Urban Form Changes and Post MRT Operation Pedestrian Use Case Study: Bundaran HI MRT Station

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Abstract. Starting the operation of the MRT in Jakarta will affect the urban form on pedestrian lanes around the MRT area. Urban form is used to describe the physical characteristics of a city. Which are the characteristics that build the area, including the shape, size, density, and configuration of settlements. This research wants to find out the impact of the presence of MRT on urban forms on pedestrian lanes before and after the MRT operates because it will cause changes in the characteristics and quality of urban forms on the pedestrian lanes of the MRT Region. There are several methods used in this research, literature studies, interviews, and observations of various urban form elements (density, land use, access and infrastructure, layout, and building characteristics) on pedestrian lanes in the Bundaran HI MRT station area. The conclusion of this research is to find out the characteristics and quality changes of urban forms on pedestrian lanes formed in the MRT area.

1. Introduction
Phase I of the MRT (Mass Rapid Transit) operations has begun in Jakarta, with the route stretched from Lebak Bulus to Bundaran HI. The presence of MRT would cause a positive impact on the area it passed. It also would cause several character changes. According to Jenks, urban form is a way to describe the physical characteristics of a city [1]. Williams had studied the impact of urban form on transportation and mobility that was centred on the 'best' urban form to facilitate sustainable transportation solutions. It includes a reduction in length and travels time. And reducing dependency on motorized vehicles, improving public transportation efficiency, encouraging people to walk and cycle, and reducing emissions associated with transportation, pollution, and accidents [2]. Therefore, the presence of MRT would cause changes in the physical characteristics of the urban form in which the route passes.

Jenks says that urban form has several elements forming it. Urban forms have physical aspects, namely size, shape, scale, density, land use, building type, urban block layout, and distribution of green open space [1]. Conceptually that urban form has several elements, namely density, diversity, and design; and accessibility affects the pattern of travel behaviour (destination, distance, frequency, mode choice) [3].
Thus, the MRT presence in Jakarta causes urban form changes. Urban form before the MRT appearance must adapt to increase the interest of the community to switch to using the MRT.

Along with the changing of physical characteristics of urban form in the area passed by the MRT route, the pedestrian lane would be also likely to change. Barros says walking facilitates understanding and experience of well-organized urban regions. The act of walking around the city could be translated according to the point of origin and destination, or the ability of the place to become the route or location of arrival. There seems to be a logical process in organizing urban space that affects path choices, which express individual preferences for one direction or another [4].

2. Method
In conducting this research, the author uses the method of observation, interviews, and literature studies. This method was chosen because it can show the relevance of the presence of the MRT with the urban form on pedestrian lines in the Bundaran HI MRT station area. So, it can be seen the impact on the urban form after the presence of the MRT. This study will explore various elements related to urban form. Some elements to be observed are shape, size, infrastructure, density, settlement configuration. These elements are needed to test the right theory/concept regarding urban forms in the MRT area, especially in Jakarta on pedestrian lines. This study conducted direct observation in the area of the Bundaran HI MRT station. The observer is the writer myself. So, it limits the subjectivity factor in the observation process. Interviews are also conducted with several pedestrians to find out the difference between before and after the MRT in the case study.

3. Results and Discussions

3.1. Bundaran HI MRT Station Location

![Figure 1 M.H. Thamrin Location– Jendral Sudirman Inside Central Jakarta](image)

The area used for observation and discussion of this case study is the Bundaran HI MRT station area. It located in the Central Jakarta area which is on the Jalan M.H. Thamrin. In this case study, the area to be analyzed is the area around the entrance and exit to the Bundaran HI MRT station which then compared to Jalan Jendral Sudirman where there is no MRT station on the pedestrian lane. Also, the author analyzes the pedestrian paths that have buildings with mixed functions with buildings that have only office functions.

3.2. Urban Form at the Bundaran HI MRT station

![Figure 2 Comparison Location Map](image)

In Figure 2, the observation area around the Bundaran HI MRT station is divided into six regions to
make a comparison between the pedestrian lanes which crowded with non-crowded and urban elements that change after the presence of the MRT. Comparison of observation locations is divided into 2, namely zones A and B (pedestrian paths that have the entrance and exit of the MRT station) with zones E and F (pedestrian lines that do not have the entry and exit of MRT stations) and zone C (pedestrian lanes are building with mixed functions) with zone D (pedestrian lanes that have buildings that have only office functions).

To find out the urban form changes in pedestrian lanes when the MRT has not yet operated and has been operating, a comparison made in 2013 with 2019. The reason for choosing these two years was because 2013 was the last year before the MRT began to be built, whereas in 2019 the MRT started operating.

Location A
Location A's observation site is on a pedestrian lane on the Jalan M.H. Thamrin. There are Japanese embassy buildings, The Plaza, Plaza Indonesia, Grand Hyatt Hotel, Keraton Hotel, and Indonesia Satu Tower, which is now under construction.

In figure 5 shows that in 2019, after the MRT operated, the pedestrian lane became more comprehensive than it was in 2013. The wider pedestrian lanes made changes to the layout of the pedestrian lanes that used to have trees, now doesn't have trees at all. Then, the presence of the MRT made the pedestrian lane in front of Plaza Indonesia more crowded because there are exits and entrances to the Bundaran HI MRT station. Which form results in the presence of many people who are exiting and entering the MRT station. The pedestrian flow also changed; the original pedestrian route was only straight, but now it is not because there is an entrance to the MRT station.
Accessibility and Transport Infrastructure
How well the transportation system connected to spatially distributed locations. The presence of MRT makes Plaza Indonesia more crowded. Because the place well connected to the MRT transportation system (access to Plaza Indonesia made it more comfortable to reach) [1].

