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**Research Article**

# LAND USE CHANGE IN DELI SERDANG REGENCY - NORTH SUMATRA PROVINCE – INDONESIA: THE DETERMINANT FACTORS OF REGIONAL DEVELOPMENT

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**ABSTRACT**

The physical changes visible development is the urban agriculture land-use change into a city building. Land-Use Change This adversely affects the formation of land-use spatial configuration in ecological as well as socio-economic in the long run. To determine and prove the influence factor of development of the territory of the land-use change as the hypothesis of this study, data analysis technique used is multiple regression models with Structural Equation Modeling (SEM). Factors topography, accessibility, infrastructure, socio-economic, regional images proved to be the attraction factor influencing changes in land use. Factors spatial planning program, which is part of the Government's program *Tembung* district *Deli Serdang* regency, is able to mediate as intervening factors influence infrastructure significantly with change in land use. Such patterns provides an opportunity for local government in policy decisions utilization of land in the area between the two poles of this growth with a choice of whether to accelerate the loss of open land/farm along with the rapid growth of urban areas hinterland or will use natural resources for the activities of agricultural and bolster space green or buffer zone development areas of the city.



## INTRODUCTION

The physical changes visible development is the urban agriculture land-use change into a city building. Land-Use Change This adversely affects the formation of land-use spatial configuration in ecological as well as socio-economic in the long run. In fact, the process of having an effect on land-use changes depending on the local culture, socioeconomic conditions of the local land (Lambin *et al*, 2001). The development of land-use change in its hinterland has been a common phenomenon development system that requires a multi-disciplinary approach (Alonso, 1964; Christaller, 1933; Fujita *et al*, 1999; Von Thunen, 1966). Changes in land use in edge city / hinterland today occur by a central element of population growth, accessibility, infrastructure and economic exchanges between the adjacent regions (Clark, 2000). In a review of some of the social factors that influence land use changes, among others, local cultural values, norms, lifestyles, socio-economic life, time, and transport activities (Pahl, 1975). The role of the Government's planning policy is also a decisive part in the change of land use (Verburg, 2004).

Statistical data District of *Percut Sei Tuan* District stated that the change in land use non-awoke land into land built between years 2010-2014 reached an average growth of 41.35%, which mostly took place in the *Tembung* district. Theoretically the change in land use is influenced by the potential push and pull factors. Acceleration of the process of change in land use in the *Tembung* district in this case triggered by the development of the city of Medan (as a push factor for regional development) is also affected by the development of rural areas and the potential attractiveness *Tembung* district (as a pull factor for regional development).

The process of urbanization in the *Tembung* district result in a change in structure of the population is made up of rural indigenous population, the city urbanisms (due conurbation of urban centers around *Medan* to *Tembung* district), the urbanisms villages (due to urbanization of agricultural village about *Tembung* district). Deli Serdang 2014 data showed the rate of population density *Tembung* district on average 35.7% of 3,857 people / $km^2$ in 2010 to 5,235 inhabitants / $km^2$ in 2014. The population density was not taking into account the flow of commuters (commuter, people living in *Tembung* district yet working in the city of *Medan*). Acceleration of population structure causes a demand market place for living.

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Understanding of the meaning of agricultural land which is usually an inheritance kept it together for generations in a kinship has been degraded into a treasure-divided for inheritance system. Ownership of land is not extensive land result becomes easy to transferable advance by economic pressure, the scarcity of jobs in the village or town cultural penetration. Kinship as one form of social capital is not strong enough to maintain the integrity of the land use. Preliminary survey showed 57.2% shrinking patch of rice field or fields because of the divided inheritance, sold or converted into a residential site or other functions that are non-agricultural (Lindarto, 2015).

Overview of changes in land use thus rises an interesting question about the appeal of local factors what are the potential influence people so that changes in land use in the *Tembung* district. Based on these questions it is necessary to study Influence Factors Development Areas to Change Land Use in Region Hinterland *Deli Serdang* Regency useful theoretically reveal the potential wisdom of a region (genius locus) as a material for spatial planning reaches the identity region and operationally these results contribute to the evaluation process control land use and priority directions of development area in *Deli Serdang* Regency.

***Theoretical Framework***

The dynamics of regional development is in line with the theory of concentric zones, which was then developed by Sinclair, namely, that the construction would likely begin at the center of the city (agglomeration) to widen towards the hinterland. This suburban areas then become a fast growing area specifically as peri-urban regions are areas experiencing such a position of the urban atmosphere and ambience of rural / agricultural. So far the phenomenon of regional development that occurs in the hinterland has been a lot of attention in various studies with a variety of contexts such as agglomeration (McCann, 2004), urban sprawl (Giyarsih, 2001; Brueckner, 2000), urbanization (Mohan, 2006). The research took place in the regional development Hinterland region with an emphasis on land use changes develop in the context of architectural conducted in this study meant to be exploratory and enrichment for zoning planning knowledge hinterland development in Indonesia.

