

LAND VALUE MODELING AND EVALUATION IN THE GREATER OF JAKARTA AREA

Bambang Edhi LEKSONO, Yuliana SUSILOWATI, SUDARMAN, ANDRAYANI, Indonesia

Key words: Land Valuation, Multiple Regression, Jabodetabek, Greater Jakarta

SUMMARY

The Greater of Jakarta is the urban agglomeration surrounding of the Jakarta as a capital city, in Indonesia. The area comprises the DKI Jakarta and parts of West Java and Banten provinces, specifically the three Regencies of those provinces which surround Jakarta - Bekasi and Bogor in West Java, and Tangerang in Banten. Also included were the *Kota* (formerly Kotamadya) independent municipalities of Bogor, Depok, Bekasi, Tangerang and South Tangerang. The name of the region is taken from the first two (or three) letters of each city's name: **Jabo(de)tabek** from **Jakarta**, **Bogor**, **(Depok)**, **Tangerang** and **Bekasi**. The Valuation of land in this area is an attempt to realize equity in the tax system and the legal aspect of land tenure, as well as the stream direction of optimum land use (highest and best use). Land value data transaction reports from some official land agencies such as PPAT in Indonesia have also proven to be inaccurate in its valuation's manner. Some research of Wibowo, et al (2009) indicated a link between population density per unit area of the village, the population density per built up area of the village, the percentage of built up area every village, and distance of villages to the CBD (Central Business District) of DKI Jakarta to land values within the greater Jakarta. This research aims to produce land value model and the evaluation of land value based on the characteristics of these four variables. The analytical method used in this study is multiple regression analysis with dependent variable $Y = \text{Value of Land}$, as well as the independent variable $X_1 = \text{population density per unit area of the village Jabodetabek}$, $X_2 = \text{density of population per built up area the village}$, $X_3 = \text{percentage of the built up area each village}$, and $X_4 = \text{distance of the village to the CBD (Central Business District) of DKI Jakarta}$. Conclusion of this research is the X_1 (population density per unit area of the village) is proportional to the value of land in Bodetabek, but inversely proportional to the value of land in the area of DKI Jakarta, X_2 (density of population per built up area of the village) did not affect value of land in the Jabodetabek area, X_3 (percentage built up area each village) is directly proportional to land value only in areas Bodetabek, and X_4 (distance of each villages to the CBD DKI Jakarta) is inversely proportional to the value of land in the Jabodetabek area.

SUMMARY (optional summary in Bahasa Indonesia)

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Greater Jakarta adalah Aglomerasi perkotaan seputar Jakarta sebagai ibu kota, di Indonesia. Daerah ini terdiri dari DKI Jakarta dan bagian-bagian dari Provinsi Jawa Barat dan Banten, khususnya tiga kabupaten di provinsi yang mengelilingi Jakarta - Bekasi dan Bogor Jawa Barat, dan Tangerang di Banten. Termasuk juga beberapa kotamadya yang independen seperti Bogor, Depok, Bekasi, Tangerang, dan Tangerang Selatan. Nama daerah ini diambil dari huruf pertama dua (atau tiga) dari masing-masing kota nama: Jabo (de) tabek dari **J**akarta, **B**ogor, (**D**epok), **T**angerang dan **B**ekasi. Penilaian tanah merupakan upaya dalam mewujudkan keadilan (equity) dalam sistem perpajakan dan legalisasi penguasaan tanah, serta pengarahan pemanfaatan tanah yang optimal (penggunaan tertinggi dan terbaik). Data laporan transaksi nilai tanah dari lembaga resmi seperti PPAT di Indonesia juga terbukti tidak akurat (Rachman : 2006). Wibowo dkk (2009) mengindikasikan adanya kaitan antara kepadatan penduduk per luas desa/kelurahan, kepadatan penduduk per area terbangun desa/kelurahan, persentase area terbangun tiap desa/kelurahan, dan jarak desa/kelurahan tersebut ke CBD (Central Business District) DKI Jakarta terhadap nilai tanah di wilayah Jabodetabek. Penelitian ini bertujuan menghasilkan model nilai tanah berdasarkan karakteristik keempat variabel tersebut. Metode analisis yang digunakan dalam penelitian ini adalah metode regresi berganda dengan variabel terikat $Y = \text{Nilai Tanah}$, serta variabel bebas $X_1 = \text{kepadatan penduduk per luas desa/kelurahan wilayah Jabodetabek}$, $X_2 = \text{kepadatan penduduk per area terbangun desa/kelurahan}$, $X_3 = \text{persentase area terbangun tiap desa/kelurahan}$, dan $X_4 = \text{jarak desa/kelurahan tersebut ke CBD (Central Business District) DKI Jakarta}$. Kesimpulan yang diperoleh dari penelitian ini adalah X_1 (kepadatan penduduk per luas desa/kelurahan) berbanding lurus dengan nilai tanah di Bodetabek, namun berbanding terbalik dengan nilai tanah di wilayah DKI Jakarta, X_2 (kepadatan penduduk per area terbangun desa/kelurahan) tidak berpengaruh terhadap nilai tanah di wilayah Jabodetabek, X_3 (persentase area terbangun tiap desa/kelurahan) berbanding lurus dengan nilai tanah hanya di wilayah Bodetabek, dan X_4 (jarak desa/kelurahan tersebut ke CBD DKI Jakarta) berbanding terbalik dengan nilai tanah di wilayah Jabodetabek.

