INNER-CITY RAILWAY STATION AREAS IN CHINESE CITIES

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Abstract
Redevelopments of Chinese inner-city station areas introduced both new transport infrastructures (high speed railway, urban mass transit system, etc.) and real estate projects to station vicinities during the past decades. However, existing station areas are isolated from the rest of the city, and seldom urban activities take place in station surroundings. This paper aims at exploring mechanisms behind the emergence of “urban isolation”. To this end, four relevant topics are discussed, namely urbanization in China, travel model shift in and between big cities, railway station operation and planning philosophy of inner-city station areas. Examining above aspects in some China’s big cities, especially in two typical station areas, Beijing West and Tianjin station areas, this paper examines why Chinese inner-city station areas have gained an increasing role as transport nodes but have paradoxically become isolated enclaves in city centers. Two recommendations are also generated out of above review and analysis.

Keywords: inner-city railway station areas in China, redevelopment, urban isolation, mechanism
1. NEW INNER-CITY STATION AREAS IN CHINESE CITIES

Since the late 2000s, Chinese cities have been vigorously promoting new inner-city station areas. These showcase projects are the latest phase in the massive infrastructure development sweeping across urban China. However, a general lack of citizen’s daily activities have turned these areas into urban ‘enclaves’, which are merely transport nodes with interior spaces only used by travelers, rather enclosed and segregated from their surroundings.

The redevelopments of inner-city station areas are closely related to local urban contexts and usually include station building renovation, interchange space between high speed railway (HSR), metro, bus and other transport means, landscape station plazas and green spaces, local street network adjustment, sometime also iconic real estate projects in station areas. These renovated station buildings and open spaces are deliberately demarcated from the surrounding city by fences and regulations. They operate according to a distinct set of rules of public behavior. This partial emphasis on security and management leads to a lack of a sense of place and concentrated in several massive projects in symbolically significant locations. In addition, visual image takes precedence over functional layout in station area redevelopments. Few service facilities and convenient spatial linkages to its immediate surroundings are in stark contrast to a profusion of architecturally distinctive tall buildings.

The primary purpose of this paper is to explore mechanisms behind the emergence of the “urban isolation”. To this end, four issues related to the emergence of “urban isolation” are identified based on Bertolini’s statements. Then a discussion on these aspects, namely urbanization in China, travel model shift in and between big cities, railway station operation and planning philosophy of inner-city station areas, will help to understand the background of these redevelopments in China, as well as the performance of station areas as transport nodes and urban spaces. Examples in this paper are drawn from China’s big cities, especially from two typical station areas that just experienced redevelopments, Beijing West station area and Tianjin station area. Finally, this paper proposes the mechanisms of “isolation” and recommendations for future projects as conclusions.

2. ASPECTS TO INVESTIGATE: INSPIRATION FROM BERTOLINI

Redevelopment of station area is increasingly becoming the focus of integrated transport and land use development efforts. Such projects are influenced by diverse driving forces, whose interactions have been studied by urban researchers to understand nature and performance of projects. The observations in this paper are based on lenses provided by Bertolini(2008).

Bertolini(2008) defines four heterogeneous, interrelated factors in triggering station area-related urban projects.

- Transport innovations mainly refer to the opportunities brought by the expansion of HSR systems and mass transit rail systems. Updated transport infrastructure is one of the primary dynamics of station renovation.

- The privatization process or at least the shift towards greater market-orientation of transportation makes the transport service providers increasingly seeking ways to create accessibility premium. Commercial activities within stations and redevelopment of land above or around stations can be generated under this trend.

- The wish to boost the competitive position of cities as places to live is mostly related to the
strategic locations of stations. Many of these projects show a dense mix of office, retail, leisure, and housing.

• The mounting concern about the sustainability of ‘sprawling’ and ‘car-dependent’ urbanization patterns focusing on providing high density, high quality development on top of sufficient public transport service in station areas, and is taken as a possible solution to growing population and motorized urban environment.

