UDC 332

# DEVELOPMENT MODEL OF NON-MOTORIZED TRANSPORTATION TOWARDS SUSTAINABLE ENVIRONMENTAL FRIENDLY INNOVATION

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## ABSTRACT
The development of an area is often accompanied and in line with human growth. Development continues to be carried out in order to meet the needs of the community whose population is increasing. Currently, the development that has been promoted by various existing individuals and institutions is still not regular and is still not in accordance with regional functions and existing resource needs. Seeing population growth that is increasing every year requires a development that is in accordance with current needs. Seeing this, spatial planning is needed to achieve harmony and balance in the utilization of existing potential to create an efficient and effective environment. In addition, the creation of an efficient and effective environment will create a harmonious and harmonious relationship between humans and the environment. The purpose of this study was to determine the relationship between the variables of technological development, population, and transportation on the existence of government policies in land use change in order to realize non-motorized transportation in Probolinggo City. The research method used is an exploratory research method with an exploratory quantitative approach with Structural Equation Modeling (SEM) analysis conducted on respondents in Probolinggo City. Based on the results of the study, it was found the relevance of the development of technology, population, transportation to changes in land use in realizing non-motorized transportation at the research location. The government policy is not related to changes in land use in the research location, so a regulation is needed that can regulate and bridge all aspects in it.

## KEY WORDS
Transportation, land use, government policy, non-motorized transportation.

In its development, there have been many changes to the spatial plan which aims to improve the function and role of this spatial plan so that it can be implemented and can regulate the development of an area so that it is safe, orderly, orderly, healthy, beautiful and comfortable. With the formulation of a plan that has undergone many developments, it is hoped that in the future it can be used as a reference in development and become a common basis for all parties involved. The impact of change and urban development is triggered by population growth, housing development, trade and service sector development. The existence of urban development, both external and internal, will greatly affect the activity, intensity and scale of the space that will be developed and planned later.

Development in the regions aims to improve the standard of living and welfare of the people in the regions, through harmonious and integrated development, both between sectors and between development sectors. The existence of efficient and effective regional development planning will lead to the achievement of community independence, and the independence of the region itself evenly throughout the country.

The city of Probolinggo has turned into a city that is quite congested even though it is still in certain areas and at certain hours, in addition to increasing environmental pollution. The current situation clearly reflects the condition of the City of Probolinggo in the future, because it is not impossible that in less than five years the City of Probolinggo will become quite jammed along with the growth and increase in motorized vehicles which seem to be a sign of prosperity and increasing economy in an area. This requires strategic and technical efforts in preserving the environment through good waste management policies, to answer this problem, the author initiated efforts to realize a sustainable transportation system in Probolinggo City and strategies to realize sustainable transportation. In addition, there will be changes and determination of land use along with the displacement.

This step requires the readiness of supporting infrastructure, including road infrastructure. As a transportation infrastructure that plays an important role in the transportation sector, especially for the distribution of goods and services, the availability of roads and reliable conditions will have a positive impact on the economic sector, government, and society. In addition, the City of Probolinggo is known as the main satellite buffer for tourist cities which are included in the ecotourism area. Along with the development of the movement towards tourist cities, it also expands the use of space for cultivation areas in the region. Currently housing development is experiencing a trend that is so rapid that it will indirectly affect it, so that it is experiencing secondary development.

Road infrastructure development is an integral part of the urban development process. As one of the requirements in meeting the basic needs of the community, the fulfillment of transportation plays an important role in improving the community's economy and regional development. Economically, the availability of road infrastructure in an area can affect the increase in the economic value of land, changes in population activities, and changes in economic structure. One of them is the availability of road infrastructure that increases accessibility across regions, the road network can increase land values, change the economic structure from agriculture to trade and can change the livelihoods of farmers to traders. In addition, policies implemented by the government can lead to conflicts between communities in the development of land use. It can be expected that based on these events, the involvement of the government concerned is needed to obtain results in dealing with these conditions.

