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MANGROVE EDUCATIONAL TOURISM DESIGN WITH SUSTAINABLE ARCHITECTURE APPROACH IN PANTAI KAMPUNG NIPAH, SERDANG BEDAGAI

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Abstract

Mangrove educational tourism offers an in-depth understanding of the ecologically, economically, and socially valuable mangrove ecosystem. Indonesia, with the largest mangrove ecosystem in the world, faces the challenge of mangrove destruction due to irresponsible land conversion. Conservation efforts through educational tourism can improve the local economy and reduce carbon emissions. A sustainable approach to planning and development, involving the principles of eco-friendly architecture, is essential to protect and restore coastal ecosystems. The implementation of energy strategies, water and waste management, and cultural preservation in the design of tourism villages will ensure environmental sustainability and community well-being. Intensive environmental studies and education can raise global awareness of the importance of mangroves, support sustainable tourism, and contribute to greenhouse gas emission reduction targets.

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Keywords

Educational Tourism, Mangrove, Sustainable Architecture

1. Introduction

Educational tourism is a form of tourism that aims to provide understanding or knowledge about the tourism sector being visited. (Hermawan, et al., 2021) With the presence of educational facilities in a tourist area, it will increase tourists' knowledge about new understanding, in this case understanding about mangroves. Mangroves are an ecosystem that has very valuable value in terms of ecology, economy, and social. At the local level, mangroves provide various ecosystem services such as food sources and livelihoods for local communities. Globally, mangroves have great potential in reducing climate change because of their great ability to store carbon. By understanding that stopping carbon emissions stored in mangroves can make a significant contribution to achieving the target of reducing greenhouse gas emissions. (Nurhati & Murdiyarso, 2023) Based on this statement, mangrove educational tourism can improve the economy of people living around the coast.

According to the Ministry of Environment and Forestry's Public Relations Data in 2017, Indonesia has the largest mangrove ecosystem in the world and a high level of biodiversity. According to research by the North Sumatra Environmental Agency in 2013, around 90% of mangrove forests in North Sumatra are in a fairly severe state of damage. The main cause of this damage is the change in land use into oil palm plantations covering 12,000 hectares and ponds covering 10,000 hectares. Continuous and irresponsible use of mangrove forests can threaten the sustainability of the mangrove forest ecosystem. However, development can still be carried out without damaging the coastal ecosystem and mangrove forests by following appropriate planning guidelines, which involve attention to the functions of coastal and marine ecosystems. This includes designing green zones along the coast, preserving green mangrove forest belts to protect the coast, maintaining the life cycle of coastal aquatic biota such as fish, shrimp, shellfish, and turtles, as well as protecting coral reefs, seaweed, and preventing seawater intrusion. (Harefa, et al., 2020) With the right and sustainable approach, development can be carried out without damaging mangrove

Jurnal Ilmiah Sain dan Teknologi

ecosystems, which are not only important for biodiversity, but also for human well-being that depends on healthy coastal ecosystems.

Mangrove studies as educational and learning facilities are very important in the context of environmental education and sustainable tourism today. As the global community grapples with the urgent need for conservation and awareness in the face of climate change and biodiversity loss, mangrove ecosystems are important areas for exploration. (Verawati & Idrus, 2023) To create a mangrove forest that becomes an educational tourism attraction, a planned effort is needed that involves all parties to better understand and care about the important role of mangrove forests in human life. This can be achieved through educational steps for tourists and local residents around the area, with the aim of maintaining and preserving the existence of mangrove forests. (Rijal, et al., 2020) The statement about the importance of mangroves as educational facilities strengthens my reasons for building educational tourism in the mangrove area.

The sustainable architecture approach is a concept in building design that not only considers the comfort of its occupants, but also takes into account its impact on the environment. The principles of sustainable architecture are very important today, requiring a shared awareness to develop environmentally friendly and sustainable buildings, by reducing the drive to seek profit alone. Sustainable architecture has long-term benefits for all parties without sacrificing the beauty and aesthetics of the building. The main goal is to restore the earth and the environment in which we currently live. (Mu'min & Satwikasari, 2020) The principles of sustainable architecture, as explained by Ardiani (2016) and Sassi (2006), in the book Sustainable Architecture: Sustainable Architecture, include various important aspects in designing environmentally friendly buildings, namely Urban Ecology, Energy Strategy, Water, Waste, Materials, Environmental Community, Economic Strategy, Cultural Preservation, and Operational Management. These principles will later be applied to tourist villages that will be designed in order to create spaces that are not only comfortable but also environmentally friendly and have long-term benefits.

