SPATIAL AUTOCORRELATION UNEMPLOYMENT AND POVERTY IN THE EASTERN PART OF INDONESIA

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Abstract

This study aims to analyze the spatial interaction of unemployment and poverty in general and locally and identify patterns and structures of economic growth on the islands of Sulawesi and Papua for the 2016-2020 period. The research method used is Moran Scatterplot, Local Indicator of Spatial Autocorrelation (LISA) and Klassen Typology. Moran's Test showed on the poverty variable has a positive spatial autocorrelation and the unemployment variable has a negative spatial autocorrelation. The results of the LISA test mapped the poverty variable in 2016 into L-L criteria in Central Sulawesi Province and in 2020 in Central Sulawesi and South Sulawesi Provinces. Meanwhile the unemployment variable in 2016 maps Papua Province into L-L criteria, in 2020 Southeast Sulawesi Province is classified as H-H criteria and Papua Province is classified as L-H criteria. Klassen's analysis classifies two provinces in Quadrant I, five provinces in Quadrant III and one province in Quadrant IV.
Keywords: Moran's index, Poverty, Spatial autocorrelation, Unemployment, Typology,

1. INTRODUCTION

Poverty is a situation when individuals or groups cannot meet the level of economic welfare and their own basic needs. Currently, poverty is a serious matter and is still a major problem in the development process in every country, including Indonesia. According to Feriyanto et al. (2020) the problem of poverty is clearly a difficult problem and is multidimensional in nature more than one problem). In theory, the unemployment rate should lead to an increase in poverty. In this situation, an increase in the unemployment rate will result in an increase in the number of people living in poverty.

The problem of poverty has indeed become an annual problem in this country, but when compared to the western and central parts of Indonesia, the percentage of poverty in Eastern Indonesia still dominates. The poverty rate in eastern Indonesia is not significantly affected by economic growth, according to regression results from 12 provinces in eastern Indonesia. These results show that there is a critical issue in the economic growth process of the eastern Indonesian provinces, namely, not only how to quickly develop the economy, but also who plays a role in economic growth. If only well-off people benefit from economic growth, then the benefits of economic growth will only be enjoyed by well-off people. This will have an effect on increasing poverty rates and income disparities in the region (Tubaka, 2019).

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Table 1. Poverty Rate in Sulawesi and Papua Island 2016-2020

Province	Poverty Rate (Percent)				
	2020	2019	2018	2017	2016
North Sulawesi	7.62	7.66	7.80	8.10	8.34
Central Sulawesi	12.92	13.48	14.01	14.14	14.45
South Sulawesi	8.72	8.69	9.06	9.38	9.40
Southeast Sulawesi	11.00	11.24	11.63	12.81	12.88
Gorontalo	15.22	15.52	16.81	17.65	17.72
West Sulawesi	10.87	11.02	11.25	11.30	11.74
West Papua	21.37	22.17	23.01	25.10	25.43
Papua	26.64	27.53	27.74	27.62	28.54

Source: Central Statistics Agency, 2016-2020

Table 1 reports the three provinces in the two islands above have the lowest percentage of poverty rates, namely West Sulawesi, South Sulawesi and North Sulawesi. Meanwhile, the other three provinces, namely Papua, West Papua and Gorontalo have the largest poverty presentations. The problem of poverty cannot be separated from the unemployment rate. In addition to the low human development index and slow economic growth, unemployment is one of the elements that contribute to poverty in developing countries (Nurdiana et al., 2020). The number of unemployed in a place can be seen by determining whether the rate of change in the labor force is balanced with the number of available jobs. In addition, the increasing population in each period has a significant effect on the labor force and unemployment (Asrol & Ahmad, 2018)

Efforts to reduce poverty in every region of Indonesia, especially on the island of Sulawesi and Papua Island, cannot be confused with other regions because they must consider the characteristics of the areas that cause poverty (Tubaka, 2019) The Central Statistics Agency claimed in 2016 that Indonesia's GDP is led by the western provinces of Indonesia and the rest are scattered among the provinces in the eastern region.

