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# MEASURING PEDESTRIAN CATCHMENT AREA AROUND THE CAMPUS AS DEVELOPMENT CORE IN THE SUBURBS OF INDONESIA. CASE STUDY OF YOGYAKARTA'S SUBURBAN PUBLIC UNIVERSITY

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***ABSTRAK***

*Indonesia is facing a rapid population growth in urban areas, thus affecting massive expansion throughout city center. Indonesia's way of urban development dominated by low density of land use. To pursue the successive case of developed countries that concentrating the development around the transit nodes to countermeasure the urban sprawl, we collected some suburban state universities in Indonesia and observed the possibility for higher education services to stimulate the compact growth around the campus. This research found that walkable area around campus has a different characteristic and revealed that the catchment areas are strongly depends on number of campus size and gates. In conclusion, campus has an important role to provide a walkable area around its location, and will need to be considered in the future studies and decision making steps by Indonesian city authorities.*

***Kata Kunci*** : *Universities, Urban expansion, urban growth*

## A. INTRODUCTION

In recent years the development in Indonesia has growth massively. Number of people in Indonesia still increase until 2045 projected by United Nations, and the economic power in Indonesia were also keep going, showed by occurring number of new built area and the ability of Indonesian people to buy goods and services. Another point of Indonesia's growth is what we commonly known as demography bonus. High amount of territory supported with huge number of people makes Indonesia's development boost in the last several years. Moreover, increased number of people that migrating into urban areas is another sign of this development phenomenon.

On the other hand, those points that explained before were not always produce a good condition. With lack of control in the growth of urban areas, the development spreading beyond the center of the activity, mostly the land expansion used to be housing for people whose get a job in the city center without get a housing that provided by the service and office authority. As a result, horizontal of urban growth with low density and single use of land area being a common situation in Indonesia's development.

Moreover, higher education service being another factor that attract more people to come to the urban areas. As the examples, Muhammadiyah Malang University has 70% of students that coming from outside the city of Malang (cited from Surya Malang news), 73% of Andalas University students are originated from outside of Padang and 78,7% of higher education students in Yogyakarta were not coming from Yogyakarta (cited from Kompas news). With low density land use, students that coming from another city increasingly aggravate the expansion of urban development and adding more kilometers of range between city center and its border. Which means, the dependence on motor vehicle to access the services are increasing.

Most of developed countries in the world have several ways to countermeasure the poor effects of urban sprawl such as implementing high density with mix type of land use. This conditions allowed people to access many kinds of basic services and needs even within walkable area. In contrast, Indonesia's current condition still dominated by high number of vehicle use and not accompanied by effort to increase the comfortability of pedestrians. This study aims to find out the existing challenges faced by pedestrians, especially on surrounding area of the campus by measuring total walkable area and assessing pedestrian way by assessing the streets and roads inside pedestrian catchment area by each intersections.

## B. LITERARTURE REVIEW

There are some studies that used as literature for this paper. Schlossberg and Brown (2004) comparing 11 transits in Portland by walkability indicators. Jeff Speck in his book "Walkable City" explained several steps to change American downtown from automobile dependence into interesting walkable areas. Yamini et al. (2017) measuring TOD-ness of 21 stations of city region of Arnhem and Nijmegen, Netherlands. Pedestrian way in Indonesia were regulated under law number 22 article 45 2009 about pedestrian way. While the correlation between transit nodes and walkability are strongly related, still there were few studies that investigating the walkability in surrounding area of higher education campus. The case of this study will be focused on surrounding area of campus in suburban area. Alfonso (2005) compiled the basic principles that influence walkability by produce Hierarchy of Walking Needs.

