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DEVELOPMENT OF GEO-SPORT TOURISM MODEL FOR PARAGLIDING AT MODANGAN BEACH FOR SUSTAINABLE ENVIRONMENTAL MANAGEMENT

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Abstract: The integration of geotourism and sports tourism is frequently observed in coastal areas. Modangan Beach is one of the locations that has successfully integrated the concepts of geotourism and sports tourism. This study aimed to (1) analyse the physical conditions that support Geo-Sport Tourism at Modangan Beach; (2) analyse the social conditions that support Geo-Sport Tourism at Modangan Beach; (3) analyse the strengths, weaknesses, opportunities, and challenges in the development of Geo-Sport Tourism at Modangan Beach; and (4) develop a Geo-Sport Tourism Model for sustainable environmental management at Modangan Beach. The analysis of quantitative data involved tabulation, percentage, and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. Meanwhile, the qualitative data were analysed using an interactive analysis model by Miles and Huberman. The results indicated that Waung Hill faces Modangan Beach directly and wind conditions with consistent wind speeds pointing toward the sea significantly support paragliding activities. In addition, the beach's length and breadth are ideal for paragliding landings. The social conditions of paragliding management, homestay owners, shop managers, and motorcycle transport drivers are very supportive of Modangan Beach's development. This geographical condition is extremely conducive to the growth of sport tourism on Modangan Beach. The SWOT analysis results indicated Quadrant 1, suggesting that the Geo-Sport Tourism Model at Modangan Beach is suitable for sustainable environmental management.

Keywords: Geo-Sport Tourism, sustainable management, sport tourism, paragliding.

Introduction

Malang Regency has several famous beaches, including Licin Beach, Sipelot Beach, Lenggoksono Beach, Perawan Beach, Sendiki Beach, Tamban Beach, Sendang Biru Beach, Clungup Beach, Goa China Beach, Ungapan Beach, Bajulmati Beach, Batu Bengkung Beach, Watu Leter Beach, Balekambang Beach, Kondang Merak Beach, Ngliyep Beach, Bantol Beach, Jaelangkung Beach, Jonggring Saloko Beach, and Modangan Beach. Some of these beaches have been developed and managed over a considerable period. In particular, after the construction of the Southern Route (Jalur Lintas Selatan - JLS) in Malang Regency, several beaches have developed significantly. This road's construction is vital for the community of the southern region of East Java to stay updated with the development of the north coast area. Thus, by facilitating access to the coast, the construction of the JLS has enabled the development of potentially productive areas. This has positively affected the community's socioeconomic conditions, including the development of nature tourism.

In recent years, the development of nature tourism in Indonesia has increased significantly. Geotourism is one example of this development. Notably, geotourism is a form of tourism that

utilises geodiversity for tourism activities in order to meet environmental conservation goals, geo-heritage preservation objectives, and educational goals (Li *et al*., 2022). Moreover, geotourism can be implemented alongside other forms of tourism since physical tourism activities can be conducted in geotourism areas (Mohamadianmansoor & Khanian, 2022). Sports tourism or tourism combined with sports activities is one of the tours that can be incorporated with geotourism (Mollah *et al*., 2021).

Sports tourism significantly impacts tourism and the natural environment in the context of nature tourism. Through sports tourism, tourists can become more aware of the impact of their actions when visiting natural tourist attractions (Bouchet *et al*., 2004). This can be accomplished through training, warning signs, literacy programs, and other forms of eco-education provided by visitor centres (Newland *et al*., 2021). Building on this, sports tourism has evolved into more than just a novel method of participating in sporting activities. In contrast, this could be an alternative economic development incorporating sport and tourism. Furthermore, sports tourism in environmental conservation areas can boost ecological protection and development in tourist attraction areas (Li *et al*., 2022). That is, sports tourism events can increase the number of tourists since they can serve as a source of information to increase the enthusiasm for tourist visits, attract repeat visits, and recommend tourism. All of these factors can impact the economic and social well-being of people in tourist areas.

However, sports tourism development requires a strong partnership between the government, the community, and business sectors to maintain effective geographic conditions and achieve sustainable development goals (Chang *et al*., 2020). In essence, sports tourism development, with the correct synergy between multiple stakeholders can increase the economy while still paying attention to environmental concerns and raising awareness of the need for nature protection (Bouhaouala, 2022).

Geography provides information about location, spatial phenomena, human interaction with the environment, as well as distance, altitude, location, and climate conditions suitable for sports activities (Ilieș *et al*., 2014). Additionally, the landscape and landshaft of the sports hall and the analysis of the surrounding area have a significant impact on the way in which visitors can experience sports tourism (Wise & Kohe, 2020).

The geotourism and sport tourism approaches have proven effective in geological conservation and regional development since they prioritise environmental sustainability while conducting infrastructure development oriented toward regional progress (Rohaendi *et al*., 2021). In addition, geotourism is closely associated with adventure tourism, which utilises geological features for mountaineering, rock climbing, and other extreme sports (Middleton *et al*., 2009). For instance, karst geological areas can be packaged as karst recreational park geotourism by providing sport tourism facilities and sporting events to support protection initiatives and the development of sustainable geo-conservation in the area (Antić *et al*., 2022).

Most previous studies have focused on developing geotourism and sports tourism separately without integrating these concepts in the context of coastal areas. This gap includes a lack of exploration of how synergies between geotourism and sports tourism can drive environmental sustainability and create positive socioeconomic impacts. Specifically, the difference between this study and previous research is the integration of geography and sports tourism in the coastal areas. Furthermore, the development of this research also examines the strategies used for geotourism development strategies. Geotourism can be implemented with a promotional strategy by conducting cultural events and adding tourist attractions in sports so that tourists are interested in visiting these geotourism objects (Ginting & Anggaly, 2021). Therefore, the Geo-Sport Tourism development model is ideally suited for tourist objects with full geological, geomorphological, and sports tourism potential (Rohaendi *et al*., 2021).

