

Taking advantage of a historic opportunity? A critical review of the literature on TOD in China

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Abstract: Since the term was coined in the United States in the early 1990s, the concept of transit-oriented development (TOD) has enjoyed worldwide success. For emerging countries that are both experiencing fast urban growth and involved in the development of mass transit transportation networks, innovative planning practices are needed. Researchers have identified the recent development of subway networks in Chinese cities as an opportunity to implement TOD principles. Based on an extensive literature review, including Chinese sources, this paper aims to identify the way in which the concept of TOD has led to the emergence of a challenging research field dedicated to the integration of urban and transportation planning in China. Results from grounded studies have failed to prove that Chinese cities are “real” TOD cities in the formal sense; however, they are useful for identifying the key factors behind the lack of integration between transportation and urban development that are likely to influence planning, design, and research practice in China in the future.

Keywords: TOD, China, land use, transportation, urban planning, transportation planning

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1 Introduction

The application of the principle of sustainable development to the city has given a new legitimacy to the search for better links between transit systems and land use. Although there is no scientific consensus on the virtues attributed to this kind of development, it has nonetheless become established as one of the key paradigms of sustainable urban planning and development; indeed, it has already given rise to many experiments relating to urban planning and urban projects in major cities in North America, South America, Europe, and Asia. Among these, the North American concept of transit-oriented development (TOD)—developed in the 1990s as a comprehensive response to the challenges raised by

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automobile dependency and urban sprawl—has enjoyed considerable scientific and political success throughout the world.

In this context, China represents a unique test bed for analyzing the dissemination and scientific and political appropriation of the TOD concept. Since the end of the 1990s, urban growth has been accompanied by large-scale public investments in urban transit systems, reflected in particular through the creation of new subway lines in most of the country's major cities. This policy has raised a number of questions and considerations, both theoretical and empirical, on the effects of these infrastructures on urban space. The term TOD, often employed in this abbreviated form, is considered both a major conceptual reference for these considerations and an example of the "best practices" that political leaders should implement. But what exactly is understood as TOD in China? What are the challenges and objectives associated with this imported concept?

To answer these questions, we propose, in this article, to analyze the emergence and stakes of research into TOD in China on the basis of a review of the international literature. This literature has for a long time been limited; however, the number of publications on this subject in English has become quite substantial in the last 15 years or so. Our selection of references, which aims to be as exhaustive as possible, has followed three main criteria: 1) the nature of the documents, including scientific and technical articles, master's theses and PhD dissertations, contributions to international conferences, and reports and documents produced by major international institutions; 2) the presence of the expression "transit-oriented development" or the abbreviation "TOD" in the title and/or abstract, or failing this, the simultaneous presence of terms associated with both of these search items (for example, transit and land use, stations and urbanization, urban planning and transportation); and 3) a date of publication situated between the late-1990s, when the first texts in English and Chinese featuring the abbreviation TOD appeared, and 2014 (included).

As a result of this work, we were able to identify 95 articles in English, which form the core of our corpus. They are summarized in a table presented in the appendix at the end of the article. To this corpus, we have also added a limited selection of articles published in Chinese, identified following our exploration of the two main Chinese databases of scientific and technical articles.¹ This relatively large secondary corpus (the abbreviation "TOD" appears in 195 article titles and almost 400 abstracts) includes articles that are more specialized than those of the international bibliography, along with more general references regarding the Chinese urban context. This allows us to put into perspective the ways in which the TOD concept is incorporated into the Chinese scientific sphere. Finally, we conducted around a dozen semi-structured interviews with individuals responsible for urban policy and transportation policy, as well as a number of Chinese academic experts,² with the aim, in particular, of comparing the key hypotheses and trends revealed by the bibliographical survey with local stakeholders' representations.

However, the aim of this article is not just to produce a summary of literature featuring research on TOD in China, but it is also to construct a real framework of interpretation that can shed light, and open up the debate, on the emergence of the TOD concept in the Chinese academic, political, and professional domains, while contrasting this emergence with recent changes in urban planning in China. Our core hypothesis is based more specifically on the idea that the successes and pitfalls of the integration of TOD in China, as both a concept and a practice, simultaneously reflect and illustrate a profound but incomplete paradigm shift in Chinese urban planning.

2 China: The new "pioneer front" of TOD?

2.1 The globalization of TOD

The concept of TOD was defined in the late 1980s by the American architect and urban planner Peter

¹We searched two major online databases: Wei Pu (<http://www.cqvip.com>) and Wang Fang (<http://www.cqvip.com>).

