJING WEST

The security check leads to too much queuing and people often arrive at the station hours in advance of trains – the waiting experience hence becomes very tedious for many.

Vertical separation of arrival, waiting and departure areas is used in most interchanges. The escalators allow high capacity movements.

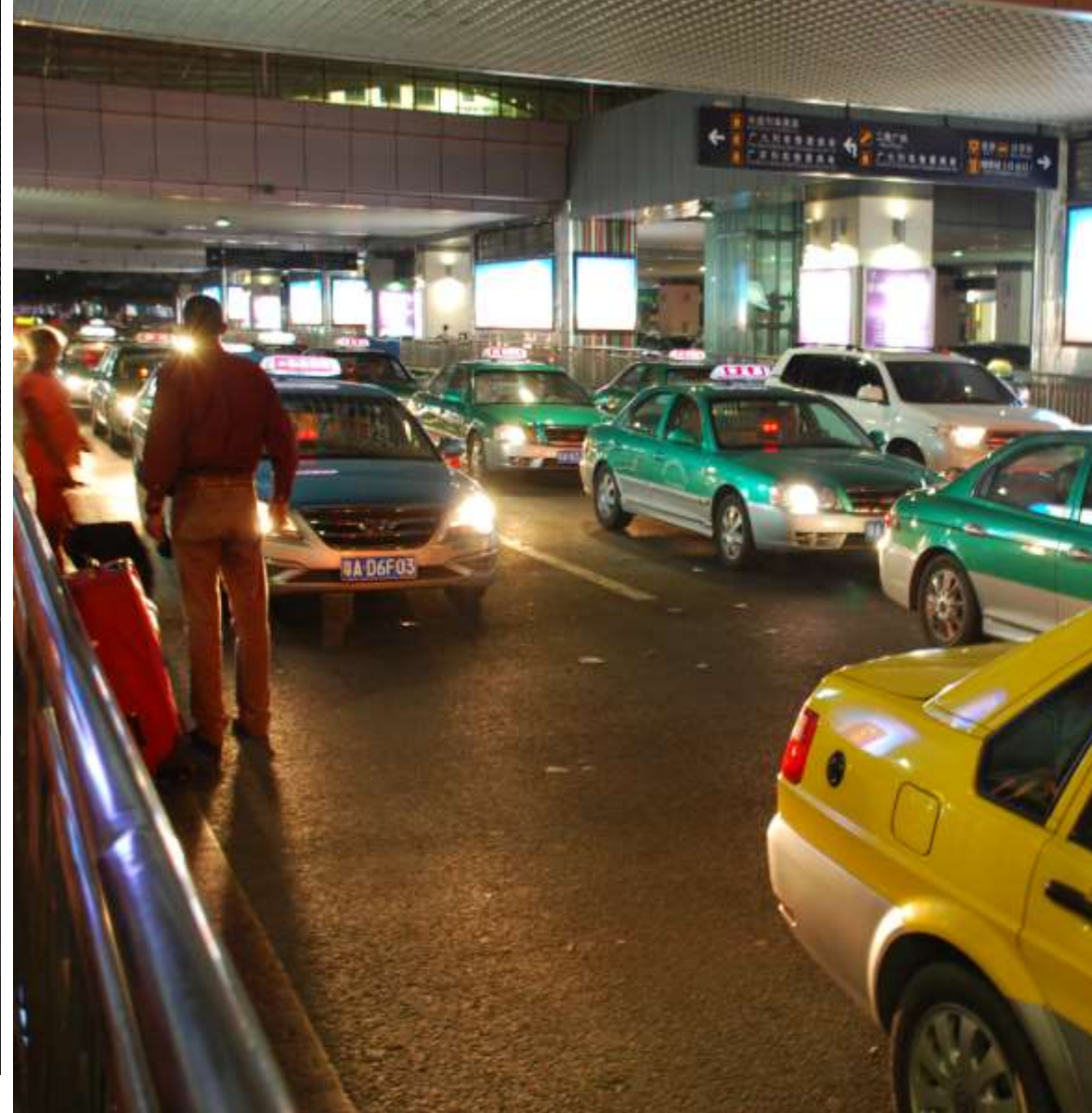


14. WUHAN STATION



15. JINAN WEST

Access by private car and taxi is often prioritised – taking up valuable space at ground level or first floor level and resulting in large severance barriers to and from the stations. Taxi space at subsurface level can be very polluted and provides an unpleasant waiting experience.



