

# Housing Provision in Transit-Oriented Development (TOD) For Advancing Sustainable Development Goal

Suraya Badaruddin<sup>1</sup>, Marlyana Azyyati Marzukhi<sup>2\*</sup>, Siti Mazzuana Shamsuddin<sup>3</sup>,  
Muhammad Hakim Danial<sup>2</sup>, Hayati Sari Hasibun<sup>4</sup>, Chrisna T Permana<sup>5</sup>

<sup>1</sup>Postgraduate Studies, College of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

<sup>2</sup>Studies of Town and Regional Planning, School of Town Planning and Landscape Architecture, College of Built Environment, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, 42300 Bandar Puncak Alam, Selangor, Malaysia

<sup>3</sup>Studies of Quantity Surveying, School of Construction and Quantity Surveying, College of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

<sup>4</sup>School of Environmental Science, Universitas Indonesia, Jakarta 10430, Indonesia

<sup>5</sup>Urban and Regional Planning Study Program, University of Sebelas Maret, Surakarta, Central Java, 57126, Indonesia

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## ABSTRACT

Human settlement is associated with shelter for the people and their daily needs (employment, recreation including other activities) which influence their travel behaviour. Furthermore, the provision of housing near the transportation system is significant to enable people to reach their desired destinations. This paper aims to explore how housing provision in Transit-Oriented Development (TOD) areas contributes towards achieving sustainable development objectives by examining the relationship between TOD, housing and sustainable development. Transit-oriented development concepts and principles including the implementation of such a concept towards sustainability will be elaborated based on evidence found in related articles from the past research. Thus, the integration of key components such as transportation and land-use are the pre-requisites and must be supported by a comprehensive plan, good governance and, coordination between agencies at federal, state and, local levels towards ensuring the success of TOD objectives. However, such integration for TOD planning, especially in existing urban areas, remains a challenge. The challenges include existing urban areas with limited space to accommodate housing in the area. The study conducts qualitative research and semi-structured interview with nine (9) respondents who were selected based on their profession and position in their respective organisations. This paper will substantiate the above claims and reinforce the idea of why planning for housing in TOD areas is important in supporting sustainable development objectives.

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<sup>1\*</sup> Corresponding author. E-mail address: marlyana@uitm.edu.my  
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## INTRODUCTION

Sufficient housing in a strategic location that allows easy access for walking or using efficient public transportation to their workplace is crucial for enhancing the quality of life. It saves time, costs and allow people to enjoy quality and productive time at home and in the workplace. Ideally, promoting people to stay around transit stations is one (1) of the key elements in the Transit Oriented Development (TOD) concept (Ma et al., 2018; Sohoni et al., 2017). TOD is being promoted to ensure integrated land use and public transport infrastructure planning is achieved (Ma et al., 2018; Sohoni et al., 2017). The TOD concepts are to be applied in urban areas to maximise access to high-quality public transport and attract public investments for both commercial and residential housing developments.

TOD encourages walkability and the efficient use of public transport to support sustainability. The objective of TOD is to reduce carbon emission by propagating compact and mixed-use development supported by other infrastructures (Gouldson et al., 2015). TOD promotes mixed communities living near transit areas and reduce their dependency on driving (Carlton, 2007). However, the valuable concept of TOD will remain unattainable unless issues related to housing provision and community facilities and basic infrastructure are addressed in a more sustainable manner. Some of the challenges related to housing provision in developing countries are rapid urbanisation, population growth and inadequate infrastructure. Therefore, this study is vital to examine the critical challenges in implementing TOD objectives in relation to housing provision in TOD areas by proposing a new framework to achieve Sustainable Development Goals (SDGs).

## LITERATURE REVIEW

Housing contributes to the wellbeing of the people (physical and spiritually) and is one (1) of the important components of economic development of a nation (Baqtaya et al., 2016; Aziz et al., 2010). A house is a place where people seek shelter, ensure their safety, and meet their needs. Housing conditions have an impact on the psychology of an individual. Meanwhile, individual behaviour is influenced by habits adopted through the environment which people lived in and the practice differs over time and across cultures and communities.

