Transactions on Computational and Scientific Methods | Vol. 2, No. 1, 2022
ISSN: 2998-8780
https://pspress.org/index.php/tcsm
Pinnacle Science Press

Evolving Urban Planning: A Comparative Study of Global TOD Models

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Abstract: Transit-Oriented Development (TOD), facilitated by public transportation, can significantly alleviate urban space and traffic congestion, manage urban sprawl, conserve resources, and enhance the aesthetic appeal of the environment. TOD exhibits strong resilience in addressing urban challenges and issues related to urban development. This paper elucidates the TOD concept, examines the necessity and feasibility of implementing the TOD model in China, and proposes corresponding strategies and recommendations.

Keywords:TOD mode; Urban traffic pressure; Public transport orientation.

1. Introduction

For a long time, the urban spatial structure dominates the urban traffic planning, but the demand-oriented traffic planning lags far behind the urban development speed. Under the dual pressure of expanding urban problems and shortage of land resources, Chinese cities urgently need to find a suitable and long-term effective development path. The strategy of public transport priority [1] has been recognized by Chinese cities and is in the process of further development. With the opportunity of public transportation Development, TOD (transit- oriented Development) guided by public transportation can be regarded as a better Development strategy. TOD mode is not only a simple urban development mode, but also can reverse the current urban demand-oriented planning mode in China. It guides the development of the city and the use of land through public transportation, which can make the traffic planning and the use of land get a good connection, improve the use efficiency of urban land, build a reasonable urban road traffic network, and promote the harmonious and healthy development of urban economy.

2. Research Review of TOD Model at Home and Abroad

TOD model theory was first proposed by Peter Calthorpe in the 1990s. He creatively created TOD, a new urban development model, and detailed description of TOD model planning and construction, formulated the principles of TOD model development and the way of land use, and formulated detailed standards for the functions of TOD community, such as public transportation, walking environment and public land. While summarizing the previous development experience, Freilich also proposed that the original intention of TOD mode design was to improve the use of public transportation, and more emphasis should be placed on the mixed use of land and diversified construction methods.

In 2003, Ma Qiang [2] summarized the development experience of the TOD model in the United States, systematically explained the origin of the TOD model, and evaluated the development of the TOD model in the United States. In 2004, Liu Qian [3] studied the influence of rail transit on urban spatial structure and urban development mode by analyzing the advantages and disadvantages of rail transit and combining the development characteristics of TOD mode. TOD mode, which takes rail

transit as transportation vehicle, has been widely recognized in China and has become the mainstream of TOD mode. In 2008, Chen Sha, Yin Guangtao, Ye Min [4] made a summative analysis of TOD, and compared domestic and foreign cases to give the key factors and framework of TOD implementation to study the development of TOD model in China through the realization of functions in the way of government function planning. In 2010, Tong Ruochun [5] proposed the TOD model suitable for the development of modern garden cities by combining the application of world garden cities and the TOD model. Taking the opportunity of Chengdu's development of world modern garden cities, the TOD model was implemented to realize the healthy development of cities, and the TOD model began to be applied in the overall development planning of cities.

3. TOD Model Concept

3.1. "Human-Centered" Design Concept

After experiencing the modernism's "functional division", "rational design" and the post-modernism's "humanism" trend of thought, the city still "lacks the care for people" and presents a state of disorder and sprawl, which causes serious urban problems. In this context, TOD model abandoned the pursuit of excessive emphasis on functional division, actively drew lessons from the "humanistic" thought, fully realized the "human-centered" design, and tried to reshape the diversified, humanized and community-based urban living atmosphere. To compact, suitable for walking, functional composite affordable and cherish environment, and achieve the goal of diversity, community, a simple and traditional values such as human scale and the organic combination of real life environment [6], thus reducing the stereotype of the city planning and construction of interpersonal estrangement, vigorously promote city on the solution of the problem.

3.2. Efficient Development of Land (High-Density, Three-Dimensional)

One of the objectives of the TOD model is to increase the efficiency of land use by increasing density and curb the spread [7]. The TOD model emphasizes the comprehensive utilization and development of land, and takes economic benefits as the core. According to the principle of economic value, the "concentric circle structure" of central business district, office area and peripheral living area is formed. This kind of concentric circle structure is based on the classical urban economic theory, which realizes the development of land differential density and causes the appreciation of land through reasonable development. It further intensifies the high-density development of the area near the urban rail transit station, which leads to the three- dimensional development tendency of land "from underground to the ground and from the ground to the underground space", and becomes the typical area of compact city.

3.3. Realization of Mixed Functions

TOD mode emphasizes multi-functional space interaction, emphasizes the design concept of "human-centered", pursues multi-functional design and efficient utilization of facilities, and realizes the integration of commercial, office, residential, leisure and entertainment functions, so as to meet the needs of people. But it does not force "small and complete" compose is redundant, achieve the efficient use in facility mix, make its satisfy people thereby to the life and environment diversity, diversity of pursuit.

