GeoJournal of Tourism and Geosites
ISSN 2065-1198, E-ISSN 2065-0817

Year XVII, vol. 52, no. 1, 2024, p.85-97
DOI 10.30892/gtg.52108-1185

MANGROVE FOREST MANAGEMENT STRATEGY IN BEDUL, BANYUWANGI: COLLABORATION BETWEEN COMMUNITY AND ALAS PURWO NATIONAL PARK FOR SUSTAINABLE ECOTOURISM DEVELOPMENT

SUMARMI*
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: sumarmi.fis@um.ac.id

Syamsul BACHRI
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: syamsul.bachri.fis@um.ac.id

PURWANTO
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: purwanto.fis@um.ac.id

Tuti MUTIA
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: tuti.mutia.fis@um.ac.id

Adellia Wardatus SHOLEHA
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: adellia.wardatus.2107218@students.um.ac.id

Pratidina Izza RAHMASYAH
Department of Geography, Universitas Negeri Malang, Malang, Indonesia, e-mail: pratidinaizza@gmail.com

Rajendra Prasad SHRESTHA
School of Environment, Asian Institute of Technology, Pathum Thani, Thailand, e-mail: rajendra@ait.ac.th

Citation: Sumarmi, Bachri, S., Purwanto, Mutia, T., Sholeha, A.W., Rahmasyah, P.I., & Shrestha, R.P. (2024). MANGROVE FOREST MANAGEMENT STRATEGY IN BEDUL, BANYUWANGI: COLLABORATION BETWEEN COMMUNITY AND ALAS PURWO NATIONAL PARK FOR SUSTAINABLE ECOTOURISM DEVELOPMENT. *GeoJournal of Tourism and Geosites*, 52(1), 85–97. https://doi.org/10.30892/gtg.52108-1185

Abstract: This study aimed to: (1) identify the condition of the Bedul Banyuwangi mangrove forest area for sustainable ecotourism; (2) evaluate the fitness of the Bedul Banyuwangi mangrove forest for sustainable ecotourism; (3) evaluate collaboration between the community and the management of Alas Purwo National Park in conserving Bedul mangrove forest areas; and (4) design a management strategy for the Bedul mangrove forest for developing sustainable ecotourism. This research is a descriptive analytic study with a survey technique constructed using a remote sensing approach and a Geographic Information System (GIS). Landsat and Quickbird satellite imagery are used to identify temporal changes in mangrove forests and temperature over the last decade. Quickbird remote sensing data are used to evaluate the current land use associated with community activities in mangrove areas and government policies related to the presence of mangrove forests. The results showed that: 1) the condition of the Bedul Banyuwangi mangrove area from 1995-2022 was in a stable state. ; 2) the fitness of the Bedul Banyuwangi mangrove forest for sustainable ecotourism is included in the S2 category or following with the Bedul mangrove ecotourism fitness index; 3) the collaborative management of the Bedul mangrove ecotourism between the community (fishing community, local government) and the management of Alas Purwo National Park is continuing good to maintain the condition of the mangroves and provide economic benefits to the community in a sustainable manner; 4) the management strategy implemented is to maintain the quality and quantity of Bedul mangroves and supporting facilities in a sustainable manner. This research can be used as a reference for future research into sustainable ecotourism, as well as for the government to create policies that support sustainable ecotourism.

Key words: management strategy, sustainable ecotourism, mangrove forest

* * * * * *

INTRODUCTION

Mangrove forests are one of the characteristics of coastal biodiversity in Indonesia as an archipelagic country. Mangroves grow along muddy coastlines, particularly in areas with large river channels and deltas with continuous flow of sediment transported from higher elevations (Eddy et al., 2021; Kathiresan, 2021; Sumarmi et al., 2023). With 17.500 islands and 95.181 km of coastline, Indonesia is estimated to have the world's largest mangrove forest at 3,2 billion hectares (DasGupta and Shaw, 2014; Eddy et al., 2021; Kusmana, 2014). This area correlates with the coastal ecosystem in preventing coastal erosion, providing habitat for various species, ensuring the quality of marine products, protecting coastal communities from extreme weather, and storing carbon for climate change mitigation (Hochard et al., 2019; Lovelock and

* Corresponding author

Reef, 2020; Wang and Gu, 2021). According to the explanation of mangrove forests' ecological role, this purpose is to ensure that coastal communities, sea creatures, and other organisms can adjust to a variety of threats from the environment (Biswas and Biswas, 2020; DasGupta and Shaw, 2014; Leal Filho et al., 2022). The economic significance of mangrove ecosystems is influenced by a deeper awareness of ecosystems and the availability of relevant mangrove conservation training (Getzner and Islam, 2020). This correlation of economic opportunities is an adaptive measure to prevent the community from picking land degradation, illegal logging, and marine life exploitation as reasons for economic sustainability (Aye et al., 2019). Environmental circulation and the economic value of mangrove ecosystems are also acknowledged as contributing to the social welfare of the community, such as food security, air circulation, a conservation mindset, and natural risk barriers (Aye et al., 2019; Vo et al., 2012). Mangrove ecosystems have the potential to be used as potential marine ecotourism areas to support the development of an area that can enhance the economic conditions of the local community while ensuring the sustainability of its natural resources (Marasabessy et al., 2018; Sumarmi et al., 2023).

Ecotourism objectives are achieved by focusing on the interconnected importance of fundamental components (Sumarmi et al., 2023). These elements include a comprehension of tourists, the minimization of negative impacts, local community participation, local community welfare, and ecotourism sustainability (Kete, 2016; Sumarmi et al., 2020). Regarding the first-mentioned elements, tourists' knowledge of mangrove tourism objects or destinations is enhanced by providing them with relevant experience and education (Arinta et al., 2023; Sumarmi et al., 2020). Second, the developed mangrove ecotourism reduces the negative impacts on environmental and cultural sustainability (Fattah et al., 2023). Third, community participation in mangrove ecotourism management and implementation. Fourth, the welfare of local communities, such as increasing economic income to make mangrove ecotourism profitable, and fifth, ecotourism that is sustainable. Based on this explanation, it is crucial to develop mangrove ecotourism. The advantages of mangroves are closely linked to their sustainability in a particular area located on the eastern tip of Java Island, Indonesia. The Bedul Mangrove Ecotourism area, located in Banyuwangi Regency, is renowned for its comprehensive mangrove biodiversity in Indonesia. The area has 24 distinct species and spans across 2.300 ha (Sumarmi et al., 2022). The Bedul mangrove forest's emphasis on environmental education and conservation aligns with the ecotourism paradigm, which was established in 2007 and formally launched for visitors in 2009. The annual escalation in tourist entry has resulted in the temporary shutdown of the Bedul mangrove ecotourism. The previously mentioned event can be attributed to the exceeding of the carrying capacity of the Bedul mangrove ecotourism by an increase of tourists, as well as certain cases of mangrove plant problems (interview, 2022).

The Bedul Mangrove Ecotourism environment's significant potential resulted in a dispute over ownership. The lack of balance in the management of this area can be attributed to the conflict over ownership and distribution of utilization rights (Kurniawati et al., 2020; Sumarmi et al., 2022). Prior studies have similarly determined that the unregulated utilization of mangrove ecosystems has led to diminished functionality and inter-user disputes, particularly within the territorial limits of Indonesia (Eddy et al., 2021). Furthermore, the evaluation of the sustainability of mangrove forests typically places emphasis on biological and ecological factors, such that the appraisal of their utilization in the context of interdisciplinary cooperation between economics and social sciences is made explicit (Aye et al., 2019; Fattah et al., 2023). The observed decline in the carrying capacity of mangrove ecosystems is frequently attributed to anthropogenic drivers (Eddy et al., 2021; Friess et al., 2019; Rudianto et al., 2020; Worthington et al., 2020). The Bedul Mangrove Ecotourism is also subject to anthropogenic impacts. The location in question is designated as a conservation area and is safeguarded by the Alas Purwo National Park. It serves as a tourist destination, thereby requiring a collaborative effort towards comprehending the ecosystem and achieving shared objectives (Sumarmi et al., 2020). This study is essential for the local community.