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1. INTRODUCTION

Background

Land valuation is required in order to bring equity in the tax system and the legalization of land tenure, as well as the direction of optimum land use (highest and best use). Land value data transaction reports from official agencies such as PPAT also prove to be inaccurate (Rachman: 2006).

Republic of Indonesia National Land Agency (BPN) according to the mandate of Article 33 paragraph (3) of Law No. 5 Year 1960 as an institution mandated by regulation carry relations with the land and people of Indonesia in its efforts to be more involved in all aspects relating to the land, including the the land valuation is based on Regulation of the Republic of Indonesia Number 10 Year 2006 concerning the National Land Agency to develop and manage organizational units returned with the release of the National Land Agency Head of National Land Agency Regulation No. 3 Year 2006 regarding Organization and Working Procedure of the National Land Agency of the Republic of Indonesia where the task set formulation of technical policy and to implement the survey and mapping of potential land (including on valuation of land) is the core duties for the Directorate of Land Potential Surveys. The value of land used in the valuation of land by the BPN is the market value. However, due to organizational units about valuating this land is still relatively new in the BPN, the provision of information on land value is still limited. For areas that are not yet available information on land value created by the BPN, NJOP data can be used.

The development value of land alone can not be separated from the development progress. Society tends to cluster in areas that are considered able to meet the needs of its survival. Grouping in the built up area is causing land values (due to the gap of supply and demand) increased. One of the real phenomenon is visible is the spread of the built up area in the area around DKI Jakarta. Research conducted by the Research Center for Limnology LIPI Bogor (Wibowo et al, 2009) in the Jabodetabek area indicated a correlation between the development of the built up area to the value of the land. DKI Jakarta, which grew into the center of activities make this city as a provider of jobs, but the land for the settlements are no longer affordable for workers, so that newly developed settlements in the suburbs like in Bekasi, Bogor and Tangerang. In accordance with the principles of an economic price if the item required is still quite available, the price established by the market mechanism would not be as high if the required items are not sufficiently available. So also with land in the area of Bogor, Depok, Tangerang and Bekasi (Bodetabek) which is still fairly widely available, is the option most suitable place for living for workers in the economy which is based in Jakarta. Fulfilling the need for settlement in line with population growth from an area of land conversion trigger has not been built into the area awakened. However, land to build settlements are no longer affordable for workers, so that newly developed built up area in Bodetabek. This certainly will impact on the value of land in the Jabodetabek area (Jakarta,

Depok, Bogor, Tangerang, Bekasi). This study uses the Tax Object Sale Value (NJOP) average each village as the reference value of the land. Pattern of land value in the Jabodetabek area (Jakarta, Bogor, Depok, Tangerang, and Bekasi) as a large area can be traced back further, based on data obtained in this study.

Problem Formulation

Problem formulation in this study is how population density per unit area of the village, the population density per built up area the village, the percentage of the built up area every village, and distance of each village to explain the Jakarta CBD land values model in Jabodetabek area.

The purpose of this study is to examine the characteristics of the population density per unit area of the village, the population density per built up area the village, the percentage of the built up area every village, and distance of each village to the CBD of Jakarta to the value of land in the Jabodetabek area.

The purpose of this research is to produce a model of land value in the Jabodetabek area based on characteristics of population density per unit area of the village, the population density per built up area the village, the percentage of the built up area every village, and distance of each village to the CBD of Jakarta.

The hypothesis of this study is the population density per unit area of the village, the population density per built up area the village, the percentage of the built up area every village, and distance of each village to the Jakarta CBD effect the value of land in the Jabodetabek area.

The benefits of this research is the model of land value generated in this study can be applied to the development of the land value model is more accurate, especially in the Jabodetabek area.

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2. LITERATURE REVIEW

2.1 Previously Research

Various research on the development of methods of land valuation has been done by some researchers. Among the research conducted Imawan (2007), who conducted the land valuation method development use spatial analysis and artificial neural network. Location variables are used as the main variables in the model of land value considering that the variable location is a very significant variable in the model of land value.

Rachman (2006) use a deterministic regression equation for predicting the NIR (Y) based on PPAT deed report (X). Based on this research indicates that PPAT transaction price averaged only 56% of the NIR PBB.

Research conducted Wibowo et al (2009) showed that there are indications that the distribution of population and the increasing need for housing that increases the built up area in the Jabodetabek area related to land value, for it was based on secondary data from these studies established the independent variable is the population density per unit area of the village, density of population per built up area the village, and the percentage built up area area of each rural village.

2.2 Land Valuation Method

Broadly speaking, land valuation methods commonly used method of market data

approach, cost approach and income approach.

1. Market Data Approach.

This approach is considering sales of similar property or replacement and related market data, and generate the estimated value through the process (object valuation) compared with transactions of comparable properties, whether the property has occurred or is still in the bidding phase of a sales process.

2. Cost Approach.

This approach considers the possibility that, as the substitution of purchasing a property, a person can make other property such as a replica of the original property or substitutes that provide comparable functionality.

3. Income Approach

This approach considers the income and expenses associated with property valued and to estimate the value through the capitalization process. Capitalization linking income (usually a net income) with a definition of value through conversion of income into value estimation.