Geo-Sport Tourism is closely related to environmental sustainability in coastal areas. This concept promotes the development of synergies between tourism management organisations and local community participation in preserving and developing a sustainable environment in coastal tourism areas (Sumarmi *et al*., 2021). In addition to influencing the environmental behaviour of sport tourism users, nature-based sports tourism can impact the environment since these activities can serve as a communication and environmental education (Sumarmi *et al*., 2022). At the same time, the implementation of sporting events can embrace guidelines that support regulations and a long-term commitment in managing the infrastructure and components utilised in nature-based sports tourism. This assures environmental sustainability by modifying the geographical conditions and sports activities (Mascarenhas *et al*., 2021). In coastal areas, the facilities available for sports tourism include restrooms, gazebos, photo spots, shops, a pavilion containing a *gamelan* set (traditional musical instrument) for cultural performances, as well as other tourism support facilities.

The development of the Geo-Sport Tourism concept can be one of the strategies utilised to promote and introduce Modangan Beach as a tourist destination. Notably, Modangan Beach possesses a unique combination of natural beauty, geological diversity, and geographical conditions conducive to paragliding. The beach's location along the JLS provides excellent accessibility. This ease of access is one of the key attractions for tourist destinations (Dumitraşcu *et al*., 2023). Through the activities of the Malang Beach Festival, which include various competitions and events centred on marine tourism and the concept of integrated one-stop tourism, it is expected that both the promotion and number of tourist visits will increase (Hemmonsbey & Tichaawa, 2020; Sumarmi *et al*., 2021). With this branding, it is anticipated that Modangan Beach's position will be more strategic in enhancing the socioeconomic conditions of the surrounding community.

This research examined 63 Scopus-indexed international articles published between 2014 and 2024 that investigated sport tourism in coastal areas. The analysis identified five main themes: Sport tourism and coastal tourism, sustainability, economic impacts, destination management, and environmental impacts. Furthermore, content analysis revealed that 56 articles investigated 12 types of sports tourism in coastal areas: Surfing (22 articles), beach sports (1 article), water cycling (only mentioned), swimming (6 articles), beach volleyball (1 article), rowing (8 articles), sailing (2 articles), jet skiing (3 articles), canoeing (3 articles), water polo (1 article), and sport fishing (8 articles). However, the study discovered no research on paragliding development in coastal areas. The research gap in coastal beach sport tourism is illustrated in the following Figure 1.

Paragliding is one of the sport tourism activities offered at Modangan Beach. Paragliding is a type of outdoor sport and a form of tourism that needs the analysis of multiple geographical study objects. Note that implementing paragliding activities requires ideal geological and topographical conditions for an enjoyable takeoff and landing (Varol *et al*., 2022). In terms of its geological structure, Modangan Beach is dominated by limestone containing foraminifera, coral, and algae, with a hilly topography that has stable wind conditions and great amenities. The landscape and natural environment indicate that the Modangan Beach area can potentially develop Geo-Sport Tourism.

Nonetheless, several challenges must be overcome to develop Modangan Beach into a national and international paragliding destination. These issues include the absence of clean water facilities, the continued use of motorbikes on the roadways between takeoff and landing, and the inadequate availability of motorbikes for international paragliding competitions (Nikitasari, 2020). Furthermore, the access road from the JLS to the beach is not wide enough, part of it is still a dirt road, making it slippery when it rains heavily. Even though construction has begun on the homestays, the

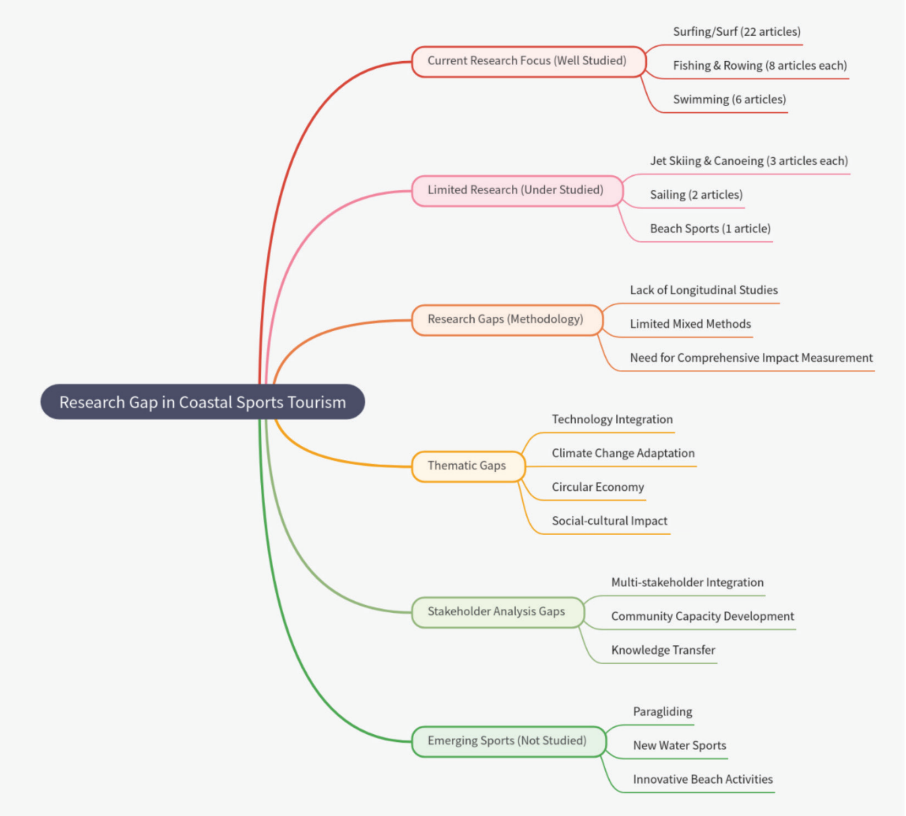

Figure 1: Research gap in paragliding sport tourism in coastal areas
Source: Research analysis (2023)

rough toponymy demands special treatment, namely using a platform, some of which have unfortunately experienced landslides. Therefore, it is necessary to conduct specialised research to develop tourist destinations with extreme geographical conditions.

Modangan Beach is a training ground for paragliding athletes and a regular venue for regional and national paragliding championships and festivals (Setiyo, 2020). With the paragliding festival in the tourism area, visitors can have an environmentally responsible attitude. This aligns with the existence of tourism protocols and facilities emphasising environmental sustainability (Gyepi-Garbrah & Preko, 2022).

This study aimed to identify Modangan Beach's geographical conditions, sports events, and tourism potential to support sustainable environmental management, particularly through paragliding. This research contributes to the advancement of tourism and sports science by demonstrating how integrating geotourism and sports tourism can enhance destination sustainability.

