How to Cite:
Shaheda, I., & Arif, N. (2025). Mapping of green open space for sustainable tourism development in South Jakarta Ecopark. *Tennessee Research International of Social Sciences*, *7*(1), 26–42. Retrieved from https://triss.org/index.php/journal/article/view/88

Mapping of green open space for sustainable tourism development in South Jakarta Ecopark

Indri Shaheda
Master of Geography Education, Faculty of Social, Law, and Political Sciences, Universitas Negeri Yogyakarta, Special Region of Yogyakarta, Indonesia
Corresponding author email: indrishaheda.2024@student.uny.ac.id

Nursida Arif
Master of Geography Education, Faculty of Social, Law, and Political Sciences, Universitas Negeri Yogyakarta, Special Region of Yogyakarta, Indonesia
Email: nursida.arif@uny.ac.id

***Abstract*---**This study aims to map the distribution of green open spaces (RTH) in order to obtain information and plan the development of Ecopark tourism in an urban area of South Jakarta. This study conducted an analysis with the help of remote sensing technology based on NDVI data satellite imagery and the use of Google Earth Engine on the existence of RTH in urban areas, especially in South Jakarta City and processed it with the help of a geographic information system. The results of the study show that Tebet Eco Park, which is the result of the revitalization of Tebet Park, functions as a public space with an important role, including in terms of water absorption, flood control, and as an effort to overcome the water crisis. This study contributes directly to the achievement of the sustainable development goals of the SDGs, especially goal 11 on sustainable cities and settlements by providing spatial-based analysis to optimize its discussion. By combining ecological and economic aspects, this study also supports the goal of SDGs 13 on climate action, through the management of green open spaces that not only support tourist attractions, but also function as mitigation and adaptation measures to the impacts of climate change.

***Keywords*---**NDVI, Green Open Space, SDGs, Sustainable Tourism Development

ISSN 2766-7464 (Online)
Publisher: Smoky Mountain Publishing
Manuscript submitted: 09 March 2025, Manuscript revised: 18 April 2025, Accepted for publication: 27 May 2025

Introduction

Since ancient times, the existence of Green Open Space has been a top priority for humans as a primary need to fulfill a comfortable life for humans themselves (Sarofah and Herliana 2023). Nowadays, along with the development of construction in every region, unfortunately, this view is becoming rare in urban areas, especially in big cities (Jabbar, Yusoff, and Shafie 2022). With its characteristics of dense population, high development, rapid land changes, green open space (RTH) is difficult to maintain and increase (Endangsih, Prayitno, and Kusumawanto 2022). In fact, green open space is useful for maintaining the sustainability of the urban environment by absorbing pollutants, providing oxygen, reducing flooding, and controlling urban development.

Currently, the city's green open space is part of urban spatial planning which functions as a protected area (Grindsted et al. 2023). The city's green areas consist of city parks, city forest green areas, city recreation green areas, sports activity green areas, and yard green areas (Wuisang et al. 2023)

Green open space functions as the lungs of a city or region. This is because all the plants in the green open space can absorb carbon dioxide (CO2), produce oxygen, lower the temperature and provide a cool atmosphere and become a water absorption area, besides that it can also be a children's play area, and an educational area (Muliasari, Suartika, and Saputra 2021).

Public Green Open Space is a Green Open Space owned by the government and can be accessed directly by the public without a certain time limit (Cellindita, Romadhan, and Roziqin 2021). In addition to improving the quality of the atmosphere, supporting the sustainability of water and soil, green open spaces in the middle of urban ecosystems also function to improve the quality of the city landscape (Lim and Xenarios 2021).

Regional development is an effort to change conditions for the better (Kurniawan et al. 2023). Regional development is also an effort to harmoniously marry natural resources, humans and technology by taking into account the carrying capacity and the environment itself (Mardiani and Suryono 2024).

Urban areas are areas that are the center of all kinds of community activities, including social and economic activities (2021 season). Demand for land development in urban areas for the construction of public facilities to support urban infrastructure has also increased along with the development of these activities. This is one of the main causes of increasing population density and land conversion in urban areas (Arti and Jumadi 2024).

The development of urban forests concerns the issue of land availability which is related to urban spatial planning issues (Nguyen and Hens 2022). The problem of land availability for urban forests, as well as how to effectively utilize available land, is the key to urban forest development (Rahmawati et al. 2021). Land is becoming more valuable, more expensive, and less and less for urban forests, so that there are often disputes over interests in land use from various sectors of city activity (Dammayatri, Susantoro, and Wikantika 2023). In this situation, the land

that is already available for urban forests for urban forests is sometimes used for other purposes. There is no guarantee of land supply for urban forests that has been allocated. The condition of urban spatial planning is irregular, here and there physical development occurs and vegetation is always cut down without considering its replacement (Harjanti and Anggraini 2020).

Eco Park is an ecological park based on natural recreation, education, as a place to play, do activities and gather which aims to increase human interaction with the biodiversity in their environment and plays a role in helping hydrological functions in terms of water absorption and reducing the potential for flooding (Alawiyah and Harintaka 2021).

In Law No. 10 of 2009 it is explained that tourism is a variety of tourism activities and is supported by various facilities and services provided by the community, business people and the government (Baloch et al. 2023).

