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# Unveiling the Spatial Imprint of Mass Rapid Transit (MRT) Stations: An Analysis of Population Density Shifts in Klang Valley using the 2020 Census Data

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**Abstract**

The Klang Valley possesses an efficient transportation system that evolves alongside the intensifying urbanization process in the area. The introduction of transportation systems like the MRT has contributed to the population growth in this region, resulting in increased population density. This study investigates the impact of Mass Rapid Transit (MRT) stations on population density patterns in Klang Valley, Malaysia, utilizing the 2020 census data. In this study, the research method that will be used is secondary data analysis and field survey. Secondary data obtained include population census data for the years 2010 and 2020 from the Department of Statistics Malaysia (DOSM), as well as data regarding the MRT system. Additionally, the field survey of the MRT stations was conducted by the researcher to observe the direct impact of development that has taken place at these stations. The findings of the study indicate that the MRT stations constructed in these areas have influenced the population density. This is because the population in these areas has been increasing over time due to the availability of transportation facilities such as the MRT system, which facilitates movement to specific destinations. Furthermore, the presence of infrastructure facilities has also been a significant factor in attracting large crowds to these areas. The construction of the MRT system in the Klang Valley area has led to changes in population density in certain areas with MRT stations, and this discovery is expected to make a valuable contribution to understanding population dynamics and urban planning strategies in the Klang Valley region. The findings contribute to the understanding of urban development dynamics around public transport infrastructure in Southeast Asia. In conclusion, the research findings underscore the pivotal role of sustainable urban development, aligning with Sustainable Development Goal 11, in fostering inclusive, safe, resilient, and sustainable cities and communities.

**Keywords**: Population Density, Transportation, Klang Valley, Urban Development, Urbanization

## Introduction

The process of urbanization has driven the development of transportation systems in many countries. Transportation is a crucial sector that impacts both the economy and the environment. Various modes of transportation have been introduced, each with varying degrees of efficiency and sustainability (Yahya & Safian, 2023). Rail transport has gained traction worldwide, especially in Malaysia, where its introduction has had significant effects on the economy, society, and urbanization. Rail transport has experienced a notable resurgence globally, proving to be a crucial element in modern transportation systems. In Malaysia, this trend is particularly evident, with the adoption of rail networks, such as the Mass Rapid Transit (MRT), playing a transformative role. These rail systems have not only facilitated improved mobility and connectivity but have also had far-reaching implications for the country's economy, society, and urbanization trends (Man & Majid 2024a;2024b).

Economically, the rail transport sector in Malaysia has stimulated growth by attracting investment, creating job opportunities, and boosting local businesses. It has provided a reliable means of commuting, reducing transportation costs and travel times, which in turn supports the efficiency and productivity of the workforce. The expansion of rail networks has also encouraged commercial development around stations, fostering vibrant urban centers and boosting property values in surrounding areas. From a societal perspective, the availability of rail transport has enhanced the quality of life for many Malaysians. It offers a convenient and accessible mode of transportation, reducing traffic congestion and lowering pollution levels due to fewer cars on the road (Man &Majid 2024a;2024b). Rail systems like the MRT promote social inclusion by connecting diverse communities and providing an affordable means of travel. This enhanced connectivity contributes to a greater sense of community and facilitates cultural exchange.

In terms of urbanization, the introduction of rail transport has been a catalyst for significant urban transformation. It has influenced the spatial distribution of population and economic activities, leading to more sustainable urban growth patterns (Calthorpe, 1993). Rail systems encourage transit-oriented development (TOD), where residential, commercial, and recreational spaces are designed around transit hubs. This shift toward compact, mixed-use development contributes to more efficient land use, reduced urban sprawl, and a greater emphasis on sustainable living. The growing prominence of rail transport in Malaysia underscores its importance as a driver of economic progress, social cohesion, and urban renewal. Its impact is evident in the evolving landscapes of cities and the changing dynamics of how people live, work, and interact in urban environments (Man & Majid 2024a;2024b).

Globally, mass transit systems carried 53 billion passengers in 2017, marking a significant increase from 2012 (Wang et al., 2018). This growth was largely observed in Asia and the Middle East-North Africa region. Asian transit systems alone serve over 26 billion passengers annually, with European routes transporting more than 10 billion, Latin America nearly 6 billion, and North America 3.7 billion passengers (Richard, 2018). The Eurasian region had the highest utilization of metro networks, with an average of 117 trips taken per capita in a given year (Farid et al., 2020). However, it is notable that Eurasia is the only region experiencing a

decline in per capita journeys (Mat et al., 2018). In Malaysia, the Malaysian Transport Statistics reported that the MRT rail transport service recorded 19,573,010 passengers in 2021 (Statistik Pengangkutan Malaysia, 2021).

