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Analysis of Industrial Worker Housing Location Factors in Malang

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ABSTRACT

This study examines the determining factors of industrial workers' housing locations as a basis for designing low-cost flats (Rusunawa) in Malang City. The rapid growth of industrial areas has increased the demand for affordable and well-located housing. However, most workers still live in inadequate rental housing with limited environmental quality. This research uses a descriptive qualitative method with spatial analysis through field observation, mapping, and literature review. The results indicate that proximity to workplaces, accessibility, economic affordability, environmental quality, availability of public facilities, and compliance with spatial planning are the main determining factors. Based on site analysis, the selected location at Jl. S. Supriadi XI shows the highest suitability value. This study provides a conceptual basis for planning sustainable and efficient housing for industrial workers.

Keywords: *Housing Location, Industrial Workers, Rusunawa, Malang City*

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INTRODUCTION

Malang City is one of the major urban areas in East Java Province that continues to develop as a center of education, trade, and industry. The rapid growth of industrial activities has attracted a significant number of workers, both from within and outside the region, resulting in increased demand for adequate and affordable housing. Housing plays a crucial role in determining workers' quality of life and productivity (Turner, 1976).

However, existing conditions indicate that most industrial workers in Malang City still live in rented houses, boarding houses, or other temporary housing with relatively low environmental quality. These settlements are generally located in densely populated areas with limited access and minimal supporting facilities. Workers tend to choose housing based on affordability and proximity to workplaces, even though environmental comfort is often compromised (Sutanto, 2020).

The issue of worker housing is important because it is directly related to economic efficiency, health, and social well-being. Long commuting distances increase transportation costs and time, while poor environmental conditions may negatively affect physical and

mental health (Morlok, 1991). Therefore, proper housing planning is necessary to improve living conditions and support sustainable urban development.

One potential solution is the development of Rusunawa (low-cost flats), which can accommodate a large number of residents on limited land while providing shared facilities. However, the success of such housing depends largely on selecting an appropriate location. An unsuitable location may lead to low occupancy rates and ineffective use of resources. Based on these conditions, this study aims to:

1. Identify the determining factors of industrial workers' housing locations
2. Formulate location criteria for Rusunawa development
3. Analyze the most suitable site in Malang City

METHOD

This study employs a descriptive qualitative method with a spatial and contextual analysis approach. The research focuses on industrial areas and surrounding residential environments in Malang City. Data were collected through field observations to identify physical conditions, environmental characteristics, accessibility, and spatial relationships with industrial zones.

In addition, mapping analysis using tools such as Google Earth was conducted to determine the site's position, land use patterns, and connectivity. A literature study was also carried out to support the analysis with theoretical and regulatory references.

The data analysis process involved identifying key location factors, evaluating alternative sites using a scoring method, and formulating location criteria for Rusunawa development. The results are presented in descriptive form supported by tables and spatial analysis.

FINDING AND DISCUSSION

RESEARCH RESULT

Location Factor Analysis

Based on the criteria compiled from the results of the analysis of factors and location patterns, two alternative sites were determined that have the potential for the development of industrial worker *Rusunawa*:

1. Alternative Site 1

Figure 1. Map of Alternative Site 1 Location
Source: Google Earth

Location: Jl. S. Supriadi XI, Sukun, Kec. Sukun, Malang City
Site Area: 1,3 Ha
Zone: Residential
Geographical Coordinates: 7°59'53"S 112°37'14"E

2. Alternative Site 2

Figure 2. Map of Alternative Site 2 Location
Source: Google Earth

Location Jl. Colonel Sugiono, Gadang, Kec Sukun, Malang City
Site Area: 2 Ha
Zone: Residential
Geographical Coordinates: 8°01'03"S 112°37'31"E

The assessment of each alternative site was carried out using a weighting method presented in tabular form. Based on the assessment, Alternative Site 1 on Jl. S. Supriadi XI, Sukun District, Malang City was determined as the selected site because it obtained the highest total score (3.98) compared to Alternative Site 2 (3.33).