Bertolini’s theoretical lenses provide broader implications for the driving forces of inner-city station area redevelopments. Therefore, the specificity of these factors can be regarded as aspects to determining nature of such projects within particular context.

In applying these dynamics in Chinese urban context, however, further adjustments are needed. In the mainland China, the implementation of “the transport innovations” is closely related to “the concern about the sustainability of ‘car-dependent’ urbanization patterns”. “The travel model shift in and between big cities” is the manifestation of both issues. At the same time “the rapid urbanization process” is another inevitable topic related to “travel model shifts”, since their interactive effect is playing increasingly significant role in urban projects in station vicinities. On the other hand, ‘urban sprawling’ does not fit inner-city context and “the wish to boost the competitive position of cities as places to live” is regarded as quantitatively fulfilling of growing demands on urban functions, rather than give priority to sense of place in China. So these aspects are not involved. “The privatization process of transportation” is not an obvious trend, because passenger railway transportation is a monopolistic industry nationwide. However, the Ministry of Railway (MOR) has experienced the “shift towards greater market-orientation of transportation”, which is shown in “railway station operation”. On top of that, the “planning philosophy of inner-city station areas” is another issue with Chinese characteristic, as existing design thinking blocks not only flexibility of transport hub, but also urban activities within station areas.

Therefore, the four aspects to be discussed in the next sessions are “urbanization in China”, “travel model shift in and between big cities”, “railway station operation” and “planning philosophy of inner-city station areas” (Table 1). Via detailed elaboration on these issues, the mechanisms behind the emergence of the “isolation” are concluded in the end.

<table>
<thead>
<tr>
<th>Bertolini</th>
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<tr>
<td>“transport innovations”</td>
<td>“shifts in travel model in and between big cities”</td>
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<td>“The mounting concern about the ‘car-dependent’ urbanization patterns”</td>
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<td>“The mounting concern about the sustainability of ‘sprawling’ ”</td>
<td>“urbanization in China”</td>
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<td>“the privatization process of transportation”</td>
<td>“railway station operation”</td>
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<td>“the shift towards greater market-orientation of transportation”</td>
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<tr>
<td>“the wish to boost the competitive position of cities as places to live”</td>
<td>“planning philosophy of inner-city station areas”</td>
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3. INTERACTION BETWEEN URBANIZATION AND MOBILITY ENVIRONMENT TRANSITION IN CHINESE BIG CITIES

The city-transport relationship is one of the main driving forces of inner-city station areas redevelopment in China and works both ways. The urbanization requires city transport systems to be further developed and modified, including expansion of city roads, construction of urban transit systems and national wide HSR network. Changes of transport behavior, in terms of travel frequency and mode choice, give potential to adjust related transport infrastructure. And the improved urban mobility, in turn, influences the distribution and density of people and their activities, as well as growth patterns, characteristics and environment of the cities (Mu, 2013).

During the past three decades, the urbanization in China is concomitant with an almost equally rapid economic growth, started in the late 1970s with the “opening-up” policies. Individual cities and coastal city-regions have been adding huge amounts of suburban land to their already urbanized areas. The larger urban dimensions and faster the economic develop, the more the urbanization is evident. For instance, as the national capital of China, Beijing experienced growth in urban land use of 30%-50% in the past 15 years (Wu, et al., 2006; Yu & Ng, 2007; Han, 2010). City agglomerations including the Beijing-Tianjin-Hebei region and the Pearl River Delta region expanded more than 70% in the 1990s (Li & Yeh, 2004; Tan, et al., 2005).

The invasion of population into big cities called for substantial urban functions and infrastructure in inner-city, and real estate featured by high-density, high-rise commercial use scattered across urban cores in China. Extensive shopping centers, offices and entertainment facilities began in earnest around 1990, outstanding examples are Wangfujing in Beijing, Pudong area and Nanjing Road in Shanghai (Figure 1), as well as pedestrian commercial street Binjiang Dao in Tianjin.