On global scale studies of land use change has been quite widely performed from the perspective of various disciplines. Changes in land use are itself a dynamic phenomenon cultivation of human development on the environment. Today the land use change is regarded as a major driver of Global Change at the interaction between climate, bioclimatic, ecosystem processes, biodiversity and human activities. Land use change research fields include land use patterns change, the process of land use change, human response to land use change, global integration of land use and land use change regional models. Some studies of land use change focuses Land Use Dynamics, Land-Cover Changes, Regional and Global Models with a focus on the analysis and process models of land use change and management in order to generalize the global situation, cruising empirical and diagnostic model of land use change through direct observation, preparation of prognostic models of regional and globals models (Lambin *et al*, 1999).

One paper writings of McCann (2004), entitled "Location, agglomeration and infrastructure" highlight the main issues Inter-relationship between transport, infrastructure, location of the company in regional development horizon and the occurrence of agglomeration in urban development. Research using transactional costs way above analysis with spatial approach to presenting the findings that the modern enterprise spatial transaction costs are influenced by transport infrastructure that exists between the environment and the location of regional economic development.

In linking the relationship between developments planning with the role of social capital then Masik (2005) describes the relationship through research that "Social Capital Relations and Planning". Writing is intended to explore the role of social aspects in the planning with the main question whether the planner should confine themselves to matters of land-use and physical environment, or preferably scope includes social and economic problems. Through critical analysis and content analysis of the obtained results that the relation of social capital and planning is a mutual relationship as the process of sustainable development. Planning of development through the use of communicative rationality has the potential to increase social capital affecting the implementation of development planning. The concept of social capital can be used achieve effective planning. Social capital provides the framework for contextual planning, gave instructions directing social change, and bridging the inter-disciplinary dialogue.

Research in New Delhi carried out by Mohan M, *et.al* (2006), with the title "Dynamics of Urbanization and Its Impact on Land-Use/Land-Cover: A Case Study of Megacity Delhi" conducted to evaluate changes in land use/land cover (LULC) changes and externality urban expansion Mega City Delhi and emphasizing the influence of urbanization and population growth on changes in land cover / land use. Research carried out by the analysis of changes in LU/LC with urban parameters such as population growth and gross regional domestic product. The results showed that there was expansion of the city toward the periphery/outskirts of the city with the characteristics of the conversion of farmland to urban areas. Urbanization and population growth influence on changes in land cover/land use. It is suggested that the implementation of urban planning should take into account the direction of preservation and management of natural land use to improve the quality of life of the urban environment, particularly in the urban periphery.

Research changes in land use settlement of problems related to social factors influence done by Brueckner (2006) in his research entitled "Social Interaction and Urban Sprawl" where this research aims to prove the premise of the argument that there is a positive relationship between social capital relationships with a population density, which further affect the settlement pattern. The study took data from the Social Capital Benchmark Survey, which is then processed and analyzed with regression method of population growth and development of residential land. This study is the measurement of social interaction and social character of the population that influence the development of the settlement. The results of this study it is found that there is a positive relationship between social interactions as a social capital with the growth of population density in a settlement.

Woltjer (2014) conducted a study entitled "A Global Review on Peri-Urban Development and Planning" as a compilation on the understanding of development in peri-urban area (peri-urbanization) which is a contemporary argument related to the development of urban areas. The study was conducted by compiling (selective literature review, content analysis) on a definition of peri-urban development; identify common characteristics of peri-urbanization and how they should respond to the phenomenon of development planning development in peri-urban regions. The findings presented are there are at least three common characteristics of the discussion around the development of peri-urban most prominent were identified, namely: space peri-urban (expression space of the development of peri-urban), the life of peri-urban (functional display of land use, activity fairy -urban and innovation), and changes in peri-urban (causal and temporal perspective that includes flow and driver of change). Showing also that general institutional response planning and development failed to respond to the characteristics of peri-urbanization dynamic global and increasingly create fragmented development planning.