## C. METHODOLOGY

### 1. Sampling Method

There are 446 universities in Indonesia, which 78 of those universities are public university. Based on the conditions that there are high percentage of non-Yogyakarta citizens that study in Yogyakarta's higher educations which makes Yogyakarta called as "students city" or "mini Indonesia", this study will be taking place of case study in Yogyakarta with public university that located in suburban area. Public university are mostly chosen by students whose are wants to continue their higher education and clearly will invite big number of new students and will need housing to support their activities during study period. The list of public universities taken from Ministry of Research, Technology, and Higher Education of Indonesia's website as public universities that will held a new student enrollment

in 2017. 4 public universities are located ini Yogyakarta city, 3 of those university were located in urban area, which are Gadjah Mada University, Universitas Sunan Kalijaga, and Universitas Negeri Yogyakarta. Only Universitas Pembangunan Negeri (UPN) Veteran Yogyakarta located in suburban area with 6,7 km distance from the city center.

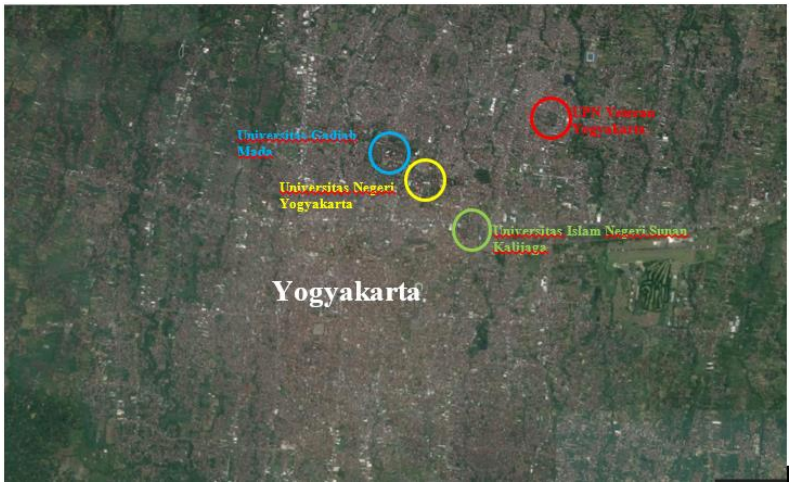


**Figure 1.** Location of Public Universities in Yogyakarta
Source: Google Earth

## 2. Measuring Pedestrian Catchment Area

Unlike transit station or the bus stop which has smaller area and easy to decide a point as starting point as shown in figure 2, university campus has larger area. To measure the pedestrian catchment area of the campus, still university campus must require a point as starting point. In this study, the starting point will be the gates of the campus, which are the point where students could access the campus from outside. Universitas Pembangunan Negeri Veteran Yogyakarta have 3 gates, and each gates then have their own shape of pedestrian catchment area (figure 3). The area made by connected point of the furthest walkable distance (800 m) as illustrated in figure 2 which will be measured from the campus gate. Polygon that shaped from every gates then combined to find out the total area of pedestrian catchment area of UPN Veteran Yogyakarta's campus.

**Figure 2**. Illustration of Pedestrian Catchment Area shown in Red Lines (left), and hypotesis of Pedestrian Catchment Area around UPN Veteran Yogyakarta's Campus (right).
Source: Google Earth

### 3. Assessment on the Walkability of Roads and Streets inside Pedestrian Catchment Area

After the walkable catchment area of surrounding campus of UPN Veteran Yogyakarta were found, then the streets and roads inside the area were assessed by the condition of its walkability, in this case is the condition of the sidewalks to find out the challenges that faced by the pedestrians and to find out the existing conditions of those streets and roads to support the pedestrians. The criteria that chosen in this study are basic criteria, which are the existence of sidewalk and the existence of the shading such as trees to improve the comfortability of pedestrians, especially in tropical country like Indonesia. Street condition assessed by using the method refers to Systematic Pedestrian and Cycling Environmental Scan (SPACES) manual. Each street or road in the study area is made up by a number of segments. A segment is a section of street or road between two intersections. Illustrated in figure 3 below, there are 3 segments as the example, segment X, Y, and Z. Each segment has a unique number, which then used to identify it.

