

Analysis of Potencies and Investment Opportunities in East Java Based on Geographic Information System

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Abstract - Investment is one of indicators to economic growth and to this effort to ensure sustainable economic growth efforts need to be made investment have been dealt with. At the time there is no a system accurate provides the potential and investment opportunities in a region. So that related department experienced difficulty in attract investor to invest capital and realize investment. The system to be built is Web-based Geographic Information System which provides information on potential and investment opportunities in East Java. The system is combined with Gross Regional Domestic Potential data using Identified Sector Location Location Quotient (LQ) Identification Technique, Growth Ratio Model Analysis, Shift Share Analysis and Overlay Analysis using classifier modeling to know the indication of grouping of sub-regions in an area. In the Kediri district case study the potentials and opportunities of the fishery sector can be seen directly through the geographic information system application.

Keywords: *Geographic Information System, Growth Ratio Model Analysis, Location Quotient Analysis, Shift Share Analysis, Overlay Analysis.*

I. INTRODUCTION

Regional potential within the framework of development is defined as the ability, strength and ability in the economic field owned by a region [1]. In the effort of development of a region, the area will utilize potential aspects that can be in the form of natural resource potential, human resource potential, geographical potential and other supporting facilities and infrastructures [2]. Thus, to see the economic potential of a region, it is identified not only natural resources or the ability to procure raw materials and human resources or the ability of the procurement of its workforce, but also aspects affecting other economic productivity, namely geographic potential, social and cultural environment and facilities and infrastructure [3].

Regional potential is an important part of development planning in Indonesia because it can double function in economic growth [4]. First, the economic potential as an input productive activity that encourages economic growth. Secondly, as a medium of increased investment activities of the region which ultimately also affects economic growth. When

the potential of the region functions in an increase in capital investment, then it has another multiplier effect such as increased employment, decreased crime rates, poverty reduction, and the like.

Regional potentials as inputs of productive economic activities. In the conceptual economy, natural resources, human resources, technology and other social capital is the input of productive economic activity, namely the activity of producing output both goods and services [5]. BPS classifies productive economic activities into 17 sectors while the Capital Investment Coordinating Board classifies them into 3 main sectors, namely primary, secondary and tertiary sectors. The primary sector group consists of Sectors: 1) Agriculture, and 2) Mining and Quarrying. Secondary sector group consists of Sector: 1) Manufacturing Industry, 2) Electricity & Clean Water, and 3) Building / Construction. The tertiary sector consists of Sectors: 1) Trade, Hotel & Restaurant, 2) Transportation & Communications, 3) Finance, Leasing, & Services Companies, and 4) Services. The twenty-four sectors are engaged in productive economic activities that ultimately produce output in the form of goods and services [6].

II. LITERATURE STUDY

Geographic Information System (GIS) can be defined as an integrated information system for there is a special levy processing the data have the information spatial. In GIS, we can edit the data in the form of maps or specific information, analyze spatial information, maps of the area and present all of the results of operations. In this present era, GIS is a tool that is very useful to analyze the suitability of the land [6]. There are two types of data in a GIS coordinate the data and data raster. Vector data in form points, a line or polygon. Vector data used to make a map administrative or development plan. Raster data is spatial data that shows the appearance of the earth's surface obtained from remote sensing satellite imagery [7]. SIG complete includes methodology and technology required, the data spatial hardware, software and the organizational structure [8]. GIS is system that could support decision-making spatial and can integrating description location by characteristic of the phenomenon of found in the location [9].

III. METHODOLOGY

In order to promote local investment, the regions need to have information on investment potential and opportunities (investment) from the sector or field of investment business as described previously [10]. This information is in the form of quantitative data of regional potential level through 5 analytical techniques such as 1) LQ analysis; 2) MRP analysis; 3) Overlay Analysis; 4) Shift Share Analysis; 5) Klassen Tipology Analysis. The next five analyzes are described below.

1. Analisa Location Quotient (LQ)

LQ analysis is an analysis used to indicate the size of the role and identify potential economic sector / subsector (base sector), which has comparative advantage in a region. Approach analysis conducted in identifying the leading sector by conducting Location Quotient (LQ) [11]. Location Quotient (LQ) is a technique used to determine the capacity of the regional economy. This technique is used to measure the concentration of an economy in a region by comparing its role in the regional economy with the same economic role in the regional economy, or used to identify the sectors and sub-sectors of activities that have excellent potential [12].

