Conference Paper

Rematching Spatial Home Based School Pattern for West Jakarta

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Abstract

Rematching spatial home-based school pattern by using the trip distribution model is a fundamental tool in demographic related to the transport planning process of urban and interurban areas. Thus the study highlights student origin-destination movement in West Jakarta as to check the level of effectiveness of Jakarta Local Government Home Based School Regulation. School profile as secondary data was included to define two leading schools from 17 public senior high schools located in West Jakarta. Geocoordinate points of students' addresses as primary data was collected to figure spatial Home Based School pattern. The data analysis was carried out using mapping network analysis and cross tabulation. Network Analysis was performed to set the origin-destination (OD) matrix. Cross-tabulation was applied to evaluate the frequency of home-based school travel pattern. The analysis showed that the local government regulation less worked ideally due to some constraint of trip distribution e.g. threshold and preference at two core schools of West Jakarta

Keywords: School, Settlement, Network Analysis, Travel Pattern, Urban

1. Introduction

This The spatial configuration of housing from the center to the periphery of the cities has high implications for the level of transportation demand. School-Settlement Trip distribution models from now on referred student trip distribution is part of fundamental tools in demographic projection related to the transport planning processes of urban and interurban areas [1].

Trip generation is a model for predicting the number of movement for a given purpose or land use system while the generated trip from each zone is then distributed to all other zones based on the choice of destination which is called as a trip distribution [2]. For recent years, to supporting active transportation, bringing the accessibility of student residence with educational facilities, and taking into account the distance and travel time from urban settlement to school, the government regulation concerning on

How to cite this article: Nisa Maulia, Raldi H Koestoer, and Ratna Saraswati, (2019), "Rematching Spatial Home Based School Pattern for West Jakarta" in *Equity, Equality, And Justice In Urban Housing Development*, KnE Social Sciences, pages 599–607. DOI 10.18502/kss.v3i21.4997

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school zoning pattern had been implemented. However, one would argue that the rule was workable effectively accepted or not. In fact The policy had also limited students residing in neighboring sub-districts with high accessibility had restriction to enroll in the desired school as it classified schools in each regency and city into separate zones based on sub-district administrative only, and mandates. The schools enrolled students living in their vicinity to make sure that no student had to travel far to attend lessons. [3]. Thus the study highlights the spatial pattern of senior high school student trip distribution in West Jakarta as to check the level of effectiveness of 2016 Jakarta local government home-based school regulation.

2. A Literature Review of School-Settlement Trip Distribution

The literature has identified that there are three key causal factors in people's use of public transport in Indonesia: travel intention, family income level, private vehicle availability, land use at home, distance, long journey, travel mode, land use, and travel time [4]. Travel patterns considered based on the origin and purpose of travel and travel behavior that included mileage, mode, travel frequency, travel time and travel costs [5].

In 2013, Beassuow conducted a study of the relationship between school-location placement and distance of school to house trips undertaken in Flandria, Belgium. The research method was by measuring the spatial distribution of school sites based on the Euclidean distance method [6]. The results show that clustered cities do not affect the distance of home-school travel. Also, the spatial distribution of primary schools in Flandria is closely related to the distribution of housing stock as well as non-spatial factors.

Meanwhile, Khalil undertook a study of the impact of urban form on the distance between settlements and educational centers affecting primary school students in choosing home-school transportation modes by using network analysis in Geographic Information System (GIS). Based on the criteria of the diversity of socioeconomic status and urban form, the study was conducted at Lefler Middle School and Scott Middle School, Lincoln, Nebraska, USA [7]. Lefler Middle School is conveniently located close to the city center with a high form of road network connectivity, and Scott Middle School is located in the urban fringe area. Survey analysis shows that 21.8 percent of students of Scott Middle School students are active in transportation while no students attend school at Lefler Middle School and only 6.7 percent of students are cycled.