Similar to the previously mentioned description of Bedul Mangrove Ecotourism, numerous studies have been conducted with a focus on the physical state of the mangrove area, the variety of mangrove species, and mangrove nurseries. Furthermore, prior academic investigations related to the Multitemporal Analysis of Mangrove Degradation in the Bedul Banyuwangi mangrove ecotourism area employed Sentinental 2A Imagery (Parela, 2020). Research has been conducted on the Mangrove Tourism Development Strategy in the Bedul areas. However, there is a lack of academic research on the collaborative efforts between the community and the Alas Purwo National Park Management in managing the Bedul Banyuwangi mangrove forest (Saifullah and Harahap, 2013). In 2022, a survey conducted by researchers revealed that facilities suffered considerable damage as a result of inadequate maintenance. This is very concerning because there is a chance that ecotourism chances will fail because of insufficient cooperation, understanding, and carrying capacity efforts, which could result in environmental destruction (Purwanti et al., 2021; Sumarmi et al., 2020).

The research process started by analyzing, identifying, and measuring the extent of changes in mangrove forest cover during the period of 1995-2022, to assess the collaboration and resilience of Mangrove Ecotourism in managing various issues. We are conducting 4 aims of research in this study, which consist of: (1) identifying the condition of the Bedul Banyuwangi mangrove forest area for sustainable ecotourism; (2) evaluating the fitness of the Bedul Banyuwangi mangrove forest for sustainable ecotourism; (3) evaluating collaboration between the community and the management of Alas Purwo National Park in conserving Bedul mangrove forest areas; and (4) designing a management strategy for the Bedul mangrove forest for developing sustainable ecotourism. The utilization of remote sensing presents a financially efficient method and valuable outcomes, particularly in the reconstruction of shifts in mangrove coverage.

LITERATURE REVIEW

Management of sustainable mangrove forests must be in line with sustainable development objectives that meet ecological, economic, and social dimensions. Particularly, alternative research indicates the existence of five main

dimensions: economy, society, ecology, technology, infrastructure, and law and institutions. According to Tjahjono et al., (2022), the five dimensions of mangrove ecotourism can be generated into three main strategic steps: 1) enhancing the quality of mangrove ecotourism products by the utilization of ecological characteristics and local wisdom; 2) enhancing the quality of human resources to effectively manage and produce competitive ecotourism products; and 3) promoting the development and construction of the main and additional mangrove ecotourism infrastructure using eco-friendly technology (Tjahjono et al., 2022). Moreover, the study from Arifanti et al. (2022) found that enhancing mangrove forest strategy and management requires the following: 1) improving the use and value of mangrove forests; 2) integrating protection management for mangrove ecosystems; 3) enhancing political commitment and law enforcement; 4) engaging all relevant stakeholders (particularly coastal communities); and 5) promoting research and innovation (Arifanti et al., 2022). The previously stated recommendations emphasize the importance of prioritizing sustainable networking among diverse stakeholders, including local government, community members, and managers.

One of the most significant challenges associated with these recommendations is establishing fair collaboration between management and the community. Cross-sectoral and multi-stakeholder participatory relationships have emerged as fundamental approaches to mangrove management in several nations, including Mexico, Ghana, and Brazil (Bryan-Brown et al., 2020). Challenges in the manager and the community relationship arise from issues such as land expansion, ownership conflicts, elite participation, unfair benefit distribution, community capacity limitations, divergent objectives, and the limited amount of time available for ecosystem development and preservation (Song et al., 2021).

Recent studies have further validated similar challenges, which include the following: 1) divergent perceptions regarding the importance and benefits of mangrove ecosystems; 2) the urgency of rehabilitation actions; 3) poor local participation; 4) the majority of low-income households residing in nearby to mangrove ecosystems; 5) the utilization of undeveloped sustainable mangrove ecosystems; and 6) rapid population expansion and economic demands that require land use changes. These socioeconomic issues serve as an indication that mangrove forest management strategies require improvement; moreover, increasing sustainable community participation is the most important concern.

It is essential that the participation of local communities in the management of mangrove forests ensures positive collaboration. This finding corresponds with previous research that establish the following factors affect local participation: 1) the presence of enough funding sources, 2) the effectiveness of law enforcement, 3) the transparency of financial management, 4) fair distribution of profits, 5) annual income level, and 7) whether an individual's livelihood is directly dependent on mangrove forests (Thuy et al., 2019). Further study indicates that fishermen have a significantly higher level of perception than other areas of society, suggesting that they perceive and experience the advantages of mangroves more extensively (Firdaus et al., 2021). Therefore, additional initiatives are required to ensure that the advantages experienced by the broader local community extend outside the fishing community. Previous research has suggested that in order to foster stronger collaborative trust and increase community access to resources, more cooperation is necessary (Valenzuela et al., 2020).

Direct observation reveals that the research location, located in the Bedul Banyuwangi Mangrove in East Java, is known for its dense population. Additionally, the area is located within the Alas Purwo National Park area, which classifies as a protected area. The existence of mandatory regulations in a protected area serves to encourage the implementation of sustainable development principles including ecological, economic, social, infrastructure/technology, and legal aspects, as suggested by previous studies (Tjahjono et al., 2022). In addition, this research is grounded in the recognition that unidirectional communication and collaboration pose a significant challenge, as demonstrated in previous research (Arifanti et al., 2022; Song et al., 2021). Therefore, current study aims to determine the current extent of mangrove resources, assess the effectiveness of current development models, examine the community and the manager collaboration in Alas Purwo National Park, and develop long-term development recommendations.

MATERIALS AND METHODS

Research Location

The research is conducted in Sumberasri Village, Purwoharjo District, Banyuwangi Regency, East Java. The researchers selected this location based on geographical studies and physical conditions available in the surrounding area. Previous research has indicated a significant increase in the phenomenon under investigation, which was then decreased as a result of excessive burden. However, the area that received a significant surge then had a substantial decline in 2018, resulting in a complete collapse during the COVID-19 pandemic. The selection of this area was based on the wide variety of mangrove species and its status as the most complex area in East Java.

Research Design

This study used field surveys, Geographic Information Systems (GIS), remote sensing techniques, and analytical descriptive research with a survey method. Remote sensing data in the form of Landsat and Quickbird satellite images are used to identify changes in the temporal extent of mangrove forests and temperature over the last 10 years. The utilization of Quickbird remote sensing data is applied for the evaluation of current land use.

Data Collecting

Data is collected using primary data and secondary data. The data that is directly obtained in the field is referred to as primary data. The collection of primary data was achieved through the implementation of field surveys, which involved various methods such as observations, field measurements, documentation, and interviews. A field survey was conducted to assess the potential of mangrove ecotourism in Bedul, Banyuwangi Regency. The survey focused on measuring physical

parameters such as height (m) and the diversity of mangrove plant species present in the area. Furthermore, interviews were conducted to determine the level of collaboration between the community and the Alas Purwo National Park management in preserving the Bedul mangrove forest. The research used secondary data obtained from remote sensing data, specifically Landsat and Quickbird satellite imagery, to observe the temporal changes in mangrove forests and temperature over a decade. The aim is to conduct a quantitative descriptive analysis to assess the condition of mangrove forest areas and their potential for sustainable ecotourism development. This research aimed to evaluate the fit of mangrove forests for the development of sustainable ecotourism by analyzing data obtained from field measurements. The tabulation of interview data was conducted to analyze the level of collaboration between the community and the Alas Purwo National Park management. Mangrove forest management strategies for sustainable ecotourism are determined based on image analysis data, field data analysis, and analysis results from interviews. For details on the research location, it is shown in the following Figure 1.

