

SPATIAL ANALYSIS OF THE UNEMPLOYMENT RATE ON THE ISLAND OF JAVA IN 2023

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Abstract

Unemployment is one of the biggest economic problems in the world. In Indonesia, the number of unemployed people reached 7.86 million people. Java Island is the island with the highest Open Unemployment Rate (TPT) which reaches 4.60 million people or equivalent to 58.52%. The areas with the highest unemployment rate are in the provinces of Banten, West Java and DKI Jakarta. This is an initial suspicion of the influence of the region, so it is necessary to carry out a spatial analysis. The method used in this study is spatial analysis using the Geographically Weighted Regression (GWR) method with a linear regression model, as well as the spatial regression method to determine the main determinants. The data used comes from the Central Statistics Agency (BPS) and includes variables of the human development index, work participation rate, education level, minimum wage and population density in each province and district or city on the island of Java. The results of the study show that there is a pattern of unemployment that is clustered in several areas, especially in urban areas with high population density and in industries that are undergoing structural changes. The main factors contributing to the unemployment rate are limited access to quality education and unequal employment opportunities. These findings can be the basis for the government to design more effective and regional-based employment policies to reduce unemployment in a sustainable manner.

Keywords: Spatial Analysis, Unemployment

INTRODUCTION

Unemployment is one of the main issues in the economic development process, especially in developing countries such as Indonesia. The Open Unemployment Rate (TPT) indicator is used to show the proportion of the labor force that has not found a job despite actively looking for it. The island of Java, as the center of economic activity, government, and the region with the largest population in Indonesia, accounts for the majority of the national workforce. However, the distribution of TPT in this region shows that there is inequality between provinces and districts/cities.

Spatial regression is a statistical method used to model a problem that is influenced by certain factors by considering the effect of location or place. This spatial regression method is a development of the multiple linear regression method. The development carried out on spatial regression is based on the influence of location or spatial of the data to be modeled. Economic development carried out by the government in Indonesia consists of various policies that aim to improve the quality of life of the community, another economic development goal that is also very important, namely reducing those who are unemployed in every community group. Unemployment is a phenomenon that occurs in various regions. The difference in the open unemployment rate reflects the performance of an area's workforce and the quality of human resources in that area. Human capital is very important in reducing open unemployment rate. In addition, the role of local governments in implementing regional economic policies is very important to increase economic growth.

According to the Central Statistics Agency (BPS), people who do not have a job but are looking for a job or who actively support a business are referred to as unemployed. However, in times like today, it is quite difficult to get a job because of the increasing frequency of the labor force that does not match the work needed. A person falls into the labor force category if they are

fifteen years of age or older and are working, have a job but are temporarily inactive, or are classified as unemployed. Some of the factors that are believed to affect the open unemployment rate on the island of Java include HDI (Human Development Index), Number of Population, TPAK (Labor Force Participation Rate), RLS (Average School Length) and MSEs (Regency/City Minimum Wage). Therefore, this study aims to analyze the complex interactions between these variables in the context of the island of Java.

The phenomenon that occurs on the island of Java in the problem of unemployment, namely the suitability of labor skills with the needs of industries in various regions, is still limited. Labor skills have a significant effect on the regional unemployment rate on the island of Java. Skills mismatches, inequities in access to education, and technological change are the main factors that exacerbate these inequalities. Solutions such as job training, distribution of economic centers, and strengthening entrepreneurship can contribute to addressing this issue.

This inequality is not solely caused by economic aspects, but also by spatial factors such as geographical location, availability and access to infrastructure, urbanization rate, and the spread of industrial activities. Therefore, the application of spatial analysis is crucial to understand the distribution of unemployment and its relationship with the characteristics of the surrounding region. By using this approach, areas with high TPT (hotspot) and low (cold spot) can be identified, so that it can be the basis for the formulation of more effective employment policies and equitable distribution of development between regions.