Based on the Regulation of the Minister of ATR/KBPN No. 14 of 2022 concerning the Utilization and Provision of Green Open Space, it is stipulated that the availability of green open space in the city/urban Jakarta area is required to be at least 30% of the total area, consisting of 20% Jakarta green open space and 10% private green open space. Green open space is divided into two categories, namely, Jakarta green open space owned and in Jakarta by the district/city government for the benefit of the general Jakarta, and private green open space owned by certain institutions or individuals whose use is limited, the Jakarta area is Jakarta, or the yard of a Jakarta house owned by Jakarta, which is planted with plants. The total area of green open space in the Jakarta area is 33,541 km² or only 5.2% of the total area. (jakartasatu.jakarta.go.id). Therefore, it is necessary to conduct a Mapping of the Distribution of Green Open Space (RTH) to obtain information and plan the development of Ecopark tourism in an urban area of South Jakarta.

Method

The research location is South Jakarta City which is located between 106°22'42'' to 106°58'18'' East Longitude (BT) and 5°19'12'" South Latitude (LS). The area of this region is 141.37 km² which contributes to 21.29% of the total area of DKI Jakarta Province, as shown in Figure 1.

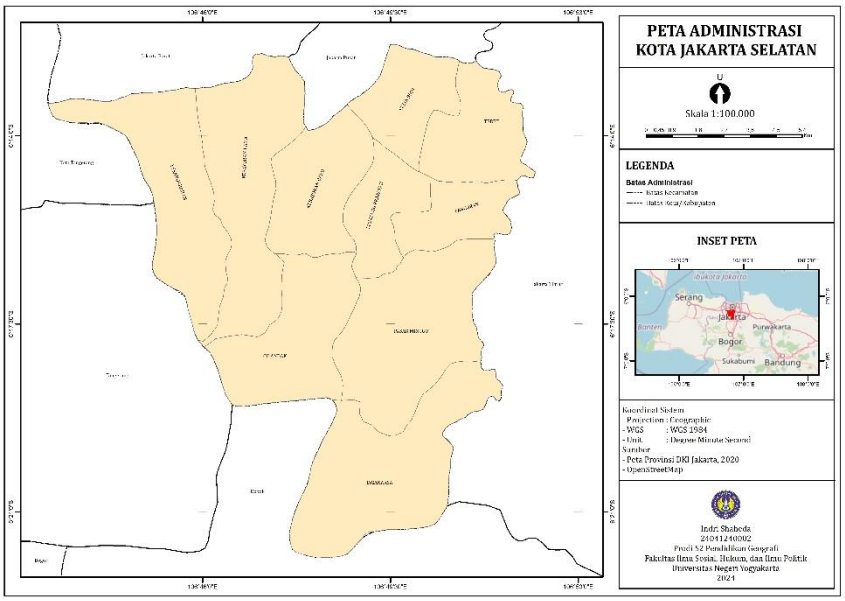

Figure 1. Map of DKI Jakarta Province in 2020

This study conducted an analysis with the help of remote sensing technology based on satellite imagery data and the use of Google Earth Engine on the existence of green open space in urban areas, especially in South Jakarta City, and processed it with the help of a geographic information system.

Landsat 8 image processing software based on geographic information systems, namely Google Earth Engine and ArcGIS version 10.8. By using Google Earth Engine, the distribution of green open spaces is analyzed using the Normalized Difference Vegetation Index (NDVI) method, which is a vegetation index that is very useful for detecting the condition and level of vegetation density in an area.

The goal is to identify and map Green Open Spaces and also to identify the potential for sustainable tourism development in Ecopark. Identification of the distribution pattern of Green Open Spaces in the research area using the Normalized Difference Vegetation Index (NDVI) vegetation density index formula (Pratama, Hindayani, and Sukriah 2023), so that it can be used as a guideline in planning Sustainable Tourism Development. This research uses a quantitative approach with a descriptive method, namely describing, studying, and explaining something as it is, and using numbers to draw conclusions from things that can be seen (Hardianto et al. 2021).

Results and Discussion

1.1 Non-Spatial Data

The following is the Green Open Space Typology as a guideline in determining the type of Green Open Space:

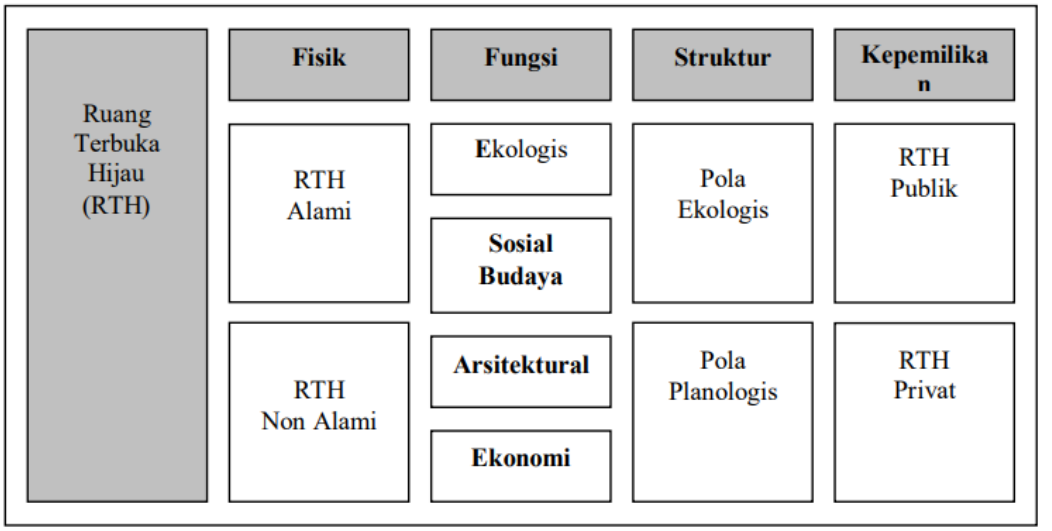

Figure 2. RTH typology
Source: Regulation of the Minister of Public Works. NO. 5/PRT/M/2008

