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## A Community-based Management Strategy for High Conservation Value Area in the Kelabba Madja Tourism Area

*Strategi Pengelolaan Areal Bernilai Konservasi Tinggi Berbasis Masyarakat di Kawasan Wisata Kelabba Madja*

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### ABSTRACT

The determination of Kelabba Madja as the target for the development of the East Nusa Tenggara Province Tourism Estate in 2022 is a potential source of increased pressure on regional sustainability. Comprehensive research identifying High Conservation Value Areas (HCVAs) and formulating community-based management strategies in non-forest tourism areas was limited. Therefore, this research aimed to formulate a community-based management strategy for HCVAs. A mixed-methods design was adopted, incorporating descriptive analysis, HCVa assessment, behavioral analysis, strengths, weaknesses, opportunities, and threats (SWOT) analysis, and the analytical hierarchy process. The results showed that Kelabba Madja contained HCVa 3 (44.7 ha), 5 (332 ha), and 6, which intersected with 3. Community activities of grazing and the accumulation of tourist waste in HCV areas 3 and 6 had the potential to become serious threats. The priority strategies included sustainable environmental management, stakeholder coordination, strong cooperation with various parties, including the government, the community, and the private sector, improving community welfare and education, and strengthening regional protection regulations. This research contributed to the body of knowledge by integrating HCVAs mapping, behavioral analysis of the local community and tourists, and a multi-criteria decision-making method as the basis for evidence-based HCVAs management.

### INTISARI

Penetapan kawasan Kelabba Madja sebagai Sasaran Pengembangan Pariwisata Estate Provinsi Nusa Tenggara Timur Tahun 2022 berpotensi meningkatkan tekanan terhadap keberlanjutan kawasan. Di sisi lain, kajian yang mengidentifikasi areal bernilai konservasi tinggi (ABKT) secara komprehensif serta merumuskan strategi pengelolaan berbasis masyarakat pada kawasan wisata non-kawasan hutan masih terbatas. Oleh karena itu, diperlukan penelitian untuk merumuskan strategi pengelolaan ABKT berbasis masyarakat. Metode penelitian yang digunakan adalah metode campuran dengan teknik analisis deskriptif, pemetaan ABKT, pemetaan perilaku, analisis Strengths-Weaknesses-Opportunities-Threats, dan Analytical Hierarchy Process. Hasil penelitian menunjukkan bahwa terdapat tiga kategori ABKT, yaitu areal 3 (44,7 ha), areal 5 (332 ha), dan areal 6 yang beririsan dengan areal 3. Aktivitas masyarakat dan penumpukan sampah wisatawan di ABKT 3 dan 6 berpotensi menjadi ancaman yang serius. Prioritas strategi pengelolaan ABKT berbasis masyarakat di Kelabba Madja meliputi pengelolaan lingkungan berkelanjutan, membangun koordinasi antarpemangku kepentingan, kerja sama dengan berbagai pihak, termasuk pemerintah, masyarakat, dan sektor swasta, peningkatan kesejahteraan dan edukasi masyarakat, serta penguatan regulasi perlindungan kawasan. Penelitian ini juga memberikan kontribusi dengan mengintegrasikan pemetaan ABKT, analisis perilaku masyarakat dan wisatawan, serta pendekatan pengambilan keputusan multikriteria sebagai dasar pengelolaan ABKT berbasis masyarakat.

## Introduction

Kelabba Madja is a unique tourist destination in Sabu Raijua Regency, East Nusa Tenggara Province. This area is popularly known as the “Rainbow Hill,” the dwelling place of deities, and the “Grand Canyon” of East Nusa Tenggara. Kelabba Madja is a vast gorge featuring cliffs with colorful rock walls and pink stone pillars topped by dark red, mushroom-like formations. This rock formation belongs to the Aitutu Formation, which consists of layered calcite and nodular chert and is estimated to be approximately 210 million years old. Kelabba Madja meets the criteria for designation as a geological nature reserve, based on its unique landscapes, rock formations, and fossilized remains (Center for Groundwater and Environmental Geology 2020).

The Consortium for Revision of the HCV Toolkit for Indonesia (2008) classified the High Conservation Value Area (HCVAs) into six categories (Table 1). Of the six HCVAs mentioned in Table 1, Kelabba Madja is under HCVA 3 (area containing rare or endangered ecosystems) and 6 (area with important functions for local cultural identity). Therefore, Kelabba Madja holds significant conservation value that must be preserved. Conservation efforts outside the state forest area can be undertaken through designation as an Essential Ecosystem Area (EEA) or HCVA. The Director General of Natural Resources and Ecosystem Conservation Regulation (Peraturan Direktur Jenderal KSDAE Nomor: P.1/KSDAE/BPE2/KSA.4/2/ 2021 2021) on the Technical Guidelines for Evaluating the Effectiveness of Essential Ecosystem Area Management states that HCVAs play a vital role in maintaining biodiversity, providing ecosystem services, fulfilling social functions, and supporting the cultural identity

of the local community. The HCVAs concept includes the principles of High Conservation Value Forests (HCVF) or HCVAs.

