Will Development and Temperature Be Reconciled?

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Submission date: 05-May-2021 10:47AM (UTC+0700)
Submission ID: 1578370485
File name: EN_Tulis_1.0_0505.pdf (1.69M)
Word count: 4558
Character count: 24063

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Abstract

Regional development is a driving force in advancing a country. In its application, it often causes a number of negative impacts, one of which is pollution. The resulting pollution has a negative impact on the climate, especially temperature. This study uses the Multiple Correspondence Analysis (MCA) method to measure the pollution index, followed by the instrumental variable (IV) method to calculate the effect of development on pollution and temperature. The data used in this study includes rural data from Podes 2018. The results of this study indicate that the negative pollution index formed occurs mostly in developed and developing areas. The construction and the resulting pollution index have a negative impact on temperature. The development process should pay attention to environmental aspects, to anticipate worse temperature changes in the coming period.

Keywords: development, pollution, temperature, multiple correspondence analysis (MCA), instrumental variables (IV)

1. Introduction

The issue of global warming has become a tough task for implementation in fighting these problems. Apart from having to pursue measurable development achievements in socio-economic indicators, the government is asked to maintain the environmental conditions of the local area and those around it (Faradiba & Lodewik, 2020; Wood & DeClerck, 2015; X. Zhang et al., 2017). Global warming that has occurred has begun to be felt in various aspects of life, so that the country has made efforts through various regulations to combat these problems (De Schryver et al., 2009; Houillon & Jolliet, 2005; Peters et al., 2011).

The simplest global warming can be felt through weather conditions that are getting warmer every day. This phenomenon occurs because humans will compare the current temperature conditions with the conditions some time ago (Faradiba, 2021; Foster & Rahmstorf, 2011; Hansen et al., 2006; Y. Li et al., 2011). To increase comfort in activities, people often take shortcuts by using an Air

Conditioner (AC). Comunity use of air conditioning will disrupt the ozone layer, and later will have a negative impact on global air temperature (Bolaji & Huan, 2013).

On the other hand, without realizing it, the development carried out by the government will have an impact on the surrounding environment (Jalil & Feridun, 2011). Exploration of natural resources will disturb the balance of the ecosystem (Mogborukor, 2014; Wilkinson et al., 2013). Significant development accelerations can be achieved when the country's focus has shifted from primary economic activities to secondary and tertiary economies. It is known that the primary economy promotes sectors based on nature. The signal of a shift in economic activity is thought to be due to the lack of natural resources in the local area.

The transition of economic activity in developed regions tends to be based on the industrial sector. Industrial sector will have greater added value, however, the residual waste caused by industrial processes is also very worrying (Z. H. Li & Randak, 2009; Y. Zhang et al., 2016). The waste disposal can be in the form of liquid, solid, and gas, all of which will cause disruption to the nature-based economic sector. This problem is usually resolved through the concentration of industrial areas located from residential areas and fields where agricultural businesses are located.

The phenomenon that occurs in Indonesia today is that many people have switched professions from the agricultural sector to the non-agricultural sector. This supports the economic theory which states that people will leave the primary sector and switch to other sectors (Inglehart, 2018). Based on Figure 1, it is known that economic progress as measured by rural development index is still centered on the island of Java. This condition is in contrast to the areas in eastern Indonesia, which are still largely underdeveloped. The difference between Java Island and eastern Indonesia is not only visible from the conditions of development, but the consequences of natural ecosystems are also important. The natural ecosystems in eastern Indonesia tend to be well preserved, compared to Java Island (Marshall & Beehler, 2012). The current condition shows that most of the villages are catching up, especially in areas that are left behind towards developing areas.

Based on Figure 2, natural conditions that are still natural can be seen from the temperature conditions in eastern Indonesia. The temperature in Indonesia is relatively low when compared to other regions. Extreme conditions can be seen in areas on the island of Java. Java Island has a relatively high temperature level in almost all regions. Extreme conditions can also be seen in East Kalimantan Province. East Kalimantan Province is a province outside Java Island which has significant economic activity in supporting the Indonesian economy.

The phenomenon between development followed by pollution and having an impact on air temperature, is like the two blades. On the one hand, the government wants socio-economic problems in the community through economic activities, but on the other hand there are things that need to be sacrificed. Many studies have concluded that economic progress as measured by GDP will have an impact on temperature at both the country and provincial levels. This research will determine the impact of development instrumented with a pollution index, and its impact on increasing air temperature. In addition, this study will measure the pollution index using the

Multiple Correspondence Analysis (MCA) method. This study uses several variables at the rural level, such as the development index and the pollution index. The village development index used has accommodated various aspects, such as education, health, economy, and governance (BPS, 2019). The pollution index built includes all pollution felt by rural communities.

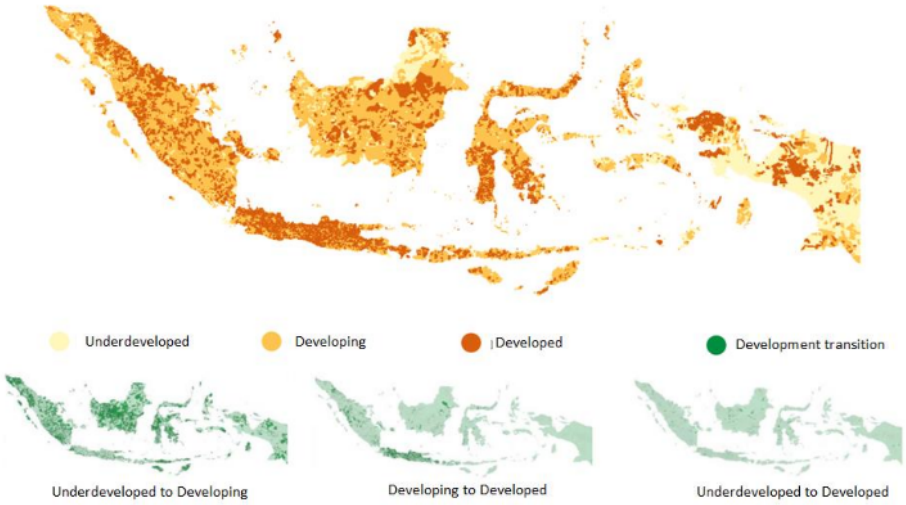


Figure 1. Distribution of Rural Development Index and Transition of Development Acceleration 2018