²In particular Pan Haixiao and Zhuo Jian (Tongji University, Shanghai), Lu Huapu (Tsinghua University, Beijing), Ma Lin (China Academy of Urban Planning and Design, Beijing), and Wang Hongyang and Yang Tao (Nanjing University).

Calthorpe, and subsequently popularized in the field of urban planning and development following the publication in 1993 of his work *The Next American Metropolis*. Calthorpe (1993) is part of a long tradition of practitioner-generated research and ideas on the links between urbanization and mobility, the precursors of which are often considered to be Ildefonso Cerda and Ebenezer Howard (Carlton 2009). Calthorpe (1993) is more directly the result of a radical critique of the North American model of urbanization, marked by extensive low-density peri-urban sprawl and associated with almost universal car use. This critique, developed from the late-1970s by the environmental and anti-sprawl movements, sparked new ways of thinking about and creating cities in the United States, often grouped together under the term “new urbanism” (Katz 1994).

Generally speaking, TOD aims to structure urban growth, at both the regional and local level, around mass transit infrastructures. The characteristics of the concept were specified by a number of works in the 1990s (Bernick and Cervero 1996; Cervero 1998). Founded on the application of three principles, known as the “3 Ds” (density, diversity, and design), later upgraded to “5 Ds,” with the addition of destination accessibility and distance to transit (Cervero and Kockelman 1997; Ewing and Cervero 2001), TOD takes the form of a set of actions of various scales and natures:

Organize growth on a regional level to be compact and transit-supportive; place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops; create pedestrian-friendly street networks that directly connect local destinations; provide a mix of housing types, densities, and costs; preserve sensitive habitat, riparian zones, and high-quality open space; make public spaces the focus of building orientation and neighborhood activity. (Dittmar and Ohland 2003, p. 43)

TOD has several aims: to reduce automobile dependency, to limit land waste, to avoid single-function land use in suburban and peri-urban developments, and to make the places where people live and work more urban (Project for Public Spaces 1997). In this way, TOD offers an integrated vision of development projects, taking into consideration their spatial, social, economic, and environmental aspects:

These transit-oriented developments have the potential to provide residents with improved quality of life and reduced household transportation expense while providing the region with stable mixed-income neighborhoods that reduce environmental impacts and provide real alternatives to traffic congestion.” (Dittmar and Ohland 2003, p. 2)

In the 1990s and 2000s, dozens of projects incorporated aspects of TOD in the United States, as well as in other English-speaking countries such as Canada (Verde 2013) and above all Australia (Renne 2007). Although cities such as San Francisco (Luscher 1995), Portland (Dill 2006), and Melbourne and Sydney (Searle, Darchen, and Huston 2014) have often been cited as examples, a number of empirical studies have highlighted the discrepancy between the theory and the local implementation of projects (Dittmar and Ohland 2003). As a result, analysis of the conditions for, and obstacles to, successful TOD in the United States has generated an abundance of literature in such varied fields as regional economics, political science, and urban design (Cervero et al. 2004; Dunphy et al. 2004; Curtis, Renne, and Bertolini 2009). Since the late 1990s, however, the most frequent and lively debates have concerned TOD’s contribution to new sustainability objectives, in particular with regard to changes in mobility practices (Boarnet and Sarmiento 1998; Ewing and Cervero 2001; Chatman 2006; Gard 2007).

The spread of the TOD concept in other geographical contexts, marked by higher urban densities, has occurred in an incomplete manner and under different circumstances. However, recent research has tended to show that, while the concept itself has enjoyed lesser success, the emergence of new references, guidelines, and tools to ensure better coordination between urban planning and transportation also

forms part of a tendency to move away from a dominant urban model (see Table 1).

For example, in Europe, the TOD concept appeared later on and has not had the same scientific and political resonance (Curtis, Renne, and Bertolini 2009). In an urban context marked by lower levels of motor-vehicle use, higher population densities and more robust mass transit systems, as well as longer experience in integrating transportation needs into urban-planning processes (Bertolini and Spit 1998), urbanization has above all been concentrated on existing transit stations and areas already accessible by public transportation, both to encourage urban renewal in central areas (e.g., the ABC location policy in the Netherlands) and to provide leverage for the reconfiguration of areas on the outskirts of cities (e.g., the “city of short distances” policy in Germany). Similarly, scientific expertise in this domain has, in a broader sense, increasingly been structured around the analysis of the multiple and complex interactions between transit and land use, where TOD is just one of the possible models. Nevertheless, the desire for better integration between urban development and transit systems has, in Europe more than anywhere else, been raised to a paradigm of “best practice” for limiting urban sprawl and achieving sustainable urban development (European Union 2007). The pursuit of dense and compact urbanization around transit spaces, almost always associated with polycentrism and functional mix, is today one of the key guiding principles—something even a cliché—of the strategic documents of major European cities. However, as in North America, there is no scientific consensus on the expected benefits.