Designating a critical area outside the state forest area has previously been implemented in East Nusa Tenggara Province. For example, the province designated the Rote Snake-Necked Turtle Habitat and Flores Island as part of the Essential Ecosystem Areas. These designations were supported by local government policies, such as the Governor's Decree No. 238/KEP/HK/2020 on the Essential Ecosystem Area in Flores Island (Nusa Tenggara Timur 2020) and the Governor's Decree No. 204/KEP/HK/2019 on Wetlands as Habitat for *Chelodina mccordi* in Rote Ndao Regency (Nusa Tenggara Timur 2019). However, the unique and threatened landscape of Kelabba Madja has not yet received official protection status. In 2022, the Provincial Government of East Nusa Tenggara issued Governor's Decree No. 27/KEP/HK/2022 officially designating Kelabba Madja as a tourism estate development area, which could increase pressure on the area (Nusa Tenggara Timur 2022).

The first source of pressure concerns the water resources in Sabu Raijua Regency. Dwihatmojo and Maryanto (2015) mapped the water resource balance and found that the regency faces significant limitations in availability. Kelabba Madja functions as a catchment area, playing an important role in collecting and regulating surface water in the surrounding landscape. The Provincial Public Works and Spatial Planning Office (Dinas PUPR Provinsi Nusa Tenggara Timur 2021) reported that Kelabba Madja has high biodiversity values while being threatened by landslides and flooding. The survey also showed a lack of human resources to manage Kelabba Madja as a tourist area. However, these surveys did not include detailed mapping of areas with high biodiversity, threatened plant and animal species, vulnerable ecosystems, landslide-prone and flood-prone areas, or areas critical to fulfilling local community needs. In other words, the HCVAs within this area have yet to be comprehensively identified.

Human activities in Kelabba Madja have increased significantly, driven by intensive promotions through various media channels, including local government social media, national news platforms, and videos produced by YouTubers, attracting a

**Table 1.** HCVA categories

No.	Categories	Description
1.	HCVA 1	Important biodiversity (species and genetic diversity).
2.	HCVA 2	Natural landscapes with significant ecosystems.
3.	HCVA 3	Area containing rare or endangered ecosystems.
4.	HCVA 4	Essential ecosystem services (water protection, erosion control).
5.	HCVA 5	Provision of basic community needs (food, water, medicine, grazing land).
6.	HCVA 6	Area with important functions for local cultural identity.

Source: Consortium for Revision of the HCV Toolkit for Indonesia (2008)

growing number of tourists (Ratu et al. 2022). In 2018, Kelabba Madja was awarded “Most Popular Hidden Paradise” and won first place in the *Anugerah Pesona Indonesia* (API). The 2019 *Festival Jelajah Pesona Kelabba Madja* successfully showcased Sabu Raijua’s tourism potential and attracted more tourists to the area. According to Safitri (2018), high levels of tourism activity in an area correlate with environmental degradation. Tourism activities may cause negative impacts, such as waste accumulation (Wara 2021). Meanwhile, tourism development disrupts natural habitats and leads to land-use conversion for tourism purposes (Ramadani et al. 2024). Other pressures from human activities, such as livestock grazing, land clearing and burning, timber cutting, and other unsustainable practices, also threaten the area’s existence but have not yet been mapped. Identification and documentation of these activities are crucial for developing appropriate management strategies for the area.

Kelabba Madja is located outside the state forest area and directly borders the Daruma Forest in Sabu Raijua Regency. Local communities maintain strong interactions with the state forest, and their culture evolves through relationships with forest resources. The paradigm of conservation area management now recognizes communities as partners, and the empowerment of local communities is essential for participation in conservation efforts (Massiri 2022). Collaboration among stakeholders is essential in community-based area management and development. A major challenge in community-based management is the weak coordination and collaboration among stakeholders (Setyara et al. 2024). Therefore, effective strategies are needed to support the roles of local communities and governments and to establish collaborative institutions that ensure sustainable, effective partnerships. This effort will benefit all parties and support environmental sustainability and community welfare.

Along with the increasing intensity of tourism activities and the utilization of community spaces, research and reports have examined the tourism potential, geological uniqueness, and environmental conditions of the Kelabba Madja area. However, they have not yet comprehensively identified HCVA nor examined the interrelationships between intensified

tourism activities, patterns of community space use, and conservation needs. Specifically, very limited research has integrated HCVA mapping, behavioral mapping of local communities and tourists, and strategic analysis as a basis for formulating sustainable management strategies for non-forest tourism areas. Based on this gap, this research offers novelty through an integrated method that combines HCVA mapping, behavioral mapping of communities and tourists, and strategic analysis using SWOT and AHP methods within a single analytical framework. This integrated method enables the formulation of community-based HCVA management strategies that consider ecological aspects and also accommodate social, cultural, and tourism development pressures in the Kelabba Madja area. In summary, Kelabba Madja holds significant conservation value, yet the designation as a tourist destination poses potential threats to its environment. An appropriate HCVA management strategy is needed to protect and preserve this area through a collaborative method, including local communities, local governments, and other relevant stakeholders.

