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IMPLEMENTATION OF THE TRANSIT-ORIENTED DEVELOPMENT (TOD)

CONCEPT AT HARMONI BUSWAY STOP

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ABSTRACT

Urban issues such as limited land, traffic congestion, and air pollution in Jakarta require efficient solutions. Transit-Oriented Development (TOD) is a concept aimed at maximizing land use and improving public facilities around transit hubs. This research evaluates the implementation of the TOD concept at the Harmoni Busway Station in Central Jakarta using QGIS software to assess data conformity with TOD principles. The results show that the Harmoni Busway Stop meets most TOD principles, mainly walking, cycling, and connecting, with sufficient sidewalks, bicycle lanes, and intermodal connections. However, further development is needed in mix-use and eco-friendly facilities to optimize the area's function as a sustainable transit hub.

Keywords: Land Use; Transit-Oriented Development (TOD), Harmoni Busway Station, QGIS, sustainable urban planning

INTRODUCTION

Jakarta is a dense and busy capital because it is the center of various economic and government activities. Various modes of transportation support these activities. It is not surprising that transportation is one of the obstacles to people's mobility when traffic jams occur. According to data from the DKI Jakarta Central Statistics Agency (*Badan Pusat Statistik - BPS*) for 2022, the number of motorized vehicles continues to increase every year. In the last five years, the most rapid increase occurred in 2021, 7.60 percent. The government is trying to change people's behavior and encourage them to switch to public transportation. The number of Trans-Jakarta passengers during 2017-2019 skyrocketed. (Knowles *et al.* 2020).

The forms of land used in DKI Jakarta are residential, office, industrial, health facilities, and transportation. Land use in the transportation sector can be through stops, stations, and terminals. In using land for bus stop construction, Jakarta launched Transjakarta in 2004. Transjakarta is a bus with integrated routes throughout Jakarta connected to many transits stops. One bustling transit stop in Transjakarta is the Harmoni Bus Stop. (Taki *et al.* 2018). Harmoni Bus Stop is in Gambir District, Central Jakarta City, Special Capital Region of Jakarta 10120. Harmoni Bus Stop uses the Transit Oriented Development (TOD) concept. TOD is defined as an approach to transportation and land use planning, especially in large cities so as to make pedestrians, cyclists, and people passing by in transit areas comfortable.

The book Urban Rail Transit Design Manual states several parameters for transit station design. One of the parameters is accessibility. "Accessibility for users from a wide variety of groups is a key factor in transit station design. Accessibility is the ease of reaching a certain area or place." TOD maximizes the efficiency of existing public transport services by focusing on development around transit stops or stations. (Taki *et al.* 2018).

The principles of TOD, as reviewed from the TOD Standard 3.0, are as follows (ITDP, 2017):

1. Walk

In the TOD Standard, the term "walking" or "walkability" should always be understood to include pedestrians with luggage, such as wheelchairs, canes, strollers, and shopping carts. Complete walkways and crosswalks should fully support all road users in accordance with applicable local or international standards.

2. Cycle

It combines the convenience of door-to-door walking and schedule flexibility with a range and speed similar to local transit services. Bicycles and other human-powered

transportation, such as tricycles, also activate streets and greatly increase the coverage area of transit station users. They are highly efficient and use little space and resources.

3. Connect

Walking can be easily hindered by detours and is particularly sensitive to network density. A dense network of streets and sidewalks offering multiple routes to destinations, many street corners, narrower streets, and slow vehicle speeds makes walking and cycling varied and enjoyable and strengthens street activity and local commerce.

4. Transit (public transportation)

Public transport services connect and integrate people with the city beyond walking and cycling distances and are essential for people to access opportunities and resources. Highly efficient and balanced urban mobility and compact development patterns support and reinforce each other.

5. Mix

A mix of land uses within an area keeps local streets vibrant and safe. The mix encourages walking and cycling, supports longer transit service times, and creates vibrant, complete neighborhoods where people want to live.

6. Densify

Urban density is needed to accommodate growth in the limited areas that can be served by quality public transport and to provide users that can encourage and justify the development of high-quality public transport infrastructure.

