



## The geographical weighted regression approach in analyzing the factors forming regional economic growth

Rendra Erdkhadifa<sup>1\*</sup>

<sup>1</sup>Faculty of Islamic Economics and Business, IAIN Tulungagung, Indonesia

### ARTICLE INFO

#### Article history:

Received 09-Sep-19

Revised 18-Nov-19

Accepted 25-Nov-19

#### Keywords:

Economic Growth;

Geographically

Weighted

Regression;

Government

Expenditure;

Mataraman;

Original Local

Government

Revenue.

### ABSTRACT

East Java has a great position to become one of a province with a predominance of the economic studies which has an allotment of a region with affects culture. Known as the Mataraman based on a culture that is inherited. Derived from the influence of ancient culture Mataram which centered on central java and D.I Yogyakarta. The effect of great culture on Mataraman region is viewed as one characteristic that has the ability on economic activities, with the result that causes differences in economic growth's indicators as reflection of economic's prosperity. This study looks at the factor which provide economic growth is based on Mataraman characteristic by Government Expenditure, Gross Domestic Regional Product, Mataraman, Original Local Government Revenue and analyzed using regression and Geographically Weighted Regression to get best model economic growth in Mataraman, East Java. The conclusion of the study is every object has different factor to influence economic growth

\*\*\*\*

#### ***Pendekatan geographically weighted regression dalam menganalisis faktor pembentuk pertumbuhan ekonomi wilayah di Mataraman Jawa Timur.***

Jawa Timur memiliki letak strategis menjadi salah satu provinsi dengan dominasi kajian perekonomian yang penting memiliki pembagian wilayah berdasarkan kebudayaan yang mempengaruhi. Dikenal sebagai wilayah Mataraman didasarkan pada budaya yang diwariskan. Berasal dari pengaruh budaya mataram kuno yang berpusat pada Jawa Tengah dan D.I Yogyakarta. Pengaruh kebudayaan yang besar pada wilayah Mataraman dipandang sebagai salah satu karakteristik kemampuan masyarakatnya terhadap kegiatan perekonomian sehingga akan menimbulkan perbedaan dalam indicator pertumbuhan ekonomi sebagai cermin kemampuan perekonomian suatu wilayah. Penelitian ini mengkaji factor yang melandasi pertumbuhan ekonomi didasarkan pada karakteristik wilayah Mataraman melalui indicator Pendapatan Asli daerah, Pengeluaran pemerintah dan PDRB. Teknik analisis data menggunakan analisis Regresi Linier beganda dan Geographically Weighted Regression (GWR) yang berfungsi untuk mendapatkan model terbaik dalam factor yang membentuk pertumbuhan ekonomi di wilayah Mataraman Jawa Timur. Hasil penelitian ini memperoleh kesimpulan bahwa setiap wilayah yang termasuk dalam Tlatah Mataraman memiliki variabel prediktor yang berbeda-beda dalam mempengaruhi pertumbuhan ekonomi

#### How to cite:

Erdkhadifa, R. (2019). The geographically weighted regression approach in analyzing the factors forming economic growth. *Indonesian Journal of Islamic Economics Research*, 1(2), 101-109. doi:<https://doi.org/10.18326/ijier.v1i2.3255>

\* Corresponding Author. [rendra.erdkhadifa@gmail.com](mailto:rendra.erdkhadifa@gmail.com)

## 1. Introduction

Economic growth is an economic development that causes the goods and services produced in the community to increase so that it will increase the level of the community's economy (Sukirno, 2006). Economic growth is a problem in a country's economy in the long run, in its activities economic growth measures the achievement of the development of an economy from one process to another within one period of the next period. In a macro analysis, the level of economic growth achieved by a country is measured through the development of real national income achieved by a country/region (Sukirno, 2006). Economic growth in a country can be seen in the aggregate of the value of a country's Gross Domestic Product. It is assumed that the higher the value of the Gross Domestic Product (GDP), the better the condition of the country's economy. Arsyad (1999) states that economic growth can also be interpreted as an increase in GDP/GNP regardless of whether the increase is greater or smaller than the rate of population growth and whether there is a structural change in the economy or not. East Java Province is the province with the largest population in Indonesia after West Java, in 2016 recorded the total population of Indonesia increased by 1.27% from 2015 to total 258,705.000 people, and East Java ranks second after West Java with a total of 39,075,200 inhabitants. East Java Province has various kinds of interests in addition to the overall distribution of its economy but also the division of culture owned by East Java is considered unique to be an object of research. East Java has a cultural division or cultural zone to make it easier to classify the community both culturally and socio-economically. Ayu Sutarto groups East Java into 7 cultural areas, one of which is Mataraman or commonly known as the Mataraman area (Map of East Java Art).

