Land Accessibility : the Effects of Distance Versus Traveling Time to CBD and FacilityAttributes on Residential Land Price

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Abstract: This study was intended to reveal the effect of accessibility believed to exert an effect on land price, where the accessibility refers to the variable of distance to city center or central business district (CBD). In this study, the accessibility was measured in terms of distance as well as travelling time from land location to CBD. In addition to accessibility to CBD, the effects of land location attributes were also tested, consisting of distances to market and schools. Based on the multiple linear regression analysis results on 379 land samples, it was shown that spatial distances did not exert significant influences, while the travelling time exert significant influences on the land prices. Travelling times to Gadjah Mada University campus, Malioboro area, traditional markets, elementary schools, junior high school and senior high schools exerted significant influences on housing land prices. The distance to markets also exerted significant influence on housing land prices.

Keywords: land price, accessibility, travelling time.

1. INTRODUCTION

The distance from the residential land location to city center and central business district (CBD) from time to time has gradually decreasing influences on the land price. It means that the distance is no longer dominant factor contributing to the land price (Lewis, 2007). City center is the location having the greatest accessibility and from the location the land price will gradually decrease toward the outer or marginal area (Drabkin, 1977).

Sleman Regency constitutes an area having the highest increase in land price in comparison to other regencies in Yogyakarta Special Territory Province. The land price increase in some land plots within Sleman Regency during the period from 1995 to 2011 has increased to the level of 760 percent in average. In addition, the urban corridor formation and land zoning have changed the landuse pattern and land

price. A decade ago, Sleman Regency was a monocentric area, where the administrative center was the only central area for administration, trading, and business. Nowadays, Sleman Regency has changed to policentric areas with the presence of several amenities such as Denggung area as an administrative center, Seturan area as a trading center, Condongcatur area as an educational center and Caturtunggal area as culinary and amusement centers. Firstly, the land has changed in price and use pattern due to the existing area development. The prices of land plots locating in the intersecting area between radial roads and ring roads are higher than those in other locations close by the city center. Secondly, the land price is less reflective of the function of distance to city center. Consequently, the land price model has shifted from that initially referring to the location theory, affected by the distance to the city center to the model referring to the travelling time to the city center and to other public facilities.

Location theory identify the location differences in terms of various agricultural activities on the basis of land rent expense by taking economic factors into account. According to the Von Thunen's Theory, the highest land lease is that of nearest distance to market and the rent expense is gradually decreasing as the land locating far more to the market. Von Thunen determined that the land lease with certain distance to the markets is in proportional to or in variable with diference between the selling price of agricultural commodities and production costs: the higher the expected net return and capital gain will result in the increased land lease, but the higher the interest rate will result in lower land lease (Shi, 1997).

2. THEORETICAL BACKGROUND

Eckert (1990) argued that the nearer the land location and buildings from CBD, the higher the land price to be paid, and on the contrary, the farthest the land location and buildings from CBD, the lower the land price to be paid. Land at the city center or CBD is generally used for office buildings and commercial activities, while the outside areas are used for light industry and the third area for housing.

The value of land lots for housing is mostly influenced by the distance from the city center (Millen, 1997). In addition to the distance from the city center, it is also influenced by the pattern of population growth at a polycentric city or a city with several city centers. The highly rapid growth of urban population also gives impact on the increasing need for residential land (Hansberg, 2003).

(A) Land Price

Land valuation is a process of estimating market value, investment value, insurable value, or other defined property value of an identified interest or interest in specific lot or lots or real estate as of a given date (American Institute of Real Estate of the National Association of Realtor, 1983). In reference to the Debin (1998), in terms of residential land use, factors that influence land prices at a certain area are location, such as shopping center, educational center, office buildings, and recreation center, position encompassing the distance to the noise, heavy industry, cemetery, and garbage dump, and physical characteristics such as building style, building type, and building quality and the building's effective lifetime.