The GWR method was used in this study to form a spatial model and measure the factors that are suspected to affect the open unemployment rate on the island of Java. The objects observed consisted of data on districts and cities on the island of Java in 2023. It can be known that the island of Java ranks fifth as the largest island in Indonesia. The island has an area of about 126,700 square km and is inhabited by about 150 million people. Administratively, Java Island is divided into 119 districts/cities.

Of the 38 provinces in Indonesia, 10 provinces have experienced an increase in TPT. Three of the ten provinces that experienced an increase in TPT in Indonesia were on the island of Java, namely Banten, West Java and DKI Jakarta. The unemployment rate in each province on the island of Java is as follows: Banten at 7.52%, West Java 7.44%, DKI Jakarta 6.53%, Central Java 5.31%, East Java 4.88% and Yogyakarta 3.58%. These figures are quite significant considering the large population in each of these provinces.

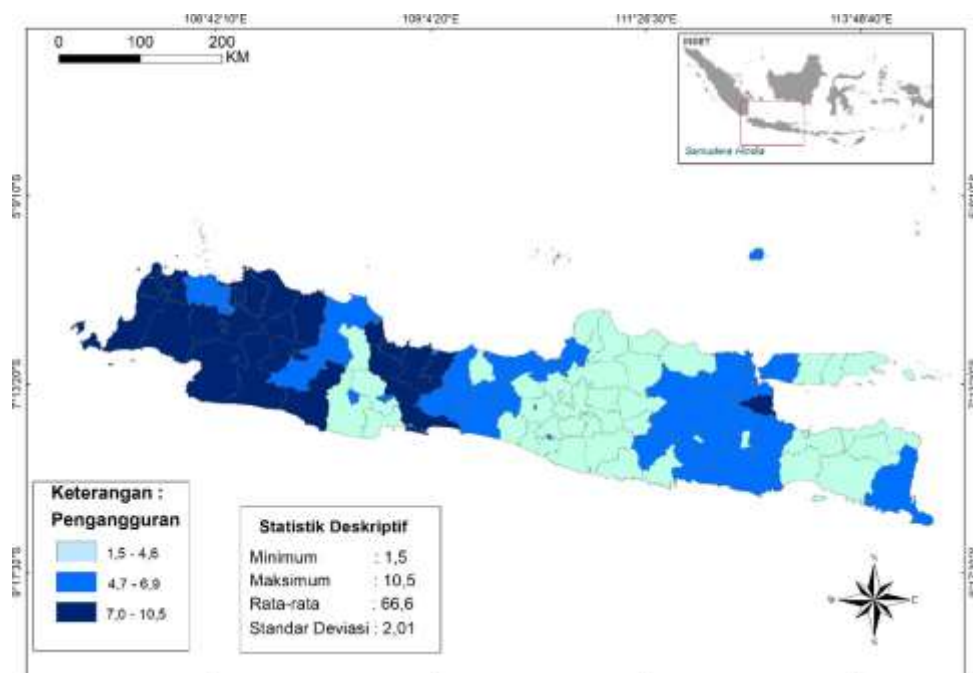


Figure 1: Pattern of Open Unemployment Rate distribution by district or cities in Pula Java 2023

Figure 1 shows that the average TPT in Pula Java is 66.6 percent. The open unemployment rate in the western part of Java, such as in DKI Jakarta, Banten, and West Java, tends to be higher than in the eastern region. This is due to several factors such as the western region of Java Island, especially the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, and Bekasi), experiencing rapid urbanization. Many immigrants from various regions come to these big cities in search of job opportunities, which ultimately leads to a high level of job competition. When the number of workers looking for work exceeds the number of available vacancies, the unemployment rate tends to increase, the mismatch between labor skills and the needs of the industrial world, most of the western region of Java Island relies on the industrial and service sectors as the main support of the economy. If there is a slowdown in these sectors, both due to the economic crisis and the implementation of automation, this can have a significant impact on the increase in the number of unemployed. and the rate of economic growth that has not yet been able to fully absorb the growing workforce.

