The influence of infrastructure development and ecological carrying capacity on the economic impact of independent integrated city of Lunang Silaut

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Abstract. Independent integrated city is a city that was built with the aim of increasing the ease of meeting various basic needs that enable the opening of opportunities for socio-economic growth of transmigrate regions and creating centers of business activities that attract investors as an effort to develop the economic activities of transmigrants and surrounding communities. The purpose of the study was to investigate the effect of the independent variables of infrastructure development and ecological carrying capacity on the dependent variable of the Economic Impact of the Independent Integrated City of Lunang Silaut. This research is a quantitative research involving 150 respondents of the Independent Integrated City Regional stakeholders Lunang Silaut who represent the Government, private parties, non-governmental organizations, and local residents. The sample selection is done in a convenient purposive sampling manner. Data analysis uses multiple regression which is preceded by data requirements test: normality, multicollinearity, autocorrelation, and heteroscedasticity. The research error rate was set at 5%. The results showed that infrastructure development and ecological carrying capacity had a significant effect on the economic impact of Independent Integrated City Lunang Silaut, with a Sig. F = 0.000; and the two independent variables can explain the dependent variable of 98.8%, while the rest is determined by other factors outside the research boundary.

1. Introduction

Independent integrated city (KTM) is a transmigration area whose construction and development is designed to be a center of growth, so that it has an urban function through sustainable management of natural resources. Urban functions refer to the transmigration paradigm which include: (a) centers of agribusiness activities that include processing agricultural products into production and / or consumer goods, specialized agroindustry service centers, and superior plant breeding, education and training centers in the agricultural sector, industry and services; and (b) regional trade centers marked by the presence of market financial institutions, wholesale and warehousing markets [1].

The Lunang Silaut area is located in the southern part of Pesisir Selatan Regency, West Sumatra Province and administratively covers 3 Sub-districts, namely Lunang Silaut District, Basa IV District, Balai Tapan and Pancung Soal District. Lunang Silaut area in the regional context is very strategic position to be developed into a new development area because it is located in the border area of West Sumatra Province with Bengkulu Province and Jambi Province. Geographically the Lunang Silaut area
is located at 2º 05', 7' - 2º 28', 6 "South latitude and 101º 00' - 101º 12 '3" East longitude, with an area of 56,984 Ha.

The concept of sustainable development began to be formulated in the late 1980s in response to previous development strategies that were more focused on the main objectives of high economic growth, and which proved to have caused degradation of production capacity and environmental quality as a result of excessive exploitation of resources. At the city and local government level, urban development strategies and integrated development plans can prioritize investment decisions and encourage synergy and interaction between several separate urban areas. At the level of the housing environment, plans and layout for the development of roads and public spaces can improve urban quality, social cohesion and inclusion, and protection of local resources.

The success of the KTM Lunang Silaut development program cannot only be seen from the perspective of the physical development of city infrastructure, but also needs to be seen from the perspective of its environmental carrying capacity, as well as the perspective of its economic impact on the community. The purpose of the study was to investigate the effect of the independent variables of infrastructure development and ecological carrying capacity on the dependent variable of the Integrated Economic Impact of the Independent City of Lunang Silaut, West Sumatra.

2. Literature review

2.1. Independent integrated city
According to [2], a self-contained integrated city (KTM) is a village or area that grows and develops as a collection, processing, distribution and service center of the Transmigrant Development Area (WPT) designed as a direction for structured development of residential unit's transmigration and surrounding villages in one infrastructure network unit and regional economic unit.

The objective of the KTM development is to increase the ease of meeting various basic needs that enable the opening of opportunities for socio-economic growth of transmigrant regions and create centers of business activity that attract investors as an effort to develop the economic activities of transmigrants and surrounding communities. The target of developing the Integrated City of Independent is the availability of social, economic and government facilities to serve the basic / living needs of the transmigrants and the surrounding villages, the infrastructure and facilities to support the business activities of the transmigrants and the surrounding villages and the establishment of business activity centers to grow economic activities in the area transmigration

2.2. Tourism development
Vaughn and Pollard [3], stated that infrastructure in general includes roads, bridges, water and sewage systems, airports, ports, public buildings, and also includes schools, health facilities, prisons, recreation, power generation, security, fire, landfills, and telecommunications.