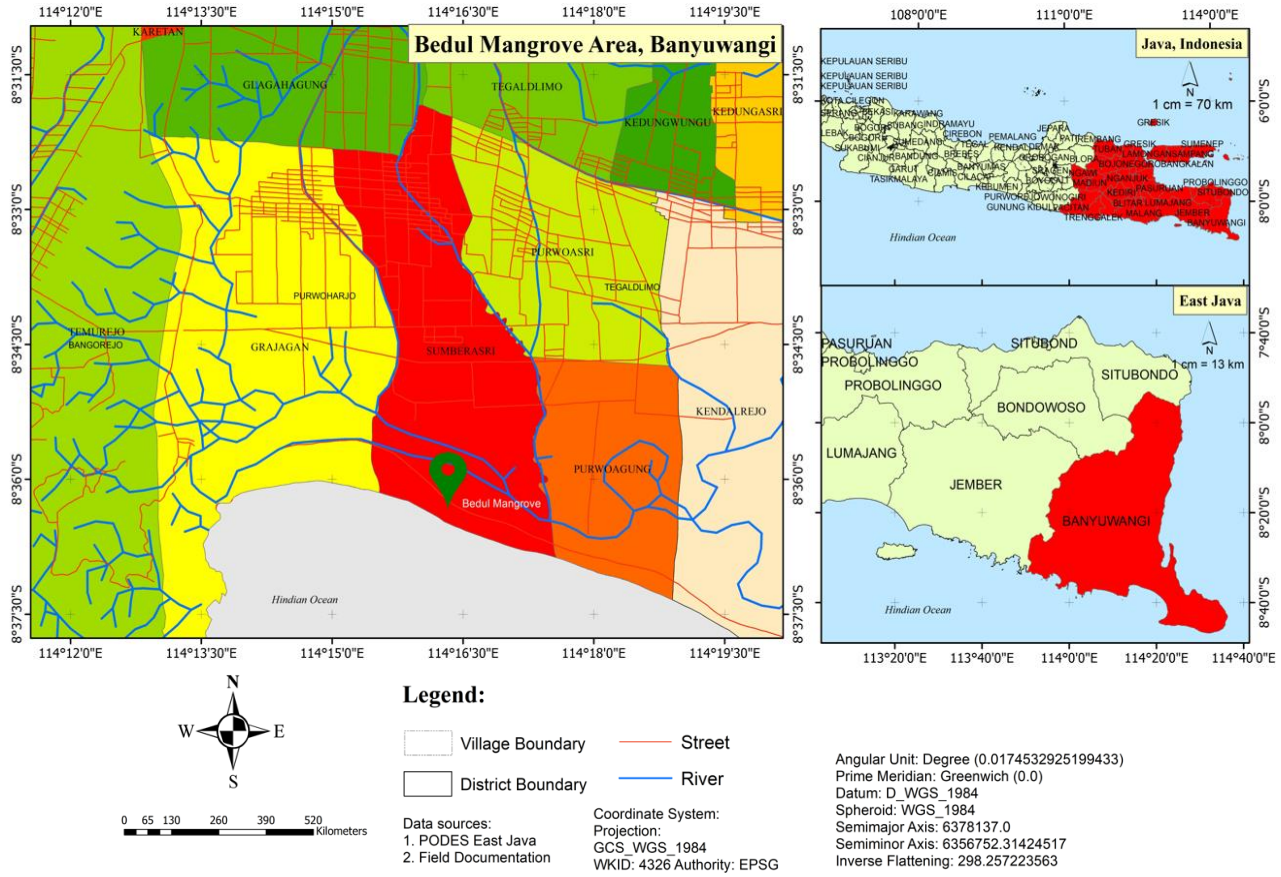


Figure 1. Research Location Map (Source: Author, 2022)

Data Analysis

This research involves a four-stage analysis process, which includes data collection, reduction, categorization, and drawing conclusions. The formula for assessing the fit of mangrove ecotourism is based on the fitness index for coastal and marine tourism (Yulianda, 2007). The process of calculating scores and weights involves the evaluation of various parameters such as mangrove thickness, density, species, biota, tides, area characteristics, and accessibility. The fitness categories can be seen in the following Table 1.

Table 1. Categories of land use for coastal ecotourism (Source: Yulianda, 2007)

Category	Index
S1 (Highy Fit)	>500
S2 (Fit)	>200-500
S3 (Moderate)	>50-200
N (Not Fit)	<50

$$IKW = \sum \left(\frac{Ni}{Nmax}\right) x\ 100\ \%$$

Description: IKW: Tourism Fitness Index; Ni: Parameter score to I (weight x score); N max: Max score from tourism category

RESULTS AND DISCUSSION

The Condition of Bedul Mangrove Forest Area for Ecotourism

The condition of the mangroves in Bedul can be classified as 'fit' category. This is evidenced from several measurement variables, including mangrove type, density, area, and thickness. There are 27 species of mangroves with a density of 28 trees per 100 m^2 and a thickness of approximately 306 m. The implementation of the ecotourism concept in the Bedul mangroves is also regarded as highly successful. Observations and interviews indicate that the environmental conditions in the mangroves of Bedul qualify as clean. Bedul mangrove ecotourism also includes a number of support amenities such as restrooms, religious sites, and food stalls. The condition of the Bedul mangrove area for ecotourism over the past decade is shown in the table 2 and for time-series mapping is shown in Appendix 1 - 2.

Table 2. The Transformation of Bedul Mangrove Areas from 1995-2022
(Source: Analysis Data Spatial Time Series Citra Landsat dan Quickbird; Author, 2022)

		Year 1995					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 1995	High-density Vegetation	1342.75	186.48				1529.23
	Low-density Vegetation	75.35	8441.41	11.52	493.02	2.75	9024.05
	Mangrove		330.27	906.96	9.66	2.39	1249.28
	Non-vegetation	6.65	2647.60	0.18	2572.72	10.10	5237.24
	Water	3.90	77.11	31.02	50.17	11722.95	11885.15
	Total Cover (ha)	1428.65	11682.86	949.68	3125.57	11738.19	28924.96
		Year 2000					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2000	High-density Vegetation	1262.72	80.48		1.95	1.60	1346.75
	Low-density Vegetation	257.39	4917.90	26.06	334.18	7.89	5543.42
	Mangrove	0.71	145.46	1213.92	57.17	137.83	1555.08
	Non-vegetation	5.76	3849.89	5.05	4821.70	48.57	8730.97
	Water		6.47	0.18	12.32	11686.70	11705.67
	Total Cover (ha)	1526.58	8999.85	1245.21	5227.32	11882.49	28881.44
		Year 2005					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2005	High-density Vegetation	1274.77	180.04	2.66	8.42	1.86	1467.75
	Low-density Vegetation	72.24	5017.50	117.36	2882.37	9.22	8098.68
	Mangrove	0.09	42.90	1370.54	9.04	9.31	1431.88
	Non-vegetation		298.82	37.31	5789.48	16.75	6142.37
	Water		4.17	27.21	41.66	11668.62	11741.65
	Total Cover (ha)	1347.10	5543.42	1555.08	8730.97	11705.75	28882.33
		Year 2010					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2010	High-density Vegetation	1400.73	154.57	0.09	1.60	1.60	1558.58
	Low-density Vegetation	61.52	5751.81	21.54	1710.63	12.85	7558.36
	Mangrove	0.53	154.23	1400.32	28.98	81.63	1665.70
	Non-vegetation	4.61	2033.46	7.62	4391.14	48.22	6485.05
	Water	0.35	4.61	2.30	10.02	11597.35	11614.64
	Total Cover (ha)	1467.74	8098.69	1431.88	6142.37	11741.65	28882.32
		Year 2015					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2015	High-density Vegetation	1331.50	53.36		0.62		1385.48
	Low-density Vegetation	220.44	5798.31	35.37	2109.59	2.04	8165.74
	Mangrove	0.18	107.52	1583.27	39.00	12.41	1742.37
	Non-vegetation		1578.08	7.36	4272.64	7.36	5865.43
	Water	6.47	21.09	39.71	63.20	11592.83	11723.30
	Total Cover (ha)	1558.58	7558.36	1665.70	6485.05	11614.64	28882.32
		Year 2020					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2020	High-density Vegetation	1301.98	502.41		1.15	2.75	1808.29
	Low-density Vegetation	72.51	7009.07	29.52	2456.55	24.20	9591.85
	Mangrove		123.30	1703.99	44.41	85.89	1957.58
	Non-vegetation	10.11	529.72	8.24	3361.63	35.45	3945.15
	Water		1.24	0.62	1.68	11575.03	11578.57
	Total Cover (ha)	1383.71	8165.74	1742.37	5865.43	11723.31	28880.56
		Year 2022					
	Land Cover	High-density Vegetation	Low-density Vegetation	Mangrove	Non-vegetation	Water	Total Cover (ha)
Year 2022	High-density Vegetation	1326.98	483.00			1.60	1811.57
	Low-density Vegetation	88.11	8155.49	1.60	1350.63	16.84	9612.67
	Mangrove	0.80	767.26	947.46	116.29	134.28	1966.09
	Non-vegetation	11.88	2264.26	0.27	1647.83	30.04	3954.28
	Water		12.85	0.35	10.81	11555.44	11579.46
	Total Cover (ha)	1426.88	11682.86	949.68	3125.57	11738.19	28923.19