Table 1. Scoring of Site Selection Alternatives

INDIKATOR	VARIABEL	BOBOT	Jl. S. Supriadi XI					Jl. Kolonel Sugiono				
			1	2	3	4	BxN	1	2	3	4	BxN
Lokasi	Kesesuaian Tata Ruang	10%				✓	0,4				✓	0,4
	Status Kepemilikan	10%				✓	0,4				✓	0,4
	Luasan Lokasi	10%				✓	0,4				✓	0,4
Aksesibilitas	Jarak Jalan	5%				✓	0,4			✓		0,15
Ketersediaan Sarana	Sarana Kesehatan	6%				✓	0,24		✓			0,12
	Sarana Pendidikan	6%				✓	0,24			✓		0,18
	Sarana Perdagangan	6%				✓	0,24			✓		0,18
	Sarana Rekreasi	6%		✓			0,12		✓			0,12
	Sarana Pemerintah	6%				✓	0,24			✓		0,18
Ketersediaan Prasarana	Jaringan Listrik	10%				✓	0,4				✓	0,4
	Jaringan Air Bersih	10%				✓	0,4				✓	0,4
	Jaringan Drainase	10%			✓		0,3		✓			0,2
Jenis Tanah	Kemiringan Lahan	2,5%				✓	0,1				✓	0,1
	Jenis Tanah	2,5%				✓	0,1				✓	0,1
Total		**100%**	**Total**				**3,98**	**Total**				**3,33**

Source: Author's Analysis

Site 1 is considered more suitable, particularly in terms of accessibility and proximity to supporting facilities. It is located in a residential zone in accordance with applicable spatial planning and building regulations. It has a maximum Basic Building Coefficient (KDB) of 75%, a maximum Building Floor Coefficient (KLB) of 12, a maximum Basement Site Coefficient of 60%, and a minimum Basic Green Coefficient (KDH). Therefore, this site is considered the most potential location for designing industrial worker *Rusunawa*.

Site Condition Analysis

The selected site, located on Jl. S. Supriadi XI, Sukun District, Malang City, has existing conditions influenced by the character of the residential environment and surrounding urban activities.

1) Site Boundary

The site is bordered by vacant land to the east, a commercial area to the west, and residential areas to the north and south. This boundary composition indicates that the site is in a transition zone between commercial/service activities and residential areas, thus directly linking it to the movement and daily needs of the surrounding community.

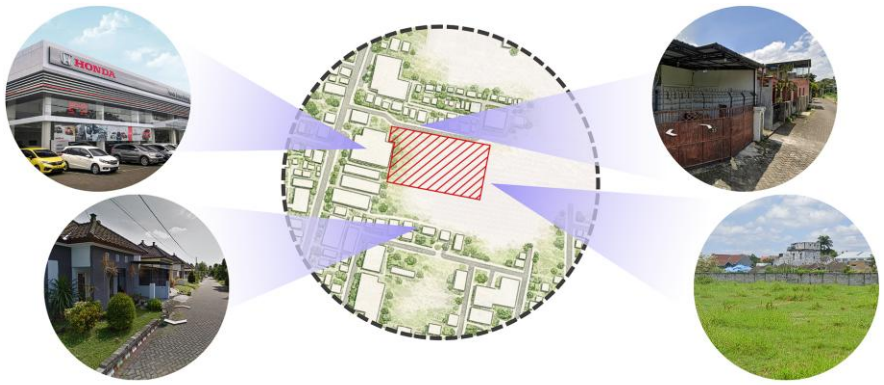

Figure 3. Site Boundaries
Source: *Author's Illustration*

2) Accessibility

The site can be reached via Jalan S. Supriadi XI with a road width of approximately ±8 m which is dominated by two-wheeled vehicles and public transportation, while direct access into the site has a width of approximately ±4 m. This condition indicates that the site has fairly good access, but requires internal circulation and parking arrangements so that user movement remains safe and smooth, especially to support the mobility of apartment residents.

