

ANALYSIS OF AIR POLLUTION DATA IN 10 REGIONS OF INDONESIA YEAR 2026

Marsela¹ & Nurlia Samiun²

¹Department of Biology Education, Universitas Islam Negeri Sunan, Yogyakarta, Indonesia,
Email: msella214@gmail.com

²Department of Biology Education, Universitas Islam Negeri Sunan, Yogyakarta, Indonesia,
Email: nurliakleden0@gmail.com

Correspondence: Marsela

Abstract

Air pollution is a significant environmental issue affecting public health and ecosystem sustainability. This study aims to analyze air pollution levels across ten regions in Indonesia in 2026 and to identify factors contributing to regional variations. The research employs a literature review method using secondary data from official reports and scientific sources, analyzed descriptively through regional comparisons. The results reveal notable disparities in pollution levels, with Ambon City showing the lowest value (15; 7.11%) and Bengkalis Regency the highest (27; 12.80%). Other regions fall into low to high categories depending on factors such as industrial activity, transportation, population density, and geographical conditions. In conclusion, air pollution levels vary significantly across regions and are strongly influenced by human activities. Therefore, integrated efforts are required to control pollution and support environmental sustainability.

Keywords: Air Pollution; Environment; Public Health; Region.

1. INTRODUCTION

The environment is an important thing in the life of living beings. The environment is everything that lives, both microbiological and macro-biological, from fauna and flora that affect each other on the existence of the organism in question. Something that is present in the life of the organism can be in the form of objects (inorganic), processes, or natural phenomena such as rain, wind, erosion, landslides, etc. The environment can be grouped into two, namely: Biotic Environment (*Biotic environment*) and Abiotic Environment (*Abiotic environment*) (Mutakin, 2018).

Biotic Environment (*Biotic environment*) are all forms of living things, both macro and micro-biological that are present around living things. Examples of biotic environments are humans, animals, and plants. While the Abiotic Environment (*Abiotic environment*) is everything in the form of substances, symptoms and processes that are not alive and present in the vicinity of an organism. Examples of abiotic environments e.g. soil, water, air, rocks, temperature, rain, wind, etc. (Mutakin, 2018).

Based on its elements, the environment is divided into three, namely the natural environment, the social environment, and the cultural environment. The natural environment is an environment in which there are elements of wind, water, sunlight, air, land, oceans, mountains, etc. The social environment is an environment in which there are elements of individuals, families, communities, ethnicities, nations, races, etc. Meanwhile, the cultural environment is an environment in which it consists of clothing, tools, buildings, regulations, values, norms, etc. (Mutakin, 2018).

Humans are one of the important indicators in supporting the creation of a pollution-free environment. Pollution can be interpreted as environmental contamination that contains harmful substances that can interfere with human health, quality of life, or the natural function of the ecosystem (Hidajat et al., 2023). According to (*World Health Organization*, 2021) Air pollution is contamination that occurs indoors or outdoors by any chemical, physical, or

biological agent that can alter the natural characteristics of the atmosphere. Pollutants can enter the air through nature or from human activities. Based on the source, air pollution can be classified into two, namely mobile and immobile sources. Moving sources of pollution usually come from human transportation activities, both on land and at sea. Meanwhile, stationary air pollution comes from power plants, industry and households (Yusrianti, 2015).

Air pollution impacts our lives, such as respiratory disorders, cardiovascular disease, and decreased lung function. Small particles that enter the body through the lungs or through the bloodstream can cause respiratory disorders such as asthma, bronchitis, and pneumonia. Air pollution can also lead to cardiovascular disease. Exposure to air pollution that occurs continuously will damage blood vessels and trigger inflammation in the cardiovascular system. In addition, pollution can also lead to decreased lung function. The condition of children and the elderly is particularly vulnerable to the effects of air pollution. Long-term exposure can cause decreased lung function in children and worsen the condition of parents (Aryanta & Maharani, 2023).