According to the figure of the mangrove area map and the table regarding the condition of the mangrove area above, the condition of the Bedul Banyuwangi mangroves from 1995 to 2022 is stable. The table presented indicates the existence of five distinct classifications of land cover, which include high density vegetation, low density vegetation, mangrove, non-vegetation, and water. The stability of land cover within the high-density vegetation or low-density categories between the years 1995 and 2022 has been classified as stable (Figure 2). The graphical representation above indicated a reduction in changes related to land cover of high-density vegetation during the years 2000 and 2005, followed by a significant increase in 2010. Although not significantly, there have been new changes from 2015 to 2022. The second classification of land

cover is related to areas characterized by sparse vegetation or low-density vegetation. The low-density vegetation category exhibits a wider range of land cover in comparison to the high-density vegetation category. Changes in the land area occupied by low density vegetation are also categorized as stable. Figure 3 showed the number of changes in land area.

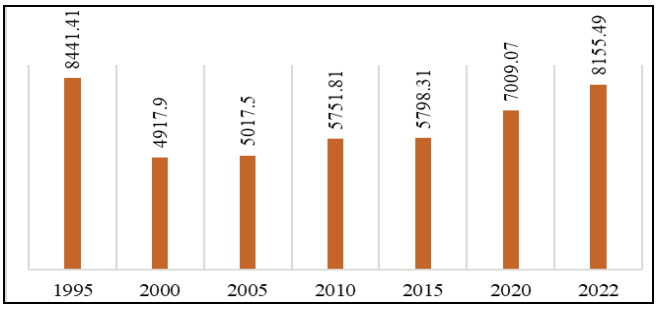


Figure 2. High-Density Vegetation (Ha) (Data Analysis, 2022)

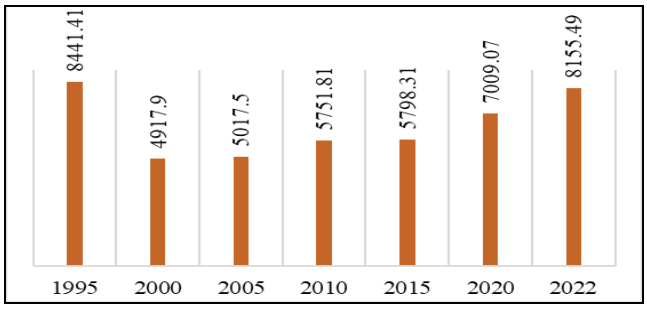


Figure 3. Low-Density Vegetation (Ha) (Data Analysis, 2022)

The amount of area covered by high-density vegetation increased in 1995 at 8441.41. The amount recorded in the year 2000 showed a decrease in comparison to the prior year, which had a value of 4917.90. The previous figure represented the minimum extent of low-density vegetation land cover in the area. Between 2005 and 2022, there has been a significant rise in land cover. It is projected that in 2022, the land area characterized by low density vegetation will reach a value of 8000, specifically 8155.49. The primary commodity in Bedul Mangrove is the mangrove land cover, which is indicated as the third parameter. The period spanning from 1995 to 2020 showed a consistent growth in the expanse of mangrove surfaces. The current year of 2020 exhibits optimal conditions for mangrove growth and development. The mangrove land area, as shown in the figure, measures 1703.99 ha. The comparison of mangrove land cover can be seen in Figure 4.

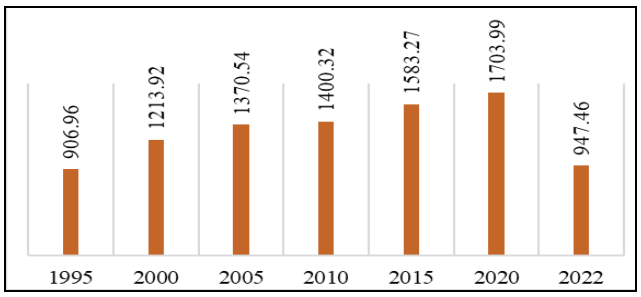


Figure 4. Mangrove Land Cover (Ha) (Data Analysis, 2022)

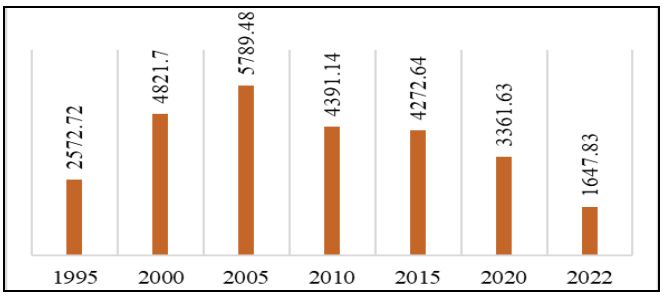


Figure 5. Non-Vegetation Land Cover (Ha) (Data Analysis, 2022)

According to the data presented in Graph 3, there is an expected decrease in the extent of mangrove land in the year 2022. The Bedul Banyuwangi mangrove area is expected to extend 947.46 hectares by the year 2022. The reduction in the expanse of mangrove land can be attributed to a swift escalation in tourist activity. The Bedul Mangrove ecotourism location experienced ecological harm due to an increase of tourists that surpassed the carrying capacity, resulting in damage to multiple mangrove plants. The fourth parameter related to land cover includes non-vegetation areas that lack vegetation growth. The non-vegetation area exhibited a rise from 2572.72 in 1995 to 4821.7 in 2000. In 2005, the area experienced a significant expansion, reaching a high figure of 5789.48, which was the highest recorded in the past seven years. It is expected that the extent of non-vegetation land cover will exhibit a decrease from 2010 to 2022. The land area numbers can be seen in Figure 5.