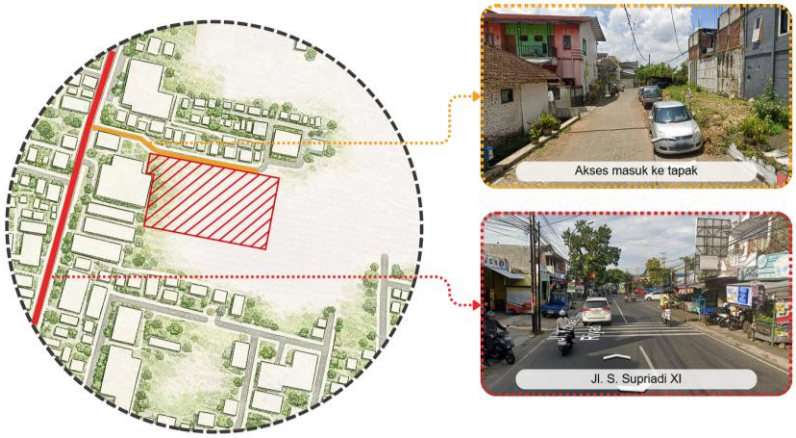

Figure 4. Accessibility Analysis
Source: *Author's Illustration*

3) Noise

Noise levels on the site vary, with the highest intensity occurring on the west side of the site, which borders the highway. Meanwhile, the south and north sides experience lower noise levels, primarily from residential activities. This situation indicates the need for buffering strategies, such as building massing, dense vegetation, or other noise-absorbing elements on the west side of the site, to minimize the impact of noise on residential areas.

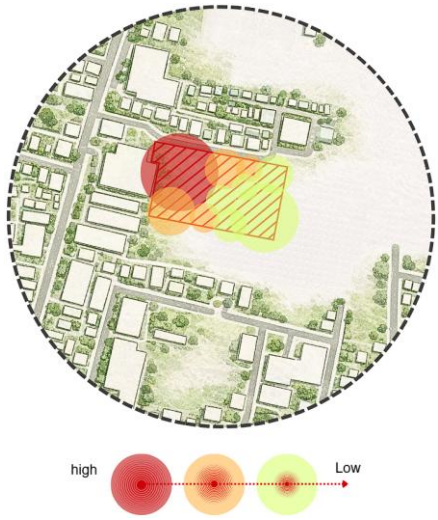

Figure 5. Noise Analysis
Source: *Author's Illustration*

4) Vegetation

The current vegetation conditions on the site are still limited. Trees and shrubs are found primarily on the western side of the site and serve as noise dampeners from road activity. However, the vegetation distribution is uneven, leaving some areas of the site unprotected from the sun's heat and noise. This indicates the need for additional and even distribution of vegetation as part of the design response to improve environmental quality, thermal comfort, and noise reduction

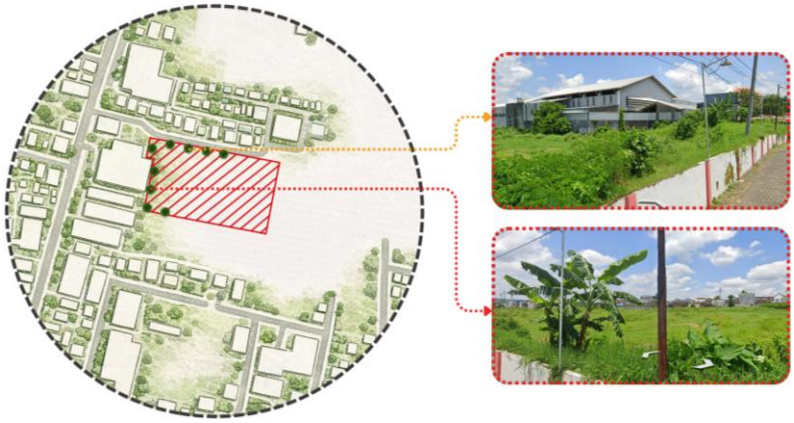

Figure 6. Vegetation Analysis
Source: *Author's Illustration*

5) Site Radius Analysis

To understand the site's accessibility and role in supporting occupant activities, a site radius analysis was conducted as part of the environmental assessment. This analysis was used to examine the spatial relationships between the site and various area functions at different service scales.