7. Compact

With shorter distances, compact cities require less time and energy to travel from one activity to another, do not require extensive and expensive infrastructure (although high planning and design standards are required), and preserve rural land from development by prioritizing density and redevelopment of previously developed land.

8. Shift

This principle aims to improve mobility by regulating parking and road use.

RESEARCH METHODS

This research uses a descriptive analytical approach to evaluate the implementation of the TOD system at Harmoni Busway Stop, Central Jakarta. This approach combines direct observation in the field with spatial analysis based on digital map data. The research focuses on the eight main

principles of TOD, namely walk, cycle, connect, transit, mix, density, compact, and shift, to assess the suitability of the area with the TOD concept and identify areas that require further development.

Primary data was obtained through direct observation at the research site, where observations were made of physical facilities, movement patterns of transportation users, and the quality of intermodal integration. Photo documentation was used to record the presence of sidewalks, bicycle lanes, and other supporting facilities.

Meanwhile, secondary data in the form of digital maps of the Central Jakarta area were obtained from Indonesia Geospatial sources to support spatial analysis. Data analysis was conducted using QGIS software, utilizing several geoprocessing tools to process spatial data. Buffer analysis was used to determine the zone of influence around the Harmoni Busway Stop within a certain radius. Clip and intersection tools were used to delimit the study area and identify areas of overlap between transportation elements, while union was used to combine various spatial data into a unified analysis.

Each TOD principle is evaluated using specific indicators. For example, the walk principle is evaluated through the presence and quality of sidewalks, while cycle is assessed based on the presence of bicycle lanes and supporting facilities. The connect principle is analyzed through the level of integration between transportation modes, and mix is seen from the availability of mixed functions such as residential, commercial, and public facilities (Taki and Maatouk 2018).

RESULTS AND DISCUSSION

The development of Transit Oriented Development (TOD) at Harmoni Bus Stop can have several positive impacts, such as reducing the use of private vehicles, which also reduces congestion, air pollution, and greenhouse gas emissions. City dwellers tend to walk when visiting nearby places, leading to a more active and healthier lifestyle. Apart from that, the development of the public transportation system, namely Transjakarta buses with adequate and comfortable facilities and infrastructure, is expected to increase interest in using the public transportation system, which can impact increasing regional income from the tariffs set for this transportation. This also aligns with the potential for increasing property values around the TOD area. The development of public transport from an economic perspective is also seen to have a positive impact by increasing access to employment and economic opportunities for urban communities. On the

other hand, in terms of urban mobility, TOD can reduce dependence on private vehicles and cut transportation costs while increasing mobility in cities. (Taki *et al.* 2024).

Table 1 Strategic Application of TOD at the Harmoni Busway Stop

Strategy/TOD Principles	Strategy Implementation	Target
Walk, connect	A Pedestrian Bridge makes it safe and comfortable for pedestrians to connect to the Harmoni Busway Stop area and the surrounding buildings.  <i>Figure 1. A Pedestrian Bridge in Harmony Area</i> <i>Source: Researchers, 2024</i>	Pedestrian safety and comfort, as well as easy and integrated access
Compact, transit, shift, density	With the availability of public transportation, Transjakarta buses are a cheap, safe, and comfortable mode of transportation  <i>Figure 1. Transjakarta users at the Harmoni bus stop</i> <i>Source: Researchers, 2024</i>	Making people switch to public transportation reduces air pollution and congestion.