Additionally, this research presents a management model that can support environmental conservation and empower local communities in coastal areas. Accordingly, the findings serve as a foundation for policy development based on Modangan Beach's potential, particularly regarding the development of paragliding tourism and its supporting infrastructure following regional geological conditions. This research is expected to provide a foundation for formulating policies based on Modangan Beach's local potential, particularly in relation to the development of paragliding tourism and its support in accordance with

regional geological conditions. Therefore, tourism at Modangan Beach is rapidly expanding without adverse environmental impacts.

Materials and Methods

Research Location

The study was conducted at Modangan Beach in the Sumberrejo Village, Sumberoto District, Donomulyo Regency, Malang, Indonesia. This coastal area is located close to the East Java JLS, which serves as a border between the Malang and Blitar regencies. The research location is illustrated in Figure 2. This research was conducted from January to March 2023, as it corresponded with the frequent paragliding activities and was also related to the current wind direction during the event.

Research Design

This research utilises a mixed-methods design that combines quantitative and qualitative approaches (Miles & Huberman, 1994). Quantitative data collected includes variables such as soil type, slope, wind speed, land management, and vegetation density related to the physical condition of the study area. Furthermore, social data were collected from various sources, including administrators, visitors, and the local community, in order to provide a comprehensive picture of the condition of the research area. Moreover, quantitative data provide objective information regarding physical conditions while qualitative data will provide a more holistic and contextual picture of social factors associated with the research area.

Research Participants

This study involves stakeholders who are participating in paragliding management at Modangan Beach. The tourism management stakeholders include (a) the village government and the Tourism Awareness Group (POKDARWIS), (b) stall owners on Waung

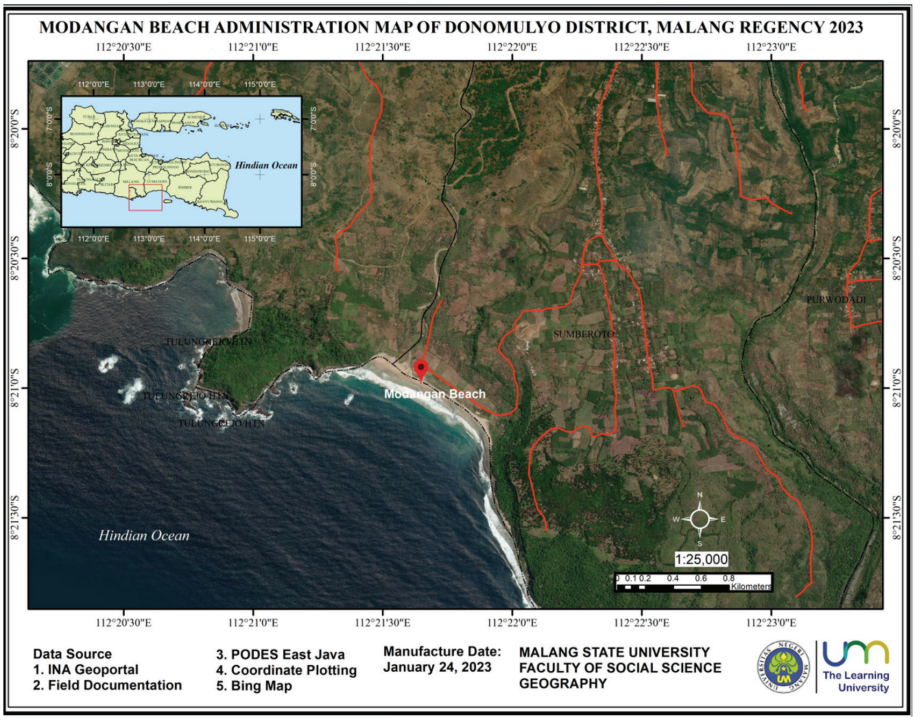

Figure 2: The map of Modangan Beach
Source: Research documentation (2023)

Hill and the beach, (c) homestay owners, (d) management teams of paragliding at the regency and provincial levels, (e) motorcycle taxi drivers, (f) forest farmers, and (g) state-owned enterprises for forest (PERHUTANI) service employees. The selection of these participants was based on their role in managing and influencing the current condition of the research area. This ensures that their perspectives and experiences can contribute significantly to answering the research questions. On that note, it is anticipated that by including multiple subjects related to the research area, a more complete and accurate understanding of the condition of the research area and its influencing factors can be obtained. The profiles of participants are summarised in Table 1.

Data Collecting Technique

This research uses various data collection techniques, one of which is measuring the field's physical condition. Meanwhile, the slope was indicated using an Abney level. An anemometer measured wind speed while Normalized Difference Vegetation Index (NDVI) measured vegetation density.

Furthermore, qualitative data were collected through observation, interviews, and documentation. Observations included the road to the beach, the takeoff location on Waung Hill, the landing site on Modangan Beach, the beachside camping ground, the lagoon, the estuary of the Klatakan River, the Modangan Beach tourism management secretariat, stalls, under-construction homestays, motorcycle taxi stations, and the density of forest vegetation around the beach and Waung Hill. At the same time, interviews were conducted with shop owners, homestay owners, the Paragliding Management Team, motorcycle taxi drivers, farmers in the forest area, tourist visitors, and paragliding athletes practicing or participating at the Modangan Beach location. Additionally, various instruments such as drones, cameras, and image data in the form of videos, photographs, and maps are utilised for documentation. Furthermore, Focus Group Discussions (FGDs) were conducted with stakeholders to obtain comprehensive data.

Data Analysis

The process of analysing data from physical condition measurements uses quantitative data analysis, including tabulations and percentages, in addition to SWOT analysis. SWOT analysis supports strategic planning in various management applications (Helms & Nixon, 2010; Sumarmi *et al*., 2020; Amrishenava & Osanloo, 2022). SWOT analysis also consists of a comparison of the positive and negative factors that affect a particular project.