Research conducted by Eka Amalia and Liza Kurnia Sari (2019) has research results that the pattern of the distribution of TPT on the island of Java is uneven, the majority of TPT is still high in the western part of Java. The research has a relationship with the research that will be researched by the author in the form of research topics, namely TPT as a dependent variable, and the research uses independent variables in the form of HDI, MSEs and TPAK as a reference in building research. This study has the same use of the same variables in the previous study. In this study, the dependent variables used were the TPT variable, while the independent variables used were HDI, MSEs and TPAK.

This study aims to collect general information about TPT on the island of Java in 2023 and analyze relevant factors. To achieve this goal, this study uses a more specific spatial analysis based on the administrative boundaries of districts/cities on the island of Java. Spatial analysis differs from non-spatial analysis, such as linear or panel regression, in that the parameters obtained are not only global, but also local, making it possible to identify cities or districts that share the same spatial pattern.

Based on the explanation of the development of regression that considers geographical factors, namely geographically weighted regression, as well as the importance of monitoring the open unemployment rate because of its impact that can extend to other sectors if not addressed, this study will focus on the analysis of the formation of spatial models. This spatial model will be constructed using kernel functions and model goodness criteria, which aim to measure and identify factors that are suspected to have an effect on the open unemployment rate.

LITERATUR REVIEW & HYPOTESIS DEVELOPMENT

Location Theory is an economic theory that discusses how and why economic activities such as industry, agriculture and services are geographically spread in an area. In the context of TPT, this theory can help explain the spatial differences in unemployment between one region and another. Classical theories (Adam Smith, David Ricardo, J. B. Say) argue that the labor market always shows equilibrium through the mechanism of prices (wages). If there is unemployment, wages will decrease, and companies will start hiring again. This suggests that open unemployment will not last long, as the labor market will adjust itself through a wage reduction mechanism. However, in the modern reality, open unemployment can persist due to many structural and institutional barriers.

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Research conducted by Dia Camartya and Anneke Iswani Achmad (2022) has research results that test results were obtained that there is a significant relationship between districts/cities and open unemployment based on the highest education completed in West Java in 2019. The research

has a relationship with the research that will be researched by the author in the form of research topics, namely TPT as a dependent variable, and the research uses an independent variable in the form of education level. This research has several similarities with the research that will be carried out, namely using the TPT variable.

Research conducted by Rendra Erdkhadifa (2021) shows that the result of the significance of the globally influential variable is the percentage of the population of working age 15 years and older with a good value of the R² model of 66.5%. For the GWR method, the weighting function used to estimate the parameter coefficient, namely adaptive bisquare with the least good value of AIC, AICc, and BIC compared to the goodness of other weighting functions.