Although air pollution is a fairly complex problem, there are several steps that can be taken to minimize its impact on health. The first step we can take is to use sustainable transportation, such as reducing the use of private vehicles and switching to using public transportation, using bicycles, or walking so that we can reduce gas emissions that can pollute the air. Then the second step is to increase public education and awareness, by educating about the impact of air pollution. As well as educating what steps can be taken for the community to protect themselves. This aims to increase their awareness of the impacts resulting from pollution (Aryanta & Maharani, 2023).

Then the third step that can be taken is to promote the use of masks. In some areas with poor air quality, the use of masks is very important for the community. The use of special masks (such as N95 masks) can help to reduce the risk of exposure to harmful particles. Furthermore, the fourth step is to monitor air quality. This activity can be carried out by the government and related institutions to monitor the air quality of an area. Monitoring should be carried out regularly to measure how high the level of air pollution is so that further action can be taken (Aryanta & Maharani, 2023).

2. MATERIALS AND METHODS

2.1 Study Area

The study areas that are the main focus of this study include ten regions spread across various regions of Indonesia with diverse geographical, demographic, and human activity characteristics. The ten areas in question include Ambon City, Gresik, Malang City, Semarang, South Lampung Regency, Madiun City, Probolinggo, Tarakan, Lumajang Regency, and Bengkalis Regency. The selection of these areas is not carried out randomly, but through careful consideration based on the availability of data, the level of relevance to air pollution issues, and the diversity of environmental conditions that can provide a comprehensive picture of the phenomenon being studied.

2.2 Research Methods

The research design used in this writing is the literature review method, which is a research approach that is carried out by studying, analyzing, and synthesizing various written information sources that are relevant to the research topic. This method was chosen because it allows researchers to gain an in-depth understanding of previous concepts, theories, and findings related to air pollution.

The research process begins with data collection activities that are carried out systematically through the search of various sources, such as textbooks, national and international scientific journals, research reports, and scientific articles available online. In this

case, researchers use search engines such as Google to access various relevant publications, while still paying attention to the credibility of the sources used. The data obtained is then selected based on the level of suitability for the research topic, so that only valid and relevant information is used in the analysis process.

Furthermore, the data that has been collected is analyzed descriptively with the aim of describing the air pollution conditions in each area that is the object of the research. The analysis is carried out by comparing data between regions, identifying the factors that cause air pollution, and examining the impact on the environment and human health. Through this approach, researchers strive to present information that is not only informative, but also analytical.

2.3 Data Collection and Its Sources

The data used in this study is secondary data, this means that the data obtained does not come from direct observation, but through intermediaries. The primary data collection was taken from the official Databoks report. The data collection process is carried out by reading, reviewing, and recording important information.

3. RESULTS AND DISCUSSION

3.1 Air Pollution Levels in 10 Regions of Indonesia

Air pollution is one of the environmental problems that continues to be a concern every year. Air pollution data for 2026, which is available in 10 regions in Indonesia, gives us an idea of the level of pollution in each of these areas. Based on the table below, each region has a different level of pollution value. This difference shows that environmental conditions, industrial activities, transportation use, and population density are not the same in each region.

Table 1. Air Pollution Values in 10 Indonesian Cities

City Name	Value
Ambon	15
Gresik	16
Malang	17
Semarang	19
Kabupaten Lampung Selatan	21
Madiun	22
Probolinggo	23
Tarakan	25
Kabupaten Lumajang	26
Kabupaten Bengkalis	27

Ambon City occupies the first position with the lowest pollution value of 15. This figure shows that the air quality in the city of Ambon is relatively better when compared to other areas

in the table. This can happen because Ambon is in the form of an archipelago, its geographical conditions are dominated by coastal areas so that the level of industrial activity is lower. This condition is likely the reason why this area has the lowest air pollution levels.

Gresik is in the next position with a score of 16. Although it is known as an area with an industrial area, the value and percentage of pollution in this area is still relatively low compared to other areas. This shows that environmental management can still be controlled.