It is referred to as the Mataraman region because this area was the former kingdom of Mataram in the past. The Mataraman area stretches from the districts of Ngawi, Kediri, Pacitan, Magetan, Madiun, Trenggalek, Nganjuk, Jombang, Mojokerto, Tuban, Lamongan and Blitar. The influence of culture on the performance of an economy becomes an important factor in analyzing its factors, economists begin to recognize that culture is one that affects economic performance, but not all parts can be explained or should not be explained by economics (Casson, 1993).

The pattern of the formation of economic growth factors in the Mataraman region is an important indicator to determine the economic conditions in a region or region within a certain period that can be seen through the Gross Regional Domestic Product (GRDP) data. The value of this GRDP provides an illustration of how the region's ability to manage and utilize resources. Each region always has a measure of the level of success of its development, so that each region always applies a target of a high level of economic growth in its development planning. The value of the GRDP distribution in the Mataraman area is fairly flat. The existence of Mataraman area mapping which is owned by East Java makes the PDRB value distribution of the Mataraman region become an interesting study because of the influence of cultural grouping so that in general the contribution of PBRB mMataraman region is very important for economic growth in East Java. The higher the distribution in the Mataraman region, the higher the contribution of each factor to the economic growth of East Java.

The role of the government in harmonizing regional economic growth as well as regional recognition has been widely discussed how far the regional government must participate directly in its development. Todaro and Smith (2004) states that the role of government to assume a large role in the effort to manage regional economies determines how the regional economy develops. Government investment in this matter does not yet have a large and direct contribution to the output of the processing industry produced by government investment in the form of infrastructure and bridges, for example, can help improve the smooth distribution of economic activities

In practice the economic growth of a region is inseparable from the role of government in it, government expenditure is a tangible form of government interference in the economy and is also an important object in analyzing the factors forming economic growth. Government expenditure as one of the important instruments in fiscal policy is able to encourage economic activity and increase economic growth. Specifically Original Local Government Revenue (PAD) in the Mataraman region, government expenditure is an optimization of the role of the government in increasing spending on the GRDP value of the Mataraman region.

Sukirno (2006) states that government expenditure is part of the fiscal policy set out in the National Expenditure Budget for National and Regional Expenditure Expenditure for Regions. In the Regional Expenditure Budget series, it consists of revenue and financing budgets, Regional Original Income, which is revenue that comes from the sources of regional income independence. The components forming the original regional income are sourced from the regional tax revenue, the results of the regional levies, the results of the management of the separated regional assets and other legal revenue. According to Saragih and Khadafi (2003), the increase in PAD is actually access to regional economic growth where positive economic growth has the possibility of getting an increase in PAD.

From the background explanation above, the author feels interested in studying the extent of the influence of the level of Government Expenditure, PAD, and GRDP in influencing economic growth in the East Java region, especially in the Mataraman region which is divided into patterns based on cultural and *adat* grouping in 2014-2016.

## 2. Research Method

This study uses multiple linear regression analysis techniques. Multiple linear is a technique to analyze the effect of several independent variables on the dependent variable (Liu, 1988). Besides that, it uses Geographically Weighted Regression (GWR) analysis which functions to get the best model in the factors that shape economic growth in the Mataraman region of East Java. Geographically Weighted Regression Model is a model used to analyze spatial data that produces estimators of local parameters for each point / location where the data is collected (Charlton, Fotheringham, & Brunson, 2009; Lin & Wen, 2011; Matthews & Yang, 2012; Tizona, Goejantoro, & Wasono, 2017; Windle, Rose, Devillers, & Fortin, 2009). The data used include regional original income, government expenditures and GRDP Constant Prices in 2014-2016 in the area of Mataram, East Java.

