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Spatial Distribution Pattern of Tourism Areas in Banjarbaru City

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Abstract

Understanding how tourist attractions are distributed across Banjarbaru City, South Kalimantan, can support regional tourism planning. This study examined the spatial patterns of four categories of attractions: natural, human-made, cultural, and geopark. The quantitative study combined GPS coordinate collection, digitization of satellite imagery in Google Earth Pro, and geographic information system (GIS) mapping. Average nearest neighbor analysis was used to characterize the spatial pattern of each category. The 39 attractions were unevenly distributed across the city. Natural, cultural, and geopark attractions exhibited dispersed patterns. Human-made attractions were clustered and accounted for 28 of the 39 locations. These category-specific patterns provide a basis for targeting infrastructure provision, improving accessibility, and guiding destination management to support sustainable tourism development in Banjarbaru City.

Keywords: Spatial Distribution; Tourist Attractions; Average Nearest Neighbor Analysis; Geographic Information Systems; Banjarbaru City

INTRODUCTION

Tourism is widely recognized as a strategic sector that can stimulate economic growth, support cultural preservation, promote environmental conservation, and strengthen local communities (Nasruddin et al., 2019). From a geographical perspective, tourism involves more than the movement of people between places; it also reflects the interaction between human activities, the physical environment, and the spatial organization of

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destinations. The distribution of tourist attractions, the availability of supporting facilities, and changes in land use are therefore essential considerations in understanding regional spatial dynamics (Baiquni, 2021). Integrating tourism development with spatial planning is particularly important to ensure that economic benefits do not come at the expense of environmental sustainability and orderly land utilization (Susanto et al., 2023).

Banjarbaru, the capital of South Kalimantan Province, has diverse tourism resources encompassing natural, artificial, cultural, and geopark attractions. The development of these resources must be considered within the framework of current spatial planning policies, particularly Regional Regulation of Banjarbaru City No. 4 of 2024 concerning the 2024–2043 Regional Spatial Plan (Rencana Tata Ruang Wilayah, RTRW). This regulation provides a formal basis for directing land utilization in accordance with designated spatial functions (Pemerintah Kota Banjarbaru, 2024). Regional development policies also reflect the government's commitment to strengthening tourism's contribution to the local economy through destination development and promotional initiatives (Pemerintah Kota Banjarbaru, 2021).

Despite its development potential, tourism growth may generate spatial conflicts when expansion is not accompanied by effective land-use controls. The conversion of former mining sites into tourist destinations, for instance, illustrates both the opportunities for land reuse and the challenges of managing changes in land function (Parapat & Andini, 2019). In urban settings, public spaces and recreational facilities also contribute to urban structure and provide settings for social interaction (Wahyuni et al., 2021). Religious tourism sites and thematic tourism villages require similar attention to spatial compatibility so that tourism activities remain consistent with the characteristics of their surrounding areas and applicable planning regulations (Norhikmah et al., 2024; Wardani et al., 2024). These conditions highlight the need to move beyond identifying tourism destinations toward examining their spatial distribution and conformity with designated land uses.

Previous studies have investigated tourism development and land-use compatibility using various conceptual and methodological approaches. Widyaningsih (2024) emphasized the importance of tourism components in destination development planning, whereas Tyas (2016) examined the legal implications of changing the designation of former community mining areas in Banjarbaru. Geographic Information System (GIS)-based research has also demonstrated the relevance of spatial analysis for assessing land suitability around tourism

development areas (Arwanto et al., 2024). Furthermore, Nababan et al. (2025) identified inconsistencies between existing land use and regional spatial plans associated with regional growth. Similarly, Fahmi et al. (2016) documented discrepancies between actual land utilization and officially designated spatial patterns, underscoring the importance of systematic spatial evaluation.

The relationship between tourism activity and land-use change has also been examined in relation to the intensity of tourism development and the availability of supporting facilities. Riswandha and Wahyono (2017) associated changes in land use with tourism activities and the provision of supporting infrastructure. In urban tourism management, spatial planning evaluations can inform destination management and efforts to improve regional economic contributions (Yulianti & Junaidi, 2021). Indraswara (2018) highlighted the environmental implications of resort development that deviated from established spatial plans. Meanwhile, Dipayana and Sunarta (2020) examined land conversion associated with tourism facilities, while Yusuf and Hadi (2020) identified both positive and negative environmental and socioeconomic consequences of tourism development. Collectively, these studies demonstrate that tourism-related spatial change requires evaluation within the broader context of land-use regulation and environmental management.

More recent research has expanded this discussion to include destination sustainability and community participation. Suyadnya et al. (2025) examined overtourism and its implications for spatial conflicts and development pressures in tourism destinations. Caro-Carretero and Monroy-R. (2025) emphasized the importance of residents' perceptions and participation in sustainable tourism planning. Juliana et al. (2025) investigated the relationship between accessibility, community participation, and the value of urban tourism. Tang et al. (2026) explored the integration of local identity and design interventions in spatial planning, while Teshome et al. (2022) identified inadequate infrastructure and weak planning integration as major constraints on the economic contribution of tourism resources.

Despite these contributions, a specific analytical need remains the integration of spatial distribution analysis and tourism land-use compatibility assessment within the context of Banjarbaru City's latest RTRW, covering 2024–2043. The studies reviewed in the present research primarily address land-use transformation, destination development, spatial planning in other regions, or the legal implications of land utilization. Consequently, a location-specific assessment connecting the distribution of tourism destinations in

Banjarbaru with the spatial allocations established by the updated regulation is necessary. Such an assessment should also consider the physical characteristics of land and its designated function within the planning framework (Revolina et al., 2020). For natural tourism destinations, environmental carrying capacity is an additional consideration in maintaining a balance between recreational activities and ecological sustainability (Silvitiani et al., 2017).

This study combines spatial pattern analysis and tourism land-use compatibility assessment within a single GIS-based analytical framework, using Banjarbaru City's 2024–2043 RTRW as its principal regulatory reference. The spatial distribution of tourism destinations is examined using the Average Nearest Neighbor (ANN) method, followed by an overlay analysis comparing existing tourism locations with the designated spatial plan. Google Earth Pro supports the preparation of spatial data and visual verification of destination boundaries and existing conditions (Bagus & Yoga, 2025). Nearest-neighbor analysis identifies whether the distribution is clustered, random, or dispersed based on distances between neighboring locations (Widyastuti & Pramana, 2021). The resulting index, z-score, and p-value provide statistical evidence for interpreting the observed spatial pattern (Valgunadi et al., 2023). This integrated approach also reflects the broader principle of assessing tourism destinations against established spatial planning provisions (Istiawan & Nugraha, 2022).