Figure 1 Nanjing Road and Pudong area in Shanghai

However, these developments were led by real estate activity rather than improved accessibility by public transport; in contrast, a car-dependent urban transportation model was formed based on the combination of several urban conditions, such as the expansion of urban roads, a lack of mass transit network, and an explosion in private automobile ownership. This trend is clearly shown in the mobility model transformation of Beijing from 2000 to 2009 in Figure 2 (Beijing Urban Transport Center, n.d.). Since 2005, the number of cars in Beijing has increased by 85% and reached 5.2 million in 2012, in Tianjin this number doubled during the same period and reached 2.36 million. On a national scale, private vehicle ownership increased by 25% to 35% each year from 2005 to 2010. On the other hand, cycling and walking which were traditionally extremely important in inner-city areas, were considered as hindrances to vehicle circulation. The percentage of non-motorized
transportation suffered consecutive drops in many big cities (Pan, 2012). Building new roads and expanding existing ones were believed to be the most promising ways to alleviate traffic jams until it is realized that road transport can never meet the growing transport demand of expanding cities, and the exacerbated road congestion have hindered urban functioning. One extreme event is the serious traffic jam in Beijing on 17th Sep 2010, over 140 roads in inner-city were congested for nine hours from evening rush hour on that day. (Figure 2)

Figure 2 Transformation of transport model in Beijing from 2000 to 2009 (left) and the congestion event in Beijing on 17th Sep 2010 (right)

It was realized that the sided pursuit of urban development regardless of sustainable accessibility, public transport infrastructure and urban constructions related to them should be adjusted. Since the new century, huge investment has been injected into urban transit systems and their surrounding area development. Compared to 1980 when urban rail lines could rarely be found in Chinese cities, a total length of 2380 km of urban rail lines have been built in 15 mainland Chinese cities by 2013. Plans call for extending and upgrading existing rail systems and building new ones in 12 other Chinese cities.

Accompany with mass transit rail development, urban properties for commercial, office and housing use gained immediate and huge success with the public. Urban transit systems provide continuous mobility between densely built areas and trigger the emergence of new urban sub-centers in big cities. Some interchange transit station areas have become local commercial and business hub. Typical examples are Jingansi subway station area in Shanghai and Xinjiekou subway station in Nanjing. Jingansi subway station locates at the end of Nanjing road in Shanghai, and it is an interchange of three subway lines. The whole area is one of the four sub-centers in Shanghai and is famous for its multiple urban functions of transport, shopping, tourist and recreation center. On the other hand, Xinjiekou subway station is located at the central commercial district of Nanjing, which has almost 1million customers during peak hours. The interchange has a 10,000㎡ underground shopping area and twenty-four exits link to surrounding malls (Figure 3). A burgeoning commercial culture and massive transport demands are well integrated in above two cases, and they have become models for replication across the country.
Concerning successful practices above, there is great potential for inner-city railway station areas turning to vibrant urban space in Chinese big cities, especially with the development of HSR network in China. Up to now, railway transport is still the most commonly used and dominant mode for the movement of both passengers and freight in large volumes and long distances. The Mid-to-Long Term Railway Development Plan in 2004 aims at improving accessibility between big cities by introducing a national HSR network. According to the plan, a 25,000 km HSR network linking main cities in mainland China will be built by 2020. Approximately 8,000 km were completed or in operation by the end of 2010, and another 8000 km will be built by 2015. For inner-city station areas which will be involved into HSR network, usually also involved in local rail networks, greatly improved accessibility and strategic locations within inner-city are definitely favorable conditions to gain economic success far beyond the geographic confines of the station areas themselves.

Although driven by the interaction between rapid urbanization and mobility transition, urban development practice in China also face some common problems which would increase the difficulty in integrating inner-city station areas with its surrounding urban fabric.

Firstly, the inexorable drive for growth almost at any cost has made urban spaces spatial collections of functions with little distinguishing character lying side-by-side across the urban landscape (See Figure 1 and Figure 3). Although the process of urban transition in China is divided into several periods, the actual boundaries between them are blurred by continual growth of urban population and new demands in various urban functions. Standardised urban planning can hardly predict and facilitate these growth and demands. Therefore, a considerable part of urban development took place at the level of building projects, the basic unit of exchange and investment, rather than at the

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1 The average distance between provincial capitals (34 cities) in China is 1893Km.
district level. Without view on long term urbanization, it is almost impossible to implement larger scale urban spatial strategies.