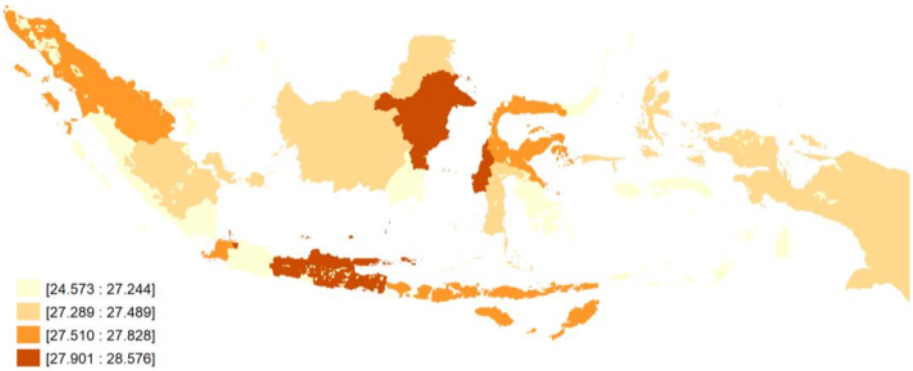


Figure 2.Average Temperature by Province 2018

2. Data and Methodology

This study uses data from the results of the Village Potential 2018 from BPS-Statistics Indonesia, which covers 75,436 villages. In this study, the pollution index will be calculated to measure the depth of pollution in rural areas. In addition, this study uses Rural Development Index data that

accommodates various aspects of a village. This study uses temperature data sourced from the BMKG-Meteorology, Climatology and Geophysics Agency.

The calculation of the pollution index in this study refers to the results of research conducted by Yokota dkk (2017) using the Multiple Correspondence Analysis (MCA) method. This method has been used to measure an index based on categorical data (Abdi & Valentin, 2007; Asselin & Anh, 2008; Rodrigues et al., 2016). In the calculation process, there are *a* number of *K* variables, and each variable has a level of *Jk* and the number of *Jk* is equal to *J*. In addition, there are as many as *I* observations. The *I x J* matrix is denoted by *X*. Establishing a correspondence analysis on the indicator matrix will produce two sets of factor scores: one for rows and one for columns. These factor scores are generally scaled such that the variance equals the corresponding eigenvalues.

The total value of the matrix of the arrangement is denoted by N, and the first step of the analysis is to calculate the probability matrix $Z = N^{-1}X$. We denote r the vector of the total row *Z*, (i.e., $r = Z1$, where *1* is the corresponding vector of *1*) and c is the vector of the total column. The notation $Dc = diag\{c\}$ and $Dr = diag\{r\}$. The factor score is obtained from the decomposition of a single value in the following equation:

$$D_r^{-\frac{1}{2}}(Z - rc^T)D_c^{-\frac{1}{2}} = P\Delta Q^T \quad (1)$$

(Δ is a diagonal matrix of a single value, and Λ=Δ2 is a matrix of eigenvalues). The row and column factor scores (respectively) are obtained by means of the following equation:

$$F = D_r^{-\frac{1}{2}}P\Delta \qquad G = D_c^{-\frac{1}{2}}Q\Delta \quad (2)$$

Distance squared (χ2) of rows and columns can be denoted in the following equation:

$$d_r = diag\{FF^T\} \qquad d_c = diag\{GG^T\} \quad (3)$$

This study will be continued with Instrumental Variable (IV) method, because model has an endogeneity problem. Wooldridge (2016) states that instrumental variable analysis is used to overcome the problem of endogeneity. The Ordinary Least Square (OLS) estimator will be biased and inconsistent if a critical variable is not included in the model. Coefficients IV and OLS will be compared in this study. According to the theory, the IV coefficient will be greater than OLS. Suppose there is a simple regression equation like the following:

$$\boldsymbol{y = \beta_0 + \beta_i x + u} \quad (4)$$

where *x* and *u* correlated or *Cov (x, u) ≠ 0*, hence the OLS method cannot be used. This is known as endogeneity. Order an estimator $\beta 0$ and $\beta 1$ consistent when *x* and *u* correlated, then additional information is needed by adding new variables that fulfill certain properties. The new variable (say *z*) must meet two assumptions, namely: (i) Variable *z* uncorrelated with *u Cov (z,u) = 0*. This assumption is called the exogeneity instrument; and (ii) Variable *z* correlated with *x or Cov (z,x) ≠ 0*. This assumption is called the relevance instrument. The variable *z* is called the instrumental variable for the variable *x* or the instrument for the variable *x*. Furthermore, the variable *x*, which is said to be an endogenous variable, raises the following regression equation:

$$\boldsymbol{x = \pi_0 + \pi_i x + z + v} \quad (5)$$

Gujarati and Porter (2009) said that the IV method is carried out in two stages. The first stage is to regress equation (2) and predict the value of the variable x which is denoted by $\hat{x}$. The second stage is to enter the variable value $\hat{x}$ into equation (1) and perform regression using OLS. This second stage estimate is an estimator from IV method, which is consistent and unbiased. The models to be built in this study are:

First stage model

$$Pollution_{index} = \alpha + \beta_1 rural\ development_{\text{index}} + \beta_2 GDRP_{\text{per capita}} + \beta_i X_i + \varepsilon \quad (6)$$

