

Spatial Dynamics of Land Use Changes and Land Carrying Capacity of Settlement in Palaran District Year 2014 – 2024

Randi Arman Pratama*, Ananto Aji, Juhadi

Department of Geography, Faculty of Social & Political Sciences,
Semarang State University, Indonesia
*randyarmanpratama1908@gmail.com

Abstract

This study examines spatial dynamics of land use change and the capacity of land to support residential development in Palaran Subdistrict, Samarinda City, over a ten-year period. The objectives are to map temporal shifts in land cover for 2014, 2019, and 2024; to evaluate land suitability for housing based on eight bio-physical parameters stipulated by national regulation; and to quantify the carrying capacity and population support capacity of suitable land. The methodology integrates multitemporal satellite imagery processing, supervised classification with a random decision forest algorithm, geographic information system overlay analysis, and field validation at two hundred sampling points. Results reveal a forty-one percent increase in built-up area and a seventy-percent decrease in agricultural land, with over eighty-seven percent of the study area classified as highly suitable for residential use. Calculations of land support capacity indicate a significant surplus relative to current population levels, underscoring opportunities for sustainable urban expansion and evidence-based spatial planning.

Keywords: Land Carrying Capacity, Land Suitability, Land Use Change, Geographic Information System.

DOI: [10.20527/jpg.v12i2.22895](https://doi.org/10.20527/jpg.v12i2.22895)

Received: 16 June 2025; **Accepted:** 19 September 2025; **Published:** 28 September 2025

How to cite: Pratama R. A., Aji, A., Juhadi. (2025). Spatial Dynamics of Land Use Changes and Land Carrying Capacity of Settlement in Palaran District Year 2014 – 2024. *JPG (Jurnal Pendidikan Geografi)*, Vol. 12 No. 2.

<http://dx.doi.org/10.20527/jpg.v12i2.22895>

© 2025 JPG (Jurnal Pendidikan Geografi)

*Corresponding Author

JPG (Jurnal Pendidikan Geografi) is licensed under
a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License



1. Introduction

Land use change is a reflection of the dynamic interaction between human activities and the environment. Population growth and rapid urbanization are the main drivers of land conversion, especially from agricultural land and forest areas to built-up areas that are often uncontrolled. This phenomenon not only has an impact on the decline in the

composition of agricultural land but also causes significant pressure on food security and ecosystem sustainability (Antrop, 1998;Wahyunto, 2001). At the local level, this dynamic is very much felt in Samarinda City, the capital of East Kalimantan Province, which experienced an average population growth rate of 1.26% per year during the period 2010–2020, with the majority of its population being of productive age. The city's economic growth has been shown to have a significant positive correlation with the rate of land conversion (Central Bureau of Statistics, 2024;Hidayat et al., 2020). As one of the strategic buffer areas, Palaran District is an area directly affected by urban expansion. Previous studies have noted that Palaran District experienced massive conversion of agricultural land into settlements and vacant land between 2006–2020, and agricultural land cover is predicted to continue to decline until 2034. This land conversion risks causing environmental impacts such as erosion, decreased water absorption capacity, and habitat fragmentation, which can ultimately reduce the environmental carrying capacity to accommodate the burden of development (Umar et al., 2020; Faoziyah et al., 2024). In geographical studies and regional planning, this phenomenon can be analyzed through several theoretical frameworks. The growth pole theory proposed by François Perroux states that economic growth tends to be concentrated in certain locations that function as "growth poles". In this context, Palaran District functions as a secondary growth pole driven by its proximity to the center of Samarinda City and its role as a buffer for the Indonesian Capital City (IKN) (Jumino, 2019;Mustika & Suhartini, 2024).

Furthermore, the concept of transportation connectivity developed by KJ Kansky emphasizes how increasing transportation network connectivity is a key factor that accelerates interaction and accessibility between regions (Suryaningsih et al., 2024; Fakhrudin, A & Gultom, Y.M.L, 2021). The development of strategic infrastructure such as toll roads and bridges in Palaran is a catalyst that accelerates the rate of urbanization and land conversion, in line with both theories (Siburian et al., 2020; Nissa et al., 2024). Although some relevant studies have been conducted, there is a significant research gap. Studies by Ghotama et al., (2021) focused on monitoring land cover changes but has not evaluated its implications for residential land capacity. Meanwhile, research Nugroho et al., (2021) static in assessing land carrying capacity without integrating multitemporal land change analysis. Other studies in different cities such as Ambon (Septory et al., 2023 ; Lasaiba, 2024). Salatiga (Rahmawan et al., 2019), and also semarang (Hidayati et al., 2015; Utami et al., 2017). has not offered an integrated approach that combines biophysical analysis, spatial dynamics, and comprehensive calculation of carrying capacity. This study is designed to fill this gap by integrating multitemporal land use change analysis (2014, 2019, and 2024), land suitability evaluation based on eight biophysical parameters, and detailed calculation of carrying capacity and settlement land capacity. Therefore, this study aims to answer the crucial question of how the spatial dynamics of land use change in Palaran District affect the carrying capacity of land for settlements. Specifically, this study will track and analyze changes in the area between built-up and non-built-up land from 2014 to 2024 to map its main trends. Furthermore, an in-depth evaluation of the land suitability status across the district will be conducted to identify the most potential areas for future development. Ultimately, this study will determine the carrying capacity and settlement land capacity status, in order to provide a quantitative picture of the region's capacity to support sustainable population growth.

2. Method

This study uses a descriptive-quantitative approach to examine land use change patterns, suitability of residential land, and land capacity to accommodate population growth in Palaran District (Figure 1). Data sources include: (1) multitemporal Landsat 8 OLI/TIRS and Sentinel-2 MSI Level-2A satellite imagery for 2014, 2019, and 2024; (2) primary data from field validation at 200 points using Stratified Random Sampling and GPS; and (3) secondary data in the form of thematic maps (DEM, soil type, infrastructure network), BPS Samarinda population statistics (2024), and Samarinda City RTRW documents 2023–2042. The use of Sentinel-2 MSI and Landsat 8 OLI/TIRS imagery was chosen because both provide multispectral data with moderate spatial and temporal resolution for land change analysis at the sub-district scale. Sentinel-2 offers 10 m spatial resolution in several key bands (VIS–NIR), a revision frequency of 5–10 days, and a red edge spectrum that is sensitive to vegetation conditions, making it ideal for monitoring green cover dynamics in detail (Ati et al., 2025). And Landsat 8 complements the thermal band and 30 m resolution that has been tested for long-term analysis since 2013, allowing multitemporal comparisons between 2014, 2019, and 2024 with consistent historical data (Gifari et al., 2023).