RESEARCH METHOD

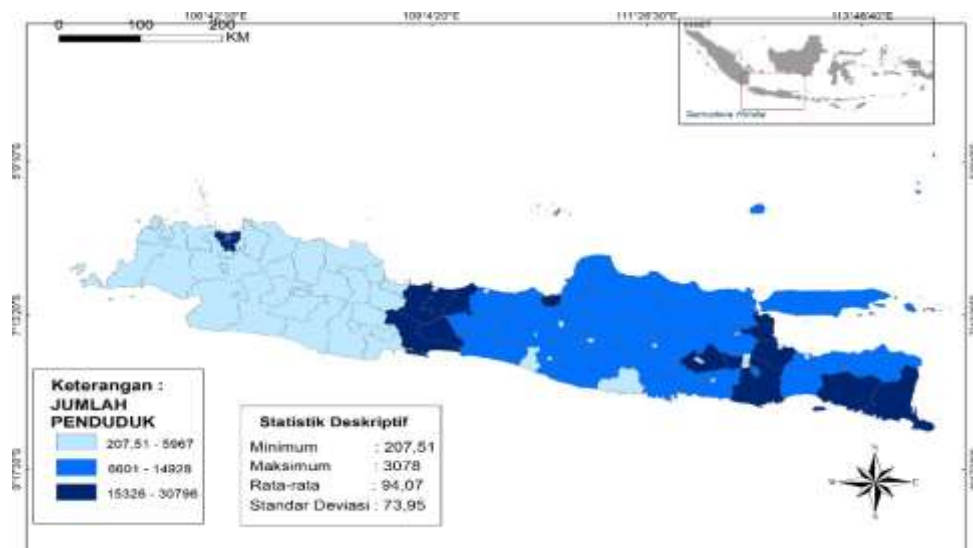
In this study, a quantitative approach is used with a spatial analysis method, the data used for the analysis is secondary data from the BPS report of East Java, Central Java, Yogyakarta, West Java, DKI Jakarta and Banten in 2023 figures. The research object uses the administrative area of Java Island which includes 119 regencies/cities from six provinces including DKI Jakarta, Banten, West Java, Central Java, DI Yogyakarta, and East Java. The unit of analysis in this study is Regency/City. The geographically weighted regression (GWR) method is a method that is the development process of the multiple regression analysis method. In this method, the emphasis is on geographical location where as the measurement point for determining weights. The GWR model is used to analyze the relationship between TPT and socioeconomic factors locally in each region. By using GWR, the value of the coefficient is obtained. Regression varies from district to district/city, which shows a variation in the influence of each variable based on its geographical location.

The spatial distribution map of the Open Unemployment Rate (TPT) at the Regency/City level is classified using color gradation (based on the results of processing from software (ArcGIS), where the color intensity indicates the amount of TPT value: the darker the color of an area, the higher the TPT value, and vice versa. Areas with low TPT (below 6.60%) are generally concentrated in the southeastern region and a small part in the northern region. These regions include four districts: Majalengka, Ciamis, Pangandaran, and Bandung; and six intermediate cities: Banjar, West Jakarta, Central Jakarta, South Jakarta, South Tangerang, and Depok. Meanwhile, areas with high TPT (9.70%–12.80%) tend to be spread in the central region and a small part in the northwest region, covering five districts: Serang, Bogor, Purwakarta, Cianjur, and Cirebon. Most of the areas in the provinces of DKI Jakarta, West Java, and Banten are classified as medium, which has a TPT value between 6.60% and 9.70%.

RESULT & DISCUSSION

Overview of Open Unemployment Rate and Factors Affecting It

The Open Unemployment Rate (TPT) varies between regions and time periods, influenced by prevailing economic, social, and employment policy conditions. In Indonesia, especially on the island of Java, there are significant differences in TPT between urban and rural areas, as well as between economic centers and areas that are still underdeveloped. Factors such as changes in the macroeconomy—including economic crises, industrial sector developments, and technological advancements—also contribute to the fluctuations in TPT. The Open Unemployment Rate (TPT) is influenced by a number of aspects, both related to the characteristics of the workforce and the economic situation. The following are some of the main factors that also determine the size of the TPT figure. The pattern of the distribution of TPT in 2023 in districts or cities in Pula Java can be seen in figure 2



**Figure 2: Population Distribution Pattern by Regency or City in Java Island
 2023**

The island of Java has the largest population in Indonesia, accommodating more than 55% of the national population despite covering only about 7% of the country's total area. Major cities such as Jakarta, Surabaya, Bandung, and Yogyakarta experienced a rapid surge in population, influenced by urbanization, the influx of people from other regions to look for work or pursue education, as well as natural population growth due to the high birth rate compared to death. Seen on the map above, it shows that the provinces with the largest population are in the provinces of Jakarta, West Java and East Java and the city with the largest population is in East Jakarta reaching 3.07 million people. Areas with very high population densities, such as Jakarta, Bandung, and Surabaya, show variations in unemployment patterns, where unemployment rates can be low or relatively high depending on socioeconomic factors and available job opportunities. Meanwhile, high concentrations of unemployment are usually found in areas with moderate to low population or in areas that are still economically underdeveloped.