This method is used to identify sectors and sub sectors of economic activity that have potential in Kediri Regency. The formulation of this analytical tool which can be seen in (1):

$$LQ = \frac{S_{ik}/PDRB_K}{S_{iP}/PDRB_P} \times 100 \quad (1)$$

Where,

From the results of this LQ calculation can be seen that if:

- LQ of a sector > 1 is said to be the base sector, since the contribution of sector i in the study area is greater than the contribution of the same sector in the reference area.
- LQ of a sector < 1 is said not the base sector, since the contribution of sector i in the study area is smaller than the contribution of the same sector in the reference area.
- LQ of a sector $= 1$ is said to be the provincial level sector level or sector specialization in the study area equal to the same sector in the reference area.

2. Growth Ratio Model Analysis (MRP)

The Growth Ratio Model Analysis (MRP) is an analysis used to identify potential economic sector / subsector based on GDP growth criteria (competitive advantage) [13].

MRP analysis is conducted to mlihat description of economic activities, especially economic structure of Kediri regency that emphasizes the growth criteria both externally (province) and internal (Kediri Regency). The MRP analysis approach can be divided into two, namely: (1) Growth Ratio, and Growth Ratio of Study Area. RPR compares the growth of each activity in the context of East Java province with East Java Province GRDP. Further analysis compares the growth of each activity in the context of the region Kediri Regency with

Gross Regional Domestic Growth of Kediri Regency (regional scope). If the RPR value is greater than 1 then RPR is said (+) and if RPR smaller than 1 is said (-). RPR (+) indicates that the growth of a particular activity is at the Provincial or Territory level Kabupaten Kediri higher than growth PDRB Province or PDRB region Kabupaten Kediri. Vice versa if RPR (-). while RPS comparing the growth of activities at the regional level Kabupaten Kediri with the growth of relevant activities at the Provincial or Territory level Kabupaten Kediri. When the growth of an activity at the level of Kediri regency is higher than the growth of the activity at the provincial / district level of Kediri is identified as (+), vice versa if RPS (-). From the Fig. 1 analysis of MRP, will be obtained the real value and nominal value then the combination of the two perbandngan will be obtained description of potential economic activities, namely;

<p>K2 RPR_k (+) RP_s (-) shows that these activities at the provincial level have prominent growth but at the district level. Kediri not yet prominent</p>	<p>K1 RPR_k (+) RP_s (+) → dominant growth shows that these activities at the provincial level have a prominent growth and so are at the regional level Kab, Kediri</p>
<p>K4 RPR (-) RPS (-) Show that the activity has low growth at the provincial level and Kabupaten. Kediri</p>	<p>K3 RPR (-) RPS (+) Indicates that the activity is not prominent in the province but at the Kediri Regency level the activity stands out to mean that this activity contributes potentially</p>

Fig. 1. analysis of MRP

3. Overlay Analisis

Overlay analysis is intended to view a description of potential economic activity based on growth criteria and contribution criteria. There are four possibilities in overlay analysis in Fig. 2;

<p>K2 Growth (+) and contribution (-) indicate a sector (subsector) whose growth is dominant but its contribution is small.</p>	<p>K1 Growth (+) and contribution (+) show a sector (subsector) that is very dominant both from growth and from its contribution</p>
<p>K4 Growth (-) and contribution (-) indicate a sector (subsector) that is not potential either growth criteria or its contribution.</p>	<p>K3 Growth (-) and contribution (+) indicate a sector (subsector) whose growth is small but its contribution is large.</p>

Fig. 2. four possibilities in overlay analysis

4. Shift Share Analisis

Shift-Share analysis is an analysis used to identify competitive advantage and know the level of economic specialization in a region.

Shift-Share analysis is a technique that describes the performance (performance) of sectors in a region compared to the performance of the sectors of the national economy. Thus can be found shift (shift) the results of regional economic development, if the region get progress more slowly or faster than the national progress. Previous researchers [14], argued that shift-share analysis is a very useful technique in analyzing

changes in economic structure compared to the national economy. This technique compares the rate of growth of sectors in a region with the rate of growth of the national economy and its sectors, and observes deviations from those comparisons. If the deviation is positive, it is called the competitive advantage of a sector within the region.

