

Industrial Activities Impacts on the Settlement Environmental Quality: A Case Study of Kwadungan Village, Kediri Regency, Indonesia

Wulan, P. Y. N.,^{1*} Putri, R. F.² and Giyarsih, S. R.³

Department of Environmental Geography, Faculty of Geography, Universitas Gadjah Mada, Indonesia

E-mail: putriyuko@mail.ugm.ac.id,¹ ratihfitria.putri@ugm.ac.id,² srium@ugm.ac.id³

*Corresponding Author

DOI: <https://doi.org/10.52939/ijg.v21i2.3931>

Abstract

Around the world, there has been tremendous industrial development, greatly aided by a variety of industries, including manufacturing, services, and infrastructure. Globalization, technological advances, and government initiatives to combat poverty and promote economic development are some of the causes driving this increase. Industrial activities have an impact on various aspects of the settlement environmental quality. Kwadungan Village is in the industrial area of Kediri Regency. Its location in the industrial area makes the settlements directly exposed to industrial activities. Therefore, a study on the environmental quality of settlements that includes an assessment of the industrial activity impacts is needed to formulate regional settlements policies. This study aims to (1) assess the settlement environmental quality, (2) analyze the effect of industrial activities on settlement environmental quality. Samples were selected using stratified random sampling method and the samples size was 306 samples. Data processing used scoring techniques from the questionnaire data. While the effect of industrial activity on the settlement environmental quality is known from the ordinal logistic regression test with a 5% error rate. The results showed that the environmental quality of settlements in Kwadungan Village was dominated by the moderate settlement environmental quality class, which is 35%. Then, the good class is 33% and the bad class is 32%. In addition, industrial activities strongly influence by 52.4% on settlement environmental quality in Kwadungan Village.

Keywords: Industrial Activities, Industrial Settlements, Settlement, Settlement Environmental Quality

1. Introduction

Kwadungan Village is in an industrial area that consists of a cigarette industry, a plastic industry, and a soy sauce industry. These industries certainly make industrial activities around Kwadungan Village more complex. People tend to choose to settle in industrial areas because there are many economic activities that can advance economic welfare and reduce the unemployment rate of communities around the industry [1] and [2]. Large industries also build public facilities and infrastructure as an ethical responsibility or Social and Environmental Responsibility (CSR) to improve the community's quality of life and environment around the industrial zone [3] and [4].

Industrial activities that include manufacturing and transportation can also adversely affect the surrounding environment [5] [6] and [7]. Environmental problems that have the potential to occur around industries are environmental pollution, congestion, and noise contamination [8] [9] [10] and

[11]. Environmental pollution can occur if industries do not manage their waste in accordance with the rules set by the government [12]. Especially in air pollution, one of the influential factors is the emission of pollutants from industrial activities and the increase of built-up areas [13] and [14]. These various environmental problems will certainly also have an impact on the settlement environmental quality around the industry [15] and [16]. Settlement environmental quality is the ability of the built environment, diverse landscapes with natural elements, social environment, and culture to meet various human needs, reflecting the comfort and suitability of human life in a particular context [17]. Settlement environmental quality assessment helps in identifying the strengths and weaknesses of a settlement, thus providing information for policy makers to formulate policies aimed at improving the residents' quality of life [18].

Settlement environmental quality assessment is rooted in the understanding that settlements are areas closely related to human productivity and life, and their quality directly affects people's quality of life [19] and [20]. Evaluating settlement environmental quality is essential to identify constraints that hinder the improvement of settlement quality and develop effective strategies to overcome these challenges. Therefore, research of the industrial activities impacts on the settlement environmental quality is needed. This research aims to assess the settlement environmental quality in Kwadungan Village and analyze the influence of industrial activities on the settlement environmental quality. This research is expected to be a source of information for the community and policy makers about the settlement environmental quality so that it can be taken into consideration in determining policies.

2. Material and Methods

Several previous studies on the environmental quality of settlements became references in this study, including [1] [5] [21] [22] and [23]. These studies used the scoring method to assess settlement quality, although the locations and results of the studies were different. This research was conducted in Kwadungan Village, Kediri District.

As it can be seen on Figure 1, this village is also located in an industrial area because there are several large industries, such as the cigarette industry, plastic industry, and soy sauce industry. Kwadungan Village has an area of 1.17 km² which is divided into 23 Neighborhood Associations, 3 Community Associations, and 1 Hamlet.

2.1 Research Data

There are several data required in this research, as listed in Table 1.

