Pedestrian and Bicycle Lanes in Transit Oriented Development Area of Dukuh Atas, Jakarta

Dharmaraty Ashri Prawesthi and Lin Yola

Abstract The Indonesian authorities progressively promote Transit-Oriented Development (TOD) big cities, including DKI Jakarta. Specifically, The Governor of DKI Jakarta develops the TOD area in Greater Jakarta as urban regeneration of transportation. Dukuh Atas TOD was chosen as a pilot model as it has been determined through local regulations of DKI Jakarta in 2019. TOD concept aims to create an integrated area with pedestrian and cyclist accessibility. It basically accommodates the transit to the public transportation for a better quality of the environment; comfortable, safe, and lively. This study investigated principles of TOD; walking and cycling. Through a field survey, the indicators of walking and cycling were used to measure the success of the Dukuh Atas TOD. This study concluded that pedestrian and cycling lanes in the area, have not fully implemented. It concluded that the Dukuh Atas TOD has not yet integrated completely.

Keywords Pedestrian · Bicycle lane · Dukuh Atas · TOD

1 Introduction

TOD is the concept of developing areas within transit locations for the added value which centered on integration between mass public transport networks and non-motorized transportation mode networks. It is also aiming to reduce the use of motorized vehicles accompanied by the development of mix and dense areas with moderate to high space utilization intensity [1].

According to Calthorpe [2], the TOD concept is a concept that combines medium to high-density housing, with public functions, offices, trade, and services

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in a mixed-use development. Calthorpe sees these environmental characteristics as a guide to neo-traditional design for creating sustainable environments.

A TOD development is a mixed-use community development within walking distance of the transit node and central commercial area. TOD combines residential land use, trade, services, offices, open spaces, and public spaces in a walkable environment that makes it easier for people and users to travel by foot, bicycle, and other modes of public transportation [2].

The Institute for Transportation and Development Policy (ITDP), a Non-Government Organization (NGO), issues the basic principles of TOD. In the guideline entitled TOD Standard 2.1, there are 8 principles of TOD [3] that must be applied in the development of the TOD area, namely: (1) Walking; (2) Cycling/Cycle; (3) Connect/Connect; (4) Public Transportation/Transit; (5) Mix/Mix; (6) Compact/Densify; (7) Compact, and (8) Toggle/Shift.

TOD is being developed in Indonesia to solve urban transportation problems. The area can be rail-based, airport-based, or bus terminal based. With the proliferation of Transit Oriented Zones development and without neglecting the principles of TOD, especially walking and cycling, it is necessary to have research that focuses on the principles of walking and cycling which require the land in its development.

2 Methods

This research is qualitative research. The analysis was conducted descriptively by studying a determination of the Dukuh Atas TOD area associated with existing conditions or actual conditions in the area regarding pedestrian and cycling lanes. This study focuses on 2 (two) principles of 8 (eight) basic principles of TOD. The two principles are Walking and Cycling. Mainly, the two principle were chosen to reinforce the TOD concept as a compact area, which can be reached by walking and cycling within 5 (five) to 15 (fifteen) minutes.

The criteria to be discussed in this study are the parameters as presented in Tables 1 and 2.

The research area delineation is based on the determination of the TOD area by the DKI Jakarta Government and focuses on the primary activity centers of Dukuh Atas which are within a radius of ±500 m (calculated from the Dukuh Atas MRT station).

3 Discussion

The Dukuh Atas TOD area was considered to have had criteria such as: being designated as the center of activity; served by rail-based mass public transport and other urban public transport; located in an area with low disaster vulnerability accompanied by mitigation to reduce disaster risk. Here are some field findings.