In Asia, Japan has played a pioneering role in the experimentation of policies that to a large extent are precursors to the TOD concept. In Tokyo, for example, the strategy known as “interconnected polycentrism” (from the early-1990s) involved planning urban intensification operations and ensuring metropolitan functions were distributed around the main interchange stations on the second orbital railway line, on land acquired by the transit companies (Chorus and Bertolini 2011). Seoul (Hyungun and Ju-Taek 2011), Singapore (Yang and Lew 2009) and, more recently, Hong Kong (Cervero and Murakami 2009; Loo, Chen, and Chan 2010) have also put into practice principles similar to those of TOD, long before the concept was formalized. In a context marked by very high densities and a modal share that is well suited to public transportation, integration between land use and mass rapid transit systems was formalized and encouraged from an early stage in order not only to manage land pressure but also to structure residential and functional de-concentration and the creation of new suburban hubs. TOD has simply been superimposed upon an already well-established culture of integrated planning.

Finally, by becoming “globalized” and gaining legitimacy in the light of urban sustainability requirements, the TOD concept has ended up designating operations of very different scales and natures, concerning downtown as well as suburban areas; urban densification as well as planned extensions to cities; and existing transit networks as well new infrastructure projects. Despite this blurred definition, the concept has been strongly promoted in China since 2000, when the first scientific article in Chinese on the subject was published.⁴

Table 1: Different emergence contexts for the paradigm of coordination between urban planning and mass transit

	Period of emergence	Urbanization model challenged	New references	Manifestations in terms of concepts and tools
North America, Australia	1980s	Urban sprawl	New urbanism	TOD and “3Ds,” land-use transport
Europe	1990s	Peri-urbanization, nebulous city	Sustainable urban development, polycentrism, functional mix	“Compact city,” “ABC” policy, “City of short distances”
Japan, South Korea	1990s	Land pressure, residential and functional de-concentration	Land management, “de-concentrated concentration”	“Interconnected polycentrism,” suburban hubs

³This is a translated version of an American paper (Boarnet and Compin 1999).

2.2 A historic opportunity for TOD in China?

In many respects, the Chinese context seems well suited to the implementation of TOD principles. First and foremost, unlike the United States and Western Europe, China is still undergoing rapid and sustained urbanization. Its urban population grew from 80 million in 1978 to over 600 million in 2011 (when the urbanization rate exceeded the symbolic 50 percent threshold), and it could, according to several estimates,⁴ reach 1 billion by 2030 (representing a 70 percent urbanization rate). This growth has been accompanied by an explosion in forms of urban mobility; the contemporary Chinese city, no longer bound by the constraints of the Maoist system, is generating ever growing numbers of ever longer journeys, in particular because of the spatially fragmented way in which functions and activities have been distributed, the liberalization of the land market, and changes in urban society (Doulet 2005).

Second, this increase in mobility has taken place in a context of relatively low levels of car use. The rate of car ownership in China (at around 90 cars per 1,000 inhabitants in 2013) is still far lower than those observed in most developed countries, which is around 500 per 1,000 in Europe and 700 per 1,000 in North America. While it is true that there are significant local differences—car ownership in the municipality of Beijing is at a level comparable with certain European countries, for example—and that access to private cars has been accelerating since the mid-2000s, the vast majority of Chinese city dwellers still depends on public transportation, mainly in the form of buses, for day-to-day mobility; in large cities, the modal share for journeys made by public transit is often more than 40 percent. The issue of TOD therefore arises in a context marked by a relationship to the motor car, which is quite different from that seen in North America, Australia, and even Europe.

Third, the late-1990s saw a shift in strategy nationally in favor of public transportation. As a result, regional and local investment choices are progressively being reoriented toward rail-based infrastructure (Cervero and Day 2008). The Beijing subway, for example, suffered years of stagnation with just two lines, but in 1998 it opened its third line, serving the north of the city (Doulet 1998). In China as a whole, the total track length of rail transit systems has increased more than eightfold from 2000 to 2010. The end of 2012 saw 62 lines and 1800 kilometers (2900 miles) operating in 26 cities, with a further 64 lines and 1600 kilometers (2600 miles) under construction (Salzberg, Mehndiratta, and Liu 2012). As we shall see, these new infrastructures provide an opportunity to rethink the way urban areas are produced, based on intensive rather than extensive methods.