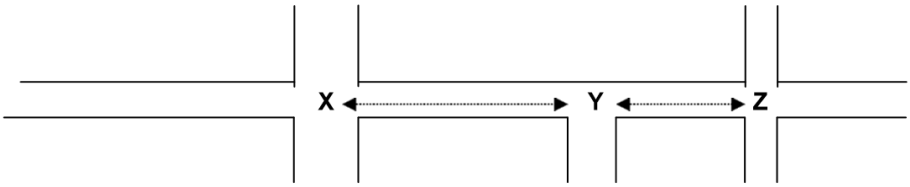


**Figure 3**. Illustration of road and street segments based on SPACES assessment tool.
Source: SPACES Assessment Tool.

## D. RESULT AND DISCUSSION

### 1. Pedestrian catchment area around Universitas Pembangunan Negeri Veteran Yogyakarta

This analysis will measure the catchment area by walking distance 800 m from the service point as study that done by Schlossberg and Brown (2004). However, because the area of university campus is mostly larger than transit or bus station, the starting point of UPN Veteran Yogyakarta's campus will be the campus gate. UPN veteran Yogyakarta have 3 gates in north, south, and east area of the campus. Walkable catchment area of each gate then measured as shown in figure 4 and table 1 below:

**Figure 4**. Walkable distance to surrounding area of UPN Veteran Yogyakarta's north gate (left), south gate (middle), and east gate (right)
Source: Google Earth

**Table 1.** Pedestrian Catchment Area from each Gate of UPN Veteran Yogyakarta

| Gate | Size of Pedestrian Catchment Area (in $km^2$) |
|---|---|
| North Gate | 0,91 |
| South Gate | 0,78 |
| East Gate | 0,9 |

Source: Analysis

After the catchment area from each gates were known, all of them then combined to find out the total catchment area from UPN Veteran Yogyakarta's campus as illustrated in figure 5. The total area from 3 gates of UPN Veteran Yogyakarta campus is 1,7 km2 (170 hectare). The lighter the red, the more the area are accessible from more than one gates. This means that students that living in lighter red area got more benefit since they have more options to access the campus area not only from single gate.

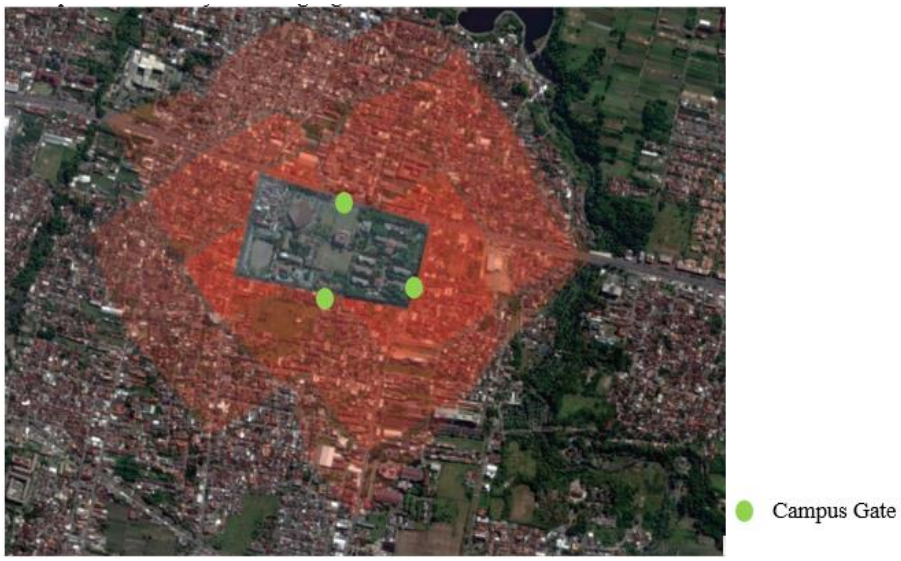


**Figure 5**. Pedestrian Catchment Area of UPN veteran Yogyakarta campus
Source: Analysis

**2. Assessment on roads and streets in UPN Veteran Yogyakarta's Pedestrian Catchment Area.**

In this analysis, each street and road segments in pedestrian catchment area were assessed. From literatures such as study of Alfonso (2005) where he compiled the basic principles that influence walkability, and the book of Walkable City by Jeff Speck (2012), safety and comfortability are 2 main keys that mentioned in those literature. Which then are used as the main criteria in this analysis. The result shown in 4 colors on the map below. The street without any barrier or sidewalk and proper shading for pedestrian will be shown in red, street with barrier or sidewalk but without proper shading will be shown in orange, street with proper shading but with