Research on the pattern of land use change (land use change patterns) performed by Appiah, *et al* (2014) entitled "Determinants of Peri-Urbanization and Land Use Change Patterns in Peri-Urban Ghana. This study aimed to describe factors influence on the occurrence of changes in the pattern of land use/land cover as part of the process of peri-urbanization. By using the technique of the regression binary logical (A triangulation of qualitative and quantitative design) the obtained results of the research findings that the increased rate of peri urbanization influenced by the increase in demand (demand) housing, the demand for recreational facilities (Hotels and Guest houses) and land use change replace commercial forest land use. Areas of public facilities be a trigger of change of land use patterns in Ghana.

## RESEARCH METHODOLOGHY

The study design was developed as a strategy and structure of the research for answers to questions and research objectives through hypothesis testing and explain the relationship comparative and associative between variables to determine the influence of topography, accessibility, infrastructure, socio-economic, image area (genius locus) and spatial planning program to changes in land use in the hinterland *Deli Serdang* regency.

Taking into account the possibility of bias, the number of respondents increased one and a half times so that the number of respondents to be a number of 300 respondents. Furthermore, the distribution of the number of respondents respectively adjusted by the percentage area of land use changes that occur in each village.

To determine and prove the influence factor of development of the territory of the land-use change as the hypothesis of this study, data analysis technique used is multiple regression models with Structural Equation Modeling (SEM). This analysis technique is a second generation of multivariate analysis technique that allows researchers to examine the relationship between variables to obtain an overall picture of the overall models. SEM models capable of testing simultaneously together between regression and factor analysis. The tools used for data analysis are AMOS (Analysis of Moment Structures) (Dachlan, 2014).

## FINDINGS AND DISCUSSION

Testing with a structural equation model is to test each variable to another variable. Here is a concept model of the complete research that has been tested using AMOS. AMOS analysis results can be seen in the following figure:

**Table 1** Feasibility Testing Index Structural SEM

| Goodness of Fit Index | Cut-off Value | Analysis Result | Model Evaluation |
|---|---|---|---|
| $\chi$2 - Chi-square | Diharapkan kecil (df=247) | 655,529 | Good |
| Probability | $\geq$ 0,05 | 0,001 | Marginal |
| RMSEA | $\leq$ 0,08 | 0,074 | Good |
| GFI | $\geq$ 0,90 | 0,855 | Marginal |
| AGFI | $\geq$ 0,90 | 0,809 | Marginal |
| TLI | $\geq$ 0,90 | 0,804 | Marginal |
| CFI | $\geq$ 0,90 | 0,839 | Marginal |

Values listed in the table above generally indicate that the model was fit to the data as a whole is considered to have met the criteria. Furthermore, the calculation of the coefficient of influence that formed the basis for answering the hypothesis in this study. The results of data processing presented in the following table:

**Table 2** Regression Weight

| Relationship of Variable | | | Estimation | P-Value | Result |
|---|---|---|---|---|---|
| Land Use Change | ← | Topography | 0.132 | 0.067 | Not Significant |
| Land Use Change | ← | Accessibility | 0.407 | 0.037 | Sifnificant |
| Land Use Change | ← | Infrastructure | 0.294 | 0.146 | Not Significant |
| Land Use Change | ← | Social Economic | 0.075 | 0.006 | Sifnificant |
| Land Use Change | ← | Genius Locus | 0.211 | 0.039 | Sifnificant |
| Land Use Change | ← | Spatial Plan | 0.757 | 0 | Sifnificant |
| Spatial Plan | ← | Infrastructure | 0.508 | 0 | Sifnificant |

Based on the results if the data in Table regression weight above it can be seen the results of the significance of the influence of each factor to changes in land use *Tembung* Region:

1. Topographical factors have a positive influence and not significant changes in land use by the community. Value effect seen in parameter estimation relationship of 0.132, with a probability value (P) is 0.067 where p> 0.05. These results showed that no significant relationship real or does not really give a considerable influence of a variable topography of the land-use change made public. Topographic factors influence the direction of the change in land use pales topographical factors show symptoms well, there will be increase in land-use change
2. The accessibility factor has a positive and significant impact on changes in land use by the community. Value effect seen in parameter estimation relationship of 0,407, with a probability value (P) is 0.037 where p <0.05. These results demonstrate the ease of public access to public facilities district have real influence significantly to changes in land use. Accessibility significantly affect community land use changes in the same direction at the time of easy accessibility means getting better and higher then a change in land use by the community is also increasingly varied and high quantity.