16. GUANGZHOU

LINK

Often HSR stations have direct links into the city centre via subway connections and there is easy access between the public transport services.

**17. SHANGHAI
SOUTH**





The station square can be a very useful congregation space and access route for pedestrians and cyclists. But sometimes it is poorly designed with little activity – and few people use the space.

18. JINAN WEST

19. CHENGDU EAST



HSR stations are designed as multi-modal hubs. There are usually bus, taxi and private car access, as well as subway. However, the edge-city locations mean that there is a high proportion of access by private car. The 'last mile' connections need careful planning. Usually there are few pedestrian and cycling facilities for local access.

Work-related inter-city high-speed rail commuting has become an emerging phenomenon, for example between a large city such as Beijing and its surrounding cities. The metropolitan area is connected by HSR allowing people to live and work in different cities across the urbanised region.



20. TIANJIN WEST

DEVELOPMENT

HSR interchanges can be integrated into the urban fabric at different levels – at the regional, city and neighbourhood scales.

The new stations are often used to create new neighbourhoods or to redevelop existing areas. High density, mixed use and walkable communities ideally surround the new station area development. Rural land is transformed over short timescales into new urban quarters, including large-scale housing projects.

**21. SUZHOU
NORTH**





HSR is used by national and city governments as a strategic development tool to assist in rapid urbanisation at the regional level – with multiple cities linked together within one hour commuting distance. For example, a new HSR station in Suzhou, on the line linking Shanghai and Beijing, was built 20 km away from the city centre.

This means that Suzhou becomes part of the Yangtze River Delta Megalopolis (the wider Shanghai urban metropolitan region), including Shanghai, Suzhou, Wuxi, Nantong, Ningbo, Jiaxing, Zhoushan and Huzhou. The slogan for HSR area planning in Suzhou was: “gathering momentum in one year, taking shape in three years, establishing a new city in eight years”. The HSR new town aims to include regional service headquarters, financial services, business travel services, data science, research and development, training and media services.

The urban design of the area surrounding the station can be improved to give better public space – with connections for walking and cycling into the local neighbourhood and some activity and interest for passengers whilst waiting for their travel.



23. WUHAN



24. TIANJIN WEST

There is much interest in research concerning the developmental impact of HSR investment. But this is dependent on a myriad of factors, including the urban planning approach at the strategic and local scales. Integrated urban planning and transport investment can help develop the station as part of new urban neighbourhoods, including affordable housing and offices – and also as part of a wider metropolitan region, with cities interlinked by high quality public transport networks.



25. SHANGHAI HONGQIAO

Much can be learnt from the Chinese HSR rail experience for practice in the UK, indeed for the rest the world:

- The ambition and speed of implementation: the PRC has built over 25,000 km of HSR network in just over a decade. The model has been to use international experience and to learn from this, with domestic knowledge then becoming very high quality, on a level with international comparators.
- The scale of interchanges: these are planned for very large passenger volumes, including projected increases in demand. There is vertical separation of arrival, waiting and departure activities.
- The inexpensive pricing of travel: this is purposively positioned to be attractive relative to short haul air, providing the possibility for high quality, electric-powered travel around the country.
- Some features can be improved: the journey experience through the interchange hub, pedestrian and cycling access, integration with other public transport options and the rest of the city fabric.

The scale of urban development in the PRC leads to many interesting policy approaches and projects being developed. The quality of HSR infrastructure is highly impressive and means that travel within and between metropolitan areas and cities has been transformed over a very short timescale.

Acknowledgements

All photographs from Robin Hickman and Chia-Lin Chen, with the exception of photograph 4, Third Rail Design Institute.

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