## LITERATURE REVIEW

Land is the surface of the earth where various activities occur and is a limited natural resource, where its use requires the provision, provision and appropriation of plans for the purposes of use for the welfare of the community (Sugandhy, 1998). Meanwhile, according to Cooke (1983), the land is the overall ability of the mainland and all the symptoms below the surface that concerns with its utilization for humans. According to Boedi Harsono in Soemadi (1999), the definition of land / land under the Basic Agrarian Law is the surface of the earth which in its use includes the lower body parts of the earth and the space above it in accordance with the purpose of its use. Accessibility changes will determine changes in land values, and these changes will affect the use of the land. If a land-use change of travel needs to transport the value of land accessibility facilities like this really happens, then the rate of trip awakening will change and will result in changes throughout the cycle. It should be noted that this cycle is a simplification of the actual reality, and market power is not shown. Nevertheless this cycle illustrates the fundamental relationship between transport and land use (Khisty & Lall, 2005).

Land use in a city is generally of a certain shape and its developmental pattern can be estimated. Decisions in urban development usually flourish freely, but are pursued in

accordance with land-use planning. Economic motive is the main motive in the formation of land use structure of a city with the emergence of strategic business centers. In addition to business motives there are also political motives, the physical form of the city, such as topography, drainage. Although the structure of the city seems irregular, but if viewed carefully have the regularity of certain patterns. Physical buildings form the city's internal zones. Existing urban structural theories are used to examine land use forms that typically comprise land use for housing, business, industry, agriculture and services (Koestoer, 2001).

The concept of livelihood used in writings on poverty and rural development. Meaning in language is a way of life (way of life). Livelihood is defined as the asset and activity capability necessary to live a household life. Life is not something temporary, but it must be strong and can be sustainable until the end. The design and rejuvenation required for mediating skills is then correlated with livelihood strategies (intensification and extensification of agriculture, diversification, and migration) and its estuary to the sustainability of livelihoods. This framework can be applied to different scales-individual, household, for kinship, village, county or even country organization, sustainable livelihoods at different levels. Such an interaction analysis between the levels that affect livelihood, both positive and negative. What can be done in the same way, what is needed, to adapt to the next situation, how one builds his ability to adapt to the environment and utilizes every opportunity available, the fulfillment of household needs by balancing between the resources/capital possessed by the level needs? Although not economic, but maximum household economic resilience is very fascinating household sustainability. Elements in Sustainability Livelihood are human capital, financial capital, natural capital, physical capital and social capital.

The transport system of several micro systems; (a) system of activities; (b) network system; (c) the movement system; and (d) institutional systems. Each system interconnected with each other. Transportation or transportation serves as a supporting factor and incentive for development (promotion sector) for economic development. The construction of a land area will generate traffic that will post land use patterns. Interaction between land use and transportation by regulation and policy. In the long run, the development of transportation facilities or the provision of means of transportation with modern technology will affect the shape and pattern of land use due to increased accessibility levels (Tamin, 2000). In the development of the developing areas of this complex, especially the development of urban areas where the city has a variety of aspects and implications are more complex than the district/city. The active participation of the community will further foster togetherness so as to accelerate the improvement of just, prosperous and prosperous welfare. This is because development is a continuous or continuous effort in achieving the goal of improving the standard of living, so as something that is limited and complex, it is impossible to only be done by the local government only, and the whole community needs to be involved and given the awareness and opportunity to participate in the development, so that participation can then develop actively and dynamically.

## MATERIALS AND METHODS OF RESEARCH

This research was conducted in the City of Probolinggo by focusing on the downtown area which is the administrative area of the local government and a tourist area that is often visited by tourists. This location was chosen because the area has a development plan and development of non-motorized transportation and is a tourist area close to the center of government administration. The number of people affected by land use change is also quite large. In addition, the location was chosen based on the ease of access to the area which is a government administration area and a tourist area. Geographically, the research location in Probolinggo City can be seen in the following figure 1.