2.3 Regression Analysis

The analysis used in this study are multiple regression (Multiple Regression Analysis). Multiple regression analysis is a statistical tool that provides an explanation of the pattern of relationships (models) between the dependent variable with independent variables which is more than one (Widarjono, 2005), in order to obtain the equation:

$$Y = C + b_3X_3 + b_2X_2 + b_1X_1 + b_4X_4 + E_t$$

where:

Y = Dependent variable, in this case the value

C = land (Rupiah/m²)

X₁ = Constant
Variable population density per unit area

X₂ = villages (Person / Ha)

X₃ = Variable population density per built up area each village (Person /

X₄ = Ha)

b_n = Variable percentage of the built up

E_t = area
to area villages
Variable Distance to CBD Jakarta (km)

Independent variable coefficients

Error term

Furthermore, the resulting multiple regression equation must be through statistical tests and classical assumption. Test statistics and classical assumption in this research was done by using statistical software *SPSS 17.00*.

3. RESEARCH METHODOLOGY

Framework and Hypotheses

Based on research from Wibowo (2009) indicate the effect of variable population density per unit area of the village, the population density per built up area the village, and the percentage of the built up area each village to land value. Modelling the value of land in this study than menggunakan variables from the research results also added to the variable distance from each village to the Jabodetabek area of Jakarta's CBD with the assumption that the further distance of the village in the Jabodetabek area of Jakarta's CBD, the land value will be increasingly reduced. Framework of research and formulation of hypotheses in this research can be seen in Figure 1.

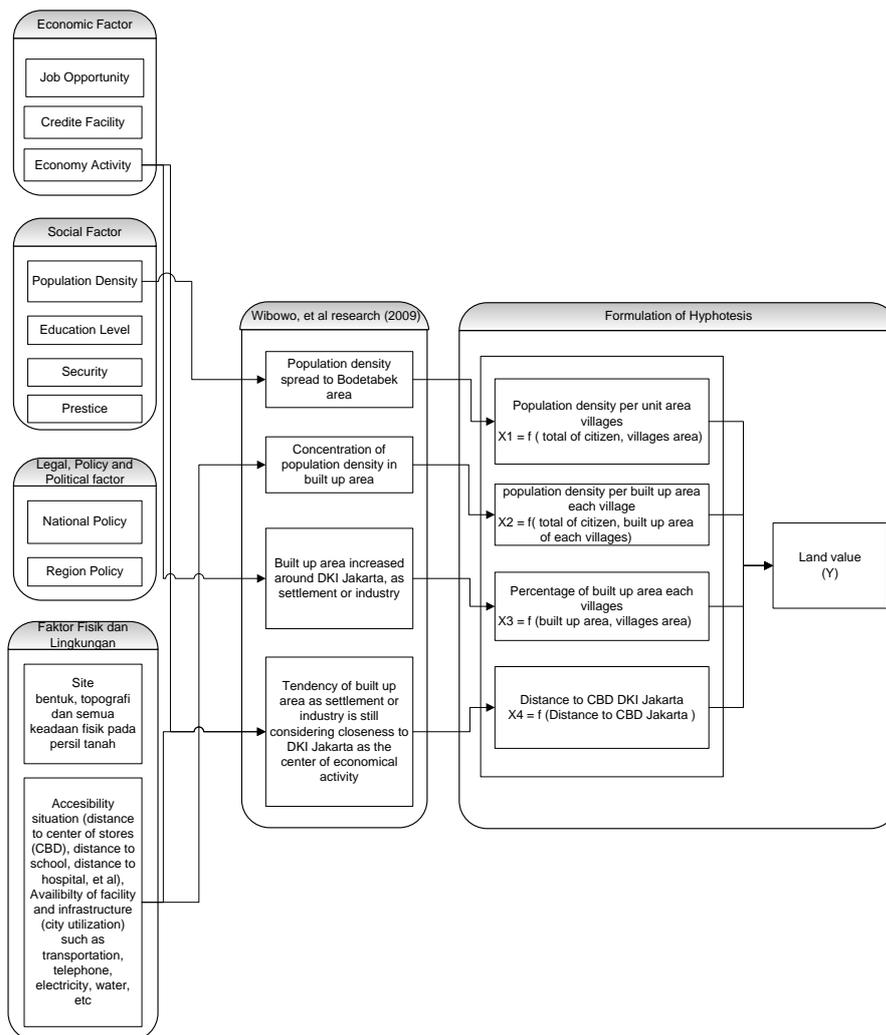


Figure 1. Framework and Hyphoteses

Stages of data analysis includes the steps (Figure 2) as follows:

1. Initial data collection.

Type and source of research data is secondary data obtained indirectly to support the writing

of this research is to collect supporting data obtained from the Limnology Research Centre LIPI Bogor Cibinong and from other relevant agencies as well as with library research, internet, and interviews .

2. Data extraction.

Secondary data have been obtained subsequently extracted to obtain data on variables - variables that will be used in modeling.

3. The selection and grouping (classification) of land value.

Selection of land value data used from the total number of villages of 1484, land value data can be obtained from the 1436 data of land value village. Furthermore, this value data were analyzed using the data distribution histogram and boxplot to determine their distribution patterns. Based on the analysis results obtained by the histogram and boxplot are several groups of land value data. Each group then separated the land value data as the data model and test data.

4. Development of mathematical models

Land value model used in this study is the land value model with multiple regression analysis. Each group of land value data were then analyzed with multiple regression.