According to the Permendagri RI No. 56 of 2015 concerning regional codes and data on government administrative areas states that the number of provinces in Indonesia is 34, in accordance with the codification and organization of regional administration of each province. Along the way, it is clear that the two regions have a tendency. Provinces in the Western Indonesia region (KBI) enjoy shorter economic development than with regions or provinces in the Eastern Indonesia region (Tubaka, 2019). With limited resources, poverty alleviation must focus and adapt to the realities and needs of local communities. Therefore, the involvement of the government in this matter is very important to increase Indonesia's economic growth.

This research uses spatial autocorrelation analysis to identify the correlation of poverty and unemployment characteristics between locations in Eastern Indonesia, especially Sulawesi Island and Papua Island. This method is so crucial in providing information about the distribution or grouping of characteristics of an observed location and its relationship with other observed locations. When some places are close to each other, the closer something is, the greater the impact. Then there is the possibility that they affect each other (Anselin & Getis, 1992). This study will compile a map of the distribution of the percentage of poor people and open unemployment rates in Sulawesi Island and Papua Island, as well as find images and patterns of economic growth structure

between locations using the Klassen Typology. Therefore, this study aims to analyze the autocorrelation of unemployment and poverty in eastern Indonesia.

2. LITERATURE REVIEW

Study by Ponce et al. (2020) and Xiang et al. (2016) in their research stated that the need for each region to reduce poverty can be identified based on the variables that have been generated. The relationship between unemployment and poverty in this scenario is reversed, according to the principles of contemporary economic theory. This phenomenon can be characterized by in one family there are unemployed, but there are other family members who work and earn enough to support the unemployed. In theory, the unemployment rate should lead to an increase in poverty. In this situation, an increase in the unemployment rate will result in an increase in the number of people living in poverty. The relationship between unemployment and poverty in this scenario is reversed (Giovanni, 2018).

Poverty and unemployment are still the main problems in development both at the national and regional levels. Each region can determine what factors can support poverty reduction efforts. This suggests that different regions need to be treated differently in the allocation of aid sectors in poverty reduction programmes. Calculating the Moran Index will tell you which areas have higher poverty rates and tend to group in a particular region. Moran Index values greater than zero indicate the existence of positive spatial dependence results or patterns with clustered traits and having similar or simply said observations of proximity to have similar characteristics in adjacent alongs.

The poverty reduction program that is carried out has not paid attention to spatial aspects so that the policies taken are often not on target. The results of this study are about the spread of poverty and unemployment in line with previous research. In accordance with research conducted by Xiang et al. (2016), (Hasibuan & Hasibuan, 2021) and (Sukanto et al., 2019) with the aim of knowing the autocorrelation of spatial analysis to determine the pattern of bonding or relationships between locations (observations) using the test analysis "*moran's I and Local Indicator of Spatial Autocorrelation (LISA)*" Found the results that There is positive spatial autocorrelation and grouping in spatial distribution. Positive spatial autocorrelation indicates that the values of adjacent locations are similar and tend to be clustered. The poverty grouping occurs where there are provinces with approximately the same observation value as daerah or adjacent neighboring provinces.

The economic growth of a region reflects the state of the economy of the area. Economic growth is the level of economic development that occurs in a region. If the growth is positive, it indicates an increase in the economy when compared to the previous year. On the other hand, negative economic growth indicates that there is an annual recession, or an economic downturn compared to a year ago. This is in line with research by Suryahadi et al. (2012) and Ginting & Rasbin (2019) the finding that poverty factors can also affect the economy in an area. Because the lower the regional economic growth rate, the higher the level of poverty. On the other hand, if a region has a low poverty rate, then the economic growth of the region will be better.

Therefore, to avoid high levels of poverty, the government must provide jobs that match the available workforce or provide training to ensure that people have the right skills in their respective fields of work so that it will be easy to get a job and be able to increase people's purchasing power. However, it is different from what Tubaka said in his research, namely that the poverty rate in eastern Indonesia is not significantly affected by economic growth, according to regression results from 12 provinces in eastern Indonesia.

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These results show that there is a critical issue in the economic growth process of the eastern Indonesian provinces, namely, not only how to quickly develop the economy, but also who plays a role in economic growth. If only well-off people benefit from economic growth, then the benefits of economic growth will only be enjoyed by well-off people. This will have an effect on increasing poverty rates and income disparities in the region (Tubaka, 2019).

