

# The Benefits and Solution to the Challenges of Transit-Oriented Development (TOD) from Public Perspectives in KL Sentral: A Review

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## Abstract

Transit-Oriented Development (TOD) is introduced in Malaysia to promote the basis for urban land use planning to ensure viability of public transport based on the design and planning tactic. It brings various services such as social, economy and environmental benefits. Although TOD has brought variety of benefits, there are still challenges might be existed due to lack of stakeholder commitment and community involvement including facilities issues. Therefore, the research paper objectives are concerning identifying through literature search, the principle, benefits and challenges including solution to the challenges from public perspectives. The expected results via a quantitative research method focusing on KL Sentral aim to further elaborate the benefits and solution to the challenges for better understanding between public transportation users and TOD.

## 1. Introduction

Transportation is a revolutionary idea that is implemented to move the people, and goods from one destination to another destination which transport large amount of goods and people to ensure the people can utilize the particular transport for long distances travel in shorter time in a comfortable environment (Gomez *et al.*, 2019).

It is also the primary choice when it comes to urban environments and developed cities as well as the good transportation strategy that can enhance the economy of the country for the population that is increasingly vibrant. Therefore, when the population increases, the demand for public transportation is uncertainly increasing to have a more convenient and safety environment when going to work, shopping, and travelling. In order to promote a sustainable development concept in city, many countries have come up with the idea of Transport-Oriented development (TOD) so that the use of private vehicles can be reduced and encourage more citizens to use public transport to reduce the traffic congestion.

According to Hrelja *et al.*, 2020; Thomas and Bertolini, 2017:p.140, Lee *et al.*, (2019), a Transport-Oriented Development (TOD) can be defined as a type of development mainly related to the development of the public transportation station in a chosen area that can maximises the efficiency of existing public transport services even more enhanced and more convenience for citizen that require interchange the public transport services which makes walking, cycling, and transit use convenient and comfortable.

Research done by Kamruzzaman *et al.*, (2014) reported that the development of Transport-Oriented Development is one of the most successful developments as it brings not only convenience for transportation, but it can also be used for mixed-use development. For instance, when a certain area consists of public transportation service which is a mix of land use including residential, commercial, recreational, institutional, shopping, and hospital service, it is no doubt that it will attract more users to stop at the public transport station

for several activities' participation. Hence, if the Transport-Oriented Development is successful in which the station is connected to goods and services, then it will encourage more people to utilize public transportation and the area that is nearby public transportation will be the main choice for people to play, shop, recreate, and socialize besides for living. In general, Transport-Oriented Development (TOD) is an innovative strategy that is not just a transit station to catch Public-transportation services daily, it is also a significant strategy and enhanced people's live by providing the goods and services for the nearby residence and reduce the use of private vehicle and reduce the greenhouse effect.

## 1.1 Research Background

According to Majid Wani *et al.* (2018), Mass Rapid Transit is also known as MRT which is a rail system that has the main function of transporting passengers within the city area. The Mass Transport System (MRT) has the efficiency of transporting large numbers of people and is the cornerstone of a city's public transportation system. The first train which is also known as the coal and steam powered train was invented by the British during the 17th Century and at that time, the coal and steam powered train has become the trend which automatically replaced the horse and human as the mass transportation system (Garratt & Wade-Matthews, 2010). After that, British once again came out the revolutionary idea by inventing the diesel-powered train for supporting long distance transportation and during the 1863, the modern transportation system has been invented by Germany by using the electricity to run the vehicle which can reduce the environmental pollution and enhance the health among the population. The best idea that came out by the Germany engineers to overcome the environmental issue and people health simultaneously is using the electrified train system. This technology has been widely adopted by many developed cities such as Shanghai, London, Tokyo, Seoul, New York and other developed cities.

When the new train system was introduced, it is no doubt that it must have numerous stations to ensure that a large population have the interface between the trains in a popular area or most demanded by people. Hence, many cities have carried out numerous research and found that Transit-Oriented Development is the best solution for public transport convenience and cities development simultaneously. According to Karim, (2018), the pioneer development of the Transit-Oriented Development is proposed by an American architect and planner named as Peter Calthrope who once emphasized the terms "affordable", "environmentally sustainable", and "superior quality of life". The main purpose is to encourage the people to reduce the use of private vehicles to their destination by putting the area surrounded by selected train stations to have several main principles which are density, walkability, public space, and mixed use for goods and services. In this case, the cities that has successfully utilized the Transit-Oriented Development (TOD) mechanism are Collingswood, New Jersey, and Fruitvale Village, Oakland California and after that many cities in Asia have implemented this mechanism such as Hong Kong, Tokyo and other developing countries in Asia. Research done by (Saffuan, 2011) reported that the concept of Transit-Oriented Development should allow the development to have a mixed-use community within the range of 2000 foot walking distance which is known as 10 minutes' walk in a comfortable environment for majority people. Specifically, the walking distance for the Transit-Oriented Development (TOD) should only be around a diameter of 400m to 800m from a transit station also known as 5 minutes to 10 minutes' walk (Habitat Magazine, 2016). The details for the walking distance of Transit-Oriented Development will be shown below

**Fig. 1** Transit-Accessibility idea: all neighbourhood activities within walking distance of central station

Figure 1 above shows the diagram summarizing the Transit Accessibility idea for average neighbourhood activities within walking distance of a central station. The good location of the transit station will definitely

benefit lots of people to have access to a wide variety of destinations which include work, services, recreation and others. As shown in diagram, the guideline highly pointed out that the boundaries from the transit station towards the surrounding developed area should have the maximum time of 5 minutes cycling and 20 minutes whereas the best and most convenient shall be only 5 minutes walking due to the high-density residential areas or high plot ratios commercial areas. By following this diagram, it is no doubt that the transit-Oriented development will be more connected to the area in the city and allowing more people to move around the city using public transportation which can reduce dependency on private vehicles that can cause more pollution. Hence, the planning of transit-Oriented development is a significant process will be successful if the government can have a good transit accessibility to more people on that surrounding which can promote more walkable and sustainable neighbourhood (Lima *et al.*, 2021).

In order to build a successful development of transit-oriented development (TOD), it is mandatory for the government or the respective authorities to follow the requirement of the transit-oriented development for the high density of residents in that area. According to Yap & Goh (2017), the requirements of a good transit-oriented development should include the comfortable walkway with access to the transit station, parking slot, and retail street walls for the nearby residents to reduce traffic congestion. When the people around the transit station want to have access to the station, it is compulsory to ensure all the walkways from different entrances should have the cover which can protect from rain and sun to ensure the people have a comfortable walkway and will be more convinced to utilise the public transportation. On the other hand, the surrounding area of the transit-oriented development should consist of nature so that people will not find the station disgusting or dizzy and the development should be well arranged to provide comfort for the people. Not only that, the transit-oriented development or the transit station should be located with the area that consists of high-density population to have more economical for the people by saving more money for the transportation cost especially the people that do not have high salary and save cost for the planning and construction of the transit station. Last but not least, the most important criteria for successful transit-oriented development are to have comfortable walking distance.

## 1.2 Problem Statement

### 1.2.1 Definition of Transit-Oriented Development in Malaysia

In Malaysia, there are also some journals that described the definition of transit-oriented development in different ways. According to Foo (2020), Transit-Oriented development (TOD) is also known as a design and planning tactic that groups together various services, jobs, housing and amenities around the public transportation systems. Research done by (Habitat Magazine, 2016) reported that the Transit-Oriented Development (TOD) can be defined as a type of strategy that utilized the land efficiently around the transit station by focusing on improving accessibility, encouraging compact, promote high density and highly recommend the mixed-use development within walking distance. Transit-Oriented Development (TOD) can also be defined as a type of development in which the development concept is based on the location of the transit station. Once the transit station has been built, the surrounding area will be started to have more development such as residential, commercial and mixed-use development centred around the rail transit or bus station to promote high efficiency of connectivity, pedestrian friendly, friendly to public transportation and reduce dependency on private vehicles (Azmi *et al.*, 2021). PlanMalaysia in 2018 also stated that the definition of Transit-Oriented Development (TOD) is a development that is supported by limited and maximize the limited space resources to develop residential, commercial and other types of development that centred on a rail or bus public transport station in order to have a better connectivity to all people and friendly use pedestrian when the people are on their way to the transit station. (Rameli, 2021).