Furthermore, the car-friendly built environment still dominates main city areas and occupies possible public open spaces, turning them into parking lots and driveways. This is particularly evident in transport nodes areas. Since a considerable number of passengers take buses and cars to get to inner-city stations, diverting transit vehicles and providing enough parking areas become the main methods to tackle with possible congestion. As a result, station areas are treated as diverter of cars and containers of temporary parking, instead of places able to provide spatial possibility for urban life and activities.

On top of above potentials and hidden problems from urban development environment, the operation of railway stations also play critical roles in the shaping of isolation. By reviewing the feature and operation of Chinese railway stations, other factors related to isolation are explored in the next session.

4. RAILWAY STATION OPERATION

The transition of passenger railway operation in China is mainly related to the sustained growths of national railway network and the increasing of population mobility. The integration of HSR and local mass transit system in inner-city stations is a significant turning point which calls for an open and integrated operation.

As a monopolistic industry in China, passenger railway transportation has been taken as a non-profit public welfare and aimed to provide low cost transport service between cities for a long time. The former Ministry of Railway (MOR) was an independent government organization, which organized and managed passenger railway transportation within mainland China. It worked on the planning and implementation of national rail network, the renovation of railway infrastructure, proposing tickets’ prices to related governmental organization for approval, and other important issues related to rail transport.

Until the beginning of the 21th century, the Chinese passenger railway transport was featured by a low average speed, a low departure frequency and huge amount of passengers. Conventional trains were composed of sixteen (or more) carriages with over 1,000 seats. Limited tracks and long distance between cities caused frequent temporary stops and an average speed at 48.1Km/h. To alleviate the contradiction between traffic volume and traffic capacity, several solutions were taken, such as adding temporary carriages and trains and six passenger train speed up projects (1997-2007). However, the effect was limited (Kiyoharu, 2011).

Above national conditions also endowed the operation of railway station in China’s cities some specifics. Firstly, to manage the massive volume of passengers, the airport-style operated station buildings were only admitted by train tickets’ holders and not open to the public. For departure, all passengers have to follow the same procedure, which is: through the security check to the waiting room, through the ticket gate, then to join the queue to board the trains. For arrival, all passengers have to take stairs to a lower underground floor and exit from there. Thus, it is impossible to leave one train and join another without going through the security check. (Figure 4)

In addition, the time-consuming boarding experience turned the station areas as temporary containers to shoulder travel related flows, rather than vibrant urban spaces with high accessibility to citizens. For example, station squares usually full of departure passengers waiting for security check, arriving flows just come out from tunnels, as well as queues for tickets.
In 2013, The MOR was abolished and replaced by two separate divisions: a national railway authority (for policy) within the Ministry of Transport and an overall national railway company (for operations). Different operation strategies on conventional lines and HSR are released recently. According to the new national rail map which is implemented since July 1st 2014, the conventional train service and HSR service (train speed ≥ 200Km/h) will take 50% in total rail service separately. The former will still run in old ticket price, the later will run with market prices according to passenger volume during peak-/off-peak periods.

Since 2004, inner-city stations are continuously involved in national HSR and local subway/light rail network and turning to inter- and intra- transport nodes. Compared to the conventional trains, high speed trains feature high departure frequency and relative lower carrying capacity of single trains. For instance, eighty pairs of high speed trains travel on Beijing-Tianjin HSR every day and each of them carries at most 556 passengers. From 2008 to 2009, the total passenger volume of this HSR reached 18.7million. Such inter-city HSR networks are gradually playing an important role in

\[\text{Data source: http://news.china.com.cn/}\]
regional mobility. Moreover, the integration with local rail network improves the local accessibility of stations greatly.