## Methods

### Time and Location

This research was conducted from October 2024 to February 2025 in Sabu Raijua Regency, East Nusa Tenggara, which was located between  $10^{\circ}25'7.12''$ – $10^{\circ}49'45.83''$  S and  $121^{\circ}16'10.78''$ – $122^{\circ}00'30.26''$  E. The total research area covered 655.20 ha, directly bordered by the Sabu Sea to the north, east, and west, and the Indian Ocean to the south. Sabu Raijua Regency was situated at an elevation ranging from 0 to 100 m above sea level. According to the Oldeman climate classification, the area fell under the D4 and E4 types, characterized by a very short rainy season, with only about 14 to 69 rainy days/year. The rainy season generally occurred from December to March, while the dry season lasted for approximately 7 to 8 months, from April to November.

### Data and Tools

In this research, both the primary and secondary data were collected. According to Sugiyono (2018), primary data were obtained directly from original

sources, while secondary data were collected indirectly through intermediary media, such as relevant institutions. The primary data for this study were collected through community behavior mapping guided by question guidelines, as well as through Internal Strategic Factor Analysis Summary (IFAS) and External Strategic Factor Analysis Summary (EFAS) assessments using questionnaires, which involved three groups of respondents.

A total of 33 respondents were selected through accidental sampling to answer the guiding question for mapping community activities. The accidental sampling method was applied to select respondents who participated in the community activity mapping (Williams & Allen 2022). This method required selecting participants based on the availability and accessibility in the research area during data collection, with those encountered who met the criteria considered suitable data sources. Accidental sampling was appropriate for exploratory and descriptive research when the focus was on observing natural behavior within a specific context and a complete sampling frame was unavailable (Williams & Allen 2022).

A total of 30 respondents were selected through purposive sampling from 10 stakeholder groups, including village government representatives from Wadumaddi, Eikare, Raerobo, Dainao, and Teriwu; the Forest Management Unit (FMU) of Sabu Raijua Regency; the Tourism Office of Sabu Raijua Regency; the Kelabba Madja management authority; local communities; and visitors, who are directly related to the Kelabba Madja tourism area, to determine IFAS and EFAS in the SWOT analysis. The weights for the IFAS and EFAS factors were determined based on the level of importance respondents assigned to each internal and external factor through questionnaire responses. The scores were averaged and normalized so that the total weight of each IFAS and EFAS matrix equaled one (Utsalina & Primandari 2020). Two experts selected were local university academics familiar with Kelabba Madja and skilled in formulating management strategies, while three others were selected from regency and provincial-level officials with at least 10 years of relevant experience to develop community-based management strategies for HCVAs in the Kelabba Madja area.

The secondary data used in this research included rainfall data (sourced from the Central Statistics Agency (BPS) of Sabu Raijua Regency), soil type data, slope, land cover or land use (Forest Area Consolidation and Environmental Management Center (BPKHTL) Area XIV Kupang), watershed map (Watershed and Protected Forest Management Agency (BPDASHL) Benanain Noelmina), biodiversity, threatened species, ecosystem services (Natural Resources Conservation Agency (BBKSDA) East Nusa Tenggara), and basic needs maps (Regional Development Planning Agency (Bappeda) of Sabu Raijua Regency), as well as tourist visitation data (the Tourism Office of Sabu Raijua Regency). This research used multiple instruments corresponding to each analytical stage. The questionnaires distributed to 30 stakeholders were designed to identify and assess internal (IFAS) and external (EFAS) strategic factors. These instruments were developed based on a literature review and preliminary field observations. Content validity was assessed through expert judgment, including two academics specializing in forest resource conservation, who reviewed the clarity, relevance, and consistency of the questionnaire items with the research objectives.

The SWOT results were subsequently analyzed using the Analytical Hierarchy Process (AHP), including five selected experts from government institutions and academia. In the AHP stage, the logical consistency of expert judgments was evaluated using the Consistency Ratio (CR). The acceptable threshold was 10%, showing acceptable consistency in the pairwise comparisons (Akmaludin et al. 2023).

## **Analysis**

### *HCVAs Mapping*

The mapping of HCVAs was conducted using secondary data from several sources. These included Provincial Environmental and Forestry Office of East Nusa Tenggara, BPKHTL Area XIV Kupang, BPDASHL Benanain Noelmina, BBKSDA East Nusa Tenggara, the Tourism Office of Sabu Raijua Regency, Bappeda of Sabu Raijua Regency, BPS of Sabu Raijua Regency, and other sources as needed for HCVAs data. The collected data were processed using ArcMap 10.3, and conclusions were drawn in accordance with the Consortium for Revision of the HCV Toolkit for Indonesia (2008).

### Behavioral Mapping

Data on community activities within the Kelabba Madja HCVA were collected using a qualitative behavioral mapping method and accidental sampling (Sugiyono 2018). This method was selected for the area's open and dynamic nature, which facilitates the observation of natural behaviors without direct intervention (Subedi 2023). Observations were conducted over a two-week period, which was considered an effective duration for observing respondents naturally through accidental sampling, as suggested by Effendi et al. (2017). The focus was on entry points and Points of Interest (POI), which were considered representative of tourist characteristics (Karagöz et al. 2022). Data collection was based on person, milieu, and temporal variables (Panuntun 2019), with observations made in the morning and afternoon, which were peak visitation times (Cohen & Avieli 2004). A combination of place-centered mapping and physical trace methods produced a distribution map of community activities that reflected behavioral patterns and the intensity of space use at various points within the tourist area. Table 2 shows the indicators used in the questionnaire design.

