



Analysis of Outdoor Advertising Visual Pollution Using Analytical Hierarchy Process in Semarang City (Case Study: Tugu Muda Semarang Area)

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Abstract

This study aims to determine the visual pollution of outdoor advertising in Semarang City, especially in the city center, namely Tugu Muda with five road segments supporting the area. The method used is the Analytical Hierarchy Process (AHP) by considering six parameters including physical conditions, land use, placement, display surface, size, and distance. The data used are spatial data in the form of taking coordinates in the field using the Survey123 application and non-spatial data in the form of accumulated scores for each parameter used. The results of this study are that the surface display parameter has the highest weight of 38.127%. 209 points of outdoor advertising have been surveyed in the field with a total of 85 points of low visual pollution, 52 points of high visual pollution, 37 points of medium visual pollution, and 20 and 15 points of very low and very high visual pollution respectively. Although the distribution of outdoor advertising has a fairly high density, the results of processing and scoring with the AHP method of outdoor advertising with low visual pollution dominate.

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INTRODUCTION

Semarang City is the capital city of Central Java Province, with high economic activity. This has an impact on increasing the number of outdoor advertisements in Semarang City. Outdoor advertising serves as a medium of communication and promotion for products and services as well as a means of public information for the government.

Often, there are outdoor advertisements piled up in one area. This accumulation of outdoor advertising raises new problems related to the phenomenon of visual pollution. The term visual pollution refers to the disruption of scenery or the loss of the impression of the aesthetic of an area. The placement of outdoor advertising that does not pay attention to regulations and interferes with urban visual quality has an environmentally unfriendly effect, especially on visual aspects (Lawranta & Pramayoza, 2021).

Urban visual pollution is the negative physical condition of several objects that have a direct or indirect relationship with the quality of the environment that ultimately impacts the people living in the location. It has been reported that visual pollution objects impact human health, distract drivers along highways, reduce property values, damage public places, spread nuisance, encourage people to become consumptive, and impact the identity of an area (Wakil, et al., 2019).

Based on this problem, it is necessary to conduct a study on the visual pollution caused by outdoor advertisements in Semarang City. The location of the case study is in the area around Tugu Muda Semarang, specifically on Mgr. Sugiyopranoto Street, Imam Bonjol Street, Pemuda Street, Pandanaran Street, and Dr. Sutomo Street. Those five roads have high traffic density and community activities (Putra, et al., 2013). So, there are many outdoor advertisements of various sizes and types in these locations.

The analysis was performed using the Analytical Hierarchy Process (AHP) method with six main parameters, including physical condition, land use, placement, display surface, size, and distance. The purpose of this research was to determine (1) the priority weight of the research parameters using the AHP method and (2) the analysis of outdoor advertising visual pollution on the five road segments using the AHP method. The results of this research are expected to contribute knowledge about visual pollution,

especially caused by outdoor advertising.

METHOD

The method used in this research is the Analytical Hierarchy Process (AHP). This method can solve unstructured problems by giving subjective values to parameters that are considered important and determining which parameters have the highest priority (Sutoyo, 2017). This research was conducted in the center of Semarang City, precisely in the Tugu Muda Semarang area, with a radius of 2 km for five segments of road supporting the area. These road segments include Dr. Sutomo Street, Mgr. Sugiyopranoto Street, Imam Bonjol Street, Pemuda Street, and Pandanaran Street.

Research Parameters

The parameters in this research refer to Wakil et al.'s 2019 research journal, Semarang City Regional Regulation No. 4 of 2019 on the Implementation Guidelines of Outdoor Advertising, and Regent Regulation No. 6 of 2009 on the Implementation Guidelines of Regional Regulation No. 8 of 2006.