Table 1: The profiles of participant

No.	Participant	Gender	Age	Occupation
1	Mahmudi	Male	48	Tourism manager of Modangan Beach
2	Rudi	Male	35	Shop owner
3	Anik	Female	35	Homestay owner
4	Sunawan	Male	42	Paragliding management
5	Wakidi	Male	37	Motorcycle taxi driver
6	Sunaryo	Male	43	Farmer in forest area
7	Muhammad Rafif A. R.	Male	25	Paragliding athletes
8	Wahyu Rio Defandiari	Male	29	Tourist visitor
9	Doni Prabowo	Male	30	Tourist visitor

Meanwhile, social data acquired from qualitative interviews was analysed using an interaction analysis model created by Miles and Huberman (1994). The stages of this analysis model are data collection, data reduction, data presentation/data display, and resulting conclusions and verification. During the data collection phase, data is collected from relevant sources, followed by data reduction to obtain essential information. The next phase is data presentation, which involves organising the data and displaying the analysis results such as graphs, tables, or diagrams. In the final stage, conclusion and verification, the analysis results are summarised and validated to ensure the accuracy and validity of the obtained data. The data were analysed using qualitative analysis by Cresswell (2019). Initially, all data for analysis was transcribed as a part of the data processing and preparation stage. Second, proceed to read and input all the data that has been acquired. Third, data reduction was achieved through selection, reduction, simplification, abstraction, and data transformation. Fourth, an extensive evaluation of Modangan Beach was conducted and the information was categorised into suitable elements for tourism development. Fifth, an in-depth analysis of Modangan Beach's potential as a paragliding destination was conducted, including many code categories at a deeper level. Sixth, research on typical and intriguing phenomena was conducted and conclusions were generated.

Results and Discussion

Potential of the Modangan Beach Area

Modangan Beach is located in Sumberoto Village, Donomulyo District, at the southernmost border of Malang Regency, East Java. The geographical location of this beach is around 65 km in the southwest area of Malang City. This beach is located on the border between Blitar Regency and Malang Regency. The border is defined by a small monument placed on the riverbank, also called the Modangan River. Modangan Beach is located near Jolosutro Beach in the Wates District of Blitar Regency.

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The Modangan coastal area has two different locations: Waung Hill and Modangan Beach. In particular, Waung Hill offers camping and paragliding options while Modangan Beach features a beach stretch extending around 1.1 km. Meanwhile, the Modangan beach is characterised by its sandy topography. Modangan Beach is home to a rich ecology of *nipah* mangroves and *waru doyong* trees, which contribute to the refreshing ambience of the coastal area. Visitors to Modangan Beach have the opportunity to engage in three tourism activities. First, tourists can engage in paragliding and camping activities. Second, the beach provides marine tourism, including swimming, fishing, sunbathing, beach recreation, playing with the sand, photography, and beach sports. Third, the beach also offers environmental tourism activities, comprising hiking, exploration, photography, leisurely strolls, and animal and plant studies (Arinta & Susilo, 2023).

Tourist amenities at Modangan Beach include gazebos, swings, campgrounds, and support facilities such as stalls, bathrooms, toilets, parking areas, and camping sites. Notably, the local youth group is responsible for the management of Modangan Beach. Modangan Beach is managed by the village government in collaboration with local residents, operating as a community-based ecotourism program.

The residents of Sipelot Beach primarily work in agriculture and fishing. Following the opening of Modangan Beach as a tourist destination, local residents commenced acquiring the skills necessary for responding to the demands of tourists. These services include

selling food and beverages, parking management, and operation of toilet and bathroom facilities. In other words, Modangan Beach demonstrates significant tourism potential.

Physical Conditions that Support Geo-Sport Tourism at Modangan Beach

Modangan Beach has the potential to be developed as a sustainable tourist destination. However, this development must include tourism-carrying capacity. Simultaneously, the environmental carrying capacity must be implemented in managing natural resources and the environment in the area to accomplish sustainable development goals (Sumarmi *et al*., 2020).

Geo-Sport Tourism, particularly paragliding contributes to the development of tourism on Modangan Beach. Paragliding serves as an attractive natural sports tourism activity for adrenaline enthusiasts (Varol *et al*., 2022) and it requires both suitable takeoff locations and safe landing areas (Kuşçu Şimşek *et al*., 2018; Varol *et al*., 2022). The carrying capacity of tourism must be carefully considered, including takeoff direction, the slope and height of the hill, adequate airspace for extended flight times, and landing area safety considerations (Kusçu Simsek *et al*., 2018; Varol *et al*., 2022; Arinta *et al*., 2022).

The hill condition element at Modangan Beach significantly impacts the paragliding takeoff path. Waung Hill, the takeoff area has a relatively flat topography and solid soil structure and is located in the Mandalika Formation. The Mandalika Formation was formed from basalt andesitic lava during the early Miocene period. Therefore, the slopes surrounding the Modangan shore are typically steep, except for areas adjacent to the coast. The topography around Modangan Beach can be observed in Figure 3.

Elevation differences in the steep topography can influence the morphology of the coast. According to Sousa *et al*. (2017), beach morphology is one of the most crucial variables influencing the potential for coastal tourism. Due to the substantial difference in elevation, Modangan Beach has physical qualities that are highly suitable for paragliding tourism activities. The height difference between the takeoff and landing points is one of the suitability criteria for paragliding tourism (Kuşçu Şimşek *et al*., 2018). The elevation difference between the takeoff and landing places at Modangan Beach is up to 300 m, which is regarded as an easy suitability level (Kuşçu Şimşek *et al*., 2018).

The slope incline is also an essential consideration for the suitability of paragliding tourism. The slope gradient between Modangan Beach and Waung Hill reaches 370, which represents an intermediate level of difficulty

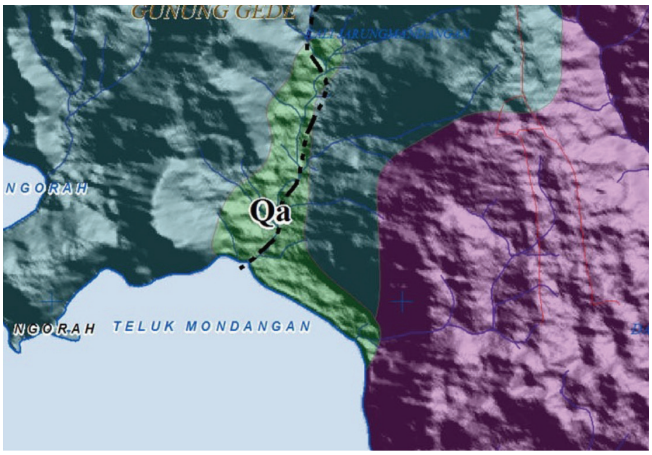


Figure 3: Geological conditions at Modangan Beach
Source: Research documentation (2023)

(Kuşçu Şimşek *et al*., 2018). The slope at the takeoff and runway positions is classified into multiple levels of difficulty (Kuşçu Şimşek *et al*., 2018). According to international standards, an appropriate location for paragliding tourism must have a maximum slope of 30 degrees and an elevation difference between 60 m and 350 m (Kuşçu Şimşek *et al*., 2018). The incline and difference in elevation between Waung Hill and Modangan Beach are displayed in Figure 4.