The characteristics of green open space are adjusted to the typology of the area. Typology is a science that studies the grouping of objects based on similarities in shape and structure (KBBI, online). The following are directions for the characteristics of green open space in urban areas for various typologies of areas: Based on the regulation of the Minister of Public Works. NO. 5/PRT/M/2008, one of the typologies of the Area is densely populated which has developed and has a primary function in terms of ecology where in terms of spatial structure (Whitten 2022). Green open space can follow ecological patterns (clustered, elongated, scattered), or planological patterns that follow the hierarchy and structure of urban space and socially, and have the application of green open space needs based on certain functions where the number of residents is one of the reasons (Aram 2024).

The population of South Jakarta City based on the results of the population projection in 2023, the population of South Jakarta City is 2,230,653 people. This value increased by 8,794 people compared to 2023. The number of male residents is 1,122,780 people, while the female population is 1,112,826 people, South Jakarta City contributes 21.02 percent of the population of the total population of DKI Jakarta Province (South Jakarta City in Figures 2024).

Table 1. Population of South Jakarta City Based on Age Group

Age	Number (of souls)
0-4	148,917
5-9	159,195
10-14	164,800
15-19	171,467
20-24	175,884
25-29	175,765
30-34	174,008
35-39	175.155
40-44	176,447
45-49	176,215
50-54	158,423
55-59	131,307
60-64	100,061
65-69	69,421
70-74	41,752
75+	36,709

Source: Central Statistics Agency, Population Projection Results of the 2020 Population Census
Last Updated: April 18, 2024

1.1.1 Map of Distribution of Green Open Space (RTH) in South Jakarta

The geographical location of DKI Jakarta is at 6° 12' South Latitude – 106° 48' East Longitude with an area of 525,982 km². The boundaries of DKI Jakarta include: 1. Northern boundary: Java Sea, 2. Western boundary: Banten Province, 3. Eastern boundary: West Java Province, 4. Southern boundary: West Java Province.

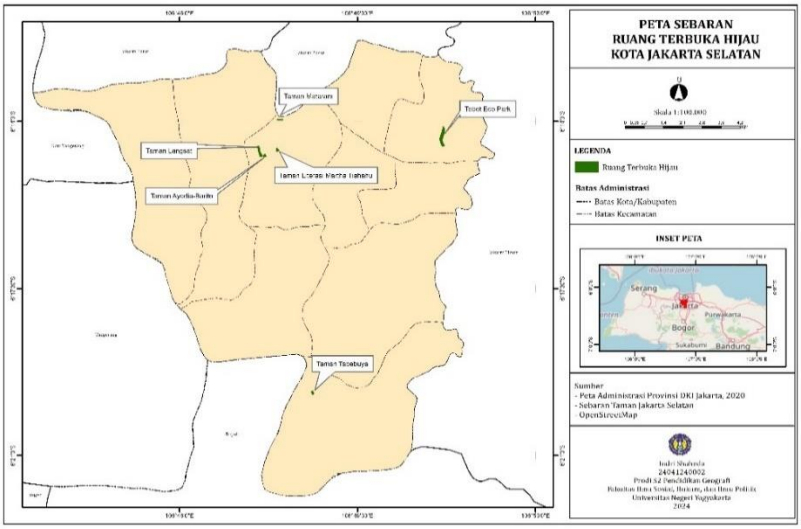

Figure 3. Administrative Map for the distribution of parks in DKI Jakarta in 2020

Distribution of Green Open Spaces in South Jakarta City:
1. Langsat Park (3.6 Ha)
2. Tebet Ecopark (7.3 Ha)
3. Tabebuya Park (0.97 Ha)
4. Mataram Park (0.85)
5. Ayodia Park-Bintaro (0.8 Ha)
6. Martha Tiahahu Literacy Park (0.97 Ha)

Source: 2024 NDVI Data

Table 2. Year of Establishment of the Park

No	Green open space	Area (Ha)	Year of Establishment
1	Langsat Park	3.6	2010
2	Tebet Eco Park	7.3	July 28, 2010 (first opening) April 23, 2022 (reopening after revitalization)
3	Tabebuya Park	0.97	Inaugurated since 2011
4	Mataram Park	0.85	The development of Mataram Park was carried out in stages starting in 2011.
5	Ayodia Park – Barito	0.8	Inaugurated in 2009
6	Martha Tiahahu Literacy Park	0.97	Opened in 1955 and September 18, 2022 (Revitalization)

Based on BPS data, topographically Jakarta is an area that has hot and dry air temperatures or a tropical climate. While the humidity ranges between 74% - 78% and the temperature reaches 29.03°C - 29.24°C. According to data from the Meteorology, Climatology and Geophysics Agency, the description of rainfall in DKI Jakarta is listed in the following table.