Temperature OLS model

$$\text{Temperature} = \alpha + \beta_1 pollution_{\text{index}} + \beta_i X_i + \varepsilon \quad (7)$$

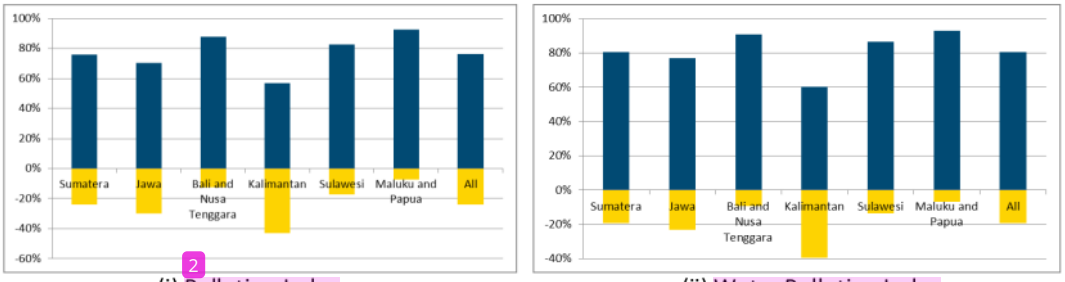
Temperature IV model

$$\text{Temperature} = \alpha + \beta_1 \widehat{pollution}_{\text{index}} + \beta_i X_i + \varepsilon \quad (8)$$

3. Result

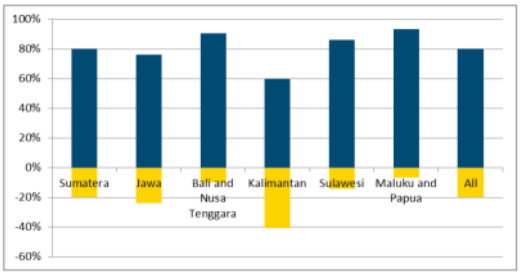
Based on Figure 3, it is known that villages that have a negative index on Kalimantan Island as a percentage have a relatively high number when compared to other islands. Negative conditions indicate that the village is experiencing pollution. Where the more negative the index value is, the deeper the pollution that occurs in an area. Relatively good levels of pollution can be seen on the islands of Maluku and Papua as well as on the islands of Bali and Nusa Tenggara. This phenomenon is seen almost the same in all types of pollution and pollution aggregation in general.

Based on Figure 4, it is known that villages that have a negative index in the independent category have a relatively high number when compared to other development categories. This phenomenon occurs both in the pollution index in general, as well as in the index of water, soil and air pollution. If you pay attention in stages, the level of pollution is getting higher, starting from the category of underdeveloped development, developing, to being developed. Air pollution is the type of pollution that has the most index level.

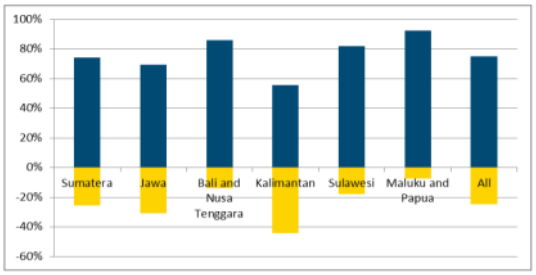


(i) Pollution Index

(ii) Water Pollution Index

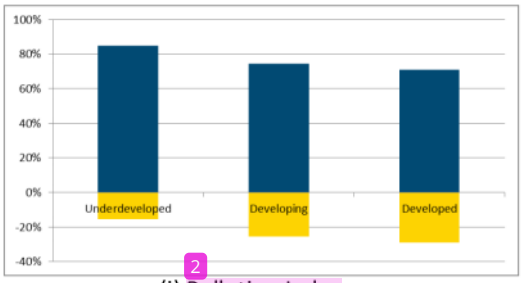


(iii) Soil Pollution Index

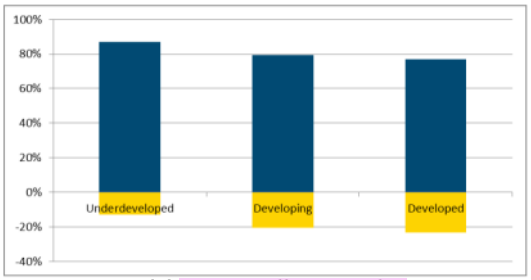


(iv) Air Pollution Index

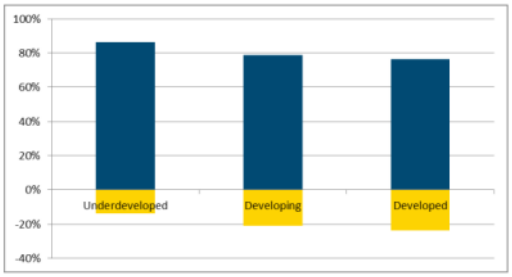
Figure 3. Index Distribution by Island 2018