### 1.2.2 The Principle of Transit-Oriented Development in Malaysia

In order to have a successful development for a Transit-Oriented Development (TOD) which can benefit the society, several planning is needed to be carried out so that the people surrounded the transit can have a good street connectivity. According to (Azmi *et al.*, 2021; PLANMALAYSIA, 2020), the nine principles of Transit-Oriented Development in Malaysia are "Diversity", "High Intensity", "Connected", "Inclusive", "Liveable", "Resilient", "Smart", "Green and Low Carbon", and "Optimise Resources". Next, research done by (Rameli, 2021) stated that there are nine principles in order to plan a Transit-Oriented Development in Malaysia including "Diverse", "High Intensity", "Connected", "Inclusive", "Liveable", "Resilient", "Smart", "Green and Low Carbon", and "Resource Optimization". In addition, the article from Ministry of Federal Territories (2018) also mentioned that the night main principle of Transit-Oriented Development in Malaysia is "Diverse", "High Intensity", "Connected", "Inclusive", "Liveable", "Resilient", "Smart", "Green and Low Carbon" and "Optimise Resources". Furthermore, the nine main principles are "Density", "Land use diversity", "Workability and Cyclability", "Economic development", "Capability utilisation of transit", "User-Friendliness of transit system", "Access and

accessibility”, and lastly the “Parking at Station”. (Gomez *et al.*, 2019). From the scholar study, it can be confirmed that most of the journals have the same number of principles of Transit-Oriented Development in Malaysia which is 9 core criteria has been firming highlighted. Therefore, the information of Transit-Oriented Development (TOD) in Malaysia has been provided with crystal clear understanding on the principle of Transit-Oriented Development (TOD).

### 1.2.3 The benefits of Transit-Oriented Development in Malaysia

The strategy of Transit-Oriented Development is not a new idea that implemented by the Government of Malaysia. Instead, it has been emphasized by the Government of Malaysia in National Physical Plan (Policy NPP27 in 2005, and Policy NPP32 in 2012) which published that “Transit-Oriented Development (TOD) shall be promoted as the basis for urban land use planning to ensure viability of public transport”. Hence, it is no doubt that Transit-Oriented Development is an innovative strategy which can bring huge benefits from different categories such as social benefits, economic benefits, and environmental benefits. According to (Rameli, 2021) the benefits of Transit-Oriented Development (TOD) can be divided into three categories which are social benefits, economic benefits, and environmental benefits. In the category of social benefits, the transit-oriented development has more freedom to move freely, the number of dependencies of private vehicles can be reduced, the job opportunities and housing can be enhanced, and lastly the transit-oriented development can improve health. In term of economy benefits, the Transit-Oriented Development (TOD) can attract more investment to invest in Malaysia, the living standard will be increased, more accessible to businesses and services, and it is no doubt that the Transit-Oriented Development (TOD) can become new business attraction. For the environmental benefits, the strategy of Transit-Oriented Development (TOD) can allow pollution to be reduced, the use of renewable sources can be increased, and the use of land and building resources can be optimized. According to (Gomez *et al.*, 2019), the benefits of Transit-Oriented Development (TOD) are also divided into three categories including social benefits, social benefits, and environmental benefits. The article stated that the benefits of Transit-Oriented Development (TOD) for social are the time spending with family in public transport can be increased, the inhabitants around when there is a transit-station can be fostered with an active lifestyle, fast, one-to-one can be provided by Transit-Oriented Development (TOD) with more efficient trips, the use of limited transportation dollars has the probability to be maximized by the contribution of Transit-Oriented Development (TOD), the issue of traffic jam can be reduced and lower parking costs, as well as the concept of liveable communities can be enhanced. In term of economic benefits, the Transit-Oriented Development (TOD) can attract more people to utilise the public transport which can highly enhanced fare revenues that can enhanced the income for localities and transit systems to reduce loss, the value of land surrounded by the Transit-Oriented Development (TOD) can be enhanced, expand a locality’s tax base at vibrant neighbourhoods with residential and commercial components and indirectly improve the economic efficiency of transit systems. For the environmental benefits, the benefits include significantly reducing the air pollution from private vehicles, creating more green transportation systems, and lastly co-located facilities for living, working, shopping and recreation may have the opportunity to be provided for communities. According to the Ministry of Federal Territories (2018), the benefits of Transit-Oriented Development can be also divided into three categories which include social benefits, economic benefits, and environmental benefits. Starting from social benefits, the Transit-Oriented Development (TOD) can enhance the mobility of the people, reduce the use of private vehicles, increase job opportunities and housing, improve health. In terms of economic benefits, the Transit-Oriented Development (TOD) can enhance investment opportunity, increase job-opportunities that can increase the living standards, easier access to businesses and services, and attract more visitors. For the environmental benefits, Transit-Oriented Development (TOD) can reduce pollution, reduce the use of non-renewable resources and optimize the land resources. Therefore, from the benefits that are stated above, it can be confirmed that Transit-Oriented Development (TOD) has brought lots of benefits to people and the country simultaneously which can highly promote the active-lifestyle and significantly reduce the use of private vehicle which can save more costs on transportation.

### 1.2.4 The challenges of Transit-Oriented Development (TOD) in Malaysia

Although it cannot be denied that the Transit-Oriented Development (TOD) has brought variety of benefits to the social, economy, and environmental, it still consists of some of the potential challenges that might be existed for the implementation of Transit-Oriented Development (TOD) in Malaysia. According to Masjutina (2016), the challenges of Transit-Oriented Development (TOD) in Malaysia are the permit processes that has long waiting time, lack of stakeholder commitment and community involvement, chances for land acquisition that is missed, deficiencies in urban design frameworks, cost of land and housing may increase due to better accessibility which can lead to the phenomenon of transit-induced gentrification. According to (Khaderi *et al.*, 2021), the challenges of Transit-Oriented Development (TOD) in Malaysia are including higher costs, the need for regular maintenance, environmental and health concerns, increased land prices in the Klang Valley area, and the

inconvenience of park-and-ride facilities. According to (Rishyakaran, 2014), the first challenges of the Transit-Oriented Development in Malaysia are the planning of the Klang Valley which is the effort of government to increase zoning in 400m to 800m radius to transit station by building more transit station or bus station to ease the people. Next, the second challenge is the effect of population boom in that area whereby the government needs to consider that the completion of the transit-oriented development will definitely attract more users to utilize the public transport and earn more income simultaneously. The third challenge would be the planning calculation used for residential and commercial development for the surrounding of the transit-oriented development because the calculation for social amenities such as education, parks, and others would be affected if the development of residential and commercial is not estimated properly. Furthermore, the third challenge of transit-oriented development is that the government needs to ensure the basic services are provided which are power supply, water supply, sewage, waste management, and telecommunication. The last challenges of Transit-Oriented Development are the traffic and transport masterplan, which means the public transportation system should be planned systematically to reduce the use of private vehicles and people can use the public transport in a comfortable and convenience environment.

### 1.2.5 Conclusion

Based on the three issues that have been highlighted previously in the problem statement category which further reflecting on the objective of the research including to identify the principle of Transport-Oriented Development in Malaysia, to discuss the benefit of Transport-Oriented Development in everyday life, and to analyse the disadvantages of Transport-Oriented Development in Malaysia. Therefore, it can be confirmed that the transit-oriented development in Klang Valley, Malaysia is still developing and there are still many challenges for the implementation of Transit-Oriented Development in Klang Valley. Most of the principles and benefits can be widely searched from numerous journals; however, the information for the challenges for the implementation of the Transit-Oriented Development is still relatively low which are still not being discovered by researchers. Hence, the ultimate achievement of this research is to further elaborate the development of Transit-Oriented Development (TOD) in Malaysia.

## 1.3 Research Goal

### 1.3.1 Research Aim

The aim of this research is to further elaborate the benefits and the solution to the challenges of Transit-Oriented Development from Public Perspective in KL Sentral.

### 1.3.2 Research Questions

The questions of the research are:

- (a) What are the principles of Transit-Oriented Development (TOD) in Klang Valley?
- (b) How does the Transit-Oriented Development (TOD) benefit people everyday life?
- (c) What are the challenges of Transit-Oriented Development (TOD) in Klang Valley?

### 1.3.3 Research Objectives

The objectives of the research are:

- (a) To identify the principle of Transit-Oriented Development (TOD) in Klang Valley
- (b) To discuss the benefit of Transit-Oriented Development (TOD) in everyday life
- (c) To propose the solution to the challenges of Transit-Oriented Development (TOD) in Klang Valley.