5. Mathematical Model Selection and Testing

The mathematical model selected is the equation that satisfy the statistical test (the value of R, R², and Sig Sig Simultaneous Partial) and economic test (multicollinearity).

6. Mathematical Model Validation

The mathematical model applied to the next selected test data, and then searched the excess land value land value of the model with field test data and analyzed with a histogram. If based on election results and the test model obtained satisfactory results (difference in value of the model results and field values is not large), we then applied to all data on land value data group.

7. Application of Mathematical Model

The mathematical model is then applied to all data on land value data group.

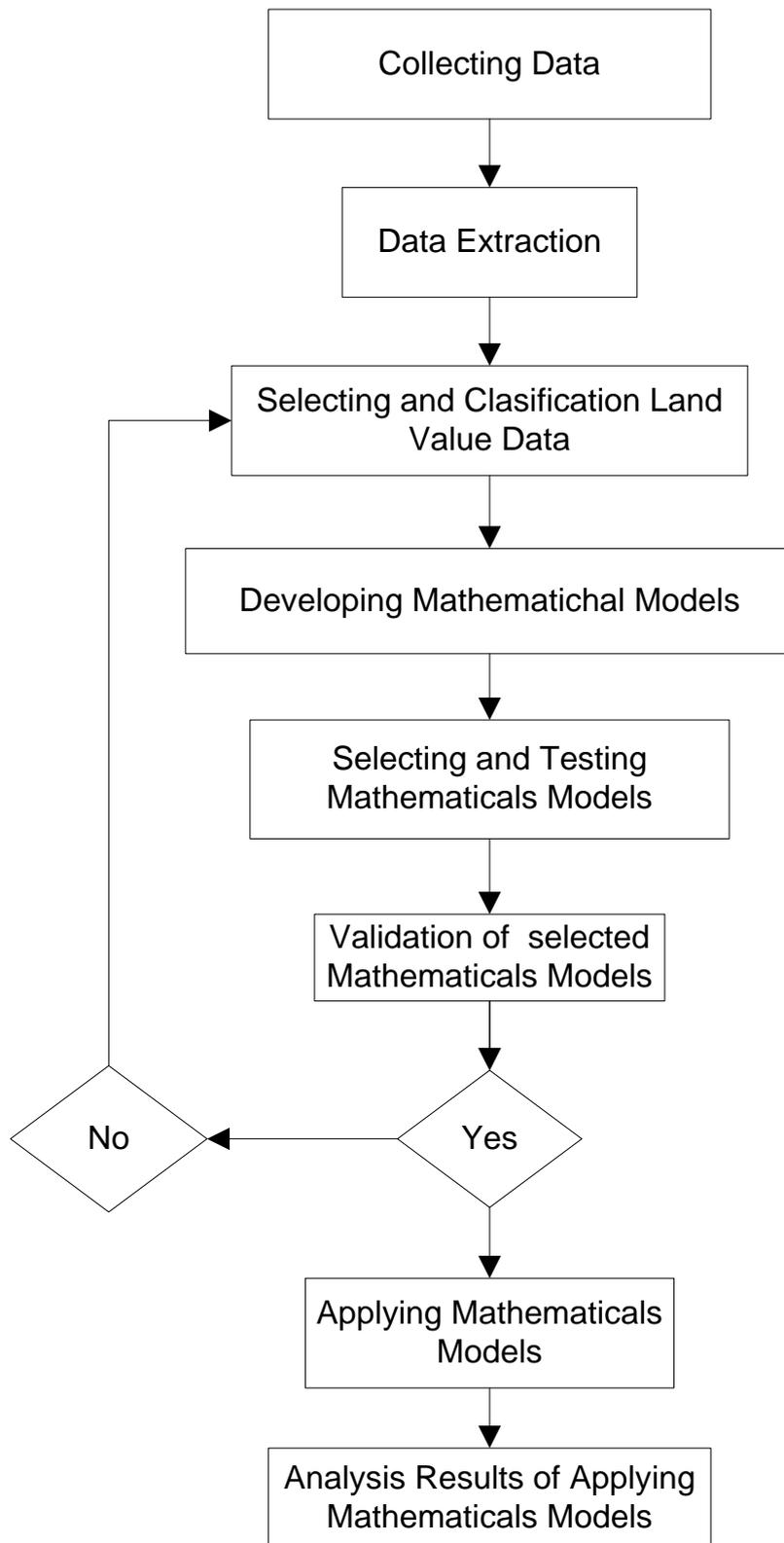


Figure 2: Stages of data analysis

4. RESULTS AND DISCUSSION

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4.1 Overview Research Areas