## 3. Result and Discussion

### Multiple Regression Analysis

The following is a multiple regression analysis for the formation of the 2014-2016 data model. Multiple regression analysis needs to be done as a basis or global model of the Geographically Weighted Regression method.

Table. Multiple Regression Economic Growth Model

Year	Model
2014	$Y = 41.9 - 0.339 \ln x_1 - 2.84 \ln x_2 + 1.40 \ln x_3$
2015	$Y = - 76.9 + 1.22 \ln X_1 + 5.25 \ln X_2 - 2.22 \ln X_3$
2016	$Y = - 110 + 1.9 \ln X_1 + 8.24 \ln X_2 - 4.18 \ln X_3$

In the 2014 model that has been formed, it can be explained that each increase in the value of the GDP by one unit, will reduce regional economic growth by 0.393. For the value of ln from the

government expenditure variable of 1 unit, it will reduce the value of economic growth by 2.84. The different variables are shown by the local revenue variable, where each increase in the value of Ln PAD by 1 unit will increase the value of economic growth by 1.40. Meanwhile, if the three variables are not valuable, in general, the estimated value of economic growth is 41.9%. Based on the results of the analysis, the results also showed that the coefficient of determination is very small at 30.8%. This means that the model is able to explain the actual condition of only 30.8%. The value of 30.8% is the value that can be explained by the variable GRDP, government spending, and regional own-source revenue.

The 2015 data model that has been formed can be explained that each increase in the value of the GDP by one unit, it will increase regional economic growth by 1.22. In contrast to 2014 data, for 1 Ln value of the government expenditure variable would increase the value of economic growth by 5.25. The different variables are shown by the local revenue variable, where each increase in the value of Ln PAD is 1 unit, it will reduce the value of economic growth by 2.22. Meanwhile, if the three variables are not valuable, in general, the estimated value of economic growth decreases by 76.9. Based on the results of the analysis, it was also shown that the coefficient of determination was very small, namely 20.7%. This means that the model is able to explain the actual condition of only 20.7%.

In the 2016 data model that has been formed, it can be explained that each increase in the value of the GDP by one unit, will increase regional economic growth by 1.9. In contrast to 2014 data, for the value of Ln from the government expenditure variable by 1 unit, it would increase the value of economic growth by 8.24. The different variables are shown by the local revenue variable, where each increase in the value of Ln PAD is 1 unit, it will reduce the value of economic growth by 4.18. Meanwhile, if the three variables are not valuable, in general, the estimated value of economic growth decreases by 110. Based on the results of the analysis, it also shows the results that the coefficient of determination is very small at 25.7%. This means that the model is able to explain the actual condition of only 25.7%. These results also explain the existence of variables/other economic factors that are actually very influential in determining the size of economic growth. There are so many variables that affect economic growth. The value of 25.7% is the value that can be explained by the variable GRDP, government spending, and local original income.

### ***Analysis of Geographically Weighted Regression***

The following is the recapitulation of predictor variables that significantly influence economic growth in 2014-2016, as shown in Table 2.

The results of a literature study conducted in theory where the variable gross regional domestic product (GRDP), government spending, and regional own-source revenue (PAD) affect economic growth. But the theory cannot be generalized to all districts/cities. In this case, the results of the analysis show that not all of these variables significantly influence all research objects. In Pacitan district different things also occur each year. In 2014 only government expenditure variables significantly affected economic growth and in 2015 none of the predictor variables used were influential. In 2016 only GRDP variables were influential. Similar to Pacitan Regency, Trenggalek Regency in 2014 its economic growth was influenced by government spending. Many different conditions occur in Tulungagung Regency, Blitar Regency, and Blitar City where none of the predictor variables used have an effect on economic growth in 2014, 2015 and 2016. This indicates that there are other variables that are thought to influence growth. economics, but not involved/used in research. For Kediri Regency and Kediri Municipality, the results of the analysis can be said that in 2014 the government and PAD influencing variables were influential but did not occur in 2015 and 2016. In Nganjuk, Madiun, Magetan, Ngawi, and Madiun Regencies had the same results wherein

the year 2014 all the predictor variables used were significantly influential whereas in 2015 and 2016 only the GRDP variable and government expenditure had a significant effect. The results that tend to be the same also occurred in Bojonegoro and Tuban Regencies. But what distinguishes, in 2014 and 2016 all the predictor variables involved significantly influence. For Lamongan District, government expenditure variables have an effect on in 2014-2016, the GRDP variable influences in 2014 and 2016 while the PAD variable only in 2014.