Fourth and finally, after years of *laissez-faire*, the environmental impacts of projects now seem to be considered a matter of priority in China. The increasingly frequent use of cars for day-to-day journeys—from 3 million vehicles in 1997 to over 30 million in 2007 (Zhang et al. 2010)—has led to a noticeable worsening of both traffic congestion and air quality (Ng, Schipper, and Chen 2010). Furthermore, uncontrolled peri-urbanization uses up extensive amounts of farmland on the edges of urban areas (Zhao, Zhang, and Jiang 2007). The public authorities are increasingly receptive to these concerns and are starting to rethink the way in which urban policies and transportation in Chinese cities are to be defined; combating urban sprawl and restricting car use, among other sustainable urban development objectives, are now on the political agenda for both central and local government. With this in mind, interactions between transit systems and urban development have been formalized by a new regulatory framework, based on targeted legislation: A decree passed in February 2010 (the Urban Comprehensive Transportation System Planning Procedure) encourages urban development along rail lines or in the vicinity of railway and subway stations, while at the same time requiring improved coordination between the respective institutions responsible for urban planning and transportation planning (Ma 2010).

In this context, many researchers are of the opinion that China today has a “golden opportunity” (Zhang and Lin 2011, p. 6) to link urban development and transit projects. As mentioned above, TOD features significantly in the Chinese and international scientific literature on the subject of Chinese cities.

⁴ See the last UNDP report devoted to China, published in Beijing on August 27, 2013 (China National Human Development Report 2013. http://www.undp.org/content/dam/china/docs/Publications/UNDP-CH_2013%20NHDR_EN.pdf).

An initial review of this literature highlights a number of key trends.

- China's "potential" with regard to TOD is considered to be very high and to a large extent still unexploited: "Opportunities for creating sustainable city forms through bundling land development and railway investments in large Chinese cities are quite substantial and largely untapped" (Cervero and Day 2008, p. 315).
- TOD is considered to be a strategy well suited to Chinese cities and the challenges they are facing: "Major cities in China are extending rail transit into the urban periphery to counter urban growth and suburbanization that are automobile-driven and automobile-dependent. In the meantime, transit-oriented development (TOD) has been adopted widely in Chinese cities" (Pan, Shen, and Zhang 2011, p. 95).
- In order to effectively combat structural tendencies that favor car ownership and use, peri-urban sprawl and the spatial separation of functions and activities, TOD must be implemented as quickly as possible (Zhang 2007; Zhang and Lin 2011): "This is the critical time when we need to fight a battle against upcoming and highly possible auto-dependency in urban China. It is now or never" (Zhang and Lin 2011, p. 6).
- The principles of TOD have been widely disseminated in the field of territorial planning, in particular, because of the influence of American expertise in Chinese academic and professional spheres; these principles have already been implemented, albeit only partially in a certain number of large cities: "Urban planners in China typically adopt the TOD concept in the planning of new neighborhoods, at least in their own interpretation" (Bruce 2012, p. 23).
- Regarding TOD, China can seek inspiration from existing "best practices," in particular, those implemented in other Asian cities such as Seoul, Taipei, Singapore, and above all Hong Kong: "Since there is limited research on this topic in a Chinese context, many researchers look to Hong Kong as a benchmark for a successful TOD strategy, given, for example, the similar culture and problems with population growth" (Bruce 2012, p. 8).

However, is China really the "country where everything is possible" with respect to TOD? "Chinese potential" must also be analyzed in the light of 20 years of urban growth during which road infrastructure played a decisive role in guiding urbanization (Zegras 2010). Since the early 1990s, the very high rate of land development has meant that roads have been the primary means of promoting new development projects (car-oriented development). The realization of these projects, prepared and approved by urban and regional planning documents, has gone hand in hand with a very extensive culture of urban development (Yang and Gakenheimer 2007). In a somewhat surprising twist, certain American researchers see this unbridled suburbanization as analogous to the situation in North America at the start of the 1960s (Calthorpe 2012). Yet it would appear that not only are the contextual parameters not at all the same (Campanella 2008; Chen 2010), but they also already partly fulfill the original objectives of TOD: Chinese cities are very dense; the vast majority of the housing they contain is organized in large collective complexes; car use remains quite low; and road-based (and to a lesser extent rail-based) public transit is relatively abundant.

How, therefore, is the application of the TOD concept relevant to China? How is it interpreted and implemented locally?