The design location will be carried out at the Mangrove Beach, Nipah Village, Serdang Bedagai Regency. The Mangrove forest ecosystem at Nipah Village Beach, Serdang Bedagai Regency has an area of ± 9 Ha. (Harefa, et al., 2020) The characteristics of mangrove tourism visitors in Nipah Village have an average age of around 21.82 years, with the majority having an educational background ranging from high school to college. The natural beauty of the Mangrove Tourism Object in Nipah Village is considered 'beautiful' by tourists. They can enjoy the beach atmosphere and feel the natural beauty of the Mangrove ecosystem around the beach. This is in accordance with the statement that natural beauty is one of the main natural attractions to attract visitors. (Purwoko, et al., 2023) The mangrove ecosystem is the main natural attraction on this beach, so it will be very effective if educational tourism with a sustainable architecture approach is applied to this location.



Jurnal Ilmiah Sain dan Teknologi

2. Literature Review

This literature review covers studies on mangrove educational tourism, sustainable architecture, and their integration as a foundation for developing a sustainable educational space.

2.1. Mangrove Educational Tourism

Suwantoro (1997) classifies educational tourism into four types, namely:

a) Educational Tourism Science / Science;

Science Educational Tourism is educational tourism based on science. This tour prioritizes information about the science obtained by tourists after traveling.

b) Sport / Sports Educational Tourism;

Sport / Sports Educational Tourism is educational tourism based on physical education or sports.

c) Culture Educational Tourism;

Culture Educational Tourism is also called Cultural Educational Tourism. This tour presents cultural education in the fields of art, customs and others related to culture.

d) Agribusiness Educational Tourism;

This educational tour is based on agro-ownership or agriculture and animal husbandry which is also the business of a company or individual.

In this case, mangrove educational tourism is included in the type of science-based educational tourism. Because in its application, this tour will tend to prioritize education or knowledge about the surrounding nature, especially the mangrove ecosystem. The type of activity in a group of activities is the basis for determining the space needed. Activity actors consist of the manager and the visitors. The manager is the person in charge of managing building operations including building maintenance. While the visitors are people who are visiting tourist attractions enjoying the facilities available while learning.

In the Educational Tourism Area, space requirements can be divided into four main groups (Irawan et al., 2020):

1. Public Facilities: Space required for activities that are accessible to all visitors.

2. Supporting Facilities: Spaces that support activities in public facilities.

3. Management Activities: Space required for tourism management and management activities.

4. Services: Space required for service activities to visitors.

No.	Name (Source)	Definition
1.	(Akhil & Kurniawan, 2021)	Mangrove Educational Tourism is tourism that has various educational potentials such as a closer introduction to nature, the availability of unique and prominent flora and fauna, the existence of tour guides, and the existence of unique customs in tourist attractions.
2.	UN Tourism	Educational tourism encompasses a type of travel where the primary motivation is the traveler's involvement and experience in learning, self-

Table 1 Definition of Mangrove Educational Tourism

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Jurnal Ilmiah Sain dan Teknologi

	improvement, intellectual growth and skill development. Educational tourism represents a wide range of products and services related to academic studies, skill-building vacations, school trips, sports training, career development courses and language courses, to name a few.
(Prasetyo, Manik, & Riyanti, 2021)	Educational tourism is a tourism activity in which tourists spend their vacation time traveling for the purpose of education and learning, either as the main focus or as one of the objectives.
(Purwanti, Utomo, Indrayani, & Fattah, 2020)	Mangrove educational tourism is tourism with activities that have the aim of raising awareness to the community, especially the younger generation in the mangrove forest area, of the importance of the benefits of mangrove vegetation for coastal ecosystems.

2.2. Sustainable Architecture

Sustainable architecture is a concept that is the basis for designing buildings that consider various environmental, social, and economic aspects. There are several definitions to understand what is meant by sustainable architecture.

No.	Name (Source)	Definition
1.	(Steele, 1997)	Architecture designed to meet the needs of the present without compromising the ability of future generations to meet their own needs. These needs vary between communities and regions, and are best determined by local people.
2.	(Mu'min & Satwikasari, 2020) (Pandu & Anggana, 2020)	The concept of designing a building that not only considers the comfort of its occupants, but also takes into account its impact on the environment that has long-term benefits for all parties without sacrificing the beauty and aesthetics of the building.
3.	(Kurniawan P., 2020)	Sustainable architecture is the application of concepts in architecture that support the principle of sustainability, i.e. keeping natural resources available for longer. The concept relates to the lifetime of the vital potential of natural resources and the human ecological environment, including agricultural, industrial, forestry and architectural systems.
4.	(Hidayatulloh & Anisa, 2021)	Sustainable architecture is an idea in architecture that emphasizes development that takes care of the environment.