The value of each subparameter follows the research journal of Wakil et al., where 5 means that the subparameter is considered to have a major influence on the visual pollution of outdoor advertising, while 1 means that the subparameter does not significantly affect the visual pollution of outdoor advertising. The following are the parameters used and their values:

Table 1. Research Parameters

No	Parameters	Values
I. Physical Condition		
1	Broken	5
2	Normal	2
3	Very well	1
II. Adjacent Land-use		
1	Education	5
2	Cultural heritage	5
3	Health	4
4	Open space	4
5	Religious	3
6	Residential	2

Table 1. Research Parameters (Continued)

No	Parameters	Values
7	Office	2
8	Commercial	1
III.	Placement	
1	On rooftop	5
2	On pedestrian bridge	5
3	On wall	3
4	Standalone	3
	IV. Display Surface	
1	V facing triangle	5
2	Double facing (back to back)	4
3	Single facing	3
	V. Size	
1	Large 24 m ² – 72 m ²	5
2	Medium 4 m ² – 24 m ²	3
3	Small < 4 m ²	1
	VI. Distance	
1	Large outdoor advertising minimum 150 m	5
2	Medium outdoor advertising min 40 m	3
3	Small outdoor advertising minimum 5 m	1

Research Data Collection and Analysis Techniques

The data in this research consisted of spatial data and non-spatial data. Spatial data in the form of outdoor advertising point coordinates obtained through tracking results along the research location road was recorded using the Survey123 application. While non-spatial data is in the form of parameter weight data and scores for each sub-parameter that has been processed by the AHP method.

Data on the main parameter weights were obtained from interviews with parties considered competent in relation to the research conducted. The respondents in this study were employees of the Semarang City Spatial Planning Office, totaling 2 people. Respondents filled out an AHP questionnaire containing comparisons between parameters on a scale of 1–9. The results of this questionnaire will be processed using MS Excel so that the weight of each parameter will be obtained and the parameters that have the most influence on visual pollution will be identified. The calculation results must meet the consistency ratio (CR) of $\leq 10\%$. While the accumulated score data for each outdoor advertisement is obtained

from the results of multiplying the main parameter weights with sub-parameter values according to the characteristics of outdoor advertisements based on the results of field surveys, after that, a join table is made on the coordinate data and the accumulated score of the outdoor advertising, so that each outdoor advertising has information about the score that is used as the basis for visual pollution classification.

RESULT AND DISCUSSION

AHP Parameter Weighting

Analytical Hierarchy Process (AHP) is a method used for decision-making in complex situations or Multiattribute Decision Making (MADM). The concept of AHP is to solve unstructured problems into components that are arranged in a hierarchy (Parhusip, 2019).

AHP parameter weighting is conducted to determine the level of each parameter that influences visual pollution caused by outdoor advertising. AHP weighting is calculated by evaluating the relationship between parameters. To determine whether the relationship between these parameters is consistent or not, the consistency ratio (CR) value is calculated. The CR value has a provision of $CR \leq 0.10$ so that the weighting of each parameter is declared consistent and the data is suitable for use (Sutoyo, 2017).

The weight of each parameter is based on the results of AHP processing as follows:

Table 2. Parameter Weights

Parameter	Weight
Physical Condition	0.04579
Adjacent Land-use	0.05529
Placement	0.08132
Display Surface	0.38127
Size	0.27661
Distance	0.15972

The AHP processing result must meet the CR value ≤ 0.10 . In this research, the CR value is 0.08197, so it can be concluded that the AHP processing results are consistent and suitable for visual pollution analysis.

Based on the results of parameter processing, the display surface surface has the highest weight, with a weight of 38.127%. The display surface is the most influential parameter because surface appearance is the most obvious visual object and is considered to have the greatest

influence on visual pollution. This is because surface displays are the most obvious visual objects and are considered to have the most influence on visual pollution. Surface displays that contain content of various types and interests cause chaotic scenes and information gaps between each other.

Visual Pollution Analysis

Visual pollution can be defined as a collection of elements that make the public feel uncomfortable about a particular scene (Ghafar et al., 2022). Based on the results of field surveys and data collection, there are 209 outdoor advertising points spread across five road segments in the research location.

The visual pollution score is obtained by multiplying the weight of the main parameters with the sub-parameter values according to the criteria of each outdoor advertisement and then calculating the accumulated score. The visual pollution classification is obtained by calculating the maximum and minimum score intervals and dividing them into five classes.

Table 3. Classification of Visual Pollution

Intervals	Description
0 - 1.93011	Very Low
1.93012 - 2.69759	Low
2.6960 - 3.46508	Medium
3.46509 - 4.23256	High
≥ 4.23257	Very High

Outdoor advertising visual pollution analysis was carried out on each road segment, the following is a description.

Mgr. Sugiyopranoto Street

This road is the main road to the city center from the west side and is a trading area where shops are lined up along the road. The number of outdoor advertisements on Mgr. Sugiyopranoto Street is 45.