## 1.4 Scope of Research

The research scope of this study is to include the better understanding of Transit-Oriented Development (TOD) in Malaysia. This research will also help to identify the definition and the main principle of Transit-Oriented Development (TOD) in Malaysia. After that, the research would explore the benefit of Transit-Oriented Development (TOD) in Malaysia, then analyse the challenges when implementing this type of development in Malaysia especially in Kuala Lumpur.

The study area for this research is in Kuala Lumpur, which is the main capital in Malaysia and would aim to provide recommendation to developers regarding the detailed information about Transit-Oriented Development (TOD) in Kuala Lumpur, Malaysia. This research paper can be also a reference for developers in other states if that state has the proposed plan on building transit as main public transportation. Overall, the scope of research on the study of Transit-Oriented Development (TOD) in Malaysia would involve a comprehensive analysis of the principle, benefit, and challenges of this type of development in Malaysia.

## 2. Literature Review

### 2.1 Overview of Transit-Oriented Development (TOD) in Malaysia

Kuala Lumpur, which most locals called it as “KL” is a national capital of Malaysia and one of the major economic and cultural growth centers in Southeast Asia that is known for its beautiful temples, vibrant market and 400 million years old cave which is the Batu Caves and it has a size of 243 square kilometers (Saffuan 2011) as shown in Figure 2. It is located at the West Malaysia and the name has come from the word “muddy confluence” in the Malay language.

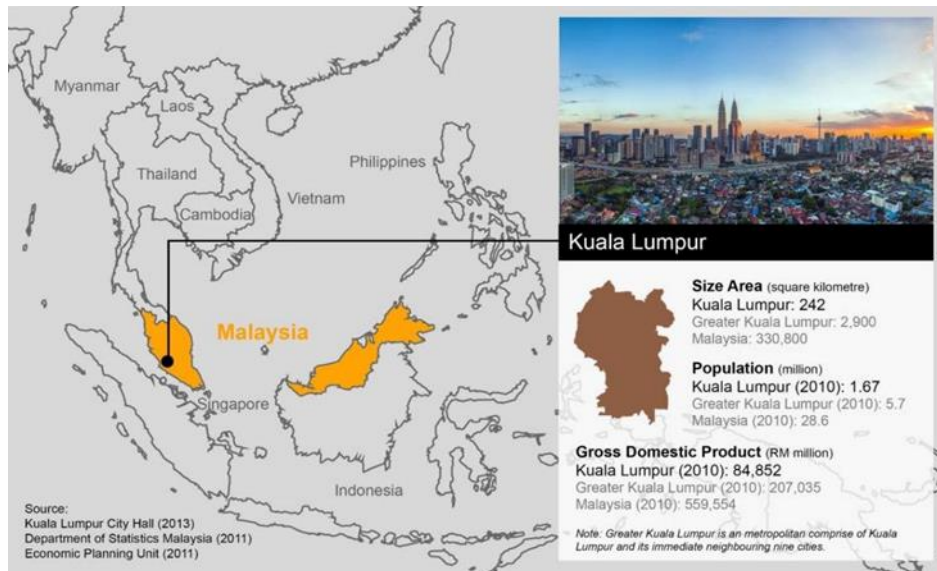


Fig. 2 Location of Kuala Lumpur

According to Hafiza *et al.*, (2017), the first Malaysian train system starting from the year 1885 which was constructed between Taiping and Port Weld during the Malaya era in 1885, and the second railway system has been expanded to Klang and Kuala Lumpur in 1886 and the third railway system was constructed in 1891 between Seremban and Port Dickson. After that, the first commuter train service which is known as “Komuter Tanah Melayu” or KTMB was constructed in order to connect Kuala Lumpur and Rawang and Kuala Lumpur Seremban.

Since the operation of Light Rail Transit (LRT) has been began in Malaysia in 1998, the government of Malaysia has put more effort on constructing more infrastructure in order to increase the percentage of using public transportation in this country especially people that lived in the undeveloped area in Klang Valley and other main city. Therefore, the Government of Malaysia has built many types of public transportation which include the Light Rail Transit (LRT) Kelana Jaya Line, Light Rail Transit (LRT) Ampang and Sri Petaling Line, KTM Commuter, Electric Train Service (ETS), East Coast Rail Link (ECRL), Monorail, Express Rail Transit (ERL) and ERL Transit, Bus Rapid Transit (BRT)- Sunway Line, Feeder Bus, Mass Rapid Transit (MRT)- Kajang Line, and the newly constructed Mass Rapid Transit (MRT)- Putrajaya Line as well as the upcoming LRT 3. In specific, the diagram below will show the picture of each public transportation in Malaysia and actual route of Public Transportation Service in Klang Valley which shows the connection of each transportation system to each other as shown in Figure 3 until Figure 9.



(a)

(b)

**Fig. 3** (a) MRT Putrajaya Line; (b) MRT Kajang Line



(a)

(b)

**Fig. 4** (a) LRT Kelana Kaya Line; (b) LRT Sri Petaling/Ampang Line



(a)

(b)

**Fig. 5** (a) Electric Train Service (ETS); (b) KTM Komuter (KTMB)



(a)

(b)

**Fig. 6** (a) KL Monorail; (b) KLIA Ekspres/ Transit



(a)

(b)

**Fig. 7** Figure description (a) BRT Sunway Linel; (b) MRT Feeder Bus



(a)

(b)