In paragliding activities, it is crucial to consider the appropriate meteorological conditions, including wind speed and direction (Varol *et al*., 2022). Determining the dominating wind direction and speed, as well as paying attention to the physical characteristics of the takeoff and landing regions is especially critical for paragliding operations (Kuşçu Şimşek *et al*., 2018). The main wind direction at Waung Hill is to the north-northeast, which corresponds to the dominant wind direction description described by Kuşçu Şimşek *et al*. (2018) is displayed in Figure 5.

The average wind speed at Waung Hill is 5.10 m/s. During paragliding activities in the hills, particularly during takeoff, flight, and landing, it is necessary to ensure no potential risks to safety (Varol *et al*., 2022). The average wind speed at the landing location at Modangan Beach is approximately 4.10 m/s. To ensure

Figure 4: The slope and elevation of Waung Hill and Modangan Beach
Source: Research documentation (2023)

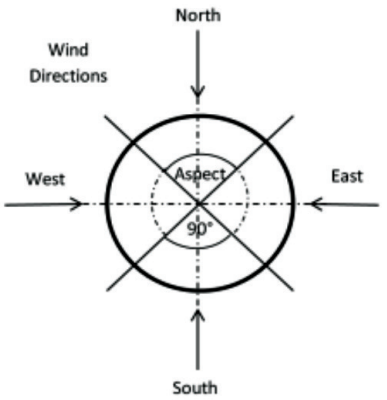


Figure 5: The wind directions of paragliding activities in Modangan Beach
Source: Kuşçu Şimşek *et al*. (2018)

a safe landing, the landing area must be level and clear of activities that can cause turbulence (Varol *et al*., 2022). Documentation of wind speed data collection activities at Waung Hill is illustrated in Figure 6.

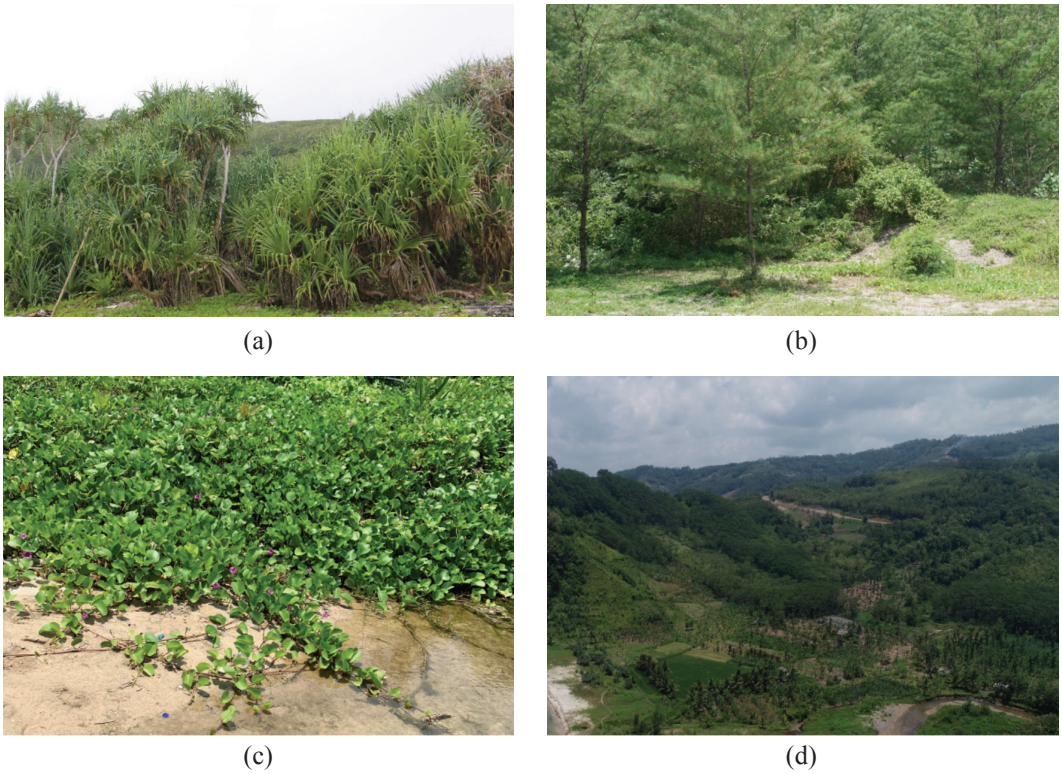
According to the study, paragliding activities are firmly supported by geographical conditions such as the physical condition of Waung Hill, which faces Modangan Beach directly and stable winds flowing from the coast direction. In addition, the length and depth of the beach are optimal for paragliding landing activities. The physical condition of Waung Hill and Modangan Beach for paragliding activities is depicted in Figure 7.

Figure 6: Getting wind speed data at Waung Hill
Source: Research documentation (2023)

Figure 7: Physical conditions of Waung Hill and Modangan Beach for paragliding activities
Source: Research documentation (2023)

In addition to the physical conditions related to topography, wind, and temperature, the condition of the vegetation on Modangan Beach also supports the development of Geo-Sport Tourism. The vegetation of Modangan Beach includes seaweed, sea cypress, trumpet flowers, and other species. Forest state-owned organisation owns vegetation in the area along the coast up to Waung Hill, including teak and community-owned plants such as bananas, cassava, corn, and others. The type of plant is displayed in Figure 8.

The results of the Landsat 8 image classification of Oli in the Modangan coastal area of Malang Regency are illustrated in Figure 9. The processing of the vegetation index (NDVI) provided a minimum value of -0.31 and a maximum value of 1. The minimum value is represented by the red colour and the maximum value is represented by a dark green colour. Specifically, red is a body of water or the sea. Hence, it cannot be identified as vegetation. Meanwhile, the coastal area of Modangan is surrounded by forest and numerous locally cultivated plants, resulting in a high density of vegetation. In Modangan Beach, which has a moderate index value, the summit of Waung Hill is marked with a yellow symbol, indicating a paragliding takeoff area and a large amount of developed land for sale by the local community.