Location B
Location B is on the pedestrian lane on Jalan M. H. Thamrin which contains Wisma Kosgoro building, Sinarmas Land Plaza, Oil Centre, Permata Plaza, and Pullman Hotel.

Figure 6 Key plan Location B

Figure 7 Section B-B

Figure 8 Comparison Location

What happened at Location B is the same as what happened to Location A. However, the building site in 2019 didn't change at all from when it was like in 2013.

Urban Layout
The urban form referred to here is as the composition of the urban layout of the elements that build up the city (roads, buildings, blocks, facades, street furniture, vegetation, etc.), in terms of dimensions and proportions (geometric framework) [4]. With the presence of the MRT, there has been a change in the urban form. In the urban layout structure because the composition of the urban layout on the pedestrian route has changed (there is no vegetation, the pedestrian lane is wider).

LOCATION C
The next observation place is Location C, located on Jalan Kebon Kacang, located between Grand Indonesia and Plaza Indonesia.
Figure 9 Key plan Location C

Figure 10 Section C-C

Figure 11 Comparison Location

Figure 11 in 2013 shows that the entrance to Grand Indonesia from the pedestrian lane was only an ordinary path, and there were no supporting elements for the exit and entry. In 2019, the entrance to the pedestrian route to Grand Indonesia changed due to the addition of features supporting the access. At this time, there is a railing for the entrance's stairs to support the comfort of people who go through these stairs. Also, there is a signage to find out which entrance visitors. And there is also a canopy to make visitors more comfortable because they not exposed to sunlight or rain.

Density
The density used as a tool to measure the feasibility of public transport infrastructure and other service provision (viability of specific land uses, primarily commercial and service, in urban design and construction) [1]. With the addition of supporting elements to the door to Grand Indonesia, the door becomes more feasible and causes additional density which will visit Grand Indonesia through the door.

Location D
The next observation place is Location D, which located on Jalan Imam Bonjol between the Mandarin Hotel and the German Bank.

Figure 12 Key plan Location D
Figure 13 Section D-D

2013 2019

Figure 14 Comparison Location

Figure 14 shows the pedestrian lane at Location D does not change after the presence of the MRT in 2019 in the Bundaran HI area. Because there is no MRT station at Location D. This also makes this location tend to be uncrowded.

Urban Layout
To determine the nature and level of routes that will traverse the linkages and permeability of urban spatial planning in claiming to determine how well space is used correctly [1]. Because this location is far from the Bundaran HI MRT station, this area tends to be uncrowded. And also, this area isn't lively because only a few people walk in this area. Because the city spatial layout of this area has large building blocks and does not have the function of mixed buildings.

Location E
The next observation place is Location E, located on Jalan Jendral Sudirman in front of Menara BCA, Kempinski Hotel, and Grand Indonesia East Mall.

Figure 15 Key plan Location E

Figure 16 Section E-E

2013 2019

Figure 17 Comparison Location

Like Location D, Location E did not change at all because there are no MRT stations located here.
Accessibility and Transport Infrastructure

The primary accessibility relationship is between houses, and the city centre is strictly related to land use and spatial planning: services, facilities, open spaces, how they organized in the city or environment, and ways to make them all contribute to how the accessibility of a place or service can be described [1]. Land use in Location E only has functions of office buildings and hotels and prioritizes access for cars. They make only a few people walk on the pedestrian and accessibility routes to Location E. There are no MRT stations and Location E, they are quite far from the MRT station. So, the pedestrian lane does not change and makes this pedestrian lane deserted.

Lokasi F

The next observation place is Location F, located on Jalan Sudirman in front of the German Embassy and the Mandarin Oriental Jakarta Hotel

Accessibility and Transport Infrastructure

Transportation infrastructure is closely related to accessibility because it determines whether buildings, spaces, and places are easy to reach. Accessibility is a layered concept and not just a matter of distance. Accessibility depends on several factors, such as the potential destination location relative to the individual starting point [1]. Therefore, the location F did not change and tended to be uncrowded because it is far from the Bundaran HI MRT Station. German Embassy and Mandarin Oriental Jakarta Hotel are the only buildings here. And usually, people go to these locations using private vehicles not by walking.
4. Conclusions
The presence of MRT as a new mode of transportation in Jakarta triggered changes to the characteristics and quality of the urban form on the pedestrian along the MRT routes. The quality of the pedestrian lane is relatively good, compared to the pedestrian lane where there is no MRT station nearby. The presence of MRT also caused a character change in the communities around the MRT area, making a cultural revolution that is the shifting of private vehicle users to public transportation modes (MRT). The operation of the MRT would likely change the urban form, including the narrower lanes for private vehicles which in turn made the pedestrian lane even larger. Therefore, it causes changes to the elements that mold the urban form on the pedestrian path.

The operation of MRT triggered changes to five urban form elements, namely, housing and building characteristics, land use, density, urban layout, and accessibility and transport infrastructure. The most visible changes in the urban form are urban layout (the pedestrian lane is wider to accommodate exit and entrance to MRT station, the pedestrian lane has no vegetation, there is no pedestrian bridge, therefore, making changes to pedestrian lane urban layout) and accessibility and transport infrastructure (travel time is faster, easier to reach, shorter distances).

However, for the other three urban form elements; housing and building characteristics, land use, and density have not experienced significant changes. Since MRT has only been operating for three months, and there have not been many changes to the physical buildings around the MRT station. Therefore, there has not been a significant change in these aspects. However, it expected that there would be further urban form changes in the future to support the existence of the MRT.

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