Accordingly, this study aims to identify the spatial patterns of tourism destinations in Banjarbaru City and evaluate their compatibility with the 2024–2043 RTRW. The findings are expected to clarify the distribution characteristics of tourism destinations and their conformity with designated land uses. By providing location-specific spatial evidence, this research may support local authorities in strengthening land-use control and guiding tourism development toward a more coordinated, regulated, and sustainable spatial structure.

METHODS

This study employed a quantitative, descriptive-spatial approach using field surveys and Geographic Information Systems (GIS). This design was selected to identify the spatial distribution patterns of tourism destinations and assess their compatibility with the 2024–2043 Regional Spatial Plan (Rencana Tata Ruang Wilayah, RTRW) of Banjarbaru City. The analysis examined existing tourism locations in relation to the spatial allocations established

by the applicable planning regulation. Two principal analytical variables were considered: tourism spatial patterns and land-use compatibility.

The study was conducted in Banjarbaru City, South Kalimantan Province, covering five administrative districts: Banjarbaru Selatan, Banjarbaru Utara, Cempaka, Landasan Ulin, and Liang Anggang. The analytical units comprised 39 inventoried tourism destinations classified into four categories: natural, artificial, cultural, and geopark tourism. A census approach was applied to include all destinations identified in the research inventory. Accordingly, the units of analysis were tourism locations rather than human participants. The source manuscript does not specify the exact research months or the overall duration of fieldwork and data processing.

Data were collected through field observation, photographic documentation, coordinate tracking, and secondary data acquisition. Primary data included the geographic coordinates, physical conditions, and visual records of tourism destinations. Secondary data consisted of the administrative boundary map of Banjarbaru City, the tourism distribution map, and the planned spatial pattern map stipulated under Banjarbaru City Regional Regulation No. 4 of 2024. The instruments and software comprised GPS Map Camera, Google Earth Pro, ArcGIS 10.8, Microsoft Excel, and a laptop for data recording, processing, and visualization. Satellite imagery was interpreted through on-screen digitization in Google Earth Pro. The resulting KML files were subsequently converted into shapefiles for further spatial processing in ArcGIS (Nur & Syahreza, 2021).

Data analysis involved two principal stages. First, the Average Nearest Neighbor (ANN) method was applied to identify tourism distribution patterns by comparing the observed mean distance between neighboring locations with the expected mean distance based on point density. The resulting (T) index was used to classify the distribution as clustered, random, or dispersed (Sarakan et al., 2025). Pattern classification followed the index intervals specified in the research framework, while statistical interpretation considered the z-score and p-value where available (Pelambi et al., 2016).

Second, spatial compatibility was assessed through GIS overlay analysis using the intersect technique. Existing tourism polygons were overlaid with the RTRW spatial allocation map to identify areas classified as compatible or incompatible with their designated land uses. The results were calculated in hectares and percentages and presented through thematic maps and descriptive analysis (Rineksi et al., 2024). Satellite image interpretation

was verified through field-based ground checks. Interpretation accuracy was calculated as the proportion of correctly identified locations relative to the total surveyed locations, with accuracy exceeding 80% adopted as the criterion specified in the thesis (Arta et al., 2024). These procedures provided the analytical basis for addressing both research objectives.

RESULTS

Spatial Distribution of Tourism Attractions

Geographic Information System (GIS) mapping and geographic coordinate processing identified 39 tourist attractions in Banjarbaru City in 2026. These attractions were classified into four categories: natural, artificial, cultural, and geopark tourism. Artificial tourism accounted for the largest number of attractions, with 28 locations, followed by natural tourism with five, cultural tourism with three, and geopark tourism with three. The total area of the tourism sites included in the analysis was 839.35 ha.

Table 1. Distribution of Tourism Attractions by Category in Banjarbaru City, 2026

Tourism Category	Number of Attractions	Area (ha)
Natural	5	144.63
Artificial	28	455.99
Cultural	3	4.99
Geopark	3	233.71
Total	39	839.35

Source: Compiled by the researcher (2026)

Table 1. Distribution of Tourism Attractions by Category in Banjarbaru City, 2026 shows that artificial tourism dominated the number of attractions, accounting for 28 of the 39 sites. It also occupied the largest area, covering 455.99 ha, followed by geopark tourism at 233.71 ha, natural tourism at 144.63 ha, and cultural tourism at 4.99 ha.

