Journal of Transport Geography 24 (2012) 234–249

Contents lists available at SciVerse ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo

Establishing the conditions for effective transit-oriented development in China: the case of Dalian

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ARTICLE INFO

Keywords:
Transit-Oriented Development (TOD)
Urbanization
Motorization
Public transport
Land use
Dalian

ABSTRACT

For many years, Dalian has been known as a green city with the modal split most favorable for public transport in all of China. But recent years show a rapid decline in bus and rail ridership. It appears that the consequences of the 'socialist market economy', such as the unbundling of social life and production activities, the marketization of urban land, and large-scale suburbanization leading many residents to live in locations far away from their jobs and daily services, have promoted the rapid expansion of motorized travel. Consequently, road congestion, air pollution and traffic safety have become major problems in Dalian. Many Chinese metropolises consider the possibility of leading urban growth onto a more sustainable development pathway and turn to the concept of Transit-Oriented Development (TOD). However, TOD could only become a promising solution for sustainable urban transport if thorough examination is conducted at the local and regional levels on how and to what extent conditions for developing effective TOD are fulfilled. Therefore, this article makes an attempt to identify conditions for effective TOD and map them systematically. We will make a distinction between critical and important conditions. After this, the record of Dalian, a coastal city in China with over 6 million people and a good tradition in using public transport which officially embraced the TOD planning method, in meeting those conditions is examined. Conclusions are drawn as to where Dalian's strengths and weaknesses lie and what actions the Dalian government has taken with regard to each of these conditions. Finally, to transfer the TOD lessons of Dalian to other Chinese cities, we conclude that to make TOD work in China, cities should at least meet all critical conditions such as pedestrian friendly urban design, good governance and high quality transit services. Furthermore, they should at least meet some of the important conditions. Meeting the latter ones can be a gradual process given the fact that most Chinese cities are still in an early stage of their TOD learning curve.

1. Introduction

Since China's opening-up, many first and second-tier cities have experienced rapid urban expansion (Deng and Huang, 2004; Li, 2008; Han, 2010a). From 1978 to 2010, China's urban population increased from 80 million to some 640 million. By 2010, 124 out of 287 prefecture cities had a population that surpasses 1 million, and megacities such as Beijing, Shanghai and Chongqing have each urban populations of over 10 million. With regard to land, China's urban land area increased by 14,641 km^2 in the period 1985–2000 and sprawled even faster over the past decade by 151,436 km^2 (China Statistical Yearbook, 2011). Fueling the trend of large cities constantly swallowing their surrounding secondary cities and rural townships within their geographical or administrative ambit have been China's drastic land reforms and a rapidly growing economy leading to rising disposable incomes. Under a series of land reforms promulgated by the central government in the 1990s, the urban centers of Chinese cities have given to governmental and business offices and retail after having been occupied by working class families before. Some households are forcefully moved to other places, while others are willing to move, cashing in their valuable central-city land holdings and seeking larger and more modern housing in suburbs with low densities, less traffic and noise. The state-owned manufacturing and industrial enterprises, as well as large organizations like universities and hospitals that originally located in the central city are also shortlisted for removal to the cities' periphery and thus releasing much land in the center for financial and service industries (Ma, 2004; Wu, 2004; Cervero and Day, 2008).

The centrifugal movement of people and jobs, along with rising personal disposable incomes, generated a skyrocketing private automobile ownership in the past decades in China. During 1985–2010 the nationwide private car ownership increased from 284,900 to 86,060,000, an annual growth rate of 46% (China Statistical Yearbook, 2011; Wang et al., 2011). As a result, mobility

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0966-6923/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.jtrangeo.2012.02.010

depending on automobiles in large Chinese cities accounts for more than 60% compared with mobility by public transport. Such a high motorization level is reason for concern in terms of sustainable development, because urban China's swift pace of growth in suburbia has predictably overwhelmed the construction of road networks. In 2010, China's urban road areas, which were expanded by 300 km^2, absorbed nearly 18 million additional cars – an average of almost 50,000 new cars per day. Therefore, it has led to serious problems of urban traffic congestion which, then, brought about a threat to urban air quality, noise and traffic safety. In large cities, the average travel speed on major arteries declined remarkably from about 40–50 kph in early 21st century to some 10–15 kph at present (Wang, 2011). Traffic jams with cars frequently accelerating and decelerating on roads have in turn worsened air quality. A study by the World Bank has shown vivid figures: in large Chinese cities, cars tend to contribute about 50% of the total CO_2 emissions; the other modes including public transport, motorcycles and taxis, contribute 10–20%; and the remaining is from production activities of factories (Darido et al., 2009).

China has recognized the negative impact of auto-dependent urban transport and aims to resolve the problem. Among the strategies being proposed to head off the rising traffic congestion and deteriorating environmental conditions have been investments in constructing and improving urban rail transit systems and also urban bus networks. This can be traced from *"Suggestions on prioritizing the development of urban public transport"* and *"Suggestions on economic policies regarding prioritizing the development of urban public transport"* reports, promulgated by the central government and ministries (State Council, 2005; MoHURD et al., 2006). Thanks to these central government initiatives, compared to 1980 when urban railway lines could rarely be found in Chinese cities, the total length of urban rail systems in 2009 had reached 999 km. And bus transit lines have also been extended from 5979 km in 1995 to 208,250 km in 2009. In addition, the urban trips by Chinese citizens have increased from some 3.7 billion in 1995 to around 70 billion in 2009. Such an increase in urban traffic demand, therefore, further justifies high-capacity urban rail investments. Urban metro systems are currently found in 8 mainland Chinese cities. And 15 other cities have plans for extending and upgrading their existing metro systems and building new ones. Bus Rapid Transit (BRT) systems are being built or expanded in Beijing, Tianjin, Dalian, Shenyang, Chengdu, Xi'an and Kunming. The cities of Tianjin and Dalian also have streetcars in operation.