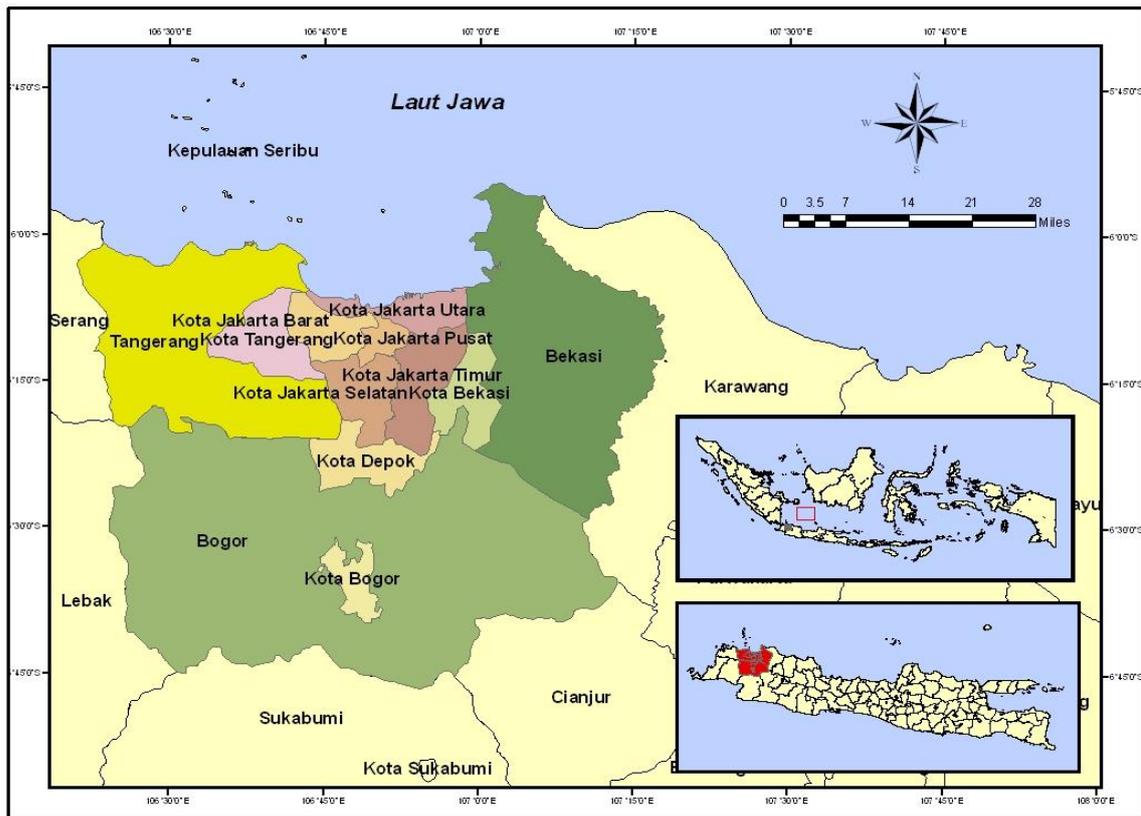


Figure 3: Areaal administration Jabodetabek

Jabodetabek is an acronym of DKI Jakarta (except the Thousand Islands), Bogor District, Bogor City, Depok City, Tangerang District, Tangerang City, South Tangerang City, Bekasi City and Bekasi District. Jabodetabek area is located at coordinates $106^{\circ} 20' - 107^{\circ} 27' 29''$ east longitude and $6^{\circ} 00' - 6^{\circ} 45'$ latitude North South. Wilayah Jabodetabek bordering the Java Sea, south by the district of Sukabumi, west side adjacent to the city of Serang, and the east by the Karawang area.

4.2 Data Input and Data Extraction

Data input and extraction of data processing results of spatial analysis can be found in Appendix 1 and 2.

4.3 Selecting and Grouping Land Value Data

Land Value Data

The next stage is selecting land value data by analyzing distribution of the data by using a histogram and boxplot.

