Peri-urban interaction and connectivity to the development area of Indragiri Hulu Regency, Riau Province

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Abstract. Indragiri Hulu Regency is geographically surrounded by three regencies in Riau Province, namely Pelalawan, Kuantan Singingi and Indragiri Hilir. In accelerating the development of peri-urban areas through inter-regional interaction, research was conducted to determine the strength of urban peri-urban interaction and connectivity, to determine the fastest growing urban peri-urban and to determine the location of peri-urban boundaries. The analytical method used descriptive qualitative analysis, gravity model, interaction strength analysis, stop point and connectivity index. The results of the research were obtained the highest interaction strength, connectivity index, level of social relations, economy and accessibility found in peri-urban III (Kuantan Singingi-Indragiri Hulu).

Keywords: Peri-Urban, Interaction, Connectivity, Indragiri Hilir

1. Introduction

The Spatial interactions are the efforts to get up the social economic development, to reduce the regional disparities and to preserve the environment. The spatial interactions between regions will form the activities that called interactions zones. There are three factors that influenced the spatial interactions, such as regional complementary, intervening opportunity and the spatial transfer ability \cite{1}. The spatial interactions between regions were needed to improve the quality of regional development.

The national development of Indonesia has general objective to actualize the people welfare and the equity across the region. But the facts, there were many problems occurred. One of the problems was encountered the lack of development in border areas (peri-urban). Nowadays, the peri-urban areas identical to rural areas, agricultural areas and poor areas. So it needs a development policy that considers the potency and deficiency of the peri-urban areas.

Indragiri Hulu is one of regency in Riau Province that surrounded by three regencies in Riau Province, namely Pelalawan, Kuantan Singingi and Indragiri Hilir. That is the opportunities to accelerate the development in peri-urban areas that directly adjacent by other regency. Moreover, Indragiri Hulu regency became the main access to the other regency and categorized as strategic areas based on Spatial Plan documents of Indragiri Hulu regency year of 2011. The rule of Indragiri Hulu Regency on the regional constellation in Riau Province was 7.39 percent (rank of 8 from 12 regencies in Riau Province) from Riau Gross Regional Domestic Product. Based on that, Indragiri Hulu Regency categorized as five regencies with the low Gross Regional Domestic Product in Riau Province. In the other hand, Indragiri Hulu Regency has the enhancement pattern of Gross Regional Domestic Product between 2012-2015 \cite{2}.
Based on above explanation, we have interest to determine the peri-urban interaction and connectivity to the development area of Indragiri Hulu Regency, Riau Province. The research goal was to determine the strength of urban peri-urban interaction and connectivity, to determine the fastest growing urban peri-urban and to determine the location of peri-urban boundaries. In this research, we divided the peri urban areas in Indragiri Hulu Regency into three peri urban areas, there were:

a. Peri-Urban I : These peri urban consisted of Lirik Sub District (Indragiri Hulu Regency) and Ukui Sub District (Pelalawan Regency).
b. Peri-Urban II : These peri urban consisted of Kuala Cinaku Sub District (Indragiri Hulu Regency) and Kempas Sub District (Indragiri Hilir Regency).
c. Peri-Urban III: These peri urban consisted of Peranap Sub District (Indragiri Hulu Regency) and Cerenti Sub District (Kuantan Seningi Regency).

![Research Map (Indragiri Hulu Regency)](image)

Figure 1. The Research Map (Indragiri Hulu Regency)

### 2. Methodology

This research was used quantitative approach that form of scientific approach that consider the fact with classification, concrete, observable and measurable attribute, the relationship between variables has causality with the form of number and statistical analysis. The data type in this research was secondary data. Secondary data are the sources of research data that was obtained by researcher indirect with intermediaries [3]. Deeper, [3] explained that the secondary data commonly in the form of evidence, notes or historical reports that have been archived and has been published or not. The secondary data in this research were:

a. The number of populations in peri-urban areas
b. The distance between peri-urban areas
c. The demographic data of peri-urban areas

In this research, the analysis divided into three steps, there are:

#### 2.1 Determine the strength of Peri-urban Interaction

The analysis was used to determine the strength of peri-urban interaction is Gravitation method. The formula is as follows:

\[ I_{AB} = k \frac{p_A \cdot p_B}{(d_{AB})^2} \]
2.2 Determine the Strength of Peri-urban Connectivity

The analysis to determine the strength of peri-urban connectivity was used graphic method. The analysis has a purposed to know the accessibility and the movement in the region. The equation is as follows:

\[ \beta = \frac{e}{V} \]

(Source : \cite{4})

\[ (1) \]

**I_{AB}** = The strength of interaction between two areas

**k** = Theempericalconstans,

**P_A** = Number of populations in area A

**P_B** = Number of populations in area B

**d_{AB}** = Absolute distance between two areas.

The results of the strength of peri-urban interaction and connectivity was used to determine the fastest growing peri-urban areas. The area with highest interaction and connectivity values means the area was growing faster than other area.