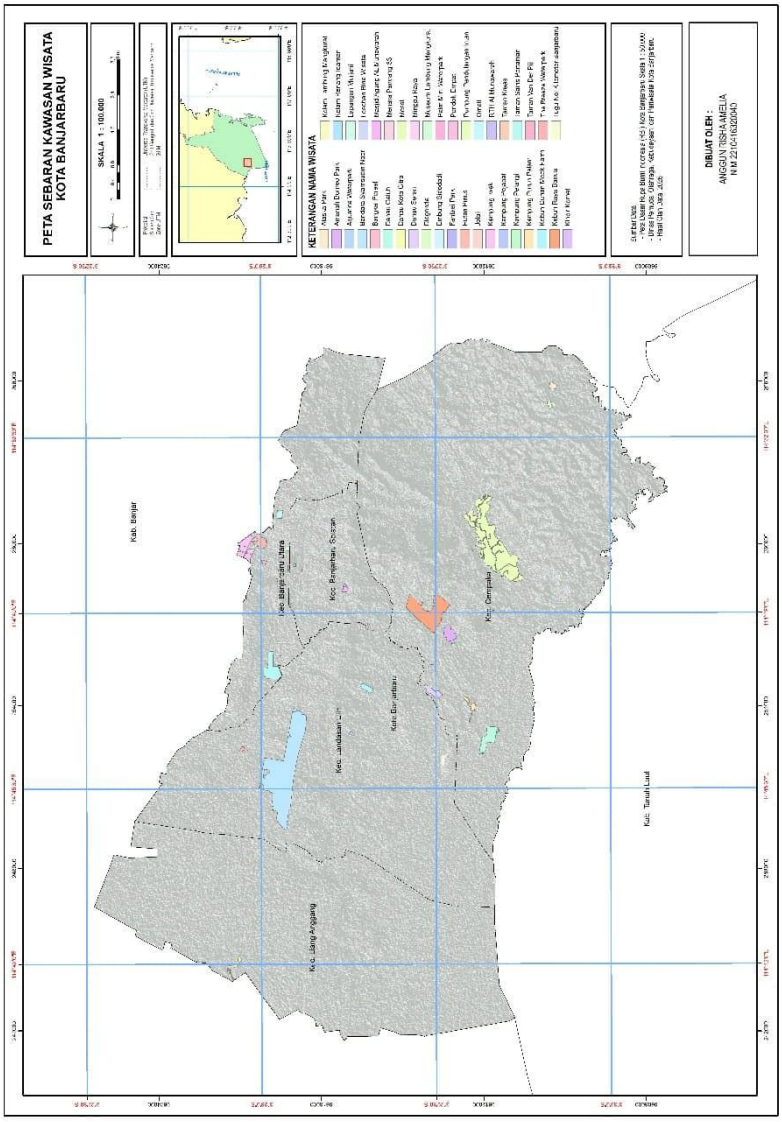


Figure 1. Spatial Distribution of Tourism Attractions in Banjarbaru City, 2026

Figure 1. Spatial Distribution of Tourism Attractions in Banjarbaru City, 2026 shows that artificial tourism attractions were concentrated in urban areas, particularly Banjarbaru Utara, Banjarbaru Selatan, and the Landasan Ulin corridor. Natural attractions were distributed across several areas, including Cempaka and Banjarbaru Utara. Cultural attractions were located around central urban service areas, whereas geopark attractions were associated with locations containing distinctive geological features and local resources.

Spatial Pattern Analysis Using Average Nearest Neighbor

The Average Nearest Neighbor (ANN) method was applied to identify the spatial distribution patterns of tourism attractions using the Nearest Neighbor Ratio (NN Ratio),

Z-score, and p-value. An NN Ratio greater than one indicates a dispersed pattern, whereas a value below one indicates a clustered pattern. Statistical significance was assessed using the reported p-values and Z-scores.

Table 2. ANN Results by Tourism Category in Banjarbaru City, 2026

Tourism Category	NN Ratio	Z-score	p-value	Spatial pattern
Natural	2.377741	5.893640	Reported as 0.000000	Dispersed
Artificial	0.760925	-2.420161	0.015514	Clustered
Cultural	3.370654	7.855244	Reported as 0.000000	Dispersed
Geopark	3.598034	8.608676	Reported as 0.000000	Dispersed

Source: Compiled by the researcher (2026)

Table 2. ANN Results by Tourism Category in Banjarbaru City, 2026 shows that the four tourism categories in Banjarbaru City exhibit two distinct spatial distribution patterns. Natural tourism (NN Ratio = 2.377741), cultural tourism (NN Ratio = 3.370654), and geopark tourism (NN Ratio = 3.598034) exhibit dispersed patterns, as their NN Ratios exceed one. In contrast, artificial tourism exhibits a clustered pattern, with an NN Ratio of 0.760925. The reported Z-scores and p-values indicate statistically significant spatial patterns across all four categories.

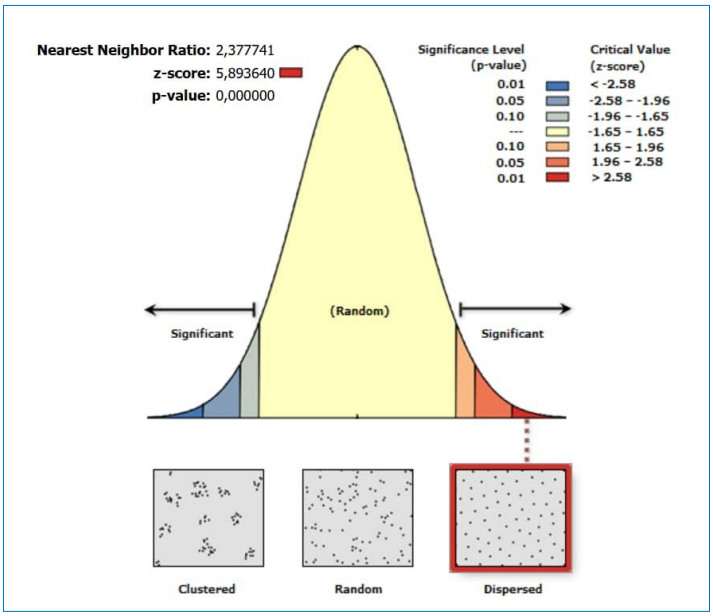


Figure 2. Spatial Pattern of Natural Tourism Attractions

Figure 2. Spatial Pattern of Natural Tourism Attractions shows that natural tourism attractions in Banjarbaru City exhibit a dispersed spatial pattern, with locations such as Hutan Pinus, Danau Seran, Kebun Raya Banua, Meek Farm, and Bangkal Forest distributed across different areas.

This pattern is supported by an NN Ratio of 2.377741, a Z-score of 5.893640, and a reported p-value of 0.000000.

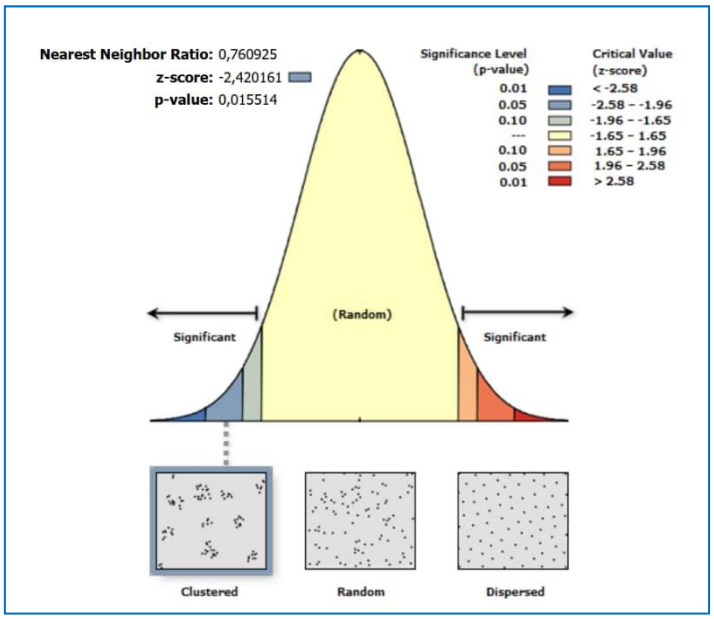


Figure 3. Spatial Pattern of Artificial Tourism Attractions

Figure 3. Spatial Pattern of Artificial Tourism Attractions shows that artificial tourism attractions tend to cluster in urban areas, particularly Banjarbaru Utara, Banjarbaru Selatan, and the corridor along Jalan A. Yani. This spatial configuration corresponds to the ANN results, which indicate a clustered distribution with an NN Ratio of 0.760925.