Nowadays, these Chinese cities with increasing numbers and scales of large, rapid transit projects have seen opportunities for creating sustainable city forms through integrating land development and transit investments. Many local governments (including Beijing, Shanghai, Hangzhou, Nanjing, Wuhan, Chengdu, Shenzhen, Guangzhou and Dalian) are turning to the concept of Transit-Oriented Development (TOD) as an option to promote public transport and thus to reduce car-dependency. Dalian, among these Chinese cities, is perhaps the most striking example of this new trend. It is one of the eastern coastal cities that can be regarded as "developed" and it actively adopts new ideas and policies. In addition, Dalian has a strong tradition in using public transit, and this can be evidenced by a very high share of public transit ridership, as well as a relatively lower housing-job commuting duration by public transport, compared to any other Chinese city (Jiang and Han, 2009) (see Figs. 1 and 2). Therefore, Dalian can be regarded as a critical case and a city that is the most appropriate candidate to adopt the TOD concept. If it does not work there, it would effectively be hard to implement it in any other city in China. Another reason for studying Dalian revolves around the issue of data accessibility. The authors of this paper have access to the transport data of Dalian through personal relationships and were able to conduct interviews with local decision makers.

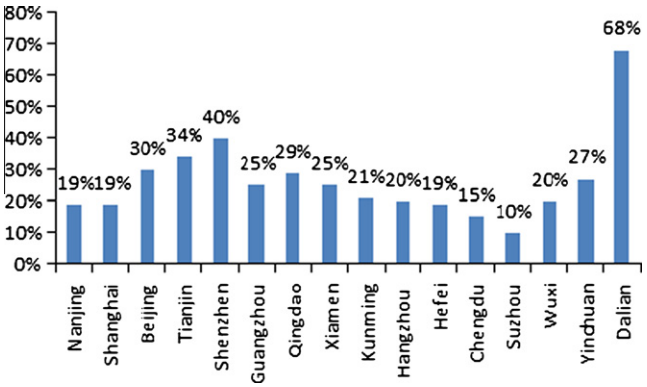

Fig. 1. Transit modal splits in major Chinese cities, 2006. *Source*: Jiang and Han (2009).

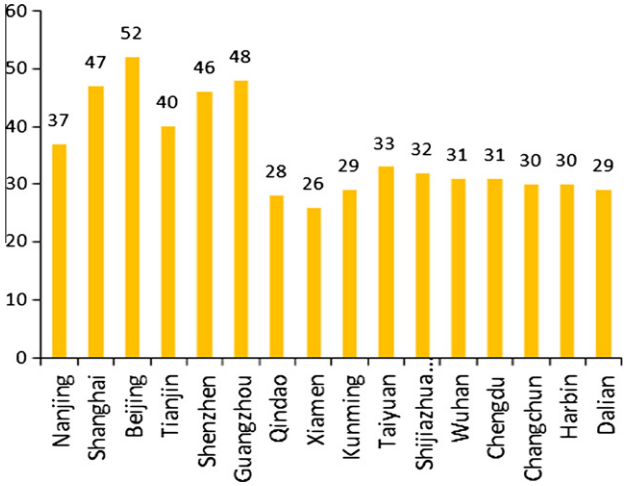

Fig. 2. Average housing-job commuting durations (min.) by public transport in major Chinese cities, 2010. *Source*: China Academy of Sciences (2010).

The TOD concept was first proposed by an American architect (Calthorpe, 1993) and therefore many American cities such as San Francisco and Atlanta were the first to adopt the TOD planning principles. Later on, it gained much attention in Europe. Various good practices with TOD adoption have been reported in Stockholm, Copenhagen, Munich, Zurich, and Karlsruhe (Bernick and Cervero, 1997; Cervero, 1998; Dittmar and Ohland, 2004; Curtis et al., 2009). Most recently, some Asian governments like those of South Korea, Hong Kong, Taiwan, mainland China, Japan and Singapore, have begun to use this concept as their primary urban planning methods (Cervero and Day, 2008; Loo et al., 2010; Sung and Oh, 2011). As can be seen, it is a good tradition for Asian countries to systematically gather knowledge from western experience and subsequently implement the most useful lessons at home. And the adoption of TOD in China is no exception to this rule. However, policy reports have noted that China still has a long way to go for effective TOD because while introducing this concept, realistic analysis and thorough examination on the diverse conditions inherently included in TOD development are missing: to what extent the national and local contexts meet the TOD development requirements; and how/in what ways the introduction of TOD would alter the urban context in various sections about transport policy, restriction on car use, land use, housing supply, etc. (Lin et al., 2004; Yang and Li, 2004; Zhao, 2006; Liu, 2007; Lu and Zhao, 2008). This article thus aims at exploring and analyzing such interactions between local context and TOD in Dalian, a forward-