(a) (b)

(c) (d)

Figure 8: (a) Sea pandan teduces beach abrasion; (b) sea fir as a wave breaker; (c) trumpet flower as a waste filter; (d) Lagoon where fresh water enters the sea
Source: Research documentation (2023)

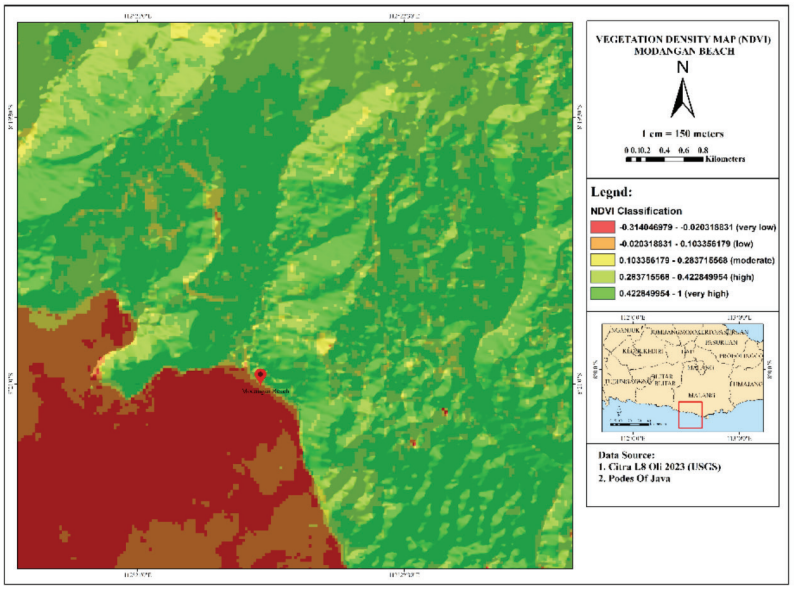


Figure 9: Vegetation density at Modangan Beach
Source: Research documentation (2023)

Socioeconomic Conditions that Support Geo-Sport Tourism on Modangan Beach

Many paragliding managers, homestays, and food stalls offering a variety of foods and beverages contribute to the socioeconomic conditions of the Modangan Beach community. Motorcycle taxi drivers are also available to assist tourists in exploring the beach. Generally, the social conditions in Modangan Beach are very beneficial to the development of sport tourism in the area.

Currently, eight stalls are operating on the coast, selling primarily heavy meals and snacks and providing tourists with cosy benches and bale-bale (gazebo). In addition, locals optimise their income by renting camping tents, stoves, and paragliding gear. Bale-bale (gazebo) is also available for tourists who wish to relax while enjoying the view of the coast.

Notably, weekends are typically active with paragliding training and championship events while weekdays tend to be quiet. This causes fluctuations in the income of coastal businesses, whose income tends to be low during the week but considerably increases on weekends as the number of tourists increases.

The owners of the stalls on Modangan Beach are locals, who live in Modangan but have houses in different areas. They offer heavy and light meals in addition to a Wi-Fi voucher service. On weekdays, sales range from IDR100,000 to IDR300,000 while on weekends, they can reach IDR800,000 to IDR1,000,000. According to AN, one of the sellers in Waung Hill said, "*The Modangan Beach area has extremely weak signals, so, we provide Wi-Fi*

Figure 10: Condition of stalls and bale-bale (gazebo) near the takeoff area
Source: Research documentation (2023)

Figure 11: Photo spots on Modangan beach
Source: Research documentation (2023)

services to facilitate tourists." Aside from that, another seller, AW, stated, "*Sales increase on weekends because visitors to Modangan Beach come from outside Malang.*" In addition, to purchase basic materials, they must travel 8 km to 11 km to the nearest market (Figure 10).

It is easy to locate a paragliding takeoff location on Waung Hill and observe Modangan Beach from above. Therefore, the beach manager provides travellers with photo spots such as boats and the phrase "I Love You", as well as other locations to enhance their experience. It is anticipated that tourists will bring back fond memories of Modangan Beach and return in the future. This is in accordance with HP, one of the Modangan Beach managers, who stated, "*We intend to offer a unique tour of Malang Regency that combines a paragliding attraction with an outstanding view from the top of the hill.*"

Modangan Beach, similar to other beaches in South Malang has a large and adequate parking area (Figure 11). There is a large takeoff area in the mountain area that is typically used for camping. In front of it is the Art Hall, which contains a gamelan (traditional musical instrument) intended to preserve Javanese culture. Therefore, the management of Modangan Beach for paragliding sports must adhere to environmental, economic, and cultural sustainability principles. According to HP, the manager of Modangan Beach, "*Modangan Beach provides tourist facilities in the form of a concert hall and musical attractions as a cultural tourist attraction*" (Figure 12).

The meeting room is utilised for paragliding administration, as well as the coordination of training activities, championship competitions, and the gathering of paragliding participants (Figure 13). The cost of training assistance

Figure 12: Cultural centre, takeoff area for paragliding, and camping area
Source: Research documentation (2023)

Figure 13: Paragliding management office
Source: Research documentation (2023)

remains reasonable. The paragliding school is only open on weekends for paragliding rental and practice, with rental prices ranging between IDR300,000 and IDR350,000.

Analysis of the Development of Geo-Sport Tourism in Modangan Beach

The following is an analysis of the physical and social conditions, strengths, weaknesses, opportunities, and challenges in the development of Geo-Sport Tourism at Modangan Beach, as well as an analysis of the development of Geo-Sport Tourism at Modangan Beach for sustainable environmental management. The result of the SWOT analysis is summarised in Table 2.