3. Factors infrastructure has a significant positive influence and not directly to changes in land use by the community. Values visible effect on the estimated parameters of the relationship 0.294 with a probability value (P) is 0,146 where p> 0.05. These results indicate that the existing infrastructure and available and easily accessible by public influence but not significant changes in community land use. Factors affect its own infrastructure in line with changes in land use in the sense that if there is an increase infrastructure then the change in land use will also likely increase.
4. Socio-economic factors have a positive and significant impact on land-use change done by the people in the region Tembung. Value effect seen in parameter estimation of the relationship of 0.075, with a probability value (P) is 0.006 where p <0.05.These results show the significant social and economic factors influence the changes in land use. The influence of socioeconomic factors with changes in land use goes way it means if a place is deemed to have socio-economic conditions and the prospect of increasing it in place increased land-use change.
5. Factors Imaji Region / Genius Locus has a positive and significant impact on changes in land use by the community. Value effect seen in parameter estimation relationship of 0,211, with a probability value (P) is 0.039 where p <0.05. This result shows images of neighborhood factors significantly influence changes in land use. Factors images influential region in the same direction, which means if there is an area of increased regional image factor then the area will be an increase in land-use change.
6. The Spatial Plan Program or the District established by the District Government has a positive and significant influence on changes in land use in the Region Tembung. Values visible effect on the estimated parameters of the relationship 0.757 with a probability value (P) is 0.000 where p <0,05.Artinya is a program or plan of arrangement of space taken by the Government to the people Tembung Region significant effect on land-use change is done by community. Program regency spatial influence the direction of the change in land use in the sense that if people's understanding of spatial planning district increases, land-use change occurs will also increase.
7. Factors infrastructure has positive and significant influence on the factors spatial program. Values visible effect on the estimated parameters of the relationship 0.508 with a probability value (P) is 0.000 where p <0.05. It means the infrastructure to be an influence factor decisive for the implementation of the program of spatial district in the same direction in the sense that if the factors on infrastructure increased it will increase people's appreciation for spatial program district.
8. Infrastructure, accessibility and spatial planning district plan is the most dominant variable influencing land-use change contribute to the communities in Region Tembung. Accessibility role of 0.407, 0.508 and infrastructure for the role of spatial planning acts amounting to 0.757.

***Hypothesis Testing 1***

The hypothesis states that a factor topography, accessibility, infrastructure becomes physical factors that most influence the change in land use in the area *Tembung* district *Deli Serdang* regency. The following submitted evidentiary testing hypothesis 1.

***Factors Topography / Landscapes***

Based on the results of regression weight it can be seen the results of the significance of the influence of topography / landscape to changes in land use in the region is that the topography factor *Tembung* districtno significant effect on the change in land use in the region Hinterland *Deli Serdang* regency. This condition is seen from the test results obtained probability value (p) is 0.067 where p> 0.05. With the value of the effect estimate is 0.132. That is not a topographical factor that can affect the attractiveness of the community in making changes in land use in the region *Tembung* district. Thus the hypothesis that topography / landscape significantly influence land-use change is not proven.

***Factors accessibility***

Based on the results of regression weight it can be seen the results of the significance of accessibility factors influence the changes in land use in the *Tembung* district namely that accessibility factors with a significant positive effect on the value of parameter estimation visible effect relationship at 0,407 with a probability value (p) is 0,037di where p <0, 05.

These results demonstrate the appeal of easy accessibility from people to move in carrying out daily activities into consideration settled base, which results in a change in land use. Accessibility significantly influence changes in community land use in the *Tembung* district same direction means if the region has the ease of accessibility for the traveling public in the region has increased as well a change in land use is intensive and varied. Thus the hypothesis that significantly influences the accessibility of land-use change is proven.

***Factors Infrastructure***

Based on the results of regression weight it can be seen the results of the significance of the influence of infrastructure on land-use change in the region infrastructure *Tembung* district that factor had a positive influence and not significant changes in land use by the community. Values visible effect on the estimated parameters of the relationship 0.294 with a probability value (p) is 0,146 where p> 0.05.

These results indicate that the existing infrastructure and available and easily obtained by people not closely related directly to changes in community land use in the *Tembung* district. Infrastructure provides no real influence or little directly to changes in community land use in the *Tembung* district. This means that although the infrastructure is available and capable to meet the needs of society, but it will not draw public attention to the maximum in the use of land in *Tembung* district. Thus the need for the role of district spatial plan which is implemented by the local government that the infrastructure is available or met properly according to community needs that would affect the public interest to make a change in land use in

the *Tembung* district. In addition to the district spatial planning program will make a change in land use in the *Tembung* district better and presentable so neat area will be able to attract more people to make changes in land use *Tembung* district.

Based on the test results of data analysis has been known that the topography and infrastructure factors did not have a significant influence or role is not real and powerful in influencing land-use change made public in *Deli Serdang* regency Hinterland. Based on the great influence of the estimate value known that accessibility is the most dominant factor influencing the formation of the pattern of land use in the area such as accessibility *Tembung* district have influence value of (0,407). Factors accessibility and infrastructure become interrelated factors, namely when more open and easy access then this condition indicates support good road facilities have been met which could connect Hinterland *Deli Serdang* district to another district.

