Factors that effect to land use change in Pandaan District

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Abstract. Land-use change is the process of changing the usage of land from its original function into other functions, either permanently or temporarily. This research is done the Pandaan Sub-District (an urban fringe area) of Pasuruan District. This location is a strategic location with the main arterial road part of the National Road. For the last decade, land-use change in Pandaan have been significant impact. The outside investors, in particular, are attracted since the operationalization of the Gempol-Pandaan Highway in 2014 that connecting the city of Malang and Surabaya, causing several areas in the sub-district to develop rapidly. We use the quantitative with Multiple Linear Regression methods, with 203 respondents as the the sample of this research. The dependent variable is the percentage of the change in land-use, while the independent variables are the systemactivity (X1), accessibility (X2), infrastructure policy (X3), supporting facility (X4), change in attitude (X5), the ties the land owners have to their land (X6), land reform or land distribution (X7), and population growth (X8). The result of analysis shown that independent variables explain 80% of the model. The most prominent factor which affects change in land-use is accessibility; and land reform/land distribution as the factor with the least effect.

Keyword: land use change, multiple linear regression, accessibility, and land distribution.

1. Introduction
Land is a surface area of the terrestrial plains characterized by all identifiers, both steady and predictable, of biosphere, atmosphere, soil, geology, hydrology and plant and animal populations, and the results of human activities in past and present, as far as the identification marks have a myrtle effect on the present and future use of land by humans. Utomo, et al define the land has the unique characteristics compared to other resources, not exhausted, fixed amount, and the location that can not be moved [1]. Jayadinata explained that the land means earth (earth), while the land is land that already exists designation and generally have owners, either individuals or institutions [2]. Land as the main natural capital that underlies life activities according to [1], has two basic functions, namely: (1) Function of cultivation activities, which has the meaning of an area that can be utilized for various uses, such as settlements, urban and rural areas, plantations, production forests and others. (2) Protected functions, meaning that the established area with its main function to protect the existing environmental sustainability, which includes natural resources, artificial resources and historical value and culture of the nation that can support the use of cultivation.

The characteristics of the land as a fixed resource requiring a plan related to the pattern of land use in order to meet diverse human needs. Various forms of human intervention to land can be said land use [2]. Land use of the land could different each regions depend on government policy and social structure.
of the population. The rules of land use are based on several categories: (i) satisfaction, (ii) tendency for activities in land use, (iii) awareness of land use, (iv) orientation and (v) aesthetic needs [3].

Jayadinata [2] classified land in three categories, namely: (1) the value of profit, which is linked to economic activities (buying and selling) in the free market. (2) The value of the public interest, which is linked with the arrangement for the general public in the improvement of community life. (3) The social value, which is fundamental to life and expressed by the population with behaviors related to conservation, tradition, and belief.

The occurrence of land conversion process (land conversion) cannot be ignored at this time. Land conversion is a change in the function of part or all of the land from its original function to other functions [1]. While [4] explained that land conversion is the conversion of land, especially from agricultural land to non-agricultural (vice versa). Land use change, mainly happens to fulfill the increasing demands of the population and the increasing demand for better quality of life of the people.

Pasuruan regency with location near to Surabaya City and in the path of the city of Surabaya to Malang (vice versa) has a large land conversion pressure. Pandaan district as one of the sub-districts in Pasuruan regency based on Pasuruan Regency Plan/RTRW 2009 – 2029 [5] is the capital city of Pasuruan regency, which serves as the Local Promotion Center (PKLp) growing rapidly. Land use change or land use conversion from agricultural use to another use is almost common. Based on the data of land use map for 10 years (2006 - 2016) there was a significant change (Figure 1 and 2). In figure 1, almost area in green colors mean as open green space and in figure 2 almost colors change to brown (built up area).

The emergence of investors who make investments, especially in the purchase of agricultural land to turned into non-agricultural areas in the District Pandaan inevitable. In addition, the Gempol-Pandaan Toll Road built in 2014 makes the tendency to convers agricultural land to non-agriculture (commercial area or building office). This is in line [2] concepts that area could convers to built area because of economic advantages (the value of profit, which is linked with economic goals and that can be achieved by buying and selling land in the free market).

There are many researches on economic value of land conversion, [6], [7], [8] and etc. This research is conducted by considering the social value of the people in the research location to maintain the land not to be converted to others use in Pandaan district. Social factors in addition to economic factors will be identified to determine the factors that affect land conversion. In our last finding there are many impact of social factors to the planning process [9] in the coastal area development.
2. Methods

2.1. Research Variable
In this research we design variable to measure the factors that has impact to land use change. We use variables based on the literature review. In this research, the variables used consist of independent and dependent variables. Below are the variables used in this research:

| Objective/Aim                                      | Variable | Sub-Variable                  |
|---------------------------------------------------|----------|-------------------------------|
| Knowing the factors affecting land use change in the Pandaan District | Physical Factor | Activity system               |
|                                                   |          | Accessibility                 |
|                                                   |          | Infrastructure policies       |
|                                                   |          | Supporting facilities         |
|                                                   | Social Factor | Behavioral change             |
|                                                   |          | Relationship of land owner with the land |
|                                                   |          | Land reform/ land distribution |
|                                                   |          | Population growth             |

2.2. Sampling Method
The sampling method used in this research involves the population of patriarch/head of the family in the Pandaan Sub-District, which amounts to 30,930 head of household. The sampling method is the simple random sampling. Simple random sampling is a method of sampling done randomly without regard to the strata which exists in the population \[10\]. Samples are determined using the Slovin formula with 7% margin of error. According to the calculation, the samples amount to 203 head of family respondents. Samples will then be spread accordingly in 18 villages and administrative village the Pandaan Sub-District to procure field data.