Malang City has a score of 17. As one of the cities of education and tourism, the possible causative factor of air pollution is the increase in the activity of private vehicles, such as motorcycles and cars. However, the city of Malang is still in the lower middle category when compared to other regions.

Semarang City showed an increase in value, namely 19. As one of the big cities in Central Java, activities from industry and transportation have begun to increase exhaust gas emissions and dust particles. This is one of the causes of the increasing value of air pollution in this region.

South Lampung Regency has a score of 21. This value represents an increase from the previous city and is included in the upper middle category. This is likely to happen due to inter-regional transportation and industrial activities that cause an increase in air pollution in this region.

Madiun City has a pollution value of 22. This figure shows that the pollution level in this area has exceeded the figure of 10% or the average of the total data. The growth of urban areas and the growth in the number of private vehicle use are likely to be the cause of the increase in air pollution in this area.

Probolinggo has a slightly higher value than the previous area, which is a value of 23. From this value, it indicates that there is a greater air pollution pressure. Industrial and transportation activities are likely to be one of the causes of the increase in air pollution in this area.

Tarakan has a pollution value of 25. This value is included in the pollution with a high category in this data. As an area with sea transportation activities and industrial areas, this is likely to be one of the causes of the high rate of air pollution in this area.

Lumajang Regency has a pollution value of 26. This value indicates a fairly high level of air pollution. This high value indicates that there is considerable environmental pressure. Apart from economic activity factors, the possible cause of this pollution also comes from natural factors, such as dust from volcanic ash.

Bengkalis Regency is the area with the highest pollution value, which is 27. This high figure indicates a major contribution to total air pollution. Industrial activities, transportation use, or the possibility of land burning can be factors that cause the increase in air pollution in this area. The high level of pollution indicates that this area needs special attention in environmental management.

Table 2. Percentage of Air Pollution in 10 Indonesian Cities

City Name	Percentage
Ambon	7.11%
Gresik	7.58%
Malang	8.06%
Semarang	9.00%
Kabupaten Lampung Selatan	9.95%

City Name	Percentage
Madiun	10,43%
Probolinggo	10.90%
Tarakan	11.85%
Kabupaten Lumajang	12.32%
Kabupaten Bengkalis	12.80%

Based on the data on the percentage of air pollution in ten cities that have been presented in Table 1, an average value of 10.00% was obtained. This average value is used as a reference to compare air pollution levels between regions, so that it can be known which areas are classified as having low, medium, or high pollution levels. In general, the data shows that there is considerable variation between one region and another, which is influenced by various factors such as industrial activity, population density, and the level of transportation mobility.

Ambon City occupies the lowest position with a percentage of 7.11%. This value shows that the air quality in Ambon is relatively better than other areas in this study. The low level of air pollution in this city can be caused by several factors, such as a not too high level of industrialization, relatively low density of motor vehicles, and geographical conditions that favor good air circulation. Thus, Ambon can be categorized as an area with a low level of air pollution and relatively safe for public health.

Gresik is in the next position with a percentage of 7.58%. Although it is known as an industrial area, this percentage value shows that the level of air pollution in Gresik is still below average. This can indicate that there is sufficient good management of emissions or certain environmental factors that help reduce pollution levels. However, an increase from the previous value still needs to be a concern, considering the potential for an increase in industrial activity in the future to have an impact on air quality.

Malang City showed a percentage of 8.06%, which is still below the average value. However, this figure shows a tendency to increase compared to the previous city. The causative factors can come from the increasing number of motor vehicles, urban activities, and population growth. Although it is still relatively safe, this condition needs to be anticipated so that it does not develop into a more serious problem.

Semarang City recorded a percentage of 9.00%. This figure shows that the level of air pollution in Semarang is starting to approach the average value. As a large city with a fairly high economic and transportation activity, this increase can be understood as an impact of urbanization and industrialization. Although still below average, this condition indicates the need for preventive measures to keep air quality stable.