The Mass Rapid Transit (MRT) system in Malaysia has prompted changes in population density in districts within the Klang Valley. The MRT consists of three lines: the Kajang Line, which opened in 2016; the Putrajaya Line, operational since June 2022; and the upcoming Circle Line, scheduled for implementation in 2028 (MRT Corporation, 2023). The project was initiated by Malaysia's Prime Minister, with the Kajang Line covering 47 km, including 9.5 km underground, and featuring 29 stations, 7 of which are underground (Khoo & Ooi, 2023; Kadir et al., 2020). Due to the growing population, estimated at 18 million by 2020, the Putrajaya Line was constructed and commenced operations in 2022, spanning 57.7 km with 13.5 km underground, comprising 10 new underground stations (MRT Corporation, 2023). The potential for this approach to contribute to a more sustainable future, through environmental benefits like reduced greenhouse gas emissions and resource consumption, social improvements through increased access and reduced inequalities, and economic growth with vibrant urban centers, motivates this research (Yahya & Safian, 2023; Man & Majid, 2024a, 2024b). The MRT research has significantly changed the transportation landscape, raising questions about its impact on population distribution and density. Using the latest 2020 census data, this study aims to analyze population density changes in districts served by MRT stations.

**Study Area & Methodology**

The Klang Valley, on the west coast of the Malaysian peninsula, includes four districts: Selangor, Gombak, Klang, Petaling, and Hulu Langat. Kuala Lumpur, Malaysia's capital, is at the heart of the Klang Valley and covers a land area of 243.7 km² (Latif et al., 2012). The region had a population of approximately 6.6 million in 2010, with an annual growth rate of 1.7% (DOSM, 2010). High traffic volume and industrial development are leading to urban expansion, particularly in the southern and northern areas of Kuala Lumpur (Leh et al., 2012). The focus of this study is the Klang Valley, with specific MRT stations such as Kajang, TRX, Pasar Seni, Taman Mutiara, and Bukit Bintang.

