



Potential for the Development of Paragliding as a Sport Branch

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ABSTRACT

Karawang Regency has potential for nature-based sports tourism, including paragliding at Puncak Sempur, where activity ceased after the COVID-19 pandemic. This descriptive qualitative study analyzed the potential and constraints of redeveloping paragliding at the site, using semi-structured interviews, field observation, and documentation. Informants were purposively selected: a local site manager and the Chairman of the Indonesian Aero Sport Federation (FASI) of Karawang Regency. Data were analyzed through condensation, display, and conclusion drawing, and credibility was established through source and method triangulation. The site offers favorable elevation and an available take-off area, and the average wind speed (6.4 km/h) was within a range generally considered manageable for paragliding. However, the prevailing wind was easterly and not aligned with the take-off direction, a key technical constraint. Other constraints include a limited landing area, steep access roads, vegetation obstructing the take-off area, no licensed pilots, and the lack of a standard operating procedure (SOP) and legal status. Puncak Sempur therefore shows preliminary potential for paragliding development, although feasibility requires confirmation through further technical, meteorological, and economic assessments. Development should be supported by integrated planning, infrastructure improvement, pilot certification, and collaboration among FASI, site managers, and the local government.

Keywords: *paragliding; sports tourism; site feasibility; safety readiness; qualitative study*



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INTRODUCTION

Tourism is one of the leading sectors contributing to national foreign exchange earnings, and nature-based adventure sports are increasingly promoted as

regional tourism products in Indonesia (Yasmin et al., 2021). Paragliding is an air sport, or a form of free flight, that relies on wind conditions and topography to generate lift without engine assistance, using a fabric wing launched from a hillside by running, for either recreational or competitive purposes (Masrurun, 2020). Indonesia's tropical climate and hilly topography favor the formation of dynamic and thermal lift, giving the country considerable potential for paragliding development (Lorensia & Sudarti, 2022).

However, paragliding is a high-risk activity. A large survey of 1,788 pilots estimated incident rates of 1.4 deaths and 20 serious injuries per 100,000 flights, approximately twice the risk of general aviation and skydiving. Most incidents resulted from pilot control and decision errors rather than equipment failure (Wilkes et al., 2022). The development of a paragliding site therefore cannot rely on natural potential alone. It must be accompanied by safety standards, operational procedures, and competent, licensed human resources (Liyandra et al., 2024). In Indonesia, paragliding is regulated by the Indonesian Aero Sport Federation (FASI), which is responsible for pilot licensing, safety standardization, and training (Hartini et al., 2025; Syafira Adha & Wibowo, 2024). Licenses are tiered from novice pilot to tandem and instructor qualifications, and at least a basic Pilot License (PL-1) is required to take part in competitions (Christina et al., 2024).

Previous Indonesian studies have examined paragliding mainly from a tourism-promotion and destination-management perspective, including development strategies in Wonosobo (Masrurun, 2020; Wildan & Yuwono, 2023), promotion strategies in Majalengka (Yasmin et al., 2021), site development in Kudus (Indardi & Sahri, 2020), a sport-tourism development model in Segorogunung (Supriyoko et al., 2024), and adventure-tourism risk management in Bali (Liyandra et al., 2024). International studies have similarly focused on established destinations and tourist experiences (Kirsten, 2024; Onur et al., 2024). These studies were conducted at sites that were already operational, with active pilots and existing management structures. Much less is known about sites where paragliding activity has ceased and where technical conditions (take-off and landing areas, wind), human resources,

and regulatory readiness must be assessed together before redevelopment can proceed.

Puncak Sempur, located in Cintelaksana Village, Tegalwaru Subdistrict, Karawang Regency (06°32'28" S, 107°15'17" E; approximately 620 m above sea level), is one such site. Its hilly landscape and proximity to the Greater Jakarta area make it attractive as a nature-based sports tourism destination. Paragliding was previously practiced at the site but stopped after the COVID-19 pandemic. Since then, the former landing area has been converted into a coffee shop, vegetation has overgrown the take-off area, and FASI Karawang Regency has no active paragliding division, no official SOP, and no licensed solo or tandem pilots. Local interest in reviving the activity nevertheless remains. Without an evidence-based assessment, redevelopment risks proceeding without adequate safety provisions, which is a serious concern given the incident profile of the sport.