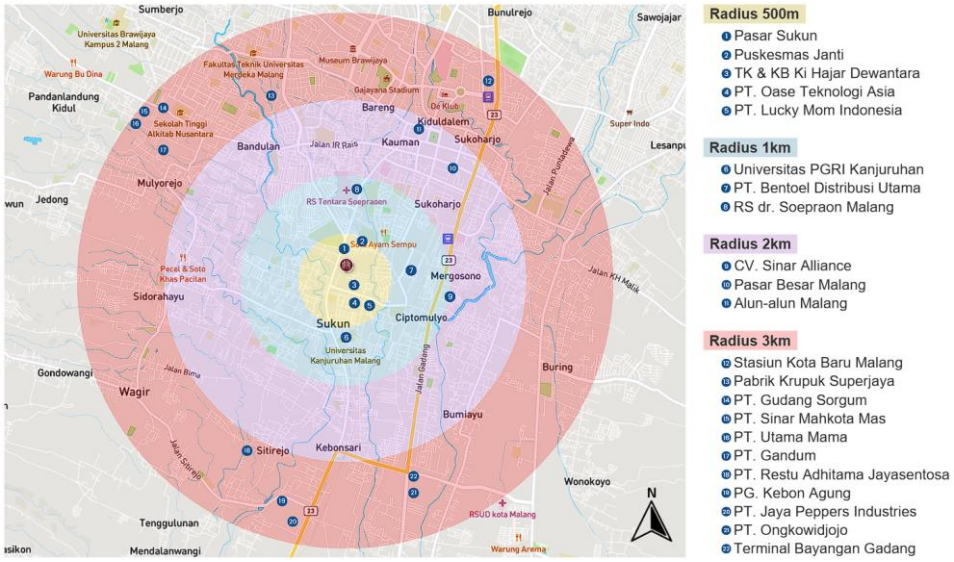

Figure 7. Footprint Radius Map
Source: Author's Analysis

The site radius analysis indicates the service coverage and connectivity of the selected site to surrounding public, social, and industrial facilities. Within a radius of approximately 500 meters, the site is close to basic service facilities such as markets, community health centers, and educational centers, which support the daily needs of apartment residents. Within a radius of approximately 1 kilometer, the site is connected to higher education facilities, hospitals, and city-scale activity centers, thus strengthening access to more comprehensive public services. Within a radius of approximately 2 to 3 kilometers, the site is within reach of industrial areas, trade centers, and transportation terminals, which are the primary destinations for industrial worker mobility. This condition indicates that the site has a good level of accessibility to facilities and activities, thus supporting the function of industrial worker *Rusunawa* as housing integrated with the urban environment and work area.

6) Climate Analysis

Malang Malang City has a tropical-humid climate characterized by high humidity and relatively stable temperatures throughout the year. The climate data used in this study were obtained from Malang Regency due to the availability of official meteorological records. Considering the geographical proximity and similar climatic characteristics between Malang City and Malang Regency, the data are considered representative of the study area.

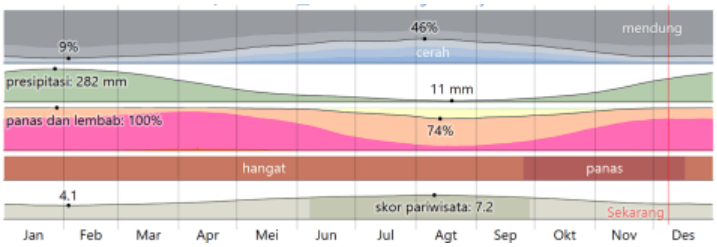

Figure 8. Climate Characteristics of the Malang Region
Source: *weatherspark*

The Malang region has a relatively stable day length throughout the year, ranging from approximately ±11 hours 40 minutes to ±12 hours 35 minutes. The shortest day duration occurs around June 21 (±11 hours 40 minutes), while the longest day duration occurs around December 21 (±12 hours 35 minutes). This condition indicates that the site receives fairly even sun exposure throughout the year without extreme differences between seasons. Therefore, building design needs to anticipate consistent daily sun exposure, especially during the day until the afternoon, through the arrangement of mass orientation, openings to minimize excess heat, and the application of shading elements (shading, secondary skin, overhangs) especially on the west-east facade.

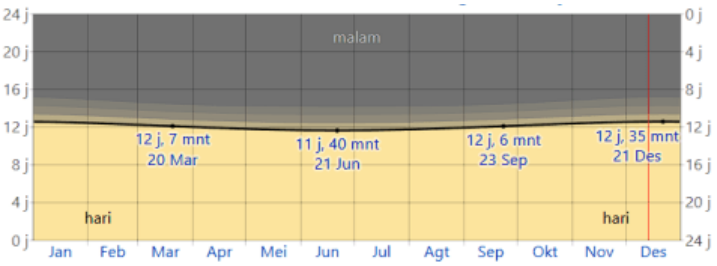

Figure 9. Day and Night Hours in Malang Regency
Source: *weatherspark*

The dominant wind direction is from the west at the beginning of the year, shifts from the east between April and September, and returns to south and west dominance at the end of the year. The recommended design response is to maximize cross-ventilation through massing that allows for wind flow, open corridors/voids, and the placement of openings on sides that capture the dominant wind direction.