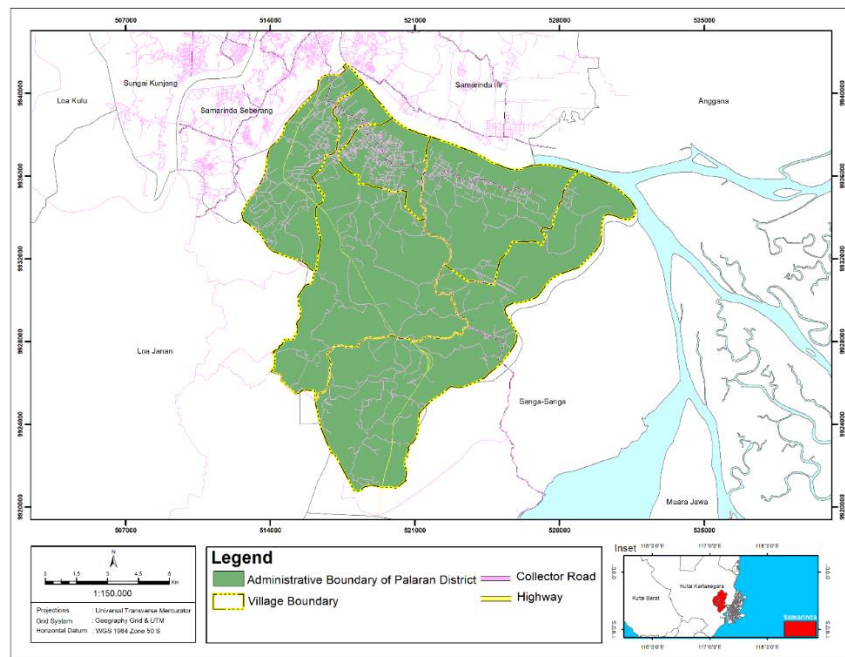


Figure 1. Research Location

The analysis procedure begins with pre-processing of geometric and radiometric correction images to normalize the position and reflectance values of pixels. Next, supervised classification is carried out using the Random Forest Tree algorithm in ArcGIS Pro to produce a land cover map, which is then validated through the confusion matrix and Kappa index. The Random Forest method was chosen as the supervised classification algorithm because it generally provides higher accuracy than the Maximum Likelihood Classification (MLC) which assumes a normal distribution of each class, especially in heterogeneous areas such as Palaran (Kanata et al., 2021). The multitemporal land cover map is then overlaid with a land capability unit (SKL) layer covering eight biophysical parameters according to PU Regulation No. 20/2007 to evaluate the suitability of

residential land (Rivaldo Restu Wirawan et al., 2019; Sitompul et al., 2025). Calculation of the carrying capacity of residential land (DDPM) using the formula (Muta'Ali, 2015):

$$DDPM = \frac{LPm/Jp}{\alpha}$$

Where LPm is the land area according to settlement (m²), Jp is the number of residents (people), and α is the allocation coefficient of 8 m²/capita. The carrying capacity (DT) is then obtained from.

$$DT = DDPM \times JP$$

The calculation results are made in the form of a table to identify areas with a deficit or surplus of residential capacity. The tools and analysis techniques used include ArcGIS Pro, Microsoft Excel. Thus, this methodology presents a series of integrated steps from image processing, land suitability analysis, to the calculation of carrying capacity and capacity that are in accordance with the scope, urgency, and research gaps that have been identified.

3. Result and Discussion

Land use change is one of the important indicators in assessing the dynamics of space utilization in an area (Hermawan & Rudiarto, 2023). In Palaran District, changes in land use over a period of ten years with a 5-year interval to see the spatial dynamics that occur in Palaran District (2014-2019-2024). Shows a shift in land function that reflects development growth, pressure on space needs, and the direction of regional management policies. The analysis was carried out on six main categories of land use: water bodies, built-up land, agriculture, grasslands, wetlands, and forests. Spatial analysis reveals a dramatic shift in land function over the past decade. The results show that built-up land has increased from 1,930.11 ha in 2014 to 2,732.73 ha in 2024 (+41.6%), indicating the expansion of settlements and major infrastructure. In contrast, agricultural land has declined sharply from 3,172.26 ha to 955.52 ha (-69.9%), due to the conversion from agrarian to non-agrarian. The fluctuation of grasslands increased from 2,847.39 ha (2014) to 3,229.59 ha (2019), then decreased to 2,675.43 ha (2024) indicating a shift in the transition zone between built-up areas and forest cover. The increase in water body area (+17.0%) and wetland area (+16.6%) reflects the expansion of canals, reservoirs, and restoration of swamp ecosystems, while forest cover grew from 9,249.24 ha to 10,510.50 ha (+13.6%), which marks reforestation or natural regeneration efforts. This shift reflects the transition from an agrarian orientation in 2014 where 48.4% of the area was still forested to a semi-peri-urban landscape that balances settlements, green conservation, and hydrological elements in 2024. Spatially, the concentration of settlement expansion is observed along the Palaran Toll Road corridor and the banks of the Mahakam River, while the increase in forest and wetland cover is spread across the outskirts of the sub-district to maintain ecological functions. This pattern emphasizes the pressure of space needs as well as local ecosystem adaptation, which is an important basis for evaluating land suitability and sustainable spatial planning (Bahrudin et al., 2023).

Table 1 Dynamics of Land Use Changes in Palaran District 2014 - 2024

Classification	Year 2014 (Ha)	Year 2019 (Ha)	Year 2024 (Ha)	Annual Change 2014 -2024 (Ha)	Percentage Change (%)
Water Body	1,796.34	1,987.44	2,102.12	+305.78	+17%
Built-up Land	1,930.11	2,350.53	2,732.73	+802.62	+41.6%
Agriculture	3,172.26	1,337.72	955.52	-2,216.74	-69.9%
Meadow	2,847.39	3,229.59	2,675.43	-171.96	-6%
Wetlands	114.66	76.44	133.77	+19.1	+16.6%
Forest	9,249.24	10,128.30	10,510.5	+1,261.26	+13.6%