Table 3. Total Rainfall and Number of Rainy Days in DKI Jakarta in 2023

Meteorological Station Location	Rainfall Amount (mm)	Number of Rainy Days (days)
Tanjung Priok Maritime	1,521.70	124
The Kemayoran	1,580.70	125

The topographic conditions of the DKI Jakarta Province are in the lowlands with the slope gradient in Jakarta being included in the relatively gentle category and there are 13 rivers flowing in the DKI Jakarta Province area, and the increasingly low water catchment areas are causing...*runoff*which is getting bigger. This causes the DKI Jakarta area and its surroundings to become increasingly vulnerable to flooding during the rainy season.(Alawiyah and Harintaka 2021).

Ecopark is a green open space that can play a role in helping hydrological functions in terms of water absorption and reducing the potential for flooding.(Warastuti et al. 2024). Trees in the ecopark can help absorb water into the soil, so that it can increase the supply of groundwater (saving water), reduce

noise, absorb pollutants and carbon dioxide and can produce oxygen. In addition, ecoparks can function as a means of learning, recreation, and play for the community, and green open spaces in the form of ecoparks are expected to raise public awareness of the city environment where they live. Therefore, it is necessary to provide green open spaces in the form of ecoparks in order to achieve the intended function. With the existence of green open spaces in the form of ecoparks in the city of Pontianak, it is hoped that it can help reduce environmental damage in the city of Pontianak, is a place for learning, recreation, and play for the community, the community can again enjoy a clean, fresh and comfortable urban environment. Thus, it is necessary to provide ecoparks in order to achieve the expected goals and can help increase the ecological value of the city of Pontianak which can also add aesthetic and economic value to the city of Jakarta itself.(Rizaldi, Rumanti, and Andrawina 2024).

Green Open Space (GOS) plays a very important role in creating a healthier, more inclusive, and sustainable urban environment. In the context of sustainable development, GOS is not only a space for recreation, but also has a significant contribution to the quality of life of the community, environmental sustainability, and the resilience of the city to climate change. Therefore, green open space can be considered a key element in realizing the Sustainable Development Goals (SDGs), especially Goal No. 11 which aims to build inclusive, safe, resilient, and sustainable cities and settlements.

The Sustainability Goals contained in SDGs No. 11 are in line with efforts to create cities that are not only livable, but also adaptable to the increasingly real challenges of climate change. Well-planned green open spaces can improve air quality, reduce pollution, provide social space for various levels of society, and function as natural disaster mitigation. In addition, green open spaces also play a role in improving city resilience to the impacts of climate change, such as flooding and increased temperatures due to the heat island effect.(Suryantari, Ngarbingan, and Akbara 2022).

Through the existence of green open spaces, people not only gain physical and mental health benefits, but also have the opportunity to experience social and economic benefits, such as increased social interaction between residents and local economic development. In the context of sustainability, green open spaces also support ecological principles by maintaining biodiversity, improving the water cycle, and strengthening water absorption functions in urban areas (Hapsoro, Triyadi, and Koerniawan 2024).

Thus, the relationship between RTH and SDGs No. 11 is very close, where green open space functions as the main pillar in realizing a sustainable city. Through a holistic and integrated approach, the development of RTH can be one of the solutions that supports the achievement of sustainability goals in the urban context, both for the current and future generations, including:

1. Accessibility and Inclusion where RTH as a public space: RTH provides space for people to gather and interact, improving social quality and relationships between residents. This is in line with SDGs target 11.7 which seeks universal access to safe, inclusive, and sustainable public open spaces.

2. Air Quality and Health for pollution filtration: Green open spaces such as city parks and urban forests can absorb pollutants and improve air quality. Good air quality contributes to public health, which is the focus of SDGs 11.6 on reducing significant negative environmental impacts.
3. Disaster Risk Management, namely disaster resilience: Green open spaces can function as water catchment areas and flood absorption, reducing the risk of natural disasters. This supports SDGs 11.5 which aims to reduce the number of people directly affected by disasters.
4. Sustainable Development for resource use: Green open space can optimize the use of natural resources in a sustainable manner. This relates to the broader SDGs goal of responsible consumption and production (SDG 12).
5. Biodiversity, namely habitat for flora and fauna: Well-managed green open spaces can be a habitat for various species, which supports SDGs 15 on life on land and biodiversity conservation.
6. Environmental education and awareness as an educational space: Green open spaces can be used as a place for environmental education, where people can learn about ecosystems and the importance of conservation. This contributes to SDGs 4 on quality education.

1.1.2 Sustainability Goals in the Context of Green Open Space

Policy Integration To achieve sustainability goals, it is important to integrate green open space management policies with overall city planning, including aspects of transportation, infrastructure, and land use.

a. Community Participation: Involving the community in the planning and management of green open spaces is essential to ensure that these spaces meet local needs and gain support from residents.
b. Maintenance and Management: The sustainability of green open spaces depends on good maintenance and sustainable management. This requires commitment from government, communities, and the private sector.
c. Measurement and Evaluation: Using clear indicators to measure the impact of green open space on people's quality of life and environmental sustainability will help in better decision making.

1.2 Satellite Imagery

Landsat satellite imagery is a remote sensing recording, Landsat itself has two sensors, namely Multi Spectra Scanner (MSS) and Tematic Mapper (TM) with a resolution of up to 30 x 30 m, and is capable of recording an area of up to 185 km x 185 km, while the radiometric resolution is 8 bits.(Aydemir et al. 2024). Landsat 8 Satellite Imagery used in this study to see the value of the NDVI vegetation density index analyzed using Google Earth Engine. Furthermore, NDVI data for 2014, 2019, and 2024 will be described as follows.