The provision of shelter, including housing and other facilities, continues to be a challenge in Malaysia, particularly in urban areas. A 2016 report by the Khazanah Research Institute (KRI) highlights that Malaysia is experiencing a significant shortage of affordable housing, especially for the middle-and lower-income groups. The report indicated that the capital city of Kuala Lumpur is facing “severely unaffordable” where house prices is 5.2 times median annual household income in 2014 and cost about RM500,000 in 2015. Thus, land use planning could be used as a tool for managing the provision of affordable housing through zoning regulations and the planning approval process (application of planning guidelines). The provision of housing and efficient public transportation has become a key focus in the five (5) year Malaysia Plan, aimed at promoting sustainable and inclusive growth. Under the five (5) year plan, the initiative is taken to provide seamless transportation system and enhance mobility of people, targeting 40% share of public transport modes in the Klang Valley area and 20% in other state capitals. Therefore, TOD is one (1) of the key concepts in integrating housing and public transportation in urban areas towards achieving sustainable development.

## Transit Oriented Development (TOD)

Transit Oriented Development (TOD) is a combination of regional planning, city revitalisation, suburban renewal and walkable neighbourhood (Calthorpe, 2014). It is a development that encourages mixed-use, pedestrian walkways, proximity to workplaces, compactness, and close access to transit stations. TOD is being promoted to ensure integrated land use and public transport infrastructure planning is achieved (Ma et al., 2018; Sohoni et al., 2017). TOD concepts are to be applied in urban areas to enhance access to high-quality public transport and attract public investments for both commercial and residential housing developments.

One (1) of the main objectives of the TOD concept aims to mitigate climate change by promoting compact development and reducing the number of vehicles, encouraging walkability and the use of public transport. Various scientific research findings conclude that human activities have impacts on climate change and carbon emissions (CO<sub>2</sub>) (Solomon et al., 2009; Hensher, 2008). This statement is supported by the Inter Panel of Climate Change (IPCC) through its report which indicates the primary source that contributes to climate change is the emission of Green House Gas (GHG) (Intergovernmental Panel on Climate Change, 2014). Furthermore, one (1) of the key factors contributing to climate change and carbon emissions is economic development and population growth. These two (2) factors are the main cause of CO<sub>2</sub> emissions increase from fossil fuel combustion (automobile) (Intergovernmental Panel on Climate Change, 2014). It is essential to take precautionary measures to minimise the environmental impact of human activities. Therefore, the effective implementation of land use planning and transportation systems is vital. Moreover, many scholars have introduced development concepts that could contribute to climate change mitigation and help achieve sustainability. TOD is being promoted worldwide towards achieving sustainable development (Carlton, 2007).

## Sustainable Development

The Brundtland Report, published by the World Commission on Environment and Development (1987), defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). Apparently, development promotes a balance between economic, environmental, and social well-being, a theme that has become central in planning practices. The general framework to implement sustainable development has been recommended to be considered in the national development agenda that are responsive to public needs. Housing is an important component of the 2030 Agenda for Sustainable Development and an essential driver for achieving many of the Sustainable Development Goals (SDG) (Habitat for Humanity, 2021). Particularly, under SDG11: Sustainable Cities and Communities, which outlines ‘Positioning housing at the centre contributes toward building better settlements and cities because of the transformational impact of housing on social, economic and environmental outcomes’ (ibid). In this sense, TOD aspires people to walk and use public transportation to their destination and reduce emission and impact on climate change. Furthermore, TOD promotes mixed communities living near transit areas and reduces their dependency on driving (Carlton, 2007). In this regard, integrating land use and transport is essential and requires planning intervention, particularly from authorities and key stakeholders involved in the development of TOD areas for advancing sustainable development goal.

## Accessibility

Spatial planning can prevent urban sprawl by limiting extension of land use activities to other areas and put emphasis on “physical proximity” factor in major land uses that reduces the need to travel. Research by Prasad & Samuels (1994) indicate there is a close relationship between accessibility and urban form

towards reducing carbon emission (Prasad & Samuels, 1994). According to Dempsey et al. (2005), accessibility is defined as the number and variety of activity locations that can be accessed within a reasonable time, particularly from home and the workplace, are key factors. The primary determinants of accessibility, as defined here, are the quality of the urban transport system (in terms of the distance covered within a given time) and the quality of the urban land use system (such as the extent to which employment and services are accessible). Sustainability is discussed in relation to accessibility and transport. While urban transport offers accessibility and various benefits, it can also generate several environmental costs. Dempsey et al. (2005) highlight, direct measures such as energy use, CO<sub>2</sub> emissions, air pollution, and traffic noise would be the best indicators of the environmental impact of urban transport (Dempsey et al., 2005).