Figure 3 Transjakarta bus at Harmoni bus stop
Source: Researchers, 2024

Televisions are provided as a reminder of the arrival schedule of Transjakarta buses that can be inserted advertisements, and a beverage vending machine is provided so that bus stop users (especially those in transit) do not need to leave the harmony busway stop area

Mix



Figure 4 Vending Machine at Harmoni Bus Stop
Source: Researchers, 2024

Additional revenue from advertising facilities and the provision of vending machines, as well as making Transjakarta bus users safe because of complete facilities and infrastructure

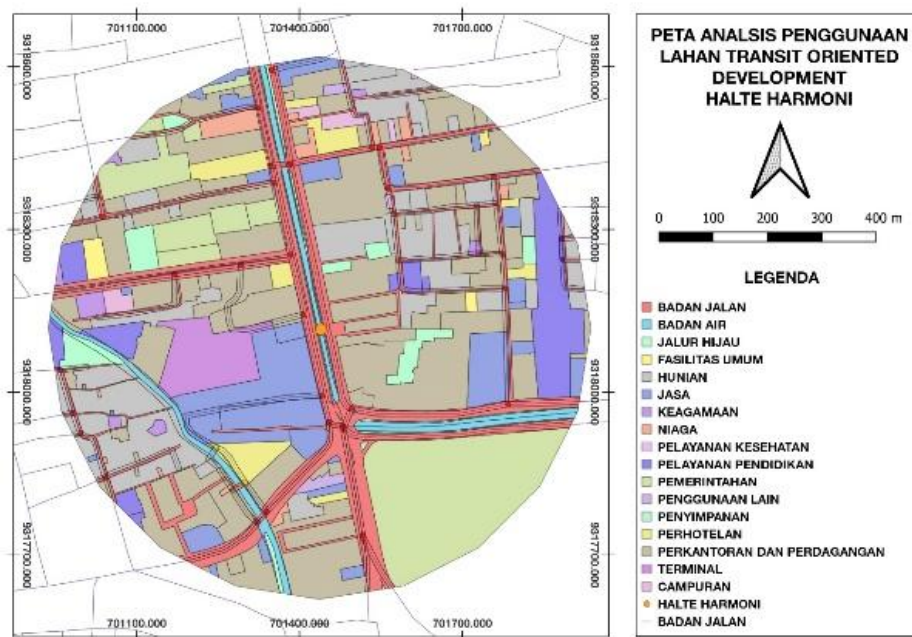


Figure 5. TOD Area from QGIS Software

Source: Researchers, 2024

The Harmoni TOD area zoning consists of:

1. Location of public transport stops

This area is passed by Transjakarta Bus Rapid Transportation (BRT) which passes through many routes. For Transjakarta BRT transportation, it has a bus stop that is connected to a pedestrian bridge. The Harmoni BRT stop is a Transjakarta stop that passes 8 routes, namely, routes 1, 2, 3, 5C, 7F, 8, 8A, and 10H.

2. Existing building objects

Within the Harmony area there are several building objects such as office buildings, commerce, services such as health centers and schools, government, hotels, and local residents' homes.

3. Land use.

In these areas, land is used for public purposes such as offices, hotels, and commercial centers.

4. Pedestrian activity level

In this area the level of pedestrian activity is very high and dense at certain hours and days such as in the morning, the hours of departure for work, and in the afternoon, the hours of return from work. Pedestrians are dominated by those who work around the Harmoni area or who want to continue their destination from the area. (Taki *et al.* 2018)

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In TOD, it is directly related to general connectivity. Connectivity has a meaning in the noun or noun class so that connectivity can express the name of a person, place, or all objects and things that are materialized. Connectivity also means relating to connectedness or connection status. Meanwhile, public transportation is a non-private mode of transportation that can accommodate many people with a predetermined destination / route. From the observation, the Harmoni bus stop is directly connected to the pedestrian bridge for people to get on, get off the bus stop, and cross the road. and if it includes the MRT stop that is being built in the same area, the bus stop and stop are connected to the JPO and open pedestrian area surrounded by offices and retail. (Taki *et al.* 2023)

CONCLUSION

In conclusion, the application of the TOD concept to the Harmoni Busway Stop provides many benefits, especially for pedestrians who move in the area. This bus stop has been well integrated through the Pedestrian Bridge and connected to commercial areas and public facilities in the vicinity. This increases convenience and safety for public transportation users, and encourages people to switch from private vehicles to public transportation, which can reduce congestion and air pollution. In addition, the area also shows potential for further development in terms of mix-use and green facilities to enhance its functionality as a sustainable transit hub.

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