



STUDY ON TRANSIT ORIENTED DEVELOPMENT (TOD) TO PROMOTE GREEN GROWTH AND SUSTAINABILITY FOR HANOI CITY

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Summary: The paper introduces a concept of Transit-Oriented Development (TOD) and its contribution to sustainable urban planning that was developed successfully in late 1990s. Through reviewing international experiences, the research will highlight the achievements of applying TOD concept in city development at different levels and find-out the possibility to integrate that concept into Hanoi's master plan. It is very important to focus on urban structure when applying TOD concept at different spatial levels such as TOD at the regional, TOD along corridor of development, TOD at and around UMRT stations. The proposed three types of integration as spatial planning, strategic action plans and institutional mechanisms are the main factors that will ensure the success of applying TOD concept to Hanoi's master plan for green growth and sustainability.

Keywords: TOD; modern urban planning; public transportation; sustainability; green growth; Hanoi city.

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1. Introduction of TOD concept

The concept of "Transit-Oriented Development" (TOD) was introduced by Arch. Peter Calthorpe in late 1980s and TOD became a fixture of modern planning when Calthorpe published "The Next American Metropolis" in 1993. TOD has been generally defined as "...a mixed-use community that encourages people to live near transit services and to decrease their dependence on driving. The stops/stations are located within walkable area of 400 m to 800 m" [5]. Calthorpe saw it as a neo-traditional guide to sustainable community design. Beyond its definition of built form, it was also a community design theory that promised to address a myriad of social issues (Figure 1).

TOD intends to achieve the following goals:

- To enhance urban mass rapid transit (UMRT) ridership by ensuring convenient, safe and comfort access to the stations.
- To promote compact urban area and local economic development by facilitating urban development at and around the stations as well as UMRT's influence area.
- To contribute to the enhancement of social and environmental conditions at the local level through the TOD measures: when TOD is properly planned, it will also contribute to the improvement of the local social and environmental conditions in a way that those who do not use UMRT can also gain the benefits.
- To contribute to the enhancement of capturing increase in the value of land and space due to TOD for cost recovery of the investment in UMRT. The value of land and space at and around UMRT stations will be enhanced through TOD [4].

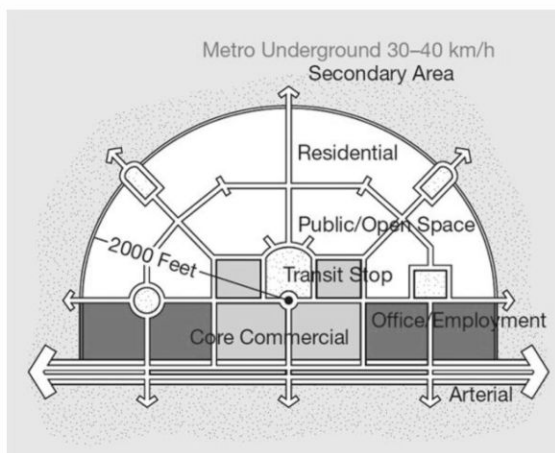


Figure 1. TOD diagram - Peter Calthorpe's concept [5]

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When the TOD concept is applied, the urban structure will be changed and reset at different levels: regional level (Figure 2); along UMRT development corridors (Figure 3); at and around UMRT stations (Figure 4).

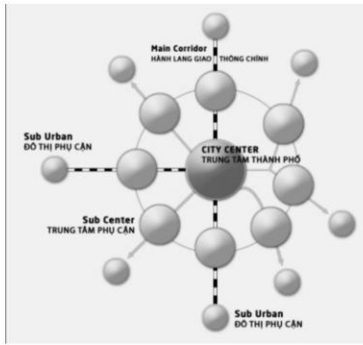


Figure 2. TOD at regional level [2]

The major objectives of TOD are to plan and then to design for a compact urban area based on the inter-connection of public transport systems where land is used effectively, living environment is protected, local people can access public transport easily and conveniently in different parts of the city. It may be less affected by climate change. The unique characters of urban design and landscape in functional areas should be taken into careful consideration.