For instance, Prasad & Samuels (1994) highlights that there is a close relationship between travelling, cycling and walking, rebuilding cities to reduce oil dependency through improved electric transit at the same time improve cycling and walking facilities (Prasad & Samuels, 1994). Cities with efficient and good accessibility benefit economically from agglomeration effects and networking advantages. Combination of urban spatial structures and transport has created different kinds of development patterns (Rode & Thomopoulos, 2014). The combination of urban spatial configurations and transportation has contributed to the formation of different development patterns. This shall depend on the level of accessibility which is based on the physical proximity between origins and destination or transparent solutions which can overcome spatial separation, and the level where these solutions involve private or public motorised vehicles (Rode & Thomopoulos, 2014). Rode & Thomopoulos (2014) highlight that the main principle towards achieving accessibility in cities relies on the physical concentration of people, services, economic activities, and exchanges. The most prominent characteristics include densities in residential and workplace areas, the distribution of functions and the extent of mixed use, as well as the degree of centralisation and local urban design. However, there are scholars who opposed the idea of density as the main criteria in determining sustainable urban form (Neuman & Hull, 2011).

Alternatively, physical proximity in cities can be achieved by increasing speed using rapid, motorised modes of public and private transport. The main objectives remain the provision for access to opportunities rather than mobility or movement itself. Infrastructure features that define such access by velocity include the roads, quality of road and rail network and other public transport-based access and increase quality of the infrastructure. A key element in supporting existing urban accessibility pathways, based on compact urban development, is the application and innovative adaptation of current technologies, including those for non-motorised transport. Rebuilding cities to reduce oil dependency by improving electric transit appears to involve a parallel improvement in cycling and walking facilities (Prasad & Samuels, 1994). This would suggest reducing automobile dependence, there is a need to restrict the number of resources put into facilities for the automobile (Prasad & Samuels, 1994). An integrated solution requires commitment from both the public and private sectors and a recognition of their responsibility to find new ways of making our cities function without so much built-in car use (Prasad & Samuels, 1994). In order to reduce dependency on automobiles, it is necessary to restrict the number of resources invest for automobile facilities (Prasad & Samuels, 1994). In this sense, housing provision in TOD areas will provide a good accessibility to the urban dwellers, thus, advancing the sustainable development goals.

## METHODOLOGY

This study conducts qualitative research, driven by the objective formulated. Semi structured interviews were conducted with government agencies, developers and resident representatives to gauge their perspectives and views with regards to the implementation of TOD in the country. A purposeful sampling of nine (9) respondents was interviewed based on their profession and position in their respective

organisations. The number of interviews is adequate as their quantity depends on the nature of the research (Fox-Rogers & Murphy, 2015). Guest et al. (2006), also supports the consideration of eight (8) to twelve (12) participants in qualitative research. All of the respondents have significant experience and expertise in planning and implementation of TOD in Malaysia. Each of the respondent were given 13 questions related to Planning and Implementation of TOD in the country. The agencies involved in the interview session are as indicated in the following table:

Table 1. Key Agencies Involved in The Semi Structured Interview

| No. | Agency                                     | Background           | Code |
|-----|--------------------------------------------|----------------------|------|
| 1.  | PLANMalaysia (Headquarters)                | TOD Expert           | R1   |
| 2.  | PLANMalaysia (Headquarters)                | Urban Renewal Expert | R2   |
| 3.  | Kajang Municipal Council (Local Authority) | Town Planner         | R3   |
| 4.  | Minconsult                                 | Transport Consultant | R4   |
| 5.  | PLANMalaysia (State of Selangor)           | Town Planner         | R5   |
| 6.  | Kwasaland                                  | Developer            | R6   |
| 7.  | Sime Darby                                 | Developer            | R7   |
| 8.  | Subang Jaya City Council                   | Town Planner         | R8   |
| 9.  | Department of Land and Mining              | Land Administrator   | R9   |

Source: Authors (2025)

The interview sessions took around one (1) to two (2) hours each and were recorded and transcribed for analysis and interpretation. The questions centred on issues related to the availability of affordable housing and its distribution within a 0.5-mile radius of transit stations in TODs. The study undertakes a case study on development around light rapid transit (LRT) and mass rapid transit (MRT) stations in Selangor. Selangor was selected as the case study area since the state is experiencing rapid growth and TOD development is actively being implemented in many cities in the state. Additionally, the state government focused on TOD as a key element of its development strategy implementation. This is aligned with the National Physical Plan and National Urbanisation Policy outlined at federal level. In line with this, the Selangor State Department of Town and Country Planning, or PLANMalaysia Selangor, formulated a TOD policy in 2016 to guide development proposals and the planning process for local authorities in Selangor. The policy applies to transit stations based on rail, such as Mass Rapid Transit (MRT), Light Rail Transit (LRT) and Commuter (KTM). However, local authorities need to revise their local plan before implementing such policy.