**Fig. 8** (a) Nadiputra Putrajaya; (b) Upcoming LRT Shah Alam Line

# Klang Valley Integrated Transit Map

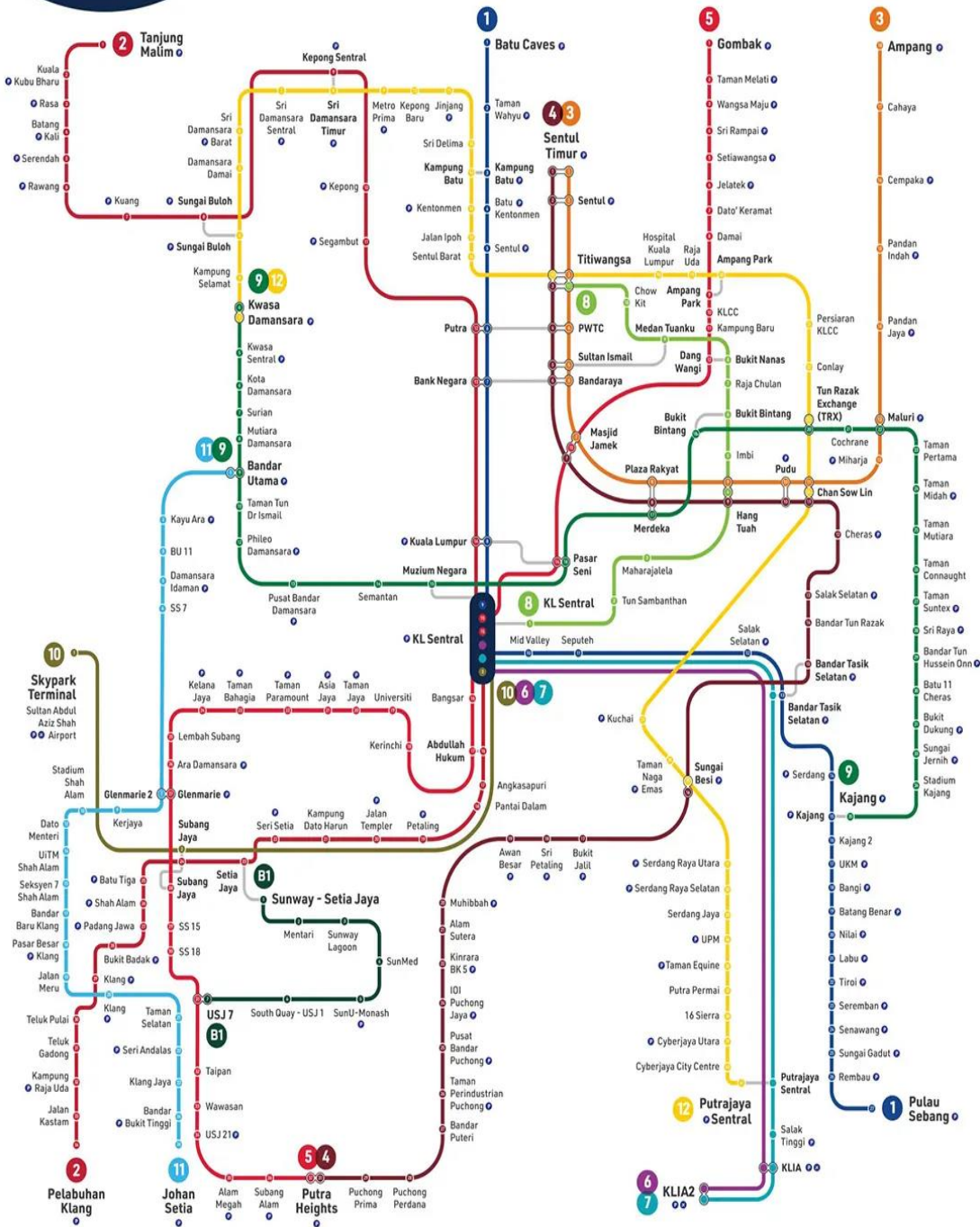


Fig. 9 Klang Valley Integrated Transit Map

Therefore, the Transit-Oriented Development (TOD) has mainly emphasized the significance of designing this type of development for compact and mixed-use development by creating pedestrian-friendly environments and using street grids for accessibility. As a result, Transit-Oriented Development (TOD) can help further the target of transforming the particular city through placemaking, and vice versa. In this case, the best example of successful Transit-Oriented Development (TOD) is the Kuala Lumpur Sentral (KL Sentral).

**Fig. 10** *The details of KL Sentral*

Figure 10 shows the entire plan of the most successful Transit-Oriented Development in Malaysia which is the Kuala Lumpur Sentral also locals call it KL Sentral. The three main developers for this mixed-use development are Malaysia Resources Corporation Berhad (MRCB), Pembinaan Redzai Sdn Bhd and Keretapi Tanah Melayu Berhad (KTMB) (Wong *et al.*, 2018). The Kuala Lumpur Sentral (KL Sentral) office space ecosystem consists of three categories including service offices such as Axiata Tower, Nu Tower, Menara CIMB and 1 Sentral, Strata Office which are Q Sentral and Plaza Sentral, and Corporate Tower which are the rest of other KL Sentral Buildings. The Kuala Lumpur Sentral (KL Sentral) is a huge development which has the area of 72-acre project that not only provides residence, office blocks, hotels, shopping malls, international exhibition and entertainment outlet, but it also provides numerous types of public transportation services. For instance, it consists of MRT Kajang line, LRT Kelana Jaya Line, Monorail, Commuter services (KTM), Electric Train Service (ETS), KLIA Transit, KLIA Express, Bus services, Taxi, and grab services (Habitat Magazine, 2016). According to Rameli (2021), Kuala Lumpur Sentral (KL Sentral) is the first Transit-Oriented Development in Malaysia that started to operate in 2001 which is designed by the late Dr. Kisho Kurokawa that was commenced in 1997. After the success of the first Transit-Oriented Development which is Kuala Lumpur Sentral, the concept of Transit-Oriented Development has been expanded to other parts of Malaysia which including Cyberjaya City Centre, PJ Sentral, Bangsar South, Kuala Lumpur Maju and Tropicana Garden in Kota Damansara.

## 2.2 The Definition of Transit-Oriented Development (TOD) in Malaysia

**Table 1** *The Definition of Transit-Oriented Development (TOD)*

No	Definition	Authors (year)	Name of Journal	Citation Index
1	a type of development that optimise the use of land surrounding a transit station in order to create strong connection between a densely populated urban layout and increased the use of public transportation.	Azmi <i>et al.</i> , (2021)	Journal of the Malaysian Institute of Planners	Scopus
2	the integration of land use and transportation that can accelerate a fast-growing trend towards creating vibrant, liveable and sustainable communities	Ramlan <i>et al.</i> (2021)	Journal of the Malaysian Institute of Planners	Scopus
3	TOD refers to the mixed-use of residential and commercial development, which promotes an urban development designed to be pedestrian-friendly, and full access of public transport such as heavy rail transit, light rail transit, bus transit etc.	Khaderi <i>et al.</i> (2021)	International Journal of Sustainable Construction Engineering and Technology	Scopus
4	a complex form of high population size, mixed and dispersed urban land use in an accessible area around a transit stop	Noor <i>et al.</i> (2020)	Journal of Architecture, Planning and Construction Management	MyJurnal
5	TODs as being designed mainly to encourage the use of public transit and create a pedestrian-friendly urban environment.	Kamruzzaman <i>et al.</i> (2014)	Journal of Transport Geography	Citescore: 8.1
6	TOD is an integrated development of housing, offices, shopping and carrying out their daily activities. Indirectly, it can improve the economy and quality of life to lead more comfortable, and organized according to their respective capabilities	Rahmat <i>et al.</i> (2016)	Journal of Built Environment, Technology and Engineering	Impact factor: 3.345
7	a development that is supported by limited and maximize the limited space resources to develop residential, commercial and other types of development that centred on a rail or bus public transport station in order to have a better connectivity to all people and friendly use pedestrian when the people are on their way to the transit station.	Rameli (2021)	PLANMalaysia	Conference Paper
8	a type of development mainly related to the development of the public transportation station in a chosen area that can maximises the efficiency of existing public transport services even more enhanced and more convenience for citizen that require interchange the public transport services which makes walking, cycling, and transit use convenient and comfortable.	Hrelja <i>et al.</i> (2020)	The Swedish Knowledge Centre for Public Transport	Open Access journals (DOA)
9	emphasized the terms “affordable”, “environmentally sustainable”, and “superior quality of life”. The main purpose is to encourage the people to reduce the use of private vehicle to their destination by putting the area surrounded by selected train stations to have several main principles which are density, walkability, public space, and mixed use for goods and services.	Karim (2018)	Academia	Google Scholar

10	TOD is expected to enhance accessibility by providing a relatively high level of transport connections and a relatively high-density, mixed-use, cycling- and pedestrian-friendly land use around transit stations	Lyu <i>et al.</i> (2019)	International journal of Sustainable Transportation	Open Access journals (DOA)
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According to Azmi *et al.*, (2021), Transit-Oriented Development (TOD) can be defined as “a type of development that optimise the use of land surrounding a transit station in order to create strong connection between a densely populated urban layout and increased the use of public transportation”, followed by Ramlan *et al.* (2021) which stated that the Transit-Oriented Development is “the integration of land use and transportation that can accelerate a fast-growing trend towards creating vibrant, liveable and sustainable communities”. Not only that, but the definition is also further emphasized by Khaderi *et al.* (2021) which mentioned that “Transit-Oriented Development (TOD) refers to the mixed-use of residential and commercial development, which promotes an urban development designed to be pedestrian-friendly, and full access of public transport such as heavy rail transit, light rail transit, bus transit etc. Noor *et al.* (2020) also elaborated that the Transit-Oriented Development is “a complex form of high population size, mixed and dispersed urban land use in an accessible area around a transit stop”.

By referring to table 1 on the definition of Transit-Oriented Development, there are 10 definitions that have been tabulated from 10 different scholars. This can be concluded that Transit-Oriented Development is a type of development which the mixed-use development including commercial development, residential development and others are developed around the public transportation station or transit station to have better connectivity to the people that lived at the surrounding, that is affordable, environmentally sustainable, and superior quality of life.

### 2.3 The Principles of Transit-Oriented Development (TOD) in Klang Valley

By referring to Table 2 which is the table of the principles of Transit-Oriented Development (TOD) in Malaysia, there are 10 principles that have been identified from previous research with 15 authors that are cited which conducted research on this topic. The greatest number of times referred is fourteen times which are “Density” and “Walkability and cyclability.” Next, the second most time referred for the principle of Transit-Oriented Development (TOD) in Malaysia is twelve times which are the “Access and accessibility” and “Land use Diversity”. Moreover, the third most times is “User-friendliness of transit system” which is eight time. Furthermore, the points that have five times referred are “Resilient”, “liveable”, “capacity utilisation of transit”, and “Economic development”. Lastly, the point that have four times referred is the principle of “Parking at station”.