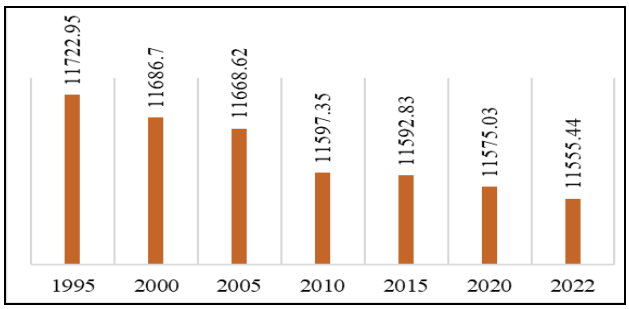


Figure 6. Water Area (Ha) (Data Analysis, 2022)

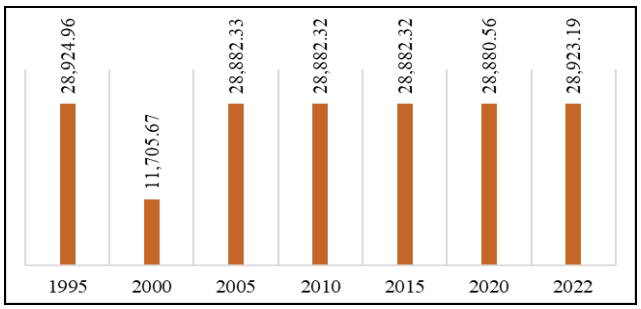


Figure 7. All Mangrove Area (Ha) (Data Analysis, 2022)

The non-vegetation land cover area was recorded as 4391.14 ha in the year 2010. The previous metric exhibited a persistent decrease in the years 2015, 2020, and 2022. In the year 2022, the minimum number recorded for non-vegetated land areas was 1647.83. The category of non-vegetation land cover includes the part of land that is occupied by built-up structures. The Bedul Banyuwangi mangrove area may contain built-up land in the form of residential areas and roads. The reduction in land cover area suggests a transition from non-vegetated regions to areas with little vegetation.

The fifth parameter refers to the measurement of the expanse of water or water-based solution. The water area included a total of 11722.95 ha in the year 1995. It is expected that the water land cover will experience a persistent decline from 2000 to 2022. It is anticipated that by the year 2022, the total area of water land cover will have reached a value of 11555.44 ha. The observed reduction in the extent of water cover can be attributed to a shift in land use practices, in which areas previously occupied by water have been converted to low density vegetation. Changes in land cover can be seen in Figure 6. The analysis of the five land cover parameters in the Bedul Banyuwangi Mangrove revealed that the overall condition of the mangrove area has exhibited minor fluctuations, indicating a stable state. The utilization of stable mangrove areas for ecotourism purposes is a possible possibility (Figure 7). The mangrove ecosystem in Bedul has the potential to be sustainably developed for the benefit of both the environment and the local communities. The guiding principle of ecotourism is to mitigate negative impacts by prioritizing ecological balance and financial stability (Salam et al., 2000).

Table 3. The Fitness Index for Bedul Mangrove Ecotourism

No.	Parameter	Observation Result	Weight	Score	Total	Classification
Observation Point 1: Jogging Track Entrance (50UTM-L 0199058 9049499)						
1.	Mangrove height (m)	310	30	3	90	S2
2.	Mangrove density (100 m2)	16	20	4	80	S1
3.	Mangrove type	5	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds	10	2	20	S3
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, small islands, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Land and sea transport routes, entrance route, near to villages, built infrastructures	5	4	20	S1
Total					330	S2 (Fit)
Observation Point 2: Mangrove Planting (50UTM-L 0199014 9049514)						
1.	Mangrove height (m)	310	30	3	90	S2
2.	Mangrove density (100 m2)	28	20	4	80	S1
3.	Mangrove type	2	20	2	40	S3
4.	Biodiversity	Fish, crabs, birds	10	2	20	S3
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Land and sea transport routes, entrance route, near to villages, coastal access road using motor boats	5	4	20	S1
Total					310	S2 (Fit)
Observation Point 3: Bedul Pier (50UTM-L 0199670 9048938)						
1.	Mangrove height (m)	310	30	3	90	S2
2.	Mangrove density (100 m2)	26	20	4	80	S1
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds	10	2	20	S3
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Land and sea transport routes, entrance route, near to villages, built infrastructures	5	4	20	S1
Total					330	S2 (Fit)
Observation Point 4: Kempeng Road-South (50UTM-L 0200232 9048506)						
1.	Mangrove height (m)	266	30	3	90	S2
2.	Mangrove density (100 m2)	24	20	4	80	S2
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds, prawns, monkeys	10	4	40	S1
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Coastal access road using motor boats	5	1	5	S3
Total					335	S2 (Fit)
Observation Point 5: Kere Estuary (50UTM-L 0200872 9048274)						
1.	Mangrove height (m)	455	30	3	90	S2
2.	Mangrove density (100 m2)	18	20	4	80	S1
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds	10	3	30	S2
5.	Tidal waves (m)	1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Coastal access road using motor boats dan canoes	5	2	10	S3
Total					330	S2 (Fit)

Observation Point 6: Canoe Spot (50UTM-L 0200974 9048375)						
1.	Mangrove height (m)	416	30	3	90	S2
2.	Mangrove density (100 m2)	16	20	4	80	S1
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish and crabs	10	2	20	S3
5.	Tidal waves (m)	1,2	10	2	20	S2
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Coastal access road using motor boats dan canoes	5	2	10	S3
Total					300	S2 (Fit)
Observation Point 7: Kere Pier (50UTM-L 0201039 9048087)						
1.	Mangrove height (m)	288	30	3	90	S2
2.	Mangrove density (100 m2)	27	20	4	80	S1
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds, prawns, monkeys	10	4	40	S1
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Coastal access road using motor boats	5	1	5	S3
Total					335	S2 (Fit)
Observation Point 8: Tender (50UTM-L 0199858 9048790)						
1.	Mangrove height (m)	313	30	3	90	S2
2.	Mangrove density (100 m2)	24	20	4	80	S1
3.	Mangrove type	3	20	3	60	S2
4.	Biodiversity	Fish, crabs, birds, prawns, monkeys	10	4	40	S1
5.	Tidal waves (m)	<1	10	4	40	S1
6.	Area Characteristics	Natural, riverside estuary, existing tourist destinations, endangered species, and flat areas	5	4	20	S1
7.	Accessibility	Coastal access road using motor boats	5	1	5	S3
Total					335	S2 (Fit)

The Fitness of Bedul Mangrove Forest for Ecotourism

Researchers obtained observation point sources for the data collection using the grid method at a distance of 400 m each. This conclusion is based on a significant area with very similar physical conditions. Furthermore, the measurement process modifies the locations or points by taking into consideration how the area is used to support the various economic activities indicated by the names of the points. Regarding the selection of the Bedul mangrove ecotourism fitness index, this research modified it based on growth outcomes based on Yulianda (2007) research. The research classified the variables for determining the potential of mangrove ecotourism according to mangrove thickness, density, mangrove species, biota, tides, area characteristics, and accessibility. The fitness index of Bedul mangrove ecotourism in Banyuwangi Regency can be seen in the Table 3. According to Table 3, there are 8 observation locations that showed mangroves have a density of 28 trees per 100 m^2 and a thickness varying from 266-455 m^2.

The Bedul Mangrove Ecotourism Fitness Index placed the mangrove's thickness in the S2 category. There are 27 different species of mangroves in this area. The mangrove vegetation that surrounds the river demonstrated the existence of different vegetation types. Fish, crabs, shrimp, and monkeys represent the majority of the fauna in Bedul's forest ecotourism. Fishermen used these ecosystems resources to grow them, then they sell them for economic gain. In conclusion, Figure 8 showed the mangrove ecotourism fitness index based on the previous table, which corresponded to the 'fit' category. Further, the entrance to the Segara Anakan area is shown in Figure 9.