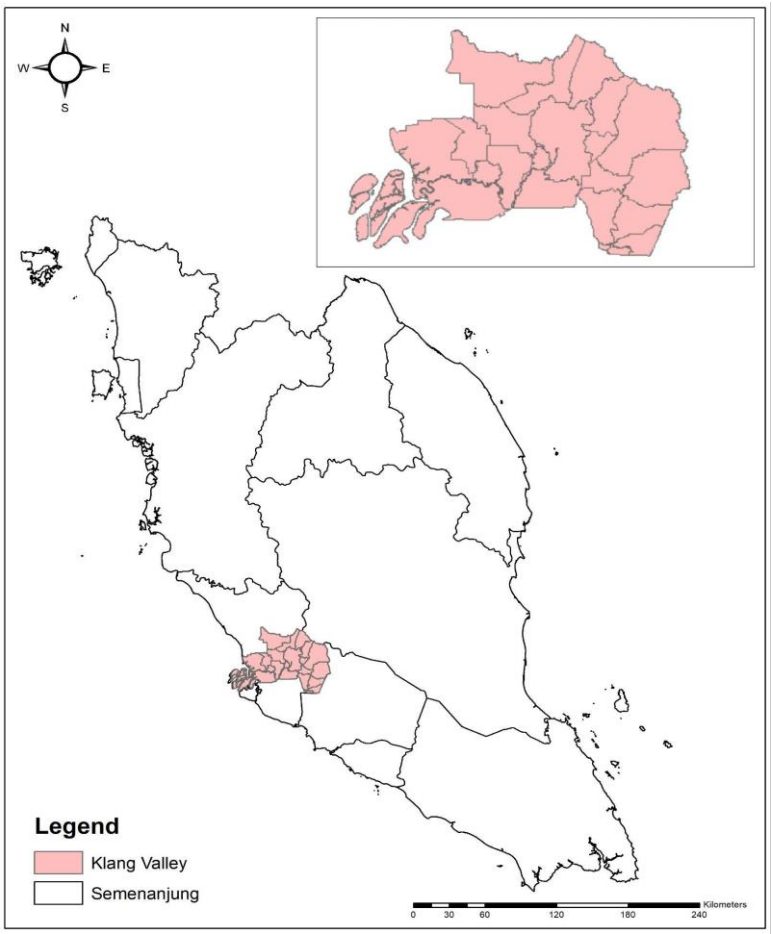


Figure 1.0: Study area Klang Valley, Malaysia

**Secondary Data Analysis**

In conducting secondary data analysis, we utilize population data for the study area provided by the Department of Statistics Malaysia (DOSM). In this study, population data from 2010 and 2020 is analyzed to investigate demographic trends and patterns of change in population composition. By leveraging secondary data analysis, we can gain insights into social dynamics and factors influencing population growth and distribution without the need for fresh data collection. This approach involves examining and interpreting existing data sets collected by others, often for different purposes (Johnston, 2014; Ewim et al., 2023).

In this case, we are using population data from the Department of Statistics Malaysia, obtained through periodic censuses or surveys (DOSM, 2022). This data includes information such as population size, age distribution, gender ratio, ethnic composition, and other relevant demographic variables. By utilizing secondary data, we gain insights into long-term trends and population dynamics in the study area without the resources required for primary data collection. This allows us to focus on analyzing the data, identifying patterns, and drawing conclusions, rather than allocating resources to data gathering.

Additionally, secondary data analysis lets us compare and contrast population dynamics in the study area with other regions or periods, offering a broader context for our analysis. Advanced statistical techniques such as regression analysis, time series analysis, or spatial analysis can be used to uncover underlying relationships and trends within the population

data. Overall, secondary data analysis is a valuable research method that allows efficient use of existing data sources to gain insights into population dynamics, inform policy decisions, and contribute to our understanding of social phenomena.

**Field Survey**

A field survey is a research method aimed at gathering primary data directly from the source, usually in the natural environment where the phenomenon being studied takes place. Its primary purpose is to obtain first hand information about a particular subject, such as environmental conditions, social behaviors, infrastructure, or any other aspect pertinent to the research objectives (Kean, 2016). Field surveys provide researchers with valuable insights into real-world phenomena, contributing significantly to the advancement of knowledge across various fields (Cabrero et al., 2022). Researchers conducted surveys at all Kajang MRT line stations to observe the development that has taken place around these station areas. There is a total of 29 MRT stations along the Kajang route, with 7 of these MRT stations situated underground. These underground MRT stations include MRT Aeon Maluri, Cochrane, Tun Razak Exchange (TRX), Pavilion Bukit Bintang, Pasar Seni, Merdeka, and Muzium Negara. The field surveys conducted at these stations aimed to assess the development occurring in the vicinity of these station areas. Additionally, they sought to identify interesting attractions within the MRT station areas that could potentially draw large crowds, leading to a higher population density compared to stations lacking such attractions. By examining these aspects, researchers aimed to understand the factors influencing urban dynamics, such as economic activities, commercial centers, recreational spots, and cultural landmarks, contributing to the popularity and liveliness of specific station areas. This information is crucial for urban planners and policymakers to enhance the accessibility, vibrancy, and overall liveability of urban spaces surrounding MRT stations.

**Discussion**

In this study, we focus on the Kajang Line of Malaysia's Mass Rapid Transit (MRT) system. This line encompasses 29 stations, including 7 underground stations: Aeon Maluri, Cochrane, Tun Razak Exchange (TRX), Pavilion Bukit Bintang, Merdeka, Pasar Seni, and Muzium Negara. The stations are strategically located across various districts in the Klang Valley, playing a pivotal role in the region's public transportation infrastructure. This research seeks to examine the impact of these MRT stations on urban development trends in the Klang Valley, aiming to offer valuable insights for urban planners, transportation policymakers, and infrastructure developers. The study's outcomes are expected to shed light on how MRT stations influence urban growth, guiding future planning and infrastructure strategies. We consider broader implications for regional development, providing recommendations that can be instrumental for both policymakers and urban developers. By analyzing data and conducting field surveys, this research aims to capture the essence of urban transformation driven by the MRT's presence. Acknowledging potential limitations, we recognize challenges such as data availability and the presence of confounding factors that could influence the findings. These issues will be carefully addressed, with a discussion on how they might be mitigated in future studies. By considering these limitations, the research aspires to deliver a thorough and realistic examination of the MRT's role in shaping the urban landscape of the Klang Valley. Ultimately, this study contributes to a more nuanced understanding of public transportation's impact on urbanization and offers a foundation for future research and planning efforts in the region.