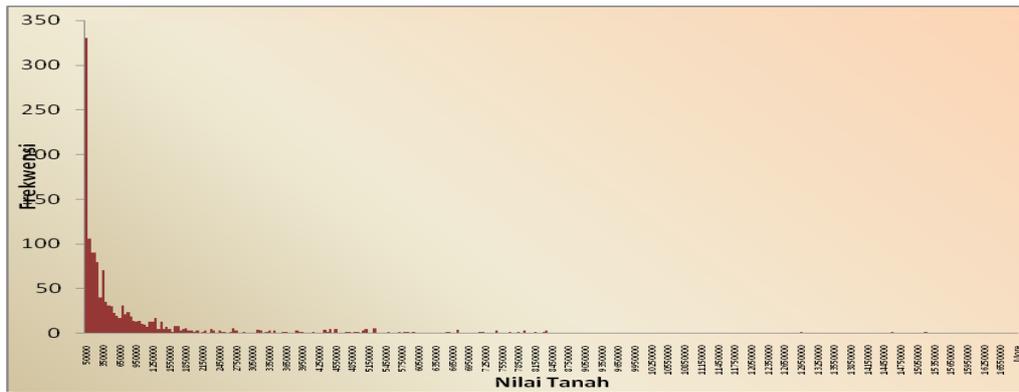


Figure 3. Histogram of Jabodetabek Land Value

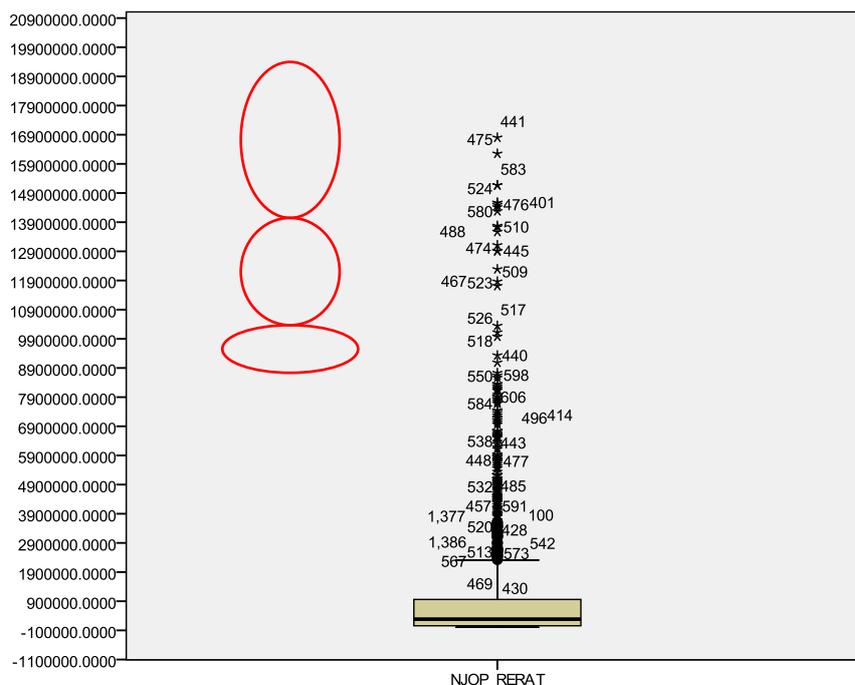


Figure 4. Boxplot of Jabodetabek Land Value

Based on the results of histogram analysis and classification of land value data obtained 3 (three) groups of the distribution of land values, namely:

1. Group of land value data less than Rp.2.309.500, -/m2.
2. Group of land value data between Rp.2.309.500, -/m2 s / d Rp. 9,000,000 -/m2
3. Group land value data more than Rp. 9,000,000 -/m2.

However, based on the results of the development and application of the model, land value of the Jabodetabek area can be divided into 3 (three) groups, which is :

1. Group of land value data less than Rp.2.309.500, -/m2 in Bodetabek area
2. Group of land value data less than Rp.9.000.000/m2 in DKI Jakarta area

3. Group of land value data more than Rp.9.000.000, - /m2 in DKI Jakarta area

Recapitulation of the selection equation of group of land value data can be found in Appendix 3.

Group of Land Value Data Less than Rp.2.309.500, -/m2 in Bodetabek Area

The relationship of each variable to the value of land at less than Rp.2.309.500 data, -/m2 Bodetabek area can be seen in Figure 5.

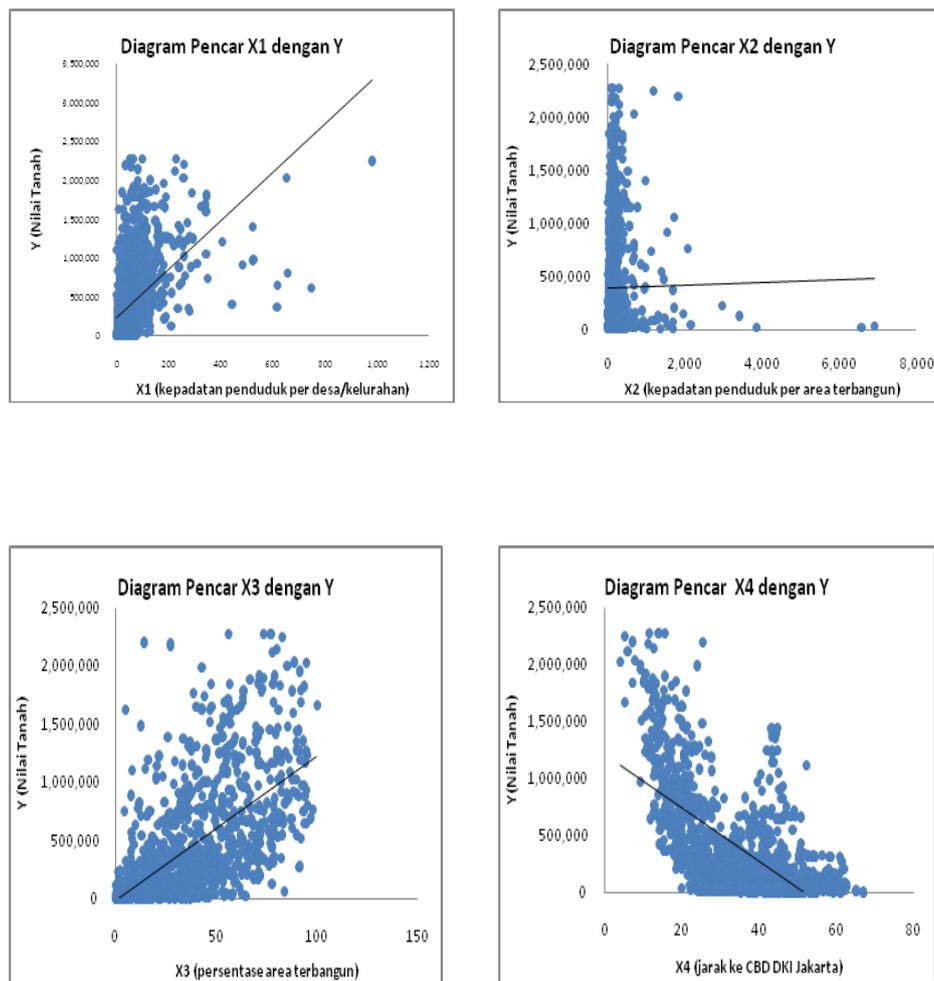


Figure.5. Scatter Diagram of Relation between Land Value Data Relations with Individual Variable Data for Group of land value data less than Rp.2.309.500, -/m2 in Bodetabek area