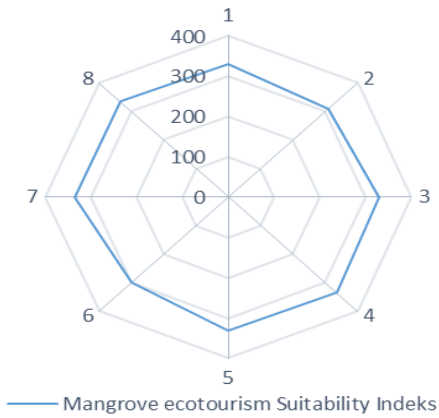


Figure 8. Mangrove Ecotourism Fitness Index (source: Data Analysis, 2022)

Figure 9. The Entrance of Bedul Mangrove Ecotourism (Source: Author, 2022)

The Collaboration between the Community and the Management of Alas Purwo National Park in Conserving Mangrove Forest Areas

The Bedul mangrove forest is a destination for environmental education and conservation (Sumarmi et al., 2023). The Bedul mangrove ecotourism was founded in 2007 and introduced to the public in 2009. The Bedul mangrove ecotourism has been temporarily closed due to the rapid rise in the number of tourists every year. The number of tourists exceeded the capacity of the Bedul mangrove ecotourism, resulting in some damage to mangrove plants (interview, 2022). The tourist and cultural attractions of Bedul Mangrove Ecotourism contributed to the increase in visitors.

Mangrove ecotourism in Bedul covers approximately 4.000 ha, 30 ha of which are used for mangrove conservation. Mangroves are spread along the Segara Anakan estuary in Bedul. In addition to conservation and environmental balance, mangroves serve as a habitat for a variety of animals and provide for the needs of local communities. Fishermen use Segara Anakan, which is located in the Bedul mangrove ecotourism area, to catch fish.

Three piers exist in the Segara Anakan mangrove Bedul, each serving a different function. The main or middle pier serves as a port for tourist boats along the Segara Anakan, as well as a docks for fishing boats. The second pier is utilized for mangrove protection along the jogging trail. Observations indicate that this second pier is already in bad condition, so it must be repaired. The third pier is the resort pier, which is managed by Alas Purwo National Park along with the Forestry Police patrol boat parking lot. This pier serves as an access point to Mageran Beach. The placement of the three piers demonstrates mutual care and support between the community, in this case the fishing community, and the management of Alas Purwo National Park. The community is highly concerned about the condition of the mangrove forest because they recognize that it is a breeding ground for fish and crabs, which are their primary source of income. And the management of the National Park is extremely concerned with the maintenance of this mangrove forest area. Management of Bedul mangrove ecotourism is a collaborative effort between the community (fishing community, local administration) and the management of Alas Purwo National Park. This collaboration is effective in maintaining the welfare of the mangroves and the economic benefits to the local community. The condition of the Segara Anakan area and the pier is shown in Figure 10.

Figure 10. The condition of the main pier, Segara Anakan for fishing,
esort and boat parking area for forestry police patrols (A – D) (Source: Author, 2022)

Mangrove Forest Management Strategy for Sustainable Ecotourism Development

The implementation of the ecotourism concept in the Bedul mangroves is also considered to be highly successful. Observations and interviews indicate that the environmental conditions in the mangroves of Bedul qualify as clean. Efforts to enhance the economy of the community surrounding the Bedul mangrove ecotourism have included the installation of food stands (Sumarmi et al., 2021). Managers and business actors in Bedul mangrove ecotourism are

committed to: 1) maintaining the quality and quantity of Bedul mangroves in a sustainable manner, 2) increasing collaboration between the community and Alas Purwo National Park management in preserving mangrove forests, 2) improving the economy and welfare by empowering local communities, 3) making Bedul mangrove ecotourism for environmental education, with mangrove seedling and planting programs, 4) equipping and maintaining the quality of supporting facilities such as toilets, religious sites, and food stalls. The image showed that the mangrove ecosystem on the Bedul beach is still sustainable; the roots and dense vegetation are strong enough to resist sea waves. Sustainable mangrove environments support local populations' needs both economically and ecologically. Mangroves help keep the coastline thick and sturdy so that it can endure waves and defend against erosion, tsunamis, hurricanes, and storms (Fitriah et al., 2013; Joandani et al., 2019). The protection of coastal habitats like coral reefs and the prevention of seawater from getting into land cannot be separated from this issue (Sumarmi et al., 2021). Figure 11 shows the condition of the Segara Anakan Mangrove Area and the conservation activities performed by researchers.

Figure 11. The Condition of the Bedul Mangrove Forest as conservation for birds, fish, crab, monkeys and others, as well as education and mangrove preservation activities (A – D) (Source: Author, 2022)

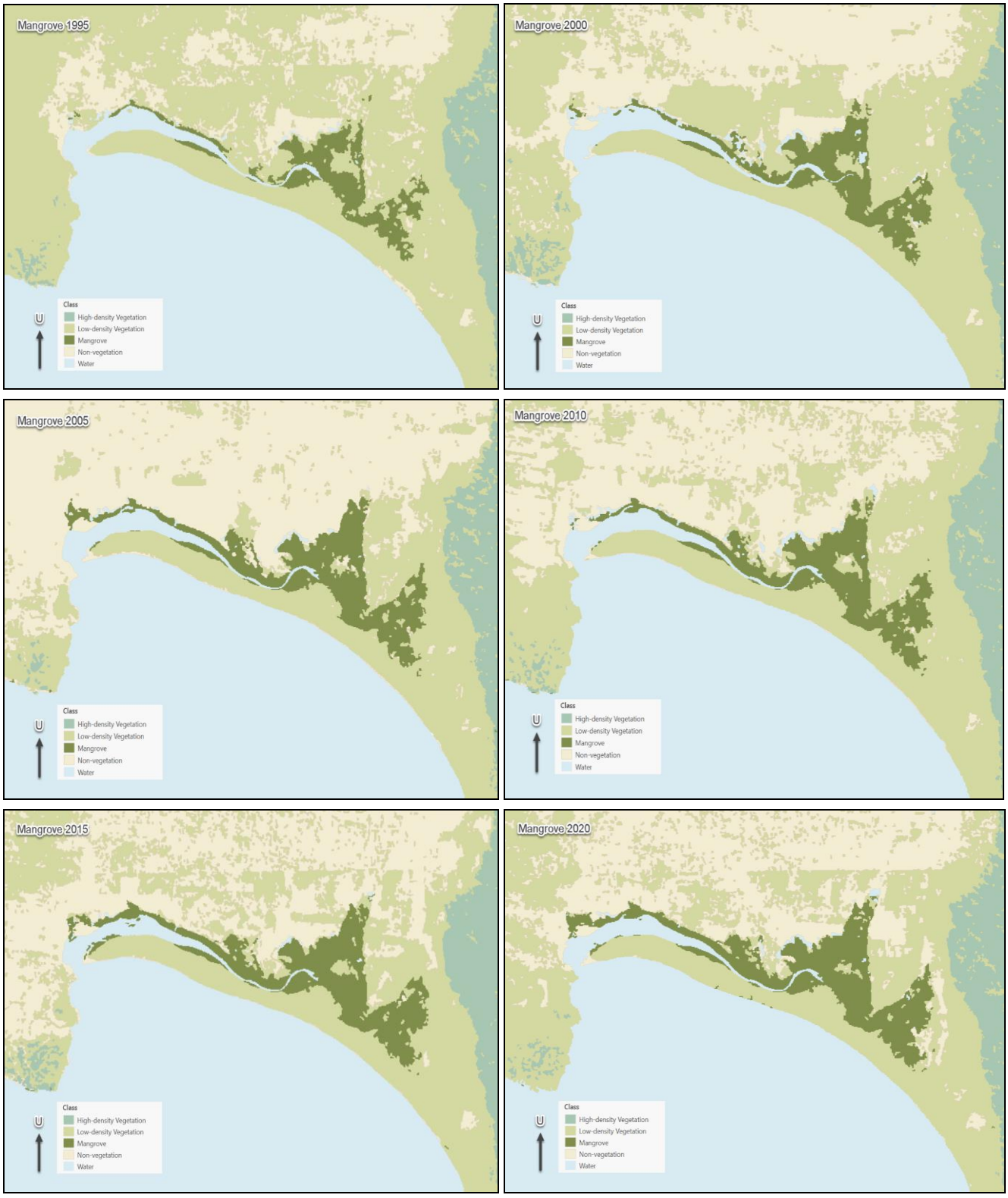
Mangrove preservation results from the growth of ecotourism, which encourages understanding and activities that protect the ecosystem. Ecotourism management at Bedul Beach is closely linked to community groups that are aware of tourism issues and are supportive of it. This is followed by community empowerment initiatives and conservation efforts through the planting of mangroves, as seen in the image above (Purwanti et al., 2021). Understanding ecological behaviour in the management of natural resources in local communities requires a thorough investigation of the growth of ecotourism potential (Henri and Ardiawati, 2020). The image above depicts community and visitor involvement in mangrove conservation on Bedul beach as a type of ecotourism management (Kurniawati et al., 2020; Purwanti et al., 2021).