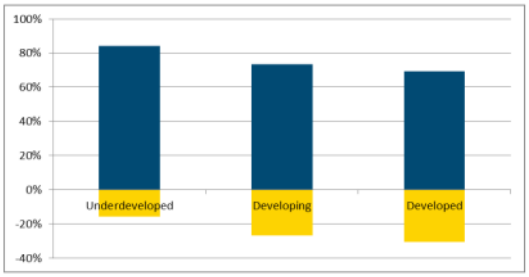
(i) Pollution Index



(ii) Water Pollution Index



(iii) Soil Pollution Index



(iv) Air Pollution Index

Figure 4. Index Distribution by Development Category 2018

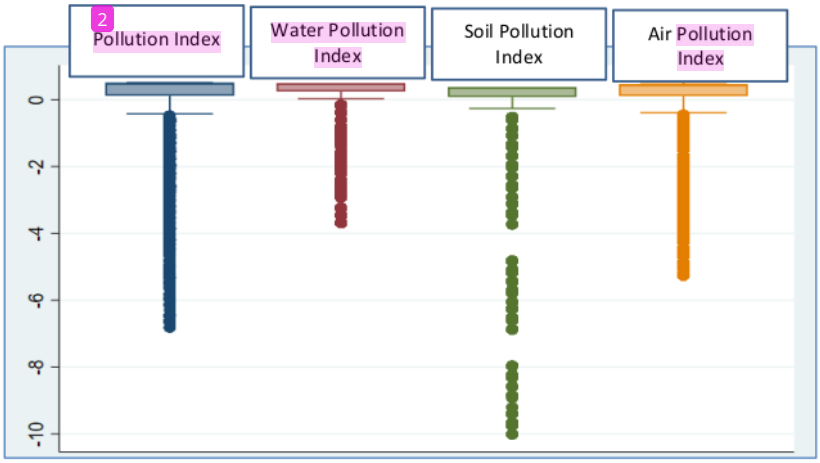


Figure 5. Pollution Index by Type

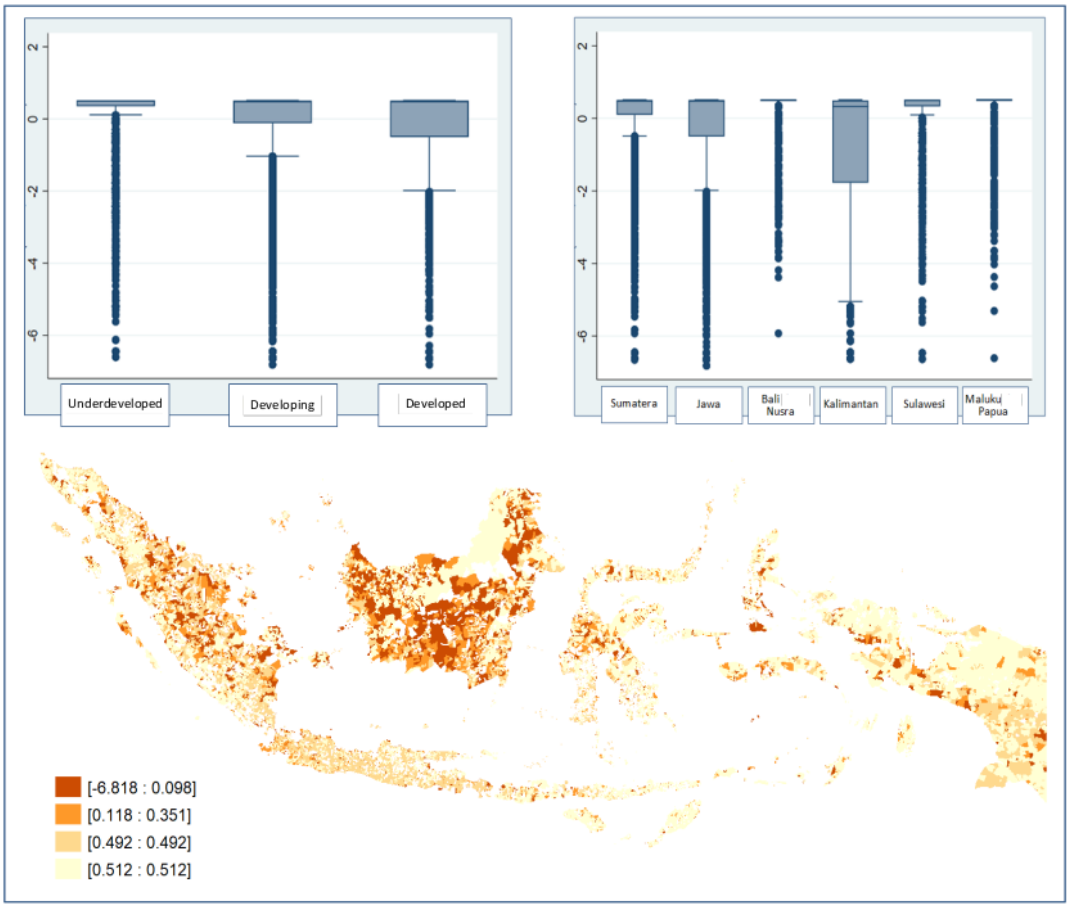


Figure 6. Distribution of Pollution Index

In the pollution index in general, if classified according to the development category, the developing category has the largest average negative index when compared to other development categories. This phenomenon can be seen from the size of the squares in the negative area. Rural with underdeveloped category have the smallest average negative index. If classified according to the major islands in Indonesia, Java and Kalimantan have an average index range that dominates in negative areas. Good conditions can be seen in Maluku and Papua Islands. On the islands of Maluku and Papua, no average grouping is seen in negative areas, this phenomenon is because there is no domination box found in negative areas. If classified according to villages in Indonesia, Kalimantan Island has the largest negative index. The distribution of the negative index can be seen in areas that are in fact urban areas or areas close to the economic center or government center. The distribution of the negative index that was formed reached -6,818.