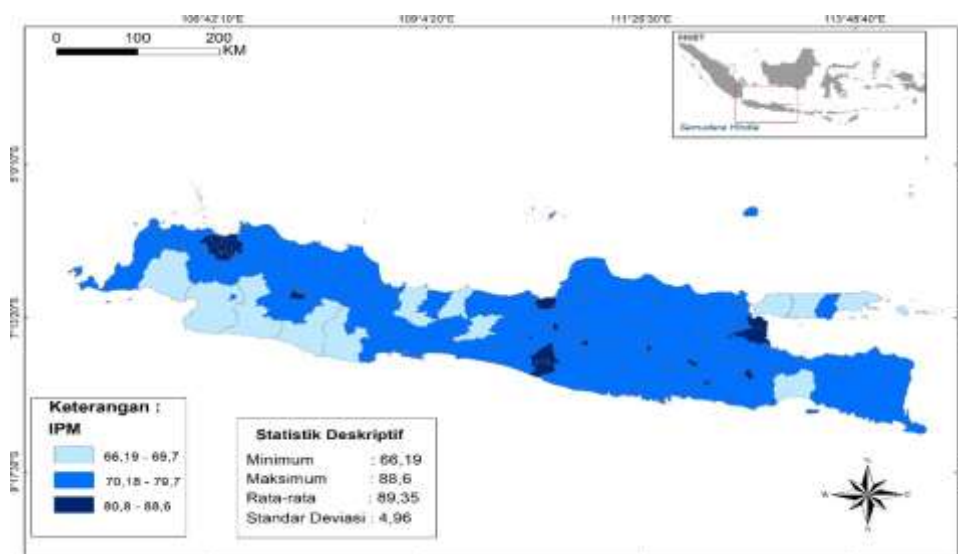


Figure 3: HDI distribution pattern by district or city in Pula Java 2023

The Human Development Index (HDI) assesses the quality of human development through three main aspects, namely: education level (measured from average and length of school), health

degree (seen from life expectancy), and economic welfare level (based on per capita income). Areas with high Human Development Index (HDI), generally located in big cities such as Jakarta, Bandung, and Surabaya, tend to have lower open unemployment rates (TPT), indicating a positive relationship between the quality of human development and labor absorption. In contrast, areas with low HDI typically face higher unemployment rates, which are likely due to limited access to education, health services, and adequate income. However, this pattern is not always spatially consistent, as there are areas with moderate HDI but experiencing high TPT due to local factors such as the availability of jobs and the structure of the industrial sector.

However, there is also a paradoxical phenomenon, where areas with higher levels of education actually experience high open unemployment. This can be caused by people's high expectations of the type of job they want, such as being reluctant to work in the informal sector or receiving low wages. The area with the highest HDI is in Yogyakarta City at 88.61 percent while the HDI is in Sampang Regency at 66.19 percent. The average HDI in Pula Java is 89.35 percent with a diversity of HDI. It can be seen from figure 3 that the majority of HDI in Pula Java has a moderate HDI.