Land prices, according to Moore (2012), that are used to analyze the current tax value are based on the assessment of professional assessor. Professional assessor uses the existing market prices at every transaction by due observation to the economic law, demand and supply. However, land prices that are based on market prices sometimes do not reflect the actual prices, because: (1) land is a product for which

the prices are frequently based on the perception, (2) the presence of transaction cost results in the prices become varied one to another, (3) price difference is caused by market segmentation and price discrimination, and (4) the sellers and buyers sometimes do not keep perfect information and knowledge about the quality and price of the land. Land price is the process of estimating market value, investment value, insurable value, or other property defined value of an identified interest or interest in specific parcel or parcels or real estate as of a given date.

(B) Factors that Influence Land Price

The residential land location is strongly related to the comfortability enjoyed by the land owner for service access at the CBD. The nearer the land location for housing to the CBD, the greater the comfortability and the productivity of the location as enjoyed by the land owner for housing (Henderson, 1985). In other words, the more distance the land location from the CBD, the more expensive the transportation cost that is required to get to the area so that the consumers at the distance *u* from the CBD will secure more times to conduct his/her activities.

$$E(u) = T - tu$$

Remarks:

$E(u)$ = time required to reach the location at the distance *u;*

T = Total time required for specific purposes;

t = the required time for transportation for one distance unit of location to reach the work place; *t* is assumed the same for every relevant city area or assumed no traffic jam in the city; this assumption implies that the transportation speed does not change or constant;

u = distance from CBD

Hanonen (2008) argued that factors that influence the urban land prices are license to build, land lots, house price indicies, coastal existence indicator, housing block indicator, housing indicator for single family, house line indicator, urban indicator, and private indicator.

According to Mundy (1976), was found land prices in financial district were statistically equal to those in the retail district, but not equal to those in the government price. Corner lots and non-corner lots do not have statistically different price. Zoning characteristics (for commercial zoned parcels) were not statistically significant. Selling price pe square foot was not a function of parcel size. The impact of unemployment appears to be contemporaneous, consisten with hypothesis that developers (buyers of land) react to leading economic variable. The impact of vacancy rate appears to be lagged bye one year, consisten with a hyphotesis that developers rationally react after key supply variables are revealed.

Subject to the Circulation Letter of the Financial Department of the Republic of Indonesia, Directorate General of Taxes Number SE-55/PJ.6/1999 concerning the Technical Guidelines for the NIR (Average Indication Indices) Determining Analysis, the economic variables that govern land value are as follows:

1. Physicals:

   a) Land area

   b) Land contour

    c)   The land's physical natures such as topography, elevation, flood/no-flood, and soil fertility.

2.   Location and accessibility:

    a)   Distance from the city center,

    b)   Distance from the supporting facilities,

    c)   Specific locations: corner lots, middle lots or skewer lots,

    d)   Accessibility,

    e)   Types of roads,

    f)   Environmental conditions.

The non-economic aspects of land value are also influenced by some variables including comfortability, nearby attractive scenery, environmental security, and population density around the location (Tita, 2006). Joly and Brossard (2009) found evidence that the landscape, such as scenery, constitutes a main factor that determines one's life quality in choosing the location for housing. Moreover, the distribution of population density in a city and the existence of metropolitan city are other factors that also influence land prices and housing prices (Cypher, 2009). Gotfried (1988) found that the recreation places or areas and the view around the river will influence the land and housing prices at the neighboring location (Higgins, 2009). Additionally, the land prices for housing are influenced by the existence of final waste disposal (Nelson, 1992). Another non-economic aspects that also influence the land prices for housing is willingness to pay or WTP at a specified price. Although the price to be paid is above the market price, but if the WTP of the buyer is fulfilled, the high price of land is not a problematic one (Moller, 2008).

(C) Accessibility

There are two components of measurement concept for accessibility, according to Stanilov (2003), namely transportation component and activity element. Transportation component is an ability to have access from one location to another which is measured using transportation indicators, such as travelled distance, travelling time, and incurred costs. While, activity element is a reflection of spatial distribution from a number of activities conducted at the area. This article highlights the used accessibility concept, namely transportation component. Using this component, the variables used are ones influencing the land prices, such as travelling distance and travelling time to the Central Business District (CBD), school facilities, market and banks.

