



# Transit Oriented Development (TOD): A Tool for Effective Urban Growth

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## ABSTRACT

*With the acceleration of urbanization, traditional travel mode will gradually change into motorized mode, which will bring about serious problems such as traffic congestion, environmental pollution, low land use efficiency and other related problems. In era of sustainable development and limited space available in cities, many of these problems can be solved by cities augmenting their public transport systems and also integrating land use planning and development with the transport network. In order to ensure balance mode share with greater use of public transport, it is essential to develop Transit Oriented Development for sustainable urban growth. TOD is a viable tool to achieve this future. TOD's approach as the basis for a sustainable city is a good one transit system along with rediscovering ways in which planning and design can better incorporate the terrain less dependent on the automobile use. In order to improve the understanding of TOD, this paper introduces the concept, basic structure and role of TOD in Urban planning and design.*

**Key words:** *TOD–Transit Oriented Development, Concept of TOD, Land use-transportation integration, Urbanization, Role of TOD*

## 1. INTRODUCTION

Urbanization is an inevitable result of economic development; it refers to the shift from a rural area to an urban area. Urbanization has led to the horizontal growth of cities, thus creating problems of urban sprawl. With the acceleration of urbanization, the traditional mode of travel will gradually change to a motorized mode, which will cause serious problems such as traffic congestion, environmental pollution, low efficiency in land use and other related problems [1]. To address these problems, many cities have strengthened their public transportation by developing massive rapid transit systems (MRTS) such as metro trains and rapid bus transit systems (BRTS). However, it is important to use these systems efficiently by integrating land use with transportation infrastructure to make cities livable, healthy and smart. In order to ensure balance mode share with greater use of public transport, it is essential to develop Transit Oriented Development for sustainable urban growth [2].

The concept of TOD (Transit Oriented Development) is an evolution of urban planning concept that emphasizes on the principles of integration between land use and transportation. This concept is an elaboration of Smart Growth city concept that guides the development of areas the heavy rail transit, light rail transit and bus transit stations and stops to improve the accessibility of areas and to provide the ease of mobility [4].



## 2. LITREATURE REVIEW

### 2.1 Concept of TOD

TOD is typically identified as a high density area with mixed use (residential and commercial), within walking distance of high capacity public transit station. TOD were firstly introduced in 1990 by American architect and planner Peter Calthorpe[7]. According to Peter Calthorpe, TOD are: "Mixed-use community within an average 2,000- foot walking distance of a transit stop and a core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot." [3]. Cervero et al. (2004), "TOD is a tool for promoting smart growth, leveraging economic development, and catering for shifting housing market demands and lifestyle preference".

The Main objectives of TOD are:

1. Reduce/discourage dependency on private vehicles and induce public transport use through design, policy measures and enforcement.
2. Provide easy access public transport to the maximum number of people within walking distance, through densification and improved connectivity. [1]

TOD is characterized by:

- A mixture of uses
- Moderate to high density development
- Transportation options, including walking, biking and the use of public transportation
- Urban design and landscape features that integrates surrounding uses and streets
- Pedestrians oriented

### 2.2 Basic structure of TOD

According to Mingqiao ZOU [5], 2014 The structure of TOD consists of the following land-based functional parts: public transportation station, core commercial, office/employment area, TOD residential area, secondary area and public open space

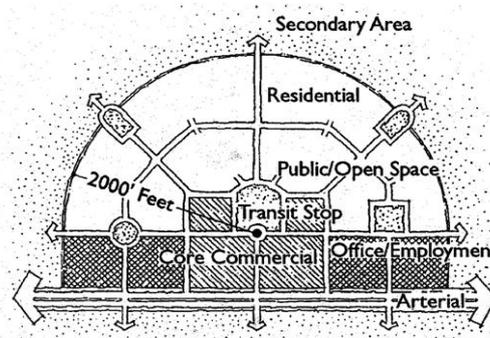


Figure: 1 Structure of TOD

Source: Diagram based on Peter Calthorpe illustration of TOD in *The Next American Metropolis, Ecology Community, and the American Dream* (1993).



- 1) Public Transportation Station: The bus station is the center of a TOD community. Like the heart of a community, it is the most important way to connect this area with the outside world. The rational distribution of the land around it follows the principle of "the closer to the station, the greater the intensity of development"
- 2) Core Commercial: Each TOD community must have CBD near the bus station and its size should be related to the size of the community, location and function.
- 3) Office/Employment Area: TOD community must be equipped with certain Office / area of employment to maintain balanced residence and employment. So we can alleviate huge traffic pressure of the pendulum commuter caused by the separation of jobs and home.
- 4) Residential Area: In general terms, the planning and construction of The TOD community requires a high residential density. On the one hand, it can balance a large number of job opportunities; On the other hand, it can provide a stable source of travellers for public transport to ensure their efficiency
- 5) Public Open Space: Within the TOD community there must be an open public space for people to meet and interact with each other. And it must include parks, libraries and other public buildings with similar functions.
- 6) Secondary Area: Secondary area is the developed low density periphery area adjacent to the TOD community. And is composed mainly of low density residence, Schools, community parks and public green spaces.