 Table 2 Definition of Sustainable Architecture



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The principles of sustainable architecture, as explained by Ardiani (2016) and Sassi (2006), in the book Sustainable Architecture: Sustainable Architecture, cover various aspects that are important in designing environmentally friendly buildings. Ardiani (2015) outlines nine main principles in sustainable architecture, namely urban ecology, energy strategy, water management, waste management, material use, community participation, economic strategy, cultural preservation, and operational management. A brief explanation of each principle follows:

- a) Urban Ecology: This principle emphasizes the importance of maintaining the sustainability of urban ecosystems to ensure the survival of people, animals and plants and preserve nature for future generations.
- b) Energy Strategy: This principle aims to reduce energy consumption or reuse wasted energy and make efficient use of renewable energy sources, both through technology and nontechnological practices.
- c) Water Management: This principle emphasizes saving water and reusing water for sustainable use.
- d) Waste Management: This principle advocates the reduction, management and recycling of waste in its various forms (liquid, solid and gas).
- e) Material Use: This principle underscores the importance of using materials that are safe, environmentally friendly, and recyclable without jeopardizing the health of residents and do not pollute the environment during the manufacturing process.
- f) Community Participation: This principle emphasizes the importance of community participation in sustainable development, creating environmental awareness and promoting the formation of sustainable communities.
- g) Economic Strategy: This principle involves opening up opportunities for small or medium enterprises to support the local economy and reduce dependence on large economies.
- h) Cultural Preservation: This principle emphasizes the importance of preserving a nation's cultural heritage, traditions and identity as part of sustainable development.
- i) Operational Management: This principle covers maintenance and user knowledge of the systems and technologies used in buildings to ensure that they function properly and efficiently.

2.3. Mangrove Educational Tourism with Sustainable Architecture Approach

Mangrove educational tourism that applies a sustainable architecture approach is an initiative that integrates tourism infrastructure development by considering environmental, social, and economic aspects. In this case, the use of sustainable architecture principles guides the design and development of the space program for the mangrove tourism destination.

The Information and Education Center and Nature Laboratory form an important part of the infrastructure, providing opportunities for visitors to learn first-hand about the mangrove ecosystem and its important impact on the coastal environment. Tourist trails and exploration areas are designed to provide visitors with an interactive experience, while keeping in mind the preservation of the natural environment.

Support facilities, such as canteens and rest areas, are also taken into account by considering the principles of energy efficiency and waste management. In addition, interactive areas and workshops allow for a deeper understanding of mangroves through seminars and training activities, in line with the principle of community participation in sustainable development. The culture and tradition space is an important place to introduce cultural aspects and local values to visitors, in line with the principle of cultural preservation in sustainable architecture. As a result, mangrove educational tourism that applies a

Jurnal Ilmiah Sain dan Teknologi

sustainable architecture approach not only provides a pleasant recreational experience, but also aims to raise environmental awareness and promote sustainability in mangrove ecosystem management.

3. Methodology



Figure 1 Method/Approach

This study uses a qualitative method with a literature review approach or comparative study, where the problem analysis is carried out through a literature study related to the design of mangrove educational tourism with a sustainable architecture approach. In a comparative study with objects that have similar functions and themes, the author reviewed several journals from Google Scholar and supporting literature from related books. This study was then analyzed and linked to comparative objects obtained from the Archdaily site, by tracing the existing architectural elements to determine the type of sustainable architectural approach applied and to compile an appropriate space program. The purpose of this study is to design an educational tourism concept that focuses on preserving the mangrove ecosystem, as well as applying the principles of sustainable architecture to create an environmentally friendly and sustainable space. Thus, this study seeks to develop solutions that not only support ecological sustainability, but also provide economic and social benefits to the local community.

4. Findings

The application of sustainable architecture in buildings aims to create a comfortable atmosphere and pay attention to environmentally friendly development, by maximizing the use of available natural potential. Utilization of plants and water to regulate air temperature, energy efficient development, and the use of easily obtained building materials. (Kurniawan &Pamungkas, 2020) In the design of mangrove educational tourism, the application of sustainable architecture principles allows the use of mangrove plants and water to regulate air temperature and enhance the beauty of the environment. Energy-efficient development and the use of easily obtained building materials will reduce environmental impacts and speed up the construction process. This not only creates an attractive environment for visitors, but also contributes to the preservation of the mangrove ecosystem and the environment as a whole.