Temporarily, College students are considered inclined to use a variety of modes of transportation, including active travel, which is more frequent than primary and secondary school students. Whalen used a case study of McMaster University, in Hamilton, Canada [8]. The multinomial logit method was used for the selection of modes consisting of many modes of transport. The results of this study indicate that the choice of modes of transportation is influenced by the combination of costs, individual attitudes, and environmental factors such as road density and sidewalks, especially that the travel time-campus factor affects the level of student satisfaction.

Also, Yoppy examined the development of urban transport by measuring index walkability or transportation convenience index on foot in University of Indonesia area [9]. Field observation analysis on service level and pedestrian characteristics showed an average walking comfort index value of 32.5 with an A for service level.

Rumanga analyzed the volume of movement of vehicles going to school during school hours against the background of many primary and student pickup modes has caused congestion problems, particularly during school hours because of schools. [10]. This research used volume and mathematical analytic survey where there is a relationship between the independent variable and the dependent variable.

Furthermore, Mahmudah identified the origin and destination of student travel and built a trip generation model for students in Sleman District, Yogyakarta. Both in the form of trip generation model and trip attraction using data obtained through household interview survey (home interview survey) in District Seyegan, Tempel and Turi [11]. The model of trip generation generated in this research is the spatial distribution of trip generation and the pull of movement and numerical model generated through data processing with the SPSS program. The independent variable that influences the student's travel generation is the population, while the variable that influences the pull of movement is the number of students. In Christaller's model, each school is situated in the center of the region it serves. Logically (assuming no restrictions), this should result in a circular complementary (education service) area. If we assume that the threshold for pupils who study is five kilometers, then it would follow (in keeping with Christaller's assumptions) that on a flat plane, we should be able to find those who study in one school located five kilometers apart. Regarding t overlapping areas, Christaller decided to use a hexagonal pattern and to set threshold limits within the perimeters of these hexagons. Under such idealized conditions, the arrangement of central places is geometrically predictable, and all complementary regions are of the same size and shape. Additionally, the hexagons interlock into one another and form a

nested hierarchy as well. Thus, each central place is equidistant from six surrounding centers. [12]

3. SHS 78 and SHS 112 Case Study: Devising a Network Analysis-Methods Approach to Social, Economic Assessment

With this background literature in mind, to address how school zoning could turn the student trip distribution pattern spatially, several steps were taken. First, to define two core schools with leading characteristics schools. Secondly, to identify the hinterland of trip distribution for each school. Third, rematching whether regulation was applicable or not in the subdistrict level. Lastly, to analyze the threshold for student trip distribution at each school and school service range.

School profile as secondary data was included to define two leading schools from 17 public senior high schools located in West Jakarta. Geocoordinate points of students' addresses as primary data was collected to figure spatial Home Based School pattern. The data analysis was carried out using mapping network analysis and cross tabulationMapping network analysis was firstly conducted to show the school services area. The range of school services area in this study was divided by a distance of less than 400 m, 400 m-2 km, two km-5 km, and more than 5 km measured from each school as a central point.

The analysis then was used to perform the students' origin-destination movement. The movements were analyzed based on the center point of each school to students' residence. Several points centered on the two schools would illustrate the conditions of SHS 78 and SHS 112 service coverage and represented its' trip distribution spatially.

Non-spatial student travel pattern characteristics considered the use of transportation modes, transportation costs and travel time. Factors influencing internal travel patterns such as sex-based differences, family economic background and several nuclear families used in this study.