### Community-based Management Strategy

The management strategy for HCVA in the Kelabba Madja Tourism Area was formulated through a SWOT analysis derived from a literature review, and through the distribution of IFAS and EFAS questionnaires to 30 respondents (Sasoko & Mahrudi 2023). Furthermore, the assessment of internal and external factors was organized into IFAS and EFAS matrices based on questionnaire results and interviews with stakeholders familiar with the area's characteristics (Oktarianda et al. 2022). Four main strategies were formulated from the SWOT combination and further analyzed using the AHP method to determine the

optimal management strategy priorities (Saaty 1999). The AHP priority assessment included experts from Wadumaddi Village Government, local customary leaders, the Sabu Raijua Regency Tourism Office, the Provincial Environmental and Forestry Office of East Nusa Tenggara, and academics from a local university in East Nusa Tenggara. An overview of the entire data analysis process is presented in Figure 1.

### Logical Framework Matrix (LFM)

Following the identification of priority strategies, the Logical Framework Matrix (LFM) approach was applied to structure each management strategy with a clear logical framework, measurable indicators, and a defined monitoring and evaluation system. This approach was employed to support the implementation of adaptive, participatory, and sustainable HCVA management strategies. The LFM was developed based on the Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) principles to systematically guide the implementation of community-based HCVA management strategies.

## Result and Discussion

### HCVA Mapping

The identification and mapping results showed that the Kelabba Madja tourism area contained significantly high conservation values that required careful consideration. The identification was conducted by overlaying various thematic maps from secondary data sources using GIS analysis, and the results were classified according to the criteria in the Consortium for Revision of the HCV Toolkit for Indonesia (2008). Based on this method, three HCVA were identified: HCVA 3, 5, and 6, which covered more than 50% of the total area (655.20 ha). The distribution of these categories showed that Kelabba Madja was not merely a tourist destination but also an area

**Table 2.** Research variables using the behavioral mapping method

Variable	Sub-Variable	Indicator
Person	Activity Participant	Type of Activity Participant (Age Group, Gender, Occupation, Distance).
	Activity	Type of Activity and Frequency of Visits.
Milieu	Space	Type of Space and Spatial Relationships.
	Space Attributes	Type of Attributes, Attributes Layout, and Attributes Relationship.
Temporal	Weekdays	Morning (08.00-10.30) and Afternoon (15.00-17.30).
	Holidays	Morning (08.00-10.30) and Afternoon (15.00-17.30).

Source: Panuntun (2019)