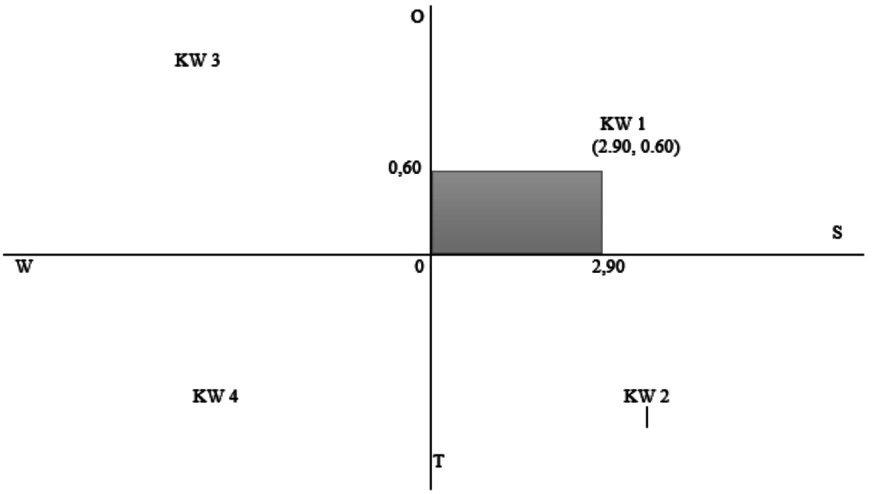
According to the results of the analysis, tourism development in Modangan Beach is in Quadrant 1, where the results are in the most profitable position due to high opportunities and strengths. Therefore, the strategy must be implemented to support an aggressive

Table 2: The result of the SWOT analysis

	Internal Factors (IFAS)			
Strengths (S)		**Weight**	**Rating**	**Score**
1	The view of Modangan Beach is really beautiful.	0.3	4	1.2
2	Facilities and infrastructure supporting tourism (toilets, stalls, prayer rooms, guesthouses, paragliding management office, group of motorcycle taxi drivers).	0.2	3	0.6
3	Waung Hill serves as an observation deck for viewing Modangan Beach and as a paragliding launch site.	0.2	4	0.8
4	There are cypress trees and sea pandanus on the beach.	0.25	3	0.75
5	The coastline features a lagoon named Gondang Wetan.	0.3	3	0.9
6	Modangan Beach is suitable for conducting national paragliding competitions because it has a great takeoff and landing area.	0.4	3	1.2
7	Modangan Beach has a bay feature, so, the waves are not too large for a recreation area, although they must be controlled.	0.4	3	1.2
8	The Klatakan River provides the direct boundary between Malang Regency and Blitar Regency and empties into Modangan Beach.	0.3	3	0.9
9	The lengthy coastline at the Modangan coast is ideal for a tourist attraction.	0.25	3	0.75
10	The beach width for recreation is very suitable.	0.25	3	0.75
11	The beach's characteristics include a fine white sandy beach, making it perfect for tourists.	0.3	3	0.9
12	Modangan coastline is suitable for paragliding because the wind is not too strong and stable near the coast.	0.4	3	1.2
13	At Modangan Beach, cultural performances such as the *campursari* (traditional song) and *gamelan* (traditional musical instrument) continue to be presented in the gazebo and on the beach.	0.25	3	0.75
14	Modangan Beach is managed by a tourism group in Sumberoto Village, Donomulyo District.	0.4	3	1.2
Total			**44**	**13.1**

Weaknesses (W)				
1	The distance from the Malang city centre is 70 km and the entrance is limited after passing JLS.	0.3	4	1.2
2	Beach access roads for both two- and four-wheeled vehicles are still being constructed.	0.25	4	1
3	KTH, as the manager of Modangan Beach has not ensured the beach's cleanliness and environmental sustainability; there are no trash cleaners available.	0.3	3	0.9
4	The infrastructure supporting tourism remains limited.	0.25	3	0.75
5	Tourism management has not been optimised.	0.25	3	0.75
6	Lack of communication network.	0.4	3	1.2
7	The availability of clean water is far from the coast.	0.4	3	1.2
8	There are currently no systemised promotions.	0.25	3	0.75
Total			**44**	**13.1**
X = Strengths - Weaknesses = 2.95				
External Factors (EFAS)				
Opportunities (O)				
1	The atmosphere is peaceful and cooler because it is far from the city.	0.2	3	0.6
2	Received government support because it is used for sport tourism by hosting national paragliding competitions; it will also be used for international competitions.	0.3	3	0.9
3	The price of travelling is relatively low.	0.25	3	0.75
4	Received support from the community.	0.1	3	0.3
5	It tends to become a private tourist destination because there are many comfortable camping spots.	0.1	3	0.3
6	The beach is suitable for fishing spots.	0.2	3	0.6
Total			**18**	**3.45**
Threats				
1	There is a high risk of tidal waves and tsunamis; therefore, the shop must be located some distance from the beach.	0.2	3	0.6
2	Several points lead to locations prone to landslides, the location of the guesthouse is very steep, and prone to landslides.	0.1	3	0.3
3	There are beaches near to one another that have different features.	0.35	3	1.05
4	Lack of awareness on the part of visitors to maintain the beach's cleanliness and sustainability.	0.3	3	0.9
Total			**12**	**2.85**
Y = Opportunities - Threats = 0.60				

or growth-oriented development policy by focusing on existing opportunities and internal strengths (Rangkuti, 2014). According to the SWOT analysis results, tourism development at Modangan Beach falls under the growth category and is located in Quadrant 1.



Graph 1: The result of SWOT analysis
Source: Research analysis (2023)

Geo-Sport Tourism Model at Modangan Beach for Sustainable Environmental Management

After discovering that the results of the SWOT analysis place Modangan Beach in Quadrant 1, indicating the most favourable conditions and the growth category, the next stage is to determine the development priority for the Geo-Sport Tourism area on Modangan Beach. The second stage utilises triangulation analysis to determine development directions consistent with the established priorities. Based on the findings of this study, the priority for developing the Modangan Beach tourism area is to maximise beach conditions and accessibility such as roads, toilet facilities, and management offices, through a SWOT analysis. It includes Internal Factor Analysis Summary (IFAS)that measures strengths and weaknesses and External Factor Analysis Summary (EFAS) that measures opportunities and challenges.

According to Quadrant 1 SWOT, the Modangan Beach Geo-Sport Tourism Model for sustainable environmental management can be implemented by offering development directions such as adding, maintaining, and improving existing infrastructure and potential in the Modangan Beach tourism area. Several activities can be performed in order to maximise the potential that has been established:

(a) Maintaining the physical condition of the Waung Hill takeoff location and the Modangan Beach landing location.