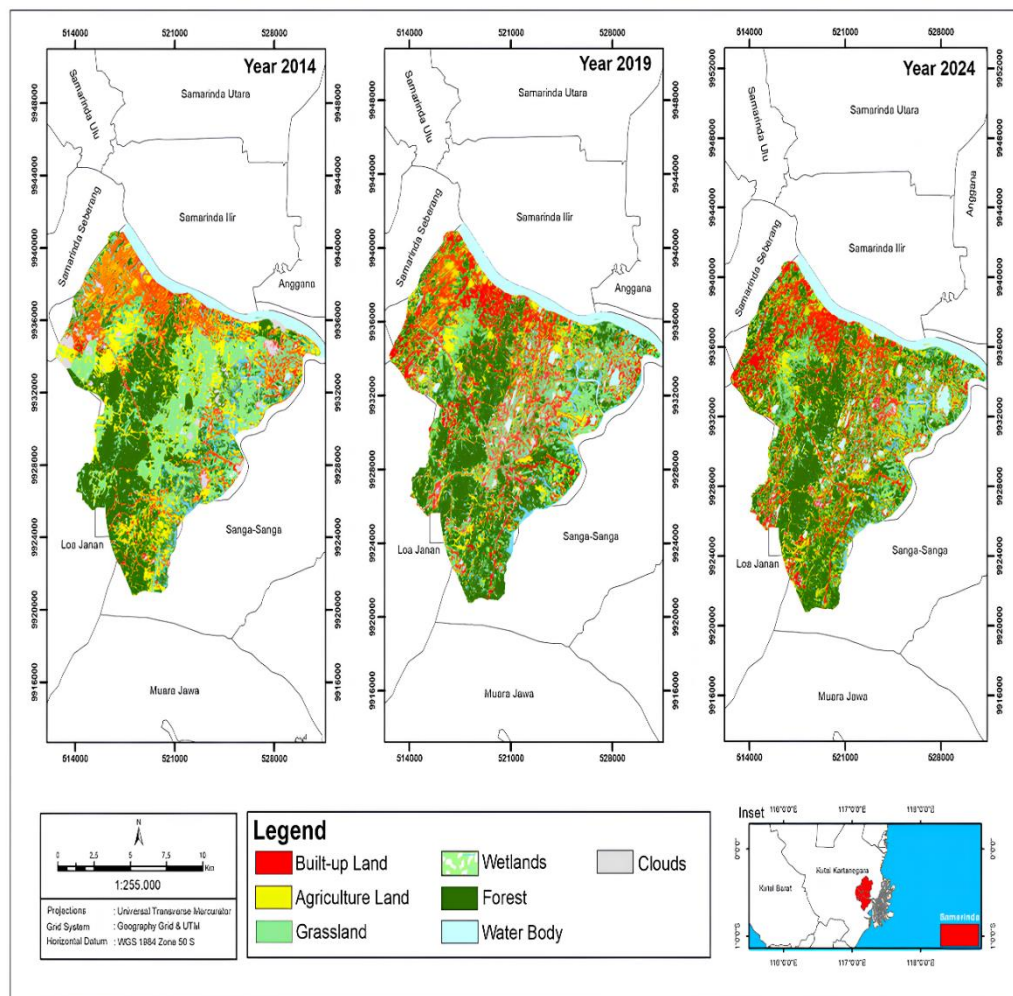


Figure 2 Land Use Change Map of Palaran District 5 Year Interval 2014 – 2024

Analysis of the suitability of residential land in Palaran District revealed that the majority of areas are physically and biophysically very supportive of residential development. By applying eight parameters of Land Capability Unit (SKL) morphology, ease of work, slope stability, foundation stability, water availability, erosion resistance, drainage capacity, and vulnerability to natural disasters based on PU Regulation No. 20/2007, each land unit is scored and weighted, then overlaid to produce a suitability map. The morphological SKL analysis confirms that Palaran District has great potential for development, with more than 89% of its area having low to gentle slopes that are ideal

for settlements. The "high" (51.7%) and "moderate" (37.8%) zones dominate the landscape, while areas with steep slopes only cover a small portion of the area.

Tabel 2 Classification of Morphological Land Capability Units

SKL Classification Palaran Morphology	Area (HA)	%
High	9,875.29	51.67
Moderate	7,224.93	37.8
Medium	1,607.21	8.4
Poor	290.39	1.52
Low	109.35	0.57

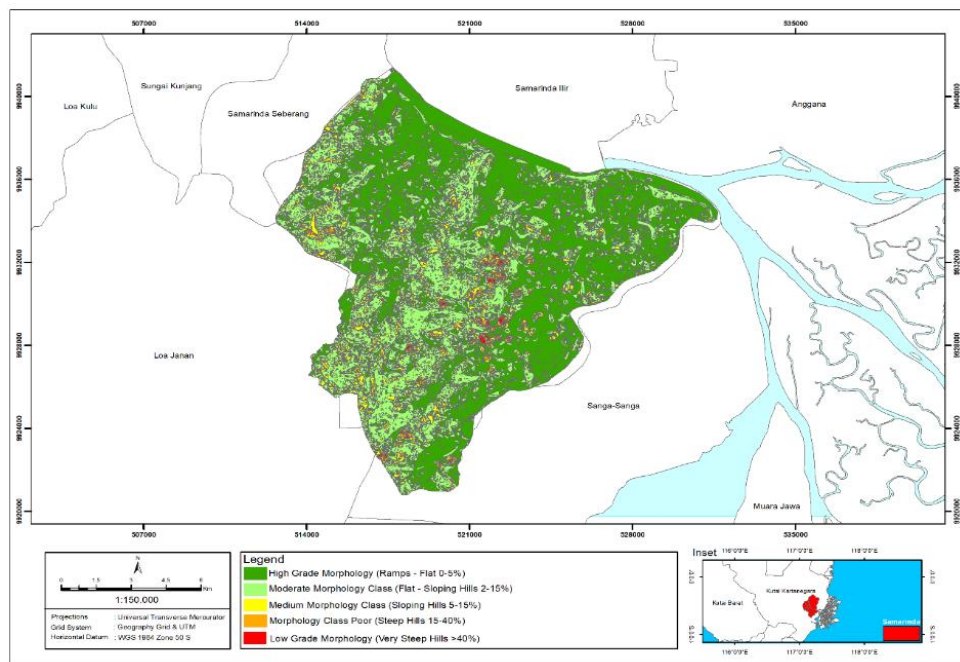


Figure 3. Morphological Map of Palaran Subdistrict

The SKL analysis of workability reveals that land in Palaran District is very supportive of construction work efficiency. As much as 92.3% of the total area (18,016 ha) is in the "high" category for workability, with only 5.7% (1,093 ha) in the "medium" category.

Table 3. Land Capability Unit Classification Ease of Workability

SKL Classification Ease of Working Palaran	Area (HA)	%
High	18,016.15	92.3
Medium	1,093.85	5.7

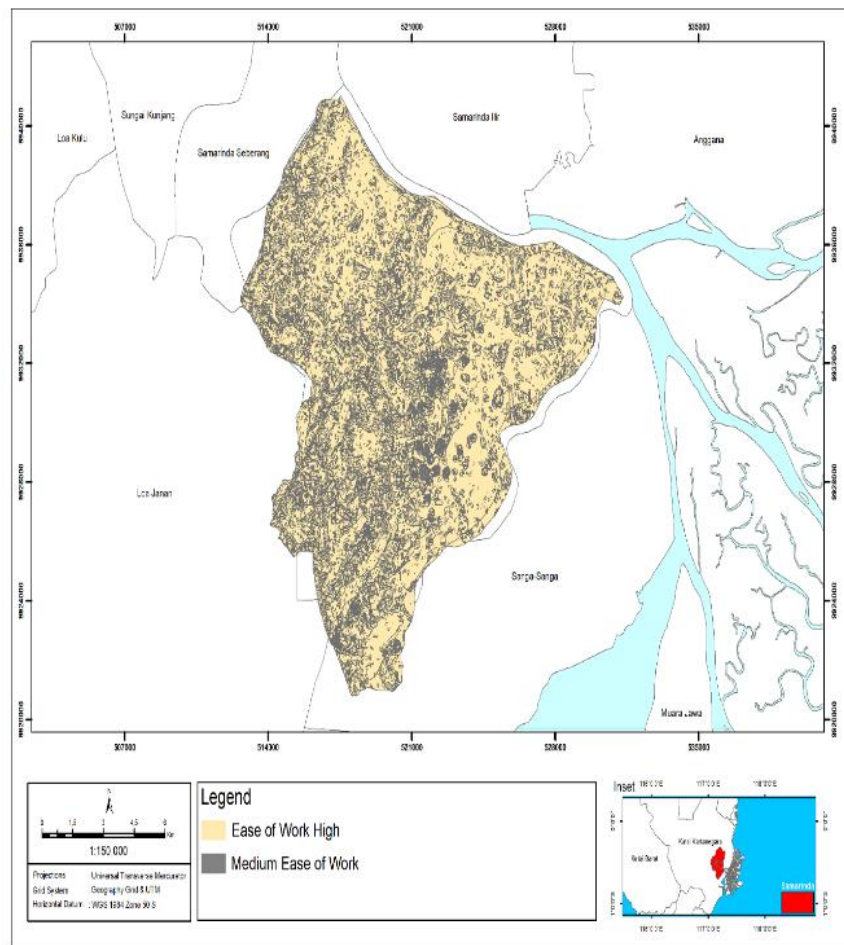


Figure 4. Map of Land Use Ease in Palaran Subdistrict

Analysis revealed that more than 90% of its area is safe for development, with the majority of land having "high" (52.1%) and "moderate" (38.1%) stability levels. Zones with moderate (8.8%) and low (0.95%) stability only constitute a small portion.