The cross-tabulation analysis was used to see the characteristics of student travel pattern in each region 0-400m, 400m-2km, 2-5km and> 5km. Travel patterns included the use of transportation modes from home to school and from school back home, the tendency of student departure time, time to arrive at school, activity after completion of school learning that would be cross-tabulated with school analysis unit and service area coverage.
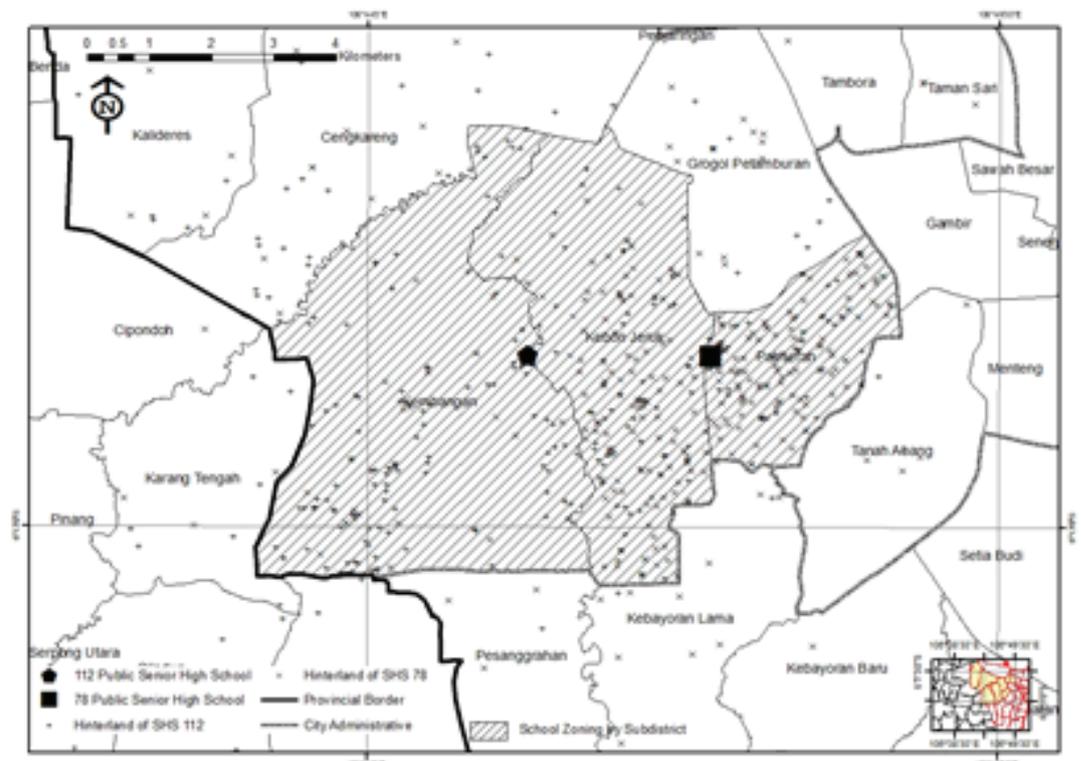
Figure 1: The hinterland of SHS 78 and SHS 112 Public Senior High School (Data Processing Resource).

4. Discussion

The spatial trip distribution of SHS 78 is shown in Figure 2. As seen on the map that SMAN 78 is located at the eastern part of West Jakarta near Jakarta-Banten Provincial border. SMAN 78 School Zonation was represented by shaded area; thus those areas un-shaded represented as Non-School Zonation administration. Nodes represented SHS 78 student address. The lines represented SHS 78 trip generation. These lines spread expansively. Nevertheless, the length of the lines had shown that the student origin-destination movements' distance was relatively stretched.