Tabel 2. Recapitalization of Significant Variables on Economic Growth

City	Predictor Variable		
	2014	2015	2016
Pacitan	X <sub>2</sub>	-	X <sub>1</sub>
Trenggalek	X <sub>2</sub>	-	-
Tulungagung	-	-	-
Blitar	-	-	-
Kediri	X <sub>2</sub> , X <sub>3</sub>	-	-
Nganjuk	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>
Madiun	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>
Magetan	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>
Ngawi	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>
Bojonegoro	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>
Tuban	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>
Lamongan	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>
Kediri Municipality	X <sub>2</sub> , X <sub>3</sub>	-	-
Blitar Municipality	-	-	-
Madiun Municipality	X <sub>1</sub> , X <sub>2</sub> , X <sub>3</sub>	X <sub>1</sub> , X <sub>2</sub>	X <sub>1</sub> , X <sub>2</sub>

## Discussion

Based on the recapitulation after the GWR analysis, it was found that the variables affecting economic growth in the Mataraman region had different levels of significance and distribution. As it is known that Tlatah Mataraman which became the main focus in this study arises is due to the classification of Javanese culture which is divided into several customs and customs of East Java itself is the island of Java which is located in the eastern part of the island of Java which has a strong culture of society with the province. Central Java and Yogyakarta. The Jember University of Culture began to divide this Tlatah Mataraman in his 2004 study.

The division of regions based on culture is carried out because the characteristics of the East Java region which is a province with the dominance of the region which is the hub of Indonesia's economic growth center in the east which is classified as strategic because it has more population domination and more thick culture, referring to previously written journals related to Culture and Economic Development of Dr. Martin Muller, who researched the empirical theme of culture in Tanah Papua Indonesia in 2005, said in one of his strophes that "culture portrays the whole organization and function of a nation's way of life. Culture consists of all the equipment, actions, thoughts and institutions used by a group of residents to protect themselves and ensure survival" (Müller, 2005).

So that further, the relationship between cultural levels in the East Java region, naturally when finally classified into several Tlatah areas, one of which is the Mataraman Tlatah, which consists of 15 regions, Pacitan, Trenggalek, Tulungagung, Blitar, Kediri, Nganjuk, Madiun, Magetan, Ngawi, Bojonegoro, Tuban, Lamongan, Kediri City, Blitar City, Madiun City. The area called Tlatah

Mataraman has a characteristic that is similar and tends to be almost the same as the Javanese Mataraman cultural style whose people's lives have a pattern of relics of the ancient Mataram kingdom, with the level of language than how to fulfill the desires of life, artistic tastes that are very very patterned on ancient Mataram because it consists from many kinds of arts. In addition, Tlatah Mataraman has another prominent characteristic is the culture of the people who embraced Islam so that the Mataraman region is also known as an area with a large number of Muslim social organizations, then many Islamic boarding schools are places and facilities for studying religious sciences.

Based on the Mataraman region with the GWR analysis that has been conducted to analyze the factors that influence economic growth, the results show that economic growth formed in these 15 regions with the period of 2014, 2015 and 2016 shows that there are several regions that are not affected by all factors included in the model, economically this might happen because the factors that influence economic growth are macro variables whose indicators are based on abilities that have a large dominance.