Table 4 Land Capability Unit Classification Slope Stability

SKL Classification Palaran Slope Stability	Area (HA)	%
High	9,948.29	52.1
Moderate	7,297.93	38.1
Medium	1,680.21	8.8
Poor	182.35	0.95

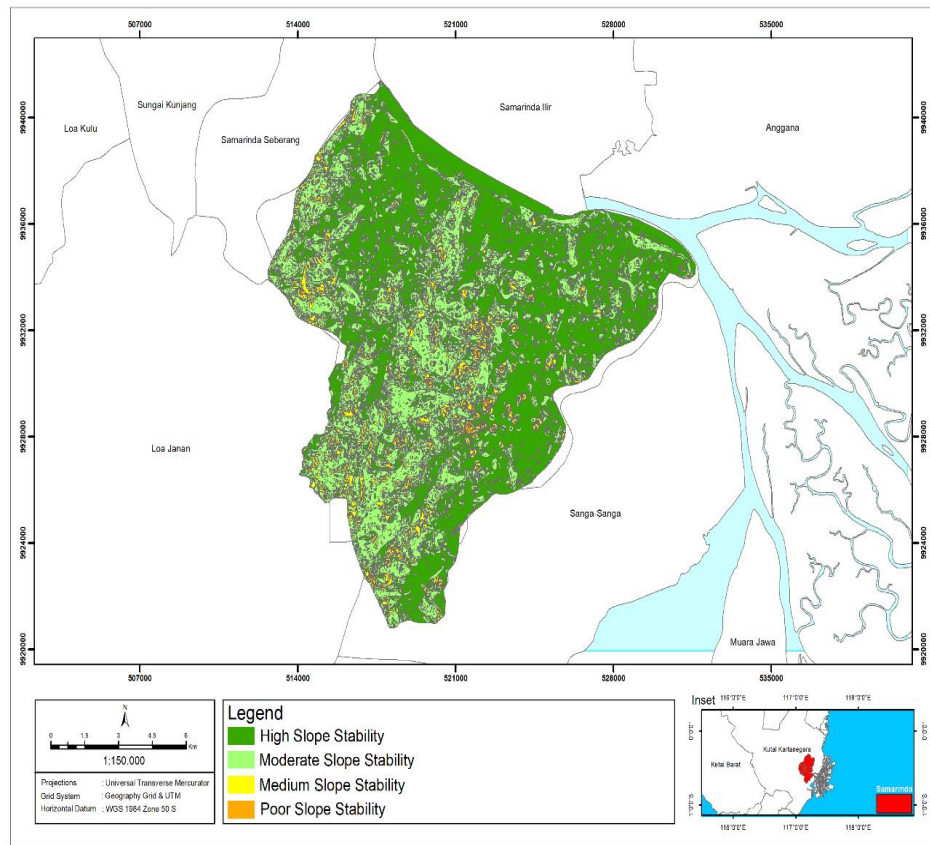


Figure 5. Slope Stability Map of Palaran Subdistrict

Analysis shows that 90% of land in Palaran District is very supportive of development, divided into "high" (50%) classes that are able to support foundations without special treatment, and "sufficient" (40%) that only require light intervention. Land that requires more mature planning or special technology only covers about 10% of the total area.

Table 5. Land Capability Unit Classification Foundation Stability

SKL Classification Stability of Palaran Foundation	Area (HA)	%
High	9,513.32	50
Moderate	7,717.38	40
Medium	1,619.47	8.5
Poor	259.09	1.4

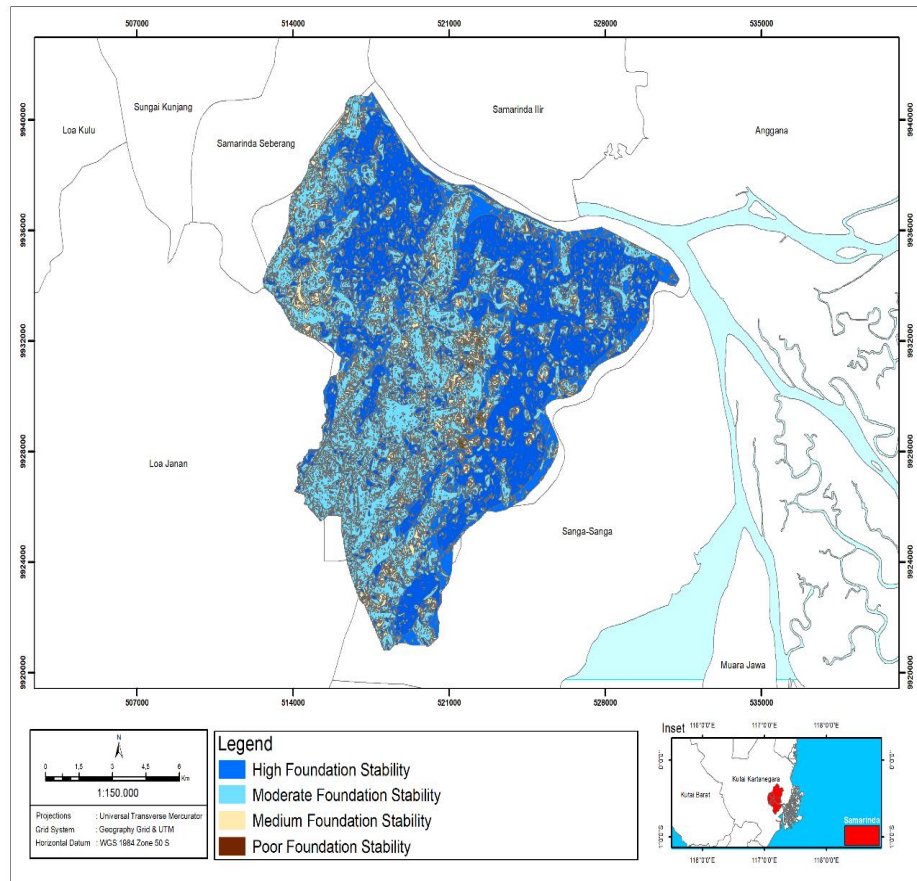


Figure 6. Foundation Stability Map of Palaran Subdistrict

Analysis of water availability in Palaran District shows that most of the land (70.2%) is in the "moderate" category, while the other 29.8% is in the "sufficient/moderate" category. This indicates sufficient groundwater potential for development, although this area is more dependent on deep water reserves due to limited shallow water availability.

Table 1. Classification of Land Capability Units Water Availability

SKL Classification	Availability of Palaran Water	Area (HA)	%
	Moderate	5,703.37	29.8
	Medium	13,406.51	70.2