3.4. Efficient Accessibility

TOD mode takes 600m(about 10 minutes' walk distance) as the effective influence boundary of the community, forms a circular radial road network centering on rail transit stations, emphasizes walking and pays attention to human care. In land development, the realization of mixed functions, public space and good ecological environment are emphasized, which greatly improve the accessibility of the whole community. This accessibility not only emphasizes the improvement of traffic mobility, but also the realization of convenient and comfortable living and working "space humanistic spirit". TOD mode is mainly based on walking and bicycle transportation, and realizes "zero transfer" of various transportation modes, which is the best performance of transportation accessibility under current conditions.

3.5. Optimized Urban Structure

On the micro scale, based on the traditional economic theory, TOD mode takes advantage of the differential density and pays attention to the efficient and intensive development of land. The realization of concentric circle structure does not lose the humanized design concept. At the same time, it also realizes the shaping of a good environment and the building of public space, so as to effectively avoid the occurrence of "tragedy of the common land", and realize the efficient and centralized development of land corresponding to the macro decentralized layout. With rail transit stations as the center and connected by rail transit lines, TOD community presents "pearl necklace" development, which coordinates the overall dispersion and local concentration, shapes pleasant living space and realizes the optimization of urban structure.

4. Research on the Application of TOD Model in China

TOD model is a better development model to solve urban problems, but also a very good development model to prevent the expansion of urban problems. At present, China is in the period of rapid promotion of motorization and urbanization. With the increasing demand for transportation, transportation planning has been far behind the development of demand. In this case, it is of great significance to change the urban development mode and demand-type planning mode.

4.1. Necessity of TOD Mode Application in China

(1) Urban traffic congestion is a serious problem in China

In the process of rapid urbanization, a large number of people have poured into the city, which makes the land resources of the city increasingly tight, and the population has caused the urban space congestion, especially in the surface transportation level. Only through a better way of development can we reduce the travel mode of cars, reduce the pressure of urban traffic and beautify the urban environment, and the TOD mode is a better choice.

(2) China's urban land use mode is single

The mixed use of land in China's traditional cities is mostly the use of low-density land. Often, the mixed use of land is mostly the facade floors in the prosperous areas of the city, as well as the private two-storey buildings. This area is a key area for business circulation and capital conversion. This low-density construction form seriously hinders the development of urban economy. Therefore, Chinese cities need TOD model to build high-density mixed-use communities, improve land use efficiency and alleviate various urban problems.

(3) China's cities need a public-transportation-oriented development model

Public transport vehicles are the basic form of urban traffic in China. However, due to the continuous expansion of cities and the deterioration of traffic conditions, the occupancy rate of public transport vehicles is constantly declining. In cities with rail transit, this phenomenon has been obviously improved, but the excessive number of passengers in the peak period of rail transit has also become the drawback of urban development.

4.2. Feasibility of TOD Mode in China

The key to the development of the TOD model is public transport, in which many cities are in preparation. China's car ownership is far lower than that of developed countries, which has become a necessary condition for the urban development of TOD in China. However, with the development of economy, China's per capita car ownership is gradually increasing, which also poses challenges for the development of TOD.

China's urban population density is far higher than that of European and American countries. The high urban population density and large urban scale have already provided the conditions for the development of TOD model. The tradition of mixed use of urban land in China also provides advantages for the development of the TOD model in China, and the high-density mixed use will not be rejected by people.

Faced with many problems left over in the process of urban development, if we don't control them, they will have a greater impact in the future. When dealing with urban problems, TOD model is not a perfect solution, but it can well deal with the problems faced by China's urban development, and it

has become an urban development model more suitable for China's development. Chinese cities have already possessed the basic conditions to develop TOD model, and Chinese cities also urgently need to develop TOD model.

5. Countermeasures and Suggestions for the Development of TOD

(1) Outstanding features and clear purpose

The application of TOD mode in the city must have its unique industrial characteristics. The purpose is to develop TOD mode by taking advantage of industrial advantages and to establish the pattern of multi-center city development mode.

(2) Coordinated development of land use and transportation planning

(3) Protect the land along the subway and improve the utilization rate of land

(4) Forward-looking detailed planning and implementation

(5) Good policies and support

6. Conclusion

The development of TOD model in the past 20 years has made a lot of achievements. However, the introduction of TOD model in China is relatively late, and it is still in the stage of research and practice. Many cities still have doubts about whether TOD model is suitable for China. By summarizing and analyzing the development experience of TOD mode at home and abroad, this paper studies the necessity and feasibility of TOD mode of urban development in China, and puts forward countermeasures and Suggestions for the development of TOD on this basis.

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