Physical conditions can be developed at the takeoff area at Waung Hill by marking the takeoff route. Moreover, at Modangan Beach, it is necessary to provide a sign for the landing site. Providing this sign provides accessibility for the visitor to try the paragliding activity. The takeoff area is presented in Figure 14.

Figure 14: Location of Waung Hill takeoff area and Modangan Beach landing area
Source: Research documentation (2023)

(b) Road construction from the Waung Hill takeoff location to the Modangan Beach landing location.

This road repair facilitates access to Modangan Beach and Waung Hill and makes walking easier for tourists. The condition of the road to Waung Hill is displayed in Figure 15.

Figure 15: Road condition from Waung Hill to Modangan Beach
Source: Research documentation (2023)

(c) Construct a shop effectively and avoid getting too near to the beach, as it is prone to tsunamis.

Various signs are placed around the tourist areas to ensure that visitors can be more careful while exploring the tourist areas. The sign boards are illustrated in Figure 16.

(d) Preserving vegetation density in the Waung Hill area.

Waung Hill conservation areas aim to reduce landslides along the route on Modangan beach. The condition of vegetation around Modangan Beach is portrayed in Figure 17.

(e) Building homestays that are sturdy and do not collapse easily.

Building homestays with a weak foundation causes the building to collapse easily since the soil around Modangan Beach has karst materials. The condition of homestays around the Waung Hill area is displayed in Figure 18.

Figure 16: Tsunami warning boards and stands that were forced to be relocated due to wave
Source: Research documentation (2023)

Figure 17: Condition of the vegetation on Modangan Beach
Source: Research documentation (2023)

Figure 18: Conditions for Homestay Development in the Waung Hill area
Source: Research documentation (2023)

(f) Providing adequate infrastructures and supporting facilities, as summarised in the following Table 3.

As a product in the field of Geo-Sport Tourism, sporting events contribute significantly to the socioeconomic development of areas surrounding tourist attractions. This factor can be explained by the large number of tourists who visit these attractions/events to see sporting events and purchase regional sporting event souvenirs as a memory of their visit. Therefore, these sports activities have the potential to increase the productivity of the local economy.

Geo-Sport Tourism, introduced through paragliding at Modangan Beach, not only has an economic impact but also contributes to the promotion of local culture, which can strengthen regional identity. The most significant contribution of tourism development is the introduction of local cultural identity.

Furthermore, by integrating paragliding activities, Modangan Beach can introduce cultural attractions such as traditional art performances and culinary festivals. This Geo-Sport Tourism can enrich the tourist experience. Additionally, this activity serves as an educational activity for tourists who are interested in the environment. In line with this, environmental education can be carried out in various ways, one of which is through adrenaline-boosting activities in the form of sports tourism. Thus, sports events in the context of Geo-Sport Tourism are a multifunctional tool to encourage social, cultural, and environmental sustainability in tourism destinations.

Table 3: The list of infrastructures and supporting facilities

No.	Infrastructure	Example	Total	Description
1.	Mosque		1	The prayer room is locked, preventing tourists from using the space except for worship. Moreover, there is no location for toileting.
2.	Toilets		13	• KM 1 = 5 units (Can be utilised. The location is suitable and relatively tidy) • KM 2 = 4 units (Still under renovation) • KM 3 = 4 units (Usable but dirty)
3.	Shops		8	At Modangan Beach, there are eight stalls, the majority of which sell groceries, heavy meals, and snacks. However, residents optimise their earnings by renting tents and stoves for camping and paragliding.

4.	Bale-bale (Gazebo)		1	Tourists may relax in a bale (gazebo) while enjoying the view of Modangan Beach.
5.	Meeting hall		1	The meeting hall is used to prepare for training and the gathering of paragliding participants when there is a paragliding championship event.
6.	Accommodations		1	Accommodation is still in the process of development. There is presently only one house with two owners. The village leader is the owner of the accommodation.
7.	Parking areas		1	The parking area is quite spacious and the cost is still reasonable. The parking lot is open 24 hours.
8.	Paragliding School for paragliding rental and training		1	The Paragliding School is only available on weekends for paragliding rental and training. Paragliding rental prices range from IDR300,000 to IDR350,000.
9.	Paragliding office		1	The paragliding office organises participant gatherings and prepares for training during a paragliding championship event.
		Total Infrastructures (except toilets)	**12**	

Conclusions

This research aims to analyse the development of the Geo-Sport Tourism Model at Modangan Beach for sustainable environmental management, focusing on paragliding as its main attraction. Through a comprehensive mixed-method approach and SWOT analysis, this study reveals several crucial findings.

First, the physical conditions supporting Geo-Sport Tourism at Modangan Beach include Waung Hill directly facing the beach with a height of 300 m, a 37° slope (medium difficulty level), ideal average wind speeds of 5.10 m/s in the takeoff area and 4.10 m/s in the landing area, and adequate beach length and width for landing area, supported by forest vegetation and local plants in the surrounding area. Second, supporting social conditions include management by the local POKDARWIS, support from paragliding managers, homestay owners, and motorcycle taxi drivers, availability of eight food stalls, and supporting facilities such as places of worship, toilets, gazebos, and meeting rooms, including cultural events. Third, SWOT analysis suggests that the development position is in Quadrant 1, which is the most favourable position with high opportunities and strengths, supporting an aggressive growth strategy. Fourth, the Geo-Sport Tourism Model for sustainable environmental management requires maintenance of physical conditions in takeoff and landing areas, road access improvements, construction of stalls at a safe distance from tsunami risk, vegetation maintenance to prevent landslides, strong homestay construction, adequate infrastructure provision, and development that considers economic, socio-cultural, and environmental sustainability aspects.

These findings indicate that Modangan Beach has significant potential to be developed as a Geo-Sport Tourism destination, focusing on paragliding while maintaining environmental sustainability and local community empowerment. Moreover, this research provides practical implications for develope beach tourism based on paragliding sports while considering geological and environmental aspects. This includes theoretical contributions to develop an integration model of geotourism and sports tourism in coastal areas that can serve as a reference for similar destination development. Additionally, this research contributes to policy formulation for tourism development based on Modangan Beach's local potential, particularly regarding paragliding tourism development and its supporting infrastructure in accordance with the region's geological conditions.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest. This research has no intention toward individuals or organisations.

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