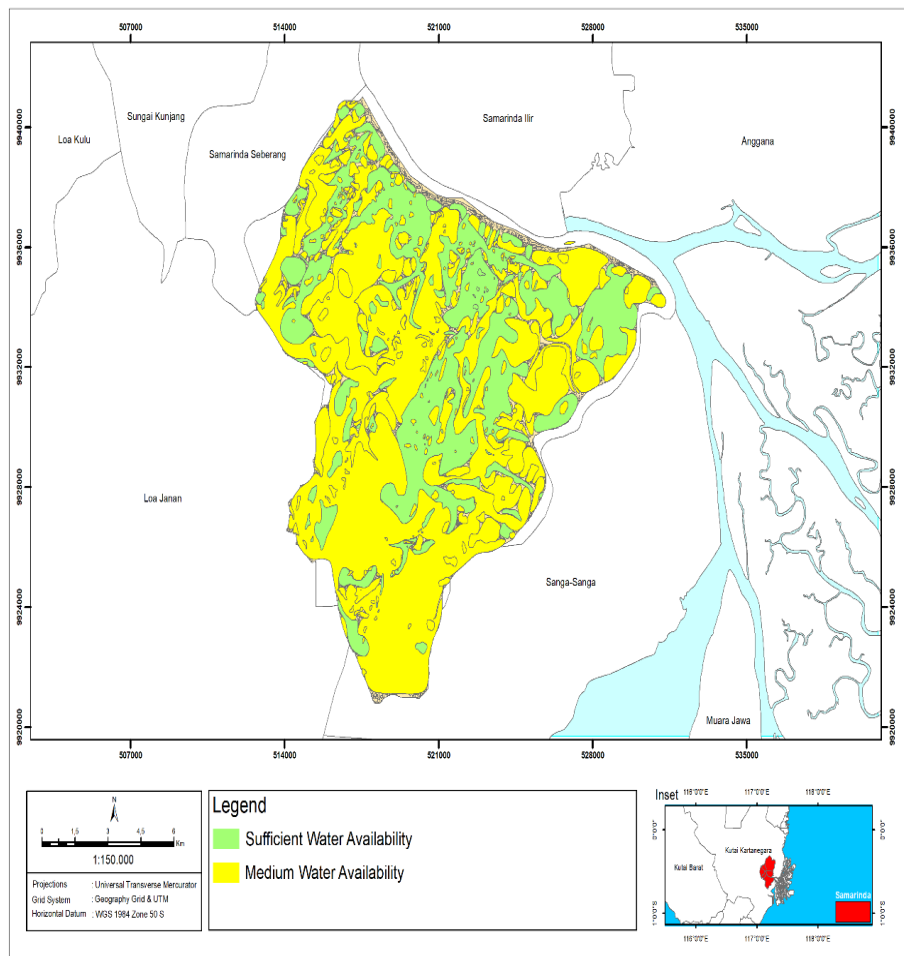


Figure 7. Water Availability Map of Palaran Subdistrict

The Drainage SKL analysis reveals excellent hydrological conditions in Palaran District, where all areas are classified as "high" (52%) or "moderate" (48%), with no low drainage zones. This condition supports the development of areas with minimal risk of inundation.

Table 2 Classification of Drainage Land Capability Units

SKL Classification Palaran Drainage	Area (Ha)	%
High	9,943.00	52
Moderate	9,166.63	48

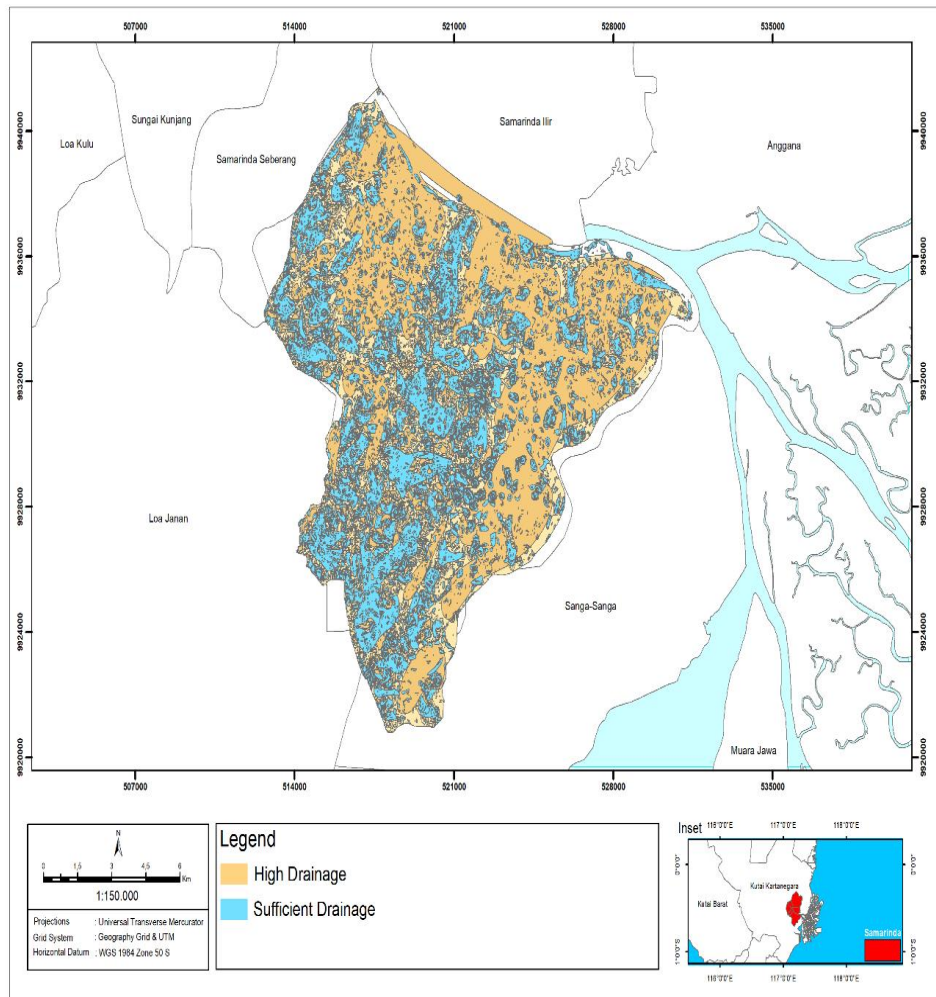


Figure 8. Palaran Subdistrict Drainage Capability Map

SKL analysis of erosion shows that the majority of land in Palaran District has good resilience, with 91.7% of its area (17,531 ha) in the "sufficient/moderate" class. Areas with high (3.1%) and low (5.1%) resilience are only a small part.

Table 3. Classification of Land Capability Units Against Erosion

SKL Classification Resistance to Palaran Erosion	Area (Ha)	%
High	600.05	3.14
Moderate	17,531.64	91.74
Poor	979.11	5.12

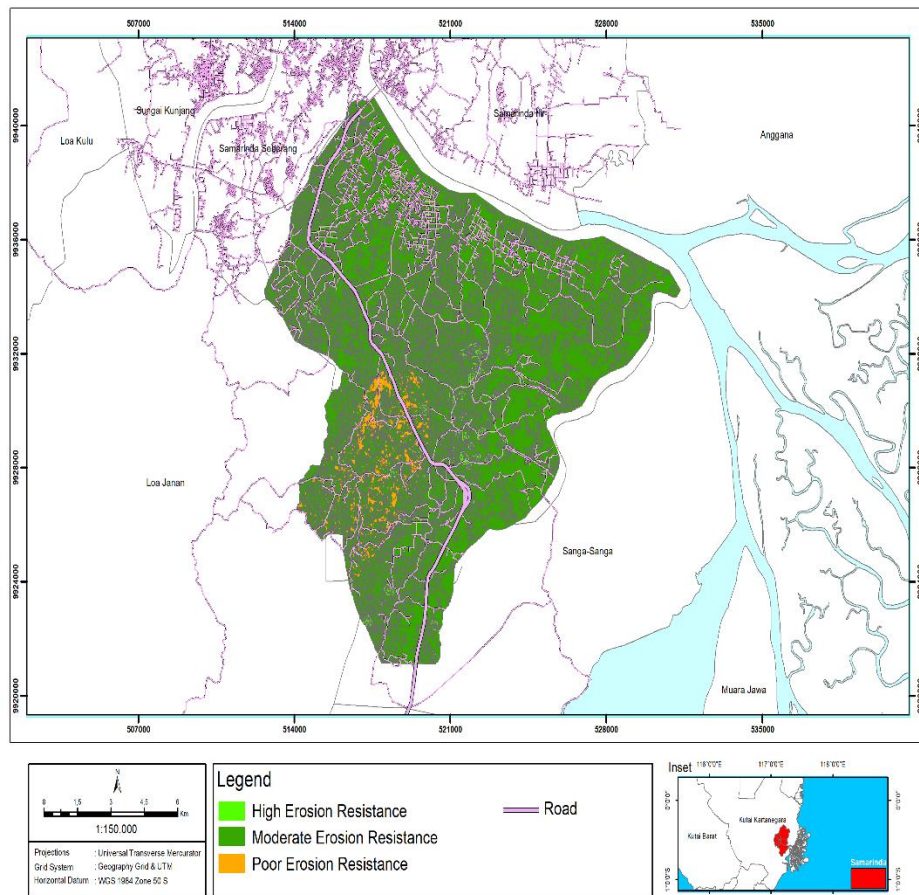


Figure 9. Map of Erosion Resistance in Palaran District

The entire Palaran District is classified as a low disaster vulnerability zone with no medium or high risk areas. This condition is caused by flat to gentle topography, stable geological structure, low slope gradient, and effective natural drainage, so that the risk of disasters such as landslides and floods is minimal.