1.2.1 Vegetation Density Data 2014

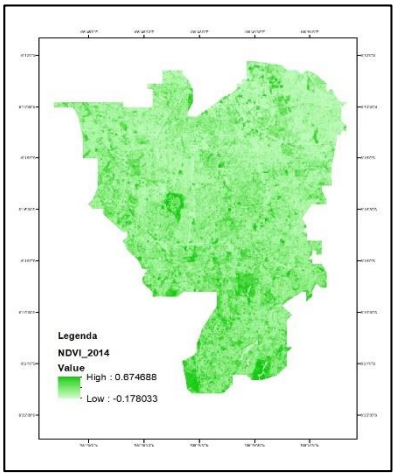

Figure 4. Landsat 8 image from 2014

Landsat 8 imagery from 2014 can be used for various types of analysis, such as determining changes in the color of lakes on Mount Kelimutu, East Nusa Tenggara, caused by changes in minerals and oxygen, determining the distribution of chlorophyll-a concentration, total phosphorus content, and water clarity in Rawapening, and determining significant temperature changes due to changes in land cover.

Table 4. Analysis table of Vegetation Density Index from NDVI in Parks in South Jakarta in 2014

No	Green open space	Area (Ha)	Percentage Area Vegetation Density				
			High Density	Percentage (%)	Low Density	Percentage (%)	Non-Vegetable Land
1	Langsat Park	3.6	1.38	38	2.20	61	0.02
2	Tebet Eco Park	7.3	6.39	88	0.88	12	0.03
3	Tabebuya Park	0.97	0.97	100	0.00	0	0.00
4	Mataram Park	0.85	0.63	74	0.22	26	0.00
5	Ayodia Park-Barito	0.8	0.00	0	0.53	66	0.27
6	Martha Tiahahu Literacy Park	0.97	0.00	0	0.74	76	0.23

Based on Landsat 8 Imagery in 2014, the Vegetation Density Index of Parks in South Jakarta in 2014 was obtained, namely Langsat Park has an area of 3.6 (Ha) with a high density of 38% and a low density of 61%, then there is Tebet Eco Park

has an area of 7.3 (Ha) with a high density of 88% and a low density of 12%, Tabebuya Park with 0.97 (Ha) with a high density of 100%, Mataram Park has an area of 0.85 (Ha) with a high density of 74% and 26% low density of vegetation, Ayodia Bintaro Park has 0.8 (Ha) with 66% low density, and Martha Tiahahu Literacy Park with an area of 0.97 (Ha) has 76% low density.

1.2.2 Vegetation Density Data 2019

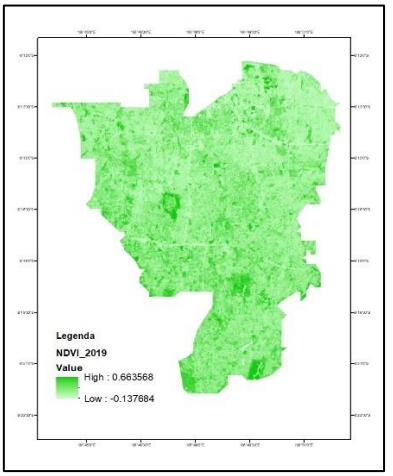

Figure 5. Landsat 8 image from 2019

Landsat 8 imagery in 2019 can be used for various purposes, such as: Identifying mangrove health, Classifying land cover, Mapping LST, Identifying LST changes. Landsat 8 imagery is a satellite image taken by the Landsat 8 satellite, which was launched by NASA in 2013. This satellite is a continuation of the Landsat program that has been running since 1972.

Table 5. Analysis of Vegetation Density Index from NDVI in Parks in South Jakarta in 2019

No	Green open space	Area (Ha)	Percentage Area Vegetation Density				
			High speed	Percentage (%)	Low Density	Percentage (%)	Non-Vegetable Land
1	Langsat Park	3.6	2.89	80	0.66	18	0.05
2	Tebet Eco Park	7.3	6.45	88	0.82	11	0.03
3	Tebebuya Park	0.97	0.97	100	0.00	0	0.00
4	Mataram Park	0.85	0.78	92	0.07	8	0.00
5	Ayodia Park-Barito	0.8	0.23	29	0.57	71	0.01

No	Green open space	Area (Ha)	Percentage Area Vegetation Density				
			High speed	Percentage (%)	Low Density	Percentage (%)	Non-Vegetable Land
6	Martha Tiahahu Literacy Park	0.97	0.35	36	0.55	57	0.07

Based on Landsat 8 Imagery in 2019, the Vegetation Density Index of Parks in South Jakarta in 2019 was obtained, namely Langsat Park has an area of 3.6 (Ha) with a high density of 80% and a low density of 18%, then there is Tebet Eco Park has an area of 7.3 (Ha) with a high density of 88% and a low density of 11%, Tabebuya Park with 0.97 (Ha) with a high density of 100%, Mataram Park has an area of 0.85 (Ha) with a high density of 92% and 8% low density of vegetation, Ayodia Bintaro Park has 0.8 (Ha) with 29% high density and 71% low density, and Martha Tiahahu Literacy Park with an area of 0.97 (Ha) has 36% high density and 57% low density.