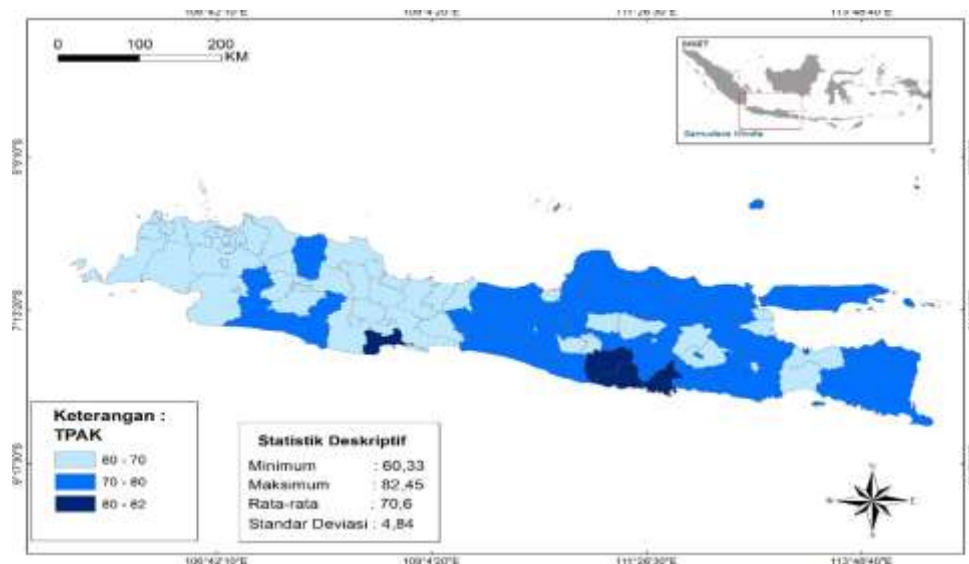


Figure 4: Pattern of TPAK distribution by district or city in Pula Java 2023

TPAK (Labor Force Participation Rate) refers to the percentage of the population aged 15 years and above who are involved in economic activities, either by working or looking for work. Figure 3 shows that the highest TPAK in Pula Jawa is in Wonogiri at 82.45 percent and the lowest is in Pandeglang at 60.33. In general, the average TPAK in Pula Jawa is 83.27 percent. TPAK plays a role in determining the open unemployment rate (TPT), but its impact is greatly influenced by how much and how good the quality of available jobs is. Regions with a high labor force participation rate (TPAK) do not necessarily have a low open unemployment rate (TPT), because the high participation can be accompanied by an increase in the number of unemployed if there are insufficient job opportunities.

There are also groups of regions with high TPAK and TPT, which shows that although many people are actively looking for work, the availability of jobs is still limited. Meanwhile, areas with low TPAK generally also show low TPT, which is likely due to the proportion of the population that is not included in the labor force, such as students, housewives, or the elderly. The increase in TPAK can be interpreted as a positive signal because it shows an increasing desire for people to work. However, if it is not accompanied by adequate job creation, this can actually lead to an increase in the number of unemployed. Therefore, efforts to reduce TPT are not enough just to encourage labor force participation, but also need to be accompanied by the development of decent and sustainable employment opportunities.