South Lampung Regency has a percentage of 9.95%, which is very close to the average value. This shows that air pollution conditions in this region are at the threshold between the low and medium categories. Factors such as agricultural activities, land burning, and local transportation likely contribute to this value. Therefore, sustainable environmental management is essential to prevent further increases.

The city of Madiun recorded a percentage of 10.43%, which means that it has exceeded the average value. This shows that the air pollution level in this region has begun to enter the medium category. This increase can be attributed to the growth of economic activity and

transportation, as well as the increasing use of fossil fuels. This condition requires special attention so that it does not develop into more severe.

Probolinggo showed a percentage of 10.90%, which is also above average. This figure indicates that the air quality in the region has begun to decline significantly. Causative factors can include industrial activities, transportation, and the possibility of open combustion. If not controlled, this condition has the potential to have a negative impact on public health.

Tarakan has a percentage of 11.85%, which shows a fairly high level of air pollution compared to the previous area. This increase signals greater environmental pressures, which are likely caused by industrial and energy activities. This high value needs to be responded to with stricter pollution control policies.

Lumajang Regency recorded a percentage of 12.32%, which further emphasizes that this area has a high level of air pollution. This value is far above the average, so it shows that there are quite serious environmental problems. Activities such as land burning, industry, as well as natural factors such as volcanic dust can be the cause of increased air pollution in this region.

Bengkalis Regency occupies the highest position with a percentage of 12.80%. This shows that the region has the highest air pollution rate among the ten areas studied. This high number can be caused by a variety of factors, including industrial activity, forest or peatland fires, as well as geographical conditions that affect the spread of pollutants. This condition is an indicator of the need for serious and sustainable handling to reduce air pollution levels.

Overall, the results of the analysis show that there is a tendency to increase air pollution from areas with low to high percentages. These differences reflect the variation in human activities and environmental conditions in each region. Therefore, an integrated effort is needed between the government, the community, and the industrial sector to control and reduce air pollution levels. Measures such as reducing vehicle emissions, using environmentally friendly energy, and supervising industrial activities are very important to maintain good air quality and support environmental sustainability.