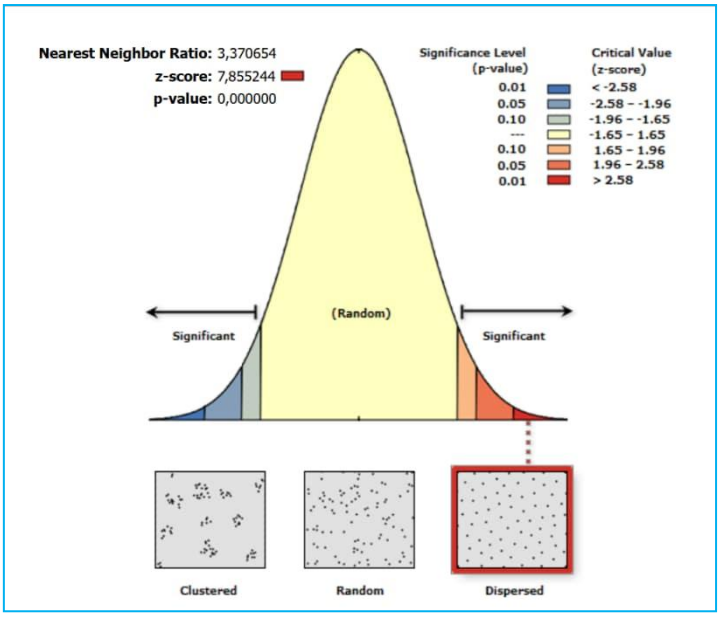


Figure 4. Spatial Pattern of Cultural Tourism Attractions

Figure 4. Spatial Pattern of Cultural Tourism Attractions shows that cultural tourism attractions, including Museum Lambung Mangkurat, Masjid Agung Al Munawarah, and Jolali, are distributed across separate locations rather than concentrated in a single area. This distribution is consistent with the ANN result, which identifies a dispersed pattern with an NN Ratio of 3.370654.

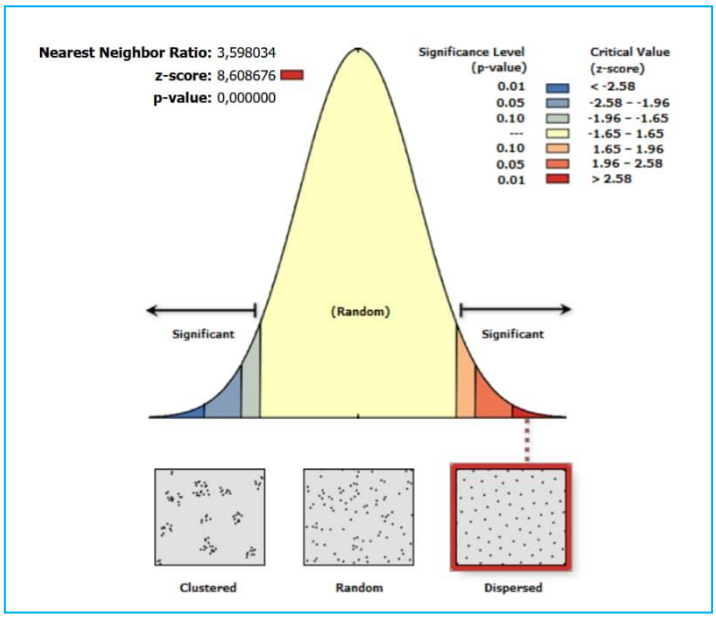


Figure 5. Spatial Pattern of Geopark Tourism Attractions

Figure 5. Spatial Pattern of Geopark Tourism Attractions shows that geopark tourism attractions, including Pumpung Pendaulangan Intan, Kampung Purun Palam, and Kampung Pejabat, are distributed across geographically separated locations. This spatial configuration is consistent with the ANN findings, which indicate a dispersed pattern with an NN Ratio of 3.598034.

Results of Tourism Area Development Suitability with the Banjarbaru City Spatial Plan (RTRW) 2024–2043

The suitability of tourism area development was evaluated through spatial analysis by comparing the distribution of tourism areas in 2024 and 2026 with the spatial allocations established in the Banjarbaru City Spatial Plan (RTRW) 2024–2043. This analysis aimed to identify the consistency between tourism area locations and designated land-use allocations, as well as to determine the distribution of tourism areas within cultivation and protected areas.