The presence of rail transportation systems such as MRT has further encouraged the process of urbanization in cities equipped with such systems. This is because, through observations, cities with MRT stations are more developed and attract more public attention compared to those without such stations. These areas become focal points for the public as various types of infrastructure are available for public use. Additionally, in the vicinity of these MRT stations, land use is more evident in terms of residential, industrial, commercial, religious, and institutional purposes. As a result, these areas have seen a steady increase in population, driven by the convenience of having easy access to multiple destinations without the usual concerns about transportation costs and traffic congestion. This study will focus on several key MRT stations to understand their role in this population growth and to explore how their presence has contributed to changing urban dynamics.

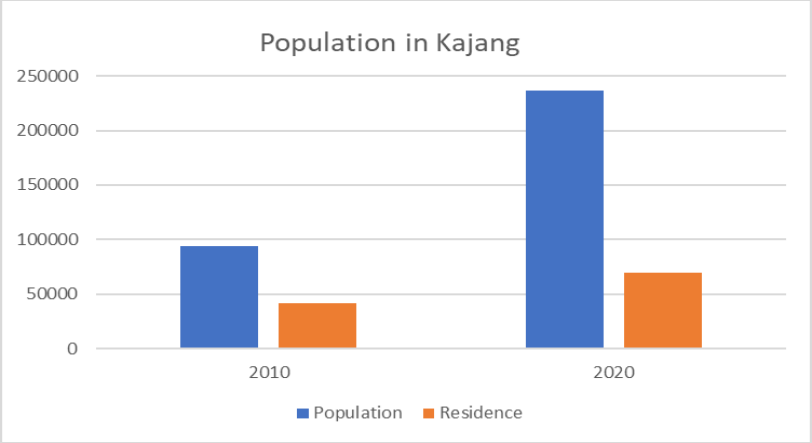


Figure 1.1: Population Statistics for Kajang
Source: DOCM 2010 & 2020

The first MRT station on the Kajang Line to Kwasa Damansara is the Kajang MRT Station, situated 1 kilometer south of Kajang Town Center. The Kajang MRT station also serves as an interchange station for the Rawang–Seremban KTM Komuter line (MRT Corporation, 2023). Kajang, located in the eastern part of Selangor, Malaysia, acts as the administrative center of Hulu Langat district and lies 21 kilometers from Kuala Lumpur. The focal point of current growth in Kajang is the Sungai Chua area. The population of Kajang has witnessed rapid expansion in recent years, with an estimated annual growth rate of 9%. Figure 1.1 shows the population in that area is 236,240 people with 46.8% female and 53.2% male, comprising 69,659 households and 61,178 occupants (Census, 2020). Several townships have emerged in Kajang, including Taman Prima Saujana (adjacent to Jalan Cheras), Sungai Chua, and Taman Kajang Perdana (Kajang Highlands). In recent times, Kajang has seen the development of numerous upscale projects such as Twin Palms, Sri Banyan, Country Heights, Jade Hills, and Prima Paramount. Figures 1.2 (a) and (b) show the development around the Kajang MRT station area.

Figure 1.2(a): Areas Surrounding Kajang MRT Stations

Figure 1.2(b): Around Kajang MRT Station

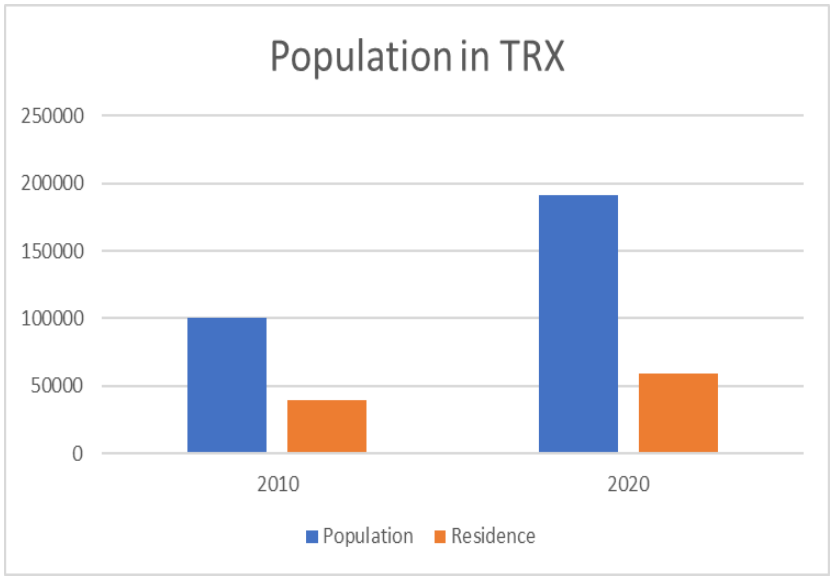


Figure 1.3: Population Data for Tun Razak Exchange (TRX)
Source: DOCM 2010 & 2020