3. RESEARCH METHODOLOGY

The study located in the eastern part of Indonesia precisely on the island of Sulawesi and Papua Island with a five-year research period, namely from 2016-2020. The data used to use secondary data includes data on the open unemployment rate, poverty rate and GRDP per capita. There are four distinct quadrants in the Moran scatterplot that show four types of spatial relationships between an area and an adjacent area; Quadrant I is an area that has a high value with areas around it that have a high value as well (High-High [H-H]), Quadrant II is an area with a low value surrounded by areas that have a high value (Low-High [L-H]), Quadrant III which is an area with a low value surrounded by areas that have lace value (Low-Low [L-L]), Quadrant IV i.e. one of the areas with high values surrounded by areas that have low values (High-Low [H-L]).

Method of Local Indicator of Spatial Autocorrelation

At the time of global spatial autocorrelation, the Moran Index has not been able to provide information about spatial patterns in certain areas. Therefore, the Local Indicator of Spatial Autocorrelation (LISA) is used to obtain information about spatial relations in each region. In addition, the Local Indicator of Spatial Autocorrelation is a local indicator used to assess the presence of local spatial tendencies and to show the forms of spatial relationships (Saputro et al., 2018) There is spatial autocorrelation showing that the value of a characteristic in a place corresponds to a characteristic value in another adjacent region (Lembo, 2006). Anselin (1995) in his book entitled Local Indicators of Spatial Association (LISA) defines LISA as a statistic that meets two criteria, namely; (1) LISA values in each region can be used to assume a significant spatial relationship by grouping the same values around the area; and (2) the total LISA values for all regions are proportional to the Moran index values.
The formula of LISA for each region i is written as:

$$L_i = \frac{Z_i}{m_2} \sum_{j=1}^{n} W_{ij} Z_j$$

with $m_2 = \frac{1}{n} \sum_i^n Z_i$, $z_i = (x_i - \bar{x})$, $z_j = (x_j - \bar{x})$; I_i is the LISA value in the region i; n are multiple locations; x_i is the number of certain events in the area to-i; x_j is the number of certain events in the area to j; $\bar{x}$ expresses the average number of events; w_{ij} is an element of the weighting matrix between regions i and j. The total LISA for the entire region as follows:

$$\sum_{i=1}^{n} L_i = \frac{1}{m_2} \left(z_i \sum_{j=1}^{n} W_{ij} Z_j \right) = \frac{1}{m^2} \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} Z_i$$

$$Z_j = \frac{1}{\frac{1}{n}(\sum_{i=1}^{n} Z_i{}^2)} \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} Z_i$$

$$Z_j = \frac{n}{(\sum_{i=1}^{n} z_i{}^2)} \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} Z_i$$

with the Moran (global) index value as in equation (1) which is written as follows:

$$\sum_{i=1}^{n} L_i = \left(\frac{n}{W \sum_{i=1}^{n} z_i{}^2} \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} z_i z_j \right) \text{ x W}$$

or $\sum_{i=1}^{n} L_{i,t} = $ I x W so that it is obtained that the Moran index value is proportional to the sum of the LISA values, namely:

$$I = \frac{\sum_{i}^{n} L_i}{W}$$

with $W = \sum_{i}^{n} \sum_{i}^{n} w_{ij}$. Next, the calculation of the expected value $E(I_i)$ and $Var(I_i)$ described as follows:

$$E(I_i) = E\left[\frac{z_i}{m_2} \sum_{j \neq i} w_{ij} z_j \right] = \frac{1}{m_2} E[z_i] E\left[\sum_{j \neq i} w_{ij} z_j \right] = \frac{1}{m_2} \left(\sum_{j \neq i} w_{ij} \right) E[z_i z_j]$$

$$= \frac{1}{m_2} \left(\sum_{j \neq i} w_{ij} \right) \frac{-m_2}{(n-1)} = -\frac{\left(\sum_{j \neq i} w_{ij} \right)}{n-1} = -\frac{w_i}{n-1}$$

with w_i is the number of row elements from $\left(\sum_{j \neq i} w_{ij} \right)$