2.2 Methodology

2.2.1 Sampling

It is known that the number of housing units in Kwadungan Village is 1,473 housing units. The sample size was determined using the Krejcie and Morgan method with an error rate of 5%. Based on the calculation, the sample size is 306 housing units. In order for the selected samples to be evenly distributed, it will be distributed to each community unit or called "Rukun Warga (RW)" in Indonesian Language (Bahasa) with the following distribution:

- Community Unit 001: 86 houses
- Community Unit 002: 87 houses
- Community Unit 003: 133 houses

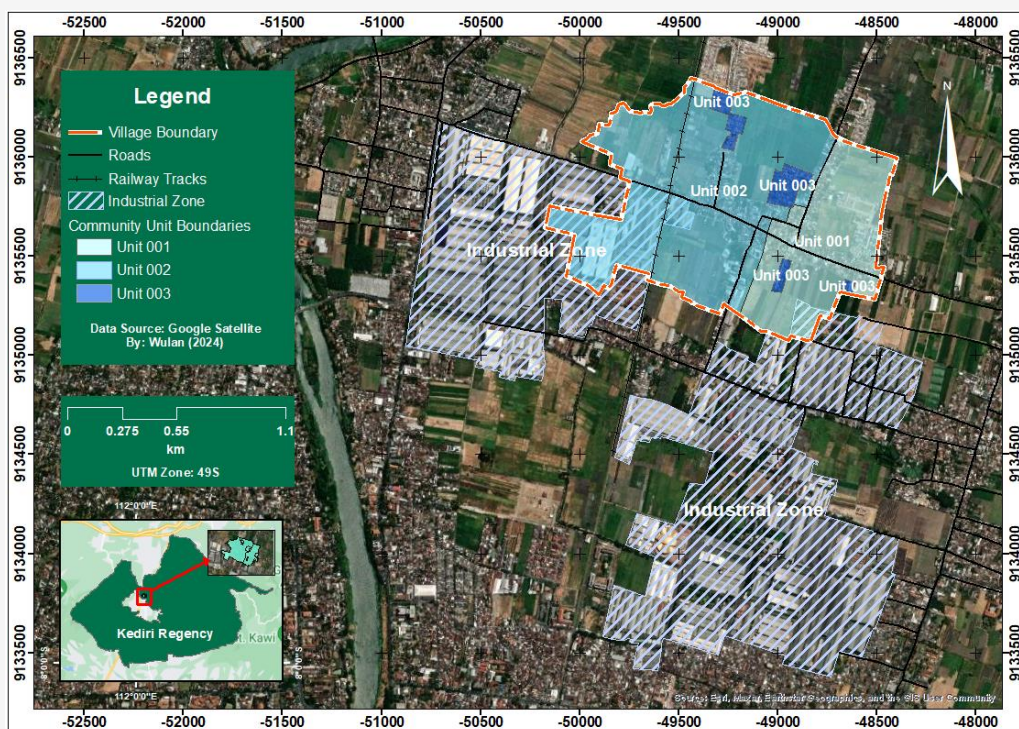


Figure 1: Kwadungan Village, Kediri Regency

Table 1: Research data

Variables	Parameters
Physical Building	Wall condition, fence condition, door condition, ventilation condition, yard condition
Settlement Environment	Infrastructure and utilities quality, availability of shade trees, type of road surface, road condition, availability of open green space
Sanitation	Garbage disposal, wastewater disposal, water sources for consumption needs, water sources for domestic needs, drainage conditions
Community Perspective (X ₁)	Disturbance to the community, impact on the community, provision of assistance from the industry, type of provision of assistance from the industry
Environmental Pollution (X ₂)	Water source contamination, air condition contamination, noise level due to industrial activities.
Congestion (X ₃)	Congestion level, availability of traffic signs, and availability of traffic arrangements by the industry.

2.2.2 Data processing

Once the data was collected using questionnaires, data coding was performed by converting interview responses into weighted values for each variable on Microsoft Excel. This process aimed to balance the importance of each variable by developing a composite index. The composite index was calculated using SPSS to ensure accurate weighting across the dataset. The Excel data was then imported into ArcGIS, where data points were plotted using their geographic coordinates. To perform spatial analysis, a new field was created in the attribute table, and the Field Calculator was used to calculate a score for each housing unit by summing the weighted variables. These scores were categorized into three settlement environmental quality classes: good, moderate, and bad. The Equal Intervals classification tool was applied, dividing the scores into evenly distributed categories. These categories were visualized using graduated colors or symbols to display spatial patterns and variations, facilitating easy interpretation and comparison of settlement environmental quality across different geographic areas.

2.2.3 Ordinal logistic regression

The predetermined classifications were then regression-tested to assess the impact of industrial activities on settlement environmental quality. The study employed ordinal logistic regression, a statistical method used for predicting the outcome of an ordinal dependent variable based on one or more independent variables. This method was chosen because the data consisted of ordinal scales, and it allows for multiple independent variables. Ordinal logistic regression evaluates the relationship between predictors and the ordered categories of the outcome variable. The model's significance value was set at 0.05, meaning that relationships with a p-value less

than 0.05 would be considered statistically significant, providing insights into how industrial activities influence the settlement's environmental quality.