3 An initial assessment of TOD in China

As we have seen, over the last 15 years, a substantial amount of literature on TOD in China has been published in English (see graph in appendix representing the cumulative number of references dealing with TOD in China by publication date). A review of these works, intended to be as exhaustive as possible, enables us to draw some initial conclusions about the results of various TOD approaches and

projects in China. Different approaches have been mobilized in different academic fields. In this part of the text, we have chosen to cite a selection of references that we consider typical of the interpretation frameworks to which we shall give priority in the third part of this paper.

3.1 The various approaches to TOD

The first criterion—methodological—is intrinsically linked to the dual nature of TOD, which is both a concept and a set of operational practices: Studies of TOD in China have given rise both to theoretical articles, which analyze the relevance and challenges of the concept when applied to the Chinese context, and to case studies that seek to explore the conditions and logistics of its implementation in the context of development projects.

The second is field-related: The approaches and methods used differ significantly depending on the scientific discipline of the author(s). The articles reviewed principally relate to transportation studies, territorial economics, urban planning and urban design, and occasionally political science, urban sociology, and even philosophy (Xuan 2009).

The third classification criterion concerns the scale of analysis of TOD. In the theory developed by Calthorpe, the implementation of truly integrated planning means taking account of the coherence between transportation and urban planning at three main levels: local (neighborhood TOD), metropolitan (urban TOD) and regional, or even national (regional TOD). Articles on China can be found at all these planning levels, as evidenced, for example, by the latest special issue of *The Journal of Transport and Land Use* (Zegras 2010). That said, aside from a few rare exceptions (Chen 2010; Zhang 2011), there are no comprehensive analyses that integrate all three dimensions.

The fourth and final criterion concerns the modes of transportation used for TOD. Naturally, there is an over-representation of subway systems, which have been the subject of the greatest number of projects over the last 15 years; however, few studies have focused on the application of the concept to China's new high-speed rail (Dai, Salet, and De Vries. 2011), streetcar systems (Zhao and Yang 2007), or bus rapid transit (BRT) networks (Spear 2006; Duduta et al. 2010; Deng and Nelson 2010).

Cross-referencing these criteria reveals a number of broad trends. Studies whose analyses concern the national and regional levels are often more conceptual and are typically produced by researchers in fields such as territorial economics and regional planning. In particular, they consider the effects of public transit infrastructures on land use (Tan et al. 2005; Yang and Gakenheimer 2007; Zhao, Zhang, and Jiang 2007) and the major environmental balances (Bertaud 2007). Case studies, on the other hand, tend to be more closely associated with fields such as urban planning, urban design, and urban sociology. At the metropolitan level, they envisage the impacts of subway systems on the structuring of urban growth (Zhao and Yang 2007; Gu and Zheng 2008) and mobility practices (Yang and Gakenheimer 2007; Pan, Shen, and Zhang 2009; Chen 2010; Næss 2010). At neighborhood level, the most commonly addressed questions concern residential densification (Duduta et al. 2010) and the development of the public spaces around transit hubs (Dai, Salet, and De Vries 2011; Bruce 2012).

3.2 A mixed assessment

While the high level of diversity in the approaches used to analyze the implementation of TOD in China allows us to establish an initial overview of the projects developed, it is quite difficult to obtain a meaningful overall vision of the various stakes and functions of TOD in the production of Chinese cities.

First, a number of works focus on economic analyses of the costs and benefits of new transit infrastructures. In particular, they assess the impact of these infrastructures on the supply and demand of

land and real estate. Although the value of land served by public transit lines does seem to have increased more quickly than elsewhere, especially in peri-urban areas (Bertaud 2007; Cervero and Day 2008; Gu and Zheng 2008)—regardless of the transportation mode in question (Deng and Nelson 2010)—an analysis of the criteria used to decide where to build housing and commercial areas shows that collective accessibility is still not a major differentiating factor in large Chinese cities (Yang and Gakenheimer 2007). Similarly, the leverage effect of transit networks on economic development, particularly around new multimodal hubs, has not yet been clearly proven. Although some studies point to a strong impact on job growth due to station proximity (Dai, Salet, and De Vries 2011), most qualify these results by pointing out that urban rail was already designed to serve high-density job sites and that no additional planning effort has been specially undertaken to attract additional higher-density development around these stations (Zhang 2007; Cervero and Day 2008).