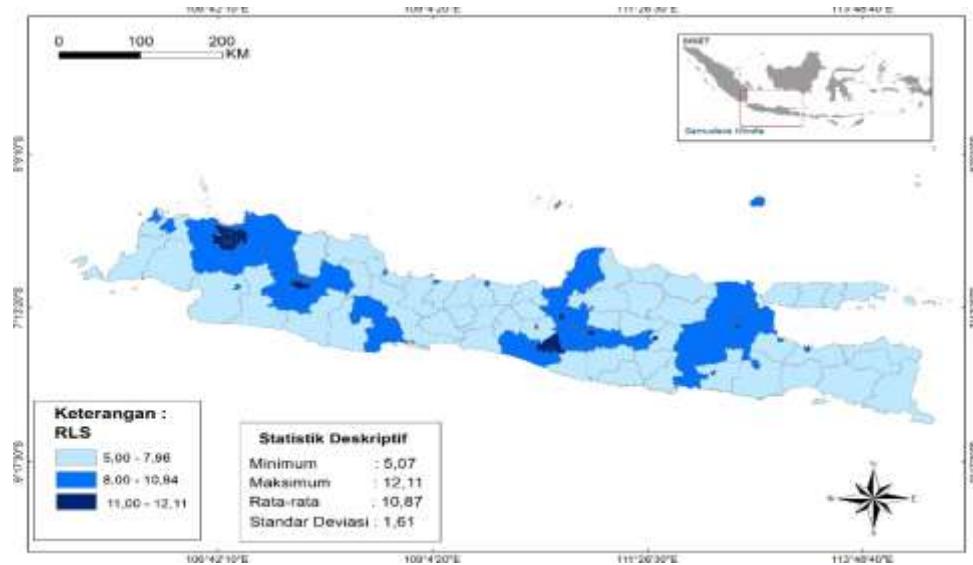


Figure 5: Pattern of RLS distribution by district or city on Java Island 2023

RLS is a measure that shows how long, in a matter of years, the average population is at least 15 years old in formal education. Figure 5 shows that the highest RLS is in Yogyakarta City at 12.11 percent and the lowest is in Sampang at 5.07 percent. The average RLS in Java Island is 10.87 percent, the high RLS in Jakarta is the result of various factors, such as the availability of complete educational facilities and infrastructure, supporting economic stability, high public awareness of the value of education, and the active role of local governments in supporting access to education. Areas with a high Length of School Ratio (RLS) generally have lower open unemployment (TPT), as the length of education contributes to increased skills and employment opportunities. On the other hand, areas with low RLS tend to face higher TPT, due to limited ability and access to job opportunities. However, this relationship can vary from region to region, as local factors such as the availability of jobs and economic sector conditions also affect the unemployment rate.

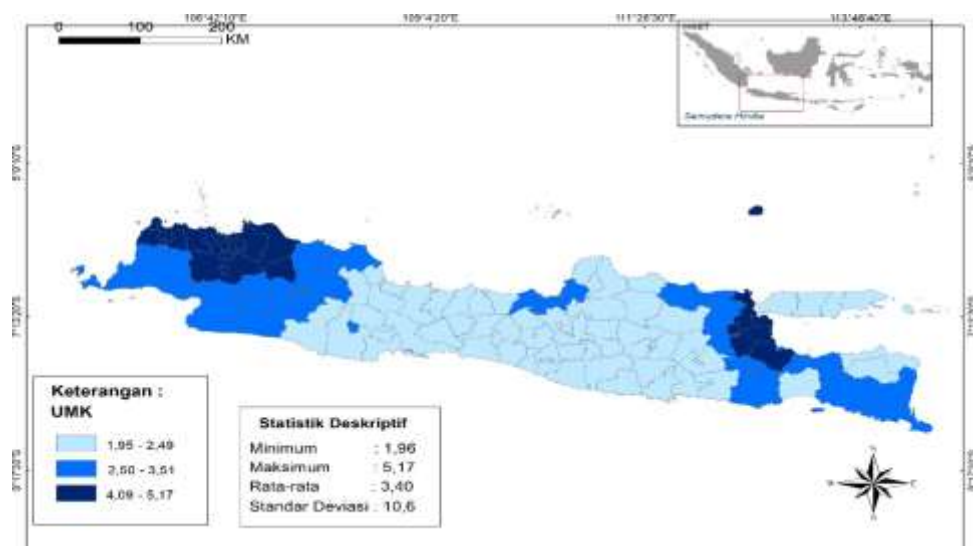


Figure 6: Distribution pattern of MSEs by district or city in Pula Java 2023

The Regency/City Minimum Wage (UMK) is a provision from the local government that sets the minimum wage amount that must be paid to workers in the region

certain districts or cities. On the island of Java, the highest MSE area is in Karawang at RP5. 176,179.07 and the area with the lowest MSEs is in Banjarnegara at IDR 1,958,170. The average MSEs in Java Island is IDR 3,405,479.82, based on Figure 3, it can be seen that most districts/cities in the western part of Java Island set relatively high MSEs. Areas with high Regency/City Minimum Wages (MSEs), such as in big cities, show variations in unemployment rates influenced by the ability of the industrial sector to absorb labor.

Some areas with high MSEs actually have a low open unemployment rate (TPT), this usually happens in areas with strong industrial and service sectors.