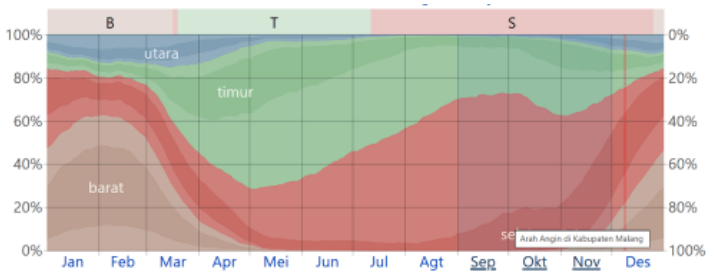

Figure 10. Wind Direction in Malang Regency
Source: *weatherspark*

Rainfall is relatively high at the beginning of the year and decreases significantly during the dry season, before increasing again towards the end of the year. Responses can include planning a good drainage system, raising the elevation of certain areas when necessary, providing infiltration wells/biopores and green open spaces for infiltration, and managing roof runoff through gutters and rainwater reservoirs to support water efficiency.

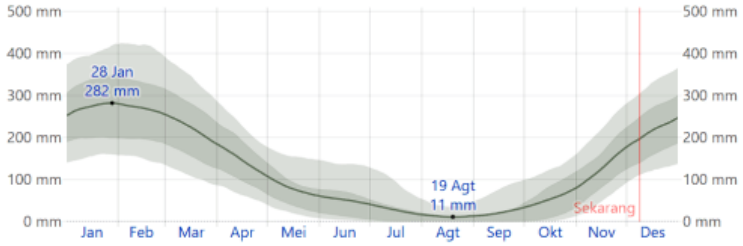

Figure 11. Rainfall in Malang Regency per Year
Source: *weatherspark*

DISCUSSION

The results of this study indicate that proximity to industrial areas and accessibility are the most dominant factors influencing the selection of housing locations for industrial workers. This finding is consistent with previous studies, which emphasize that workers tend to prioritize efficiency in commuting time and transportation costs over other considerations (Turner, 1976; Sutanto, 2020). The preference for housing located within a short distance from the workplace reflects an adaptive strategy to reduce daily mobility burdens and increase productivity.

In addition to proximity and accessibility, economic affordability plays a significant role in determining housing choices. Industrial workers generally have limited income, which leads them to select housing that offers lower rental costs, even if it means compromising environmental quality. This condition is supported by previous research, which states that affordability is often prioritized over comfort and environmental conditions in low-income housing decisions (Yudohusodo, 1991).

However, environmental factors such as noise levels, lack of vegetation, and high density still influence the overall quality of living. The selected site at Jl. S. Supriadi XI demonstrates good accessibility and proximity to public facilities, but also presents challenges related to environmental conditions. Therefore, appropriate design strategies are required to mitigate these issues, including the use of vegetation as noise buffers, building orientation to reduce solar heat gain, and the application of cross-ventilation systems to improve thermal comfort.

This study also highlights the importance of integrating spatial planning with housing development. The suitability of the selected site in terms of zoning regulations and accessibility to supporting facilities indicates that location planning is a key determinant of successful Rusunawa development.

CONCLUSION

This study concludes that the selection of housing locations for industrial workers in Malang City is influenced by six main factors: proximity to workplaces, accessibility, economic affordability, environmental quality, availability of public facilities, and compliance with spatial planning. Among these factors, proximity and accessibility are identified as the most dominant determinants, as they directly affect daily mobility efficiency and transportation costs.

Based on the analysis of alternative sites, the location at Jl. S. Supriadi XI in Sukun District is identified as the most suitable site for the development of Rusunawa for industrial workers. The site demonstrates strong potential due to its strategic location, good accessibility, and proximity to supporting facilities. However, environmental challenges such as noise, limited vegetation, and tropical climate conditions require appropriate design responses to ensure residential comfort. The findings of this study provide a conceptual basis for planning sustainable, efficient, and worker-oriented housing in urban areas. The proposed location criteria can be used as a reference for future housing development, particularly in rapidly growing industrial cities.

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