3. Result and Discussion

3.1 Settlement Environmental Quality of Kwadungan Village

Based on the variables (physical building, residential environment, sanitation, community perspective, environmental pollution, and congestion) for each house in Kwadungan Village that have been scored and the composite index calculated, the settlement environmental quality in Kwadungan Village can be assessed. The following (Figure 2) is the percentage of settlement environmental quality in Kwadungan Village. Figure 2 illustrates the settlement environmental quality percentage in Kwadungan Village, Kediri Regency, broken down into three categories: Good (33%), Moderate (35%), and Bad (32%). This distribution suggests that the environmental quality across the village is relatively balanced, with a slightly larger portion of households falling under the moderate category. The proximity of the percentages for good and bad quality conditions indicates that while some areas enjoy good environmental conditions, an almost equal proportion of the village faces significant environmental challenges. Figure 2 highlights that roughly one-third of the village requires substantial attention to address poor environmental conditions, while another third is performing well in maintaining a healthy environment. The fact that most of the households (68%) fall under the moderate and bad categories suggests that overall environmental improvement efforts in the village are necessary to achieve a more sustainable and healthier living condition.

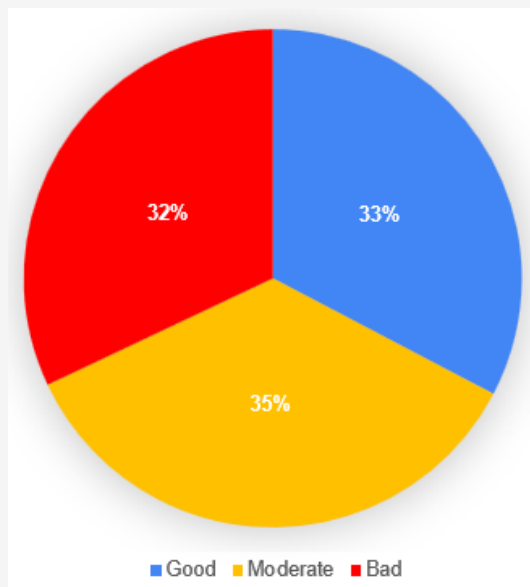


Figure 2: Settlement environmental quality percentage of Kwadungan Village, Kediri Regency [23]

This distribution provides a useful snapshot for decision-makers to focus on interventions targeting moderate and poor areas to improve the overall environmental quality of the village. Meanwhile, if the results of settlement environmental quality are

broken down by community unit, they are as shown in Figure 3. Figure 3 is a result of an assessment that evaluates the settlement environmental quality for each house within three community units (RW) in Kwadungan Village, Kediri Regency. The individual assessments of each house were then aggregated and grouped per unit to represent the overall environmental conditions in each area using Microsoft Excel. The environmental quality was categorized into three levels by combining house-level data, the chart gives an overall view of the environmental conditions in the respective units, enabling an evaluation of which areas require improvement or intervention. The chart reveals that Unit 003 has the best environmental quality, with 88% of the houses falling under the good category, which suggests that the settlement in this area is well-maintained. Unit 002, however, faces significant environmental challenges, with 56% of its houses categorized as having bad environmental conditions, signalling urgent attention is needed. Unit 001 shows a more balanced distribution, with 43% in the bad category, but also a relatively higher proportion of moderate-quality houses. This analysis highlights the importance of targeted environmental improvement initiatives in specific units, particularly in Unit 002 and Unit 001, where addressing poor conditions could enhance overall community wellbeing.

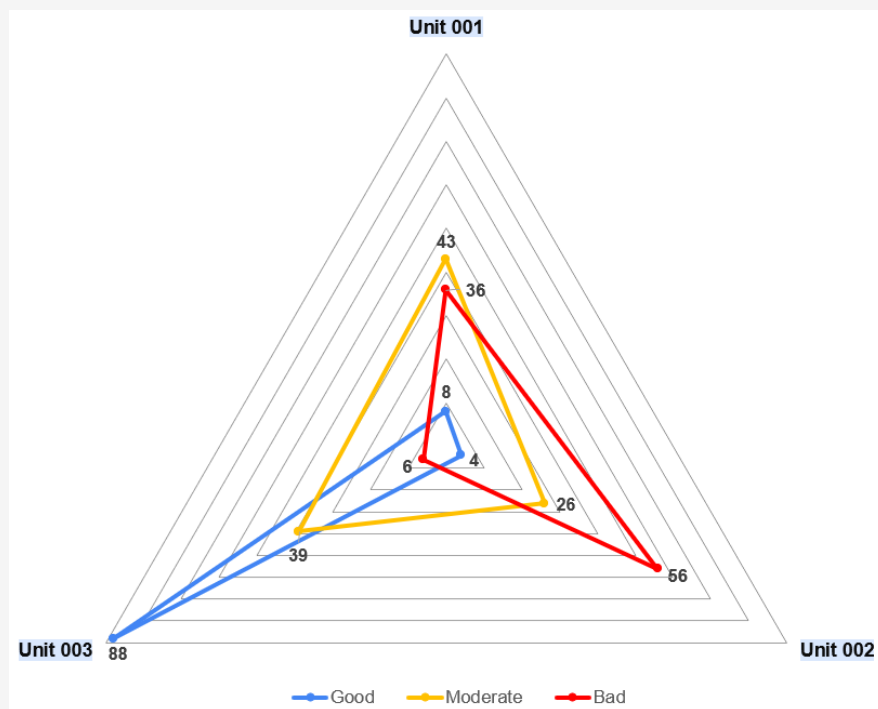


Figure 3: Distribution of settlement environmental quality per community unit (RW) in Kwadungan Village, Kediri Regency [23]