Table 4. Outdoor Advertising Visual Pollution on Mgr. Sugiyopranoto Street

Description	Points
Very Low	4
Low	16
Medium	9
High	16
Very High	-
Total	45



Figure 1. Visual Pollution Map of Mgr. Sugiyopranoto Street

High and low visual pollution classifications dominate at 16 points. High visual pollution is dominated by large-sized outdoor advertising that has high accumulated scores, while low visual pollution is in the form of shop signboards or small-sized grouped neon boxes that have low accumulated scores.

Imam Bonjol Street

The number of outdoor advertisements on Imam Bonjol Street is 5. Based on interviews with the Semarang City Spatial Planning Department, this road segment has a low density of outdoor advertising because it is influenced by the width of the sidewalk (<2 m) and along a road filled with large trees, so it does not qualify as a location for outdoor advertising.

Table 5. Outdoor Advertising Visual Pollution on Imam Bonjol Street

Description	Points
Very Low	-
Low	3
Medium	-
High	2
Very High	-
Total	5

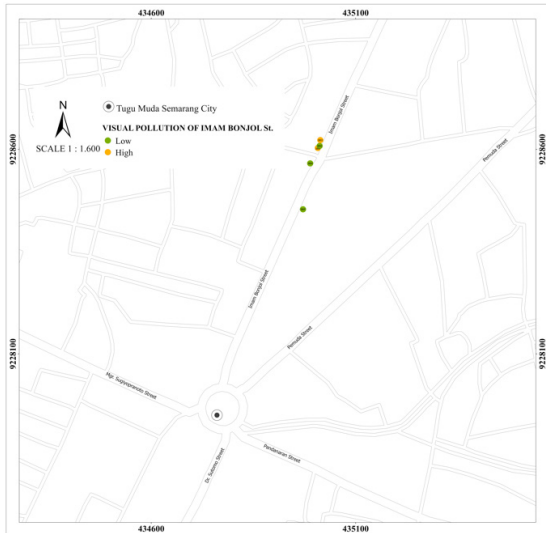


Figure 2. Visual Pollution Map of Imam Bonjol Streets

Although the density of outdoor advertising is low, there is visual pollution with a high classification. This is because the different characteristics of each outdoor advertisement cause different values for each point of the outdoor advertising.

Pemuda Street

Pemuda Street functions as a trade, office, and educational area. The density of outdoor advertising on this road is quite high, with a total of 54 points.

Table 6. Outdoor Advertising Visual Pollution on Pemuda Street

Description	Points
Very Low	4
Low	23
Medium	14
High	9
Very High	4
Total	54

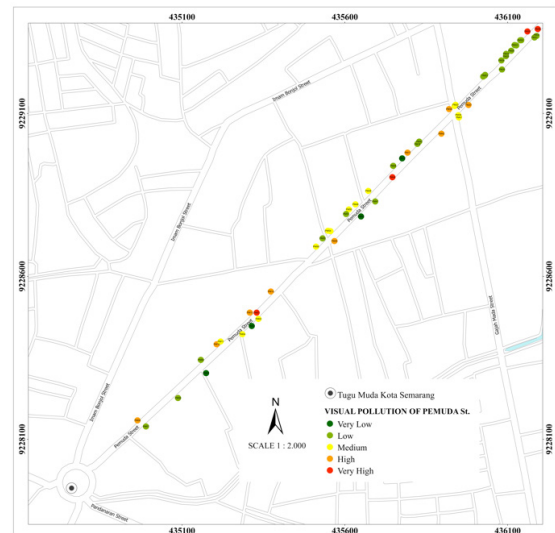


Figure 3. Visual Pollution Map of Pemuda Street

On the map, it can be seen that there is outdoor advertising with low classification that is at high density, while outdoor advertising with very high visual pollution is relatively at high density because there is quite a lot of outdoor advertising on this road segment and equally.

Pandanaran Street

Pandanaran Street functioned as a trading area and became a center for souvenirs typical of Semarang. The existence of high community activity encourages the growth of outdoor advertising in the area. The largest number of outdoor advertisements on this road segment is 92.