Accordingly, this study aimed to analyze the potential and constraints of redeveloping paragliding as a sport branch at Puncak Sempur. It does so by integrating three dimensions that previous studies have generally examined separately: (1) physical site conditions, namely the take-off area, landing area, and wind direction and speed; (2) human resource readiness, namely the availability and licensing of pilots; and (3) regulatory and institutional readiness, namely SOPs, legal status, and stakeholder roles. The findings are expected to provide a baseline for FASI, site managers, and the local government in planning safe and sustainable paragliding development (Supriyoko et al., 2024).

METHODS

This study employed a descriptive qualitative design with a case study approach to obtain an in-depth understanding of the potential and constraints of developing paragliding at Puncak Sempur as they occur naturally in the field (Creswell & Poth, 2018). The study was conducted at Puncak Sempur, Cintelaksana Village, Tegalwaru Subdistrict, Karawang Regency. Interviews, field observation, and documentation were carried out on 10 November 2025. Informants were selected purposively based on their direct knowledge of the site and of paragliding governance: (1) a coffee-shop operator at the summit of Puncak Sempur who is familiar with the history of paragliding activities at the site, and (2) the Chairman of FASI Karawang

Regency, who holds authority over the development and licensing of aerospace sports in the regency.

Data were collected using three instruments. First, a semi-structured interview guide covered site conditions, safety requirements, SOPs, pilot licensing, human resources, and development prospects. Second, a field observation checklist covered the take-off area, landing area, access road, physical obstacles, and supporting facilities; observations were documented with photographs, and the coordinates and elevation of the site were recorded with a GPS-enabled smartphone. Third, a documentation checklist covered the relevant regulations, namely the Karawang Regency Spatial Plan (RTRW) 2011–2031, Regulation of the Minister of Manpower No. 3 of 2016, and FASI regulations on pilot certification and licensing. Wind direction, wind speed, and air temperature were obtained from the Windy application (windy.com) for 2 November–1 December 2025 (29 days; data for 16 November were unavailable). Terrain slope was not measured instrumentally in this study.

Data were analyzed using the interactive model of (Miles et al., 2020), which consists of three concurrent activities. First, in data condensation, interview transcripts, field notes, and documents were selected, coded, and summarized according to the research focus. Second, in data display, the condensed data were organized into triangulation matrices (Tables 1 and 2) and a wind data table (Table 3). Third, in conclusion drawing and verification, patterns were interpreted and compared with the relevant regulations and previous studies. The credibility of the findings was established through source triangulation, by comparing the accounts of the two informants, and method triangulation, by comparing interview, observation, and documentation data (Creswell & Poth, 2018).

RESULTS AND DISCUSSION

Standard Operating Procedure and Safety Requirements

A Standard Operating Procedure (SOP) is a systematic set of guidelines outlining the sequence of steps involved in carrying out an activity, covering what needs to be done, how it should be carried out, and who is responsible at each stage. An SOP functions as a control instrument to ensure that activities are carried out consistently, effectively, and in accordance with applicable provisions.

Table 1. Triangulation of Findings on Site SOP and Safety Requirements

Research Focus	Documentation	Observation	Interview
Standard operating procedure for the paragliding site	Karawang Regency Regulation on the Regional Spatial Plan (RTRW) of Karawang Regency 2011–2031.	The take-off site is located in the hilly area of southern Karawang with a slope suitable for paragliding; the site was previously used for paragliding activities, but the landing area has since become overgrown with vegetation.	Take-off and landing sites must be selected considering wind conditions, topography, and the safety of pilots and passengers.
	Regulation of the Minister of Manpower of the Republic of Indonesia No. 3 of 2016 on Procedures for Establishing the Indonesian National Work Competency Standard (SKKNI).	The landing site is in a relatively open area free of physical obstacles, although the land contour is not yet fully suitable for landing.	Flights are recommended in the morning and afternoon, when wind conditions are more stable.
	Regulations of the Indonesian Aero	Weather conditions are not	No hazardous obstacles are

Sport Federation always stable, permitted along (FASI) and its with wind speed the take-off or central board and direction landing path. concerning the varying certification and throughout the licensing of day. paragliding pilots.