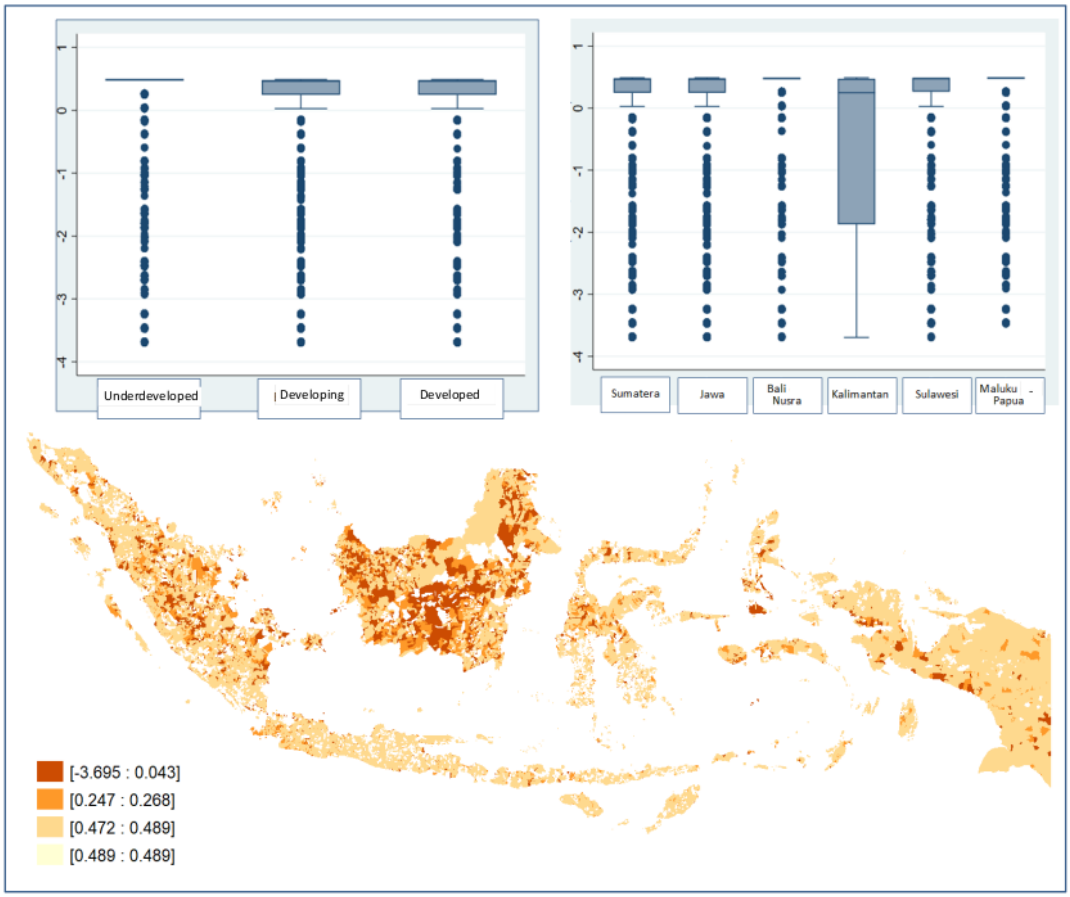


Figure 7. Distribution of Water Pollution Index

In the water pollution index, all development categories have mostly positive index ranges. This can be seen from the box size in the area above 0. If classified according to the large islands in

Indonesia, Kalimantan Island has an average index range that dominates in the negative area. Good conditions can be seen in the islands of Sumatra, Java and Sulawesi. On the islands of Bali and Nusa Tenggara as well as the islands of Maluku and Papua, there is no average grouping in negative areas, this phenomenon is because there is no domination box found in negative areas. If classified according to rural in Indonesia, Kalimantan Island has the largest negative index. The distribution of the negative index formed in water pollution reaches -3,695.

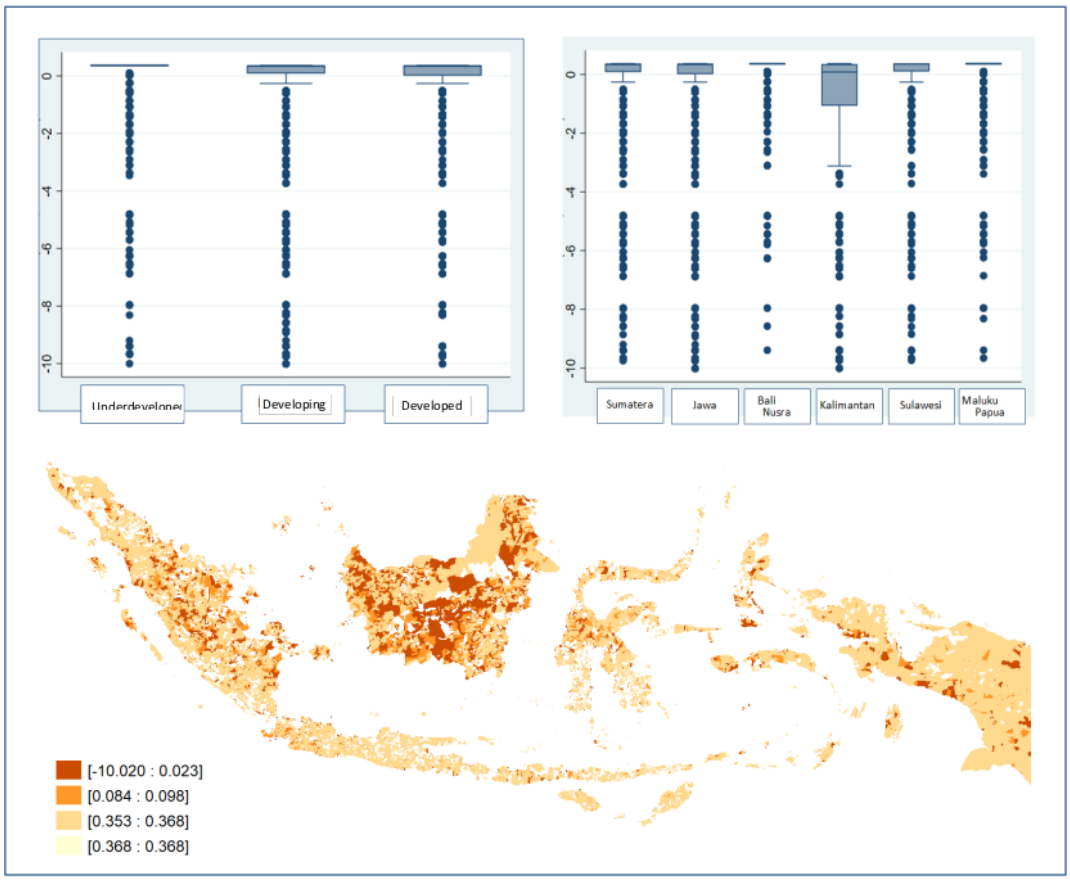


Figure 8. Distribution of Soil Pollution Index

In the soil pollution index, all development categories have mostly positive index ranges. This can be seen from the box size in the area above 0. If classified according to the large islands in Indonesia, Kalimantan Island has an average index range that dominates in the negative area. Good conditions can be seen in the islands of Sumatra, Java and Sulawesi. On the islands of Bali and Nusa Tenggara as well as the islands of Maluku and Papua, there is no average grouping in negative areas, this phenomenon is because there is no domination box found in negative areas. If classified according to villages in Indonesia, Kalimantan Island has the largest negative index. The distribution of the negative index formed in water pollution reaches -10.020.