When it was associated with school service area coverage, the nature trip distribution of SHS 78 was equally expansionary diffusion far over than 5km. The movement of origin-destination SHS 78 in the region more than 5 km reached 23 percent with the length of traction, which was very far beyond the boundary of the sub-district zonation even beyond Jakarta-Banten provincial boundary. The diffusion concentrated on region 2km-5km, as there was 46 percent of movements came to this area then followed by 5 percent of movements came from region 0-400m. This shows the school could attract more than student trip distribution from Non-School Zonation.
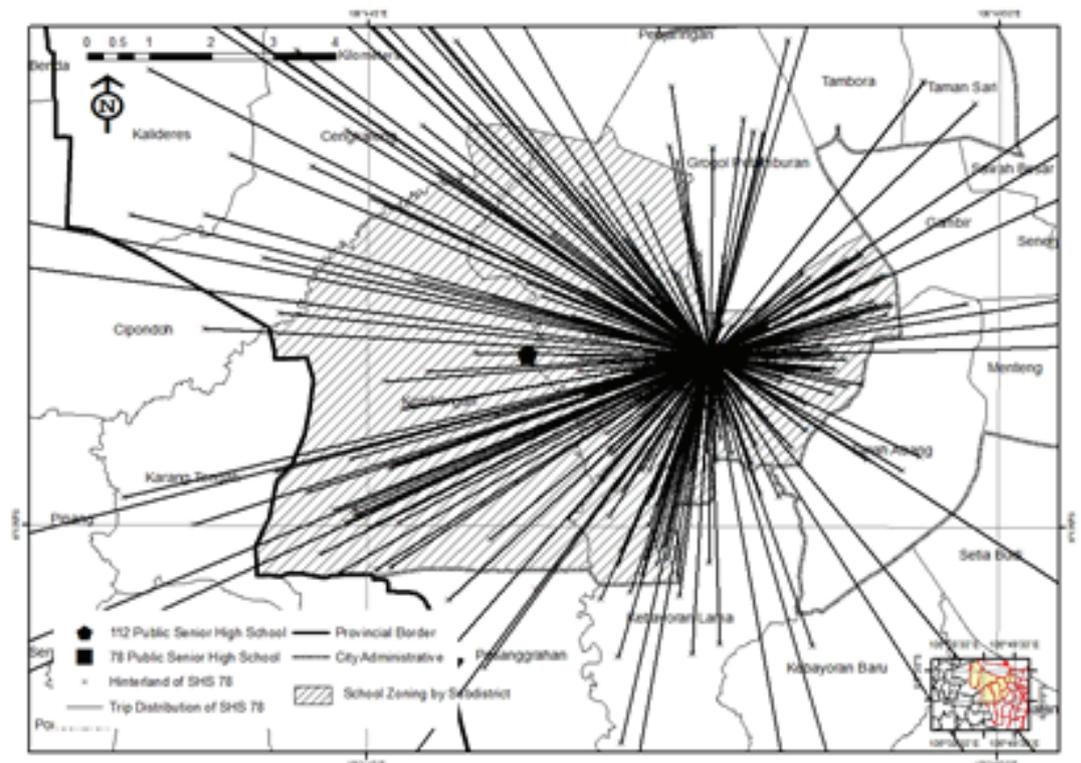
Figure 2: Spatial Trip Distribution of SHS 78 (Data Processing Resource).

From Figure 3, as it was associated with school service area coverage, the spatial trip distribution of SHS 112 is expansive because it spreads from the center point to far areas. The movement of origin-destination SHS 112 in the region more than 5 km reached 40 percent with the length of traction, which was very far beyond the boundary of the sub-district zonation even beyond Jakarta-Banten provincial boundary. The diffusion concentrated on region 2km-5km, as there was 50 percent of movements came to this area then followed by 1 percent of movements came from region 0-400m.

When viewed from the west and east sides of the school, the origin of the student movement on the west side is more than the east side of SMAN 112. The farthest travel attraction on the east side is up to Tanah Abang District but does not exceed the district. The farthest travel attraction on the west side of the school is up to Kalideres, Cengkareng, Cipondoh, Karang Tengah, to Ciledug and Larangan Districts.

SMAN 112 is located near the Tangerang-DKI Jakarta provincial border. Even its region of 2km-5km school service area intersects with the administrative boundaries of both provinces. Widespread trip generation of students on the west side to the City of Tangerang because of ease of accessibility from Tangerang to Jakarta.