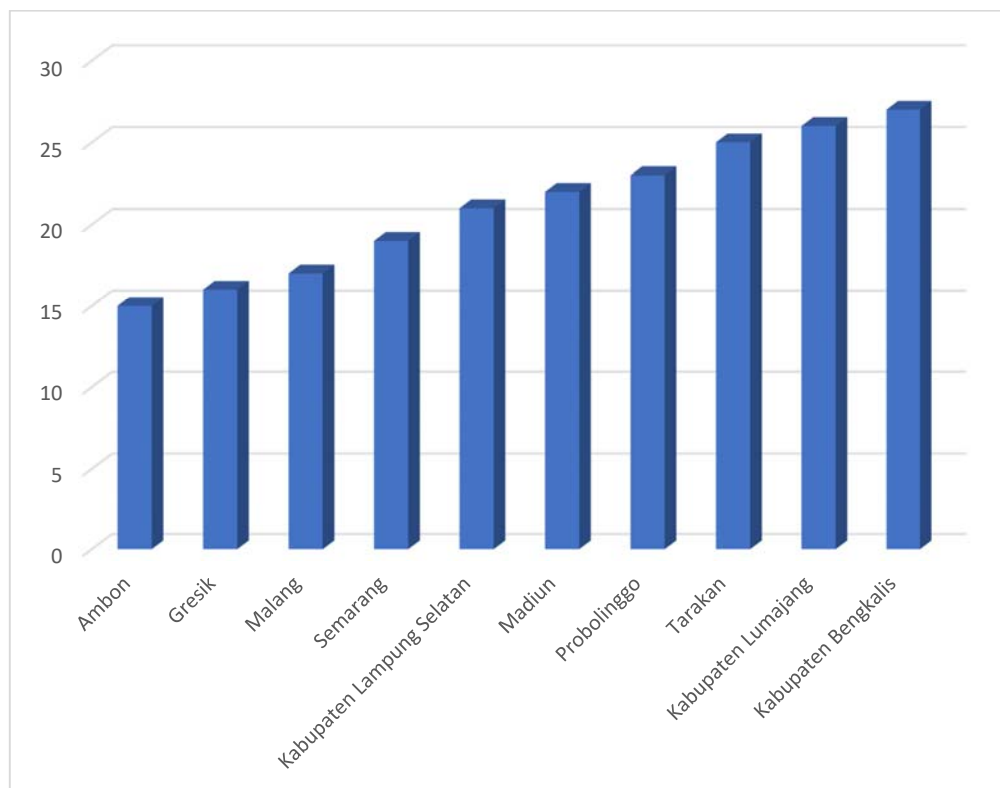


Figure 1. Graph Air Pollution Values in 10 Regions of Indonesia

Based on the graph above, the air pollution values in ten cities can be seen that there is a clear variation in air pollution levels between regions. In this graph, it can be seen that there is an increase in air pollution values. The lowest air pollution value is found in Ambon City with a value of 15. This shows relatively better air quality compared to other areas. Furthermore, some cities such as Gresik, Malang, and Semarang began to show a gradual increase in scores from 16 to 19. This increase is likely to occur due to industrial activity and the growth of urban transportation which is increasing day by day.

Medium to high air pollution values are seen in South Lampung, Madiun, and Probolinggo Regencies with a value range of 21–23. Meanwhile, the highest scores were found in 3 cities, namely: Tarakan with a score of 25, Lumajang Regency with a score of 26, and Bengkalis Regency with a score of 27. This high value indicates that the clean air quality in the area is lower than other areas in the data. The causes can include industrial activities, land burning, fossil fuel use, and high transportation mobility. The form of the graph produced is that it continues to increase with each city.

3.2. The Application of Air Pollution Statistics from 10 Regions in Indonesia as Batik Patterns

The batik image above contains the philosophy contained in it, as the outline of this batik motif raises the theme of air pollution. The meaning of the philosophy of each pattern is as follows:

a. Repeated pollution cycles

This repetitive pattern illustrates that air pollution is an ongoing problem. This is due to the use of private vehicles or industrial activities.

b. Cloud-shaped elements

If we notice, the cloud-shaped element here means that this pattern is similar to smoke or dirty air. This smoke is constantly appearing so that there is hardly any clean space.

c. Patterns that look stiff

This pattern that looks rigid is likened to a human being trapped in a lifestyle that is difficult to dismiss. But life will continue even though this pattern of life remains.

d. Monotonous pattern repetition

This monotonous repetition of the pattern illustrates that nature has lost its variety and balance. This happens because he is constantly exposed to pollution.

e. Cross sign

The cross here represents the multiplication sign in mathematics. This motif combines the cross and the multiplication sign in mathematics.

Overall, this batik motif pattern can be interpreted as a criticism that air pollution is not a momentary event. Pollution is a pattern that we repeat every day.