Table 1 Aspects that affect pedestrians

Indicator	Variable	Parameter
Easy to access the Pedestrian lane	Availability of pedestrian lane	Pedestrian lanes that protect people from vehicles and other disturbances such as street vendors
		Directly available on the exit of the public transport station
Pedestrian lane connectivity	The area that is accessible by foot	100% available in all region
		Inter-connected between transit stations in the area
	Ideal walking distance	The maximum walking distance from and to transit stations and service centers is about <1 km
Friendly Pedestrian lane	Pedestrian lane dimensions	• The width of the main street is at least 3 m • Minimum width of 2 m on neighborhood roads (residential street/mixed use street)
	Secure Pedestrian lane	The material is unslippery and uses tactile for people with disability
		There are bollards for safety
		Adequate lighting
		There are road crossing facilities
	Convenience Pedestrian lane	There is shade (could be trees or an arcade and canopy)
		Shelters such as bus stops
		Rest areas including park benches/benches/another street furniture
		Food/drink stalls or kiosk at certain points
		Public toilet
		Public nursing room

Source The results of literature review that come from: Ditmass dan Ohland 2004 [4] and TOD Standards, 2013 [5]

Table 2 Aspects that affect cyclists

Indicator	Variable
Safety bike lane	For roads that have a driving speed of >30 km/h, the bicycle lane must be protected/separated from the direct vehicle lanes
	Roads that have a driving speed of <30 km/h do not need to use protected bicycle lanes, with markings are highly recommended
	Roads that prioritize pedestrians or shared streets with a speed limit of 15 km/h (pedestrian and bicycle lanes do not need to be separated)
	Lanes dedicated specifically to pedestrians and bicycle users

Source ITDP, 2017

3.1 Availability of Pedestrian and Bike Lanes

According to the Minister of Public Works Regulation No. 3/2014 concerning guidelines for planning, providing, and utilizing pedestrian network infrastructure and facilities in urban areas, explains that pedestrian lanes must be a connecting route between activity centers, block to block, and parcels to parcels in urban areas.

All blocks in the Dukuh Atas TOD area are previously connected to pedestrian lanes, especially on that direct connection to the highway. For neighborhood roads, some use the pedestrian lane, and some don't. Overall, based on survey results, the availability of pedestrian lanes in the area has only reached 60%. As for the bicycle lane, in the Dukuh Atas TOD area, there are only Sudirman Street, Tanjung Karang Street, and Teluk Betung Street (Fig. 1).

3.2 Pedestrian and Cyclist Lane Connectivity

From the observations, there is pedestrian access between the Trans Jakarta Bus Stop, the City Bus Stop, the KRL Sudirman Station, and the Dukuh Atas MRT Station. However, accessibility with BNI City Station is not yet connected (Fig. 2).

Based on the survey results, the travel time to Dukuh Atas MRT station on foot from blocks 3, 4, 6, 7, and 8 will average about 11.38 min. Meanwhile, for cycling from the same block, an average of 3.46 min. That may occur due to constraints on

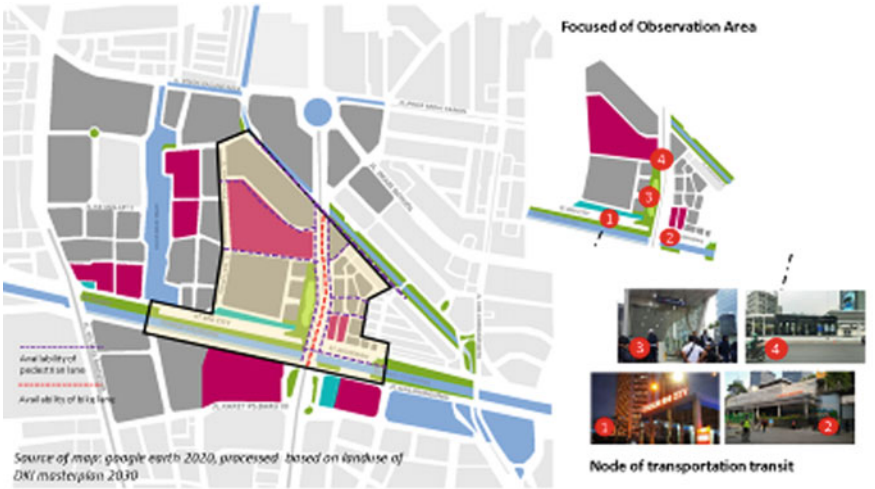

Fig. 1 Availability of pedestrian and bike lane in the Dukuh Atas TOD area. *Source* Map of RDTR DKI Jakarta, compiled

Fig. 2 Pedestrian line connectivity between Dukuh Atas MRT Station (**a** and **b**); Sudirman KRL Station (**c** and **d**); Trans Jakarta Bus Stop (**d**); unconnected pedestrian lanes at BNI City Station (**e**). *Image source* Documentation of field survey, 2019

the pedestrian lane that are not continuous or damage and become a place of street stalls.