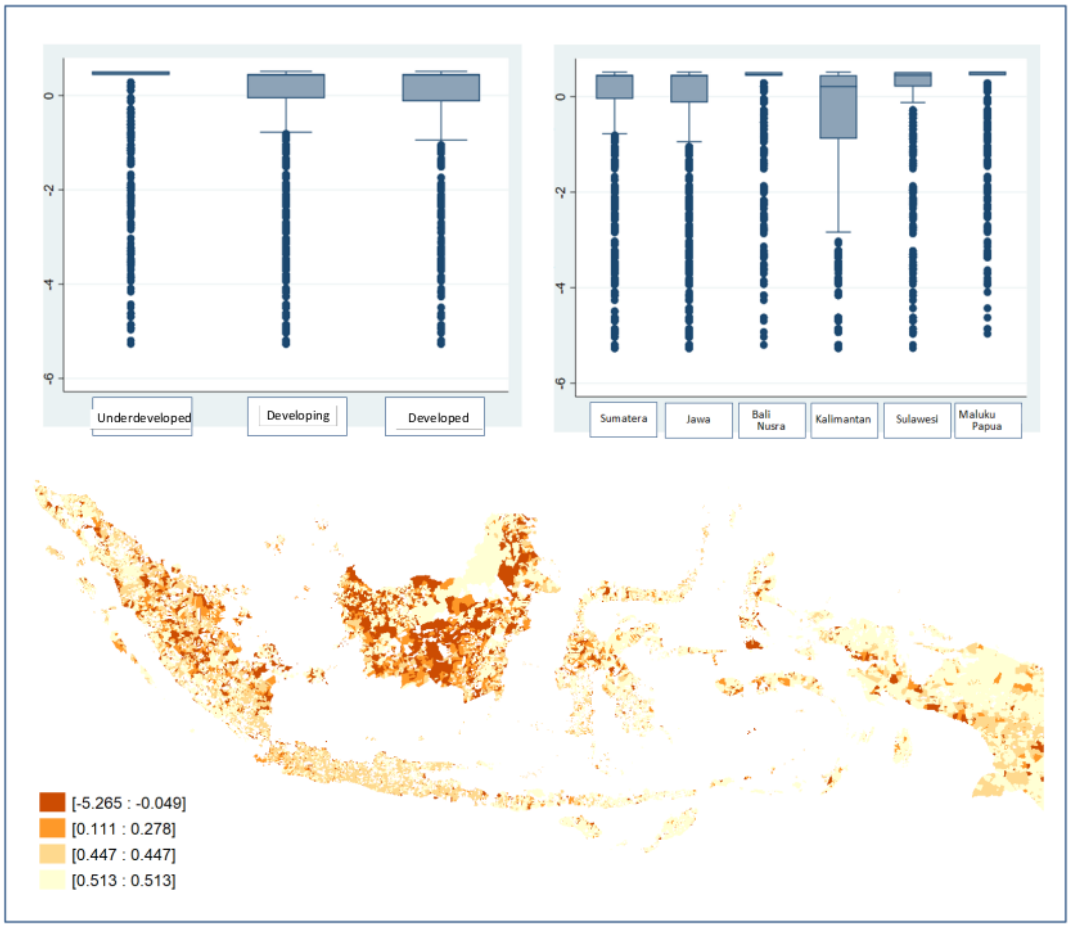


Figure 9. Distribution of Air Pollution Index

In the air pollution index, all development categories have an index range that is mostly positive in underdeveloped areas. This can be seen from the box size in the area above 0. In developing and developed areas the grouping occurs in the negative area, this indicates that most of the indexes are in the negative range. If classified according to the major islands in Indonesia, Sumatra, Java, and Kalimantan have an average index range that dominates in negative areas. Good conditions can be seen on the island of Sulawesi, because there is a grouping of positive index ranges. On the islands of Bali and Nusa Tenggara as well as the islands of Maluku and Papua, there is no average grouping in negative areas, this phenomenon is because there is no domination box found in negative areas. If classified according to villages in Indonesia, Kalimantan Island has the largest negative index. The distribution of the negative index formed in water pollution reaches -5,265.

Table 1. General estimation results for first stage IV on the pollution index

Variable	Country	Suma-tera	Jawa	Bali and Nusa Tenggara	Kali-mantan	Sulawesi	Maluku and Papua
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rural development index	-0,0088***	-0,0049***	-0,0030***	-0,0098***	0,0024	-0,0023**	-0,0016***
GRDP per capita	-0,2108***	-0,2536***	-0,1610***	-0,3492***	-0,1881	-0,1910***	-0,0957***
R^2	0,0189	0,0130	0,0029	0,0440	0,0047	0,0068	0,0087
Observation	75.436						

Source: Results of processing with Stata 16 (processed)
Note: The dependent variable in the model is the pollution index. The instrument variables in the model are the village development index and GRDP per capita. Significance level notation *** p <1%, ** p <5%, and * p <10%.