The research approach used in this research is by exploratory survey analysis. According to Nazir (2005), explains that explorative survey methods are often used to reveal facts and identify problems and justify ongoing implementation. The samples used in this study were obtained using Slovin formula (Setiawan, 2007). Respondents in the study also involved some supporting informants such as journalists Malang, NGOs, Vice Regent,

District Officers, Entrepreneurs and village community leaders. Technics measurement of this research variable using questionnaires as an instrument in collecting data from respondents, because the method of data collection in this studies survey. The answers obtained with the research instrument were scored. The questionnaire in this study used five levels, ie Strongly Disagree (STS), Disagree (TS), Quite Agree (CS) or Neutral, Agree (S), and Strongly Agree (SS). Likert-scale usage can generate data categorized in interval scale (now, 2003). The score of answers to the questionnaire: Strongly Disagree (STS) = 1, Disagree (TS) = 2, Neutral (N) = 3, Agree (S) = 4, and Strongly Agree (SS) = 5.

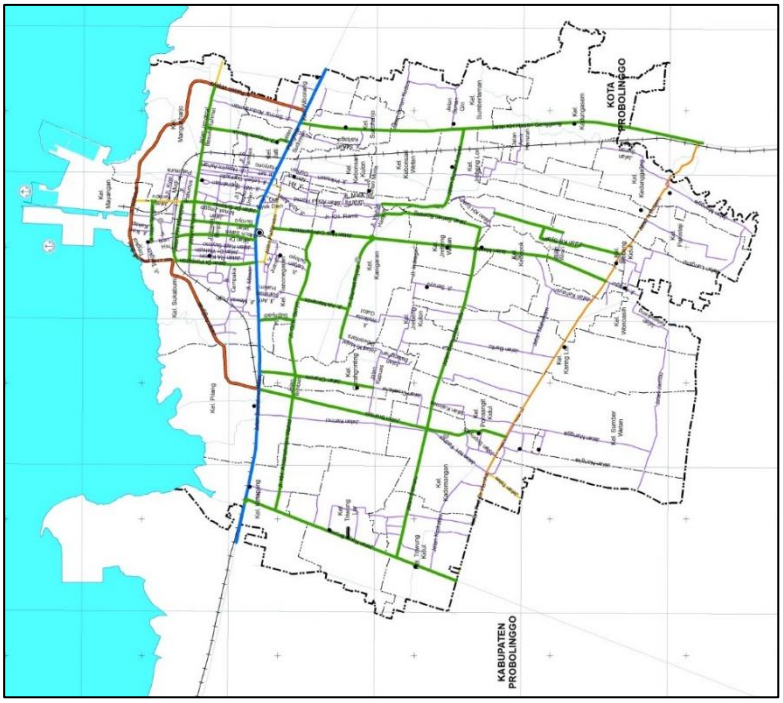


Figure 1 – Map of Research Locations

To analyze the relationship between Sustainability Livelihood Approach, Population, Transportation, Government Policy and Land Use is used quantitative method with Structural Equation Modeling (SEM) analysis. Structural Equation Modeling (SEM) is a statistical technique that performs a relatively complex and simultaneous set of relationships. The relationship can be constructed between one or several variables depending on one or more independent variables and can take the form of a factor or construction, constructed from several indicator variables.

## RESULTS AND DISCUSSION

To find out whether the hypothetical model is supported by empirical data or not, it is necessary to test the goodness of fit overall model. According to Arbuckle and Wothke, in Solimun (2009), the best criterion used as an indication of model goodness is the value of Chi Square / DF less than 2, and the RMSEA is below 0.08. In this study, the values of CMIN / DF and RMSEA have met the cut off value. Therefore SEM model in this research get Goodness of Fit value some not yet fulfill cut-off, thus model that formed can be said marginal. As for some test results are presented in the following table 1.