According to the table in Appendix 4a obtained equation was chosen for the data with land value land value of less than Rp. 2.309.500,-/m2 Bodetabek areas namely:

$$Y = 393.387,143 + 1.252,894 X_1 + 5.535,138 X_3 - 8.632,081 X_4$$

X_1 and X_4 have significant correlation with the value of land with a strong enough that the R value of 0.702. Adjusted R^2 value of 0,491 means that the independent variables in this case X_1 (population density per unit area of the village) and X_4 (distance to the CBD DKI Jakarta) jointly explain the variable land value only amounted for 49,1%, while the remaining 50, 9% is explained by other variables not examined in this study. This may imply that in fact the land value data group is the only variable X_1 (population density per unit area of the village) and X_4 that affect land values. The equation is then applied to all data. Validation and application of the model on test data and field data on land value data group can be found in Appendix 5a.

Distribution maps of the difference in value of land application of the results of this model can be seen in Appendix 6a which shows that:

1. Under estimate spread along the road network (arterial roads, highways and railways) and areal around center of Bogor City.
2. Most of the difference error is over estimate less than Rp.500,000, -.
3. The highest over estimate (more than 500,000,-) is in the area of Bekasi.
4. There are still negative results for the area with a distance more than 50 km from the center of DKI Jakarta's CBD.

Group of land value data less than Rp.9.000.000/m² in DKI Jakarta area
The relationship of each variable on land value land value data on less than Rp.9.000.000, -/m² in Jakarta area can be seen in Figure 6.

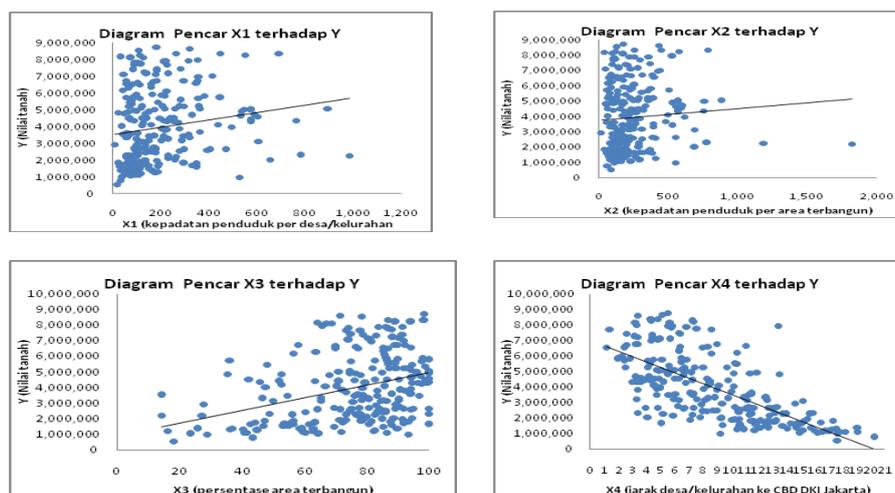


Figure 6. Scatter Diagram of Relation between Land Value Data Relations with Individual Variable Data for Group of Land Value Data less than Rp.9.000.000, -/m² in DKI Jakarta Area

According to the table in Appendix 4b obtained equation to the data selected land value land value is less than Rp.9.000.000/m² in Jakarta area, namely:

$$Y = 8.025.301,689 - 2.664,118 X_1 - 399,283.318 X_4$$

R value of 0.701 which may imply a correlation between these two variables are strong enough to land value. Adjusted R^2 value of 0.489 means that the independent variables in this case, X_1 and X_4 explain the variable value of land amounting to 48.9%, while the remaining 51.1% is explained by other variables

not examined in this study. VIF values each of variables which is smaller than 10 are qualified multicollinearity test. Selected equation shows that the variable X_2 and X_3 on the land value data of this group had no significant effect on land value. Validation and application of the model on test data and field data on land value data group can be found in Appendix 5b.

Distribution maps of the difference of land value data application of the results of this model can be seen in the picture in Appendix 6 which shows that the highest under estimate (more than Rp.2.000.000, -) is located in the central location of business (trade) such as Mangga Dua well as the elite residential location (Kelapa Gading, Ancol, Menteng) and the the highest over estimate (more than Rp.1.000.000, -) are found in villages near the center of DKI Jakarta's CBD.

Group of Land Value Data more than Rp.9.000.000, -/m² in DKI Jakarta Area

This land value data group consists of only 23 land value data. The relationship of each variable on land value land value data on more than Rp.9.000.000,-/m² in DKI Jakarta area can be seen in Figure 7.