Jurnal Ilmiah Sain dan Teknologi

5. Discussion

This research uses two types of comparative studies: functional, focusing on projects with similar uses and thematic, analyzing projects with similar architectural themes, and These studies provide relevant insights for the design approach.

5.1. Comparative Study of Similar Functions

Three comparative studies were selected based on their similar function as mangrove educational tourism facilities, namely Wisata Kebun Raya Mangrove Surabaya, Mangrove Centre Graha Indah, and Bontang Mangrove Park. These case studies were analyzed to understand space requirements, main activities, and methods of presenting educational information to visitors.

Space Program		Wisata Kebun	Mangrove	Bontang
		Raya	Centre Graha	Mangrove
		Mangrove	Indah	Park
		Surabaya		
Information and Ed	lucation Center	\checkmark	-	-
Library		\checkmark	-	-
Natural Laboratory		\checkmark	-	-
Tourist Trails and H	Exploration Areas	\checkmark	\checkmark	\checkmark
Supporting	Canteen	\checkmark	-	\checkmark
Facilities	Rest area	\checkmark	\checkmark	\checkmark
	Prayer Room	\checkmark	\checkmark	\checkmark
	Toilet	\checkmark	\checkmark	\checkmark
Interactive Area and	d Workshop	\checkmark	\checkmark	\checkmark
Cultural and Tradit	ion Space	-	-	-
Monitoring Towe	er or Surveillance	\checkmark	\checkmark	\checkmark
Room				
Suspension bridge		\checkmark	-	-
Auditorium		\checkmark	-	-
Merchandise		\checkmark	-	-
Management Office		\checkmark	-	-
Living Area		-	\checkmark	-
Nursery Area		-	\checkmark	-
Gazebo		-	-	\checkmark
Additional	Electric Car	\checkmark	-	-
Facilities	Tour Boat	\checkmark	\checkmark	-
	Water Bike	\checkmark	-	-
	Photo Spot	\checkmark	-	
	Playground	\checkmark	-	
	Fishing Pond	-	-	
	Mini Zoo	-	-	

Table 3 Comparison of Space Programs between Case Studies

Jurnal Ilmiah Sain dan Teknologi

Based on the comparison table of space programs that have been provided, it can be concluded that the Mangrove Educational Tour that will be built according to the potential of the location will meet the requirements of the space program in accordance with existing regulations for Mangrove Educational Tour. In addition, there will be additional space programs for outdoor activities for visitors. The overall space program of the resort that will be designed includes:

- 1. Information and Education Center
- 2. Natural Laboratory
- 3. Tourist Trails and Exploration Areas
- 4. Canteen
- 5. Rest Area
- 6. Prayer Room
- 7. Toilet
- 8. Interactive Area and Workshop
- 9. Watchtower
- 10. Merchandise
- 11. Management Office
- 12. Guest Area
- 13. Nursery Area
- 14. Gazebo
- 15. Library

Additional Space Program:

- 16. Tour Boat
- 17. Photo Spot

5.2. Comparative Study of Similar Themes

Three comparative studies with similar themes of sustainable architecture were selected for analysis to see the application of environmentally friendly principles in various project contexts. The similarity of these themes provides a relevant picture of the design approach carried out in the design.

Comparison	Ágape Productive	KAKR Bamboo Hall	Sustainable Weekend
Factors	Housing	Buluh Awar	Villa
Interaction with the Environment	ÁgapeColectivo exemplifies sustainable design by harmonizing with its natural surroundings. It features pedestrian- friendly spaces, efficient water management systems,	KAKR Bamboo Hall uses local bamboo and natural ventilation to reduce environmental impact and energy use. Serving as both a multifunctional space and education center, it promotes bamboo	This tropical villa harmonizes with its environment by considering wind, rainfall, and sunlight for comfort. Its green garden and use of local plants enhance connection to