Based on the survey results, the travel time to Dukuh Atas MRT station on foot from blocks 3, 4, 6, 7, and 8 will average about 11.38 min. Meanwhile, for cycling from the same block, an average of 3.46 min. That may occur due to constraints on the pedestrian lane that are not continuous or damage and become a place of street stalls (Fig. 3).

Fig. 3 Obstacles encountered in the movement of pedestrians and cyclists (Jalan Kendal and Jalan Blora). *Image source* Documentation of field survey, 2019

3.3 Friendly Pedestrian Lane

3.3.1 Pedestrian Lane Dimensions

The width of the pedestrian lanes still varies. The width found in the area is between 1.5 and 2 m (on neighborhood roads) to 4.5 m (on Jalan Sudirman) (Fig. 4).

3.3.2 Convinience

In general, the distribution of shade facilities is still lacking. Some lanes are still not shaded by shady trees or building canopies. It becomes heated during the day. Besides, there will be no place to take shelter during the rain.

Street furniture on the pedestrian lane, not yet fully available. Only the pedestrian lanes on the main road have street furniture such as benches, shelters, kiosks, and not equipped with public toilets.

Fig. 4 Dimensions of the Pedestrian Lane in Blocks 2, 3 and 4 of TOD Dukuh Atas. *Image source* Documentation of field survey, 2019

3.3.3 Security

Public Street Lighting (PJU) is already available on all pedestrian lanes in the area. Likewise, with the person crossing facilities in the form of crossing bridge and pelican crossing.

Security for people with disability is readily available but at best on large pedestrian lanes, which are close to transit points or roads.

3.4 Bike Lane Condition

The bike lane is not fully connected to the area. Only on the main road that previously has its own bike lane. In addition, there are 2 (two) bike stations, which are around the Dukuh Atas MRT Station and the Tosari Trans Jakarta Bus Stop (Fig. 5).

Based on the explanation above, the TOD Dukuh Atas area is still not optimal in applying the principles of walking and cycling. Most of the indicators used as references in this study are still not ideally applied to the Dukuh Atas transit areas.

The private building lots in the area are not open to the public and difficult to access for pedestrians. The provision of level crossing facilities, pedestrian bridges, and underpasses in the area is still limited, making it quite difficult for pedestrians who want to move from one block to another.

Fig. 5 Bike lane's condition in TOD Area of Dukuh Atas. *Image source* Documentation of field survey, 2019

4 Conclusions

The Dukuh Atas TOD area is an ongoing process of being developed into a better TOD area. Pedestrian and cycling lanes that should be applied to the area are still not running perfectly. Pedestrian and cycling lanes that should be provided to facilitate affordability in the area are not yet completely available.

Some concerns are needed to improve Dukuh Atas as a TOD area as follow:

1. It is necessary to conduct research with high technology to determine the movement of pedestrians and cyclists using GPS or Wi-Fi, and other sophisticated tools.
2. It is required to build a transit area infrastructure that can accommodate and allow pedestrian movement across the Dukuh Atas urban block which is separated by four sections by the canal and the Sudirman flyover road.
3. The development and additional length of the number of pedestrian lanes will be directed at all blocks in the Dukuh Atas transit area so that they can support walking activities in the transit area.
4. Eliminate the land guardrail found on each plot and create a dedicated passport for pedestrians to improve good connectivity.
5. Creating a safe and comfortable and friendly design for pedestrians and cyclists
6. Creating an inclusive design that is for all users.

The findings of this study were recommended for the DKI Jakarta authorities to improve the current Dukuh Atas TOD system and development. It was also suggested as a significant literature for the general planning of TOD area in DKI Jakarta or other big cities in Indonesia with the similar context.

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