### **2.3 Benefits of Transit-Oriented Development (TOD)**

The advantages from TOD which might increase the comfortable living in future are summarised as: [5], [1]

- Increase transit ridership and improves the efficiency and effectiveness of transit service investments
- Decrease in regional congestion, air pollution and greenhouse gas emissions due to reduced household driving
- Walkable communities encourage more healthy and active lifestyles
- Provide opportunities to jobs and economic development
- Decrease infrastructure costs
- Increase public safety
- Contribute to more affordable housing
- Helps Conserve resource lands and open space

### **2.4 Role of TOD in Urban Planning and Design**

Ketut Dewi Martha Erli Handayani [6], 2014 overviews that in Surabaya city number of motorized vehicles can be increased 5% per year which result in increased emission of green house gases and told that 5.48 million tons of carbon emission per year and 90% air emission in Surabaya city due to transportation. To mitigate the GHG and reduce the long transport system, city has adopted the concept of TOD to integrate the land use and transportation by creating area around transit station. Surabaya city adopt the method of data collection and analysis method. Analysis technique describes the success of mass rapid transportation system in worldwide by applying transport and land use strategy. From analysis he describes that only 5.96% trip with public transport,



private car usage is more. Effectiveness of shifting to use monorail and tramway was estimated 93-96% from car usage and 65-84% from motorcycle usage reduces the number of car usage 164-1739 vehicle per hour and 1499-2718 vehicles per hour from motorcycles. To experience of applying TOD is worldwide to solve the problem of congestion and also strategy to reduce GHG emission from the transportation sector. Surabaya city has planned mass rapid transit system to reduce private car usage and also experience TOD in Portland, Singapore and Arlington conclude that TOD is necessary for land management strategy and reduction in private vehicle usage.

Hayati Sari Hasibuan et al. [7], 2014 describes that Jabodetabek faces rapid urbanization and economic growth prosperity which increase high rate of motorization. Approximately 11 million people are coming to Jakarta for every day from Bodetabek which cause problem of urban mobility in Jabodetak. So Jabodetak. So adopt TOD concept for managing urban growth around transit corridor. TOD means not only to redevelop urban land use growth but also improving the environment quality. Urban sustainability demands a balance between the economic, Social and environmental concerns. The development of the urban sustainability involves several aspects including populations, land use, urban structure and mobility behaviour. The dynamics of urban is reflected in the interaction between humans and environment in the spatial and temporal context. For ease of study, study area divided into 3 concentric zones: 1<sup>st</sup> ring, inner circle, the heart/centre of city i.e. CBD; 2nd ring, the Peri-Urban area and 3<sup>rd</sup> ring, semi rural area. With that Complex system, single or partial spatial structure strategies, such as transport infrastructure policies, cannot be reliable on to achieve sustainability; instead, integrated land use, transportation and environmental strategies are necessary.

Nasri, [8] 2014 represents how travel behaviour is different for TOD residents in the two metro politant areas of Washington, D.C. and Baltimore. This is done specifically by examining the changes in vehicle miles travelled in order to analyse the effectiveness of TOD on encouraging driving less and switching to transit, walking, biking and other sustainable modes of transportation. This will provide a better understanding of travel behaviour differences between TOD and non-TOD residents in terms of amount of driving and the degree to which they use transit for various trip purposes. The results obtained from analysis indicate that living in areas with good transit accessbity along with other land use characterics such as high density development and mix of land use types, encourages people towards a more sustainable and healthy life with more transit use and less driving. This can eventually change urban neighbourhoods into more pedestrians and transit friendly areas.

Sara Shadier [2], 2018 describe the transit-oriented development tries to make a series of interrelated purposes for different types of users. Ideally, TODs provide places for people to live, work, buy and relax. Affordable home often has a remarkable place in TODs. Households with low or moderate incomes are attracted to transit access and are likely to own fewer cars and occupy more efficient space homes, which mean that they can take full advantage of transit orientation. Many TOD features are in a planning or scale of the policy. The relevant characteristics at this scale include frequency of transit, prices, equity, development mechanisms and regulation. Hence, the stage of planning and urban design of the projects is where the goals and ideas of TOD fit the real world constraints of space, time and money. In terms of urban growth and development over time, the researchers in the field of urban planning and design realize that TODs will rise as the numbers of riders,



residents, and shoppers increase but do not address the question of how future growth can be factored into the comprehensive TOD design stage.

### 3. CONCLUSION

Future developments and the evolution of modern cities require a perspective of sustainable development and integrated management of existing resources. TOD can be used as a strategy to solve the existing problem of traffic congestion, environmental pollution, low efficiency in land use and problems of urban growth for all kinds of cities. TOD will generally be adopted as a real option for car-oriented urban planning and design. In the aspect of land use structure, TOD encourages mixed land use, including planar mixed use and vertical mixed use, to reduce travel demand. The TOD based planning is tool for checking sustainability and promotion of Non-Motorized Transportation(NMT) by providing walking zones and green spaces.

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