Figure 4: Settlement environmental quality map of Kwadungan Village, Kediri Regency [23]

Figure 4 is a map that provides a spatial analysis of the settlement environmental quality in Kwadungan Village, Kediri Regency. The distribution of these categories across the village shows clear spatial patterns. For instance, areas near the railroad tracks and main roads appear to have a higher concentration of bad environmental quality (red), while regions further from the infrastructure tend to exhibit better conditions (green). The moderate-quality areas are more scattered and seem to transition between good and bad zones. This Figure 4 highlights the impact of industrial zones on environmental quality. Areas near the railroad tracks and roads might face more environmental challenges, such as pollution, noise, or poor waste management, which results in a higher concentration of households marked in red. Meanwhile, the clusters of green dots in the northeastern part of the village suggest a relatively well-maintained and healthier environment in those areas. This map can be a valuable tool for urban planners and local authorities in identifying priority areas for intervention, particularly where poor environmental conditions overlap with infrastructure.

Unit 002 has a significant concentration of poor settlement environmental quality, largely due to its proximity to industrial zone and major infrastructure such as roads and railway tracks. Industrial zones tend to have less stringent environmental regulations

compared to residential areas, which can result in waste mismanagement, adding to pollution concerns. The residents in Unit 002 may also face limited access to green spaces or cleaner environments, as the land near industrial zones is often used for industrial and logistical purposes, reducing opportunities for cleaner air and recreational areas. Industrial areas typically generate various environmental hazards, including air pollution from factory emissions, noise pollution from machinery, and potential soil or water contamination from industrial waste. These factors degrade the living conditions for nearby residents, making Unit 002 more vulnerable to environmental challenges. The closer a settlement is to an industrial area, the more likely it is to be directly exposed to the impacts of industrial activities. These factors not only affect the environmental quality of settlements, but can also affect public health, the emergence of slums, and the quality of life of the community [5] [21] and [24].

Additionally, the roads running through Unit 002 are likely used for heavy transportation, such as trucks carrying goods to and from the industrial zones. The roads are heavily utilized by industrial traffic, leading to quicker wear and tear, as well as potential safety hazards for residents. Frequent movement of these large vehicles exacerbates road damage, increases dust and air pollution, and contributes to higher noise levels.

Also poorly maintained roads can lead to water stagnation during the rainy season, further deteriorating the surrounding environment. These combined factors significantly reduce the quality of life in Unit 002, as indicated by the red-marked areas on the map.

Unit 001 shows a variety of settlement environmental quality due to its location at the intersection of different land uses and infrastructure. It is close to both industrial areas and the main road, similar to Unit 002, which explains the presence of poor environmental quality in certain parts, likely caused by pollution, noise, and heavy traffic. However, Unit 001 also contains regions farther from the industrial activities and main roads, where environmental conditions improve, as indicated by the presence of moderate and even good quality areas. This diversity could be due to a mix of residential zones that are better maintained or located slightly farther from pollution sources, as well as varying levels of infrastructure and waste management across different neighborhoods. The combination of proximity to both detrimental infrastructure and more well-kept areas results in the wide range of settlement qualities within Unit 001.

Based on the map above (Figure 4), good residential neighborhood quality is farthest from the main road when compared to poor and moderate residential neighborhood quality. It is particularly clustered in Community Unit 003 of Kwadungan Village, which is a housing complex. Therefore, it can be said that the settlement environment quality of a housing complex is better than that of an ordinary settlement. This is in line with research [25].

Unit 003 has a high concentration of good settlement environmental quality primarily because it is a designated housing complex, which typically benefits from better planning, infrastructure, and maintenance compared to other types of residential areas. Housing complexes are often developed with a focus on providing a more organized and controlled living environment. In Unit 003, this likely includes well-maintained roads, adequate drainage systems, and green spaces that contribute to better air quality and overall liveability. The design and planning of such complexes often prioritize the well-being of residents, which translates into better environmental management practices, such as proper waste disposal, efficient utility services, and restrictions on polluting activities within the area. These factors all contribute to the area's predominantly "good" environmental quality, as seen on the map (Figure 4).

Furthermore, Unit 003 is located farther away from the industrial areas and main roads. This minimizes the exposure of the housing complexes to the impact of industrial activities [25] and [26]. The distance from these negative externalities allows the environmental quality in Unit 003 to remain high. Housing complexes are often developed with zoning regulations that ensure a buffer between industrial or commercial activities and residential areas, further safeguarding the environmental health of the settlement. The lack of industrial infrastructure nearby allows for better air quality, lower noise levels, and less risk of environmental contamination, which are all critical factors for maintaining a high quality of life.