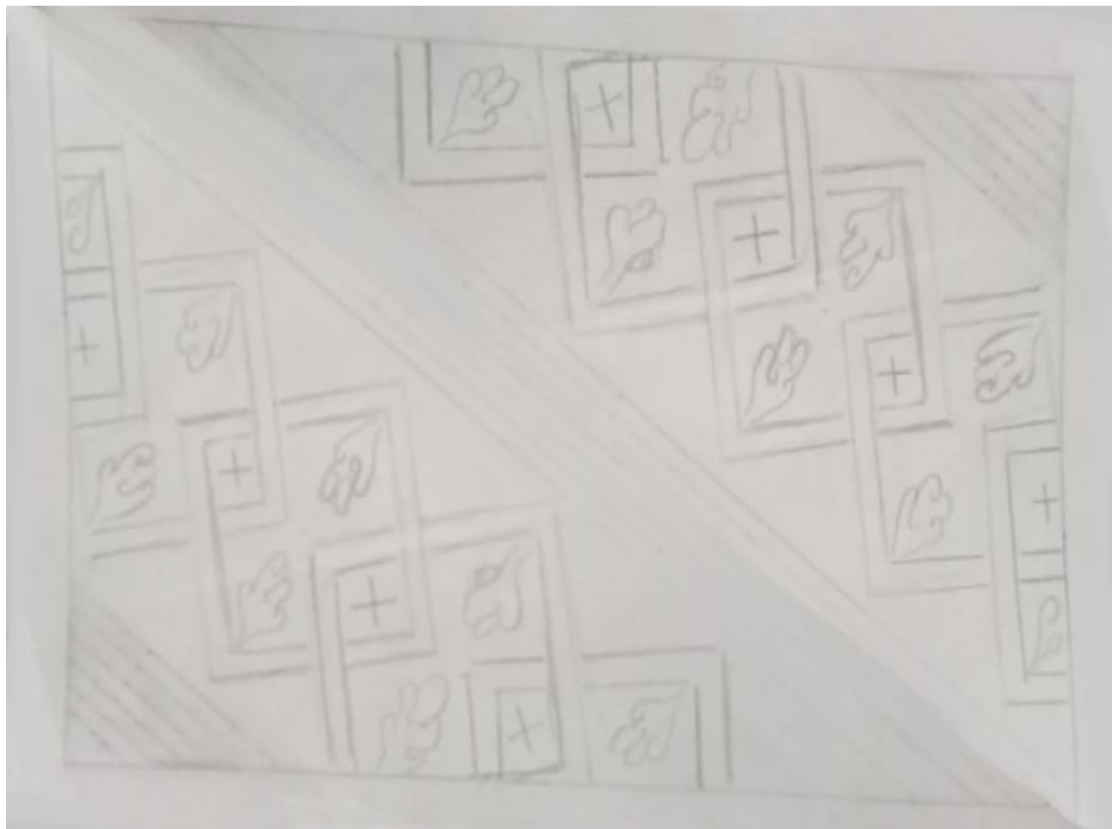


Figure 2. Batik Patterns Based on Air Pollution Data from 10 Regions in Indonesia

4. CONCLUSION

The increase of every human activity or activity contributes to the increase in air pollution levels in various regions. Based on the analysis of air pollution data in ten regions of Indonesia in 2026, there is a significant variation in pollution levels. Ambon is the area with the lowest pollution level, while Bengkalis Regency has the highest level.

This analysis shows that human activities, geographical conditions, and economic development have a major influence on air quality. Therefore, cooperation between the government, industry, and the community is needed to maintain the quality of the environment. Just as the government must be active in checking air quality, the government must be able to educate the public about the dangers and how to overcome the impact of air pollution. With proper management, it is hoped that the level of air pollution in Indonesia can be controlled so that a healthy and sustainable environment is created for future generations.

5. REFERENCES

- Aryanta, I. W. R., & Maharani, S. E. (2023). The adverse impact of air pollution on health and how to minimize the risks. *Jurnal Ecocentrism*, 3(2), 47–58.
- Hidajat, D., Tilana, F. G., & Kusuma, I. G. B. S. A. (2023). The Impact of Air Pollution on Skin Health. *Unram Journal of Medicine*, 12(04), 371–378.
- Mutakin, A. (2018). What is the environment? *Geoarea*, 1(2), 65–68.
- World Health Organization. (2021). *WHO global air quality guidelines: Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*. World Health Organization.

Yusrianti, Y. (2015). Literature Study on Air Pollution Due to Motor Vehicle Activities on Surabaya City Roads. *Al-Ard: Journal of Environmental Engineering*, 1(1), 11–20. <https://doi.org/10.29080/alard.v1i1.29>