Table 4 Comparative Study of Similar Themes

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	Jurnal Ilmiah S	ain dan Teknologi	
	and a façade that provides natural shading. The building serves as a functional therapeutic space while promoting environmental awareness.	conservation and sustainable building, benefiting the ecosystem and community.	the ecosystem, offering a peaceful, sustainable living experience.
Use of Types and Types of Materials	ÁgapeColectivo uses wood, earth, metal, and ceramics to support sustainable construction. It recycles rainwater and greywater for irrigation and treats blackwater with a biodigester, reflecting its commitment to environmental sustainability.	KAKR Buluh Awar Hall uses bamboo as the main material in its construction. The abundant bamboo growth around this village is utilized for the development needs of BuluhAwar village. Bamboo material is very strong if processed properly and correctly.	The villa uses wood, bamboo, concrete, and rice husks to balance sustainability and aesthetics. Wood and bamboo create a warm feel, concrete adds strength, and rice husks help control temperature and protect the roof, blending natural beauty with eco-friendly design.
Construction Technology	The building utilizes local materials and vernacular construction technologies. The bahareque construction process was modernized by using a mortar projecting gun with a compressor, allowing the use of soil mixtures in less time and with better compression.	KAKR Bamboo Hall combines traditional and modern techniques to optimize bamboo as an eco-friendly material. Preservation methods enhance its durability, while natural ventilation and locally adapted foundations support a cool, energy-efficient structure.	This tropical villa in Ho Tram applies bioclimatic design, aligning with wind, sun, and rain patterns for comfort. Its T-shaped layout includes an open living space and a climate-controlled section with rice husk insulation. Thoughtful lighting and local landscape choices enhance mood, biodiversity, and sustainability.

Jurnal Ilmiah Sain dan Teknologi

Based on comparative studies related to similar themes, it can be concluded that several concepts in the Mangrove Educational Tourism design with a sustainable architectural approach are:

- a. The concept of sustainability is very important for the stability of the surrounding environment. With a design that takes into account aspects of sustainability and user needs, the landscape of the Mangrove Educational Tour with the building will be well integrated.
- b. The use of efficient construction technology and attention to user comfort.
- c. The use of sustainable materials in buildings such as wood, bamboo, or other materials that are easily obtained in the surrounding environment and do not damage nature. Open spaces or outdoor areas also use sustainable materials.

6. Conclusion

This study highlights the importance of mangrove educational tourism in increasing understanding of the ecological, economic, and social values of mangrove ecosystems in Indonesia. A sustainable approach in planning and development, by integrating the principles of environmentally friendly architecture, is essential to protect and restore coastal ecosystems.

The comparative study of similar functions reveals varied spatial focuses, emphasizing the need for flexible, context-sensitive design. Meanwhile, the comparative study of similar themes demonstrates the consistent application of sustainable strategies—such as the use of local materials and passive design principles—providing valuable references for the development of environmentally friendly tourism facilities.

Recommendations include the development of a comprehensive educational program, the application of sustainable architecture principles, diversification of facilities, effective management of natural resources, involvement of local communities, and the implementation of a sustainable monitoring and evaluation system. By following these recommendations, it is hoped that Mangrove Educational Tourism can become a pilot model for sustainable mangrove ecosystem management and provide benefits to the surrounding community.