In the research model proposed predictor variables consisting of constant price GRDP, PAD and the level of government expenditure, predictor variables used in this study refer to regional economic theory, in fact, regional economics include elements that limit the potential of one region to another, in regional economic theory in macro-economic potential of the region is an activity in tandem through the participation of the government to accelerate the rate of economic growth throughout the region, so that what happens in the division of elements Mataraman region, in fact, both macro and micro are related to each other, based on the things mentioned previously according to [Arsyad \(2010\)](#) regional is an administrative area as a planning, so that basically the core of regional economic theory lies in the method of analyzing the economy of a region and theories that discuss the factors that determine Regional economic growth. So if you return to the GWR results show that the region that does not have a division in each period in Table 2 shows that Tulungagung Regency, Blitar Regency and Blitar City in the observation years do not have an influence on economic growth through regional original income, regional original income, in theory, is revenue derived from legitimate regional revenue sources which are then managed independently by the region to manage regional government. Basically, regional original income is one of the factors that influence regional economic growth because regional financing in managing the role of government comes from regional income funds derived from regional potentials themselves, in fact, this regional income has a positive correlation to the formation of regional economic growth when a large regional income will make the funds bigger when the large regional income fund reserves will continue to increase so that the government can maximize the level of expenditure through regional spending to meet regional needs, but in fact the findings, it was found that Tulungagung Regency, Blitar Regency, and Blitar City revenue each region in the observation period did not have any connection and did not have the GWR model form this happened because of fiscal decentralization carried out by Tulungagung, Blitar and Blitar City maximum is done.

Theoretically, when regional income increases, the influence of the role of government in the development process is also high, it can be seen through the indicators of regional expenditure because the growth rate of a region can be measured by how much the government treats in sacrificing its regional expenditure to all regional needs, regional expenditure is a form of fiscal which is carried out by the government because in this fiscal expenditure there is an assumption that when there is a large income the expenditure will also increase, in line with the regional development whose progress continues to experience a positive trend. Expenditure approach theory states that consumption carried

out by the government through the budget is a major element in the pace of economic growth which is reflected through the GRDP in the regional arena and the GDP in the National.

In Tulungagung Regency, Blitar Regency and Blitar City, the values of the factors forming economic growth did not affect each other respectively, this led to the assumption that the delay in development experienced by Tulungagung Regency, Blitar Regency, and Blitar City was influenced by the unequal distribution of the regions, causing insignificance. Variable factors forming economic growth. The next assumption that is formed based on the data obtained is then calculated through the GWR analysis is the government's unpreparedness to the potential values that exist in each region, this unpreparedness makes Tulungagung Regency, Blitar Regency and Blitar City unable to be maximized in the framework of their regional revenue. As it is known that in addition to being on the Mataraman which has diverse cultural potentials and stable political conditions should be with regional wealth in the non-manufacturing sector, such as the tourism sector owned by Tulungagung Regency, Blitar Regency and Blitar City because these three regions are located next to south of East Java and has a long coastline.

The non-manufacturing sector, which has not yet been maximally developed, has made the formation of economic growth in this region a road in place, the fiscal decentralization that has been implemented is still not optimal so that the large potentials of the region become pockets that are not optimal.

Then in the observation period of 2014, 2015, 2016 in other regions too many did not have the effect of economic growth from some of the factors proposed, this happened because of the region's lack of interest in reading the potential of the region. Economic development is based on the value of economic growth which then changes society towards several conditions, one of which is the wider economic structure. The Mataraman region has strength in the social community if it is related to the factors forming economic growth factors in the years of observation the regions that do not consistently produce the same model shows that apart from the role of government that is felt to be lacking in maximizing its role.

According to [Setyaningsih and Rofi \(2014\)](#), the perception related to monoculture culture in Java does not all have uniformity, because each sub-culture has differences that affect life activities in an area. The Mataraman area itself is located in East Java, which indeed has a high level of heterogeneity due to the different character of the people but has the same cultural influence. [Müller \(2005\)](#) in his study states that culture can be interactively interrelated with one another and the combination of these possibilities is open, if it is aligned with findings in areas that do not have the influence of the factors, it can be said that the utilization of Mataraman cultural heritage which is inherited in the area of classification of Mataraman is not optimally absorbed.

The ancient Mataram cultural heritage is that the majority of people utilize the natural wealth of the surrounding area by carrying out activities that can fulfill their livelihoods, such as agriculture and the creativity of their regional economy. For example, if in the modern era this is a combination of regional potential with creativity, the UMKM path to increase revenue potential and maximize the role of government can also be a factor that can be developed. When referring to the results that Muller has done in West Papua on cultural studies and economic development, the definition used by Muller is according to Schumpeter that the modern economic sector cannot be considered a private entrepreneurial activity among farmers. So that in accordance with the findings in the GWR model some regions experience a failure of the model to analyze the factors that influence economic growth is because there is no maximization of the potential use available, the lack of the government's role in maximizing fiscal decentralization is also a factor that makes certain models.