There are two equation approaches that can be used to measure the economic growth of a region [14], which can be seen in (2):

$$G = NS + IM + RS \quad \text{or} \quad G = RP + RS \quad (2)$$

with :

G = Regional Economic Growth = $(Eri(t+1) / Eri(t))$, to measure the growth of regional gross added value from year to year.

NS = National Share = $(En(t+1) / En(t))$, to measure national gross value added growth year after year.

IM = Industrial Mix = $\{ (Eni(t+1) / Eni(t)) - (En(t+1) / En(t)) \}$, to measure the growth of gross national added value of sector i than its total sector.

RS = Regional Shift = $\{ (Eri(t+1) / Eri(t)) - (Eni(t+1) / Eni(t)) \}$, to measure growth of gross added value of sector i region compared to growth of national gross value added of sector i .

RP = Regional Proportion ($RP = NS + IM$).

5. Tipology Klassen Analisis

Klassen Tipology is an analysis used to determine the relative potential of sector / sub-sector of Kediri Regency to other districts / cities as East Java Province. In the marticular table of typology klassen, there are two approaches; namely the sectoral approach and the approach of local or regional. Basically Klassen typology method divides the area based on two main indicators, namely regional economic growth and regional per capita income by determining the average economic growth as a vertical axis and average per capita income as a horizontal axis. The observed area can be divided into four classifications in Fig. 3 and Fig. 4:

1) The area is fast forward and fast growing (High growth and high income) is the rate of growth PDRB and per capita income is higher than the average national average percapita growth and income.

2) The area is advanced but depressed. (high income but low growth) ie a relatively advanced region, but in recent years the rate of growth has declined due to the depressed main activities of the region concerned. This area is an area that has been developed but in the future growth will not be so fast although the potential for development is basically very large. This region has higher per capita income but its economic growth rate is lower than the national average.

3) The area is growing fast (high growth but low income) is a fast-growing region with huge potential development potential but not fully processed properly. The level of regional economic growth is very high, but the per capita income level reflecting from the stage of development that has

been achieved is actually still relatively low. This area has a high growth rate but percapita income level is lower than the national average.

4) The area is relatively left behind (low growth and low income) is an area that still has a growth rate and percapita income is lower than the national average.

Quadrant I The forward and growing very rapidly $g_i > g_1 \quad gk_i > gk$	Quadrant II Regional forward but depressed $g_i < g_1 \quad gk_i > gk$
Quadrant III he regions that can still be perkembang by leaps and bounds $g_i > g_1 \quad gk_i < gk$	Quadrant IV The relative left behind $g_i < g_1 \quad gk_i < gk$

Fig. 3. Classifications klassen typologies regional approach

As for the sector, picture klassennya typology is as follows:

Quadrant I The forward and growing by leaps and bounds $g_i > g_1 \quad s_i > s$	Quadrant II Forward but depressed sector $g_i < g_1 \quad s_i > s$
Quadrant III Potential sectors or can still be growing very rapidly $g_i > g_1 \quad s_i < s$	Quadrant IV The relative left behind $g_i < g_1 \quad s_i < s$

Fig. 4. Classifications klassen typologies regional approach for sector

a) *advanced and growing sectors (Quadrant I).*

This quadrant is a sector quadrant with a growth rate of PDRB (g_i) greater than the growth of the reference area or nationally (g) and has a contribution to PDRB (s_i) greater than the sector's contribution to the PDR regional PFR which is the reference or national (s). This classification is commonly denoted by $g_i > g$ and $s_i > s$.

b) *Sector advanced but depressed (Quadrant II).*

The sectors in this quadrant have a lower GDP growth value (GDP) than the GDP growth of the reference region or nationally (g), but contribute to regional GDP (PDRB) greater than the contribution of the sector's value to the regional GDP which is the reference or nationally (s). This classification is usually denoted by $g_i < g$ and $s_i > s$.

c) *Potential sector or still can grow rapidly (Quadrant III).*

This quadrant is a quadrant for a sector that has growth value PDRB (g_i) which is higher than growth PDRB areas of reference or nationally (g), but the contribution of the sector to PDRB (s_i) is smaller than the contribution value of the sector to PDRB areas of reference or nationally (s). This classification is commonly denoted by $g_i > g$ and $s_i < s$.

d) *The relatively lagging sectors (Quadrant IV).*

This quadrant is occupied by a sector that has a growth value PDRB (g_i) which is lower than growth PDRB areas of reference or national (g) and at the same time have the contribution to PDRB (s_i) which is smaller than the value of the sector's contribution to PDRB areas of reference or nationally (s).