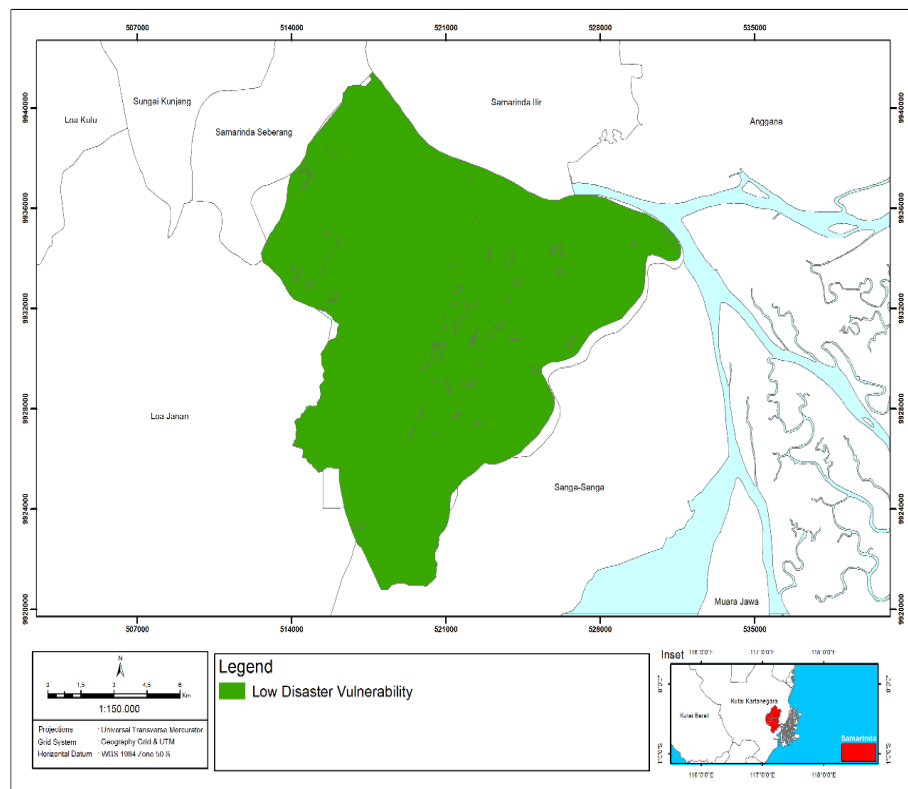


Figure 10. Disaster Vulnerability Map in Palaran Subdistrict

The final classification results show that more than 87% of the total area of Palaran (16,773 ha) has optimal potential for settlement. This land is divided into the "high" development capability class of 46.6% (8,905 ha) and "moderate" of 41.17% (7,868 ha). Only a small portion of the remainder falls into the "medium" and "low" classes, which may require technical interventions such as improving the drainage system.

Table 4. Palaran District Residential Land Development Capability Class

Suitability of Land for Residential Development	Area (Ha)	%
High Development Land	8,905.28	46.6
Land Development Slightly High	7,867.87	41.17
Medium Development Land	2,050.04	10.73
Low Development Land	286.95	1.5

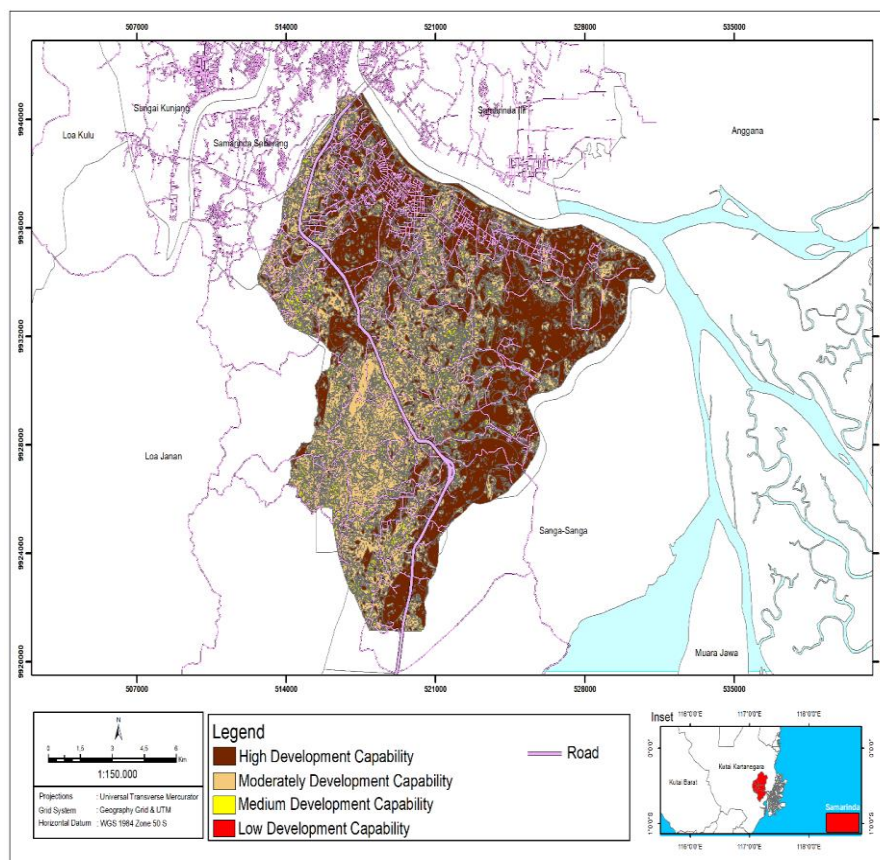


Figure 11. Land Suitability for Residential Development in 2024

The settlement capacity analysis in Palaran groups the land into three main zones based on its carrying capacity. The potential zone covers 87.8% of the total area (16,773 ha), very suitable for development with minimal technical intervention due to its ideal conditions. The constraint zone (10.7% or 2,050 ha) can be developed, but requires special engineering such as terracing due to several physical obstacles. Finally, the limitation zone (1.5% or 287 ha) which has high risk and major obstacles, is ideally allocated for conservation functions or green open spaces. Overall, around 98.5% of the Palaran area is very feasible or feasible to be developed with appropriate technical handling.

Table 5. Land Carrying Capacity of Palaran District Residential Areas

Carrying Capacity of Residential Land	Area (Ha)	%
Potential Land	16,773.15	87.8
Land Constraints	2,050.04	10.7
Land Limitation	286.95	1.5

Calculation of settlement capacity in Palaran District reveals a very large land availability, with a Settlement Carrying Capacity (DDPm) value reaching 18.35. This results in a total carrying capacity of 1,227,724 people, far exceeding the current population of 66,912 people and leaving a surplus capacity of around 1.16 million people. At the sub-district level, all areas show a significant surplus, with DDPm values varying from 3.4 in the densely populated Rawa Makmur to 88 in the more sparsely populated

Bantuas, confirming that Palaran's land reserves are very moderate for long-term spatial planning.