Table 2. Estimation results of OLS and IV in general at temperature

Variable	Country		Sumatera		Jawa	
	OLS	IV	OLS	IV	OLS	IV
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pollution index	0,0605***	0,5810***	0,0059**	-0,0587	0,1230***	2,6880***
R^2	0,0047	< 0,0001	0,0003	< 0,0001	0,0078	< 0,0001
Observation	75.436					

Variable	Bali and Nusa Tenggara		Kalimantan		Sulawesi	
	OLS	IV	OLS	IV	OLS	IV
(1)	(8)	(9)	(10)	(11)	(12)	(13)
Pollution index	0,0295***	0,3410***	0,0042**	1,1144***	0,0035	-0,0190
R^2	0,0779	< 0,0001	0,0009	< 0,0001	0,0001	0,0065
Observation	75.436					

Variable	Maluku and Papua	
	OLS	IV
(1)	(14)	(15)
Pollution index	0,0302***	0,2688***
R^2	0,0108	< 0,0001
Observation	75.436	

Source: Results of processing with Stata 16 (processed)
Note: The dependent variable in the model is temperature. The independent variable in the model is the pollution index. The instrument variables in the model are the village development index and GRDP per capita. Significance level notation *** p <1%, ** p <5%, and * p <10%.

Table 1 shows the role of instrument variables on the variable of interest. From these results it can be concluded that both nationally and archipelago in Indonesia, development has a negative impact on pollution in general. In addition, per capita GRDP as a control variable has the same direction and significance. The greatest development influence was seen on the islands of Bali and Nusa Tenggara, while the smallest occurred in the islands of Maluku and Papua.

Table 2 shows the effect of the pollution index on temperature. From the calculation results, it can be concluded that both nationally and in the archipelago in Indonesia, in general, pollution has a positive impact on temperature. The greatest development influence is seen on the island of Java, while the smallest occurs in the islands of Bali and Nusa Tenggara.

4. Discussion

As a factor for the success of a region, development is often used as an indicator that can be compared between regions. However, development turns out to have bad impacts, especially on environmental aspects and indirect impacts on climate change. Climate change that has occurred has prompted environmental experts to urge the public and the government to continue to maintain the purity of nature, as a legacy for future generations. The climatic impact that is most felt is the higher temperature in the last decade.

From this research it is known that the greatest pollution is seen in developed and developing areas, followed by underdeveloped areas. Underdeveloped areas tend to be still natural, so the pollution index formed for all types of pollution tends to be good. This is different from the developed and developing regions which have a relatively large negative index. The negative index that is formed can be described as the developed and developing regions have more pollution than the underdeveloped areas. The results of this study are in line with previous research which states that pollution in developed areas will be higher than in underdeveloped areas (Hoffmann, 2019; Kumar et al., 2015; Mayer, 1999).

When linked to the development that occurs, the entire region confirms that development will cause significant pollution. This phenomenon that occurs in rural areas of Indonesia is in line with research that has been conducted in other countries (Brauer et al., 2002; Gan et al., 2020; Gehring et al., 2010). The development carried out by each region often explores the natural resources that are around it, so that it has an impact on the ecosystem. In the short term, the most felt is the progress of the area and the welfare of the surrounding community. However, in the long term this will be eroded by the negative impacts that arise, especially on environmental factors.

Pollution that occurs in developed areas is often found in several countries. It is the government's duty to anticipate the bad impacts caused by the development that occurs. The government can endeavor to reinforce the rules relating to the exploration of natural resources that have an impact on the environment. Thus, in practice the progress of an area is not only measured through development alone, but through the environmental impacts that occur.

From the results of the regression calculation in this study, it is known that development has a negative impact on temperature conditions. These results are visible both nationally, as well as on most islands in Indonesia. This result reaffirms that the recent climate change is the impact of development. The results of this study are in line with several previous studies that have linked development with temperature (Ding et al., 2007; Horne et al., 2019; Melicher et al., 2019). The global warming that occurs will certainly have a negative impact on human life, especially the livelihoods of most Indonesians as farmers. The yields were no longer as expected due to the long drought.

It takes coordination between the government, investors, and the community to be able to anticipate the negative impacts of development on pollution and temperature. It is hoped that with good coordination the development process can run, and the environmental ecosystem can be maintained. This study still uses temperature data at the provincial level. In further research, temperature data at the village level are needed in order to produce more representative research results.

5. Conclusion

Environmental activists and the government are always trying to control climate change that is happening. The climate change that most people feel is increasing global warming. This phenomenon adversely affects various community activities. Through research it is known that the development that occurs has a negative impact on the temperature in Indonesia. This result occurs in most archipelagic regions in Indonesia. It takes various efforts from the government and society to anticipate worse events, because development often takes precedence over environmental aspects.

References

Abdi, H., & Valentin, D. (2007). Multiple correspondence analysis. *Encyclopedia of Measurement and Statistics*, *2*(4), 651–657.

Asselin, L.-M., & Anh, V. T. (2008). Multidimensional poverty and multiple correspondence analysis. In *Quantitative approaches to multidimensional poverty measurement* (pp. 80–103). Springer.

Bolaji, B. O., & Huan, Z. (2013). Ozone depletion and global warming: Case for the use of natural refrigerant–a review. *Renewable and Sustainable Energy Reviews*, *18*, 49–54.

BPS. (2019). *Indeks pembangunan desa 2018*.

Brauer, M., Hoek, G., Van Vliet, P., Meliefste, K., Fischer, P. H., Wijga, A., Koopman, L. P., Neijens, H. J., Gerritsen, J., & Kerkhof, M. (2002). Air pollution from traffic and the development of respiratory infections and asthmatic and allergic symptoms in children. *American Journal of Respiratory and Critical Care Medicine*, *166*(8), 1092–1098.

De Schryver, A. M., Brakkee, K. W., Goedkoop, M. J., & Huijbregts, M. A. J. (2009). *Characterization factors for global warming in life cycle assessment based on damages to humans and ecosystems*. ACS Publications.