Thus, it is obtained that $Var(I_i) = E\left[I_i{}^2 \right]^2$ or

$$Var(I_i) = \left(\sum_{j \neq i} w_{ij} \right)^2 \left(\frac{n - b_2}{(n-1)} \right) + \sum_{k \neq i} \sum_{h \neq i} w_{ik} w_{ih} \left(\frac{2b_2 - n}{(n-1)(n-2)} \right) - \left(-\frac{w_i}{n-1} \right)^2$$

Klassen Typology Method

   Klassen's typology is an analytical tool to determine the pattern and structure of economic growth in an area by determining the average economic growth as a vertical axis and the average GRDP as a horizontal axis. The regional approach produces four classifications of districts/cities, each of which has different economic regional growth characteristics, namely; the developed and fast-growing regions (rapid growth region/quadrant I), developed but depressed regions (retarted region/quadrant II), Rapidly developing regions (growing region/quadrant-III), and relatively underdeveloped areas (relatively backward region/quadrant IV).
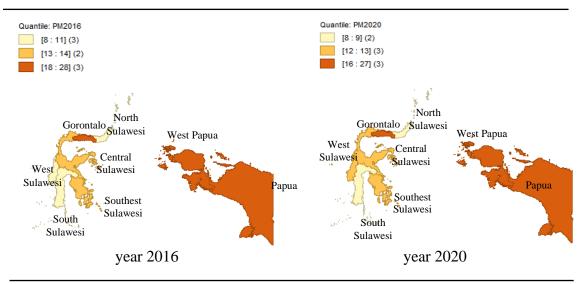
Table 2. Klassen Typology Method

GDRP Per kapita (y) / Growth rate (r)	$y_i < y$	$y_i > y$
$r_i > r$	(Quadrant-II) Developed and fast-growing regions	(Quadrant-I) Developed but depressed regions
$r_i < r$	(Quadrant-III) Rapidly developing regions	(Quadrant-IV) Relatively underdeveloped areas

4. RESULT AND DISCUSSION

Analysis of the Spatial Interaction of Poverty

Based on the results of data processing output, it was found that the poverty distribution of all provinces on Sulawesi Island and Papua Island. There are three kinds of classifications on the poverty distribution map; high, middle, and low.

Source: Geoda Software Data Processing Results, 2022
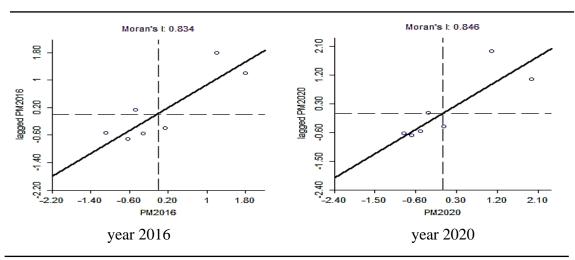
Figure 1. Poverty Distribution Map

Figure 1 reports the distribution of poverty in Sulawesi Island and Papua Island, which were included in the high category in 2016, there were three provinces, namely Papua, West Papua, and Gorontalo. This is due to the geographical conditions and accessibility of this region, which is quite difficult, and the uneven development that occurs in this region. Furthermore, there are two provinces that are categorized as medium poverty distribution, namely Central Sulawesi and Southeast Sulawesi Provinces. Meanwhile, the provinces of West Sulawesi, South Sulawesi and North Sulawesi are included in the areas with a low category of poverty distribution. The existence of this pattern allows poverty alleviation policies to be more effective and targeted by distinguishing the handling of areas with relatively low poverty from areas with high poverty.

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Figure 2. The LISA Cluster Map Poverty