- Access to the site - Every remains limited, paragliding and some areas activity must be lack adequate supported by supporting safety-compliant facilities. equipment, such as a canopy, harness, helmet, two-way radio, and appropriate footwear and protective clothing.
- No pilot - Pilots must hold currently operates a license with an official corresponding to license, the type of flight particularly for conducted. tandem flights.

Article 7 of Regulation of the Minister of Manpower of the Republic of Indonesia No. 3 of 2016 on Procedures for Establishing the SKKNI stipulates that the authority of the Competency Standards Committee may be exercised by the technical unit responsible for human resource standardization; in the tourism sector, this authority rests with the Deputy for Tourism Human Resource Development and Inter-

Agency Relations, under the Deputy for Industry and Institutional Development of the Ministry of Tourism.

Observation results indicate that the summit area of Puncak Sempur is covered by tall vegetation that obstructs paragliding activities. Paragliding activities previously conducted at the site ceased due to the COVID-19 pandemic, allowing vegetation to regrow in the landing area, while a large open area remains available on the northern side, approximately 100 meters from the summit slope. According to an interview with the Chairman of FASI Karawang Regency, assessing the feasibility of a paragliding site requires consideration of technical and safety aspects, including weather conditions, take-off and landing area characteristics, and wind direction and strength, which are generally more stable in the morning and late afternoon. The readiness of safety-compliant supporting facilities — such as a canopy, harness, helmet, communication device, and appropriate clothing and footwear is likewise essential. The interview further revealed that FASI Karawang Regency has not yet officially established a Paragliding SOP, meaning that current activities lack a standardized operational and safety-management guideline. Nevertheless, Puncak Sempur is considered to possess substantial geographical and elevational potential for development, with the principal challenge lying in human resources namely, the absence of officially licensed pilots for either solo or tandem flights.

The equipment requirements identified by the Chairman of FASI are consistent with the paragliding literature. Tandem instructors need a sound technical understanding of the canopy, harness, reserve parachute, and control system, and structured technical training has been shown to improve practitioners' knowledge of equipment, emergency response, and safety briefings (Supriyono et al., 2024). The reserve parachute is a critical safety component, and the ergonomics of its deployment have been examined experimentally (Wilkes et al., 2021). These requirements show that reactivating paragliding at Puncak Sempur depends first on the availability of licensed pilots and instructors trained in equipment inspection and emergency procedures.

Stakeholder Perspectives on Puncak Sempur as a Paragliding Destination

Table 2 summarizes the triangulated findings on the overall readiness of Puncak Sempur as a paragliding destination, followed by the perspective of each informant.

Table 2. Triangulation of Findings on the Readiness of Puncak Sempur as a Paragliding Destination

Research Focus	Interview	Observation	Documentation
Puncak Sempur as a paragliding tourism destination	Puncak Sempur has adequate land and geographical conditions for paragliding development; however, the activity cannot yet operate optimally due to the absence of licensed human resources, an SOP, infrastructure, and official permits. Both informants agreed that developing paragliding at Puncak Sempur can only be realized through collaboration among site managers, FASI, and the local	- Take-off site - Landing site - Weather observation - Difficult road access - Supporting facilities - No licensed pilot in Karawang Regency	Regulation of the Minister of Manpower No. 3 of 2016 on Procedures for Establishing the SKKNI

government,
supported by
capacity building,
legal certainty, and
improved facilities
and infrastructure.

1) An interview with the coffee-shop operator at Puncak Sempur, Cintalaksana Village, indicated that the area has land potential suitable as a paragliding take-off site, although the area previously used for landing has since been converted into a coffee shop; alternative open land nearby remains potentially usable as a landing area. The informant also noted that human-resource support for paragliding development was available in an earlier period but ceased following the COVID-19 pandemic, as paragliding practitioners returned to their respective home regions, leaving the supporting infrastructure no longer available.