***Hypothesis Testing 2***

Hypothesis two states that socio-economic factors, the image area and the setup program space into non-physical factors that most influence the change in land use in the area *Tembung* district Deli Serdang regency. The following submitted evidentiary testing hypotheses 2.

***Socioeconomic Factors***

Based on the results of regression weight it can be seen the results of the significance of the influence of socio-economic factors to changes in land use in the *Tembung* district namely that socio-economic factors have a positive and significant impact on changes in land use by the community. Value effect seen in parameter estimation of the relationship of 0.075, with a probability value (p) is 0.006 where p <0.05.

These results indicate that socio-economic factors have a significant influence in the direction of the change in land use. It is therefore clear that if the people of the region have the social capital as well as the potential economic benefits of good it will be an attraction in arousing interest to settle thereby increasing the occurrence of a change in land use. Thus the hypothesis that socio-economic factors significantly influence land-use change is proven.

***Factors Imaji Region (Genius Locus)***

Based on the results of regression weight it can be seen the results of the significance of the influence of the image of the region to changes in land use in the region is that the factor images *Tembung* district has positive and significant impact on changes in land use by the community. *Tembung* district Value effect seen in parameter estimation relationship of 0,211, with a probability value (p) is 0.039 where p <0.05.

These results demonstrate the appeal of the image of the region have a very close relationship with the land-use change. The appeal of images of the region significantly affect land-use change in the same direction means that if an area has an element image of the region (such as landmarks, paths, edges, nodes, districts) it will increase the attractiveness of public interest resides in consideration of the acquisition cost of land will soon increase because of the support popularity image area. Thus the hypothesis that factors significantly influence the image of the area of land use changes proven.

***Factors Spatial Planning Program***

Based on the results of regression weight it can be seen the results of the program's significant influence on the spatial planning of land use changes in the *Tembung* district namely that factor Spatial Plan Program or the District established by the District Government has a positive and significant influence on changes in land use in the *Tembung* district. Values visible effect on the estimated parameters of the relationship 0.757 with a probability value (P) is 0.000 where p <0,05. Artinya is a program or plan of arrangement of space taken by the Government to the people *Tembung* district have a significant impact or robust to changes in land use by the community.

These results show the spatial planning program has a relationship with changes in land use and spatial planning program attractiveness significantly affect the change in land use. Thus the hypothesis that spatial planning program factors significantly influence land-use change is proven.

Based on the overall results of the test data analysis has been made known that socio-economic factors, the image area and spatial planning program to be a factor that is able to attract to changes in land use in the *Tembung* district. The estimate value of the impact that these factors to changes in land use are the socio-economic value (0.075), the image of the area has a value (0,211) and spatial program discount value (0.757).

***Hypothesis Testing 3***

The hypothesis states that three factors of spatial planning program as an intervening variable for infrastructure factors to changes in land use in the area *Tembung* district *Deli Serdang* regency. Infrastructure factors directly influence positive and not significant changes in land use by the community with the effect parameter value estimate of 0.294. But indirectly with mediation by the program spatial infrastructure factors will have a significant effect with the effect parameter value estimate of 0.757. This means that a program or plan of arrangement of space taken by the Government as a real intervention or mediation robust to changes in land use proven.

## CONLUSSION AND RECOMMENDATION

Factors topography, accessibility, infrastructure, socio-economic, regional images proved to be the attraction factor influencing changes in land use. Factors spatial planning program, which is part of the Government's program *Tembung* district *Deli Serdang* regency, is able to mediate as intervening factors influence infrastructure significantly with change in land use. Factors image area can be considered as an aspect of regional indigenous wisdom emphasizes local place as an influential factor in the planning of land use area. Changes in land use in the hinterland area *Tembung* district specifically influenced by the fusion of the push factors and pull factors Medan city *Tembung* district thus creating an atmosphere of rural-urban development intensively so that the necessary spatial planning to accommodate changes to the dynamic development of the region and progressive. Regional development planning strategies through product spatial planning should be more down to earth so it can be unrealistic in implementation as a product that is up to date and sustainable anticipatory. Such patterns provides an opportunity for local government in policy decisions utilization of land in the area between the two poles of this growth with a choice of

whether to accelerate the loss of open land/farm along with the rapid growth of urban areas hinterland or will use natural resources for the activities of agricultural and bolster space green or buffer zone development areas of the city.

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