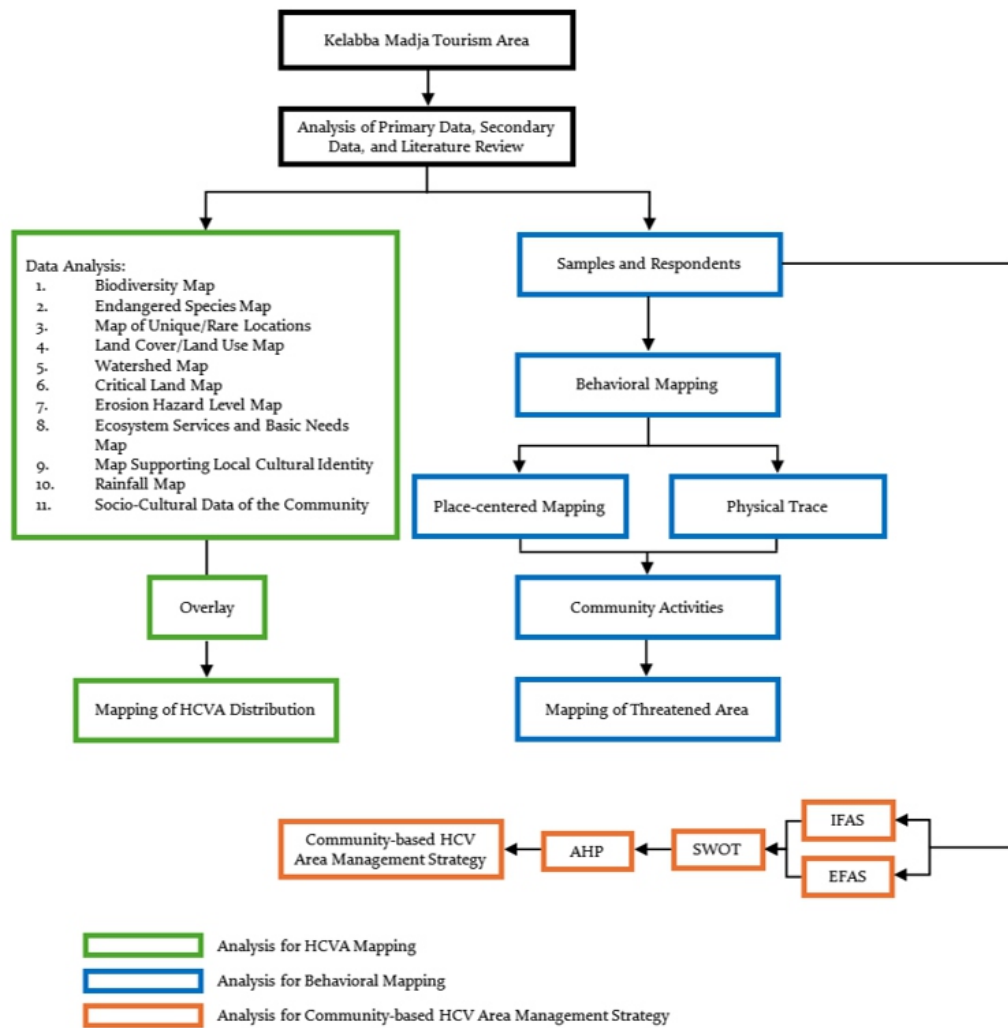


Figure 1. The data analysis process

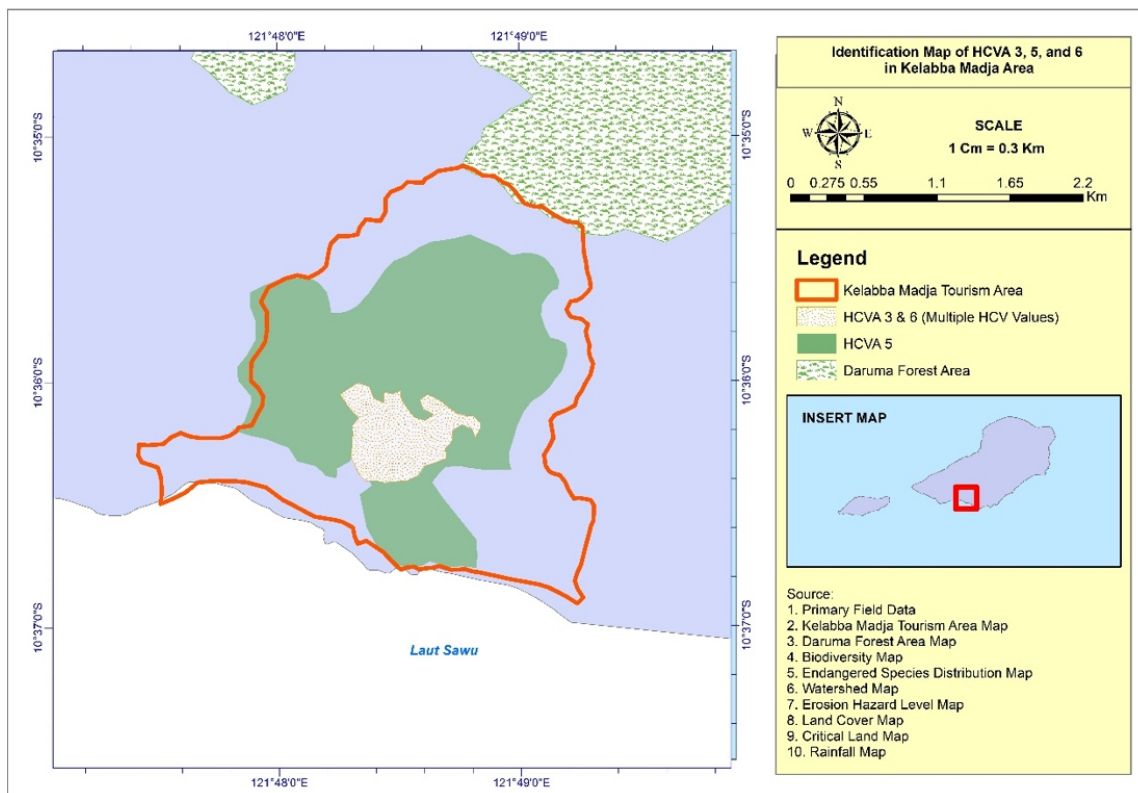
with substantial ecological, social, and cultural significance.

Spatial analysis identified that the unique ecosystem within the Kelabba Madja Tourism Area occupied approximately 44.7 ha, representing about 4.2% of the adjacent total watershed. This spatial result showed the presence of HCVA 3 within the Kelabba Madja Tourism Area. HCVA 3 comprised an area with rare or endangered ecosystems, including unique geological landscapes and distinctive endemic vegetation that were vulnerable to damage (Consortium for Revision of the HCV Toolkit for Indonesia 2008). In addition, HCVA 6 overlapped directly with 3, showing the area's high cultural value and the presence of ongoing spiritual activities (Consortium for Revision of the HCV Toolkit for Indonesia 2008). The stones used for rituals reflected the existence of sacred areas and traditional belief locations that were

still well preserved by the Sabu community. Meanwhile, HCVA 5 covered approximately 332 ha (50.67%) that were actively used by local communities to meet basic needs, mainly as livestock grazing land. These results showed the community's dependence on the area's ecological functions. The identification served as a crucial basis for developing balanced conservation and tourism policies. Therefore, the designation of Kelabba Madja as a priority tourism development area in East Nusa Tenggara must take into account its sensitive ecological and socio-cultural functions. Figure 2 shows the identified HCVA map for the Kelabba Madja area.