(D) Accessibility Measurement

For an area with multi-nuclei, accessibility is defined not only in relation between a location and city center, but as a location accessible from various locations within an area. In the integral model, accessibility is developed in two factors, the one is the distance to the nearest freeway interchange and the other is the nearest distance to the arterial highway. In this respect, the distance is measured with a stright line from each location to the marked place. Traffic capacity, speed and actual route to the nearest freeway interchange and separated arterial highway. This is illustrated in the figure below that is used to measure the distance to city center.

Stanilov (2003) also defined two measurement concepts for the accessibility from the location to the CBD city center, i.e. integral accessibility and relative accessibility. Relative accessibility measures the impact of the metropolitan city center on the weakening distribution of urban land use. It is shown by the development at every category of land use that strongly tends to move away from the city center at every decade.
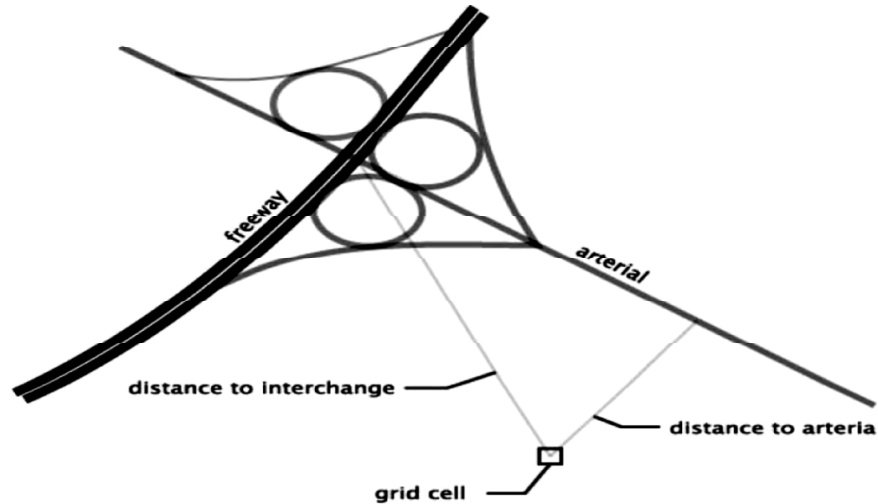

Figure 1

Source: Stanilov (2003)

(E) Previous Research

Researchers have done previous research findings of this study are Samphatkumar (2010); Cypher(2009); Kryovobokov (2007), and Hwang (2006). This research is a compilation that based on reviews, analysisand combination of several variables that applied in the previous research. This research has a differentlocation and population. Samphatkumar (2010)with inflation, Crude Palm Oil price, interest rate, dan export variables. Research instruments are multiple regression with time series data. Cypher(2009) with distance to CBD, Personal Income, environment quality, and demand for land. Research instruments are multiple regression with time series data. Kryovobokov (2007) with distance to CBD, Distance to railway station, distance to the river, and location prestige. Hwang (2006) in Taipei, land price influence are: distance to school, distance to parking area, and railway station.

3. MATERIAL AND METHOD

(A) Data

Data used in this study were cross sectional and taken from two sources, primary data and secondary data. The primary data were collected by measuring the travelled distance and travelling time from each land location to the city center, market and education facilities with the fastest public street access. The measurement of travelled distance and travelling time by motorcycle in average speed of 40 km/hour was made according to the traffic conditions at 09.00 a.m – 15.00 p.m WIB (Western Indonesian Time). The choice of these times refers to the moderate rushhour level, and the observation of the accessibility route

of the covered study area showed that the highest traffic density occurs between 06.00 – 08.30 a.m WIB and between 16.00 – 19.00 p.m WIB, thus the measurement of this accessibility was conducted at 09.00 – 15.00 WIB.