Housing complexes like those in Unit 003 typically implement stricter rules and regulations regarding land use and environmental management. These complexes often have homeowners' associations or management bodies that enforce regulations on waste management, landscaping, and neighborhood cleanliness. This results in a more organized and well-maintained living environment compared to informal settlements or older, unregulated areas. Additionally, Unit 003 likely benefits from modern construction standards, which include efficient utilities, such as proper sewage and drainage systems, that help prevent flooding and reduce water stagnation, further improving environmental quality.

3.2 Industrial Activity Impact on Settlement Environmental Quality

Settlement environmental quality classes are generally classified on a class or scale of bad, moderate, and good. This multilevel data scale in statistical analysis is called an ordinal data scale. The ordinal logistic regression model is one type of regression model used to model dependent variables that have an ordinal scale and consist of 3 or more categories, while the independent variables can be categorical or quantitative data. The following are the results of the ordinal logistic regression test using SPSS. Pseudo R-square values, shown in the Table 2, are often used to assesses the impact magnitude of independent variables.

Table 2: Pseudo R-squared

Pseudo R-Squared	
Cox and Snell	0.341
Nagelkerke	0.524
McFadden	0.256

Table 3: Estimated parameters

		Estimated	Std. Error	Wald	df	Sig.	Exp
Threshold	[Y = 1]	-7.454	0.745	100.015	1	0.000	-
	[Y = 2]	-2.872	0.517	30.792	1	0.000	-
Location	[X ₁ =1]	-1.660	0.503	10.869	1	0.001	0.191
	[X ₁ =2]	-1.492	0.498	8.977	1	0.003	0.227
	[X ₂ =1]	-3.993	0.502	63.301	1	0.000	0.021
	[X ₂ =2]	-1.254	0.302	17.249	1	0.000	0.287
	[X ₃ =2]	-0.708	0.405	3.047	1	0.081	0.492

There are several measures of Pseudo R-square, each calculated differently and providing slightly different insights into the model's effectiveness.

1. *Cox and Snell*: based on the likelihood function and is constrained by its maximum possible value being less than 1, which makes it harder to interpret as an absolute measure of fit. In this table, its value is 0.341, suggesting a moderate fit.
2. *Nagelkerke*: an adjusted version of Cox and Snell, corrects for the limitation by rescaling the value so it can reach 1.0, making it easier to interpret. In this case, Nagelkerke's value is 0.524, indicating the model explains about 52.4% of the variation in the data, which is higher than Cox and Snell because it adjusts the scale.
3. *McFadden*: a more conservative measure, often yielding lower values. It compares the log-likelihood of the full model with a null model (one with no predictors). In this case, it is 0.256, which still suggests some explanatory power but is generally considered low.

The higher value of the Nagelkerke pseudo R-square compared to the others is because it corrects the shortcomings of Cox and Snell, making it a more reliable metric in assessing model fit when logistic regression is used. In this study, the model used is Nagelkerke because it has the highest R-square value, which is 0.524 or 52.4%. The degree of correlation based on the R-square value is grouped as follows: 0 (no correlation), 0.00-0.25 (very weak correlation), 0.25-0.50 (moderate correlation), 0.50-0.75 (strong correlation), 0.75-0.99 (very strong correlation), and 1 (perfect correlation) [27]. Thus, the Nagelkerke R-square value in this study belongs to the strong correlation category. This means that industrial activities strongly influence 52.4% of the environmental quality of settlements in Kwadungan Village. Based on the parameter estimates table above (Table 3), the parameter coefficient of Community Perspective (X₁) (1) has a negative value of -1.660 with a significance value of 0.001.

From there, the exp value is known, which is 0.191. Likewise, X₁(2) has a negative parameter coefficient of -1.492 with a significance value of 0.003. The exp value of X₁(2) is 0.227. The Environmental Pollution (X₂) variable (1) has a parameter coefficient of -3.992 with a significance value of 0.000. The exp value of X₂(1) is 0.021. While X₂(2) has a parameter coefficient of -1.254 with a significance value of 0.000. The exp value of X₂(2) is 0.287. Congestion variable (X₃)(2) parameter coefficient -0.708 with a significance value of 0.081. The exp value of X₃(2) is 0.492. All probabilities, except X₃(2) are stated to have an impact on the settlement environment quality (Y).

It is undeniable that industrial activities affect the quality of the residential environment. In this case, if industrial activities both from manufacturing activities and industrial transportation activities follow the correct procedures or standards, the settlement's environmental quality will also improve [22]. As proven by the results of the ordinal logistic regression test conducted, industrial activity has a strong effect of 52.4% on the settlement's environmental quality in Kwadungan Village. Of the three variables tested, only 2 variables affect the quality of the residential environment, namely Community Perception and Environmental Pollution.