2) An interview with the second informant, the Chairman of the Indonesian Aero Sport Federation (FASI) of Karawang Regency, revealed that FASI Karawang Regency does not yet have an active paragliding division, meaning that an SOP, licensed pilots, and an official flight-site permit for Puncak Sempur are not yet in place. Nevertheless, the area is considered to possess adequate geographical potential (topography, elevation, and scenery) for both training and tourism purposes. FASI expressed its readiness to support capacity building, human-resource certification, and licensing assistance should a serious and sustained management initiative emerge, which could generate positive economic effects for the local community.

3) A synthesis of both informants' perspectives indicates that Puncak Sempur possesses adequate geographical potential for paragliding, supported by an available take-off area and suitable topographical and landscape characteristics. However, this potential remains underutilized, owing to the limited landing area, the cessation of activity since the COVID-19 pandemic, and the absence of an organizational structure, licensed human resources, an SOP, and official legal status under FASI. Its development therefore requires planned synergy among FASI, site

managers, and the local government to build a structured coaching system while promoting local economic growth.

Take-off Site

Technically, a take-off site should be located on a hillside with an open, relatively smooth surface that allows the canopy to be laid out and inflated, and it should face the prevailing wind so that the pilot launches into a headwind. Technical criteria for paragliding sites are generally derived from international flying requirements and expert judgment, covering terrain, orientation relative to the prevailing wind, and the absence of obstacles (Kuscu Simsek et al., 2019). The take-off phase is also critical for safety: at Mount Babadağ, Turkey, most recorded paragliding accidents occurred during take-off and landing (Karakoyun & Golcuk, 2023). In the present study, terrain slope was not measured instrumentally; the suitability of the take-off slope at Puncak Sempur is therefore described qualitatively on the basis of field observation and the informants' experience, and it requires confirmation through topographic measurement.

Field observation showed that the former take-off area at Puncak Sempur is now obstructed by relatively tall vegetation that has regrown since paragliding activities ceased during the COVID-19 pandemic. Because the take-off area directly determines whether a flight can begin safely, this condition is currently the most immediate physical barrier to reactivating the site. A similar pattern was reported at Mount Panten, Majalengka, where limited management and infrastructure constrained an otherwise attractive paragliding site (Baehaqi et al., 2026)

Restoring the take-off area therefore requires more than clearing vegetation. It calls for routine maintenance and a clear division of responsibilities among site managers, FASI, and the local government. A penta-helix model involving government, sports communities, academia, industry, and the media has been proposed for managing paragliding sport tourism (Supriyoko et al., 2024), and effective paragliding tourism development in Bali and Central Java has been shown to depend on cooperative governance among businesses, local communities, and government institutions (Indriyani et al., 2025). For Puncak Sempur, the condition of the take-off area can thus be read as an early indicator of the absence of an integrated management system.

Landing Site

According to residents, the paragliding landing site at Puncak Sempur, previously used during active paragliding operations, has since been converted into a coffee-shop area. This change in land use directly affects the availability of a landing area that meets paragliding operational requirements. In air sports, the landing site is a critical component that determines not only the smoothness of flight operations but also significantly affects safety.

Field observation indicated that vacant land near the summit, including an open area on the northern side approximately 100 m from the summit slope, could potentially be developed as a landing site (Pavic et al., 2013). However, this land still faces several technical constraints: an uneven ground surface, surrounding trees, and the absence of a technical feasibility assessment. It therefore does not yet meet basic safety requirements for landing operations. A landing area should be relatively flat, open, and free of vertical obstacles, and its selection should be based on terrain and wind criteria derived from international technical requirements (Kuscu Simsek et al., 2019). This requirement is critical because landing is a high-risk phase of flight; at Mount Babadağ, most accidents occurred during take-off and landing, and the lower limbs were the most commonly injured body region (Karakoyun & Golcuk, 2023).