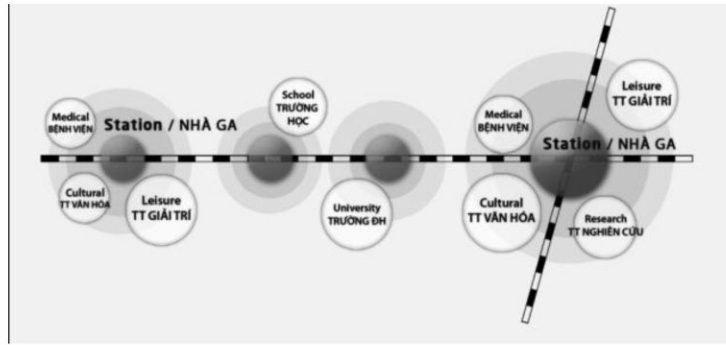


Figure 3. TOD along UMRT corridor [2]

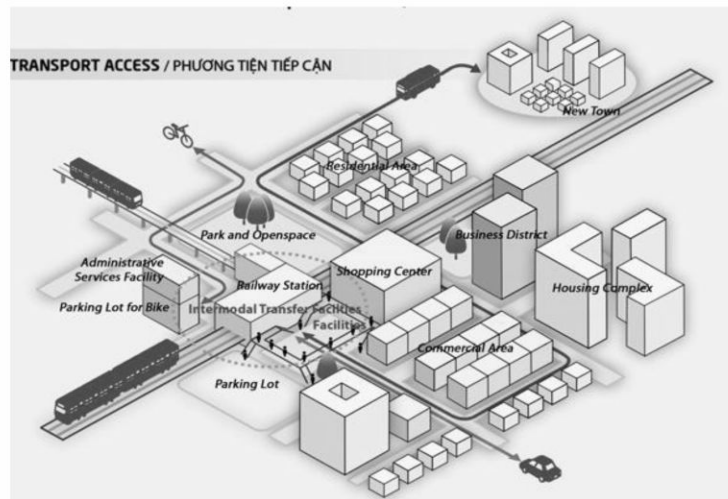


Figure 4. TOD at and around UMRT stations [2]



2. International experiences of applying TOD concepts in city development

2.1 TOD at regional/city level - To create adaptive cities

Stockholm, Copenhagen, Tokyo and Singapore are typical examples. These cities are planned with strong integration with UMRT. The railway systems help to direct the city development towards important social aims as preserving open and green spaces, creating social housing stock for low in-come people [7]. The suburban areas have mix-use functions and new cities are concentrated near UMRT stations

2.2 TOD model along development corridors

Ottawa (Canada), Curitiba (Brazil) and Munich (Germany) are seen as the best cities that integrated well with public transportation to develop urban areas along major transport corridors and using different transportation modes to serve effectively the people in suburban areas. The cooperation among major railway systems, tramlines and traditional buses in Munich - under the management of official agency of transportation - has empowered the city center and create spatial development axes for suburban areas. Both Ottawa and Curitiba have provided public transport models based on bus systems and set up a goal for regional commercial development around major bus stops. The integration of bus system and mix use complexes has increased remarkably the number of people using public transport in these cities [6].

2.3 TOD model that helps the urban cores to connect well with peripheral areas (Strong core cities)

Zurich and Melbourne achieve successes in integrating urban development and public transportation in dense and narrow city's core areas. All public transportation services concentrate around rail and tram systems. The station squares and inter-modal transaction areas were designed in the harmony with existing urban landscapes, pedestrian and walking places. Both cities have fruitful results in improvement at the same time the current urban centers and traditional tramline system (Figure 6,7).

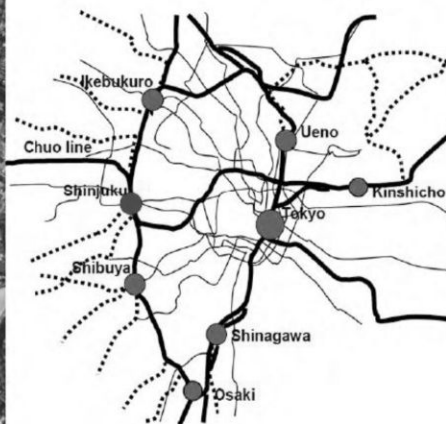


Figure 5. TOD model in Tokyo when city's centers are developed around railway station - the intermodal transport linkage nodes. The image is the development around Sinjuku station where high-rise official, shopping center buildings located in the west part of the station [6]



Figure 6. Melbourne city (Australia, is recognized as sustainable core city supports public transport system to attract and serve numerous officials that are working in the city center



Figure 7. Zurich center station is a hub to connect rail systems spreading all over the city. Station square links well with shopping & commercial centers and provide good services for customers

Experiences from many cities in the world show that the application of TOD model brings a lot of benefit to individuals, community and society through the work of improving living quality and provide good spaces for living, working, studying, amusing and shopping... for citizens at all ages. The conventional development model in the past often required a lot of land, infrastructure expenses and depended on private means of transport. Model of TOD will reduce the commuting travel time, shorten travel routes and provide many options for transport modes while reduce the dependence on private transport.