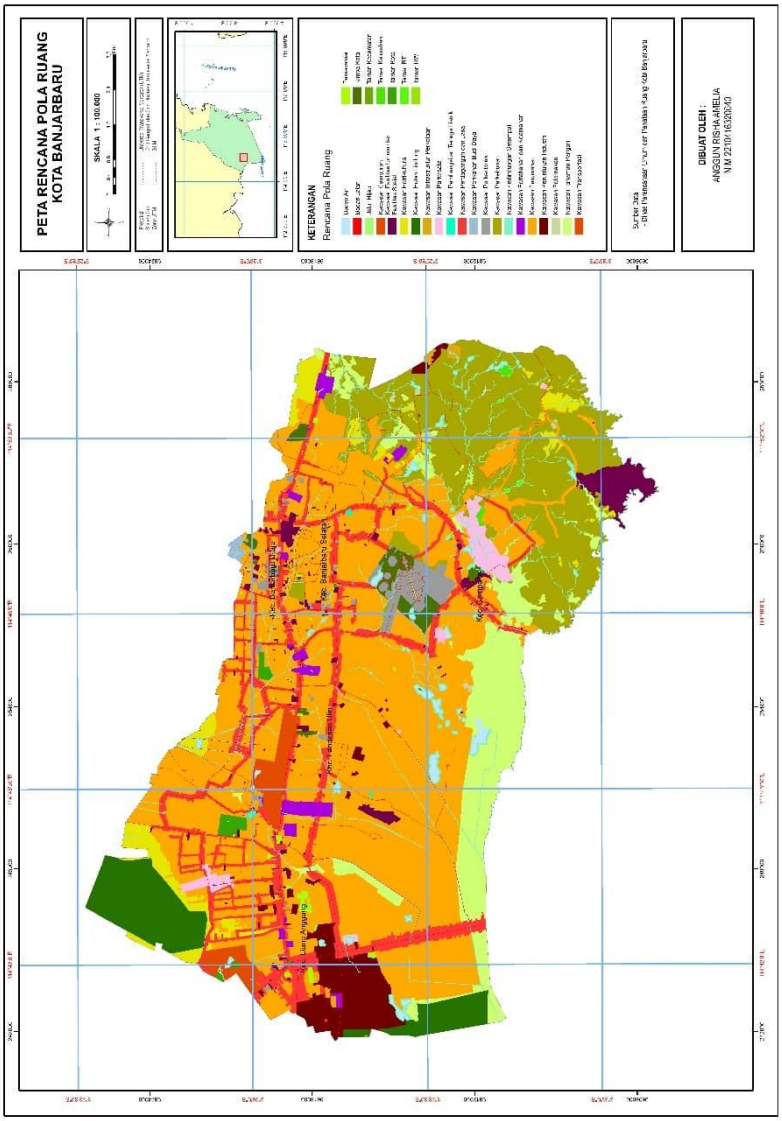


Figure 6. Banjarbaru City Spatial Plan Map for 2024–2043

Figure 6. Banjarbaru City Spatial Plan Map for 2024–2043 shows that the spatial allocation of Banjarbaru City under the 2024–2043 RTRW, covering protected and cultivation areas across five districts: Banjarbaru Selatan, Banjarbaru Utara, Cempaka, Landasan Ulin, and Liang Anggang. Cultivation areas include various designated uses, such as residential areas, plantations, trade and services, transportation, and tourism. This map serves as the basis for evaluating the consistency of tourism area distribution with the spatial allocations established in the plan.

The spatial analysis indicates that the total tourism area increased from 831.17 ha in 2024 to 839.35 ha in 2026, representing an increase of 8.18 ha. In 2024, the largest tourism

areas were located in Cempaka District, covering 399.06 ha, followed by Landasan Ulin District, covering 357.39 ha. This pattern remained consistent in 2026, when tourism areas in Cempaka and Landasan Ulin reached 399.28 ha and 365.53 ha, respectively. The largest increase occurred in Landasan Ulin District, amounting to 8.14 ha, while changes in the other districts were relatively small.

The spatial overlay analysis with the RTRW indicates that approximately 250.18 ha of tourism areas fall within designated tourism allocations. These areas are distributed across Banjarbaru Utara District, covering 1.90 ha, and Cempaka District, covering 248.28 ha. Meanwhile, tourism areas located within other cultivation allocations covered 370.96 ha in 2024 and 379.13 ha in 2026. Most of this area overlapped with transportation allocations, covering 302.53 ha, while the remainder was distributed across residential areas, aquaculture, trade and services, offices, plantations, public and social facilities, and roads.

In addition to cultivation areas, the analysis identified approximately 210.03 ha of tourism areas within designated protected areas. These areas were primarily associated with urban forests, covering 110.86 ha; water bodies, covering 55.08 ha; and city parks, covering 37.35 ha. The remaining areas were associated with locally protected areas and green belts. These findings indicate that tourism areas are not entirely located within the tourism allocations specified in the RTRW but also overlap with other spatial designations, including protected areas.

DISCUSSION

The findings reveal substantial differences in the spatial distribution of tourism attractions across Banjarbaru City. Of the 39 identified attractions, 28 belong to the artificial tourism category, covering a total area of 455.99 ha. This dominance indicates that purpose-built recreational facilities constitute a major component of the city's tourism landscape. However, the greater number and area of artificial attractions do not necessarily indicate higher visitor numbers, stronger tourist appeal, or greater economic contribution, as these aspects were not examined in the present study. The Average Nearest Neighbor (ANN) analysis identifies a clustered distribution for artificial tourism, with an NN Ratio of 0.760925, a Z-score of -2.420161, and a p-value of 0.015514. An NN Ratio below one indicates that the observed distances between attractions tend to be shorter than those expected under a spatially random distribution. This result is consistent with the mapped

concentration of artificial attractions in Banjarbaru Utara, Banjarbaru Selatan, and the Landasan Ulin corridor. The concentration may be associated with established urban activities, supporting infrastructure, and accessibility, although these factors were not directly examined in the analysis and therefore cannot be confirmed as the causes of the observed pattern.

In contrast, natural tourism exhibits a dispersed distribution, with an NN Ratio of 2.377741, a Z-score of 5.893640, and a p-value reported as 0.000000. The five attractions in this category, namely Hutan Pinus, Danau Seran, Kebun Raya Banua, Meek Farm, and Bangkal Forest, are geographically separated rather than concentrated around a single centre. This pattern may be related to the distribution of natural resources and the physical characteristics of the landscape, although these relationships require further investigation. Cultural tourism also exhibits a dispersed distribution, with an NN Ratio of 3.370654, a Z-score of 7.855244, and a p-value reported as 0.000000. The locations of Museum Lambung Mangkurat, Masjid Agung Al Munawarah, and Jolali do not form a strong spatial concentration. Their distribution may reflect the distinct locations of cultural facilities, historical buildings, and places of cultural activity. Nevertheless, this finding should be interpreted cautiously because the category comprises only three attractions, making the calculated NN Ratio particularly sensitive to the location of each site. A more comprehensive inventory of cultural attractions would be necessary to establish a more robust understanding of their spatial distribution.