Figure 2 reports the local spatial impact of poverty in each province on the islands of Sulawesi and Papua falls under the *Low-Low* (L-L) classification. In 2016 there was one province included in the L-L cluster, namely Central Sulawesi Province and in 2020 which was included in the L-L classification, namely the provinces of Central Sulawesi and South Sulawesi. This means that areas with low poverty rates are surrounded by areas with equally low poverty rates. This means that in 2020 Central Sulawesi Province is surrounded by the provinces of West Sulawesi, South Sulawesi and Gorontalo which are also equally low in poverty. Likewise, South Sulawesi Province, which is surrounded by Central Sulawesi, West Sulawesi, and Southeast Sulawesi, is equally low in poverty.
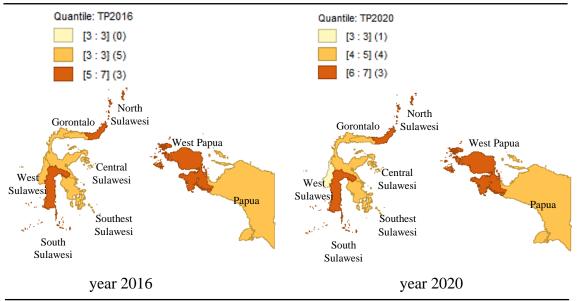
Figure 3. Moran's Scatter Plot of Poverty

In 2016 it was 0.834 and in 2020 it was 0.846, this value is greater than the value $E[I] = -0,143$, so it can be concluded that the poverty spread pattern of 8 provinces on the islands of Sulawesi and Papua has a positive spatial autocorrelation (Figure 3).

Analysis of the Spatial Interaction of Unemployment

Based on the output that has been obtained on mapping and spreading the unemployment rate of all provinces on the islands of Sulawesi and Papua in 2016. The provinces of West Papua, North Sulawesi and South Sulawesi are included in the category of high unemployment distribution. Furthermore, those included in the category of medium unemployment distribution are Gorontalo Province, Central Sulawesi, West Sulawesi, Southeast Sulawesi, and Papua.
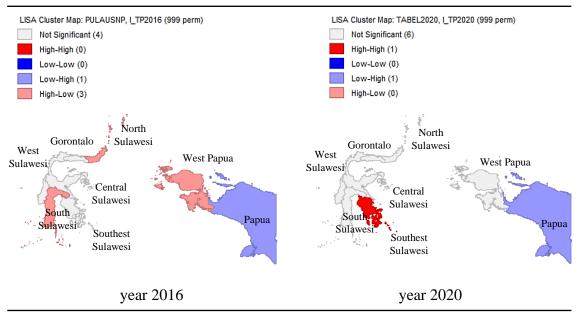

Source: Geoda Software Data Processing Results, 2022

Figure 4. Unemployment Distribution Map

Additionally, the mapping in Figure 4 shows that 2016 that none of the provinces fall into the category of low unemployment. When compared to 2016, in 2020 there was only a slight difference, which was seen in the Province of West Sulawesi in the previous year, namely 2016. This province is included in the distribution of moderate or medium unemployment, then in 2020 the distribution of the unemployment rate has decreased. The TPT of West Sulawesi in the last four years has always been lower than the national TPT, where in 2020 the National TPT was recorded at 7.07 percent. However, this achievement has not met the government's target in West Sulawesi which is expected to be reduced to the level of 2.96 percent (Hapsoro & Yoduke, 2019).
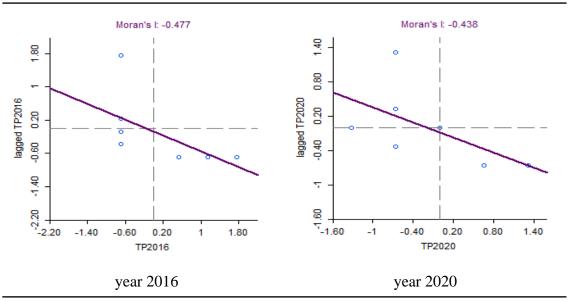
Figure 5 reports the identifications using mapping or LISA Cluster Map in 2020 showed that High-High (H-H) spatial relationships occurred in Southeast Sulawesi Province. The H-H relationship shows that provinces with high LISA values are surrounded by provinces that are also high. The Low-High (L-H) spatial relationship is a classification with the same province as the previous year, namely 2016, occupied by Papua Province. As previously explained, this circumstance means that regions with low unemployment rates are surrounded by regions with high unemployment rates.
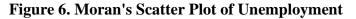
year 2016   year 2020