3. TOD approaches for Hanoi city

3.1 Urbanization of Hanoi city

The Capital City of Hanoi has been growing rapidly in many aspects. The administrative boundary expansion in 2008 that made the city area increased three times from 924 km² in 1998 to 3324 km² currently. The city population has risen in size rapidly in recent time, from 2 million people in early 1990s to nearly 7.4 million in 2014. It is estimated that in 2030 the Hanoi population will reach more than 10 million. The annual population increase rate of Hanoi is at 2.34%, which is a very high rate in comparison to other provinces in Vietnam. The GDP per capita has been growing quickly. Within 20 years, the average income of Hanoi citizens has six times increased. The picture of Hanoi has many changes in a positive way toward modernization. Many projects are implemented recently including big complexes of commercial centers, high-end offices, hotels and residential apartments. Many social housing projects are under construction to meet housing needs for Hanoi's citizens especially for poor and low-income people. Infrastructure has been improved. Beside the economic growth and city expansion is the fast process of motorization. Until now Hanoi has more than 300 thousand private cars and 5 million motorbikes (General Statistic Department, 2013).

All of these growing aspects are taking place at the same time. The growth is expected to continue further in the future which will bring many prospects and challenges for the city development.

3.2 Public transport development and urban planning integration

The Ministry of Construction had adopted "Master plan of construction and urban planning for Hanoi capital city to 2030, with the visions to 2050" with the major goals were set up as (i) building sustainable urban structure; (ii) active spatial development by connecting with natural, cultural and historical resources; and (iii) to ensure effective land use, modern infrastructure and sustainable environment.

In order to improve the situation and bring back the growth trend to sustainable orbit, Hanoi City has committed to realizing green and public transport-based city based on "Hanoi Master Plan to 2030". In this master plan, the city will have to re-structure from mono - pole to multi - poles with (i) urban center links with (ii) satellite cities and (iii) rural ecological towns. According to the Master plan estimation, the Hanoi city's population will be 10.8 million people in 2050 in comparison to 6.4 million people in 2008. Besides, the historical city inner area will be decentralized to reduce one third of the population; the new extended areas of city center and satellite cities will attract more people to live.

UMRT development and TOD application will play a very important role in supporting the above mentioned city urban development strategies and Hanoi Master plan. This total of 307 km of UMRT network comprising urban rail, BRT and other transit systems was planned in the Hanoi Master plan. The city bus system will also be improved and expanded further. In line with this policy, 4 UMRT lines are currently being implemented at different stages including Line 2A, Line 2, Line 1 and Line 3.

Line 1: From Ngoc Hoi to Yen Vien

Line 2 and line 2A: Connect Ha Dong to Noi Bai

Line 3: From Troi - Nhon to Yen So

Through these efforts of the Government, it is expected that 30-40% of the total urban traffic demand shall be met by public transport by 2030 (Figure 8).

3.3 TOD approaches for Hanoi city

In order to develop appropriate and effective UMRT system for Hanoi, the concept of TOD should be applied and implemented in recent time. The integration of TOD with UMRT system in Hanoi city is strategic tool to facilitate the bellowed factors:

- To facilitate smart growth of City based on TOD: promote smart growth of large cities like Hanoi - a city with centralized model of high dense population in the center. Decentralizing population in the city center and facilitating the population increase in the suburban areas are basic city's development strategies that follow the directions of urban transportation development with private sector's involment. UMRT and TOD create many oppotunitites to promote expansion of urban areas in sustainable manner to be convenient, livable and affordable along the rail line corridors: 1) Convinient as suburban areas to be directly connect to commercial centers by railway system; 2) Livable as suburban areas have better living environment than in the city centers; 3) Affordable as housing and infrastructure cost are lower than in the downtown.

- To enhance re-organizing/revitalizing central commercial areas: by reducing traffic congestion or reducing individual's vehicles, improving transport environment (safe, low emission, noice control) and improving walking environment. However, in order to achieve that goals, the Hanoi's UMRT lines should be planned as an integrate network. It needs to ensure that both local who live in city centers or tourists can access to UMRT stations from walkable distance or by convenient public transport.