Table 6. Calculation of Carrying Capacity and Land Capacity of Residential Land

Carrying Capacity of Palaran District, Samarinda City					
Total population	LWp	LPm x 60%	DDPm	DT	DT Remainder
66,912	16,370	9822	18.35	1227724	1,160,812

Table 7. Carrying Capacity of Residential Land Per Sub-district, Palaran District

Carrying Capacity Per Sub-district, Palaran District				
Subdistrict	Total population	LWp	LPm x 60%	DDPm
Bantuas Sub-District	4,806	5,647	3,388	88
Bukuan Sub-District	17,173	2,765	1,659	12
Rawa Makmur Subdistrict	24.168	1,086	651	3
Handil Bakti Sub-District	11,01	4,877	2,926	33
Simpang Pasir Sub-District	9,755	1,995	1,197	15
Total	66,912			

Table 8. Population Capacity Per Sub-district, Palaran District

Capacity Per Sub-district, Palaran District				
Subdistrict	DDPm	Total population	DT (Living Capacity)	Remaining DT (Living Capacity)
Bantuas Sub-District	88	4,806	422928	418122
Bukuan Sub-District	12	17,173	206076	188903
Rawa Makmur Subdistrict	3	24.168	72504	48336
Handil Bakti Sub-District	33	11,01	363330	352320
Simpang Pasir Sub-District	15	9,755	146325	136570
Total			66,912	1211163

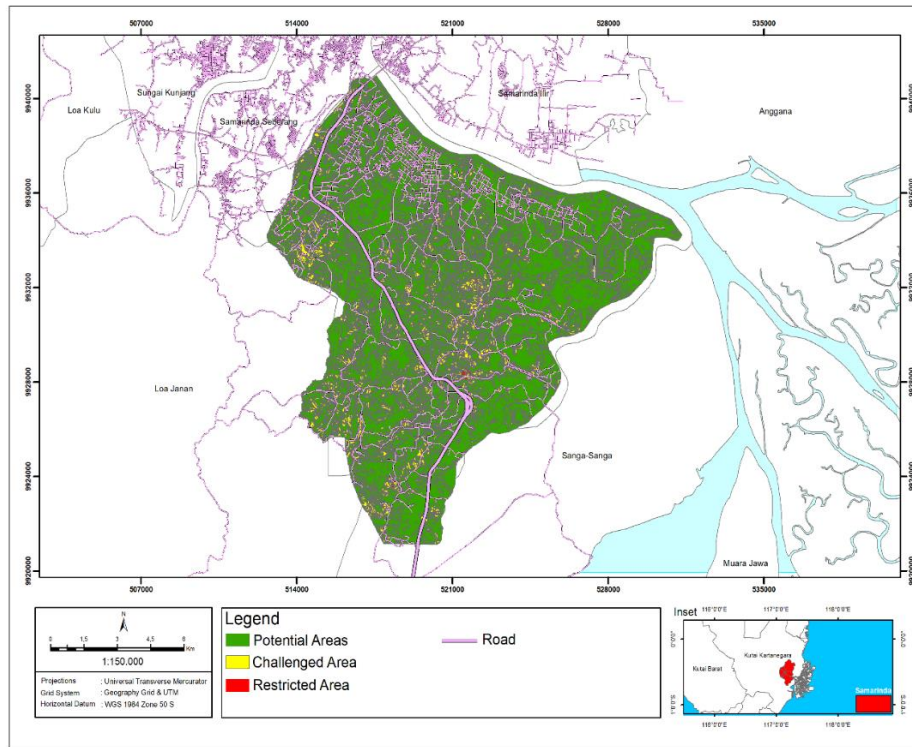


Figure 12. Residential Land Carrying Capacity in 2024

The results of the land carrying capacity model in Palaran District show that the availability of land for residential development is still in a state of significant surplus compared to the current population needs. This finding is in line with the government's policy direction, which places Palaran as a strategic buffer zone for the city of Samarinda and the Capital City of Nusantara (IKN), where development pressure will continue to increase due to population growth, infrastructure development, and the need for new residential space. However, the current condition of the region also shows the rapid conversion of agricultural land and an increasing concentration of settlements along the toll road corridor and the banks of the Mahakam River. Thus, the results of the land carrying capacity model not only provide a scientific basis that Palaran still has adequate spatial capacity, but also serve as an important reference for the government in formulating adaptive spatial policies so that this land surplus can be utilized in a controlled manner, maintaining ecological balance, and supporting sustainable development amid the pressures of urbanization and regional transformation.

4. Conclusion

This study concludes that Palaran District holds great potential for sustainable settlement development.

1. The analysis of land cover over the past ten years shows a shift in dominance from agricultural functions to built-up areas, especially along major transportation routes, while there has also been an increase in forest cover as an ecological response in former agricultural lands.
2. Land suitability evaluation using land capability units confirms that most areas are very suitable to moderately suitable for residential development, with only a small portion requiring light technical interventions such as terracing or drainage network

improvements.

3. And the calculation of residential land capacity shows that the available space far exceeds the current housing demand, reaffirming that all villages in Palaran have moderate land readiness for residential expansion without sacrificing environmental balance.

Thus, these findings not only fill the methodological and conceptual gaps in the study of land use change and settlement suitability in Palaran, but also provide a strong scientific foundation for the formulation of adaptive and sustainable spatial planning policies.

5. Acknowledgment

The author would like to express his gratitude to God Almighty for His grace so that this research can be completed. The greatest gratitude is addressed to various parties who have made valuable contributions. In particular, thanks to Dr. Ir. Ananto Aji, MS, as the supervisor, for his intellectual direction, constructive input, and invaluable patience. Appreciation is also expressed to Dr. Rahma Hayati, S.Si., M.Si., as the Coordinator of the Geography Study Program, along with all the lecturers and administrative staff at the Faculty of Social and Political Sciences, Semarang State University for the technical, administrative, and scientific support provided during the study. Thanks to the Rector of Semarang State University, Prof. Dr. S. Martono, M.Si., for providing facilities, equipment, and a conducive academic climate. Finally, sincere thanks to all fellow students and friends for the moral support that has always accompanied until the completion of this research.

6. References

- Antrop, M. (1998). Landscape change: Plan or chaos? *Landscape and Urban Planning*, 41(3–4), 155–161. [https://doi.org/10.1016/S0169-2046\(98\)00068-1](https://doi.org/10.1016/S0169-2046(98)00068-1)
- Arfiansyah, D., Han, H., & Zlatanova, S. (2024). Land Suitability Analysis for Residential Development in an Ecologically Sensitive Area: A Case Study of Nusantara, the New Indonesian Capital. *Sustainability (Switzerland)*, 16(13). <https://doi.org/10.3390/su16135767>
- Ati, A., Aldiansyah, S., Hasan, H., Windayani, W., Bahar, H., Saleh Qadri, M., Juryan Ladianto, A., & Putra, A. (2025). *Perubahan Penggunaan Lahan dan Tutupan Lahan Menggunakan Metode Maximum Likelihood*. 10(1). <https://doi.org/doi.org/10.36709/jppg.v10i1.390>
- Badan Pusat Statistik. (2024). *BPS Kota Samarinda 2024*.
- Bahrudin, M. L., Wagistina, S., Masruroh, H., & Astuti, I. S. (2023). Klasterisasi Spasial dan Penggunaan Lahan Wilayah Peri Urban Lowokwaru Kota Malang. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHIS)*, 3(10), 1111–1127. <https://doi.org/10.17977/um063v3i102023p1111-1127>