1.2.3 Vegetation Density Data for 2024.

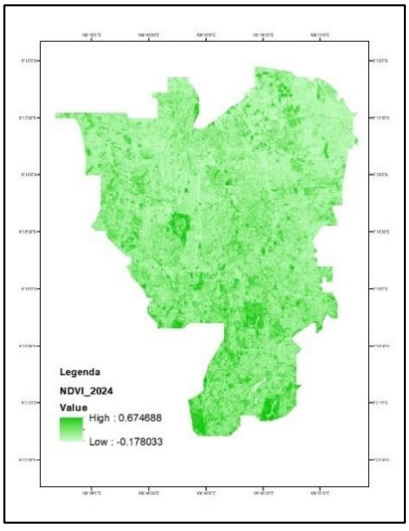

Figure 6. Landsat 8 imagery from 2024

Landsat 8 imagery in 2024 can be used for various purposes, including as a primary instrument in supporting spatial analysis, enabling precise monitoring of ecosystem changes to integrate environmental conservation with sustainable resource management. Landsat 8 imagery's ability to detect changes in land cover and vegetation density makes it a strategic solution for spatial planning and mitigating the impacts of climate change in urban and rural areas.

Table 6. Analysis of Vegetation Density Index from NDVI in Parks in South Jakarta in 2024

No	Green open space	Area (Ha)	Percentage Area Vegetation Density				
			High Density	Percentage (%)	Low Density	Percentage (%)	Non-Vegetable Land
1	Langsat Park	3.6	0.47	13	3.13	87	0.00
2	Tebet Eco ParkTabebuya Park	7.3	2.61	36	4.69	64	0.00
3	Mataram Park	0.97	0.97	100	0.00	0	0.00
4	Mataram Park	0.85	0.16	19	0.69	81	0.00
5	Ayodia Park-Barito	0.8	0.00	0	0.53	66	0.27
6	Martha Tiahahu Literacy Park	0.97	0.00	0	0.41	42	0.56

Based on Landsat 8 Imagery in 2024, the Vegetation Density Index of Parks in South Jakarta in 2024 is that Langsat Park has an area of 3.6 (Ha) with a high density of 13% and a low density of 87%, then there is Tebet Eco Park with an area of 7.3 (Ha) with a high density of 36% and a low density of 64%, Tabebuya Park with 0.97 (Ha) with a high density of 100%, Mataram Park has an area of 0.85 (Ha) with a high density of 19% and 81% low density of vegetation, Ayodia Bintaro Park has 0.8 (Ha) with 66% low density, and Martha Tiahahu Literacy Park with an area of 0.97 (Ha) has a low density of 4%.

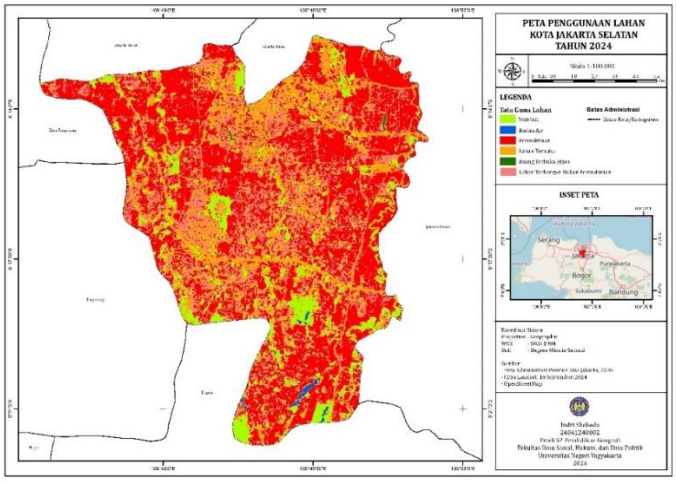

Figure 6. Land use map of South Jakarta 2024

Table 7. Residential Land Analysis

No	Land Use	Area (km2)	Percentage (%)
1	Settlement	66.08	46.7
2	Non-residential Built-up Land	32.71	23.1
3	Open Land	25.45	18.0
4	Vegetation	16.57	11.7
5	Water Body	0.42	0.3
6	Green open space	0.14	0.1
Total		141.37	100

Based on the table above, land use for settlements ranks first with a land area of 66.08 Km², with a percentage of 46.7% of the area of South Jakarta. Non-residential built-up land is 32.71 Km² with a percentage of 23.1%. Open land has an area of 25.45 Km² with a percentage of 18% while land use for vegetation has an area of 16.57% with a percentage of 11.7%, water bodies have 0.42 Km² with a percentage of 0.3%. Green open space itself has the smallest land area, namely 0.14 Km² which explains only 0.1% of the land area of South Jakarta, this is still very far from the recommendation that should have been set, namely the area of green open space is required to be at least 30% of the total area.

Table 8. Comparison of Area (Ha) of Vegetation Density in Parks in South Jakarta

No	Green open space	Wide	High Density			Low Density			Non-Vegetable Land		
			2014	2019	2024	2014	2019	2024	2014	2019	2024
1	Langsat Park	3.6	1.38	2.89	0.47	2.20	0.66	3.13	0.02	0.05	0.00
2	Tebet Eco Park	7.3	6.39	6.45	2.61	0.88	0.82	4.69	0.03	0.03	0.00
3	Tabebuya Park	0.97	0.97	0.97	0.97	0.00	0.00	0.00	0.00	0.00	0.00
4	Mataram Park	0.85	0.63	0.78	0.78	0.22	0.07	0.69	0.00	0.00	0.00
5	Ayodia Park-Barito	0.8	0.00	0.23	0.23	0.53	0.57	0.53	0.27	0.01	0.27
6	Martha Tiahahu Literacy Park	0.97	0.00	0.35	0.35	0.74	0.55	0.41	0.23	0.07	0.56

Based on the comparison table of vegetation density, there is a change from high density to low density or vice versa, this can be caused mainly by the Revitalization that occurred where many old trees were cut down and replaced with new trees, Revitalization of the Park functions the city park as a flood controller and overcomes the water crisis. Tebet Eco Park is one of the public spaces that has the function of water absorption and flood control. Revitalization of Tebet Park into Tebet Eco Park will function the city park as a flood controller

and overcomes the water crisis(Hapsoro et al. 2024). Tebet Eco Park is one of the public spaces that has the largest function of water absorption and flood control. In addition to revitalization, another thing is the ecological restoration that occurs in Tebet Park by restoring natural rocks and plants, park animals, and also public accessibility to natural features in the park, or what is commonly known as naturalization.