Based on the results of the study revealed that the testing of research hypotheses conducted with t test on each path of direct influence partially. The results of the complete analysis, contained in the results of SEM analysis. A summary of the results of hypothesis testing is given in the following table 2.

Table 1 – Test Result of Goodness of Fit Overall Model Initial Stage

| *Goodness of Fit index* Y | *Cut off Value* | Analysis Results | Model Evaluation |
|---|---|---|---|
| $\chi^2$ *- chi quare* | < df dengan α = 0.05 | 151.592 | Good model |
| *Sig.* | ≥ 0.05 | 0.057 | Good model |
| *RMSEA* | ≤ 0.08 | 0.049 | Good model |
| *RMR* | < 0.10 | 0.037 | Good model |
| *GFI* | ≥ 0.90 | 0.902 | Good model |
| *AGFI* | ≥ 0.90 | 0.940 | Good model |
| *CMIN/ DF* | ≤ 2.00 | 1.072 | Good model |
| *TLI* | ≥ 0.90 | 0.931 | Good model |
| *CFI* | ≥ 0.90 | 0.958 | Good model |

*Source: Data Processed, 2022.*

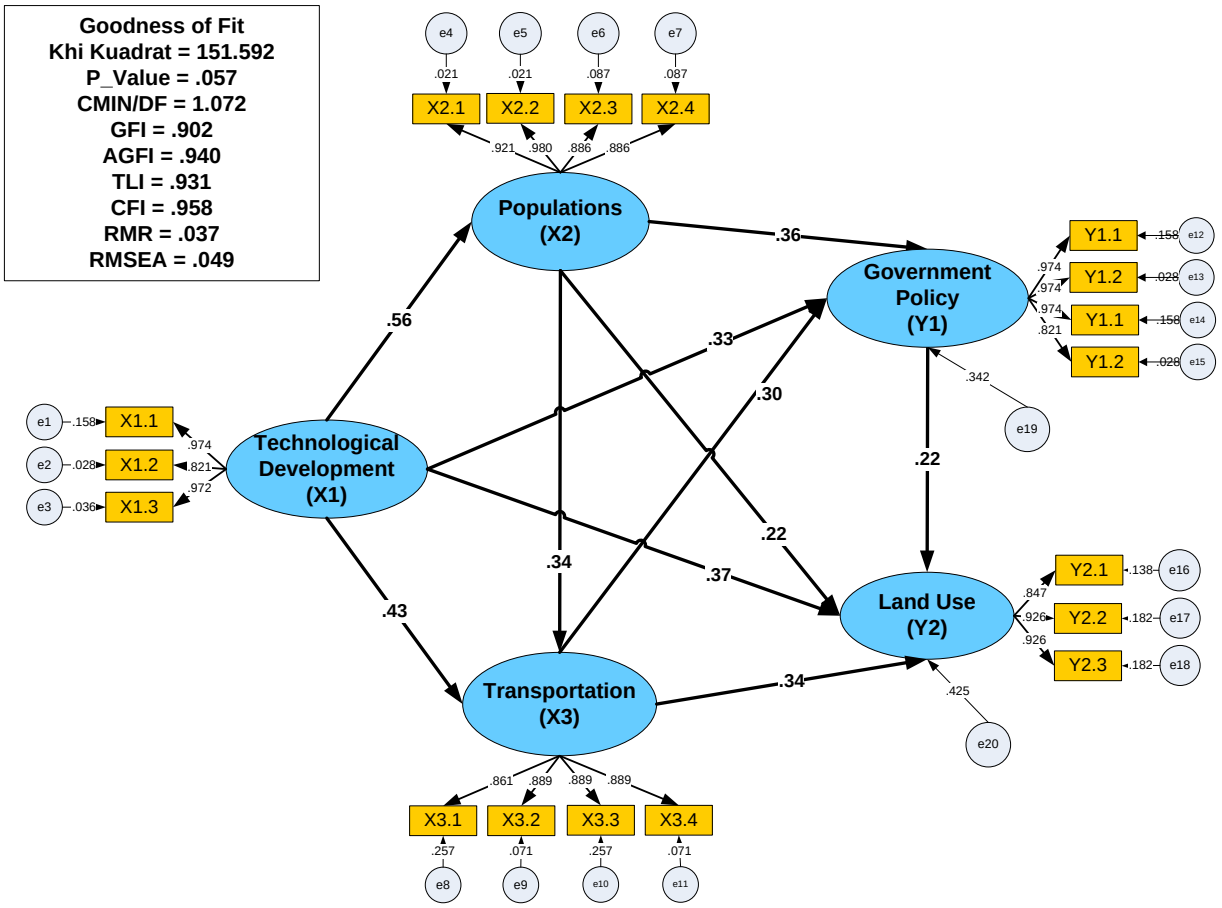


Figure 2 – Line Diagram Result of SEM Analysis

Table 2 – Hypothesis Testing Results

| Hypothesis | Independent Variables | Dependent Variables | Direct Effect Line Coefficients | | |
|---|---|---|---|---|---|
| | | | Std'ize | *P-value* | Desc. |
| $H_1$ | Technological Development | Population | 0.387 | 0.000 | Sig*** |
| $H_2$ | Technological Development | Transportation | 0.419 | 0.000 | Sig*** |
| $H_3$ | Population | Transportation | 0.475 | 0.000 | Sig*** |
| $H_4$ | Technological Development | Government policy | 0.244 | 0.001 | Sig** |
| $H_5$ | Population | Government policy | 0.392 | 0.006 | Sig** |
| $H_6$ | Transportation | Government policy | 0.228 | 0.002 | Sig** |
| $H_7$ | Technological Development | Land Use | 0.245 | 0.000 | Sig*** |
| $H_8$ | Population | Land Use | 0.212 | 0.000 | Sig*** |
| $H_9$ | Transportation | Land Use | 0.233 | 0.013 | Sig** |
| $H_{10}$ | Government policy | Land Use | 0.197 | 0.000 | Sig*** |

*Source: Data Processed, 2022.*

Based on calculation result by using approach of Structural Equation Modeling (SEM) obtained by result of hypothesis test as presented below:

*Hypothesis 1.* Technological developments have a significant effect on the accepted population. The path standardization coefficient = 0.387 with p value = 0.000 is significant. This shows that there is a significant positive effect of the Livelihood Approach Sustainability on the population. This illustrates that the increasing technological development or good, the involvement of the population is also increasing.

*Hypothesis 2.* Technological developments have a significant effect on transportation can be accepted. Standardize line coefficient = 0.419 with p value = 0.000 is significant. This illustrates that there is a significant positive effect of increasingly advanced technological developments on the increase in transportation. This illustrates that the higher or better the development of technology, the more comfortable and sophisticated transportation will be.

*Hypothesis 3.* Population has a significant effect on transportation is acceptable. Standardize line coefficient = 0.475 with p value = 0.000 is significant. This illustrates that there is a significant positive effect of population on transportation. This illustrates that the higher the population in an area or the better the community, the greater the safety and comfort of transportation.

*Hypothesis 4.* Technological developments have a significant effect on Government Policy is accepted. Standardize line coefficient = 0.244 with p value = 0.001 significant. This illustrates the significant positive impact of technological developments on Government Policy. This illustrates that the higher or better the perceived technological development, the better the perceived impact of Government Policy.

*Hypothesis 5.* Population has a significant effect on government policies is accepted. The standardize line coefficient = 0.392 with a p value of 0.000, it was significant. This illustrates that Population has a significant positive effect on Government Policy. This shows that the better the population or community involved, the more government policies will be followed.