These changes have brought simplified boarding processes which make travelling by train as easy as traveling by local subway or bus. For instance, citizens in Beijing and Tianjin can easily board on regional high speed trains with local public transport cards. This breaks down the traditional boarding process and has been accepted by more cities involved in dense HSR network.

It can be predicted that with the rail renaissance, the passenger structure and their behavior pattern in inner-city station areas are facing significant transitions. The number of daily commuters and urban life activities is growing fast in existing inner-city station areas, especially in big cities along the east coast metropolitans. The adaptive reconfiguration of spaces in station areas which fit above trend is urgently needed.

5. PLANNING PHILOSOPHY OF INNER-CITY STATION AREAS

Influenced by above factors, the planning and design thinking of inner-city stations experienced a huge transition from closed station building to inter-model transport hub. Their relations to urban space also turned from a totally separation to integration with urban transport infrastructure.

Facing acute contradiction between traffic volume and traffic capacity from 1978 to 2004, the station design in big cities focused on circulation, the holding capacity of passengers and the identity of station buildings; the functional and spatial integration with urban space were very rare in China at that time.

To manage and control passengers, the vertical separation of different flows and the elevated longspan waiting room on top of the tracks were taken as effective solutions in station design, although these interventions created lengthy routes and inconvenience of station use (Table 2). (Lu, 1989; Zhou, 1990; Zhu & Zhang, 2005). The expansion of Tianjin station in 1988 employed above approach and turned the old single-story 2400㎡ station building into a new one with over 55,000㎡ and an elevated waiting room. The passenger capacity of the new station waiting room increased to 10,000 passengers.

Table 2 Figures on main passenger railway stations in China (Lu, 1989)

<table>
<thead>
<tr>
<th>Station</th>
<th>The maximum passenger accumulation amount</th>
<th>The total area of interior waiting rooms (㎡)</th>
<th>Largest length of boarding route(m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing</td>
<td>14,000</td>
<td>8,939</td>
<td>Ground floor 117</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 231</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>6,800</td>
<td>7,437</td>
<td>Ground floor 194</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 136</td>
</tr>
<tr>
<td>Chengdu</td>
<td>10,000</td>
<td>15,900</td>
<td>Ground floor 73</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 115</td>
</tr>
<tr>
<td>Chongqing</td>
<td>3,000</td>
<td>9,200</td>
<td>Ground floor 67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 99</td>
</tr>
<tr>
<td>Nanjing</td>
<td>2,000</td>
<td>2,293</td>
<td>Ground floor 62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 109</td>
</tr>
<tr>
<td>Shanghai</td>
<td>11,000</td>
<td>2,079</td>
<td>Ground floor 109</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>First floor 163</td>
</tr>
</tbody>
</table>
Commercial facilities and other services in station areas were deliberately taken apart from the main passenger routes. They were either centralized, located at an independent part within the station building or at an independent building apart from the main one, because the static waiting behavior of passengers played dominant role in station areas and shopping activities were taken as possible encumber on station circulation. The spatial configuration of Tianjin station and Beijing West station are representatives of these two strategies. Besides the main station building, Tianjin station complex also included Longmen Mansion and a local postal hub located on two corners of the site. The combination of these three buildings, huge sculpture and landscape square created a visual centre along the Hai river (Figure 5). In the Beijing West case service facilities were placed above the waiting room and visualized the “gateway” image with a height of 90m door shaped structure (Figure 6).

![Figure 5 Renovated Tianjin station 1988(Headquarter of Tianjin station renovation project, 1988; Han, 1988) (Marked by the author)](image1)

![Figure 6 Master plan and main station building of Beijing West station (Management committee of Beijing West station area, 2007) (Marked by the author)](image2)

With regards to the interchange between different transport modes and the relation to urban space, the urban transport hub was not realized due to a lack of cooperation between the MOR and local authority, not mention the spatial integration with urban environment. According to land use natures in China, station building sites are traffic lands and governed by the MOR, while other lands within station areas are governed by local authorities. The MOR was keen to keep effective boarding and
leaving process, regardless of any other activities and movements related to train travels. During the redevelopment of Tianjin station area in 1988, the MOR strongly opposed placing bus stops besides station building because they might influence the order of boarding process (Zhou, 1990). In the Beijing West project, the construction of the south square was delayed fifteen years due to similar cooperation gap. However, 40% of passengers were expected to approach station building from the south square by different transport means in original design proposal (Chen, 2007).