The potential for biodiversity that is still quite diverse draws visitors to the area, and the development of Bedul mangrove ecotourism creates employment, boosting the local community's economy. Bedul Beach mangrove ecotourism is environmentally sustainable. The potential of mangroves offers residents of mangrove areas chances for welfare. Mangrove ecotourism management seeks to protect mangroves while having financial advantages (Hakim et al., 2017). The success of Bedul's mangrove tourist operations can be attributed to its foundation in sustainability. This is so that management can take into consideration cultural, social, economic, and environmental factors (Purwanti et al., 2021; Sumarmi et al., 2021).

CONCLUSION

This study found that the status of the Bedul Banyuwangi mangrove area between 1995 and 2022 remained stable. The Bedul mangrove forest's potential for sustainable ecotourism is classified under the S2 category, as per ecotourism fitness index for the Bedul mangrove. The successful management of the Bedul mangrove ecotourism involved a

collaborative effort between the local community (including the fishing community and local government) and the Alas Purwo National Park management. This partnership aimed to ensure the preservation of the mangroves and the sustainable economic benefits for the community. The implementation of the management strategy involved the sustainable maintenance of both the quality and quantity of the Bedul mangroves, as well as the supporting facilities. This study offered guidance for the formulation of a mangrove forest management plan aimed at ensuring the sustainable future of the Bedul mangrove ecotourism. The recommendations for ensuring the sustainability of ecotourism required careful consideration of the involvement of local communities, ecotourism managers, and governmental entities in a collaborative effort to establish ecotourism practices that are both environmentally and financially sustainable.



Appendix 1. Mangrove Mapping Time-Series (1995 – 2020)

Appendix 2. Mangrove Mapping Time-Series 2022

Author Contributions: Conceptualization, S.S. and S.B.; methodology, S.S. and S.B.; software, P.P. and P.R.; validation, S.S. and T.M.; formal analysis, T.M. and A.S.; investigation, A.S. and P.R.; data curation, A.S. and P.R.; writing - original draft preparation, S.S. and A.S.; writing - review and editing, S.B. and R.S.; visualization, A.S. and P.R.; supervision, R.S.; project administration, T.M. All authors have read and agreed to the published version of the manuscript.

Funding: Not applicable.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study may be obtained on request from the corresponding author.

Acknowledgments: Thank you is given for the research funding support from the Institute for Research and Community Service (LPPM) Universitas Negeri Malang. Thank you is also given to the research staff. There are no intentions or conflicts of interest toward individuals or groups in the research.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Arifanti, V.B., Sidik, F., Mulyanto, B., Susilowati, A., Wahyuni, T., Subarno, S., Yulianti, Y., Yuniarti, N., Aminah, A., Suita, E., Karlina, E., Suharti, S., Pratiwi, P., Turjaman, M., Hidayat, A., Rachmat, H.H., Imanuddin, R., Yeny, I., Darwiati, W., & Novita, N. (2022). Challenges and Strategies for Sustainable Mangrove Management in Indonesia: A Review. *Forests*, *13*(5), 695. https://doi.org/10.3390/f13050695

Arinta, D., Sumarmi, S., Budijanto, B., & Susilo, S. (2023). Development of Integrated and Sustainable Community Based Eco-Tourism on Sipelot Beach, Indonesia. *GeoJournal of Tourism and Geosites*, *46*(1), 19–26. https://doi.org/10.30892/gtg.46102-996

Aye, W.N., Wen, Y., Marin, K., Thapa, S., & Tun, A.W. (2019). Contribution of mangrove forest to the livelihood of local communities in Ayeyarwaddy region, Myanmar. *Forests*, *10*(5), 414. https://doi.org/10.3390/f10050414

Biswas, P.L., & Biswas, S.R. (2020). Mangrove forests: Ecology, management, and threats. In *Life on Land* (pp. 627–640). Springer. https://doi.org/10.1007/978-3-319-95981-8_26

Bryan-Brown, D.N., Connolly, R.M., Richards, D.R., Adame, F., Friess, D.A., & Brown, C.J. (2020). Global trends in mangrove forest fragmentation. *Scientific Reports*, *10*(1), 7117. https://doi.org/10.1038/s41598-020-63880-1

DasGupta, R., & Shaw, R. (2014). Role of NGOs and CBOs in a decentralized mangrove management regime and its implications in building coastal resilience in India. *Civil Society Organization and Disaster Risk Reduction: The Asian Dilemma*, 203–218. https://doi.org/10.1007/978-4-431-54877-5_11

Eddy, S., Milantara, N., Sasmito, S.D., Kajita, T., & Basyuni, M. (2021). Anthropogenic drivers of mangrove loss and associated carbon emissions in South Sumatra, Indonesia. *Forests*, *12*(2), 187. https://doi.org/10.3390/f12020187

Fattah, M., Intyas, C.A., Ruminar, H., & Arif, M.E. (2023). Evaluation of The Sustainability Status of The Bangsring Underwater with Indonesia's Coral Reef Ecosystem. *GeoJournal of Tourism and Geosites*, *49*(3), 858–865. https://doi.org/10.30892/gtg.49302-1086

Firdaus, M., Hatanaka, K., & Saville, R. (2021). Mangrove Forest Restoration by Fisheries Communities in Lampung Bay: A study based on perceptions, willingness to pay, and management strategy. *Forest and Society*, 224–244. https://doi.org/10.24259/fs.v5i2.12008

Fitriah, E., Maryuningsih, Y., Chandra, E., & Mulyani, A. (2013). Studi analisis pengelolaan hutan mangrove Kabupaten Cirebon. *Scientiae Educatia: Jurnal Pendidikan Sains*, *2*(2), 73–92. https://doi.org/DOI: 10.24235/sc.educatia.v2i2.521

Friess, D.A., Rogers, K., Lovelock, C.E., Krauss, K.W., Hamilton, S.E., Lee, S.Y., Lucas, R., Primavera, J., Rajkaran, A., & Shi, S. (2019). The state of the world's mangrove forests: Past, present, and future. *Annual Review of Environment and Resources*, *44*, 89–115. https://doi.org/10.1146/annurev-environ-101718-033302

Getzner, M., & Islam, M.S. (2020). Ecosystem services of mangrove forests: Results of a meta-analysis of economic values. *International Journal of Environmental Research and Public Health*, *17*(16), 5830. https://doi.org/10.3390/ijerph17165830

Hakim, L., Siswanto, D., & Makagoshi, N. (2017). Mangrove conservation in East Java: The ecotourism development perspectives. *Journal of Tropical Life Science*, *7*(3), 277–285.