Two (2) transit stations have been selected within the Petaling Jaya Municipal Council area, specifically Mutiara Damansara MRT Station, and Ara Damansara LRT station (Figure 1 and Figure 2). The selection of the case studies is based on TOD principles and the Selangor State Government policy on TOD development. Thus, every transit station will have the following criteria:

- (i) Development located <400 metres from transit station
- (ii) Active transit station (operating stations)
- (iii) Common Features (area consists of mixed types of housing i.e High, Medium and Low density)

(iv) Consist of support facilities (feeder bus, parking facilities)



Fig. 1. Mutiara Damansara MRT Station

Source: Google Earth (2024)

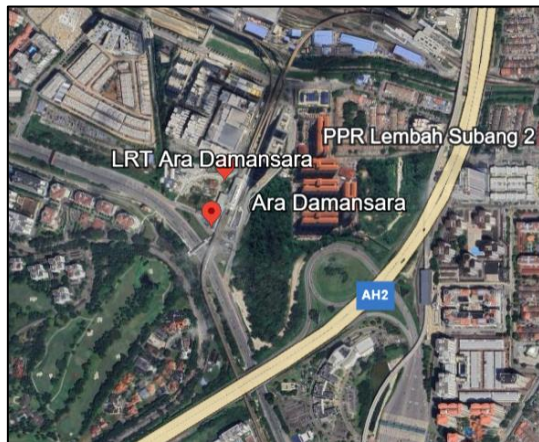


Fig. 2. Ara Damansara LRT Station

Source: Google Earth (2024)

## RESULTS AND DISCUSSION

Respondent R1 claimed that the most fundamental aspect of housing provision in TOD areas is the need to understand the concept of TOD. The concept promotes low carbon settlements and walkability within 400-800metres. TOD coverage extends the zone of influence within 1000-1500m. One (1) of the objectives of TOD concept is to promote Urban Governance in cities. R1 claimed that:

*“TOD could help in terms of reducing transportation cost, road tax and financial burden of local authorities. This is implemented through car park reduction and promoting public transport. There*

*must be the first and last mile consideration and ensure seamless connectivity. Connectivity is very important for TOD. Reduce parking and promote public transport and all plans need to be realistic. These can further promote low carbon use in the city. Other aspects include good connectivity and there should be special lanes for bus and information board, parking facilities. Good promotion and information of such facilities in planning TOD for housing development is needed too”.*

The implementation of such concept needs to ensure provision for affordable housing and provision of community facilities and good infrastructure and utilities and recreational areas in the area. Another important aspect is ensuring land bank and value control especially for housing prices within the area. He suggested that the government intervention and clear policy must be in place. This also includes vehicle ownership policy that should not contradict with TOD objectives. Therefore, there is a need to have a lead agency to ensure no policy contradiction between agencies. Thus, coordination between agencies is crucial. In this regard, the government should control and intervene through land acquisition process for housing provision in the area and need to invest in this. Government agencies need to assess, plan taking into account of the transport demand and readiness of facilities. They need to ensure the provision of support facilities such as shuttle bus, information board. This can only be implemented efficiently in public land. For private owned land usually will result in high cost of development and high value development. As a result, affordable housing is located in outskirts of cities/far away from the main station.