The congestion variable has no effect because the results show that congestion only occurs at certain hours, especially rush hour. Rush hour is the time when most people leave and return from work or school which increases the volume of vehicles, so the roads become very jam-packed, and congestion occurs. In addition, traffic signs and traffic control are already provided by industries and the surrounding communities themselves. After all tests have been conducted, the ordinal logistic regression model with proportional odds can be formed. Based on the coefficients from Table 3 of the Ordinal Logistic Regression Test, the equations used to calculate the logit model odds are presented as follows:

$$\text{Logit}[P(Y_i \leq 1 | X_i)] = \frac{e^{-7.454+1.660X_1+3.993X_2+0.708X_3}}{1+e^{-7.454+1.660X_1+3.993X_2+0.708X_3}}$$

Equation 1

$$\text{Logit}[P(Y_i \leq 2 | X_i)] = \frac{e^{-2.872+1.660X_1+3.993X_2+0.708X_3}}{1+e^{-2.872+1.660X_1+3.993X_2+0.708X_3}}$$

Equation 2

Where:

- X_1 is Community Perspective
- X_2 is Environmental Pollution
- X_3 is Congestion

The next step involves calculating the probability for each category of settlement environmental quality using the ordinal logistic regression results. The cumulative probability for each category is obtained based on the regression model. For example:

- $X_1 = 1$ (Community Perspective)
- $X_2 = 1$ (Environmental Pollution)
- $X_3 = 2$ (Congestion, given that it varies more, and the value of 2 is chosen to reflect different conditions)

The next step involves calculating the probability for each category of settlement environmental quality using the ordinal logistic regression results. The cumulative probability for each category is obtained based on the regression model. The probabilities for each category illustrates in Table 4. The table shows that the probability of the settlement environmental quality being categorized as poor is 40.4%. This indicates that the combined factors of community perspective, environmental pollution, and congestion

exert some influence on the settlement, although this influence is not strong enough to definitively place the environmental quality into the poor category. The negative logit value for this category suggests that while these factors are impactful, their overall effect tends to pull the settlement quality away from the poor classification. Essentially, there is still a significant chance (40.4%) that a settlement could fall into the poor category, but it's not the most likely outcome when considering the total influence of all variables.

For the moderate category, the results are more pronounced. The probability of the settlement environmental quality being classified as moderate is 58.1%. This is derived after accounting for the probability of being classified as poor. The higher positive logit value here reflects that community perspective, pollution, and congestion have a strong cumulative impact, driving the quality of the settlement toward the moderate classification. This suggests that, despite the challenges from industrial activities, most of the settlement's environmental quality aligns more with a moderate standard rather than poor. The factors at play, including congestion and pollution, contribute to conditions that are less severe than expected in a poor category, pushing the probability into this middle-ground classification.

Table 4: The probabilities for each category

Category	Logit Calculation Result	Probability (%)	Interpretation
Poor	-0.385	40.4%	Community perspective, pollution, and congestion shift the quality from the poor category, but there's still a significant 40.4% chance of it being classified as poor.
Moderate	4.197	58.1%	A strong influence of factors with a high likelihood for a moderate classification, reflecting the cumulative impact on settlement quality.
Good	Very low	1.5%	Minimal chance for high-quality classification because of industrial activities, resulting in conditions rarely supporting good environmental quality.

Finally, the chance of the settlement environmental quality being classified as good is notably low at 1.5%. This probability is calculated after considering both the poor and moderate categories. The very low likelihood of reaching the good category indicates that the cumulative effects of community perspective, pollution, and congestion create conditions that rarely support high-quality settlement environments. Given the presence of industrial activities and their significant impact on the surrounding environment, it is unsurprising that the chance of achieving a "good" environmental quality classification is minimal. The data shows that these influencing factors make it highly unlikely for the settlements to experience optimal environmental conditions. In conclusion, the results from the ordinal logistic regression indicate that the settlement environmental quality of Kwadungan Village is most likely to fall within the moderate category, with a 58.1% chance. There is a smaller but still significant chance that the quality could be categorized as poor (40.4%), while the chance of the quality being considered good is minimal (1.5%). This distribution highlights the substantial impact that industrial activities have on the local environmental quality, pushing most of the area into moderate conditions with few opportunities for high-quality living environments.

4. Conclusion

The settlement environmental quality in Kwadungan Village is dominated by the moderate class at 35%, followed by the good class at 33%, and the bad class at 32%. Spatial analysis indicates that settlement quality improves as the distance from industrial zones and main roads increases, suggesting a notable impact of industrial activities on the living environment. The results of the ordinal logistic regression test show a significant influence of 52.4% (Nagelkerke R-square value of 0.524), emphasizing the strong correlation between industrial activities and the degradation of settlement conditions, particularly those near industrial zones. The presence of industry not only degrades the environment but also affects the quality of life in these communities. Increased pollution levels, poor air quality, severe noise levels, and contamination of water sources can result in health issues, such as respiratory problems and water-borne diseases. Moreover, industrial activities often lead to reduced green spaces and changes in land use and contributing to environmental degradation. From a community perspective, residents may perceive their environment as unsafe or less desirable, influencing their overall well-being and satisfaction.