*Hypothesis 6.* Transportation has a significant effect on Government Policy is accepted. Standard Coefficient Line = 0.228 with p value = 0.015, it turns out to be significant. This illustrates that Transportation has a significant positive effect on Government Policy. This indicates that better transportation will be followed by increasing government policies.

*Hypothesis 7.* Technological developments have a significant effect on land use is accepted. Standard Coefficient Line = 0.245 with p value = 0.007 significant. This illustrates that there is a significant positive effect of technological developments on land use. This illustrates that the higher or better the technological development, the more land use can be directed according to the applicable limits.

*Hypothesis 8.* Population has a significant effect on land use is accepted. Standard Line Coefficient = 0.212 with p value of 0.036, was significant. This illustrates that there is a significant positive effect between population and land use. This shows that the better the community or population in responding to everything, the more land use processes in an area will be followed.

*Hypothesis 9.* The significant effect of transportation with land use is accepted. Standard Coefficient Line = 0.233 with p value = 0.013, was significant. This illustrates that transportation has a significant positive effect on land use. This shows that the better the development of transportation, it will be followed by a good improvement in land use management in an area.

*Hypothesis 10.* Government policy has a significant effect on land use is accepted. Standardize line coefficient = 0.197 with p value = 0.000, significant. This illustrates that there is a significant influence of Government Policy on land use management in an area.

Based on the results obtained, it can be illustrated that the relationship between the four variables, especially changes in land use in the research location, does not only depend on government policies but also depends on the influence of other variables. In addition, changes in land use are also caused by increased technological developments, population and transportation. However, it is possible that there will be government policies needed by

the community in areas experiencing land conversion. Although government policies are able to influence land use changes in an area, with government policies it is hoped that the impacts of land use changes can be controlled so as to create sustainable development. Therefore, changes and developments in land use in the Probolinggo City area cannot be separated from government policies that make Probolinggo City an environmentally friendly city.

## CONCLUSION

Based on the results of the study above, it can be concluded that technological developments, increasing population in an area and transportation developments are one of the benchmarks for the success of land use development aimed at developing environmentally friendly Probolinggo City, especially the use of environmentally friendly transportation. In addition to providing increased human development, land use development also pays attention to environmental aspects that are affected by the development of the city of Probolinggo itself. This refers to the existence of urban planning as a tourist city. In addition, changes in land use are also influenced by the increase in environmentally friendly transportation and the increasing population so that the government will provide policies to facilitate the accessibility of the population by building road routes and infrastructure in the vicinity by prioritizing environmentally friendly vehicles for both local and foreign tourists. The role of government policies can affect changes in land use in an area but it is necessary to have limits set out in regulations so that sustainable development can be carried out properly so that negative impacts can be minimized.

## REFERENCES

1. Cooke, P. 1983. Theory of Planning and Spatial Development. London: Hutchinson and Co Publiser LTD.
2. Khisty, C. J. dan Lall, B. K. 2005. Fundamentals of Transport Engineering. Jakarta: Erlangga.
3. Koestoer, R.H. 2001. Dimensional Spatial City (Theory and Case). Jakarta: Publisher Universitas Indonesia.
4. Nazir, M. 2005. Research Methods. Ghalia Indonesia. Jakarta.
5. Setiawan. Nugraha. 2007. Sample Size Determination Using Slovin Formula and Krejcie-Morgan Table. Bandung: Universitas Padjadjaran.
6. Soemadi, H. 1999. Spatial Policy and Building Arrangement. Yogyakarta: STPN.
7. Solimun. 2002. Multivariate Analysis Structural Equation Modelling (SEM) Lisrel and. Amos. Faculty of Mathematics and Natural Sciences, Universitas Brawijaya.
8. Sughandy. A. 1998. Spatial Planning In Environmental Management. Jakarta. Grasindo.
9. Tamin, O. Z. 2000. Transport Planning and Modeling. Bandung: ITB Bandung.