The TRX MRT Station, situated within the bustling Tun Razak Exchange (TRX) financial district in Kuala Lumpur, Malaysia, serves as a key transportation hub linking the area's vibrant commercial activities with other parts of the Klang Valley (MRT Corp, 2023). This modern station is an integral component of the Mass Rapid Transit (MRT) Kajang Line, facilitating seamless connectivity and efficient mobility for commuters. Figure 1.4 (a) shows that the establishment of the TRX MRT Station has contributed significantly to the growth and development of the surrounding area, particularly in terms of population. As a transportation hub located in a thriving commercial district, the station has attracted an influx of residents, workers, and visitors to the TRX precinct and its vicinity (New Straits Times, 2024). The convenience of accessing public transportation via the MRT system has made the area more desirable for both residential and commercial purposes. Statistically, the impact of the TRX MRT Station on population growth can be observed through various indicators. Firstly, there has been a notable increase in the number of residential developments in the vicinity of the station. The availability of efficient public transportation has encouraged more people to live in the area, leading to the construction of new residential units to meet the growing demand. A total of 59,166 residential units were found in the vicinity of the TRX MRT station (Census, 2020). Additionally, demographic data may reveal changes in the population composition, with a potential rise in the number of residents within a certain radius of the TRX MRT Station.

According to statistics recorded by the 2020 Census in figure 1.3 shows, the population in the surrounding area increased to 191,318 compared to the previous year. This could be accompanied by shifts in the socioeconomic profile of the area's population, reflecting the evolving dynamics of urbanization and development. Furthermore, the station's ridership statistics provide insights into its usage and popularity among commuters. A steady increase in passenger numbers over time may indicate the station's growing importance as a transportation hub and its positive impact on the surrounding population. In conclusion, the TRX MRT Station has played a significant role in driving population growth and development in its vicinity. By providing efficient connectivity and accessibility shown in Figure 1.4 (b), the station has attracted residents, workers, and visitors to the TRX precinct, contributing to its transformation into a vibrant urban hub.

Figure 1.4(a): Areas Around TRX MRT Station

Figure 1.4(b): Areas Around TRX MRT Station

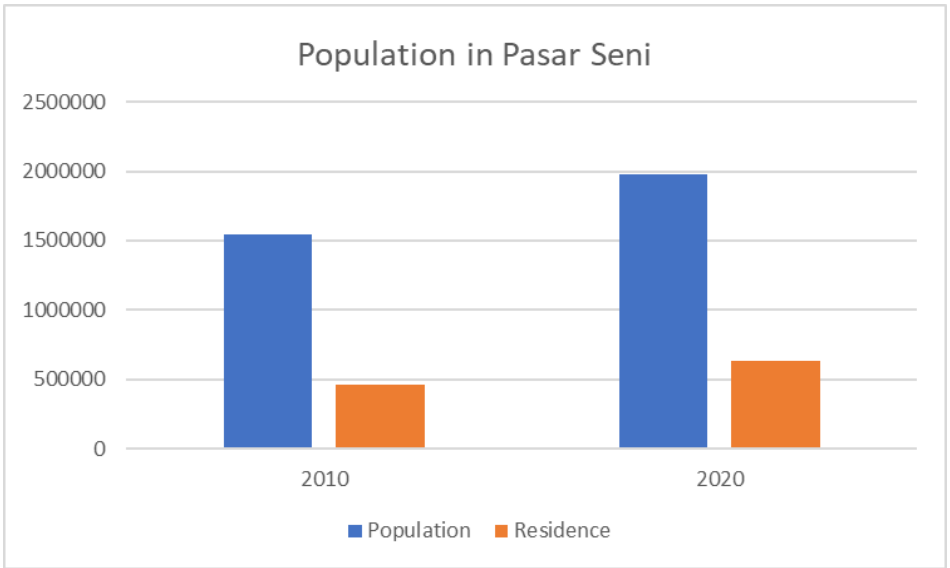


Figure 1.5: Population Trends in Pasar Seni
Source: DOCM 2010 & 2020

The Pasar Seni MRT Station stands as a pivotal transportation hub located in the heart of Kuala Lumpur, Malaysia. As a central component of the Mass Rapid Transit (MRT) Sungai Buloh-Kajang Line, this station serves as a vital link connecting various parts of the Klang Valley, including the vibrant commercial, cultural, and historical district of Pasar Seni (MRT Corp, 2023). Figure 1.6 (a) shows that the establishment of the Pasar Seni MRT Station has