As more and more inner-city stations were involved into HSR and local rail networks, the urgent tasks of the redevelopment turned to create seamless connections between different transport modes and offer convenient waiting experience for passengers. In addition, local governments began to exploiting lands within immediate station surroundings for commercial uses in order to gain higher revenue. However, functional and spatial relations between these facilities and station buildings, as well as the utilizing of station areas to facilitate urban life were rarely considered.

Since the beginning of Tianjin station area redevelopment in 2008, great efforts were put on transport infrastructure and new properties within station vicinities. For the transport part, corridors to three local subway lines beneath the station building, underground trunk roads and tunnels around station area were built. On top of that, dense urban functions also increased rapidly, the average annual developing building area reaches 463,220㎡ within 1500m radium of station vicinity from 2005 to 2010 (Lin, 2011). However, the 40,000㎡ station square is still empty during peak-off period of rail transport, leaving the commercial building complex and the station building face each other across the Hai River (Figure 7).

![Figure 7 Tianjin station area in 2013](image)

In Beijing West station area, the redevelopment also focused on making seamless routes for passengers to enter and leave the station by different transport means. As one of the busiest passenger station nation-wide in terms of passenger number, Beijing West ran overload without local rail support and one-side entrance/exit until 2013, the redevelopment take the south square as new entrance and exit of station area, over twenty local bus lines were introduced. However, regarding to connections between station sites and their surrounding blocks, as well as the human scale of the built environment of the area, there is no obvious improvement.

6. DISCUSSION AND CONCLUSION

After analyzing above influential issues of inner-city station area redevelopment in China, a further exploration on mechanisms of the “isolated” inner-city station areas follows and is shown in Figure 8.
The interaction between rapid urbanization and travel model shift in and between big cities triggered large amount of urban projects in many Chinese inner-city station areas. However, these flagship projects are still at early stages in which the inexorable drive for growth and economic profit plays a main role. The catering for high density urban functions is not based on rational analysis of local needs and accessibility of human scale, but on central image and possible high revenue could be made. Meanwhile, too much attention on development speed and the existing car friendly mobility environment pose potential challenges for the realization of the dual role of station areas as both transport hubs and urban life centers.

Influenced by railway station operation, evolution and development in planning philosophy of station areas, inner-city stations are turning from static and enclosed transport buildings to vertically integrated transport hubs. Although partly connected to other modes of transport, stations are still closed to non-passengers and citizens, and station areas cannot facilitate urban activities as public spaces. New behavior pattern of daily commuters is calling for further evolution of station operation.

Based on above analysis and review, two recommendations are proposed for future inner-city station area redevelopment projects in China:

On the one hand, holistic strategies fit the dual roles of inner-city station areas under Chinese context and should be employed in the future. According to experiences of the west, urban places with high accessibility by different transport means have high potential to aggregate resources and urban life. Successful experiences in the west could provide possible solutions to status quo of urban isolation. New user composition and their behavior patterns in station areas should be taken into account.

On the other hand, the cooperation between transport service providers and local authorities should be strengthened. It can be identified that both sides focus on their own short-term profits and lack cooperation based on long-term view. Although their joint work has turned station areas into multi-model transport hubs, further improvement on spatial and functional integration will make these areas really perform as urban central places in the future.

REFERENCES


**BIOGRAPHY**

Xialu Wang (1986) studied architecture at School of Architecture, Tianjin University, graduating with a master thesis on urban design in subway station areas. Since 2012 she has been a guest researcher at the Delft University of Technology’s Faculty of Architecture. She is currently working on the research topic: urban vitality of inner-city station areas in China and focus on the improvements of spatial performance of station areas as vibrant urban spaces within Chinese urban context.