IV. EXPERIMENTAL RESULT

1. Level Potency of Investment Regions

1.1 Analisa Location Quotient (LQ)

In the process of economic development planning, local governments prioritize the development and strengthening of sectors in the economic field by developing, improving and utilizing existing resources optimally. Uky [15], stated that within the framework of achieving the objectives of regional economic development, it needs a development policy based on regional peculiarities (endogenous development), using local potential resources, economic development in the region requires special attention and handling.

Each region has different potential with other regions. In the implementation of regional economic development required the existence of appropriate planning and strategy targets, because in every region the situation is not the same. Each region has the characteristics and potential of different areas with each other. The diverse regional potential will shape the structure of the regional economy. Regional economic structure can be seen from the contribution of each sector of the economy to PDRB. By knowing the description of the regional economic structure, the economic development efforts can be more directed in accordance with the potential of the region.

As a first step to identify potential regional potentials, the economic base model can be used. The indicator that an economic sector can be categorized as economic sector is able to become the base sector, that is if it has a Location Quotient (LQ) value greater than one ($LQ > 1$). Whereas if it has a value less than one ($LQ < 1$) then belong to the non-base sektor. Locations Quotient Analysis (LQ) used to know the sectors of the economy in PDRB which can be classified into the base sector as well as non-base sectors. From calculation based on Location Quotient analysis (LQ) the following results are obtained:

To calculate the value LQ, then the data needed is data PDRB Kabupaten Kediri dan value PDRB East Java Province. Based on the results of the analysis LQ, of the 17 sectors and their sub-sectors based on business fields that play a role in economic activity Kabupaten Kediri, as many as eight sectors that become the leading sectors in the economic movement Kabupaten Kediri. 8 The sectors are 1) Agriculture, Forestry and Fisheries; 2) Large and Retail Trade; Car and Motorcycle Repair; 3) Information and Communication; 4) Real Estate; 5) Mandatory Government, Defense and Social Security Administration; 6) Educational Services; 7) Health Services and Social Activities; 8) Other Services. More can be seen in TABLE I below.

1.2 Results Calculation Analysis LQ

From LQ analysis result from agriculture, forestry and fishery category data from 2011 to 2015 generated average: 1.96 Base, mining category and average quarrying: 0.34 Non Basis, category of processing industry average: 0.66 Non Basis, category of electricity and gas procurement average: 0.17 Non Basis, Category of Water Supply, Waste Management, Waste and Recycling averages: 0.57 Non Basis, Average Construction

Category: 1.01 Basis, Category of Large and Retail Trade; Average Car and Motorcycle Activity: 1.10 Base, Transportation and Warehouse category on average: 0.56 Non Basis, Category of Accommodation and Drinking Average Drinking: 0.26 Non Base Base, Information and Communication Category on average: 1.05 Base, Average category of Financial Services and Insurance: 0.70 Non Basis, Real Estate category average: 1.22 Base, Category of Service Company average: 0.38 Non Basis, category Administration, Defense and Social Security Compulsory Average: 1.63 Basis, Average educational services category: 1.85 Base, category Health Services and Average Social Activities: 1.26 Basis, Other Service categories on average: 1.26 Basis.

Furthermore, to know the sub-sectors that have competitive advantage then analyzed the Growth Ratio Model (MRP). This data processing uses the average growth PDRB sector in Kediri Regency and East Java Province.