The location of SMAN 112 is close to the Tangerang-Jakarta border and is traversed by inter-provincial toll roads and arterial roads that are very close to SMAN 112 and

got prestige as one of the schools located in the capital city that attracted prospective students from another province. But It was interesting to note from the trip generation lines of SHS 78 that as a leading school, with curriculum semester credit system, SMAN 78 had been able to attract students across the provincial boundary even farther than SMAN 112.
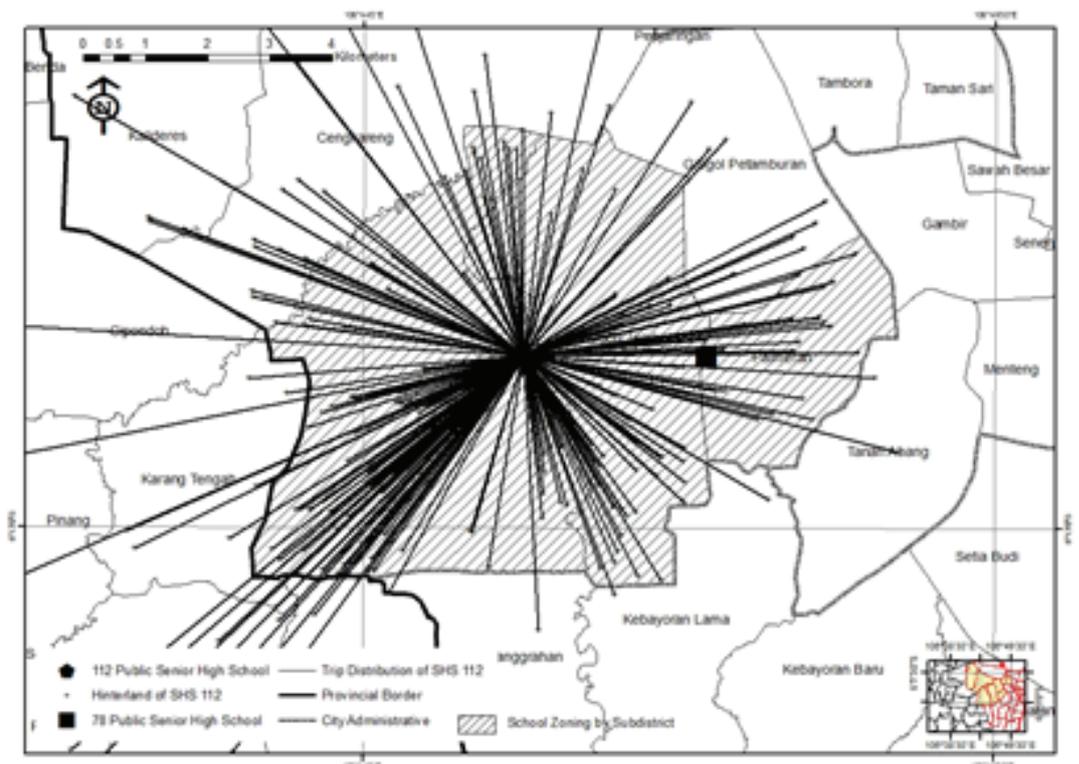

Figure 3: Spatial Trip Distribution of SHS 112 (Data Processing Resource).

Even though Home-Based School regulation enacted to student enrolment academic year, 2016/2017 had restricted prospective students residing in neighboring subdistricts with accessibility to enroll in the desired school, The spatial trip distribution of SHS 78 and SHS 112 had shifted by its attractiveness. Table 1 shows the regulation had encouraged student origin-destination movement, which came mostly from within school zonation. There was 8 percent of SHS 78 trip distribution, and 42 percent of SHS 112 trip distribution came from Kembangan. Then 31 percent of SHS 78 trip distribution and 23 percent of SHS 112 trip distribution from Kebon Jeruk. There were 38 percent of SHS 78 trip distribution and nine percent of SHS 112 trip distribution from Palmerah.

The threshold limit stated in the technical guidance for the admission of the potential student at academic year 2016/2017 was 10 percent of the total number of learners coming from Non-School Zonation. But it turned out that SMAN 78 and SMAN 112 met

overflow of serving Non-School Zonation potential students with excess up to 12 percent and 16 percent of the terms imposed.