The second respondent, R2 highlighted:

*“for existing cities, to implement TOD will need a lot of adjustment to the existing city fabric, like rearranging the city layout, adding density, getting space to provide walkways and cycling lanes. Not so much such issues if the concepts are implemented at new, green field. One (1) way to get these concepts implemented in existing cities or housing area is through redevelopment or revitalisation. Affected land or building owners need to be supported via planning control benefits, tax incentives or government subsidies. By creating these mechanism, local authority will have easier way to adopt and implement these concepts like creating or upgrading infrastructure for walking, cycling and micro mobility. The public and local communities also need to be encouraged and incentivised to adopt a more-walking-cycling lifestyle and less car-dependent traveling habit to make the concepts of sustainability work.”*

Whereas R3 of the view that integrated transportation and land use is vital. Overall connectivity that links transport and land use is very important. He further reiterates that there should not be piecemeal development for housing and transport planning. Land use and transport must be integrated. For instance, feeder bus needs to support public transport system. The following points need to be taken for effective TOD implementation:

- (i) Provide walking path with covered roof or shelter
- (ii) Reducing costs such as parking
- (iii) Promotes awareness for healthy lifestyle (walking and cycling) among the people through good through urban design practices such as signage provision which show health information
- (iv) Provide safety in TOD facilities such as locks in bicycle facilities.
- (v) Impose TOD design standard as part of planning requirement for development within 400 metres from the station

- (vi) TOD area must be user friendly (take into account of facilities for the disabled group)

The fourth respondent, R4, outlined her concerns with regards to TOD implementation which include the following:

- (i) Land availability – most of the land near TOD belongs to private entities. Thus, land acquisition for TOD development remains a challenge for the authorities.
- (ii) Land cost issue - developers are not willing to build affordable housing because of high land value
- (iii) Land use zoning issue- implementation of mixed-use zoning – landowners not willing to change their land status. Policy on mixed use zoning – high tariff for utilities etc.
- (iv) Provision of facilities in TOD areas- inadequate facilities to cater to population needs in TOD area.
- (v) Ineffective role of implementing agencies. Agencies need to acquire more land for future infrastructure and utility provisions (for e.g. UDA, PRASARANA etc have difficulties acquiring land for future expansion) to support TOD development. Agencies need to acquire more land for future development (land reserves for infrastructures and other facilities)

R4 also claimed that to provide the right type of housing within the 400-metre radius is tough. In reality, several local authorities are not supporting affordable housing within 400-metre radius. Such provision will affect income/revenue to the local authorities and sometimes resulted to other issues related to the provision of community facilities (mosques) and other facilities (schools etc). He claimed that Mutiara Damansara MRT station is a good example of TOD development, in which the housing area and commercial centre are located within the 400-metre radius. However, he demanded the local authority to provide the right type of housing area such as low-cost housing in the TOD area.



Fig. 3. Mutiara Damansara MRT Station

Source: Authors (2024)





Fig. 4. Mutiara Damansara MRT Station Next to High-End Residential Area

Source: Google Earth (2024)

R5 believed that TOD concept is suitable depending on local situation. There is a need to be selective in selecting TOD area. Key concerns related to TOD include:

- (i) Density – Some areas may not be suitable for high density development especially saturated areas in the city. High density could create other social issues such as traffic congestion, insufficient public spaces etc.
- (ii) Height control – this is one (1) of the important aspects in development planning in Selangor. It is observed that some of the stations are too big compared to those overseas. Selangor has imposed plot ratio of 8 to control building skylines. Transit stations may not need a bigger area, just basic requirements such as sitting area and operation office. This could help in terms of reducing land acquisition etc.

In a similar vein, R6 claimed that:

*“the main issue in the implementation of a TOD development in Malaysia is that the policy we have now is actually preventing us from the execution of a real TOD concept development. Our policy is very much outdated and also inconsistent, especially the TOD Policy of Federal Government and policy used by the local government. We acknowledge that the government is currently trying to amend the policy, but my concern is that the policymaker doesn’t have the expertise nor have the knowledge in TOD development since none of the policymakers is industry players. So, I doubt the policies that are being formulated is flexible nor will it be comprehensive enough to be a guideline/law to govern the TOD development in Malaysia”.*

As proposed by R7, the housing provision must consider the location of the houses within 400 metres and the relevant infrastructure network is needed to avoid traffic congestion, and insufficient community facilities such as schools. In the early stage, such facilities need to be integrated with walkways. A clear concept to implement TOD is important to avoid unnecessary disturbance to the area. The authorities also need to ensure the issues in regard to traffic near recreational and school areas are solved. R1 stated that:

*“one (1) of good example of TOD is KL Sentral. This TOD is well connected with LRT, MRT and KTM. For the provision of housing in TOD area, clear concepts are needed and good signages are*

important to indicate road for vehicle, signages for MRT and LRT route. To ensure the improvement of the existing eco system. Equality in terms of social facilities and community /groups”.