The prepared infrastructure also needs to be adjusted to the needs of each region, so that it can improve its welfare. Infrastructure needed by developed countries is certainly different from what is needed by developing countries even backward. The same is true for urban and rural areas, or industrial areas with agricultural and coastal regions or islands.

2.3. Ecological carrying capacity
According to the [4], the carrying capacity and capacity of the environment is the ability of the environment to be able to support human life, other living things, and the balance between the two. Thus, the concept of carrying capacity in general can be seen from two sides, namely:

- In terms of availability, by looking at the characteristics of the region, the potential of natural resources in an area.
- In terms of needs, namely by looking at the needs of humans and other living things and the direction of the priority policy of a region.
The carrying capacity and capacity of the environment in spatial planning is intended to make spatial use based on spatial planning not to exceed the limits of environmental capabilities in supporting and accommodating human activities without causing environmental damage. These capabilities include the ability to provide space, the ability to provide natural resources, and the ability to improve environmental quality if there are impacts that disrupt the balance of the ecosystem. Spatial planning that ignores the carrying capacity of the environment will certainly cause problems and degradation of environmental quality such as floods, landslides and droughts, pollution and so on.

Suratmo explained the impact is any change that occurs in the environment due to human activities [5]. The impact of a development project on socio-economic aspects, especially for developing countries, is found in the following components that are defined as indicators of socio-economic, among others: (1) employment, (2) the development of economic structures, namely the emergence of other economic activities due to the project such as shops, stalls, restaurants, transportation, etc., (3) increasing community income, (4) public health, (5) community perception, (6) population growth, and so on.

Therefore, [6] conducted a study which is a study of the development of the Integrated Independent Area model with the One Village One Product (OVOP) approach in an effort to empower the economy of the Transmigration area to become independent by developing superior products with high competitiveness in the domestic and global markets. [7] conducted a study to analyze territorial aspects (suitability of commodity land, superiority, land cover, land characteristics, geology, regional hierarchy), and integrate it for the design of land use and KTM spatial planning.

According to [8] in their research stated that the carrying capacity of resources and the environment is the foundation of sustainable development has often been the concern of researchers. The writing aims to discuss the main concepts of the carrying capacity of resources and the environment and the problems that arise. According to [9] in his research explained that land carrying capacity (LCC) explains whether local land resources are effectively used to support economic activities and/or human populations. According to [10] in his research revealed that electricity infrastructure, labor, and development expenditure have a positive and significant influence on economic growth.

3. Methodology

The research design used is quantitative and causal. Respondents of the study amounted to 150 stakeholders of the Independent Integrated City of Lunang Silaut region representing the Government, private parties, non-governmental organizations, and local residents. Data was collected using a questionnaire instrument designed as a closed question with five choices of Likert scale answers. The infrastructure development questionnaire numbered 10 items, the ecological carrying capacity questionnaire numbered 24 items and the economic impact questionnaire numbered 16 items. Data analysis uses multiple regression which is preceded by data requirements test: normality, multicollinearity, autocorrelation, and heteroscedasticity. The research error rate was set at 5%.

Based on the description of relevant research and research concepts, the research framework can be identified as follows:

![Figure 1. Research Framework](image)
Hypotheses
H1 Infrastructure development (X1) affects the economic impact (Y)
H2 Economic carrying capacity (X2) affects the economic impact (Y)

4. Results

4.1. Instrument validity and reliability test
Test the validity and reliability of the instrument carried out on 30 respondents with a summary of the results of the instrument validity and reliability testing as follows:

| Variable | r-count | r-table | Conclusion | Alpha Cronbach | Conclusion |
|----------|---------|---------|------------|----------------|------------|
| PI (X1)  | 0.853-  | 0.361   | Valid      | 0.973          | Reliable   |
|          | 0.891   |         |            |                |            |
| DDE (X2) | 0.866-  | 0.361   | Valid      | 0.990          | Reliable   |
|          | 0.927   |         |            |                |            |
| DE (Y)   | 0.885-  | 0.361   | Valid      | 0.988          | Reliable   |
|          | 0.919   |         |            |                |            |

The summary of the results of the validity and reliability of the instrument above shows that all research instruments are valid and reliable so that they can be disseminated to collect data.