### Behavioral Mapping

The behavioral mapping in the Kelabba Madja tourism area revealed patterns of community and tourist activities that reflected simultaneous space



**Figure 2.** Identification map of HCVA 3, 5, and 6 in Kelabba Madja area

utilization for both local and tourism purposes. According to previous research, the identified activities fell into two main categories, namely tourism and non-tourism activities (Klein et al. 2018). Non-tourism activities were dominated by local communities, who herd livestock and provide drinking water for the animals. Meanwhile, tourism activities included sightseeing, photography, camping, stargazing (observing the Milky Way), walking around, and maintaining the Kelabba Madja tourism area.

In terms of participants, both activities were carried out predominantly by men, with percentages of 60.61% and 39.39%, respectively. This result showed gender inequality, consistent with the report by Hadiarta et al. (2022), which found that women still have lower access to and participation in resource development and management. By age group, participants were predominantly adults (18–59 years old), accounting for 96.97%, with only one (3.03%) classified as an adolescent (10–17 years old). This result showed the area's limited appeal or accessibility for non-productive age groups (Hudiono 2022). Regarding occupation, the majority were farmers

(54.55%), followed by entrepreneurs (24.24%), with the rest working in education and government sectors. The Kelabba Madja still functioned as an important agrarian space. Based on residential distance, most participants (60.61%) came from a nearby area ( $\leq 2$  km), suggesting high local community participation in space utilization within the area.

The observed activities showed that 54.55% were non-tourism activities, dominated by livestock grazing (17 participants). Meanwhile, tourism activities accounted for only 45.45%, including sightseeing, photography, socializing, camping, stargazing (observing the Milky Way), walking around, and maintaining the Kelabba Madja tourism area (10 participants). This condition suggested that the area's traditional socio-ecological function remained more dominant than the tourism function. Space utilization was different between the two activity types. Non-tourism activities were widely dispersed, covering approximately 332 ha (50.67% of the total area), and heavily dependent on natural features, such as grasslands and water reservoirs. However, tourism activities were concentrated in a single spot covering 44.7 ha (6.82%) and used the

natural landscape, ritual stones, and tourism facilities. Facilities such as toilets and vendor stalls were in poor condition, affecting tourist comfort.

A temporal perspective based on observation showed that non-tourism activities were consistently carried out in the morning and afternoon on both weekdays and holidays. This observation suggested that subsistence activities were unaffected by tourism dynamics. Livestock grazing was recorded 17 times during each observed time period and day, reflecting a daily, repetitive activity pattern that did not vary with the period. However, tourism activities showed greater fluctuation, with an increase in the afternoon on holidays, rising from 3 occurrences on weekdays to 4 occurrences on weekends. Camping and stargazing were observed only on holidays, showing the potential for developing nighttime tourism. Although Kelabba Madja was designated as a tourism area, its use remained predominantly driven by the local community's traditional functions.

**Community-based Management Strategy for HCVAs**

The SWOT analysis identified internal (strengths and weaknesses) and external factors (opportunities and threats) influencing the management of HCVAs in Kelabba Madja. The strengths included the preservation of natural ecosystems, local wisdom and cultural practices, the area's aesthetic appeal, community participation, and its economic contribution. Meanwhile, the weaknesses included insufficient human resources, poor coordination among stakeholders, a lack of management knowledge, budget constraints, and social issues such as poverty and low educational levels.

The identified opportunities included the potential for cross-sector collaboration, the growing trend of nature and cultural tourism, youth and Micro, Small, and Medium Enterprises (MSME) participation, local government policy support, and the use of digital technology. Several threats were identified, including the negative impacts of tourism, environ-

mentally damaging human activities, natural hazards, such as landslides, external interventions, and the degradation of cultural values due to commercialization. Based on the scoring results of the IFAS matrix analysis, the total score for the strength factors was 4.04, while the total score for the weakness factors was 2.02. Meanwhile, the EFAS matrix analysis indicated that the total score for the opportunity factors was 4.97, and for the threat factors was 1.77. The combination of these scores resulted in coordinate values of (1.01; 1.59). The IFAS and EFAS matrices placed the SWOT results in Quadrant I (as presented in Figure 3), suggesting an aggressive, growth-oriented strategy. Figure 4 presents the detailed strategy formulation.

The SWOT analysis identified 11 community-based HCV management strategies that were formulated for the Kelabba Madja area. Subsequently, an AHP analysis was conducted to determine the highest-priority strategies. The hierarchy of community-based HCVAs management strategies is presented as follows (see Figure 5).