1.3 Analysis results Growth Ratio Model Analysis

From the result of Growth Ratio Model analysis from agriculture, forestry and fishery category data from 2011 until 2015, the growth value 1, the mining category and the 1s growth value growth, the category of growth value 1 industry, the category of electricity procurement and gas the value of growth 1, categories of Water Supply, Waste Management, Waste and Recycling of growth value 1, category of growth value 1, Large and Retail Trade category; Caring and Motorcycles value growth 1, Transportation category and Warehouse growth value 1, category of Accommodation and Feeding Provision Drinking growth value 1, category Information and Communication growth value 1, Financial Services and Insurance growth value 1, Real Estate category growth value 1, category Company Services growth value 1, category Administration Government, Defense and Social Security Mandatory growth value 1, category Education services growth value 1, category Health Services and Social Activities growth value 1, category Other Services value growth 1.

So from several categories of growth Kediri district with the growth of East Java balanced with the decision of one.

1.4 Analysis of Overlay

After doing the analysis LQ and MRP, the analysis is continued by using Overlay analysis which aims to derive a description of potential economic activity in a region based on growth criteria (analysis of the study area or RPs) and contribution criteria (LQ analysis results). According to Kadek [13], there are four possibilities in this analysis: a combination of potential economic sectors or sub-sectors that describe the state of an area as follows:

Overlay analysis results are an analysis used to obtain a description of potential economy based on growth and contribution criteria. Overlay analysis is intended to view a description of potential economic activity based on growth criteria and contribution criteria.

Based on the result of Overlay analysis then obtained, the result in TABLE I below. In TABLE I below shows there are 16 sectors in Kediri Regency indicating that the activities in the

sector is a sector (sub-sector) is very dominant both from growth and from its contribution at the level of Kediri regency. However, there is one sector in Kediri Regency such as electricity and gas procurement sector which is categorized as quadrant 3. This means that the sector of Electricity and Gas Procurement in Kediri Regency is a small economic activity but its contribution is big in Kediri Regency. More can be seen in TABLE I below.

1.5 Result of Overlay Analysis

Result of Overlay Analysis from data of agriculture, forestry and fishery category in 2011 until 2015 resulted in growth value 4, mining category and excavation growth value 4, category of processing industry growth value 4, electricity procurement category and gas value growth 3, categories of Water Supply, Waste Management, Waste and Recycling of growth value 3, category of growth value value 3, category of Big and Retail Trade; Car and Motorcycles growth value 3, Transportation category and Warehouse growth value 3, category of Accommodation and Feeding Provision Drinking growth value 3, category Information and Communication growth value 3, Financial Services and Insurance growth value 3, Real Estate category growth value 3, category of Corporate Services growth value 3, category of Government Administration, Defense and Social Security Mandatory growth value 3, category Education Services growth value 3, category Health Services and Social Activities growth value 3, category Other Services growth value 3.

1.6 Shift Share Analysis

Shift-Share Analysis is a technique that describes performance (performance) sectors in a region compared to the performance of the sectors of the national economy. Thus can be found shift the results of regional economic development, if the region get progress more slowly or faster than the national progress. Previous researchers [14], suggests that shift-share analysis is a very useful technique in analyzing changes in regional economic structures compared to the national economy. This technique compares the rate of growth of sectors in a region with the rate of growth of the national economy and its sectors, and observes deviations from those comparisons. If the deviation is positive, it is called the competitive advantage of a sector within the region.

Of these two components if the quantity PS and DS expressed in a plane, with the PS value as the horizontal axis and the DS value as the vertical axis, there will be four categories of relative positions from all regions or sectors of the economy. The four categories are as follows:

- Category I (PS positif and DS positif) is a region / sector with very rapid growth (rapid growth region).
- Category II (PS negatif and DS positif) is the region / sector with the growth rate stunted but growing (depressed region that develops).
- Category III (PS positif and DS negatif) is a region / sector with slowing growth rates but potentially potential (depressed region that potential).

- Category IV (PS negatif and DS negatif) adalah areas or sectors of the depressed region with weak competitiveness and also the role of low-lying areas.

Based on the analysis, from 17 economic driving sector in Kediri Regency, there are 3 sectors included in category 1 of which are 1) Large and Retail Trade sector; car repair and Motorcycles; 2) Transportation and Warehousing sectors; and 3) Information and Communications sector. This means that these three sectors are the sectors with a very rapid growth in Kediri Regency and have great potential for development.

While the sectors included in category 2 of 3 sectors are: 1) Water Supply, Waste Management, Waste and Recycling; 2) Mandatory Government Administration, Defense and Social Security; and 3) Other Services. These three sectors are the sectors with stunted but growing growth rates.