less barrier or sidewalk will be shown in yellow, and street with high amount of sidewalk and proper shading will be shown in green.

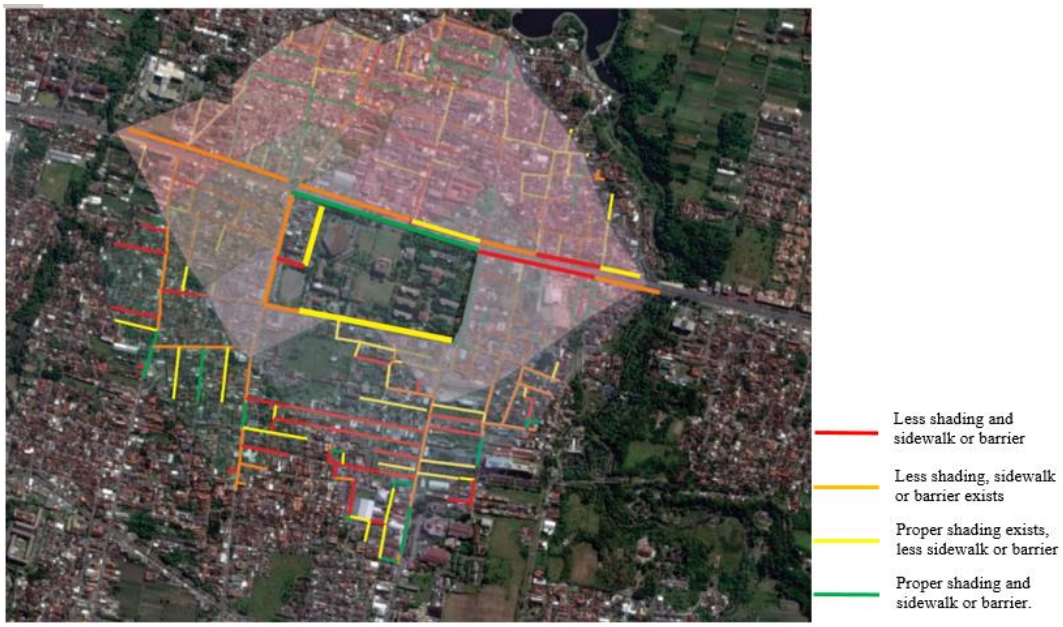


**Figure 6.** Assesment result on streets in UPN Veteran Yogyakarta's pedestrian catchment area.
Source: Analysis

The result of the assessment displayed on map in figure 6. It could be seen that most of street inside the pedestrian catchment area are still far from pedestrian friendly, and could be a reference for city authorities cooperating with university to improve the quality of those street to support the main goals of sustainable development, which one of the is reducing the automobile dependency by inviting more people to use bicycle or walking to moving from one place to another on affordable distance.

## E. CONCLUSIONS

The study shows that the case study of this Indonesian suburban campus, it shows that the streets of surrounding suburban campus still far from pedestrian friendly. This condition could reduce the willingness of students to walking or cycling and choosing the turning point by using motorized vehicle such as motorbike or car to access their campus even they are living relatively close to their campus. However, in case of main road, part that passed in front of the campus site, the walkability condition is much better than main road part that located far from campus site. There are more topics that could be studied in future research, such as classified the pedestrian friendly streets based on each topic such as the comfortability, safety, accessibility, and so on by different maps. It is also possible to assessing the conditions of streets on surrounding campus area by comparing inside and outside pedestrian catchment area.

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