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References

- Akhil, A., & Kurniawan, E. (2021). Analisis Potensi Obyek Wisata Hutan Mangrove Pandansari Sebagai Eduwisata/Wisata Edukasi di Desa Kaliwlingi Kecamatan Brebes Kabupaten Brebes. *Edu Geography*, 78-88.
- Arieza, U. (2023). *Panduan Wisata Kebun Raya Mangrove Surabaya*. Dipetik April 6, 2024, dari https://travel.kompas.com/read/2023/07/31/124000827/panduan-wisata-kebunraya-mangrove-surabaya-?page=all
- Harefa, M., Bobby, P., Amri, S., & Andre, K. (2020). Analisis Konservasi Ekosistem Hutan Mangrove Daerah Pesisir Kampung Nipah Kecamatan Perbaungan. Jurnal Georafflesia , 112-121.
- Hasan, V. (2023). *Ekosistem Hutan Mangrove*. Dipetik April 6, 2024, dari https://unair.ac.id/ekosistem-hutan-mangrove/
- Hermawan, Y., Hidayatullah, S., Alviana, S., Hermin, D., & Rachmadian, A. (2021). Pemberdayaan Masyarakat Melalui Wisata Edukasi dan Dampak yang didapatkan Masyarakat Desa Pujonkidul. *Edusia: Jurnal Ilmiah Pendidikan Asia*, 1 (1), 1-14.
- Hidayatulloh, S., & Anisa. (2021). KAJIAN PRINSIP ARSITEKTUR BERKELANJUTAN PADA BANGUNAN PERKANTORAN (STUDI KASUS: MENARA BCA JAKARTA). *MEDIA MATRASAIN, 18* (1), 89-97.
- Hogart, P. (2015). *The Biology of Mangroves and Seagrasses* (3rd ed.). Oxford: Oxford University Press.
- Husnatarina, F., Jasiah, Arianti, S., Minggawati, I., Nugraha, S., & Sumiatie. (2022). Desa Bukit Bamba: wisata edu dan wisata kesehatan. *Masyarakat Berdaya dan Inovasi, 3* (1), 36-41.
- Kurniawan, R., & Pamungkas, L. (2020). PENERAPAN ARSITEKTUR BERKELANJUTAN (SUSTAINABLE ARCHITECTURE) PADA PERANCANGAN TAMAN BUDAYA DI KABUPATEN SLEMAN. JURNAL ARSITEKTUR GRID – Journal of Architecture and Built Environment, 2 (1), 35-39.
- Mu'min, P., & Satwikasari, A. (2020). KAJIAN KONSEP ARSITEKTUR BERKELANJUTAN PADA BANGUNAN PUSAT PERBELANJAAN : MAL CILANDAK TOWN SQUARE. *Jurnal Arsitektur Zonasi, 3* (2).
- Nurhati, I., & Murdiyarso, D. (2023). Strategi Nasional Pengelolaan Ekosistem Mangrove: Sebagai Rujukan Konservasi dan Rehabilitasi Kawasan Pesisir untuk mencapai Tujuan Pembangunan Berkelanjutan dan Pembangunan Rendah Karbon. *CIFOR-ICRAF Working Paper*, 1-19.
- Pandu, A., & Anggana, F. (2020). KAJIAN KONSEP ARSITEKTUR BERKELANJUTAN PADA BANGUNAN PUSAT PERBELANJAAN : MAL CILANDAK TOWN SQUARE. Jurnal Arsitektur Zonasi, 3 (2), 142-151.
- Prasetyo, D., Manik, T., & Riyanti, D. (2021). Pemanfaatan Museum Sebagai Objek Wisata Edukasi. *Kepariwisataan: Jurnal Ilmiah, 15* (1), 1-11.
- Purwanti, P., Utomo, T., Indrayani, E., & Fattah, M. (2020). Peran Perguruan Tinggi Dalam Penguatan Pengelolaan Wisata Edukasi "Mangrove Pancer Cengkrong" Kabupaten Trenggalek. *Journal of Innovation and Applied Technology*, 6 (1), 954-959.
- Purwoko, A., Hartini, K., Basyuni, M., & Situmorang, M. (2023). Community-Based Mangrove Tourism Object Development in Kampung Nipah, North Sumatera, Indonesia. Universal Journal of Agricultural Research, 241-254.
- Rahim, S., & Baderan, D. (2017). *Hutan Mangrove Dan Pemanfaatannya* (1st ed.). Gorontalo: Deepublish.
- Rijal, S., Zainal, F., & Badollahi, M. (2020). Potensi Hutan Mangrove Sebagai Daya Tarik Wisata (Studi Kasus Pada Hutan Mangrove Idaman, Kec. Tarowang, Kab. Jeneponto,

Scientica

Jurnal Ilmiah Sain dan Teknologi

- Prov. Sulawesi Selatan. Journal of Tourism, Hospitality, Travel and Busines Event, 153-159.
- Sari, A. (2023, May 24). Hutan Mangrove : Pengertian , Fungsi , Ciri-ciri dan Manfaatnya. Dipetik April 6, 2024, dari https://faperta.umsu.ac.id/2023/05/24/hutan-mangrovepengertian-fungsi-ciri-ciri-dan-manfaatnya/
- Steele, J. (1997). Sustainable Architecture: Principles, Paradigms, and Case Studies (1 ed.). Los Angeles: McGraw-Hill.
- Tanggok, M. (2018). Buddhist and Confucian Relations in Indonesia: Conflict over the Ownership, Name and Function of Chinese Temples (Kelenteng). Proceedings of the 1st International Conference on Recent Innovations, (hal. 1683–1690).
- Trisbiantoro, D., Kusyairi, A., & Mansur, S. (2020). ANALISIS POTENSI OBYEK EKOWISATA MANGROVE GUNUNG ANYAR, KELURAHAN GUNUNG ANYAR TAMBAK, KECAMATAN GUNUNG ANYAR, SURABAYA. Jurnal TECHNO-FISH, 4 (1), 52-71.
- Verawati, N., & Idrus, A. (2023). Mangrove Ecotourism as an Education and Learning Facility. *Jurnal Ilmiah Biologi*, 1409-1419.