- To promote local socio-economy in and around UMRT stations: UMRT stations create many oppotunities for urban development (population allocation, commercial and office construction, trading

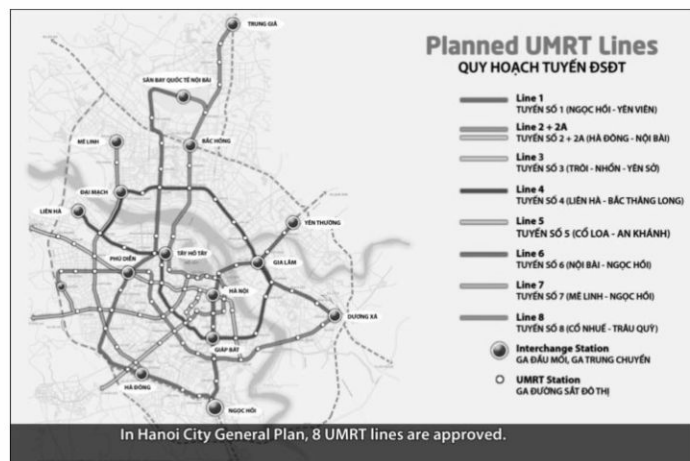


Figure 8. Map of UMRT lines is planned and constructed in Hanoi city [1]

improvement, culture - relaxation, public services...) depending on station's location, the concerns of community, local residents, investors and stakeholders.

3.4 Importance of integration

Spatial integration

In formulating TOD concept plans for each UMRT station, three levels of influence areas should be considered.

a) Urban cluster: Urban areas along UMRT development corridors are broadly classified to number of urban clusters, which involve more or less homogenous urban characteristics. In case of the coverage of phase 1 section of UMRT Line 1 and Line 2, five clusters are identified as follow (Figure 9):

- Cluster 1: North West Urban Cluster. North-west new urban core of commercial, public administration, residential and extension of transit toward Noi Bai airport including C1- Nam Thang Long, C2 Ngoai Giao Doan, C3 Tay Ho Tay and C4 Buoi.

- Cluster 2: West of West Lake Cluster. Existing dense urbanized area with public transport oriented development area: C5 Quan Ngua, C6 Bach Thao, C7 Ho Tay.

- Cluster 3: Hanoi City Center. Old downtown, commercial, business district and pedestrian centered urban spaces: C8 Hang Dau, C9 Hoan Kiem lake, C10 Tran Hung Dao, V6 Long Bien Nam, V8 Hanoi.

- Cluster 4: South Urban Cluster. South urbanizing area and expansion area: V9 CV Thong Nhat, V10 Phuong Mai, V11 Phuong Liet, V12 Giap Bat.

- Cluster 5: East Urban Cluster: East urbanizing area and expansion area: V4 Gia Lam, V5 Bac Long Bien.

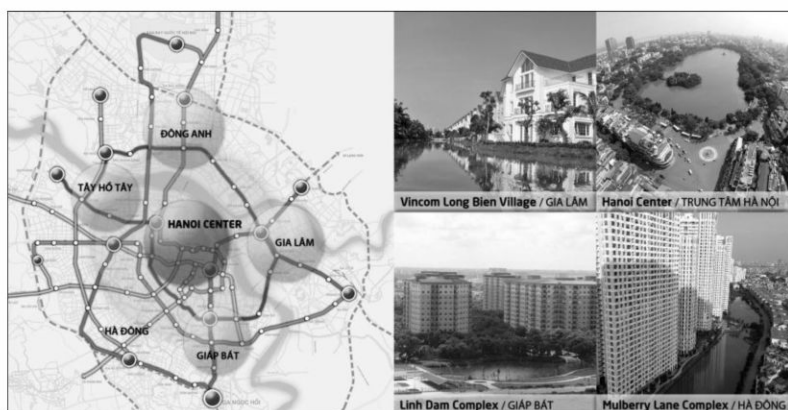


Figure 9. Map of UMRT lines is planned and constructed in Hanoi city [1]

Note: C1, C2, ...C8, C9 are UMRT stations in Line 1 that were approved by Hanoi PC

V1, V2, ...V11, V12 are UMRT stations in Line 2 that were approved by Hanoi PC

b) Area within Walking Distance: Though it varies by nature or physical conditions of a city in general and a station specifically, there is a general consensus suitable distance by walk is 500m to 800m. In case of the coverage of phase 1 section of UMRT Line 1 and Line 2, walking distance is 500m radius in general and 800m radius for core station such as Hanoi, Giap Bat and Gia Lam.

c) Station area and TOD area: The area also varies by station depending on its specific physical condition.