played a significant role in shaping the growth and development of the surrounding population. Its strategic location within the bustling Pasar Seni area has made it an attractive destination for both residents and visitors alike. The convenience of accessing public transportation via the MRT system has contributed to the area's appeal, leading to an increase in the number of residents choosing to reside in the vicinity. Statistically, the impact of the Pasar Seni MRT Station on population growth can be observed through various indicators. Figure 1.5 shows, that the population in that area has been increasing over time as it serves as a focal point for many people, resulting in a total population of 192,122 in the year 2020 (Census, 2020). There has been a significant increase in residential development near the station, with 634,639 residences (Census, 2020). New housing units have been built to accommodate the growing population. Additionally, demographic data may reveal changes in the population composition surrounding the station, reflecting shifts in age demographics, household sizes, and socioeconomic profiles. Aside from its influence on population growth, the Pasar Seni MRT Station also serves as a gateway to several notable attractions in the surrounding area. Figure 1.6 (b) also shows that the nearby points of interest include the historic Central Market, the iconic Petaling Street (Chinatown), the vibrant street art along Jalan Sultan, and the Sultan Abdul Samad Building (Central Market, 2024). These attractions attract both locals and tourists alike, contributing to the vibrancy and cultural richness of the Pasar Seni district. In conclusion, the Pasar Seni MRT Station plays a crucial role in facilitating connectivity and mobility in Kuala Lumpur's bustling Pasar Seni area. Its impact extends beyond transportation, influencing population growth, and contributing to the area's cultural and economic vibrancy. As a key transportation hub and gateway to various attractions, the Pasar Seni MRT Station continues to shape the urban landscape and enhance the overall livability of the surrounding area.