Second, with regard to land use and urban forms, most studies remind us that Chinese cities already had very high population density levels, easily matching the thresholds recommended by the TOD theory. Therefore, the impacts in this regard are difficult to observe (Bertaud 2007; Chen 2010; Næss 2010), especially as access to data at detailed output levels is not easy to obtain (Spear 2006). Several studies merely highlight a certain intensification of urban development around stations (Gu and Zheng 2008; Deng and Nelson 2010). Furthermore, any densification operations would appear to be less the result of proactive policies than of opportunistic strategies on the part of public and private players (Yang and Gakenheimer 2007). More generally, the new ways in which urban space is used seem to only marginally take into consideration the challenges and constraints of collective mobility; the disproportionately large dimensions of residential buildings and city blocks (Bruce 2012), along with the rigid hierarchy of different street and road types (Zhao and Yang 2007; Tao, Mehndiratta, and Deakin 2010), reduce the accessibility of stations at the micro-local level (Pan, Shen, and Zang 2009) and compromise inter-modality between sustainable modes of transportation (walking, cycling) and mass transit (Duduta et al. 2010).

Third, taking a different perspective—but one that is just as typical of research into TOD—several studies have focused on the effects of new transit service creation on city-dwellers' mobility practices. In general, as in the overwhelming majority of urban spaces worldwide, the use of sustainable and public transportation modes seems to be greater in dense central districts where there are high concentrations of jobs and housing than in new suburban and peri-urban areas (Bertaud 2007). Furthermore, the creation of new mass transit lines with high levels of service seems to encourage higher ridership levels, particularly in outlying areas (Næss 2010; Deng and Nelson 2010), and in some cases makes it possible to reduce congestion (Zhao and Yang 2007; Lin 2013). However, the studies in question remain cautious in their interpretation of these results. As the modal share for car use is still much lower than for mass transit use, it is difficult to assess the reality of the situation and the magnitude of modal shifts. Fundamentally, the motivation for improved transit infrastructures seems to be less about restricting demand for car-based mobility and more about responding to rampant urbanization by trying to ensure minimum levels of accessibility for the residents of new neighborhoods.

Ultimately, whichever indicator is used, the results of the studies are mixed at best and underscore the difficulties encountered in implementing TOD principles. Has the local implementation of TOD been hindered by a certain number of structural obstacles inherent to the methods used in the planning and production of Chinese cities?

4 Defining a “China-specific” form of TOD

Although the current situation regarding TOD in China is difficult to assess, it is essential that we understand the ways in which the concept has been appropriated in order to identify how it can become

a lever for strategy changes that will encourage better links between urban planning and transit. What would be an appropriate form of TOD with respect to the Chinese context?

4.1 What TOD tells us about China

It would seem that difficulties experienced in integrating transit into urban planning via the notion of TOD do not lie in the Chinese urban structure, whose flexibility is generally well suited to this type of integration, but rather in the mechanisms involved in the production of the city (governance, land tenure, role of promoters, etc.). There are several reasons for this (see Table 2).

First of all, implementation of TOD is compromised by planning methods that are still very much inspired by the functionalist approaches favored by communism (Cervero and Murakami 2009). Although transit infrastructures have been built to serve new urban projects on the edges of cities, they do not seem to have been in any way designed as vectors to drive and shape urbanization. On the contrary, the network is superimposed upon the urban space, creating its own objects (such as monumental stations located far from the high-speed rail network: Tang, Savy, and Doulet 2011). The structural effect of subway networks is thus often reduced in their ability to connect different parts of the city, without taking account of the potential impacts on urban structure. Indeed, these impacts would seem to have less to do with TOD and more to do with what some call DOT (development-oriented transit⁵). Similarly, new residential complexes (xiaoqu) and business parks (fazhan xinqu) are laid out according to formal, rigid street plans that divide the space into very large blocks (often called mega-blocks) that are not particularly conducive to travel on foot or by bicycle.

Second, TOD is hindered by the absence of any real land-management measures. Land development is a major economic lever for local authorities, which means that priority is often given to short-term value maximization strategies. Land speculation and an unbridled enthusiasm for homeownership, all in a climate of rising prices, explain why new residential neighborhoods do not necessarily need a rail-based mass transit service to be profitable (Spear 2006). More generally, urban development choices are guided by priorities relating to economic growth and investment attractiveness, considered more important than the priorities laid down by the master plans. In this context, a great deal of freedom is granted to property developers, at the expense of the regulations concerning the integration of urban planning and transit. This relatively liberal model for the production of the city has been described by some researchers as “entrepreneurial” (Wu 2015) or “developmentalist” (Doulet 2015). In this context, public transportation networks serve above all as levers for land development.

Third, TOD suffers from segmented governance (Spear 2006; Zhao and Yang 2007; Delaunay 2012). While it is true that the “compartmentalization” of public action is a classic obstacle to the implementation of TOD that can be found in many other geographical and political contexts, it takes on particularly unusual and complex forms in China.