**Table 2** *The Principles of Transit-Oriented Development (TOD) in Klang Valley*

According to Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021), Liu *et al.* (2020), Niu *et al.* (2021), Nesmachnow & Hipogrosso (2022), Saffuan (2011), Azmi *et al.*, (2021), Black *et al.* (2016), Nasri and Zhang (2014), Furlan *et al.* (2019), Ibrahim *et al.* (2023), and Wey *et al.* (2016), the principles of Transit-Oriented Development (TOD) that they have shared is the first principle known as “Density”. Followed by the second principle “Land use diversity” which has 12 mentions from authors including Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021), Liu *et al.* (2020), Niu *et al.* (2021), Saffuan (2011), Azmi *et al.*, (2021), Nasri and Zhang (2014), Park *et al.* (2016), Furlan *et al.* (2019), and Ibrahim *et al.* (2023).

Next, the “Walkability and Cyclability” has 14 mentions which are cited by “Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021), Liu *et al.* (2020), Niu *et al.* (2021), Nesmachnow & Hipogrosso (2022), Saffuan (2011), Azmi *et al.*, (2021), Black *et al.* (2016), Nasri and Zhang (2014), Park *et al.* (2016), Furlan *et al.* (2019), and Wey *et al.* (2016). On the other hand, research done by Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021) and Ibrahim *et al.* (2023) have shared the same principle of Transit-Oriented Development which is “Economic Development” that has 5 mentions.

Besides, “Capacity utilisation of transit” has 5 mentions which are Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021), and Furlan *et al.* (2019). “User Friendliness of Transit System” has received 8 mentions which are Gomez *et al.* (2019), Singh *et al.* (2017) Niu *et al.* (2021), Nesmachnow & Hipogrosso (2022), Saffuan (2011), Azmi *et al.*, (2021), Ibrahim *et al.* (2023), and Wey *et al.* (2016). Not only that, for the principle of “Access and accessibility”, it has received 12 time referred which are Ministry of Federal Territories (2018), Gomez *et al.* (2019), Singh *et al.* (2017), Rameli (2021), Nesmachnow & Hipogrosso (2022), Azmi *et al.*, (2021), Black *et al.* (2016), Nasri & Zhang (2014), Park *et al.* (2016), Furlan *et al.* (2019), Ibrahim *et al.* (2023), Wey *et al.* (2016). In addition, “Parking at station” received 4 times referred which are Gomez *et al.* (2019), Singh *et al.* (2017), Niu *et al.* (2021), and Black *et al.* (2016) while “Liveable” has 5 times referred which are Ministry of Federal Territories (2018), Rameli (2021), Saffuan (2011), Azmi *et al.*, (2021), and Furlan *et al.* (2019). Lastly, the principle “Resilient” consists of 5 times referred which are Ministry of Federal Territories (2018), Rameli (2021), Azmi *et al.*, (2021), Black *et al.* (2016), and Furlan *et al.* (2019).

## 2.4 The Benefit of Transit-Oriented Development (TOD) in everyday life

**Table 3** *The Benefits of Transit-Oriented Development (TOD) in Klang Valley*

By referring to Table 3 which is the benefit of Transit-Oriented Development in Malaysia, there are 10 benefit of Transit-Oriented Development in Malaysia that have been identified from previous research, with 15 authors that have conducted research on this topic.

The greatest number of times that are referred is 12 times which are “Social Benefit: the number of dependencies of private vehicles can be reduced”, “Economic Benefit: the living standard will be increased”, and “Environmental Benefit: pollution to be reduced”. Next, the second most time referred are 10 times which is “Social Benefit: the job opportunities and housing can be enhanced”, and “Economic Benefit: more accessible to businesses and services”. On the other hand, the point that has 9 times referred is the “Economic Benefit: can attract more investment to invest”. Furthermore, the benefits that have 7 times referred are “Social Benefit: more freedom to move freely”, and “Environmental Benefit: Use of land and building resources can be optimized”. The benefits that have 6 times referred is “Environmental Benefit: lastly co-located facilities for living, working, shopping and recreation may have the opportunity to be provided for communities” while “Economic Benefit: become new business attraction” has 4 times referred in this benefit.

The benefit can be divided into three categories which are social benefit, economic benefit, and social benefit. Starting from the social benefit, According to Habitat Magazine (2016), Gomez *et al.* (2019), Rameli (2021), Ramlan *et al.* (2021), Lyu *et al.* (2019), Ibraeva *et al.* (2022) and Griffiths & Curtis (2017), the benefit of Transit-Oriented Development is “more freedom to move freely”. Next, “the number of dependencies of private vehicles can be reduced” has 12 mentions such as Khaderi *et al.* (2021), Karim (2018), Gomez *et al.* (2019), Masjutina (2016), Rameli (2021), Ramlan *et al.* (2021), Hrelja *et al.* (2020), Saffuan (2011), Teh (2019), Ibraeva *et al.* (2022), Griffiths & Curtis (2017), and Shastry (2010).

For the Economic Benefit, “can attract more investment to invest” has 9 votes from authors such as Karim (2018), Gomez *et al.* (2019), Rameli (2021), Ramlan *et al.* (2021), Hrelja *et al.* (2020), Lyu *et al.* (2019), Saffuan (2011), Shastry (2010) and Anderson (2011). In addition, “the living standard will be increased” has been mentioned by 12 authors including Khaderi *et al.* (2021), Karim (2018), Gomez *et al.* (2019), Masjutina (2016), Ramlan *et al.* (2021), Hrelja *et al.* (2020), Lyu *et al.* (2019), Teh (2019), Ibraeva *et al.* (2022), Griffiths & Curtis (2017), Shastry (2010), and Anderson (2011). According to Khaderi *et al.* (2021), Habitat Magazine (2016), Karim (2018), Gomez *et al.* (2019), Masjutina (2016), Rameli (2021), Lyu *et al.* (2019), Teh (2019), Griffiths & Curtis (2017), Anderson (2011), the benefit include “more accessible to businesses and services” while authors such as Karim (2018), Gomez *et al.* (2019), Rameli (2021), and Anderson (2011) mentioned that benefit include “become new business attraction”.

For the environmental benefit, “pollution to be reduced,” has mentioned by 12 authors which are Khaderi *et al.* (2021), Habitat Magazine (2016), Karim (2018), Gomez *et al.* (2019), Masjutina (2016), Rameli (2021), Ramlan *et al.* (2021), Hrelja *et al.* (2020), Saffuan (2011), Teh (2019), Ibraeva *et al.* (2022), and Shastry (2010). According to Habitat Magazine (2016), Karim (2018), Gomez *et al.* (2019), Rameli (2021), Lyu *et al.* (2019), Shastry (2010), and Anderson (2011), the benefit of Transit-Oriented Development (TOD) for the environment is that “use of land and building resources can be optimized” while “lastly co-located facilities for living, working, shopping and recreation may have the opportunity to be provided for communities” has been mentioned by 6

authors which are Habitat Magazine (2016), Karim (2018), Gomez *et al.* (2019), Saffuan (2011), Griffiths & Curtis (2017), and Shastry (2010).

## 2.5 The Challenges of Transit-Oriented Development (TOD) in Klang Valley

**Table 4** *The Challenges of Transit-Oriented Development (TOD) in Klang Valley*

By referring to Table 4 which is the challenges of Transit-Oriented Development in Malaysia, there are 10 challenges of Transit-Oriented Development in Malaysia that have been identified from previous research, with 15 authors that have conducted research on this topic.

The greatest number of times that is referred is 15 times which is “planning calculation used for residential and commercial development for the surrounding of the transit-oriented development”. Next, the second most time referred is 10 times which are “lack of stakeholder commitment and community involvement” following by “Chances of land acquisition that is missed” with 9 times referred. On the other hand, the fourth most time referred is 8 times which is “cost of land and housing may increase due to better accessibility”. Furthermore, the challenges that have 5 time referred are “Less reliable services”, “the effort of government to increase zoning in 400m to 800m radius to transit station by building more transit station or bus station to ease the people”, and while the 4 times that referred is “High car dependency in an urban area”. Moreover, the point “the need for regular maintenance” and “inconvenience for park and ride facilities” has 3 time referred while “the government needs to ensure the basic services are provided which are power supply, water supply, sewage, waste management, and telecommunication” has 2 times referred.