Secondary data of this study were total transactions of housing lands at 9 (nine) Sub-districts and 20 (twenty) villages at Sleman Regency of the Yogyakarta Special Territory Province during 2015 as recorded at the Department for Regional Property and Assets Management/*Dinas Pengelolaan Kekayaan dan Aset Daerah* (DPKAD) of Sleman Regency. During the year, there were total 6,995 transactions and of the total amount, total 379 transactions or 5.2 percent of total population were chosen as the samples of this study using the proporsional cluster random sampling technique, thus total samples that will be distributed to each region are as follows:

Table 1
Total Transactions for Housing at Sleman Regency of Yogyakarta Special Territory Province in 2015

No	Sub-District	Village	Total Transactions	Total Samples
1.	Gamping Sub-District	Trihanggo Village	365	20
		Ambarketawang Village	315	17
		Banyuraden Village	240	13
		Nogotirto Village	230	13
		Balecatur Village	330	18
2.	Godean Sub-District	Sidoarum Village	256	14
3.	Mlati Sub-District	Sinduadi Village	446	24
		Sendangadi Village	409	22
		Sumberadi Village	172	9
		Tlogoadi Village	50	5
		Tirtoadi Village	179	10
4.	Depok Sub-District	Maguwoharjo Village	556	30
		Condongcatur Village	616	32
		Caturtunggal Village	598	32
5.	Berbah Sub-District	Kalitirto Village	207	11
6.	Kalasan Sub-District	Purwomartani Village	616	33
7.	Ngemplak Sub-District	Wedomartani Village	657	36
8.	Ngaglik Sub-District	Sariharjo Village	452	25
		Minomartani Village	119	6
9.	Sleman Sub-District	Tridadi Village	182	10
	Total Population	**6,995**	**379**	

Source: DPKAD, Sleman Regency of 2013.

This study used a method to measure the distance of land location to the CBD using the similar method as used by Stanilov (2003), that is a stright line distance from the location to the CBD point and to the ringroad. Levy (1985) defined the CBD concept as an economic activity area within the land value zone (ZNT) encompassing or relating to the activity center location for shopping, education, office building, terminal, railway station, hotels, recreation place and other economic activity centers.

(B) Metodhology

There were two CBDs in this study, UGM campus area and Malioboro area. An area, according to Tang (2009), can be specified as a CBD if it meets some criteria as follows: high accessibility, centralized, being tertiary employment concentration, high value of land, development with high density, tough competition, and broadening area. Gadjah Mada University is the largest and oldest public university in the Yogyakarta Special Territory Province. Also, it is surounded by varied economic supporting activities such as boarding rooms, logements, food stalls, and minimarkets and other supporting facilities for the student needs. While Malioboro Area is the center of the Yogyakarta Special Territory Province and well-known as commercial, cultural, hotel and tourism area.

The type of this study was causal *ex post facto*, meaning that data were collected after the entire events in question had occurred (passed) by taking one or more variables and examining the correlation and influence of the variables to and on the variables under study, namely the land prices for housing. To know the influence of each independent variable on the residential land prices, a multiple regression analysis tool was used.

$$MLP = \beta_0 \pm \beta_1 DMAL \pm \beta_2 DUGM \pm \beta_3 DMKT \pm \beta_4 DES \pm \beta_5 DIS \pm \beta_6 DHS \pm \beta_7 TMAL \pm \beta_8 TUGM \pm \beta_9 TMKT \pm \beta_{10} TES \pm \beta_{11} TIS \pm \beta_{12} THS$$

Remarks:

MLP	:	Land prices
DMAL	:	Distance to Malioboro area
DUGM	:	Distance to UGM campus area
DMKT	:	Distance to market
DES	:	Distance to elementary schools
DIS	:	Distance to Junior High School
DHS	:	Distance to senior high school
TMAL	:	Travelling time to Malioboro area
TUGM	:	Travelling time to UGM campus area
TMKT	:	Travelling time to traditional market
TES	:	Travelling time to elementary schools
TIS	:	Travelling time to junior high schools
THS	:	Travelling time to senior high schools

4. RESULT AND DISCUSSION

(A) Goodnes of Fit

From F statistics, it is known that all independent variables of this study significantly influenced the prices of residential lands. Viewed from the determinant coefficients, the entire independent variables as predictors were able to explain the variation of dependent variables of total 41 percent, or in other words 59 percent of the land price variations for housing were explained by other variables out of the independent variables used in this study.