A comprehensive technical contribution would be to further develop GIS technology that can dynamically assess settlement environmental quality, incorporating real-time monitoring and predictive models to visualize potential risks and promote sustainable urban planning. Additionally, policies should focus on stricter industrial regulations and buffer zones to mitigate the environmental impacts on adjacent residential areas. This would ensure the long-term improvement of environmental quality and the health of the community.

Acknowledgment

This research is part of thesis to graduate from Postgraduate Geography, Gadjah Mada University. We would like to thank for the guidance to all of lecturer.

References

- [1] Mena, T. D., Tyas, W. P. and Budiati, R. E., (2019). Kajian Dampak Lingkungan Industri Terhadap Kualitas Hidup Warga Sekitar [Study of the Environmental Impact of Industry on the Quality of Life of Surrounding Residents]. *Jurnal Kesehatan Masyarakat*, Vol. 7(1). <https://doi.org/10.31596/jkm.v7i1.384>.
- [2] Salonga, R., (2019). What Are the Advantages of Industrialization?. *Science Park*. [Online]. Available: <https://sciencepark.com.ph/blog/wh-are-the-advantages-of-industrialization/> [Accessed Jun. 5, 2024].
- [3] Pera, G., (2015). Pengembangan Model Program Tanggung Jawab Sosial dan Lingkungan Perusahaan Kehutanan, Perkebunan dan Pertambangan di Kalimantan Timur [Development of a Social and Environmental Responsibility Program Model for Forestry, Plantation, and Mining Companies in East Kalimantan]. *Jurnal Agrifor*. Vol. 14(2), 161-184. <https://doi.org/10.31293/af.v14i2.1361>.
- [4] Blegur, M. M., (2023). Tanggung Jawab Sosial dan Lingkungan Perseroan Terbatas Dalam Pemanfaatan Air Terhadap Masyarakat di Daerah [Corporate Social and Environmental Responsibility in Water Utilization for Local Communities]. *Journal Publicuho*, Vol. 6(1). <https://doi.org/10.35817/publicuho.v6i1.89>.
- [5] Pradani, D., Rahayu, M. J. and Putri, R. A., (2017). Klasifikasi Karakteristik Dampak Industri pada Kawasan Permukiman Terdampak Industri di Cemani Kabupaten Sukoharjo [Classification of the Characteristics of Industrial Impacts on Residential Areas