Ding, Y., Ren, G., Zhao, Z., Xu, Y., Luo, Y., Li, Q., & Zhang, J. (2007). Detection, causes and projection of climate change over China: an overview of recent progress. *Advances in Atmospheric Sciences*, *24*(6), 954–971.

Faradiba, F. (2021). Analysis of Intensity, Duration, and Frequency Rain Daily of Java Island Using Mononobe Method. *Journal of Physics: Conference Series*, *1783*, 1–7.

Faradiba, F., & Lodewik, Z. (2020). The Impact of Climate Factors, Disaster, and Social Community in Rural Development. *The Journal of Asian Finance, Economics and Business (JAFEB)*, *7*(9), 707–717.

Foster, G., & Rahmstorf, S. (2011). Global temperature evolution 1979–2010. *Environmental Research Letters*, *6*(4), 44022.

Gan, T., Liang, W., Yang, H., & Liao, X. (2020). The effect of Economic Development on haze pollution (PM2. 5) based on a spatial perspective: Urbanization as a mediating variable. *Journal of Cleaner Production*, *266*, 121880.

Gehring, U., Wijga, A. H., Brauer, M., Fischer, P., de Jongste, J. C., Kerkhof, M., Oldenwening, M., Smit, H. A., & Brunekreef, B. (2010). Traffic-related air pollution and the development of asthma and allergies during the first 8 years of life. *American Journal of Respiratory and Critical Care Medicine*, *181*(6), 596–603.

Gujarati, D. N., & Porter, D. (2009). *Basic econometrics mc graw-hill international edition* (p. 719).

Hansen, J., Sato, M., Ruedy, R., Lo, K., Lea, D. W., & Medina-Elizade, M. (2006). Global temperature change. *Proceedings of the National Academy of Sciences*, *103*(39), 14288–14293.

Hoffmann, B. (2019). Air pollution in cities: Urban and transport planning determinants and health in cities. In *Integrating Human Health into Urban and Transport Planning* (pp. 425–441). Springer.

Horne, C. R., Hirst, A. G., Atkinson, D., Almeda, R., & Kiørboe, T. (2019). Rapid shifts in the thermal sensitivity of growth but not development rate causes temperature–size response variability during ontogeny in arthropods. *Oikos*, *128*(6), 823–835.

Houillon, G., & Jolliet, O. (2005). Life cycle assessment of processes for the treatment of wastewater urban sludge: energy and global warming analysis. *Journal of Cleaner Production*, *13*(3), 287–299.

Inglehart, R. (2018). *Culture shift in advanced industrial society*. Princeton University Press.

Jalil, A., & Feridun, M. (2011). The impact of growth, energy and financial development on the environment in China: a cointegration analysis. *Energy Economics*, *33*(2), 284–291.

Kumar, P., Morawska, L., Martani, C., Biskos, G., Neophytou, M., Di Sabatino, S., Bell, M., Norford, L., & Britter, R. (2015). The rise of low-cost sensing for managing air pollution in cities.

Environment International, *75*, 199–205.

Li, Y., Johnson, E. J., & Zaval, L. (2011). Local warming: Daily temperature change influences belief in global warming. *Psychological Science*, *22*(4), 454–459.

Li, Z. H., & Randak, T. (2009). Residual pharmaceutically active compounds (PhACs) in aquatic environment–status, toxicity and kinetics: a review. *Veterinarni Medicina*, *54*(7), 295–314.

Marshall, A. J., & Beehler, B. M. (2012). *Ecology of Indonesian Papua part two*.

Mayer, H. (1999). Air pollution in cities. *Atmospheric Environment*, *33*(24–25), 4029–4037.

Melicher, D., Wilson, E. S., Bowsher, J. H., Peterson, S. S., Yocum, G. D., & Rinehart, J. P. (2019). Long-distance transportation causes temperature stress in the honey bee, Apis mellifera (Hymenoptera: Apidae). *Environmental Entomology*, *48*(3), 691–701.

Mogborukor, J. O. A. (2014). The impact of oil exploration and exploitation on water quality and vegetal resources in a rain forest ecosystem of Nigeria. *Mediterranean Journal of Social Sciences*, *5*(27 P3), 1678.

Peters, G. P., Aamaas, B., T. Lund, M., Solli, C., & Fuglestvedt, J. S. (2011). Alternative "global warming" metrics in life cycle assessment: a case study with existing transportation data. *Environmental Science & Technology*, *45*(20), 8633–8641.

Rodrigues, L., Grave, R., de Oliveira, J. M., & Nogueira, C. (2016). Study on homophobic bullying in Portugal using Multiple Correspondence Analysis (MCA). *Revista Latinoamericana de Psicología*, *48*(3), 191–200.

Wilkinson, C., Saarne, T., Peterson, G. D., & Colding, J. (2013). Strategic spatial planning and the ecosystem services concept–an historical exploration. *Ecology and Society*, *18*(1).

Wood, S. L. R., & DeClerck, F. (2015). *Ecosystems and human well-being in the Sustainable Development Goals*. Wiley Online Library.

Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach*. Nelson Education.

Yokota, K., Watanabe, K., Wachi, T., Otsuka, Y., Hirama, K., & Fujita, G. (2017). Crime linkage of sex offences in Japan by multiple correspondence analysis. *Journal of Investigative Psychology and Offender Profiling*. https://doi.org/10.1002/jip.1468

Zhang, X., Warner, M. E., & Homsy, G. C. (2017). Environment, equity, and economic development goals: Understanding differences in local economic development strategies. *Economic Development Quarterly*, *31*(3), 196–209.

Zhang, Y., Feng, G., Zhang, M., Ren, H., Bai, J., Guo, Y., Jiang, H., & Kang, L. (2016). Residual coal exploitation and its impact on sustainable development of the coal industry in China. *Energy Policy*, *96*, 534–541.

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