Table 7. Outdoor Advertising Visual Pollution on Pandanaran Street

Description	Points
Very Low	12
Low	38
Medium	9
High	23
Very High	10
Total	92

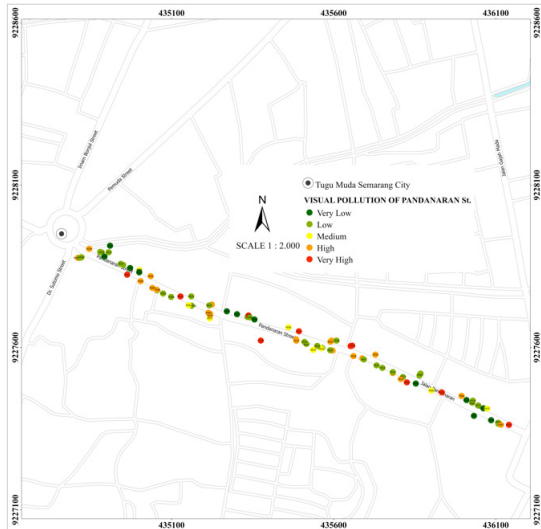


Figure 4. Visual Pollution Map of Pandanaran Street

Pandanaran Street has a very dense and even distribution of outdoor advertising along the road, with various types of outdoor advertising and different criteria for each type of outdoor advertising. On the map, it can be seen that even though it is in high density, there is outdoor advertising with a very low visual pollution classification. This is because of the different criteria, so the scoring results are different for each outdoor advertising point.

Dr. Sutomo Street

Dr. Sutomo Street is one of the arterial roads to the city center from the south side of Semarang City. Along this road, you can find many flower shops, and it is one of the flower selling centers in Semarang City. The number of outdoor advertisements on this road segment is 13 points.

Table 8. Outdoor Advertising Visual Pollution on Dr. Sutomo Street

Description	Points
Very Low	-
Low	5
Medium	5
High	2
Very High	1
Total	13

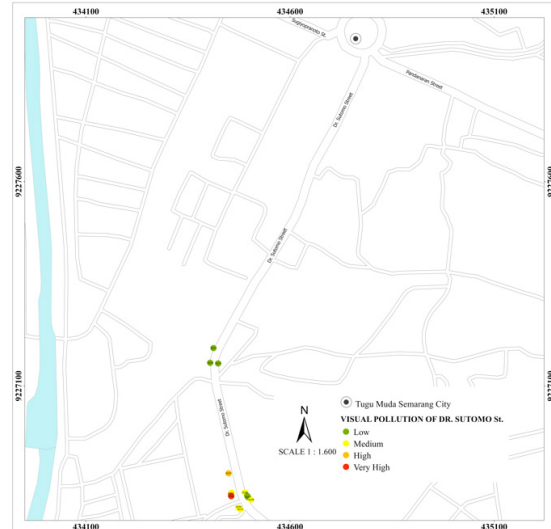


Figure 5. Visual Pollution Map of Dr. Sutomo Street

This road has a scattering of outdoor advertising that gathers in one location and is not evenly distributed. On the map, it can be seen that the largest number of outdoor advertisements are at crossroads with different visual pollution classifications. There are outdoor advertisements with very high and low visual pollution classifications at that one location.

Pandanaran Street has the highest density of outdoor advertising compared to other road segments, so visual pollution on this road segment dominates. This is because Pandanaran Street is the center of trade and office activities, so public activity is high on this road. Meanwhile, Imam Bonjol Street has the least amount of outdoor advertising compared to other road segments, resulting in insignificant visual pollution. Although public activity is quite high on this road segment, the small distribution of outdoor advertisements is influenced by the condition of the road, where the sidewalk width is less than 2 m and there are many large trees along the road.

CONCLUSION

According to the processing results of the AHP method, the biggest factor in determining the visual pollution of outdoor advertising is the display surface, which has a weight of 38.127%. This is because surface displays are the most obvious visual objects and are considered to have the most influence on visual pollution.

Visual pollution is classified into five classes. In this study, low-grade visual pollution dominated with 85 points out of a total of 209 points on the five roads studied. The results of

this visual pollution classification are determined based on the results of calculations using the AHP method. Pemuda Street and Pandanaran Street have the highest density of outdoor advertising compared to other roads in the study area. Based on these results, the solution that can be given to reduce the visual pollution of outdoor advertisements is that the Semarang City Government must firmly take action against advertising services that illegally install outdoor advertisements and provide alternative locations for advertising services to place advertisements in locations with low outdoor advertising density, of course with due regard to existing regulations.

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