Table 2
Summary of the Results of Multiple Regression Analysis

Variable	Coeficients	P-Value	Conclusion	Adj. R-Square	F-Test
TUGM	17.381	-2.04	significant	0.41	43.142
TMKT	-.222	-5.095	significant		
TES	-.251	-8.460	significant		
THS'	.456	-3.378	significant		
TMAL	-.131	-3.642	significant		
TIS	-.501	-2.807	significant		

Source: Results of the primary data processing, 2015

(B) Hyphothesis Testing

From data processing, the result demonstrated that of the fourteen independent variables that were used for predicting the prices of housing lands, six independent variables influenced the prices of housing lands at Sleman Regency.

MLP = 17.381 - .222 TUGM - .251 TMKT +.456 TES- .131 THS- .501 TMAL - .163 TIS+ å

Of the six independent variables that are of significant influences on the prices of residential lands, the travelling times to Malioboro Area was of the greatest influence on the prices of residential lands. This happened because Malioboro Area is the city center of the province that it becomes central for commercial and governmental activities that, in turn, attracts many people. The rapid travelling time enables the public to engage in business activities and other activities at Malioboro area.

The travelling times to UGM campus area significantly influenced the prices of residential land. The people are interested in having access to UGM area for any purposes, for example to take advanced study at the university, buying foods, for working, and other activities in relation to other economic activities.

The presence of, close distances and travelling times from the residential lands to traditional markets influenced the prices of residential lands, although the presence of traditional markets is assumed to have less advantageous impact on the choice of land locations for housing. The traditional markets in the developing countries like Indonesia is poorly managed. Traffic jam and slum environment that are typically happened at the traditional market areas are generally hindered by the residents to stay near such areas. The disorganized parking and traffics around the markets commonly exert traffic jam and noise that the people are reluctant to live nearby.

The travelling times from the residential land areas to the elementary school facilities were of significant influence on land prices, but such influences are positive indeed. It means that the people do not consider both the distance and travelling times from the residential location to the schools. They choose the ones that are far away from the land location with some motives, including, among others, choosing more qualified element schools despite of being far distance from the residentials. Additionally, the choice of more qualified schools that are located near the city center for their children gives certain pride to the parents. Therefore, the distance and travelling times to the elementary school facilities, though it is of significant influence, are not considered in choosing the locations near to the residentials.

On the contrary, the travelling times to the junior high school and senior high school facilities has significantly negative influence on the residential land prices. Different from elementary schools, junior and senior high schools draw the interests of the people in making choice of the location of residential lands. The shorter the time for travelling to the junior and senior high school facilities, the land prices becomes higher.

In fact, the accessibility that has been measured based on the travelled distance to the city center has shifted to be measured based on the travelling time to the city center. It means that the development of transportation modes has changed the people's choice for their residential locations that are far from the city center but with the shorter travelling time accessibility, and this is in accordance with the finding of Lewis (2006).

One interesting finding is that the people do not consider the travelling times from the residential locations to the elementary school facilities, they even choose the schools far away from their residential locations due to any different orientations, such as the elementary schools with good quality educations are located far from the locations. This finding also demonstrates that the location theory stating that land prices are influenced by the location distance to the city center and physical facilities is not significantly proved to be happened at Sleman Regency. In fact, distance and travelling time from the land location for housing to the elementary schools has positive influence on the land prices at Sleman Regency. This demonstrates that the near distance of one city center to another nearby city center will result in that the people do not consider the distance from their residential locations to the elementary school facilities.