The student socioeconomic background at SHS 78 and SHS 112 is examined from several variables that are the sex-based difference, family structure, and family-owned vehicles. Female students are the majority in each region. The standard family structure type for SMAN 78 and SMAN 112 students is the nuclear family that consists of 4 to 5 members. Generally, the families residing in the 400m-2km area have two units of motorcycles while families residing in area 0-400m, 2km-5km, and> 5km have one. Ownership of cars in all regions is as much as one unit.

TABLE 1: SHS 78 and SHS 112 Trip Distribution.

Subdistrict	SHS 78	SHS 112
School zoning-kebon jeruk	31 %	23 %
School zoning-palmerah	8 %	42 %
School zoning-kembangan	38 %	9 %
Non School zoning	22 %	26 %
Total	100	100 %

Changes in land use in West Jakarta occur along with the growth and development of city areas had reflected in changes in urban spatial use patterns [13]. This may trigger school-settlement trip behavior where most of the students got their parents escorting (ride and drive) them to/from School around 06.15-06.30 AM. On the other hand, the return trip pattern is contrary to the house to a school trip. Transportation mode that is walking. Majority students residing in region 400m-2km, 2km-5km, and area > 5km choose to ride ojek online while Students residing at area 0-400m were arranging active transportation.

5. Conclusion

As discuss above, several points are worth nothing. Firstly, The spatial trip distribution of SHS 78 and SHS 112 is expansionary diffusion. Secondly, based on regulation, each of SHS has a certain hinterland coverage area in terms of home-based school. Due to its attractiveness by its location near to the provincial boundary, the trip distribution of SHS 112 is wide. But beyond the regulation, as a favorite school, the trip distribution of SHS 78 even wider than average expected. A particularly novel contribution of our research

is that it has empirically demonstrated the school zoning for a school located near the provincial boundary and the favorite school can't be restricted by regional regulation, as there is a disguise pattern of the spatial distribution of Student High School in West Jakarta. Moreover, the local government regulation less worked ideally due to some constraint of student trip distribution e.g. threshold and preference at two core schools of West Jakarta. Lastly, a student from home to school shows going pattern for both SHS is slightly different compared to a student coming home pattern.

References

[1] Louis de,Grange. David,Boyce. Felipe,Gonza￿lez. Juan de Dios,Ortu￿zar. (2009). A combined trip generation and distribution model with hierarchical levels and spatial correlation, *in XIV Congreso Chileno de Ingenieri￿a de Transporte*.

[2] Tamin,O. (2000). *Transportation planning and modeling*: ITB, Bandung.

[3] Decree of The Head of DKI Jakarta Provincial Education Board No.926 Year 2013 about a school zoning system.

[4] W.Suwardjoko. (2002). *Traffic and Road Transportation Management*: ITB, Bandung.

[5] Pendyala. (2003). Quality and Innovation in Time Use and Activity Surveys, *in Journal Transport Survey Quality and Innovation*, 181-190.

[6] Kobe,Boussauw. (2013). Does primary school siting influence pupil's trip lengths in Flanders?, *in BIVEC Transport Research Day*, May 30 and 31st, Luxemburg.

[7] Nivin,Khalil. (2013). Factors affecting students walking to school: Case Study of Two Middle Schools in Lincoln, Nebraska, University of Nebraska-Lincoln.

[8] Whalen, Kate. (2013). Mode Choice of University Students Commuting to School and The Role of Active Travel, *in Journal Transport Geography,* 31, 132-142.

[9] R,Yoppy. (2013). Walkability index analysis of educational regions at Margonda Street Depok, University of Indonesia.

[10] Andi,Rumanga. (2015). Modelling Analysis of trip distribution at private schools located in periphery area of Makassar City,Hasanudin University.

[11] Noor,Mahmudah. (2016). Modeling of student trip distribution at Sleman Regency, *in Journal Civil engineering,* 13, 301-304.

[12] www.e-education.psu.edu

[13] Pangaribowo,L. (2018). Dynamics of land - use change in urban area in West Jakarta: in IOP Conf. Series: Earth and Environmental Science, 106.