Geopark tourism records the highest NN Ratio among the four categories, at 3.598034, with a Z-score of 8.608676 and a p-value reported as 0.000000. The three attractions in this category are Pumpung Pendaulangan Intan, Kampung Purun Palam, and Kampung Pejabat. Their geographical separation indicates a dispersed spatial pattern that may be associated with differences in local resources and activities, including diamond mining and purun-based handicrafts. However, the observed distribution does not establish geological conditions as the primary cause of the pattern. Further analysis of geological characteristics, land use, and the functional relationships between sites would be required to examine these potential influences. Overall, the ANN results show that natural, cultural, and geopark tourism have dispersed distributions, whereas artificial tourism exhibits a clustered pattern. These differences demonstrate that tourism attractions within the same city can have distinct spatial configurations depending on their categories and locations.

Beyond the distribution patterns identified through ANN analysis, the spatial overlay with the Banjarbaru City Spatial Plan (Rencana Tata Ruang Wilayah or RTRW) 2024–2043 provides an additional perspective on the relationship between tourism areas and designated land uses. The spatial plan, established under Regional Regulation No. 4 of 2024, provides the framework for examining the locations of tourism areas in relation to the city's planned spatial allocations. The results show that the total mapped tourism area increased from 831.17 ha in 2024 to 839.35 ha in 2026, representing an increase of 8.18 ha. In 2024, the largest tourism areas were located in Cempaka District, covering 399.06 ha, and Landasan Ulin District, covering 357.39 ha. In 2026, these areas reached 399.28 ha and 365.53 ha, respectively. Landasan Ulin recorded the largest increase, at 8.14 ha, while changes in the other districts were comparatively small. These findings indicate that the overall increase in mapped tourism area was concentrated primarily in Landasan Ulin.

The spatial overlay results indicate that approximately 250.18 ha of mapped tourism areas fell within the tourism allocations designated in the RTRW in both 2024 and 2026. These areas were concentrated in Cempaka District, covering approximately 248.28 ha, and Banjarbaru Utara District, covering approximately 1.90 ha. Meanwhile, tourism areas overlapping with other cultivation allocations increased from 370.96 ha in 2024 to 379.13 ha in 2026. The largest component of this overlap was associated with transportation allocations, covering 302.53 ha in both years. Other intersecting allocations included residential areas, aquaculture, trade and services, offices, plantations, public and social facilities, and roads. These results indicate that the mapped tourism areas extend across multiple cultivation designations rather than being confined to areas explicitly allocated for tourism in the spatial plan. Nevertheless, spatial overlap alone does not establish whether a particular tourism activity is permitted or prohibited within each designation, as this requires examination of the applicable regulations and conditions at individual sites.

The overlay analysis also identified approximately 210.03 ha of tourism areas within spatial allocations classified as protected areas in both years. These overlaps were primarily associated with urban forests, covering 110.86 ha, followed by water bodies at 55.08 ha and city parks at 37.35 ha. Smaller areas intersected with locally protected areas and green belts. The presence of mapped tourism areas within these designations highlights the need to examine the relationship between tourism activities and the protection functions assigned to these locations. However, these results should not automatically be interpreted as evidence of spatial planning violations or incompatible development. The analysis identifies

geographical intersections between tourism areas and protected-area allocations but does not independently establish the legal status of each attraction, the nature of its activities, or whether the activities comply with applicable land-use provisions. Further site-level verification is therefore necessary to determine the degree of compatibility between tourism activities and the relevant spatial planning requirements.

Taken together, the ANN and spatial overlay results describe two complementary dimensions of tourism geography in Banjarbaru City. ANN analysis identifies the geographical arrangement of attractions, distinguishing the clustered pattern of artificial tourism from the dispersed patterns of natural, cultural, and geopark tourism. The RTRW overlay, in contrast, identifies the relationship between mapped tourism areas and designated land-use allocations. These dimensions should be interpreted separately because a clustered distribution does not necessarily indicate conformity with the spatial plan, while a dispersed distribution does not necessarily indicate incompatibility. By combining the two approaches, the study provides a more differentiated account of tourism distribution than an analysis that considers either attraction categories or spatial planning allocations in isolation.

The application of ANN in this study is consistent with spatial analytical approaches used to distinguish clustered, random, and dispersed distributions. Valgunadi et al. (2023) provides a methodological reference for applying nearest-neighbor analysis to examine spatial distribution patterns. By applying ANN separately to four tourism categories, this study provides a more differentiated account of Banjarbaru's tourism geography than an analysis that treats all attractions as a single group. The integration of spatial mapping, statistical indicators, and spatial overlay enables the study to move beyond a descriptive inventory of attractions by identifying differences in spatial configurations and examining their relationship with planned land uses. Nevertheless, the extent to which these findings support, extend, or contradict empirical studies of other destinations requires further comparison with relevant literature. Such comparisons should consider analytical indicators, geographical scale, sample size, tourism category definitions, and the characteristics of the destinations examined.

The findings have several theoretical, methodological, and practical implications. Theoretically, the results demonstrate the importance of differentiating tourism categories in spatial analyses because treating all attractions as a single group may obscure variations in their distribution patterns. Methodologically, the combination of Geographic Information

System (GIS) mapping, ANN statistics, and spatial overlay provides a means of examining geographical patterns through visual representations, quantitative measurements, and comparisons with planned spatial allocations. In practical terms, the clustered distribution of artificial attractions may help local authorities identify areas where road access, parking capacity, visitor flows, and supporting facilities require particular attention. The development of additional attractions should also consider spatial planning regulations and existing infrastructure capacity to avoid excessive pressure on particular urban areas. Meanwhile, the dispersed distribution of natural, cultural, and geopark attractions highlights the potential importance of improving connectivity between destinations, providing reliable travel information, and ensuring access to essential facilities. The spatial distribution maps could also serve as preliminary resources for developing thematic tourism routes that connect attractions according to their distinctive characteristics. In addition, the RTRW overlay can inform further assessment of whether tourism activities are consistent with designated land uses, particularly where tourism areas intersect with protected-area allocations. Such assessments should be supported by detailed site-level verification and a review of the relevant spatial planning provisions before conclusions about regulatory compliance are drawn.