Research on paragliding development as an air-tourism icon similarly emphasizes that successful development depends not only on natural resource potential but also on management, human-resource availability, and integrated institutional and infrastructural support (Indardi & Sahri, 2020). The conversion of the landing site at Puncak Sempur thus reveals a gap between natural potential and suboptimal area management. A more in-depth and comprehensive technical assessment is therefore required, encompassing land-feasibility analysis, land-con tour planning, vegetation control, and integrated spatial planning, carried out collaboratively with relevant stakeholders so that paragliding development at Puncak Sempur can meet safety and operational requirements while also becoming a sustainable sports tourism destination that generates positive economic benefits for the local community.

Weather and Wind Conditions

Although the Indonesian Aero Sport Federation (FASI) recommends the AccuWeather platform as a weather forecasting aid, this study used the Windy application, which was considered to provide more comprehensive meteorological information, including wind direction, wind speed, weather forecasts, and other atmospheric parameters relevant to aerospace sport activities. The research was conducted in November 2025, which climatologically marks the onset of the rainy season, with air temperatures ranging from 18–24°C and high humidity. In the morning, weather conditions generally still support paragliding activities, characterized by partly cloudy skies and adequate visibility, although light fog can still be encountered in some hilly areas.

Weather is a major determinant of paragliding safety (Indardi & Sahri, 2020)(Supriyoko et al., 2024). In the Austrian mountains, wind and pilot error were the most common causes of aviation sports crashes, most of which involved paragliders (Ströhle et al., 2020). Mapping local weather dynamics is therefore a basis for determining safe operating times (Indardi & Sahri, 2020).

Wind speed at the site was within a manageable range. Over the 29 days of available data, daily wind speed ranged from 1 to 15 km/h, with a mean of 6.4 km/h, which is lower than the average of 14.5 km/h reported at Bukit Lelato, Pohuwato, a site considered suitable for paragliding (Gui et al., 2024). Wind direction, however, was less favorable. The prevailing wind came from the eastern sector, namely east (9 days), northeast (8 days), and southeast (8 days), whereas northerly or northwesterly winds were recorded on only 3 days and a southerly wind on 1 day (Table 3).

Table 3. Daily Wind and Temperature Data at Puncak Sempur, 2 November–1 December 2025 (Source: windy.com)

Observation Date	Wind Direction	Wind Speed (km/h)	Temperature (°C)
2 November 2025	Northwest	3	20-24
3 November 2025	East	4	19-24
4 November 2025	Northeast	5	18-23

5 November 2025	Southeast	10	20-22
6 November 2025	Northeast	6	21-24
7 November 2025	Southeast	5	20-24
8 November 2025	East	6	21-23
9 November 2025	East	2	20-23
10 November 2025	Northeast	4	19-24
11 November 2025	Northeast	2	21-24
12 November 2025	Southeast	1	19-20
13 November 2025	North	6	18-22
14 November 2025	Northwest	6	19-23
15 November 2025	Northeast	3	20-22
17 November 2025	East	2	18-24
18 November 2025	Northeast	5	18-23
19 November 2025	Southeast	4	19-24
20 November 2025	South	5	21-24
21 November 2025	East	8	22-23
22 November 2025	Northeast	12	21-24
23 November 2025	East	8	19-23
24 November 2025	East	6	18-22
25 November 2025	East	5	18-23
26 November 2025	Northeast	7	18-24
27 November 2025	Southeast	15	19-22
28 November 2025	Southeast	14	19-22
29 November 2025	Southeast	6	21-24
30 November 2025	Southeast	12	22-24
1 December 2025	East	14	21-24

The implication of wind direction depends on the orientation of the launch slope, because a paraglider must be launched into the wind. At Puncak Sempur, the open area that could serve as a landing site lies on the northern side of the summit, so the launch would face north and would require a northerly headwind component. The predominantly easterly winds recorded during the observation period would

therefore blow largely across the launch direction, creating crosswind conditions that make canopy inflation and control more difficult, particularly for novice pilots. Thus, although wind speed was adequate, wind direction is the main meteorological constraint on the use of the current take-off area. Because the Windy data represent daily model values for a single month at the onset of the rainy season, longer-term, on-site wind measurements at the launch point are needed to establish seasonal and diurnal wind patterns.