However, in areas with high MSEs but less developed industrial sectors, the unemployment rate tends to be high because companies have difficulty meeting wage standards, thus delaying or reducing hiring. Meanwhile, areas with low MSEs sometimes have low TPT due to cheaper labor costs, although this condition can negatively impact the quality of work and worker welfare.

CONCLUSION

The results of the analysis using the Geographically Weighted Regression (GWR) method revealed that the impact of socioeconomic variables on the Open Unemployment Rate (TPT) varied between regions. Factors such as education level, HDI, population, RLS and TPAK show a significant influence only in certain areas, and do not apply uniformly throughout the island of Java. These findings emphasize the importance of implementing contextual and region-based unemployment mitigation policies.

A number of districts/cities on the island of Java form a group of regions with a high Open Unemployment Rate (TPT), especially in areas with high population density, rapid urbanization rates, but limited employment in the formal sector. On the other hand, areas with low TPT are generally in areas with a more stable economic structure and a balance between the formal and informal sectors. Therefore, the strategy to combat unemployment on the island of Java needs to adopt a spatial-based approach, strengthen cooperation between regions, and encourage equitable distribution of infrastructure development and new economic centers as a whole.

BIBLIOGRAPHY

- Amalia, E., & Sari, L. K. (2019). Spatial analysis to identify the open unemployment rate by district/city in Java in 2017. *Indonesian Journal of Statistics and Its Applications*, 3(3), 202–215. <https://doi.org/10.29244/ijsa.v3i3.240>
- Camartya, D., & Achmad, A. I. (2022). Correspondence Analysis on the Number of Open Unemployment by Regency/City Based on Highest Education. *Journal of Statistical Research*, 119–128. <https://doi.org/10.29313/jrs.v2i2.1424>
- Herniwati, D. P., & Handayani, R. (2019). Unemployment is open in Central Java Province. *Diponegoro Journal of Economics*, 1, 159. <https://ejournal2.undip.ac.id/index.php/dje>
- Nursing, S. (2023). *Submitted as one of the requirements for obtaining a Bachelor's degree*
- Kurnianto, D., Arya, M. A. N., Kharisudin, I., & Fauzi, F. (2021). Spatial Regression Analysis with Queen Confidity Weighting on Open Unemployment Rate in Central Java Province of Year. *PRISMA, Proceedings of the National Seminar on Mathematics*, 4, 595–601. <https://journal.unnes.ac.id/sju/index.php/prisma/>
- Mahmud, A., & Pasaribu, E. (2021). Spatial Modeling on the Analysis of Factors Affecting the Open Unemployment Rate of Bangka Belitung Province in 2018. *Engineering, MATHEMATICS and Computer Science (EMACS) Journal*, 3(2), 47–58. <https://doi.org/10.21512/emacsjournal.v3i2.7034>
- Ningtias, I. P., & Rahayu, S. P. (2017). Modeling Factors Affecting Levels

- Open Unemployment in East Java Province in 2015 Using Spatial Regression.
ITS Journal of Science and Arts, 6(2). <https://doi.org/10.12962/j23373520.v6i2.24984>
- Pratiwi, L. P. S., Hendayanti, N. P. N., & Suniantara, I. K. P. (2020). Comparison of weighting Seemingly Unrelated Regression – Spatial Durbin model for poverty and unemployment factors. *Journal of Variance*, 3(2), 51–64. <https://doi.org/10.30812/varian.v3i2.596>
- Rendra Erdkhadifa. (2022). Spatial Modeling of Open Unemployment Rate in East Java with Geographically Weighted Regression. *STATISTICS Journal of Theoretical Statistics and Its Applications*, 21(2), 85–97. <https://doi.org/10.29313/statistika.v21i2.295>
- Septiyanto, W. G., & Tusiati, E. (2020). Spatial Analysis of Open Unemployment Rate in West Java Province. *Indonesian Journal of Economics*, 9(2), 119–131. <https://doi.org/10.52813/jei.v9i2.40>