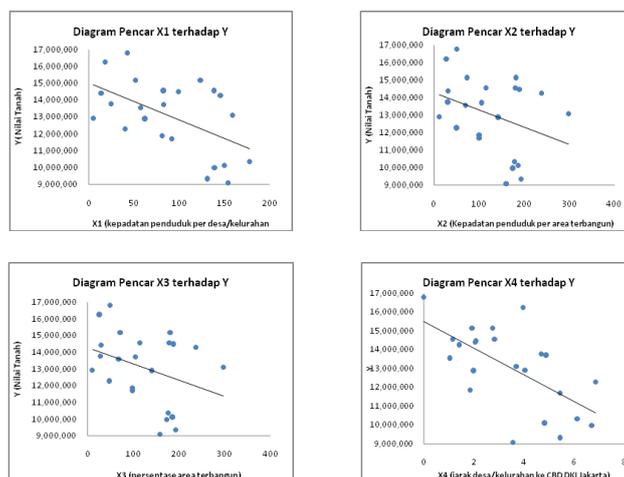


Figure 7: Scatter Diagram of Relation between Land Value Data Relations with Individual Variable Data for Group of Land Value Data more than Rp.9.000.000, -/m² in DKI Jakarta Area

According to the table in Appendix 4c obtained equation was chosen for the data with land value land value of more than Rp.9.000.000/m² in DKI Jakarta area, namely:

$$Y = 16.760.173,473 - 17.571,799 X_1 - 616.217,677 X_4$$

X_1 and X_4 which correlate quite strongly with land values with the R value of 0.761. Adjusted R^2 value of 0.536 means that the independent variables in this case X_1 (population density per unit area of the village) and X_4 (distance to the CBD DKI Jakarta) jointly explain the variable value of land registration by 53.6%, while the remaining 46, 4% is explained by other variables not examined in this study. This means that in fact the land value data group is the only variable X_1 (population density per unit area of the village) and X_4 that affect land values. The equation is then applied to all data (Annex 5c).

Land value data on this group as well as a test data so that the results of the above equation can be further illustrated in Figure in the Appendix which shows that:

1. The highest under estimate (more than Rp1, 000,000, -) is in this group is located in the central location of business (trade), namely in the area Setia Budi, South Jakarta district.
2. The highest over estimate (more than Rp.2.000.000,-) is in North Petojo district (Kecamatan Gambir) and Kampung Bali (Tanah Abang District) which is a densely populated slum.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion:

Based on the results of research on the conclusion drawn is:

- The value of land in the Jabodetabek area is the highest land value in the center of Jakarta CBD.
- Model the value of land in the Jabodetabek area is divided in 3 (three) groups of land value data, namely:
 1. Group of land value data less than Rp.2.309.500, -/m² in Bodetabek area
 $Y = 393.387,143 + 1.252,894 X_1 + 5.535,138 X_3 - 8.632,081 X_4$
 2. Group of land value data less than Rp.9.000.000/m² in DKI Jakarta area
 $Y = 8.025.301,689 - 2.664,118 X_1 - 399,283.318 X_4$
 3. Group of land value data more than Rp.9.000.000, - /m² in DKI Jakarta area
 $Y = 16.760.173,473 - 17.571,799 X_1 - 616.217,677 X_4$
- From the analysis above conclusions have been associated with the effect of each variable to the value of the land, among others:
 1. X_1 variables (population density per unit area of the village) influence land value in the Jabodetabek area. This variable is directly proportional to the value of land in the area Bodetabek, but inversely proportional to the value of land in Jakarta area. This is more due to the function of areas of Jakarta as a center of business and government.
 2. X_2 variables (population density per built up area each village) did not affect land values in all groups of land value data in the Jabodetabek area.
 3. X_3 variables only affect the data value of land in Bodetabek area. This variable is directly proportional to the value of land in the territory Bodetabek. This could mean that the percentage of built up area in Bidetabek is smaller compared to Jakarta area so that can still allowing movement of population movement into Bodetabek area.
 4. X_4 (distance to the center of DKI Jakarta's CBD) effect on land values in all groups of land value data in the Jabodetabek area. This variable is inversely proportional to the value of land in the Jabodetabek area, This can be interpreted as the accessibility to the center of Jakarta CBD is very influential on the value of land in the Jabodetabek area.

- The highest under estimate in the Bodetabek area is around the facility of a road to Jakarta and surrounding areas close to areas of Jakarta, while at the Jakarta area under estimate as there are differences in the area that functioned as business centers and elite residential location.
- Over estimate (model results are higher than the ground field) in the Bodetabek area is in areas far from the center of Jakarta's CBD, but the over estimate on Bodetabek area are generally not too large (less than 500,000, -/m²) . Differences over estimate the highest in the Jakarta area (more than Rp1.000.000, -/m²) contained in the areas adjacent to the center of Jakarta's CBD, but with high population density.

5.2 Recommendations

- Based on these results, the distance to the CBD of DKI Jakarta is the distance that most influence on land values, but there are differences under the model estimate land value when approaching the center of CBD in other areas. For further research is needed to consider in addition to the Jakarta CBD is also the influence of accessibility to Karawaci (Tangerang) and Cikarang (Bekasi).
- The model generated in this study can be applied to the valuation of land in the BPN using the market value.
- Linear regression method was used in this study need to be developed on a different approach methods, especially nonlinear model approach

6. ACKNOWLEDGEMENTS

Praise and gratitude to Allah SWT with His blessing and mercy. Authors are also grateful to Mr. Ir.Didik Wihardi, MS and Mrs.Dr.Ir.Yuliana Susilowati,M.Si as an mentor, Drs. Wahyono Ary, M.Si as a reviewer and Mr Hendro Wibowo, S. Si, M. Si, Mr Ir.Eko Harsono, MT and Mr. Fajar Setiawan, S. with all members of LIPI competitive team for ideas, suggestions and data have been provided

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