Category 3, there are 8 sectors, including sector 1) Processing Industry; 2) Procurement of Electricity and Gas; 3) Construction; 4) Provision of Accommodation and Drinking; 5) Financial Services and Insurance; 6) Real Estate; 7) Educational Services; 8) Health Services and Social Activities. These eight sectors are sectors with stunted growth speed but potentially potential (depressed regions that potential). Some sectors included in category 4, there are 2 sectors including 1) Agriculture, Forestry and Fisheries; and 2) Mining and Quarrying. Both of these sectors are depressed regions with low competitiveness and also low roles.

1.7 Result Shift Share Analysis

The result of Shift Share Analysis analysis from agriculture, forestry and fishery category data from 2011 until 2015 was generated growth value 1, mining category and excavation of growth value 1s, category of industry value growth 1, electricity and gas procurement category 1, categories of Water Supply, Waste Management, Waste and Recycling of growth value 1, category of growth value 1, Large and Retail Trade category; Car and Motorcycles value growth 1, Transportation category and Warehouse growth value 1, category of Accommodation and Feeding Provision Drinking growth value 1, category Information and Communication growth value 1, Financial Services and Insurance growth value 1, Real Estate category growth value 1, category Company Services growth value 1, category Administration Government, Defense and Social Security Mandatory growth value 1, category Education services growth value 1, category Health Services and Social Activities growth value 1, category Other Services value growth 1. So from several categories of growth Kediri district with the growth of East Java balanced with the decision of one.

Based on some analysis above, among others LQ analysis, MRP analysis, Overlay analysis, Shift Share Analysis and Klassen Tipology Analysis, the Level of Investment Potential in Kediri Regency. Potential Level of Investment Area in Kediri Regency Based on TABLE I above, several sectors / subsectors included in the level of local investment potential are very high among others are sectors or sub-sectors 1)Agriculture, Animal Husbandry, Hunting and Agricultural Services; 2) Construction; 3) Large and Retail Trade; Reparasi Mobil and Motorcycles; 4)Transportation of land

transportation; 5)Information and Communications; 6)Financial Services; 7)Real Estate; 8)Mandatory Administration of Government, Defense and Social Security; 9) Health Services and Social Activities; 10) Other Services. Then to determine the carrying capacity of investment potential is done qualitative approach which will be discussed further in the next discussion.

2. Analysis of Offer and Request

After analyzing the potential of the region, one of the potentials of the region is the sector or sub-sector of Agriculture, Animal Husbandry, Hunting and Agricultural Services. One example to analyze the supply and demand of the case study is the potential of the fishery area is catfish. Following the analysis of supply and demand of catfish are discussed below;

Based on TABLE I total demand catfish production in the year 2016 reached 10,347.00 kg then the value of production is compared with value of market demand of catfish commodity.

TABLE I. Total Demand of Catfish Consumption Kab. Kediri

Average requests per pokdakan	Number of Pokdakan	Estimated demand for catfish for year
201.460 kg	35	7,051,100

Source : Department of Fisheries, Kediri Regency

Based on data of catfish production and demand of catfish, surplus for catfish fish commodity consumption amounted to 3,295,900 kg. Karena commodity value which become area potency have high surplus value then catfish can be offered to investor through some business field which can done from catfish.

Geographic Information System to display potential investment and investment opportunities, Regional Potential Measurement and Measurement of Regional Investment Opportunities in Fig. 5. on the basic data menu explains the Gross Regional Domestic Potential Data (PDRB - ADHB) District and East Java.

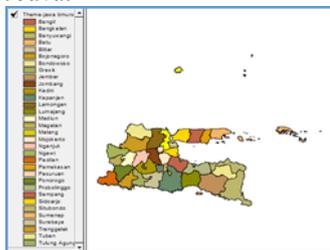


Fig. 5. Screenshot of data of catfish production and demand of catfish

V. CONCLUSION

Web-based Geographic Information System can provide information on potential data and investment opportunities in the Region of East Java in the form of a thematic map of the regions of the sector that is superior and less sectors for

investors Domestic and International Investors. From the case study of Kediri regency obtained the potential and the superior opportunity is in fishery sector.

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