Figure 5 shows the strategies analyzed using the web-based AHP Online System from Business Performance Management Singapore (BPMSG). The AHP analysis of these eleven alternative HCVAs management strategies for the Kelabba Madja area identified priority strategies representing the most urgent policy directions for implementation. This assessment was carried out using the pairwise comparison method by five experts from government and academia. The Consistency Ratio (CR) was 6.7%, within the acceptable threshold ( $\leq 10\%$ ). A CR value of 6.7% suggested that the level of consistency in the experts' assessments remained acceptable, considering that the recommended CR for AHP results should be less than or equal to 10% (Akmaludin et al. 2023). Therefore, the resulting priority weights were considered valid and could serve as a basis for formulating appropriate management strategies.

The five strategies with the highest priority weights, considered the most important to implement immediately, are as follows:

**Table 3.** Consistency Ratio (CR) for priority HCVAs management strategies

A	B	C	D	E	F	G	H	I	J	K	CRmax
6.7%	5.0%	7.0%	11.0%	4.9%	2.4%	12.2%	17.5%	7.8%	15.8%	9.7%	6.7%

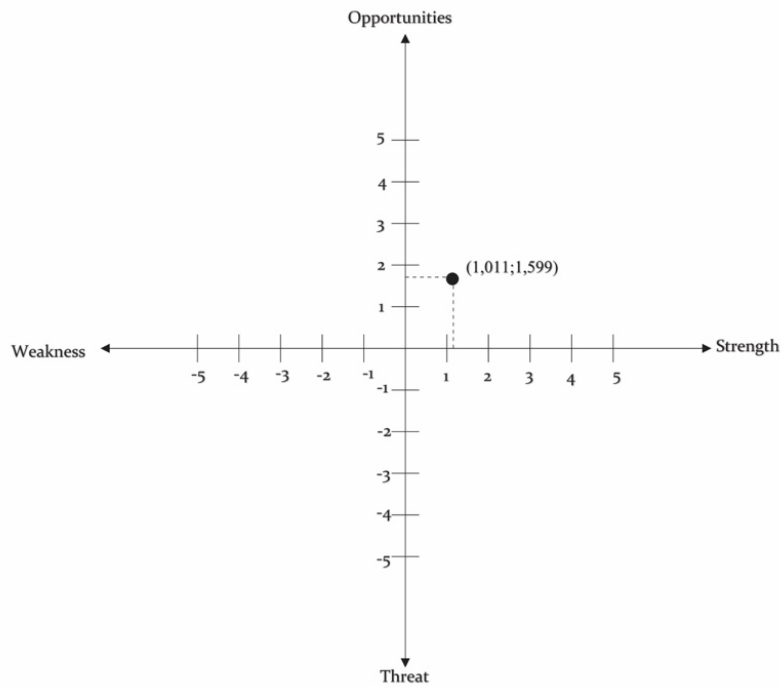
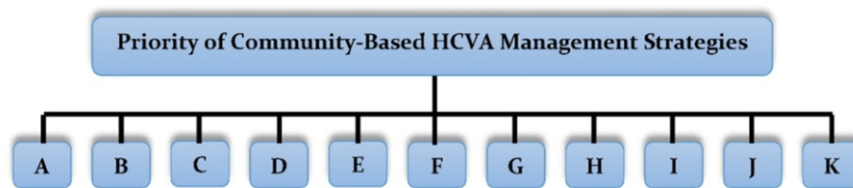


Figure 3. SWOT analysis matrix

<p><b>WO Strategy (Weakness–Opportunity)</b>                  (C) Human Resource Capacity Building                  (J) Establishing Better Coordination</p>	<p><b>SO Strategy (Strength-Opportunity)</b>                  (A) Enhancing Community Involvement                  (E) Strengthening Cultural and Conservation Tourism Branding                  (F) Application of Technology in Management                  (G) Collaboration with Various Stakeholders</p>
<p><b>WT Strategy (Weakness-Threat)</b>                  (D) Improving Community Welfare and Education                  (I) Environmental Risk Mitigation                  (K) Strengthening Regulations for Area Protection</p>	<p><b>ST Strategy (Strength-Threat)</b>                  (B) Preservation of Local Culture and Traditions                  (H) Sustainable Environmental Management</p>

Figure 4. Formulation of the HCVA's management strategy



- The Strategies:
- (A) Enhancing Community Involvement
  - (B) Preservation of Local Culture and Traditions
  - (C) Human Resource Capacity Building
  - (D) Improving Community Welfare and Education
  - (E) Strengthening Cultural and Conservation Tourism Branding
  - (F) Application of Technology in Management
  - (G) Collaboration with Various Stakeholders
  - (H) Sustainable Environmental Management
  - (I) Environmental Risk Mitigation
  - (J) Establishing Better Coordination
  - (K) Strengthening Regulations for Area Protection.

Figure 5. Community-based HCVA's management strategy hierarchy

1. Sustainable Environmental Management (17.5%)

This strategy highlighted the urgent need to sustain the HCVAs area against environmental degradation, including biodiversity conservation and the preservation of Kelabba Madja's unique geological landscape. Suggested activities included implementing tourism zoning to protect sensitive areas from erosion and landslides, establishing community-based environmental patrol teams to monitor the impacts of tourism and free-grazing livestock, and developing an integrated community-based waste management system to address the negative impacts of tourism.