According to Masjutina (2016), Bolleter *et al.* (2021), Bolleter *et al.*, (2020), Hrelja *et al.* (2022), Azizi (2016), Scherrer (2019), Abdi & Lamíquiz-Daudén (2020), Ibraeva *et al.* (2020), Mathur & Gatdula (2021), Tan *et al.* (2014), the challenges of Transit-Oriented Development (TOD) in Malaysia has shared the same points which is the “Lack of Stakeholder commitment and community involvement”. Following by Masjutina (2016), Yen *et al.* (2023), Bolleter *et al.*, (2020), Papa (2019), Hrelja *et al.* (2022), Abdi & Lamíquiz-Daudén (2020), Khaderi *et al.* (2021), Mathur & Gatdula (2021), and Tan *et al.* (2014) mentioned that the challenges of Transit-Oriented Development (TOD) in Malaysia include “Chances of land acquisition that is missed”. Next, Masjutina (2016), Bolleter *et al.* (2021), Kim (2020), Yen *et al.* (2023), Azizi (2016), Ibraeva *et al.* (2020), Khaderi *et al.* (2021), and Tan *et al.* (2014) mentioned that one of the challenges of Transit-Oriented Development (TOD) is the “Cost of land and housing may increase due to better accessibility”. On the other hand, Hrelja *et al.* (2022), Azizi (2016),

and Khaderi *et al.* (2021) mentioned that the challenges are “Inconvenience for park and ride”. Besides, Delpirou *et al.* (2017), Masjutina (2016), Bolleter *et al.* (2021), Kim (2020), Yen *et al.* (2023), Bolleter *et al.*, (2020), Papa (2019), Hrelja *et al.* (2022), Azizi (2016), Scherrer (2019), Abdi & Lamíquiz-Daudén (2020), Ibraeva *et al.* (2020), Khaderi *et al.* (2021), Mathur & Gatdula (2021), and Tan *et al.* (2014) mentioned that “Planning calculation used for residential and commercial development for the surrounding of the Transit-Oriented Development” is one of the challenges of Transit-Oriented Development (TOD) in Malaysia. Moreover, Kim (2020), Abdi & Lamíquiz-Daudén (2020), and Khaderi *et al.* (2021) mentioned that the challenges of Transit-Oriented Development (TOD) in Malaysia include “The need for regular maintenance”. After that, Delpirou *et al.* (2017), Bolleter *et al.*, (2020), Papa (2019), Azizi (2016), and Mathur & Gatdula (2021) mentioned that “The effort of government to increase zoning in 400m to 800m radius to transit station by building more transit station or bus station to ease the people” is one of the challenges of Transit-Oriented Development (TOD) in Malaysia. Lastly, the challenge “Less reliable services” has been mentioned by 5 authors include Delpirou *et al.* (2017), Bolleter *et al.* (2021), Yen *et al.* (2023), Hrelja *et al.* (2022), and Abdi & Lamíquiz-Daudén (2020) while “High car dependency in an urban area” has been mentioned by 4 authors who are Delpirou *et al.* (2017), Yen *et al.* (2023), Bolleter *et al.*, (2020), and Abdi & Lamíquiz-Daudén (2020).

However, there are some solutions to the transit-oriented development that can be made to the challenges of Transit-Oriented development in Klang Valley. For instance, one of the most common issues for the development of Transit-Oriented Development is that the lack of stakeholder commitment and community involvement and this type of development requires more participation such as mixed-used development including commercial, residential and other more that need lots of skills and determine risks than typical development project (Carlton, 2009). According to Hrelja *et al.* (2022), Transit-Oriented Development may be a higher risk development for most developers as the investment is higher. Therefore, the solution that was made by (Carlton, 2009) is that different stakeholders including government agencies, local authorities, community groups, developers and other relevant teams should interact and make decisions in the planning and implementation of Transit-Oriented Development (TOD) projects. Hence, the Transit-Oriented Development should be a situated practice in both formal institutions of government and informal governance processes.

The cost of land and housing may increase due to better accessibility is also the main challenges for all the countries that develop Transit-Oriented Development (TOD). However, it is a fact that the price of residential property near the rail transit will be influenced because of the accessibility and facilities offered. Hence, for this type of challenge, the best that the developers can do is to optimize the price of the housing, and they have their target buyers which will not highly increase the housing price as it will affect the selling record (Khaderi *et al.*, 2021).

The inconvenience for parks and rides is also the main challenge of Transit-Oriented Development in Klang Valley. The lack parking space for the park and ride service will highly affect the Transit-Oriented Development and discouraged from going there for buying groceries, or using public transportation. According to Ho *et al.* (2017), There are many cases of double parking at the Rawang Park and Ride facility in 2008 as there is limited parking spaces which is very inconvenience for the users there. Moreover, in Kelana Jaya LRT station, many cars parked at the roadside in the residential area has caused traffic congestion which has 92% of parking occupancy rate. Not only that, vehicles at Putrajaya Park and Ride facility were found out that have illegally parked at the surface parking with 95% of parking occupancy rate. Therefore, the solution to the challenges of inconvenience for park and ride is to build more parking spaces or build a multi-storey car park at the existing car park. For instance, the Railway Assets Corporation (RAC) reported that the idea was initiated by the transport ministry and is upgrading the Park and Ride facility at the Rawang KTM stations to a four-storey car park building that consists of 494 parking lots, 4 lots for OKUs, 104 motorcycle parking lots. The park and ride will be closed from 8th November 2022 and will be completed in November 2025 and added new facilities such as “Drop by Zone” for easier pick up and drop off for variety types of vehicles, better public toilet, lifts, streetlamps, walkways and CCTVs (Tan, 2022).

Not only that, planning calculation used for residential and commercial development for the surroundings of Transit-Oriented Development is also the main obstacles when developing this kind of development. According to Sheng *et al.* (2022), Transit-Oriented Development should merge with services, facilities and individual social activities. For instance, some young urbanites work overtime OT until 8pm or 9pm and this is where the Transit-Oriented Development plays an important role on it. The young urbanites can look for food, groceries, sports and leisure activities at that area after work. Therefore, the planner, or different stakeholders should invest huge amounts of money to serve that area to not only a transit station, but for workers to have work support facilities to increase the work life balance.

The ninth challenge is the effort of the government to increase zones in 400m to 800m radius to transit stations by building more transit stations or bus stations to ease the people. The Transit-Oriented Development that is planned by the government must ensure that the daily activities can be easily done at one point with maximum 800m radius to reduce the walking or travel distance from one place to another place. For instance, when the number of shared- bicycle stations, bus stops, and commercial floor area around the transit station

increases, the efficiency of the public transportation increases as well (Sheng *et al.*, 2022). Not only that, but the government also needs to ensure that Klang Valley has sufficient bus network, and Rapid KL should have the proper planning to expand the bus network for better connectivity. According to Sheng *et al.* (2022), the Transit-oriented Development must have variety of developments when doing the planning including services, destinations, residences and place of employment at the selected place to create sustainable development and become sustainable city.

The less reliable services and high car dependency are also the challenges when implementing the Transit-Oriented Development (TOD) in Malaysia. Hence, research done by Ministry of Urban Wellbeing, Housing and Local Government Malaysia (2016) mentioned that it is compulsory to add more stations not only for rapid station, but also for bus station. The concentration of high intensity development for a rail-based TOD should be within 400m radius from the transit station, while for a bus-based TOD it should be within 200m radius. This guideline also suggests the allowance for 30% bonus plot ratio for commercial and residential development, within 200m and 100m respectively for a rail based and bus-based TOD as shown in Figure 11.