Several limitations should be considered when interpreting the findings. First, although the analysis covers 39 attractions across four categories, cultural and geopark tourism each comprise only three sites. Consequently, the results for these categories are particularly sensitive to changes in individual locations or the inclusion of additional attractions. Second, ANN characterizes spatial distribution through distances between points but does not directly identify the causes of distribution, visitor volumes, facility quality, or the economic contributions of individual destinations. Third, although the maps indicate that artificial attractions are concentrated in urban areas, the study does not statistically examine the effects of accessibility, road networks, population density, land use, or spatial planning policies on the observed patterns. Fourth, the findings represent tourism conditions mapped for 2024 and 2026 and do not establish long-term trends beyond this period. Fifth, the spatial overlay identifies intersections between tourism areas and RTRW allocations but does not independently assess the legality of individual activities, site-specific restrictions, or actual land-use changes over time. The mapped tourism areas should therefore not be interpreted as evidence of land conversion unless changes in actual land use have been separately measured. In addition, p-values reported as 0.000000 should be expressed as $p < 0.001$ if the

displayed values result from software rounding, rather than implying that the probability is exactly zero. Future research should develop a more comprehensive inventory of tourism attractions, compare spatial patterns across multiple periods, and integrate ANN with accessibility measures, road-network analysis, and environmental variables. Further research should also examine site-level compatibility with the RTRW by incorporating detailed land-use data, relevant regulatory provisions, and field verification to provide a more robust assessment of tourism distribution and spatial planning suitability in Banjarbaru City.

CONCLUSION

This study demonstrates that the total mapped tourism area in Banjarbaru City increased from 831.17 ha in 2024 to 839.35 ha in 2026, while the number of identified locations remained at 39. Spatial analysis revealed a clustered distribution of artificial tourism attractions, whereas natural, cultural, and geopark tourism exhibited dispersed patterns. These findings address the research objectives by identifying changes in tourism area extent, category composition, and spatial distribution. The overlay analysis with the Banjarbaru City Spatial Plan (RTRW) 2024–2043 further revealed that approximately 250.18 ha of tourism areas overlapped with designated tourism allocations, while 370.96 ha in 2024 and 379.13 ha in 2026 overlapped with other cultivation allocations. An additional 210.03 ha intersected with protected-area designations. These results indicate that mapped tourism areas extend beyond the spatial allocations specifically designated for tourism, highlighting the importance of examining tourism development in relation to planned land uses. The study contributes methodologically by integrating Average Nearest Neighbor (ANN) analysis with spatial overlay, enabling a combined assessment of attraction distribution patterns and their relationship with spatial planning.

In practical terms, the findings provide a basis for local authorities to strengthen interagency coordination, review land-use compatibility, and guide tourism development in consideration of spatial functions and environmental sustainability. Tourism operators and communities should also consider applicable zoning provisions before establishing or expanding destinations. Future research should incorporate field verification, detailed assessments of zoning regulations, and qualitative interviews to determine the compatibility of tourism activities with designated land uses more comprehensively. Furthermore, multitemporal spatial analysis could improve understanding of changes in tourism

distribution, while the development of a tourism-oriented WebGIS could support destination monitoring and provide accessible, reliable spatial information for government agencies, tourism operators, and visitors.

REFERENCES

Arta, P. A. W., Putra, I. W. K. E., & Wisnawa, I. G. Y. (2024). Analisis Persebaran Ruang Terbuka Hijau Menggunakan Google Earth Pro di Kecamatan Buleleng, Kabupaten Buleleng. *5*(2).

Arwanto, D. S., Wijaya, A. P., & Wahyuddin, Y. (2024). Pemetaan Kesesuaian Lahan Kawasan Permukiman di Sekitar Pengembangan Kawasan Strategis Pariwisata Nasional (KSPN) Menggunakan Sistem Informasi Geografis (Studi Kasus: Kecamatan Prambanan dan Kecamatan Kalasan). *Jurnal Geodesi Undip, 13*(3), 548–557. https://ejournal3.undip.ac.id/index.php/geodesi/article/view/44134

Bagus, I., & Yoga, A. (2025). Pembuatan Peta Sebaran Air Terjun dalam Mendukung Pengelolaan Ekowisata Berbasis Informasi Spasial di Desa Wanagiri, Bali. *2*(2), 53–60.

Baiquni. (2021). *Pengertian dan Ruang Lingkup Geografi Pariwisata*. Universitas Terbuka.

Caro-Carretero, Monroy-Rodríguez, R., & Sandra. (2025). Residents' perceptions of tourism and sustainable tourism management: Planning to prevent future problems in destination management — The case of Cáceres, Spain. *Cogent Social Sciences, 11*(1).

Fahmi, F., Sitorus, S. R. P., & Fauzi, A. (2016). Evaluasi Pemanfaatan Penggunaan Lahan Berbasis Rencana Pola Ruang Kota Baubau, Provinsi Sulawesi Tenggara. *Tataloka, 18*(1), 27–39.

Indraswara, M. S. (2008). Evaluasi Penerapan Rencana Tata Ruang Resort Pariwisata Gilitrawangan Nusa Tenggara. *Jurnal Ilmiah Perancangan Kota dan Permukiman, 7*(1), 19–27. https://eprints.undip.ac.id/20142/

Istiawan, & Nugraha. (2022). Unsur-Unsur yang Mendukung Pengembangan Desa Wisata Melung Kecamatan Kedungbanteng dan Kesesuaiannya dengan Rencana Tata Ruang Wilayah Kabupaten Banyumas. *11*(2).

Juliana, J., Pramezwary, A., Djakasaputra, A., Anwar, M. M., & Jie, F. (2025). The missing link in urban tourism: Connecting leisure, accessibility and resident participation for enhanced value. *Cogent Social Sciences, 11*(1), Article 2556473.

Nababan, E. S., & Achmad, I. (2025). *Analisis Kesesuaian Penggunaan Lahan dengan Rencana Tata Ruang Wilayah di Kabupaten Bandung*.

Nasruddin, Normelani, E., & Kumalawati, R. (2019). Strategy for the development of Kampung Sasirangan as edutourism village. *7*(3), 205–210.

Norhikmah, L., Hariati, A., Kalminan, R., Rahmatinah, & Sabirin, M. (2024). Eksplorasi Etnomatematika pada Masjid Agung Al-Munawarah Banjarbaru. *ELIPS: Jurnal Pendidikan Matematika, 5*(2), 252–263. https://doi.org/10.47650/elips.v5i2.1370

Nur, I. R., & Syahreza, S. (2021). Pemanfaatan Citra Satelit Google Earth untuk Penilaian Progres Pemulihan Lahan Pasca 15 Tahun Tsunami Aceh di Kecamatan Lhoong, Aceh Besar. *17*(1), 62–69.