Source: Geoda Software Data Processing Results, 2022

Figure 5. LISA *Cluster* Map Unemployment

Figure 6 also shown the Moran Index value in 2016 of -0.477 and in 2020 of -0.438, this value is smaller than the value = so it can be concluded that the pattern of unemployment spread of 8 provinces on the islands of Sulawesi and Papua there is a negative spatial autocorrelation. In this case, the scattered distribution pattern in question means that the provinces in Sulawesi and Papua have different poverty distributions from each other. In addition, scattered patterns can also be influenced by the distance of provinces from one another. $E[I] - 0,143$.
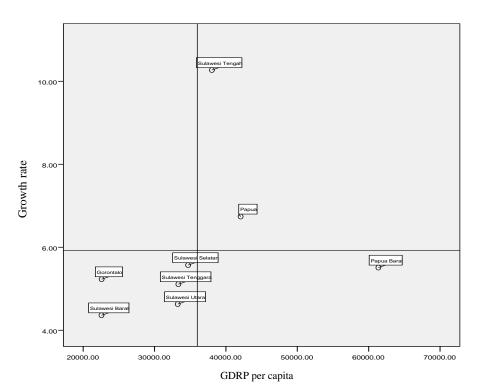

year 2016   year 2020

Source: Geoda Software Data Processing Results, 2022

Figure 6. Moran's Scatter Plot of Unemployment

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Analysis of Klassen's Typology

The economic growth of a region reflects the state of the economy of the area. If the growth is positive, it indicates an increase in the economy when compared to the previous year. On the other hand, negative economic growth indicates that there is an annual recession, or an economic downturn compared to a year ago.
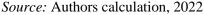

Source: Authors calculation, 2022

Figure 7. Klassen Typology of Economic Growth of Sulawesi and Papua Island

From the results of the calculation of the klassen typology, it can be classified that the developed and fast-growing areas on Sulawesi Island and Papua Island in 2016-2020, namely Central Sulawesi Province and Papua Province. Economic growth in this region is indeed the highest compared to other provinces on Sulawesi Island and Papua Island with an average growth rate of 10.27 percent. Meanwhile, Papua Province is also classified into Quadrants I and during 2020 the Papuan economy experienced a growth of 2.32 percent. In terms of production, this growth was due to the growth of mining and quarrying business fields by 16.62 percent.

Based on the analysis of the Klassen Typology Quadrant II is commonly called a developed but depressed region or province. The provinces that fall into this category are relatively developed areas but within a few years experienced relatively small growth, due to the reduction in the main activities of the provinces concerned. But in this case there is not a single region in the object of study that belongs to Quadrant II.

South Sulawesi, Southeast Sulawesi, North Sulawesi, Gorontalo, and West Sulawesi are areas that can develop quickly according to the analysis of the Klassen Typology. The Central Statistics Agency in 2020 stated that the economy of West Sulawesi has indeed contracted as deep as -2.40 percent, supported by the lack of utilization of abundant natural resources but has not been processed properly.

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The area classified in Quadrant IV is West Papua Province. Quadrant IV is a quadrant with the designation of a relatively lagging area. According to Yuanjaya (2018) there are several factors that contribute to explaining the slow economic performance and development in West Papua, namely the location of the West Papua region at the eastern end which is very far away and different from other provinces in Indonesia. This is in line with research by Suryahadi et al. (2019) and Ginting & Rasbin (2019) states that poverty factors can also affect the economy in an area. Because the lower the regional economic growth rate, the higher the level of poverty and vice versa.

5. CONCLUSION

The results of the Moran Test calculation on the poverty variable have positive spatial autocorrelation and the unemployment variable have negative spatial autocorrelation. The results of the LISA test mapped the poverty variables in 2016 into the L-L criteria in Central Sulawesi Province and in 2020 in Central Sulawesi and South Sulawesi Provinces. Meanwhile, the unemployment variable in 2016 mapped Papua Province into the L-L criterion, in 2020 Southeast Sulawesi Province was classified as the H-H criterion and Papua Province was classified as the L-H criterion. Klassen's analysis classifies the provinces of Central Sulawesi and Papua as quadrant I (fast-growing and fast-growing regions), Quadrant III (fast-growing regions) occupied by the provinces of South Sulawesi, Southeast Sulawesi, North Sulawesi, Gorontalo, and West Sulawesi while the areas that are classifiedas quadrant IV (relatively underdeveloped areas) are West Papua Province.

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