4.2. Descriptive statistics
The results of research data collection if described statistically are as follows:

| Variable | N  | Range | Minimum | Maximum | Sum  | Mean | Std. Deviation | Variance |
|----------|----|-------|---------|---------|------|------|----------------|----------|
| PI       | 150| 32    | 18      | 50      | 5100 | 34.00| 5.975          | 35.705   |
| DDE      | 150| 72    | 48      | 120     | 12600| 84.00| 14.463         | 209.181  |
| DE       | 150| 51    | 29      | 80      | 8175 | 54.50| 9.823          | 96.493   |
| Valid N  |    |       |         |         |      |      |                |          |
|          |    |       |         |         |      |      |                |          |

4.3. Test data requirements
Data collected successfully before being used to test the research hypothesis needs to be tested for data requirements including normality, multicollinearity, autocorrelation, and heteroscedasticity. The data requirements test results show:

- All research variable data are normally distributed
- The research model is free from symptoms of autocorrelation, multicollinearity and heteroscedasticity

4.4. Hypothesis testing
The results of hypothesis testing are as follows:

| Model | R     | R Square | Adjusted R Square | STD. Error of the Estimate |
|-------|-------|----------|-------------------|---------------------------|
| 1     | .914+ | .836     | .834              | 4.005                     |

a. Predictors: (Constant), DDE, PI
Table 4. ANOVA²

| Model      | Sum of Square | df | Mean Square | F     | Sig.  |
|------------|---------------|----|-------------|-------|-------|
| 1 Regression | 12019.218     | 2  | 6009.609    | 374.600 | .000⁵ |
| Residual   | 2358.282      | 147| 16.043      |        |       |
| Total      | 14377.500     | 149|             |        |       |

a. Predictors: (Constant), DDE, PI  
b. Dependent Variable: DE

Table 5. Coefficients⁴

| Model      | Unstandardized Coefficients | Standardized Coefficients | t | Sig.  |
|------------|----------------------------|---------------------------|---|-------|
| 1 (Constant)| 1.254                      | 1.974                     | .635 | .526 |
| PI         | .782                       | .116                      | .476 | 6.757 | .000 |
| DDE        | .317                       | .048                      | .476 | 6.634 | .000 |

a. Dependent Variable: DE

Hypothesis test results show that:
- Simultaneously infrastructure development and environmental carrying capacity have a significant effect on economic impacts, with sig. F = 0.000 which is smaller than 0.05
- Partially infrastructure development has a significant effect on economic impact with the Sig. t = 0.000 which is smaller than 0.05. Thus H1: proven
- Partially, the ecological carrying capacity has a significant effect on economic impact with the Sig. t = 0.000 which is smaller than 0.05. Thus H2: proven
- Both the independent variables of infrastructure development and the carrying capacity of the economy can explain the dependent variable of the economic impact of 83.6% (0.836)

5. Discussion

The results of the above analysis are in line with Maqin's [10] research which states that infrastructure development has a positive and significant influence on economic growth. The results of the above analysis are also in line with the research of Tian and Wang [8] and Qian et al [9] which state that the carrying capacity of resources and the environment is the foundation of sustainable development, and the carrying capacity of the land explains whether local land resources are effectively used to support economic activities and/or human population.

The new growth theory incorporates infrastructure as an input in influencing aggregate output and is also a possible source of increasing the limits of technological advances obtained from the emergence of externalities in infrastructure development. Infrastructure externalities affect production activities by providing accessibility, convenience and the possibility of more productive production activities. Thus it can be said that public capital and private capital are complementary in production, and infrastructure as part of public capital has an important role in economic growth.

Efforts to reunite economics and environmental have important meaning in the effort to realize sustainable development. The process of integrating both is through the formulation of paradigms and policy directions that rely on partnerships and the participation of development actors in managing resources as optimally as possible. In order for the development to be carried out to grow the economy without causing a lot of environmental damage, the concept of sustainable development is needed, namely the concept of economic growth which continues to maintain the natural resources used, as well as strategies for environmental integration into economic development.
6. Conclusion
Infrastructure development and ecological carrying capacity partially and simultaneously have a significant effect on the economic impact of the Independent Integrated City of Lunang Silaut, West Sumatra. It is strongly recommended that economic development in integrated areas such as in Lunang Silaut requires the development of measurable infrastructure and prioritizing the carrying capacity of the ecological environment for sustainable development.

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