Parapat, A. A., & Andini, D. N. (2019). Konsep Perancangan Wisata Alam Lahan Basah: Studi Kasus Kawasan Wisata Danau Seran di Banjarbaru. *Prosiding Seminar Nasional Lingkungan Lahan Basah, 4*(2), 341–350. https://snllb.ulm.ac.id/prosiding/index.php/snllb-lit/article/view/211

Pelambi, M. M., Tilaar, S., & Rengkung, M. M. (2016). Identifikasi Pola Sebaran Permukiman Terencana di Kota Manado. *Spasial, 3*(1), 55–65.

Peraturan Daerah Kota Banjarbaru Nomor 4 Tahun 2024 tentang Rencana Tata Ruang Wilayah Tahun 2024–2043 (2024). https://jdih.banjarbarukota.go.id/produk-hukum/perda-4-2024-rencana-tata-ruang-wilayah-tahun-2024-2043

Peraturan Daerah Kota Banjarbaru Nomor 7 Tahun 2021 tentang Rencana Pembangunan Jangka Menengah Daerah Tahun 2021–2026 (2021).

Revolina, E., Hidayat, A., Basuni, S., & Widiatmaka. (2020). Kesesuaian Lahan dan Keberlanjutan Pengelolaan Kawasan Wisata Alam Pantai Panjang di Kota Bengkulu. *Jurnal Ilmu Lingkungan, 18*(2), 261–271.

Rineksi, T. W., Amrin, R. N., Ayu, S. S., Kuncoro, D. M., Anggorowati, D. F., Khoirunisa, L. Q., & Bhagaskara, R. P. (2024). Instrumen Pelaporan dalam Rangka Pengendalian Alih Fungsi Lahan Pertanian Berbasis Partisipasi Masyarakat. *Tunas Agraria, 7*(2), 263–284. https://doi.org/10.31292/jta.v7i2.312

Riswandha, Y., & Wahyono, H. (2017). Pengaruh Kegiatan Wisata terhadap Perubahan Penggunaan Lahan di Kecamatan Tawangmangu, Kabupaten Karanganyar. *Teknik PWK (Perencanaan Wilayah Kota), 6*(2), 131–141. https://ejournal3.undip.ac.id/index.php/pwk/article/view/18052

Sarakan, J. M., Pepekai, A. E. R., Abrauw, R. D., Ridwan, M., & Ginting, I. S. P. (2025). Kajian Pola Persebaran Permukiman Menggunakan Nearest Neighbor Analysis di Kelurahan Dobonsolo Distrik Sentani Kabupaten Jayapura. *Buana Jurnal Geografi, Ekologi dan Kebencanaan, 3*(1), 1–10. https://jurnal.ilmubersama.com/index.php/buana/article/view/1127

Silvitiani, K., Yulianda, F., & Siregar, V. P. (2017). Perencanaan Pengembangan Wisata Pantai Berbasis Potensi Sumberdaya Alam dan Daya Dukung Kawasan di Desa Sawarna, Banten (Coastal tourism development based on natural resources and carrying capacity in Sawarna Village, Banten). *Jurnal Manusia dan Lingkungan, 24*(2), 66–72. https://doi.org/10.22146/jml.23076

Susanto, L., Gunawan, C., & Maulana, A. A. (2023). Pengaruh Perkembangan Pariwisata terhadap Perubahan Penggunaan Lahan: Situ Cileunca Kabupaten Bandung. *Acitya, 2*(1).

Suyadnya, Cahyadi, Tirtayani, & Nuryani, F. (2025). Overtourism sensitivity and tourism development in Canggu, Bali. *Cogent Social Sciences, 11*(1).

Tang, H., Liu, X., Li, J., & Wang, H. (2026). Research on design intervention in spatial planning of traditional rural tourism: Based on the perspective of tourists' willingness to visit again. *Journal of Asian Architecture and Building Engineering, 25*(1), 650–670.

Teshome, E., Dereje, M., & Asfaw, Y. (2022). Potentials, challenges and economic contributions of tourism resources in the South Achefer district, Ethiopia. *Cogent Social Sciences, 8*(1).

Tyas, R. A. (2016). Perubahan Peruntukan Kawasan Bekas Wilayah Pertambangan Rakyat Menjadi Kawasan Permukiman dan Kawasan Pariwisata Menurut Peraturan Daerah Nomor 13 Tahun 2014 tentang Rencana Tata Ruang Wilayah Kota Banjarbaru Tahun 2014–2034. *Jurnal Mahasiswa Fakultas Hukum Universitas Brawijaya*, 119161.

Wahyuni, S., Hasanah, M., & Jumriani. (2021). Community social activities in Murjani Field as a learning resource on social studies. *The Kalimantan Social Studies Journal, 3*(1), 71–81. https://doi.org/10.20527/kss.v3i1.3717

Wardani, E., Ruswinarsih, S., & P, R. (2024). Modal Sosial Kelompok Pengolah dan Penjual Jamu dalam Pengembangan Objek Wisata Kampung Pejabat Kota Banjarbaru. *Jurnal Tugas Akhir Mahasiswa Pendidikan Sosiologi, 4*(1), 338–360. https://doi.org/10.20527/jtamps.v4i1.12303

Widyaningsih. (2024). Perencanaan Pengembangan Kawasan Wisata Banyuurip Desa Jatimulyo, Kecamatan Dlinggo, Kabupaten Bantul. *Dialektika Publik, 8*(8), 226.

Widyastuti, A. A. S. A., & Pramana, R. D. (2021). Pola Persebaran Wisata Taman dan Lingkungan di Kota Surabaya. *Jurnal Plano Buana, 1*(2), 110–121. https://jurnal.unipasby.ac.id/jurnal_plano_buana/article/view/3533

Yulianti, D., & Junaidi, H. (2021). Evaluasi Manajemen Tata Ruang Wisata dan Ruang Terbuka untuk Meningkatkan Kunjungan Wisata dan PAD Kota Palembang. *Jurnal Tekno Global, 10*(2), 41–46. https://doi.org/10.36982/jtg.v10i2.1906

Yusuf, I., & Hadi, T. S. (2020). Studi Literatur: Dampak Pengembangan Pariwisata terhadap Perubahan Lahan. *Pondasi, 25*(2), 157–183. https://jurnal.unissula.ac.id/index.php/pondasi/article/view/13041