- First, the practice of inter-territorial cooperation is limited to a few metropolitan areas. Moreover, the model of urban governance remains highly hierarchical and leaves little room for consultation between municipalities and lower-level administrative territories such as districts and counties.⁶ This vertical segmentation is reinforced by the competition that exists between different tiers of government in terms of attracting investments liable to finance their projects. Accordingly, the choice of location for new transit infrastructures often has little regard for local development conditions, while infra-municipal territories, particularly counties, are rarely involved in strategic planning regarding the impact of these infrastructures and the opportunities that they offer.

⁵Let us not forget that, in his book *Garden Cities of Tomorrow*, Ebenezer Howard put forward the concept of “development-oriented transit” as early as 1894. He imagined “garden cities” that would be interconnected by a strong transportation network, composed mainly of inter-municipal trains and streetcars, around the central city.

⁶In China, municipalities are infra-provincial administrative divisions that often cover very large areas (extending to several thousands, or even tens of thousands, of square kilometers). They incorporate a number of administrative subdivisions, notably districts in the urban core and counties in the more rural peripheral areas.

- Second, local authorities' ability to take integrated action within their territories is limited by the lack of horizontal coordination between different technical departments. As these departments are subject to the supervision of national organizations, their respective areas of action are clearly circumscribed and mutually independent. Therefore, despite the creation in recent years of bodies such as "line committees"⁷ that aim to improve coordination between transportation and urban development, the formulation of cross-functional goals has little influence in the face of sectoral cultures that are still highly compartmentalized.
- Third, the culture of urban projects—cross-functional by nature—has not really been adopted in China, particularly because designs for new urban spaces have difficulty incorporating the different uses that will be made of them, in the absence of any consultation or demand-based approach. Even when a transit line is incorporated into efforts to promote new residential programs, the stations are often placed too far apart and, above all, are poorly linked to the buildings of the neighborhoods themselves. This segmented approach to land use and flow management leads to developments around stations described as transit-adjacent (Renne 2009) rather than transit-oriented (Zhang and Lin 2011).
- Fourth and finally, the implementation of TOD is hampered by the way the transit networks are managed and operated. Typically, different modes of transportation are handled by different administrations, according to what is known as the "traditional" model (Jiang et al. 2009), resulting in a lack of intermodal coordination. Within a given network, lines may be created for different temporal and operational reasons, thus making transfers difficult for users (one particularly notable case being the connection between lines 2 and 13 of the Beijing subway at Xizhimen station). While certain municipalities set up "municipal transit committees" in the 2000s, these committees have not yet managed to significantly improve modal integration (Jiang et al. 2009).

Table 2: Impediments to the implementation of TOD principles in China

	Density	Diversity	Design
Functionalism legacies	Suburbanization	Zoning	Mega-blocks
Developmentalist strategies	Urban sprawl	Functional and social specialization	Transport-adjacent development
Segmented governance	Compartmentalized urban structure	Fragmented projects	Lack of public space

4.2 What China tells us about TOD

Given these very mixed results, we might ask why the notion of TOD is thought to make sense in the context of the local public action guidelines concerning transportation and urban development in China. Or, to put it another way, why do national and local bodies associate TOD above all with its sustainable development credentials and its image of virtuous urbanism?

Three main categories of article can be identified according to the way the concept is understood: 1) TOD is considered as a broad concept that requires a connection between urban planning and transportation; these articles use the concept to emphasize the importance of this connection (Wang, Hu, and Zhang 2010); 2) TOD is understood as one of the ingredients for sustainable transportation; these articles seek to build up a scientific corpus on which to base the principles for a potential form of sustainable transportation in China; 3) TOD is used as the basis for new planning methods; these articles describe the rules and conditions for their implementation, in particular via "transit villages" (Huang and Su 2010) and appropriate measures for new residential programs in peri-urban areas (Liu, Pan, and Jia 2011).

⁷In the late 1990s, the funding for line 13 of the Beijing subway was supported by a measure of this kind, involving the main developers of new housing schemes in the northern suburbs (Doulet 1998).

4.3 Some key recommendations

If we consider that the aim of TOD is to respond to specific challenges relating to the links between urban planning and transportation in China, we can try to identify the key principles that could define a form of TOD that is “made in China.” Following the work of Zhang (2007), who proposes a highly effective reworking of the TOD principles, we would like to make the four following thematic points—expressed in the form of questions—our key priorities and recommendations.