This is in accordance with the location theory as proposed by Colby (1979) which states that there will be centripetal and centrifugal powers in the city development in relation to CBD. This centrifugal power tends to move the people and business activities toward the city center from any places because of the economic attractions and benefits and any pleasures existing in the city center. The phenomenon as found in this study is pushed by three major factors, namely ability or prosperity, searching for quality and pride. This centrifugal power is benefited by the people with sufficient financial strength because this choice will result in extra accessibility costs to be paid. Other than the extra accessibility costs to be incurred, educational fees to be paid become higher compared to if they choose the schools in near distance to their homes. This centrifugal power will continously happen by the increasing welfare of the people living in the suburbans, so that it is predicted that this power will be extensively larger in the future, especially for the education.

The second centrifugal power is the people's will to chase for the good quality of educational schools located at the city center, especially at the level of elementary schools that are assumed to be more qualified compared to the ones in the suburbans. If the different quality of education between the suburban areas and the city center still persists, this centrifugal power will exist as well. In addition to the quality of education and prosperity, the motivation of this centrifugal power is searching for satisfaction and pride in choosing the better quality schools. The centrifugal power as found in this study is described in the picture below.

(C) Descriptive Analysis

The average price for residential land was Rp. 2,238,509,-, and the highest was Rp 10.500.000,- that was applicable at Caturtunggal Sub-District. There was difference in land prices among the areas due to varied
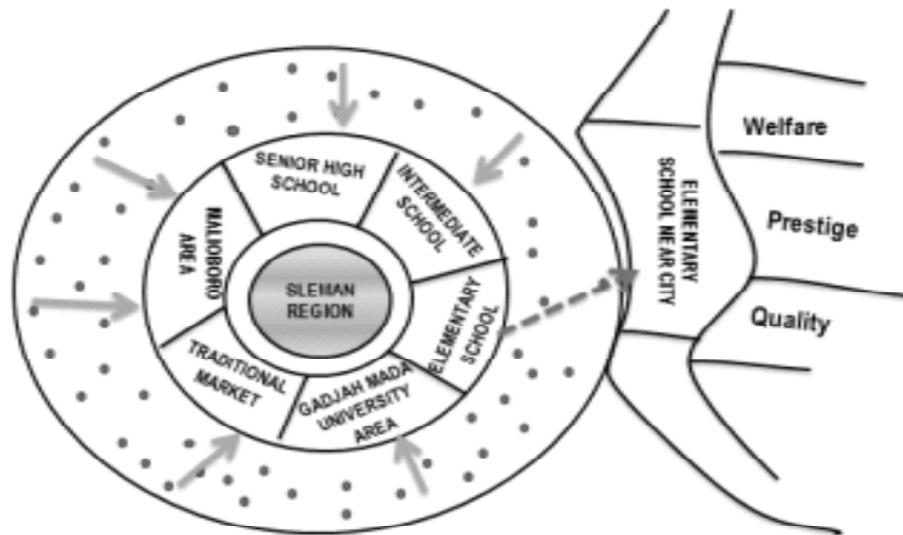
Figure 2: of the Influence of the Land Accessibility on the Prices of Housing Lands

Source: Analytical Result

travelling times to the land location from the city center, both at UGM campus area and Malioboro area. For the average land area for housing under transaction, the widest land area was located at Kalitirto Village measuring 387 m², and the least was 173 m² located at Minomartani Village. The slight difference of land area under transaction was caused by the Regent Regulation concerning residential area. The average land prices at Sleman Regency were closely similar to the average land prices for residential land applicable at Yogyakarta Municipality that ranged between Rp. 1,000,000,- up to Rp. 2,000,000,- per meter square.