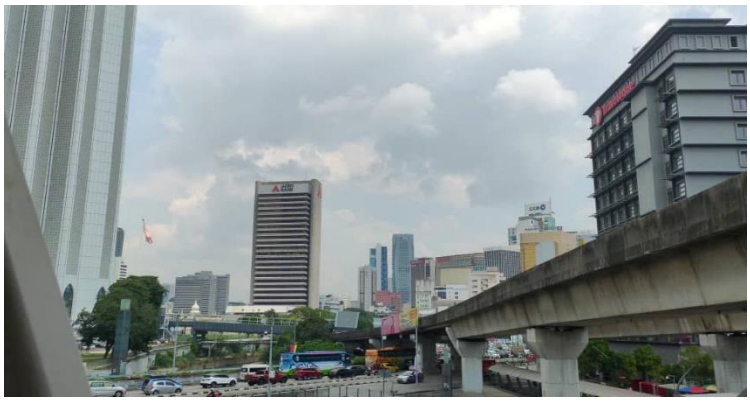

Figure 1.6 (a): Around Pasar Seni MRT Station

Figure 1.6 (b): Around Pasar Seni MRT Station

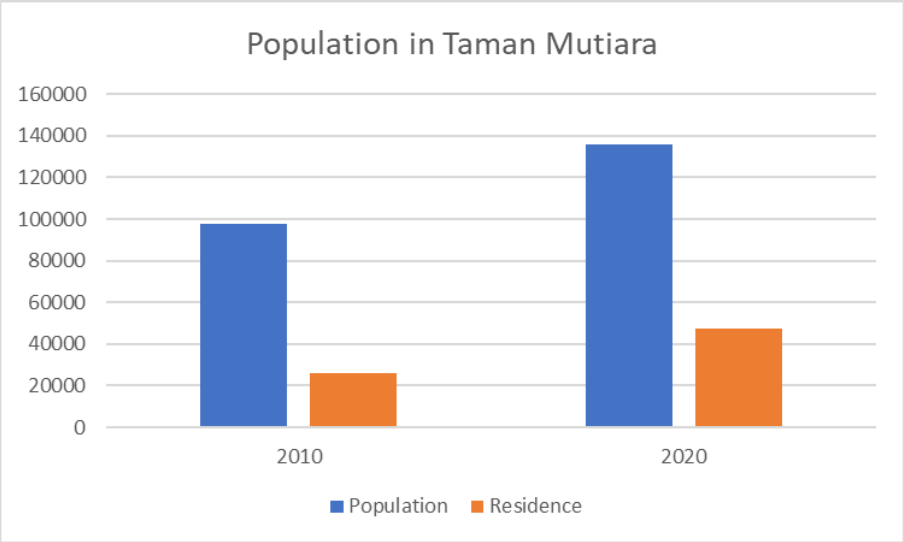


Figure 1.7: Population Trends in Taman Mutiara
Source: DOCM 2010 & 2020

The Taman Mutiara MRT Station, situated in the heart of the Taman Mutiara neighborhood in Kuala Lumpur, Malaysia, serves as a crucial link in the Mass Rapid Transit (MRT) Sungai Buloh-Kajang Line, providing seamless connectivity and accessibility to residents and commuters in the vicinity (MRT Corp, 2023). Since its inception, the establishment of the Taman Mutiara MRT Station has significantly impacted the growth and development of the local population. Its strategic positioning within the Taman Mutiara neighborhood has made it an appealing destination for both residential and commercial purposes, attracting an influx of residents seeking convenient access to public transportation. This surge in residential demand is evidenced by the noticeable increase in housing developments near the station, approximately 47,148 residential units Census (2020), with ongoing projects aimed at accommodating the growing population. Furthermore, demographic data suggests shifts in the population composition surrounding the station, including changes in age demographics, household sizes, and socioeconomic profiles. The total population shown in Figure 1.7 in the vicinity of the Taman Mutiara MRT station is recorded at 135,823 population (Census, 2020). Beyond its role in population growth, the Taman Mutiara MRT Station provides access to various attractions and amenities in the area. Nearby establishments such as the Tesco Extra hypermarket offer convenient shopping options while dining venues and recreational facilities contribute to the neighbourhood's vibrancy. Additionally, the station's proximity to educational institutions, healthcare facilities, and commercial centers further enhances its appeal to residents and commuters alike. In conclusion, the Taman Mutiara MRT Station serves as a vital nexus for connectivity and mobility within the Taman Mutiara neighborhood and its environs. Its impact transcends transportation, influencing population dynamics and bolstering the area's overall livability and accessibility. Figures 1.8 (a) and (b) illustrate that, as a pivotal transportation hub, the Taman Mutiara MRT Station continues to influence urban development and improve the quality of life for residents in the surrounding area.

Figure 1.8(a): Around Taman Mutiara MRT Station

Figure 1.8(b): Around Taman Mutiara MRT Station

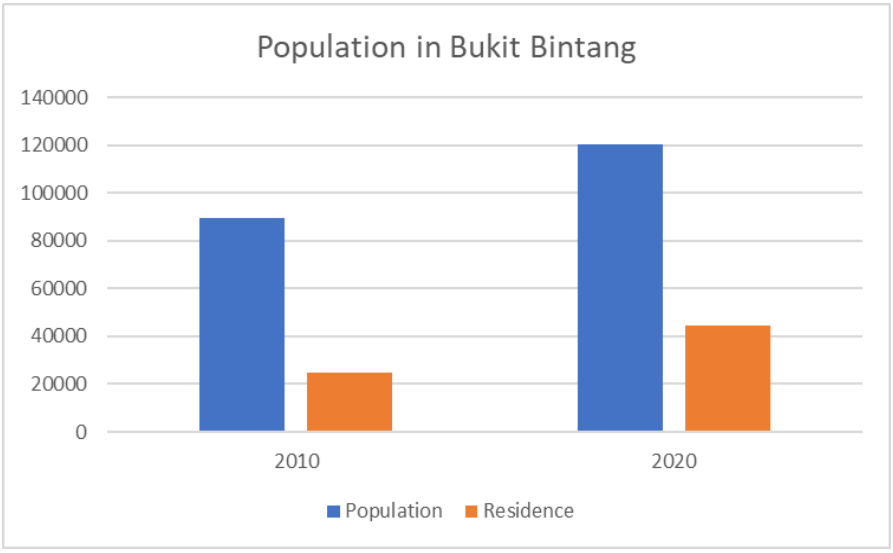


Figure 1.9: Population trend in Bukit Bintang
Source: DOCM 2010 & 2020

The Bukit Bintang MRT Station serves as a crucial transportation hub in the bustling Bukit Bintang district of Kuala Lumpur, Malaysia. As part of the Mass Rapid Transit (MRT) Sungai Buloh-Kajang Line, this station plays a crucial role in providing seamless connectivity and access to residents and visitors in one of Kuala Lumpur's busiest areas (MRT Crop, 2023). Since its inception, the Bukit Bintang MRT Station has significantly impacted the growth and development of the local population. Figure 1.10 (a) shows, that its strategic location in the heart of the Bukit Bintang district has made it an appealing destination for both residential and commercial purposes. The convenience of accessing public transportation via the MRT system has contributed to an increase in the number of residents choosing to live in the area. Statistically, the influence of the Bukit Bintang MRT Station on population growth can be observed through various indicators. 120,529 population in 2020 in that area as shown in Figure 1.9 (Census, 2023). There has been a noticeable surge in residential developments near the station, with new housing projects meeting the growing demand. Additionally,