It is considered the station area is defined as the necessary area to ensure provision of basic intermodal facilities of UMRT. The capacity of each UMRT station's carpark is carefully designed depending on station's location and users' needs. This particular area is further defined for each UMRT station to delineate the boundary specifically. It is proposed that the area called "TOD area" and incorporate in Zoning Plan (Figure 10).

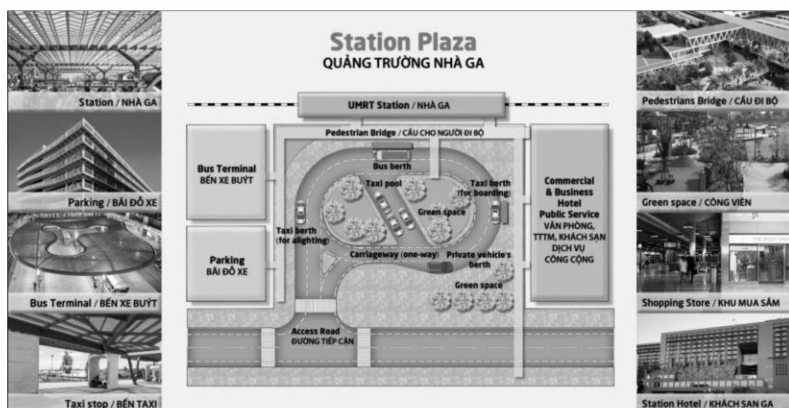


Figure 10. UMRT station area - an important part of TOD [2]



4. Conclusions

TOD concepts and plans should be implemented especially as the UMRT projects are already on going. When the UMRT is opened, at least UMRT users must be provided with reasonable access and the UMRT should not cause traffic conflicts at and around station. While those minimum requirements should be met timely, it is also important to establish a base to farther promote TOD and contribute to sustainable development.

In order to achieve spatial integration metioned above in applying TOD concept in Hanoi master plan, it is essential to consider carefully a number of factors:

- To facilitate sector integration: TOD involves three important scopes in planning and development (i) transportation access, (ii) integrated urban development and (iii) community improvement. Improvement of transportation access should not be limited to UMRT users and isolated from community improvement and integrated urban development. Urban development and re-development, which have been and will be undertaken, should also consider the availability of UMRT to promote the utilization of public transport. Station areas will also provide oportunities for local socio - economic development as well as create a symbolic public space in the surrounding communities.

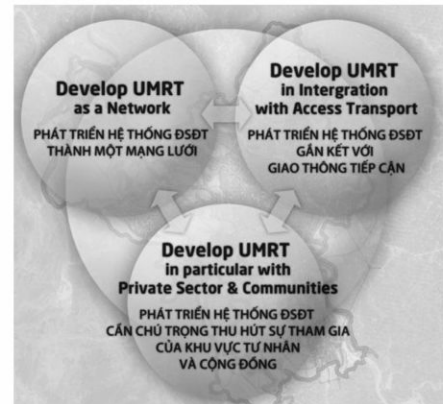
- To enhance institutional integration: TOD plans must be combined with zoning plans that are completed. Moreover, TOD plans include many development projects implemented by different stakeholders (SOEs, private sectors and local communities). Therefore, it is essential to develop sutaible mechanisms to encourage the investements and managements from private sectors and communities.

- + At provincial level: Provide incentive policies to encourage private enterprises to invest into public transport infrastructure systems and services at and around UMRT stations.

- + At local level: Provide financial support mechanisms as: consessional loans, ODA loans; land-use tax reduction or exemption for investment in the TOD areas; flexible mechanisms for relocation, provide incentives for private investors to invest in 'service systems' construction and management in TOD areas.

- + Community: Establish cohesion and coherence community to create livable spaces for residents in the TOD areas.

- To establish strategic action plans: TOD plan must be implemented in accordance with UMRT project construction to ensure suitable access conditions for UMRT users and mitigate access difficulties at and around UMRT station. This will create foundation to promote TOD concept in the sustainable development though: (i) short term projects implemented before exploring UMRT system; (ii) basic projects to improve multi modal functions of UMRT stations; and (iii) strategic projects to create positive motivation for urban extension areas.



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