**Fig. 11** *The diagram of radius of one station*

### 3. Research Methodology

#### 3.1 Introduction

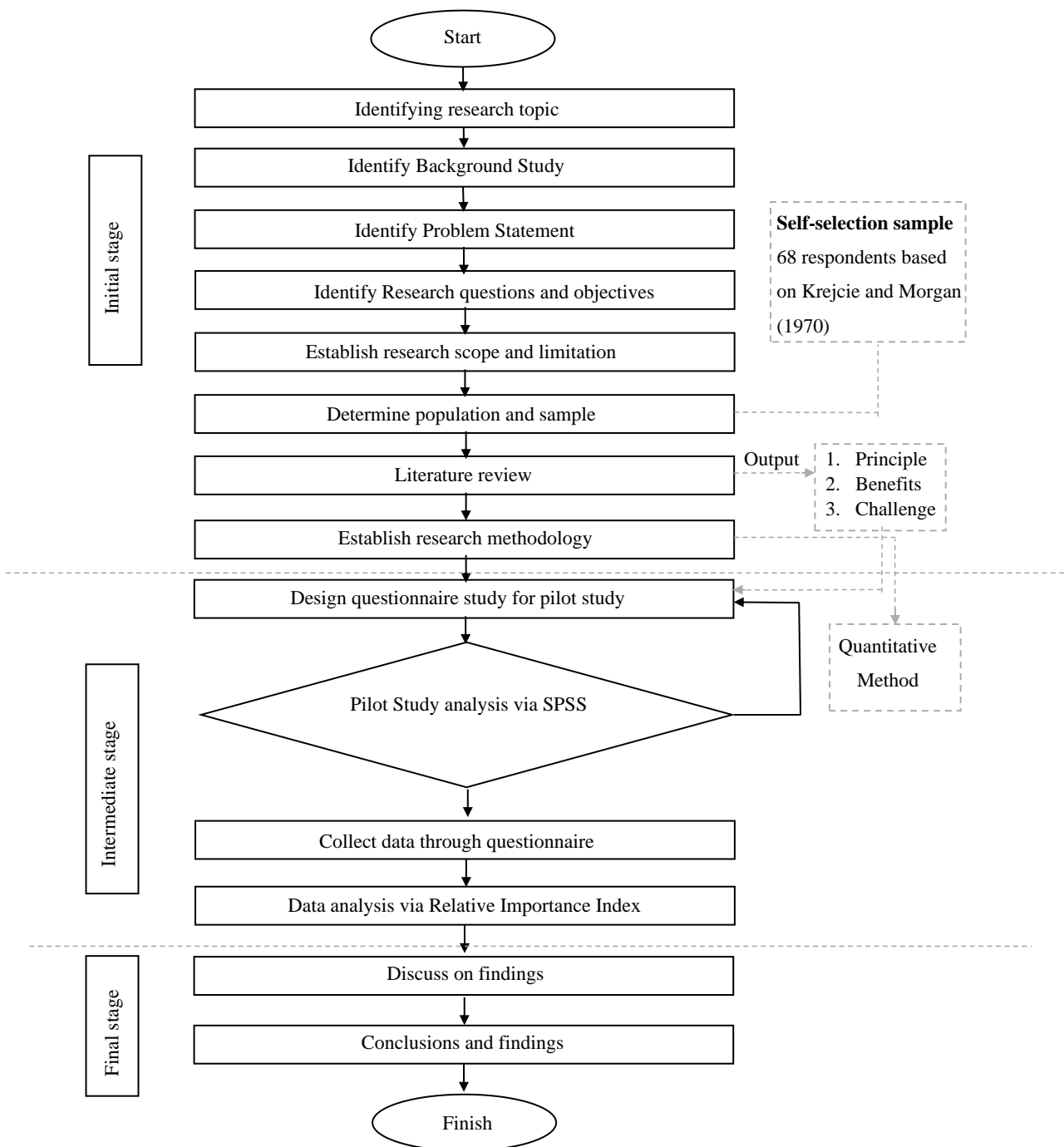
This chapter will be explaining about the research methodology that will be utilized in this research topic which is the “The benefits and solution to the challenges of Transit-Oriented Development (TOD) in Klang Valley.” The methodologies include the location of the study, the targeted audience of this study, research design framework, population and sampling and data collection method.

#### 3.2 Area of Study

The study was carried out in Klang Valley, Malaysia. The purpose behind the chosen option is that Klang Valley is the only place in Malaysia that consists of numerous types of public transportation which are the Mass Rapid Transit (MRT), Light Rapid Transit (LRT), Bus Rapid Transit (BRT), KLIA Express, KLIA Transit, Monorail, Komuter Tanah Melayu (KTM), Rapid KL feeder bus and MRT feeder bus.

#### 3.3 Research Design

According to Bhat (2018), a research design can be defined as the plan that a researcher will adopt to carry out a study, encompassing the selection of appropriate research methods and techniques. This framework enables researchers to refine their chosen methods, ensuring they are well-suited to the specific subject matter, and helps set the stage for successful implementation of the study.



**Fig. 12** Figure description: Flowchart of Research Design

Figure 12 above shows the flowchart for Research Design. According to Jilcha's (2019) article, research design is a framework that a researcher chooses to effectively solve a research problem by integrating various components of the research process in a logical and efficient manner. This framework includes specific methods and techniques for conducting research and provides clarity about the research methodology. The primary objective of research design is to minimize bias in data and increase confidence and accuracy in the collected information. Generally, this research paper will be carried out based on three stages which are initial stage, intermediate stage, and final stage.

### 3.3.1 Initial Stage

The first stage for this assignment is the initial stage. The initial stage means that the researcher will list out the process of doing the research paper before doing and sending the questionnaire to the targeted participants and they will conduct the literature review to identify the issue or the lack of knowledge for the existing knowledge related to the research problem. In this case, the researcher is compulsory to identify the research topic which exists and is able to identify gaps and limitations for that particular research topic as well as identify the research background for that topic to gather all the information regarding the topic. After that, they need to identify the problem statement by listing out into 5 paragraphs which are introduction, the details for the objective 1,2, and 3 as well as the conclusion that can be obtained from the problem statement. Then, the researcher is also needed to identify research questions and objectives to let the reader understand the purpose of the research paper for the research topic. Furthermore, the researcher needs to establish the research scope and limitation. Determine population and sample means that 68 respondents will be sent based on Krejcie and Morgan (1970) as self-collection sample. Moreover, they need to identify the literature review which aims to identify and analyse relevant literature which has the output of principles, benefits and challenges of Transit-Oriented Development in Klang Valley. Lastly, the research methodology for this research is utilizing quantitative methods and the details for each step will be stated below.

As mentioned before, the first step in the initial stage is to identify research topics. A research topic refers to a particular subject or area of interest that a researcher intends to investigate in order to address a specific issue or gap in existing knowledge (McCombes, 2019). It is an important step to not end up with an unfocused and unmanageable project and the topic that is decided on is the benefits and challenges of Transit-Oriented Development (TOD) from Public Perspective in Klang Valley.

In terms of identifying the Background Study, it can be defined as the basic information or the most significant studies that have been carried out in a sequential manner (Olawale, 2022). It also includes a brief discussion of major models that are related to the research problem.

The third process is the problem statement. A problem statement can be defined as the way of communicating the specific problem that a research topic seeks to address, as well as the importance of the selected research topic. This step is important in the research process because it helps readers to understand the objectives of the research and provides guidance for refining the research topic throughout the research paper.

The fourth process is identifying the research objectives and research questions. According to Ryan (2022), research objectives can be defined as a process that ensure the goals to be achieved in a research project and guide the entire research process, from data collection to developing the main body of the paper and drawing conclusions while the research questions are process that listed out the possible questions that might be possible based on the research topic. In this case, the research objectives for “The benefits and challenges of Transit-Oriented Development (TOD) from Public Perspective in Klang Valley” are to identify the principle of Transit-Oriented Development (TOD) in Klang Valley, to discuss the benefit of Transit-Oriented Development (TOD) in everyday life, and to analyse the challenges of Transit-Oriented Development (TOD) in Klang Valley.

For the literature review, research done by The University of Edinburgh (2022) stated that a literature review is known as the survey of academic sources regarding a chosen topic which provides the researcher understanding of the present topic. In this case, the outputs for A study of Transit-Oriented Development in Malaysia are principle, benefits and the challenges that are available for this type of development. Next is to establish research methodology. According to Goundar (2012), a research methodology can be defined as the methods that are available in a research paper to overcome the problem based on the research which includes quantitative method, qualitative method, and mixed method. In this case, the research methodology that are used for the research topic of the benefits and challenges of Transit-Oriented Development (TOD) from Public Perspective in Klang valley are quantitative method.

### 3.3.2 Intermediate Stage

The second stage for the research design is the intermediate stage. Intermediate stage is a stage after the initial stage but before the final stage in which this stage will highly focus on conducting a pilot study to test the research design and methodology, problem statement or limitation in research design. In this stage, it is a stage which is also known as the data collection stage whereby the researcher is compulsory to collect all the data that is related to the respective research questions. The first process that is in the intermediate stage is that the researcher is required to design questionnaire study for pilot study which is related to the research topic such as the principle, benefits, and challenges of Transit-Oriented Development in Klang Valley. After the process of designing questionnaire study for pilot study, then the researcher is needed to complete the pilot study analysis via SPSS. The diamond shape based on the Research Design Framework above means that this process can be repeated again to the process of Design questionnaire study for pilot study once the process of completing the pilot study analysis via SPSS is not successful. The process after this is the data analysis via Relative Importance Index which is known as a way of quantifying the influence of each variable in relation to the others details for each step will be stated as below.