Henri, H., & Ardiawati, S. (2020). Ecotourism development of Munjang mangrove forest and conservation efforts based on community approach. *BIOLINK (Jurnal Biologi Lingkungan Industri Kesehatan)*, *7*(1), 106–116. https://doi.org/10.31289/biolink.v7i1.2952

Hochard, J.P., Hamilton, S., & Barbier, E.B. (2019). Mangroves shelter coastal economic activity from cyclones. *Proceedings of the National Academy of Sciences*, *116*(25), 12232–12237. https://doi.org/10.1073/pnas.1820067116

Joandani, G.K.J., Pribadi, R., & Suryono, C.A. (2019). Kajian potensi pengembangan ekowisata sebagai upaya konservasi mangrove di Desa Pasar Banggi, Kabupaten Rembang. *Journal of Marine Research*, *8*(1), 117–126. https://doi.org/10.14710/jmr.v8i1.24337

Kathiresan, K. (2021). Mangroves: Types and importance. *Mangroves: Ecology, Biodiversity and Management*, 1–31. https://doi.org/10.1007/978-981-16-2494-0_1

Kete, S.C.R. (2016). *Pengelolaan Ekowisata Berbasis Goa: Wisata Alam Goa Pindul*. Deepublish.

Kurniawati, E., Sumarmi, S., & Aliman, M. (2020). Participation of Green Environmental Group and Ulur-ulur Local Wisdom on Buret Lake Ecotourism Management in Karst Area of Tulungagung, Indonesia. *GeoJournal of Tourism and Geosites*, *30*(2 supplement), 889–895. https://doi.org/10.30892/gtg.302spl15-519

Kusmana, C. (2014). Distribution and current status of mangrove forests in Indonesia. *Mangrove Ecosystems of Asia: Status, Challenges and Management Strategies*, 37–60. https://doi.org/10.1007/978-1-4614-8582-7_3

Leal Filho, W., Alam, G.M., Nagy, G.J., Rahman, M.M., Roy, S., Wolf, F., Kovaleva, M., Saroar, M., & Li, C. (2022). Climate change adaptation responses among riparian settlements: A case study from Bangladesh. *Plos One*, *17*(12), e0278605. https://doi.org/10.1371/journal.pone.0278605

Lovelock, C.E., & Reef, R. (2020). Variable impacts of climate change on blue carbon. *One Earth*, *3*(2), 195–211. https://doi.org/10.1016/j.oneear.2020.07.010

Marasabessy, I., Fahrudin, A., Imran, Z., & Agus, S.B. (2018). Strategi Pengelolaan Berkelanjutan Pesisir dan Laut Pulau Nusa Manu dan Pulau Nusa Leun di Kabupaten Maluku Tengah. *Journal of Regional and Rural Development Planning (Jurnal Perencanaan Pembangunan Wilayah Dan Perdesaan)*, *2*(1), 11–22. https://doi.org/doi:10.29244/jp2wd.2018.2.1.11-22

Parela, A. (2020). *Analisis multitemporal degradasi mangrove di area ekowisata mangrove bedul, banyuwangi menggunakan citra sentinel-2A* [Universitas Gadjah Mada]. http://etd.repository.ugm.ac.id/penelitian/detail/191226

Purwanti, P., Fattah, M., Qurrata, V.A., & Narmaditya, B.S. (2021). An Institutional Reinforcement Model for the Protection of Mangroves Sustainable Ecotourism in Indonesia. *GeoJournal of Tourism and Geosites*, *35*(2), 471–479. https://doi.org/10.30892/gtg.35227-674

Rudianto, R., Bengen, D.G., & Kurniawan, F. (2020). Causes and effects of mangrove ecosystem damage on carbon stocks and absorption in East Java, Indonesia. *Sustainability*, *12*(24), 10319. https://doi.org/10.3390/su122410319

Saifullah, S., & Harahap, N. (2013). Strategi pengembangan wista mangrove di â€ øeBlok Bedulâ€ Taman Nasional Alas Purwo Kabupaten Banyuwangi Jawa Timur. *Journal of Indonesian Tourism and Development Studies*, *1*(2), 79–86.

Salam, M.A., Lindsay, G.R., & Beveridge, M.C. (2000). Eco-tourism to protect the reserve mangrove forest the Sundarbans and its flora and fauna. *Anatolia*, *11*(1), 56–66. https://doi.org/10.1080/13032917.2000.9686983

Song, F., Su, F., Mi, C., & Sun, D. (2021). Analysis of driving forces on wetland ecosystem services value change: A case in Northeast China. *Science of The Total Environment*, *751*, 141778. https://doi.org/10.1016/j.scitotenv.2020.141778

Sumarmi, S., Arinta, D., Suprianto, A., & Aliman, M. (2021). The development of ecotourism with community-based tourism (CBT)in clungup mangrove conservation (CMC) of tiga warna beach for sustainable conservation. *Folia Geographica*, *63*(1), 123–142.

Sumarmi, S., Bachri, S., Purwanto, P., Zubaidah, S., Shrestha, R.P., & Sholiha, A.W. (2022). Assessing Bedul Mangrove Ecotourism Using Green and Fair Strategy Empowerment to Fulfill SDGs 2030 Agenda for Tourism. *Environmental Research, Engineering and Management*, *78*(2), 73–87. https://doi.org/10.5755/j01.erem.78.2.31006

Sumarmi, S., Bachri, S., Sholeha, A.W., Kurniawati, E., Hakiki, A.R., & Hidiyah, T.M. (2023). Development Strategy for Special Interest Tourism (SIT) Through Community-Based Ecotourism (CBET) in Perawan Beach to Promote a Sustainable Economy. *GeoJournal of Tourism and Geosites*, *48*(2 supplement), 696–708. https://doi.org/10.30892/gtg.482spl03-1069

Sumarmi, S., Kurniawati, E., & Aliman, M. (2020). Community Based Tourism (CBT) to Establish Blue Economy and Improve Public Welfare for Fishing Tourism Development in Klatak Beach, Tulungagung, Indonesia. *GeoJournal of Tourism and Geosites*, *31*(3), 979–986. https://doi.org/10.30892/gtg.31307-530

Thuy, P.T., Phuong, V.T., Chien, P.D., Trang, D.L.H., Truong, N.V., Hoa, H.N.V., Long, H.T., Chi, D.T.L., & Tien, N.D. (2019). *Opportunities and challenges for mangrove management in Vietnam: Lessons learned from Thanh Hoa, Thai Binh and Quang Ninh provinces*. CIFOR.

Tjahjono, A., Adi Intyas, C., & Fattah, M. (2022). Mangrove Management Strategy For Sustainable Business Based On Indonesian Ecological Products. *GeoJournal of Tourism and Geosites*, *43*(3), 1045–1055. https://doi.org/10.30892/gtg.43325-919

Valenzuela, R.B., Yeo-Chang, Y., Park, M.S., & Chun, J.N. (2020). Local People's Participation in Mangrove Restoration Projects and Impacts on Social Capital and Livelihood: A Case Study in the Philippines. *Forests*, *11*(5), 580. https://doi.org/10.3390/f11050580

Vo, Q.T., Künzer, C., Vo, Q.M., Moder, F., & Oppelt, N. (2012). Review of valuation methods for mangrove ecosystem services. *Ecological Indicators*, *23*, 431–446. https://doi.org/10.1016/j.ecolind.2012.04.022

Wang, Y.S., & Gu, J.D. (2021). Ecological responses, adaptation and mechanisms of mangrove wetland ecosystem to global climate change and anthropogenic activities. *International Biodeterioration & Biodegradation*, *162*, 105248. https://doi.org/10.1016/j.ibiod.2021.105248

Worthington, T.A., Andradi-Brown, D.A., Bhargava, R., Buelow, C., Bunting, P., Duncan, C., Fatoyinbo, L., Friess, D.A., Goldberg, L., & Hilarides, L. (2020). Harnessing big data to support the conservation and rehabilitation of mangrove forests globally. *One Earth*, *2*(5), 429–443. https://doi.org/10.1016/j.oneear.2020.04.018

Article history: Received: 27.10.2023 Revised: 08.12.2023 Accepted: 10.01.2024 Available online: 02.02.2024