What can be done to transform growing recognition of the importance of transit infrastructures into leverage for the improved integration of transportation issues into urban planning? Recent changes in transportation planning and the new legal framework that has been gradually introduced since 2010 are good opportunities to initiate a new paradigm in spatial planning. In this new model, which we have described as “integrationist” (Doulet 2015), the Chinese public authorities have created the conditions for development projects based on public transit networks—railway stations in particular—in order to encourage dense, multifunctional urban development. However, it would no doubt be necessary for national standards to be established in order to structure and stimulate initiatives launched by local players—municipalities and developers in particular. For example, in France, in the 2000s, the implementation of a new national standards framework (the 2000 Law on Urban Solidarity and Renewal) was accompanied by a number of original initiatives at the metropolitan level to foster integration between urban planning and public transportation, such as the *contrats d’axes* (route contracts) established in Grenoble and Toulouse.

What can be done to overcome the absence of transverse action in territorial planning? This is a question not just of improving the links between functions and spaces, but also of rethinking the governance of urban planning, with the aim of fully integrating the different players and scales involved in planning, resulting in comprehensive TOD (Goethals 2011). The dominant model of urbanization in China has contributed in no small part to the segmentation of practices and professional fields in the production of the city. The new attention paid to ensuring public transportation is more effectively incorporated into spatial planning is undeniably an opportunity to foster new approaches that are integrated into projects’ thematic aspects on the one hand and transversal in terms of their form of governance on the other. Indeed, European experiences—and French experiences in particular—of changes to urban-planning practices have tended to place considerable emphasis on the notion of “urban projects.”

What can be done to improve multimodality? A number of mobility solutions can be used to “tie in” rail-based transit networks to the urban structure; it is therefore vital that great importance be attached to the development of transit hubs. Ambitious developments have facilitated improvements in the intermodality of transit spaces, particularly in the context of the Chinese high-speed rail development program (Doulet and Ramos-Doulet 2012). Today, several stations are directly connected to the subway and bus networks, and even to airport hubs in some cases, as at Hongqiao in Shanghai. However, significant efforts are still required, especially with respect to subway stations. From this perspective, it would without doubt be of great interest to improve links between rail networks and new mobility services—such as shuttle services (Sun and Doulet 2015) and self-service bicycles (Pan and Doulet 2010)—by extending the field of competence of urban transportation organizing authorities.

What can be done to modify an urban structure that lacks urbanity? Architectural and urban solutions that can “break up the blocks” and develop real public spaces around transportation hubs are essential (Chen 2010). As has been shown by the work of certain architecture firms (Brearley and Fang 2010), the spatial and functional restructuring of “mega-blocks” is a key opportunity and challenge. Today, there is an urgent need to adapt planning codes that promote pedestrian-friendly environments with small blocks and mixed use (Pan, Shen, and Zhang 2009).

5 Conclusion

As we have seen, the many local studies, in different Chinese cities, focusing on the structural effects of transit networks have produced very mixed results: Changes were observed in certain cases, but not in others; and sometimes the construction of a new transit line fits in logically with the development of a new neighborhood, sometimes not. It would therefore be rash to talk about a “Chinese TOD model,” or even a systematic effort to apply TOD when new subway networks are rolled out. After all, the contemporary Chinese context of urbanization is not a “blank canvas” on which TOD can easily be imposed; the notion of an “historic opportunity” goes against the pragmatic nature of existing urban development mechanisms in China.

However, certain changes are occurring in urban and transportation planning, from a legal, technical and philosophical perspective. Integration has become a new scientific and political paradigm and TOD could easily benefit from this turning point. More specifically, since the late-2000s, new national strategies have called for an intensification of the urbanization process by, for example, increasing the density of already urbanized spaces following the removal of restrictions on migratory movements, limiting urban sprawl through fiscal measures based on land tax, or increasing the number of urban renewal operations in response to rising property prices in densely populated areas. Indeed, it is likely that this change of paradigm is in the process of emerging in urban-planning practices. The four key areas deserve to be explored further are:

- Defining a national framework for stimulating innovation in terms of tools to ensure greater integration between urban planning and public transit
- Promoting a culture of urban projects that is better integrated into the development of transit, and in particular around stations
- Fostering the development of solutions that encourage intermodality, particularly by attaching greater importance to new mobility services
- Encouraging the improvement of spaces in proximity to transit by prioritizing urban design that is adapted to active modes of transportation

Ultimately, the Chinese case is interesting because it shows how important it is to contextualize the spread of the TOD concept. Moreover, this is a concept that only seems to make sense once the limits of the development model in question have been established; the fundamental criticism of the Chinese model of expansive and production-focused urbanization today gives this model a certain legitimacy, just as calling into question the notion of suburbia in the past stimulated its very invention in the United States.

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