The first step is to design questionnaire study for pilot study via SPSS. According to In (2017), pilot study assists in planning and modification of the entire research paper and analyse the feasibility before the full study is carried out. On the other hand, SPSS software can be defined as a set of software tools designed to analyse social science data. Its modelling environment is capable of handling models ranging from simple to complicated, and the data it produces can be used for many purposes including surveys, market research, and data mining (William, 2022). In this case, the questionnaire will be set up and sent to experts to check the questionnaire and answer the questionnaire simultaneously.

The second step is to collect data through questionnaires. In this case, quantitative method will be used to carry out the research method to identify the results from the google form and will send to 68 respondents based on table of Krejcie and Morgan (1970).

The last step for the intermediate stage is to do data analysis via Relative Importance Index. Johnson and Lebreton (2004) explain that the Relative Importance Index is a statistical method used in research to measure the significance of a group of variables in relation to a specific outcome. This technique assigns a numerical value to each variable, which indicates its relative influence compared to the other variables.

### 3.3.3 Final Stage

The final stage in research design framework can be defined as the last phase of a research project. This is the stage in which the data that is collected from the previous stage, which is the intermediate stage, will be analysed and interpreted to draw conclusions and make recommendations. In this case, the researcher will review the data from the previous stage to discuss findings as well as make conclusions and findings through reports, or publications.

## 3.4 Proposed Method

There are three types of research methodologies in a research paper which are qualitative method, quantitative method, and mixed method. Each of them has their own purposes which can be differentiated by whether they focus on words, numbers, or both of it. Hence, this research paper will utilize the quantitative method to collect necessary data.

### 3.4.1 Quantitative Method

According to Bhandari (2020), a quantitative method can be defined as a method that analyse and collect the numerical data in order to find the patterns and averages of the research topic. Not only that, quantitative methods of research can also make some predictions, test causal relationship as well as generalize results to wider population. Research article from (Apuke, 2017) also stated that the quantitative method can be defined as "the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute alternative knowledge claims". Not only that, Quantitative research, which is also referred to as the quantitative method, typically begins with identifying a research problem or formulating a hypothesis or research question. The next step is to conduct a review of relevant literature, followed by the collection and analysis of numerical data (Apuke, 2017; Williams, 2021). According to Fleetwood (2018), Quantitative research involves systematic exploration of phenomena through the collection of measurable data and the application of statistical, mathematical, or computational techniques. This method is mainly using sampling method to collect information from previous customers by sending out online surveys, online polls, and questionnaires.

According to Williams (2021), quantitative methods have the purpose of expanding the knowledge and understanding of the social world in which it can examine events and situations that impact individuals. Not only that, but it also relies on numerical data and statistical analysis to produce objective results that can be communicated with clarity. The example of quantitative method of research can be taken from the article from (Fleetwood, 2018) which shows that the importance of Quantitative method. The story begins with organizations that can use a customer satisfaction template to carry out a CSAT survey, which allows them to gather quantitative data on various parameters such as product quality, pricing, and customer experience. By asking questions like net promoter score (NPS) and matrix table questions, organizations can obtain numerical data that can be analyzed to assess the brand's or organization's goodwill in the customer's mind.

Hence, this research will utilize the quantitative research methods which are sending the questionnaire google form to many respondents to answer all the questions that are provided. The quantitative research methods are chosen because it is linear and focused which is known as a step-by-step approach. Not only that, but the design of the quantitative research methods has also significantly helped the researcher to highlight the facts and figures. Specifically, the researchers will present the data of the respondents mainly in numbers and quantitative research data tend to collect data through larger samples (Kandel, 2020). Not only that, but the quantitative research method is also fast as it can delivered to large number of related people through online platforms such as email, messaging, WhatsApp and messaging and the respondents can complete the questionnaire whenever and wherever as long as it does not meet the deadline.

### 3.5 Population and Sampling

According to Shukla (2020), population can be defined as the findings that are to be answered by the group of all the units to be applied by the researchers to answer their research topic. Sampling on the other hand refers to the smaller group or individuals that will be selected from the population to represent the group of all the units in the research study (Bhandari, 2020). In general, the smaller group or individuals are also known as the sample. The population and sampling are very significant for the research study, especially the sampling as it has the scope of sampling is high which means that the study of the entire population is impractical while the sampling can help the researcher significantly by studying a smaller representative subset of the population (Adams, 2020). Not only that, the advantage of using a sample is that it allows for a high degree of accuracy while working in a limited area which provides sufficiently reliable data for drawing meaningful conclusions about the entire population. Hence, the target population for this research is 1998600 because this is the estimated population for 2023 in Kuala Lumpur by the Department of Statistics Malaysia and the sample size will be determined using a simple random sampling approach. According to Bhardwaj (2019), the simple random sampling approach is a type of sampling that determines the members randomly and purely by chance from the population. This approach will be utilized for research because the results for this research topic are from the public perspectives that are highly homogenous because all the public that utilized Transit-Oriented Development which are mostly utilizing the services and facilities in the mix-used development as well as the public transportation. According to Noor *et al.* (2022), the simple random sampling approach has the benefits of reducing bias and simplicity. Reducing bias means that each of the members from the population will have equal chance to be selected in the sample and this will not affect the quality of the sample. Simplicity on the other hand will help the researcher to reduce the complexity and of the sampling process that is easy to implement. Hence, with a margin error of 10%, 90% of confidence level and the response distribution of 50%, the minimum recommended sample size is 68 to obtain valid data on the benefits and the solution to the challenges of the Transit-Oriented Development (TOD) in Klang Valley. Figure 13 shows total Population and Annual Growth Rate by State.

**Fig. 13** Total Population and Annual Growth Rate by State

### 3.6 Software

In this research paper, which is the benefits and solution to the challenges of Transit-Oriented Development (TOD) in Klang Valley, the SPSS software will be utilized to conduct the study. According to M. Nagaiah and K. Ayyanar (2016), Statistical Package for the Social Sciences (SPSS) is a software that is commonly used in business world and Social Sciences which helps the researcher to perform data entry and analysis to create graphs and table. Not only that, Statistical Package for the Social Sciences (SPSS) also allows researchers to rearrange the data in order to simplify the data processing and perform statistic functions such as analytic statistics, Bivariate statistics, predictions for numerical outcomes and prediction for identifying groups. According to Rahman and Muktadir (2021), one of the main benefits of the SPSS software is user-friendliness. Specifically, this type of software is suitable for people with non-technical backgrounds which means the

researcher that is using the SPSS software does not need to have the knowledge of programming language before using the SPSS software compared to other types of statistical data analysis software including PSPP, Stata, SAS, SPlus, JASP, and BMDP. According to Rahman and Muktadir (2021), the four types of variables in SPSS datasheet software are independent variables, dependent variables, intervening variables, and moderator variables. Independent variables are the variables that are controlled by the researcher in a study, and it is the one that the researcher believes has an effect on the dependent variable. Dependent variable can be defined as the outcome or response variable that the researcher is interested in studying. After that, the intervening variables also act as a mediator known as the variable between the independent variables and the dependant variables which helps to explain the relationship between the independent and dependent variables. Lastly, the moderator variables is a variable that can exert an influence on the research situation or phenomenon, and may or may not be under the researcher's control.

In this case, the researcher has the research topic of “The benefits and solution to the challenges of Transit-Oriented Development (TOD) in Klang Valley”

Independent Variable: The benefits and improvement of Transit-Oriented Development in Klang Valley.

Dependent Variable: the behaviour of the respondents, the knowledge of Transit-Oriented Development.

Intervening Variable: The planning of Transit-Oriented Development

Moderator Variable: Civil status, age, Gender, years of working experience

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## Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

## Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Adrian Bong Yew Chung and Irna Nursyafina Rosdi; **data collection:** Adrian Bong Yew Chung; **analysis and interpretation of results:** Adrian Bong Yew Chung; **draft manuscript preparation:** Adrian Bong Yew Chung and Irna Nursyafina Rosdi. All authors reviewed the results and approved the final version of the manuscript.

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