Table 2
Descriptive Statistic

No.	Variabel	Mean	Median	Modus	Simpang Baku	Minimum	Maksimum
1	MLP (Rupiah)	2.239.420	1.500.000	1.500.000	2.017.830	120.000	10.500.000
2	JRMAL (meters)	13.508.94	12.250.00	20000.00	6.508.08	4.150.00	32.000.00
3	JRUGM (meters)	11.495.53	9.700.00	18.000.00	6.123.49	3.000.00	29.000.00
4	JPASAR (meters)	1.845.38	1.500.00	1.000.00	1.221.37	100.00	9.000.00
6	JSD (meters)	822.23	500.00	500.00	883.58	50.00	4.550.00
7	JSMP (meters)	1.220.04	1.000.00	1.000.00	1.009.16	50.00	5.300.00
8	JSMA (meters)	2.272.28	2.000.00	1.000.00	1.537.25	50.00	7.400.00
9	WKMAL (munites)	18.89	16.00	15.00	7.80	7.00	45.00
10	WKUGM (munites)	14.94	14.00	21.00	7.01	4.50	33.00
11	WKPASAR (munites)	5.54	5.00	4.00	5.28	0.45	82.00
13	WKSD (munites)	3.23	2.00	2.00	3.15	0.15	19.00
14	WKSMP (munites)	3.72	3.00	4.00	2.81	0.15	15.00
15	WKSMA (munites)	6.13	5.50	9.00	3.99	0.13	17.00

Source: Results of the primary data processing, 2015

In average, the distance from the residential lands to Malioboro area is varied, but the residential land nearest to the area is located at Nogotirto Village, that is 5,1 kilometer and the farthest residential land to and from UGM campus area is located at Tirtoadi Village, namely 20.45 kilometer. Whereas, the distances to the traditional market facilities were varied and the nearest distance to the facilities is 1 kilometer, to the banks 1.7 kilometer, to junior high schools 823.42 meter, to senior high schools 5.217 kilometer.

The average times needed to travel from the residential land locations to Malioboro area was 17.41 minutes, while to UGM campus area was 14.47 minutes. And, the average travelling time needed from the residential lands to bank facilities was 5.54 minutes, to elementary schools was 3.25 minutes, to junior high schools was 3.72 minutes, and to senior high schools was 6.14 minutes.

5. CONCLUSION AND RECCOMENDATION

The location theory recently developed states that the distance of the land locations to the city center influences land prices and not the travelling time. Also, the research finding as referred in this study entirely demonstrates that it is the distance to the city center that influences the land prices. On the contrary, finding of this research even shows that the distance has no more influence on the prices of residential lands, and it is travelling time that influences the prices. This demonstrates that the development of transportation modes that occurs in the urban area and at the surounding areas results in that the far distance from the city center can be dealt with the transportation modes that shorten the travelling time compared to the locations near to the city center with heavy traffic jam.

1. In this study, the people who are more preferred to more qualified education especially that of the elementary schools and who have sufficient financial capacity tend to push the divergence process toward the city center with adequate educational facilities. It is possible that other facilities that were once considered as determinant attracting factors for the prices of residential land will also experience the divergence process as the phenomenon that has happened to the people's orientaton to the education of elementary school. This will be a challenging matter for other researchers who will conduct similar study to find the answer of how far the divergence process will happen to other variables, such as banks, markets, Junior High Schools and Senior High Schools, and existing road facilities. By this phenomenon, it will be of course a meaningful contribution to the location theory already developed so far.

2. The sharp difference of the land prices for housing between one village to another in a regency is caused by any significant difference in the facilities around the land locations, for example market and education facilities, ability to access, especially the travelling time to the city center. For example, the most expensive price is Rp 10,500,000,- as happened at Caturtunggal Sub-District. Also, the average land price, which is the highest is Rp 5,100,000,- as happened at Caturtunggal Village, if compared to the lowest land price at Sumberadi Village, in average of Rp 466,667,-. The implication is that the government must improve the transportation and bank facilities at the areas far distant from the city center, such as at Sumberadi Village, Banyuraden Village, and Tridadi Village. Moreover, the government is expected to provide and extend public roads, both the village roads and regency roads for the areas with lower accessibility. On the other hand, the procurement of adequate public transportation facilities is necessary in reducing the traffic jam at the streets/roads.

Limitation

This article only highlights the accessibility factor to the city center and the location facility attributes such education and market in influencing the prices of residential lands. In fact, there are many factors, both social, safety and security determining the prices of residential lands, and therefore it is necessary to include such variables in predicting the prices of residential lands so that the analysis as made can be comprehensive.

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