- Affected by Industry in Cemani, Sukoharjo Regency]. *Jurnal Ilmiah Arsitektur dan Lingkungan Binaan*, Vol 15(1). 215-220. <https://doi.org/10.20961/arst.v15i1.12166>.
- [6] Patnaik, R., (2018). Impact of Industrialization on Environment and Sustainable Solutions - Reflections from a South Indian Region. *IOP Conference Series: Earth and Environmental Science*, Vol. 120(1). <https://doi.org/10.1088/1755-1315/120/1/012016>.
- [7] Goswami, P., (2021). Impact of Industrialization on Environment. [Online serial]. Available at: <https://www.researchgate.net/publication/351599623>. [Accessed: Jun. 4, 2024].
- [8] Mohammadzadeh, M., Ahmadi, S. H., Sekhavati, E. and Ahani-Jegar, K., (2015). Noise Pollution Effect in Flour Factory on Workers' Hearing in Lamerd City. *Journal of Medicine and Life*, Vol. 8(3), 208–211.
- [9] Zhou, Z., Kang, J., Zou, Z. and Wang, H., (2016). Analysis of Traffic Noise Distribution and Influence Factors in Chinese Urban Residential Blocks. *Environment and Planning B: Planning and Design*, Vol. 44(3), 570-587. <https://doi.org/10.1177/0265813516647733>.
- [10] Cheng, Z., Li, L. and Liu, J., (2017). Identifying the Spatial Effects and Driving Factors of Urban PM2.5 Pollution in China. Institute of Manufacturing Development. *Ecological Indicators Journal*, Vol. 82. 61–75. <https://doi.org/10.1016/j.ecolind.2017.06.043>.
- [11] Alfitra, F. and Umar, U. H., (2023). Analysis of Traffic Jams: Cases of Congestion Caused by U-Turns on Jalan Gajah Mada, Batam. *Civil Engineering and Architecture Journal*, Vol. 1(3). <https://doi.org/10.37253/leader.v1i3.8283>
- [12] Currie, J., Davis, L., Greenstone, M. and Walker, R., (2015). Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings. *The American Economic Review*, Vol. 105(2), 678–709. <https://doi.org/10.1257/aer.20121656>.
- [13] Al-Hasnawi, S. S., Hussain, H. M., Al-Ansari, N. and Nutsson, S. K., (2016). The Effect of Industrial Activities on Air Pollution at Baiji and Its Surrounding Areas, Iraq. *Engineering*, Vol. 8(1), 34–44. <https://doi.org/10.4236/eng.2016.81004>
- [14] Li, X., Li, S., Gao, J., Zhao, P. and Li, H., (2018). Human Settlement Quality Evaluation Based on Air Quality in Major Cities of China. *Advances in Meteorology*, Vol. 2018(1). <https://doi.org/10.1155/2018/4914760>.
- [15] Jagtap, A., Shedge, D., and Mane, P. (2024). Exploring the Effects of Land Use/Land Cover (LULC) Modifications and Land Surface Temperature (LST) in Pune, Maharashtra with Anticipated LULC for 2030. *International Journal of Geoinformatics*, Vol. 20(2), 42–63. <https://doi.org/10.52939/ijg.v20i2.3065>
- [16] Wesnawa, I. G., (2010). Perubahan Lingkungan Permukiman Mikro Daerah Perkotaan Berbasis Konsep Tri Hita Karana di Kabupaten Buleleng Bali [Changes in Micro-Settlement Environments in Urban Areas Based on the Concept of Tri Hita Karana in Buleleng, Bali]. *Forum Geografi*, Vol. 24(2), 111–118. <https://doi.org/10.23917/forgeo.v24i2.5020>.
- [17] Qin, Y., Wang, L., Yu, M., Meng, X., Fan, Y., Huang, Z., Luo, E. and Pijanowski, B., (2024). The Spatio-Temporal Evolution and Transformation Mode of Human Settlement Quality from the Perspective of "Production-Living-Ecological" Spaces: A Case Study of Jilin Province. *Journal Habitat International*, Vol. 145. <https://doi.org/10.1016/j.habitatint.2024.103021>.
- [18] Rosu, L., Corodescu, E. and Blageanu, A., (2015). Does Geographical Location Matter? Assessing Spatial Patterns in Perceived Quality of Life in European Cities. *European Journal of Geography*, Vol. 6(2), 15–34.
- [19] Xiaoyu, L., Jian, G., Fei, C. and Hokao, K., (2007). Residential Environment Evaluation Model and Residential Preferences of the Changjiang Delta Region of China. *Journal of Asian Architecture and Building Engineering*, Vol. 299, 13–22. <https://doi.org/10.3130/jaabe.6.299>.
- [20] Ovsianikova, T. and Nikolaenko, M., (2019). Quality Assessment of Urban Environment. *IOP Conference Series: Materials Science and Engineering*, Vol. 71. <https://doi.org/10.1088/1757-8997/1/1/012051>.
- [21] Ayuningtyas, S. and Pegiwati, B., (2018). Kualitas Lingkungan Permukiman Kawasan Industri di Kecamatan Genuk Kota Semarang [Environmental Quality of Industrial Area Settlements in Genuk District, Semarang City]. *Jurnal Geografi Indonesia*, Vol. 21(1). 192–203. <https://doi.org/10.14710/tataloka.21.1.192-203>.
- [22] Sakul, F. G., Tilaar, S. and Rondowunu., (2021). Pengaruh Kegiatan Industri Terhadap Kualitas Permukiman Kota Bitung [The Impact of Industrial Activities on the Quality of Settlements in Bitung City]. *Jurnal Media Matrasain*, Vol. 18(2), 44–54. <https://doi.org/10.35793/matrasain.v18i2.37069>.

- [23] Wulan, P. Y. N., (2024). *Pengaruh Aktivitas Industri Terhadap Kualitas Lingkungan Permukiman di Desa Kwadungan, Kabupaten Kediri [The Impact of Industrial Activities on the Settlement Environmental Quality in Kwadungan Village, Kediri Regency]*. Master's Thesis, Geography Postgraduate, Gadjah Mada University.
- [24] Oznobikhina, L. A., (2022). Assessment of the Impact of Industrial Activities on Environmental Quality and Public Health. *IOP Conference Series: Earth and Environmental Science*, Vol. 979(1). <https://doi.org/10.1088/1755-1315/979/1/012151>.
- [25] Rizki, D. A., Wulandari, A. and Chairunnisa, (2022). Analisis Kualitas Lingkungan Perumahan Berdasarkan Karakteristik Perumahan di Desa Sungai Raya Dalam Kecamatan Sungai Raya [Analysis of Housing Environmental Quality Based on Housing Characteristics in Sungai Raya Village, Sungai Raya District]. *JeLAST: Jurnal PWK, Laut, Sipil, Tambang*, Vol. 9(1). <https://doi.org/10.26418/jelast.v9i1.52348>.
- [26] Wulan, P. Y. N. and Putri, R. F., (2023). Relationship between Settlement Environmental Quality and Socio-Economic Conditions in Kwadungan Permai Housing, Kediri Regency. *E3S Web of Conferences*, Vol. 468. <https://doi.org/10.1051/e3sconf/202346806013>.
- [27] Sarwono, J., (2023). Memadu Pendekatan Kuantitatif dan Kualitatif: Mungkinkah? [Blending Quantitative and Qualitative Approaches: Is It Possible?]. *Jurnal Ilmiah Manajemen Bisnis Ukrida*, Vol. 9(2).