demographic data may reveal changes in the population composition surrounding the station, including shifts in age demographics, household sizes, and socioeconomic profiles. In addition to its impact on population growth, the Bukit Bintang MRT Station provides access to a variety of attractions and amenities in the surrounding area. Nestled within easy walking distance of iconic landmarks including Pavilion Kuala Lumpur, Fahrenheit 88, and Lot 10 Shopping Center, the station offers residents and visitors unparalleled shopping, dining, and entertainment choices, as depicted in Figure 10.1 (b). Furthermore, its proximity to cultural attractions like Bukit Bintang Walk and Jalan Alor Food Street enhances its appeal further. In conclusion, the Bukit Bintang MRT Station serves as a crucial link for connectivity and mobility within the Bukit Bintang district and its vicinity. Its impact transcends transportation, influencing population dynamics, and contributing to the overall vibrancy and livability of the area. As a key transportation hub, the Bukit Bintang MRT Station continues to shape urban development and enhance the quality of life for residents and visitors in the vicinity.

Figure 1.10(a): Around Bukit Bintang MRT Station


Figure 1.10(b): Around Bukit Bintang MRT Station

**Conclusion**

In conclusion, this study has shed light on the significant impact of MRT stations on population density in the Klang Valley through the analysis of 2020 census data and consideration of various control factors. The findings contribute valuable insights into the role of public transportation infrastructure in shaping urban demographics in Southeast Asia. Establishing the MRT system has brought tangible benefits to residents in the surrounding areas of the Klang Valley, resulting in discernible changes in population density within those districts. Furthermore, the MRT system has acted as a catalyst for urbanization in the neighboring regions of the Klang Valley, driven by the increasing demand for facilities and infrastructure among Malaysia's population. For future research endeavors, exploring earlier census data to analyse population density changes over a more extended period is recommended. Additionally, integrating data on ridership, property values, and land use changes would provide a more comprehensive understanding of the MRT system's overall impact. Moreover, conducting detailed station-level analyses using additional data sources or local-level studies can offer deeper insights into the dynamics at play. Aligned with Sustainable Development Goal 11, the transportation system emerges as a crucial driver of sustainable urban development, contributing to the realization of the 2030 agenda for sustainable and resilient

environments. As such, further research and policy interventions in this realm are essential for fostering inclusive and sustainable urban growth in the Klang Valley and beyond. In advancing urban planning endeavors, fostering collaboration among city planners, transportation authorities, and local communities is paramount. This involves advocating for transit-oriented development principles to cultivate vibrant, mixed-use communities around MRT stations, enhancing last-mile connectivity, and prioritizing environmental considerations in transportation planning. Continuous data analysis and monitoring are crucial for evaluating the effectiveness of MRT expansion initiatives and guiding future decision-making processes. Equally essential is policy reinforcement at local, regional, and national levels to incentivize the adoption of sustainable development practices and enhance public transportation infrastructure. Implementing these recommendations allows stakeholders to collectively optimize the benefits of the MRT system, fostering sustainable urban development and improving residents' well-being.

Driven by the profound impact of MRT systems on urban landscapes, this research delves into the intricate relationship between MRT stations and shifts in population density within the dynamic Klang Valley. Understanding the transformative role of public transportation infrastructure in shaping urban demographics is vital for informing future policy decisions and urban planning efforts. Leveraging the comprehensive 2020 Census data, our objective is to unveil the spatial footprint left by MRT stations on their surroundings. This pioneering study provides a nuanced analysis that not only illuminates the multifaceted evolution of urban demographics but also offers valuable insights for policymakers, urban planners, and stakeholders. Through our comprehensive exploration, we aim to enrich the discourse on sustainable urban development strategies, with a focus on fostering inclusive, resilient communities amidst the rapidly expanding urban landscape of the Klang Valley and its environs.

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