#### 4. Conclusion

Based on the results of the analysis conducted previously, the analysis using the regression method, the predictor variables used both GRDP, government spending, and PAD did not significantly influence economic growth. Even the results of the analysis also showed abnormal conditions, so it was very appropriate if an analysis was carried out with a non-parametric method, one of them using the Geographically Weighted Regression method. The analysis also shows that economic theory regarding economic growth as measured by several variables including the value of GRDP, government spending, and PAD cannot be generalized to all districts/cities. Because from the analysis of several regencies/cities such as Tulungagung, Blitar, and Blitar City the regional economic growth is not influenced by the predictor variable used. Other conditions also indicate that between years, the variables that contribute to economic growth are also not the same even in the same district/city. The results of grouping as a whole that the Districts of Nganjuk, Madiun, Magetan, Lamongan, Ngawi, Madiun City have the same characteristics. Bojonegoro and Tuban group in 1 group. Whereas Tulungagung, Blitar, and Blitar City are clustered were in 2014-2016 there were no predictor variables that affected economic growth. As for other regencies/cities that are not grouped because they have different characteristics

#### 5. Acknowledgment

The authors would like to thank all those who helped complete this research.

#### 6. References

- Arsyad, L. (1999). *Pengantar perencanaan dan pembangunan ekonomi daerah*. Badan Penerbitan Fakultas Ekonomi (BPFE).
- Arsyad, L. (2010). *Ekonomi Pembangunan* (5th ed.). Yogyakarta: UPP STIM YKPN.
- Casson, M. (1993). Cultural determinants of economic performance. *Journal of Comparative Economics*, 17(2), 418–442.
- Charlton, M., Fotheringham, S., & Brunson, C. (2009). Geographically weighted regression. *White Paper. National Centre for Geocomputation. National University of Ireland Maynooth*.
- Lin, C.-H., & Wen, T.-H. (2011). Using geographically weighted regression (GWR) to explore spatial varying relationships of immature mosquitoes and human densities with the incidence of dengue. *International Journal of Environmental Research and Public Health*, 8(7), 2798–2815.
- Liu, K. (1988). Measurement error and its impact on partial correlation and multiple linear regression analyses. *American Journal of Epidemiology*, 127(4), 864–874.
- Matthews, S. A., & Yang, T.-C. (2012). Mapping the results of local statistics: Using geographically weighted regression. *Demographic Research*, 26, 151.
- Müller, M. (2005). *Kultur und ökonomische Entwicklung-Eine empirische Untersuchung kultureller Umwelt und unternehmerischer Fähigkeiten in der indonesischen Provinz Papua (West-Neuguinea)*.
- Saragih, J. P., & Khadafi, M. S. (2003). *Desentralisasi Fiskal dan Keuangan Daerah dalam Otonomi*. Ghalia Indonesia.
- Setyaningsih, P., & Rofi, A. (2014). Pekerja Perempuan dan Segmentasi Pasar Kerja Menurut Wilayah Kebudayaan di Provinsi Jawa Timur (Analisa Sakernas 2012). *Jurnal Bumi Indonesia*, 3(1).
- Sukirno, S. (2006). *Ekonomi Pembangunan Proses masalah dan Dasar Kebijakan*, cetakan ketiga. Penerbit Kencana, Jakarta.



- Tizona, A. R., Goejantoro, R., & Wasono, W. (2017). Pemodelan Geographically Weighted Regression (Gwr) Dengan Fungsi Pembobot Adaptive Kernel Bisquare Untuk Angka Kesakitan Demam Berdarah di Kalimantan Timur Tahun 2015. *Jurnal Eksponensial*, 8(1), 87–94.
- Todaro, M. P., & Smith, S. C. (2004). Pembangunan Ekonomi di Dunia Ketiga Edisi Kedelapan. *Jakarta: Penerbit Erlangga*.
- Windle, M. J. S., Rose, G. A., Devillers, R., & Fortin, M.-J. (2009). Exploring spatial non-stationarity of fisheries survey data using geographically weighted regression (GWR): an example from the Northwest Atlantic. *ICES Journal of Marine Science*, 67(1), 145–154.