Fig. 5. Ara Damansara LRT Station Near Low-Cost Housing Area, PPR Lembah Subang 2

Source: Google Earth (2024)

The eight (8) respondent R8 emphasis on housing and mixed-use development must be in-situ with the development of community facilities. He suggested that the reduction of parking provision of 30% can encourage walkability:

*“Housing provision should be diverse and balance. The concept of TOD cannot be escaped without facilities as it would not work in KL and Selangor such as in Subang. The development of TOD can boost the economy by providing many shops in the area. For example, when developers want to develop service apartments, the Local Authority will insist for shop in the area, such as Mutiara Damansara MRT station. It can further create employment opportunities.”*

Finally, the R9 highlighted that the key concern regarding housing provision and TOD principles from the context of land development and management are cost of acquisition for TOD, strata management and affordable houses. As the principles are related to creating the housing area that is walkable and liveable, the challenge is to ensure that the TOD can be built within the vicinity which is already dense and committed, to reduce the impact of gentrification by building more affordable housing, and to ensure that the strata community can live in harmony in mixed use development that may include commercial, industry and public amenities to achieve sustainable.

From the findings, it can be concluded that the provision of housing within TOD plays a crucial role in advancing the SDGs, particularly those related to sustainable cities, climate action, and inclusive growth. TOD emphasises the integration of affordable housing, sustainable transportation, and mixed-use spaces, which reduce dependency on private vehicles, promote public transit use, and contribute to environmental sustainability. Additionally, TOD encourages social inclusion by providing housing options that are accessible to diverse socio-economic groups. Furthermore, SDG play an important role in providing guidance for planners when evaluating of the potential environmental and economic impacts of TOD. This is to ensure design solutions can integrate a more balanced and holistic vision of sustainability (Berke, 2002). Therefore, implementing TOD strategies in urban planning is essential for achieving the SDGs, particularly SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action), ultimately creating more sustainable, equitable, and liveable urban environments. Figure 6 shows framework that outlines the elements of housing provision and sustainability that need to consider when planning a TOD area.

## Framework

| Transit Oriented Development                                                                                                                                                                                                                                                                                       | Housing Provision                                                                                                                                                                                                                                                                                      | Recommendation                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>No specific definition for TOD, however, proposed for TOD to have the following characteristics:</p> <ol style="list-style-type: none"> <li>Cover area ranging from 0.25-0.75-mile radius from transit station.</li> <li>Mixed land use development (commercial, retail, and residential buildings).</li> </ol> | <ul style="list-style-type: none"> <li>Type of Housing (Low, Medium and High Income)</li> </ul>                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Housing Distribution</li> <li>Land Banking/Phasing</li> <li>Zoning Regulation and Guidelines</li> <li>Preservation of Green Spaces</li> <li>Contain Urban Sprawl</li> <li>Governance – Monitoring</li> </ul> |
|                                                                                                                                                                                                                                                                                                                    | <p>Sustainability</p> <ul style="list-style-type: none"> <li>Spatial Equality</li> <li>Job and Housing proximity</li> <li>Promote Land preservation</li> <li>Energy efficiency</li> <li>Quality of Life (liveability)</li> <li>Increase Public Transport Modes</li> <li>Promote walkability</li> </ul> |                                                                                                                                                                                                                                                     |

Fig. 6. Framework From the Findings

Source: Authors (2025)

## CONCLUSION

This article explores the housing provision in TOD areas. Thus far, the authors are able to conclude that the land use integration and transportation system plays an important role in housing provision towards effective implementation of TOD in achieving sustainable development goals. There is a need for the readjustment of existing land use which also involves rearrangement of layouts and provision of space for walkways. However, this is a challenge especially in city centres and such provision cannot be provided as it involves private lands and entities. Plot ratio requirement and its challenges through zoning mechanism need to be addressed to ensure the effectiveness of TOD in Malaysia. Finally, government intervention is crucial to promote TOD concept and its implementation such as by giving incentives and enhance the policy coordination among agencies.

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## CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

## AUTHOR'S CONTRIBUTION

Suraya Badaruddin carried out the research, wrote and revised the article. Marlyana Azyyati Marzukhi anchored the review, revisions, supervised research progress and approved the article submission. All other authors participated in revising the article, conceptualising the central research idea and reviewing the article for submission.

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