2.3 Determine the Location of Peri-urban Boundaries

This part was used The Breaking Point method to determine the boundaries between the peri-urban areas. The results has a purposed as the site selection of activity or community centers. The equation is as follows:

\[ TH_{AB} = \frac{d_{AB}}{1 + \sqrt{\frac{P_B}{P_A}}} \]

(Source: \cite{4})

\[ (3) \]

**TH_{AB}** = The distance to end point, which the starting point was the area with the small amount of populations.

**d_{AB}** = The distance between area A and B

**P_A** = The number of populations in area A

**P_B** = The number of populations in area B

3. Results and Discussion

3.1 The Strength of Peri-Urban Interaction Analysis

Based on the analysis results showed that peri-urban III (Peranap Sub District-Cerenti Sub Districts) with value is 2.599 903.7. The results mean between two areas, there was the high frequency of social and economic relations. It is because the distance between the two areas was close so that simplify the accessibility between them. The analysis results of the strength of peri-urban interaction can be showed at table 1.
Table 1. The Strength of Peri-Urban Interaction

| No | Area       | The Strength of Peri-Urban Interaction | Ranked |
|----|------------|----------------------------------------|--------|
| 1  | Peri urban I | 1.731.163,7                           | II     |
| 2  | Peri urban II| 331.072,9                              | III    |
| 3  | Peri urban III| 2.599.903,7                           | I      |

3.2 The Strength of Peri-Urban Connectivity Analysis

Based on the results (table 2) of connectivity, the peri urban area III has the highest index (1.66) and peri urban area I has the lowest index (1.41). From the results mean the Peranap Sub District-Cerenti Sub Districts has good connectivity because they had a good amount of roads.

Table 2. The Strength of Peri-Urban Connectivity

| No | Area       | The Strength of Peri-Urban Connectivity | Ranked |
|----|------------|----------------------------------------|--------|
| 1  | Peri urban I | 1.41                                   | III    |
| 2  | Peri urban II| 1.5                                    | II     |
| 3  | Peri urban III| 1.66                                  | I      |

The next analysis was to determine the fastest growing peri urban area using the results of interaction and connectivity. Based on the results the order of the fastest growing area is peri urban III, peri urban I and peri urban II. That means peri urban area III was categorized as the fastest growing area in Indragiri Hulu Regency.

3.3 The Location Analysis of Peri-Urban Boundaries

The purpose of this analysis was to determine the location placement of activities or social centers between the peri urban area such as gas station, hospital, school and the others. This is as a strategy for regional development. The analysis results of location peri urban boundaries shown in table 3.

Table 3. The Distance of Peri-Urban Boundaries

| No | Area       | The Distance of Peri-Urban Boundaries | Remarks                      |
|----|------------|--------------------------------------|------------------------------|
| 1  | Peri urban I | 13.16                                | Starting point at Lirik Sub-District |
| 2  | Peri urban II| 14.04                                | Starting point at Kuala Cinaku Sub-District |
| 3  | Peri urban III| 5.54                                 | Starting point at Cerenti Sub-District |

Based on the results of this research, we can know that peri urban III (Peranap Sub District-Cerenti Sub Districts) has a good value of interaction, connectivity and the boundary distance. That means this peri urban III can be developed into new development areas in Indragiri Hulu Regency with their interaction to Kuantan Sengingi Regency. It is very useful referrals to the Indragiri Hulu Regency and Kuantan Sengingi Regency. But in fact, there are still many factors can be included to determine the development area in peri urban areas, but in this research only used the interaction and connectivity variables and that became the research limitations.

4. Conclusions

So the conclusion of this paper is drawn as follows:

1. Based on interaction analysis, peri urban III (Peranap Sub Districts and Cirenti Sub District) has a high value of interaction, an amount of 2.599.903,7 and peri urban II with the lowest value with the amount of 331.072,9.
2. Based on connectivity analysis, peri urban III (Peranap Sub Districts and Cirenti Sub District) has a high index of connectivity, an amount of 1.66 and peri urban I (Lirik Sub Districts and Uku Sub Districts) with the lowest value with the amount of 1.41.

3. Refers to interaction values and connectivity index, can be concluded that peri urban III (Peranap Sub Districts and Cirenti Sub District) categorized as the fastest growing area.

4. Based on location analysis of peri-urban boundaries, peri urban III have the low distance with the value amount of 5.54 and peri urban II (Kuala Cinaku Sub Districts and Kempas Sub Districts) has the highest distance with the value amount of 14.04.

5. Based on the results of this research, peri urban III (Peranap Sub District-Cerenti Sub Districts) can be developed into new development areas in Indragiri Hulu Regency.

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