The contribution of NDVI analysis in the study shows changes in vegetation density in several parks in South Jakarta, including Tebet Eco Park. The decline in vegetation density in recent years, such as in Taman Langsat (from 80% in 2019 to 13% in 2024) and Tebet Eco Park (from 88% in 2019 to 36% in 2024), reflects the impact of revitalization and replacement of old vegetation with new plants. However, this revitalization supports tourism goals by improving the accessibility, aesthetics, and sustainability of the park as a recreational destination while maintaining its function as a water catchment area and flood control. The management of green open space (RTH) in Babakan Siliwangi, Bandung, is an example of the success of vegetation conservation by utilizing high density for ecological functions and tourist attractions. In Pontianak, the development of an ecopark also aims to improve ecological functions while creating educational and recreational spaces for the community. Compared to Tebet Eco Park, the approach in these two locations shows that preserving high vegetation density tends to be more effective in supporting tourism sustainability goals without sacrificing primary ecological functions.

The results of this study emphasize the importance of revitalization and restoration of Green Open Space as a key element in creating a sustainable and inclusive city, which is in line with SDGs 11 and 13. By prioritizing the development and maintenance of green open space, we can support broader development goals, creating a healthier, safer, and more harmonious environment for all.

Conclusion

The conclusion of this study shows that the revitalization of the park functions as a flood controller and overcomes the water crisis. Tebet Eco Park is one of the public spaces that has the function of water absorption and flood control. Revitalization of Tebet Park into Tebet Eco Park will function as a flood controller and overcome the water crisis. Tebet Eco Park is one of the public spaces that has the largest function of water absorption and flood control. In addition to revitalization, another thing is the ecological restoration that occurs in Tebet Park by restoring natural rocks and plants, park animals, and also public accessibility to natural features in the park, or what is commonly known as naturalization. With revitalization and restoration, Green Open Space functions as a key element in creating a sustainable and inclusive city, which is in line with SDGs no. 11.

Acknowledgments

We are grateful to two anonymous reviewers for their valuable comments on the earlier version of this paper.

References

Alawiyah, Ana Mardhiyana, and Harintaka Harintaka. 2021. "Identifikasi Genangan Banjir di Wilayah DKI Jakarta Menggunakan Citra Satelit Sentinel-1." *JGISE: Journal of Geospatial Information Science and Engineering* 4(2):95. doi: 10.22146/jgise.68353.

Aram, Farshid. 2024. "Resources of Urban Green Spaces and Sustainable Development." *Resources* 13(1):10. doi: 10.3390/resources13010010.

Arti, R. S. and Jumadi. 2024. "GIS Application For Mapping and Analyzing Urban Green Open Spaces (Case Study of Sragen City)." *IOP Conference Series: Earth and Environmental Science* 1357(1):012034. doi: 10.1088/1755-1315/1357/1/012034.

Aydemir, Buket, Güney Çetinkaya, Abdullah Güngör, and Ece Ömüriş. 2024. "Understanding the Visitor Complaints about Urban Green Spaces: A Thematic Investigation of Online Reviews on Nation Gardens in Istanbul, Türkiye." *Humanities and Social Sciences Communications* 11(1):720. doi: 10.1057/s41599-024-03255-3.

Baloch, Qadar Bakhsh, Syed Naseeb Shah, Nadeem Iqbal, Muhammad Sheeraz, Muhammad Asadullah, Sourath Mahar, and Asia Umar Khan. 2023. "Impact of Tourism Development upon Environmental Sustainability: A Suggested Framework for Sustainable Ecotourism." *Environmental Science and Pollution Research* 30(3):5917–30. doi: 10.1007/s11356-022-22496-w.

Cellindita, Switsa, Ach Apriyanto Romadhan, and Ali Roziqin. 2021. "Development of Green Open Space Policy in The Order to Realize A Sustainable City in Malang." *Publik (Jurnal Ilmu Administrasi)* 10(2):212. doi: 10.31314/pjia.10.2.212-225.2021.

Dammayatri, Retno, Tri Muji Susantoro, and Ketut Wikantika. 2023. "Green Open Space and Barren Land Mapping for Flood Mitigation in Jakarta, the Capital of Indonesia." *Indonesian Journal of Geography* 55(2):197. doi: 10.22146/ijg.76452.

Endangsih, T., B. Prayitno, and A. Kusumawanto. 2022. "Assessment of Green Open Space in the Transit-Oriented Development Area in Jakarta." *Civil Engineering and Architecture* 10(1):1–11. doi: 10.13189/cea.2022.100101.