2.3. Analysis Method
2.3.1. Land-use transformation Analysis
Analyzing the change in land-use could be done through satellite images Landsat obtained in 2006 and 2016 respectively. From that same images, differences in land-use (built and unbuilt) could be seen.

2.3.2. Multiple Linear Regression Analysis
Multiple Linear Regression Analysis is an analytical method used to determine the accuracy prediction from the effects between the independent variables (X) with the dependent variable (Y). In this research, the Multiple Linear Regression Analysis method is used to know how factors affect the land-use transformation in the Pandaan Sub-District. The data used are data acquired from the survey conducted by the people of the Pandaan Sub-District.

3. Result and Discussions
3.1. Factors Affecting Land Use Change
To know the factors that affect land use change in the Pandaan Sub-District, the Multiple Linear Regression Analysis Method is used. This analysis is one of the various methods of analysis to measure the effect of multiple independent variables toward the lone dependent variable. Data is acquired from a survey of 203 samples spread across the Pandaan Sub-District. Tests done to see validity, reliability,
normality, multicollinearity, heteroscedasticity model feasibility, regression coefficient, have all shown to produce a feasible model of analysis.

3.2. Model Interpretation
The model for the Multiple Linear Regression Equation according to the Coefficient Table from the SPSS program is as follow:

\[ Y = 21,098 + 1,639X_1 + 3,318X_2 + 2,766X_3 + 1,528X_4 + 1,905X_5 + 0,668X_6 – 0,393X_7 + 3,155X_8 \] (1)

According to the R-Square test, the independent variable in the model above illustrates 80% of the dependent variable, the percentage of change in land-use. The most affluent variable toward the change in land-use in the Pandaan Sub-District is accessibility, while the variable with the least effect, even so far as having an inversely proportional effect (negative results), is land distribution.

The interpretation of the regression model above are as follow:

1. Constants (a): Valued at 21,098 in the model, which shows if every independent variable have a value of zero (0) then the value of the dependent variable will be 21,098
2. Activity System (X1): Valued at 1,639 in the model, which means that for every unit increase in the value of the activity system, then the Y variable will rise 1,639 with the assumption that other independent variables are fixed.
3. Accessibility (X2): Valued at 3,318 in the model, which means that for every unit increase in the value of accessibility, then the Y variable will rise 3,318 with the assumption that other independent variables are fixed.
4. Infrastructure policies (X3): Valued at 2,766 in the model, which means that for every unit increase in the value of infrastructure policies, then the Y variable will rise 2,766 with the assumption that other independent variables are fixed.
5. Supporting facilities (X4): Valued at 1,528 in the model, which means that for every unit increase in the value of supporting facilities, then the Y variable will rise 1,528 with the assumption that other independent variables are fixed.
6. Behavioral change (X5): Valued at 1,905 in the model, which means that for every unit increase in the value of behavioral change, then the Y variable will rise 1,905 with the assumption that other independent variables are fixed.
7. The relationship between landowner with their land (X6): Valued at 0,668 in the model, which means that for every unit increase in the value of the relationship between landowner with their land, then the Y variable will rise 0,668 with the assumption that other independent variables are fixed.
8. Land reform/land distribution (X7): Valued at 0,393 in the model with a negative mark, which shows that this variable has a proportionally inverse effect with the change in land-use. The meaning of this is, for every unit increase in the value of the land reform/land distribution, the Y variable will decrease 0,393 with the assumption that other independent variables are fixed.
9. Population growth (X8): Valued at 3,155 in the model, which means that for every unit increase in the value of population growth, then the Y variable will rise 3,155 with the assumption that other independent variables are fixed.

The result of this multiple linear regression models can be used as inputs for policy-making in the Pandaan Sub-District in regards to land-use transformation. Good accessibility, as well as infrastructure, has made the activity system around the Pandaan Sub-District more profitable. The development of human settlements as well as trading facilities has also sparked investors’ interest to invest capital in Pandaan. If not supported with the right policies, this phenomenon of land-use transformation could go into a dissatisfactory direction, such as the development of an urban area without policy control.

4. Conclusion
The arrival of external parties, investors, in particular, investing capital in the Pandaan Sub-District causes development in several areas in Pandaan. The existence of the Gempol-Pandaan Highway built
in 2014 causes the trend of land-use transformation and further develop. From the result of the multiple linear regression analysis on the factors of land-use transformation in Pandaan Sub-District, it is concluded from the eight variables; accessibility plays the largest role while land distribution plays the least role. The contribution value of the various independent variables toward the dependent variable is 80%, while the other 20% comes from the contribution of other variables unexplained in this regression model research.

The accessibility variable is the most influential variable toward the change in land-use because of the Gempol-Pandaan Highway cutting through this sub-district. Accessibility becomes the push factor for the investors as well as other parties out of Pandaan Sub-District with interest in buying valuable unbuilt land. The good condition of the road in the sub-district is also an effort to further push development, land-use, trade, and industries due to better road access surrounding the area. Meanwhile, land distribution variable does not have a significant role in changing land-use in Pandaan Sub-District because of the difficulty in distributing the land rights. This trend will cause landowners acquiring their land in a distributed form, or in other words inherited land, to generally not harness their land maximally and abandon the land to be as it is, without increasing its profitability.

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