- Faoziyah, U., Rosyaridho, M. F., & Panggabean, R. (2024). Unearthing Agricultural Land Use Dynamics in Indonesia: Between Food Security and Policy Interventions. *Land*, 13(12). <https://doi.org/10.3390/land13122030>
- Ghotama, D. Y., Damayanti, A., Indra, T. L., & Dimyati, M. (2021). Monitoring agricultural land-use change in Palaran Subdistrict, Samarinda City, East Kalimantan Province in 2006, 2014, and 2020. *IOP Conference Series: Earth and Environmental Science*, 716(1). <https://doi.org/10.1088/1755-1315/716/1/012019>
- Gifari, O. I., Kusrini, K., & Yuana, K. A. (2023). Analisis Perubahan Tutupan Lahan Menggunakan Metode Klasifikasi Terbimbing Pada Data Citra Penginderaan Jauh Kota Samarinda-Kalimantan Timur. *Informatika Mulawarman : Jurnal Ilmiah Ilmu Komputer*, 18(2), 71. <https://doi.org/10.30872/jim.v18i2.5716>
- Gultom, Y. M. L., & Fakhruddin, A. (2021). The Impact Of Toll Road Construction On Changes In Built-Up Land (Case Study Of Trans Java Toll Road). *Jurnal Geografi Lingkungan Tropik*, 5(2). <https://doi.org/10.7454/jglitrop.v5i2.125>
- Hamzah, U., Resty, I. P., Adjie, Z. T., & Utari, A. (2020). Geology And Analysis Of Land Suitability For Settlement Based On A Geomorphological Approach In Bukit Pinang, Kecamatan Samarinda Ulu, Kota Samarinda. In *Ilmu Pengetahuan dan Teknologi* (Vol. 3, Issue 1). <https://doi.org/http://doi.org/10.30872/jtg.v3i1.6476>
- Hermawan, A. D., & Rudiarto, I. (2023). Daya Dukung Permukiman dan Kesesuaian Pola Ruang Kawasan Permukiman di Kecamatan Gunungpati Kota Semarang. *Jurnal Pembangunan Wilayah Dan Kota*, 19(1), 48–63. <https://doi.org/10.14710/pwk.v19i1.23914>
- Hidayati, P. F., Kahar, S., & Subiyanto, S. (2015). Evaluasi Kesesuaian Lahan Permukiman Berbasis Sistem Informasi Geografis (Studi Kasus : Semarang Bagian Selatan. In *JurnalGeodesiUndip APRIL* (Vol. 4, Issue 2). <https://doi.org/doi.org/10.14710/jgundip.2015.8560>
- Jumino. (2019). Kajian Teori Growth Poles Dari Francois Perroux Dan Relevansinya Untuk Pertumbuhan Ekonomi Regional Tangerang Selatan. *EDUKA : Jurnal Pendidikan, Hukum, dan Bisnis*, 4(1), 24–36. <https://doi.org/doi.org/10.32493/eduka.v4i1.3824>
- Kanata, B., Iqbal, M. S., & Ramdayanti, R. (2021). Analisis Citra Satelit Menggunakan Metode Supervised Classification Maximum Likelihood Pada Pemetaan Tutupan Lahan Di Taman Nasional Bukit Barisan Selatan (TNBBS). *DIELEKTRIKA*, 8(1), 44. <https://doi.org/10.29303/dielektrika.v8i1.265>
- Lasaiba, M. A. (2024). *Evaluasi Daya Dukung Lahan Permukiman Di Kecamatan Sirimau Kota Ambon Menggunakan Teknik Penginderaan Jauh Dan Gis*. <https://doi.org/DOI:10.30998/string.v9i1.18409>

- Mustika, W., & Suhartini, N. (2024). Implikasi Penetapan Pusat Pertumbuhan Terhadap Perubahan Pemanfaatan Ruang (Studi Kasus: Kota Bengkulu). *Jurnal Pengembangan Kota*, 12(1), 64–73. <https://doi.org/10.14710/jpk.12.1.64-73>
- Muta'Ali. (2015). Teknik analisis regional untuk perencanaan wilayah, tata ruang dan lingkungan. In *Badan Penerbit Fakultas Geografi (BPFG)* (1st ed.). Badan Penerbit Fakultas Geografi UGM. https://scholar.google.co.id/citations?view_op=view_citation&hl=en&user=1xd4bGwAAAAJ&citation_for_view=1xd4bGwAAAAJ:u-x6o8ySG0sC
- Nissa, T., Hidayat, A., Nugroho, R. A., & Putra, R. S. (2024). Pengaruh Bangkitan Penggunaan Lahan Terhadap Kinerja Ruas Jalan (Studi Kasus : Jalan Soekarno Hatta KM. 4-5). *Compact: Spatial Development Journal*, 03(01), 74–81. <https://doi.org/https://doi.org/10.35718/compact.v3i1.1157>
- Noor, A., & Hidayat, A. M. (2020). *Pengaruh pertumbuhan ekonomi terhadap alih fungsi lahan di kota samarinda*. 2, 299–308. <https://doi.org/Doi.org:10.29264/JINV.V16I2.8256>
- Nugroho, D., Setiawan, Y., Kahar, A., & Sulistioadi, B. Y. (2021). Analisis Daya Dukung Lahan Perumahan Di Kecamatan Palaran Kota Samarinda, Provinsi Kalimantan Timur (Analysis of Housing Land Carrying Capacity in The District Palaran, Samarinda City East Kalimantan). *Jurnal Infrastruktur*, 7(2), 111–119. <https://doi.org/doi.org/10.35814/infrastruktur.v7i2.2617>
- Permen PU Nomor. 20/2007, Pub. L. No. NO.20/PRT/M/2007, 1.
- Rahmawan, S., Juhadi, & Santoso, A. B. (2019). Perkembangan Permukiman dan Pengaruhnya Terhadap Daya Dukung Lahan Kota Salatiga. *Geo Image* 8, 2, 134–140. <https://doi.org/doi.org/10.15294/geoimage.v8i2.33606>
- Septory, J. S. I., Latue, P. C., & Rakuasa, H. (2023). Model Dinamika Spasial Perubahan Tutupan Lahan dan Daya Dukung Lahan Permukiman Kota Ambon Tahun 2031. *GEOGRAPHIA: Jurnal Pendidikan Dan Penelitian Geografi*, 4(1), 51–62. <https://doi.org/10.53682/gjppg.v4i1.5801>
- Siburian, T. E., Widyawati, W., & Ash Shidiq, I. P. (2020). Characteristics of Transit Oriented Development Area (Case Study: Jakarta MRT). *Jurnal Geografi Lingkungan Tropik*, 4(1), 46–47. <https://doi.org/10.7454/jglitrop.v4i1.79>
- Sitompul, K., Nuraini, C., & Sugiarto, A. (2025). Analysis of the Carrying Capacity and Land Capacity for Residential Areas in the Southern Part of Medan City. *International Journal of Mechanical, Electrical and Civil Engineering*, 2(1), 215–236. <https://doi.org/10.61132/ijmecie.v2i1.195>
- Suryaningsih, W., Siregar, H., & Mulatsih, S. (2024). Pengaruh Pembangunan Jalan Tol terhadap Perubahan Tata Guna Lahan dan Luas Lahan Sawah di Kabupaten Brebes. *TATALOKA*, 26(3), 154–164. <https://doi.org/10.14710/tataloka.26.3.154-164>

- Utami, P., Aji, A., & Juhadi. (2017). Analisis Spasial Perubahan Penggunaan Lahan Dengan Daya Dukung Tata Air Daerah Aliran Sungai (Das) Kreo Di Kota Semarang. *Geo Image*, 2, 131–138. <https://doi.org/https://doi.org/10.15294/geoimage.v6i2>
- Wahyunto. (2001). *Analisis Perubahan Penggunaan Lahan*. UGM.
- Wirawan, R. R., Kumurur, V. A., & Warouw, F. (2019). Daya Dukung Lingkungan Berbasis Kemampuan Lahan Di Kota Palu. *Jurnal Spasial*, 6(1), 137–148. <https://doi.org/https://doi.org/10.35793/sp.v6i1.23294>