Gelan, Eshetu. 2021. "GIS-Based Multi-criteria Analysis for Sustainable Urban Green Spaces Planning in Emerging Towns of Ethiopia: The Case of Sululta Town." *Environmental Systems Research* 10(1):13. doi: 10.1186/s40068-021-00220-w.

Grindsted, Thomas Skou, Jesper Holm, Flemming Sørensen, Thomas Theis Nielsen, Nanna Byrnak-Storm, and Jens Friis Jensen. 2023. "Conflicting Landscapes – Integrating Sustainable Tourism in Nature Park Developments." *Geografiska Annaler: Series B, Human Geography* 1–20. doi: 10.1080/04353684.2023.2280262.

Hapsoro, Nur Arief, Sugeng Triyadi, and Mochamad Donny Koerniawan. 2024. "The Effect of the Existence of Sustainable Green Open Space on the Community's Economy in Big Cities." 1(1).

Hardianto, Arnas, Pegita Urmala Dewi, Taufiq Feriansyah, Novia Fadillah Sekar Sari, and Nadifa Salsabila Rifiana. 2021. "Pemanfaatan Citra Landsat 8 Dalam Mengidentifikasi Nilai Indeks Kerapatan Vegetasi (NDVI) Tahun 2013 dan 2019 (Area Studi: Kota Bandar Lampung)." *Jurnal Geosains dan Remote Sensing* 2(1):8–15. doi: 10.23960/jgrs.2021.v2i1.38.

Harjanti, Intan Muning, and Pratamaningtyas Anggraini. 2020. “Green Open Space Functions in Kauman Area, Semarang City, Indonesia.” *Journal of Architectural Design and Urbanism* 3(1):1–9. doi: 10.14710/jadu.v3i1.7164.

Jabbar, Muhammad, Mariney Mohd Yusoff, and Aziz Shafie. 2022. “Assessing the Role of Urban Green Spaces for Human Well-Being: A Systematic Review.” *GeoJournal* 87(5):4405–23. doi: 10.1007/s10708-021-10474-7.

Kurniawan, Hary, Abdul Khamid, Dwi Denny Apriliano, and Wahudin Diantoro. 2023. “Evaluasi dan Rencana Pengembangan Sistem Drainase di Kota Tegal (Studi Kasus di Kecamatan Tegal Barat).” 1(1).

Lim, Mabel, and Stefanos Xenarios. 2021. “Economic Assessment of Urban Space and Blue-Green Infrastructure in Singapore.” *Journal of Urban Ecology* 7(1):juab020. doi: 10.1093/jue/juab020.

Mardiani, Eri, and Wiwid Suryono. 2024. “Exploring Sustainable Tourism Development Strategies: A Case Study.” 2(2).

Muliasari, I. Gusti Ayu Dwi, Gusti Ayu Made Suartika, and Kadek Edi Saputra. 2021. “Conversion of Public Green Open Spaces to Facilitate the Tourist Industry.” *IOP Conference Series: Earth and Environmental Science* 903(1):012011. doi: 10.1088/1755-1315/903/1/012011.

Nguyen, An Thinh, and Luc Hens, eds. 2022. *Global Changes and Sustainable Development in Asian Emerging Market Economies Vol. 2: Proceedings of EDESUS 2019*. Cham: Springer International Publishing.

Pratama, Armandha Redo, Purna Hindayani, and Erry Sukriah. 2023. “Mapping the Structure of Tourist Space in the North Bandung Conservation Area.” 6(2).

Rahmawati, Anastasia Riani Suprapti, Sarah Rum Handayani Pinta, and Putu Sudira. 2021. “Green Entrepreneurship: A Study for Developing Eco-Tourism in Indonesia.” *The Journal of Asian Finance, Economics and Business* 8(5):143–50. doi: 10.13106/JAFEB.2021.VOL8.NO5.0143.

Rizaldi, Artamevia Salsabila, Augustina Asih Rumanti, and Luciana Andrawina. 2024. “Sustainable Tourism Industry in Indonesia through Mapping Natural Tourism Potential: Taxonomy Approach.” *Sustainability* 16(10):4201. doi: 10.3390/su16104201.

Sarofah, Riska, and Priska Ayu Herliana. 2023. “Analysis of Government Policy on Green Open Space in Bekasi City.” 4(1).

Suryantari, Yulita, Hubertina Karolina Ngarbingan, and Anisa Zahwa Akbara. 2022. “Tebet Eco Park’s Potential as a New Green Open Space in South Jakarta, Indonesia: An Analysis.” *Journal Of Tourism And Economic* 5(2):107–19. doi: 10.36594/jtec/xeh0ze54.

Warastuthi, Made Rai, Made Sudiana Mahendra, Syamsul Alam Paturusi, and I. Nyoman Darma Putra. 2024. “Spatio-Temporal Changes in Green Open Spaces in Tourism Areas of Bali, Indonesia and Their Implications on Climate Change.” *Environment and Ecology Research* 12(2):203–13. doi: 10.13189/eer.2024.120211.

Whitten, Meredith. 2022. “Planning Past Parks: Overcoming Restrictive Green-Space Narratives in Contemporary Compact Cities.” *Town Planning Review* 93(5):469–93. doi: 10.3828/tpr.2021.55.

Wuisang, Cynthia E. V., Dwight M. Rondonuwu, Rieneke L. E. Sela, and Sonny Tilaar. 2023. “Characteristics of Public Green Open Spaces And Efforts In Enhancing The Quality And Function Using Tri- Valent Approach: Case Of Manado City, Indonesia.” 3(2).