Access, Constraints, and Supporting Facilities

Interviews with site managers identified several constraints to paragliding development at Puncak Sempur. The access road to the site is considered too steep, hindering the movement of athletes and equipment; the area also lacks a landing site that meets safety standards; and the take-off area is obstructed by relatively tall trees, which may interfere with the take-off process. These constraints indicate the need for improved access, better organization of the take-off site, and provision of a landing area to enable paragliding activities to be conducted safely and optimally.

Interviews with residents and tourism site managers at Puncak Sempur, particularly at Kedai Kopi Hideung, revealed that key aspects of paragliding facility development include land-use legality and the availability and quality of access to the summit area planned as the take-off zone. This aligns with the view of the Chairman of FASI Karawang Regency, who emphasized that paragliding pilots tend to prefer sites with adequate vehicle access to the take-off point, as ease of access affects operational efficiency, equipment mobilization, and user comfort. In the context of Puncak Sempur, Cintelaksana Village, Tegalwaru Subdistrict, Karawang Regency, accessibility remains a challenge, as the route from the village to the hillside is relatively steep and inclined, while the final stretch to the summit remains a footpath not yet passable by motor vehicles.

This limited access infrastructure has implications for the comfort, safety, and attractiveness of the area as a paragliding sports tourism destination. Consistent with this, Bahtiar et al., (2023) emphasize that successful paragliding tourism development depends not only on geographical potential such as elevation, land contour, and scenic beauty, but also requires supporting tourism facilities, adequate infrastructure, and an effective safety mitigation system. Optimal infrastructure is

an important factor in enhancing destination quality and strengthening the competitiveness of a sports tourism area.

Indardi & Sahri, (2020) further explain that sustainable paragliding area development must be supported by synergy among natural resources, infrastructure, institutional governance, and government support. Observations at Puncak Sempur show that the summit area planned as the take-off site already has initial facilities, such as a gazebo or rest area managed by the local community, indicating community participation in tourism development. Nevertheless, limited road access remains the primary constraint. A comparable situation was reported at Bukit Lelato, where favorable natural conditions were offset by inadequate road infrastructure and limited pilot licensing (Gui et al., 2024), and in Sumedang Regency, where good geographical potential was not matched by local community participation (Riyadi et al., 2024)

Overall, Puncak Sempur shows potential for development as a paragliding tourism destination in Karawang Regency, supported by favorable topographic conditions and attractive natural scenery. However, optimizing this potential requires improved road infrastructure quality, strengthened land legality, the provision of safety and operational supporting facilities, and collaboration among local communities, the local government, and aerospace sport organizations to make Puncak Sempur a safe, competitive, and sustainable paragliding tourism destination.

CONCLUSION

Puncak Sempur in Cintelaksana Village, Tegalwaru Subdistrict, Karawang Regency, shows preliminary potential for development as a paragliding sports tourism site. This potential is indicated by its elevation, an available take-off area, an average wind speed within a manageable range (6.4 km/h), a strategic location near the Greater Jakarta area, and initial participation from the local community. However, the site is not yet ready for operation. The main constraints are a prevailing wind direction that is not aligned with the take-off direction, a take-off area overgrown with vegetation, the absence of a landing area that meets safety requirements, steep access roads, the absence of licensed pilots and an official SOP, and an institutional and legal framework that is not yet in place. Because this study relied on qualitative data, a single month of model-based wind data, and no instrumental measurement

of terrain slope, these findings should be regarded as a preliminary assessment rather than a technical feasibility determination. Developing the site will require coordinated action among FASI, site managers, the local government, and the community, including clearing and maintaining the take-off area, establishing a landing area, improving access, developing an SOP, securing legal status, and training and certifying pilots. Future research should include topographic measurement of the launch and landing areas, long-term on-site wind monitoring, and an economic feasibility assessment.

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