2. Establishing Better Coordination (15.8%)

The need for cross-sector coordination among government agencies, traditional institutions, NGOs, and local communities has become essential to ensure the effectiveness and sustainability of management programs. In this case, suggested activities included establishing a multi-stakeholder communication forum comprising government, communities, academics, and local investors to jointly develop action plans to implement the management strategies. Capacity building and role strengthening of Tourism Awareness Groups (Pokdarwis) were also proposed, as these groups served as key actors in HCVAs management and protection. In addition, Memoranda of Understanding (MoUs) or formal regulations among relevant stakeholders were recommended to ensure more structured, legally binding management arrangements.

3. Collaboration with Various Stakeholders (12.2%)

The participation of external parties, including donor agencies and development partners, will broaden available resources and strengthen the area's management capacity. Suggested activities included using collaboration opportunities with NGOs, universities, and tour operators for training and tourism development. The research promoted support from the local government through budget allocations and pro-sustainable tourism policies. In addition, youth and the local community were empowered to become key

actors in tourism and conservation, such as tour guides, homestay managers, and local artisans.

4. Improving Community Welfare and Education (11.0%)

This strategy highlighted the importance of the social aspect, which had previously been ranked fourth. Improving understanding and welfare in the surrounding community will further enhance support and active participation in conservation efforts. Suggested activities included developing creative economy programs rooted in local culture to increase community income and providing education on sustainable tourism and conservation for both local communities and tourists.

5. Strengthening Regulations for Area Protection (9.7%)

Strong and operational regulations were a prerequisite to establishing clear boundaries for area utilization and to imposing sanctions on violations. Suggested activities included proposing Kelabba Madja as a community-managed conservation area supported by robust legal frameworks, encouraging local governments to issue policies that regulate development limits and tourism activities, and developing community-based environmental patrol regulations to monitor the impacts of tourism and free-grazing livestock.

All of these strategies resulted from expert assessments and could be implemented through community-based activities. The local community was not merely an object of management but also actively played a central role as a key factor in conservation and sustainable development efforts.

### Logical Framework Matrix (LFM)

As a follow-up to the five priority strategies, the LFM was applied, ensuring that each management strategy had a clear logical structure, measurable indicators, and a defined monitoring and evaluation system. This method was expected to ensure the implementation of adaptive, participatory, and sustainable HCV management strategies. The LFM in Table 4 was developed based on the Specific, Measurable, Achievable, Relevant, and Time-bound

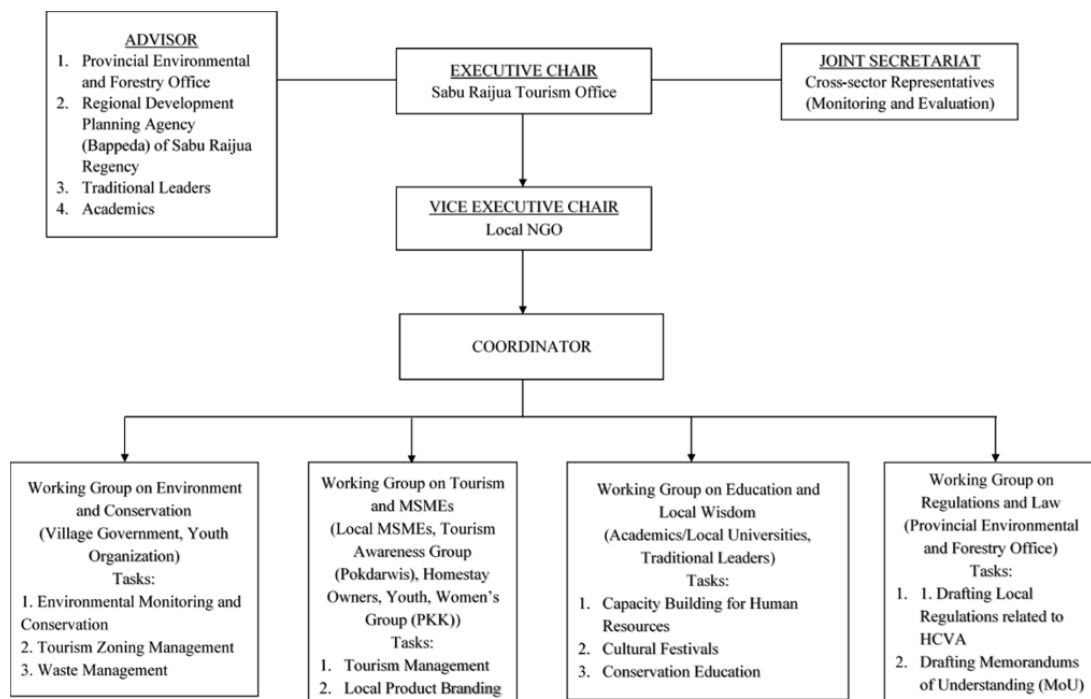
(SMART) principles to systematically guide the implementation of community-based HCVAs management strategies. However, the implementation timeline outlined in the LFM represented an ideal planning scenario.

In practice, these timelines could be adjusted in accordance with institutional capacity, regulatory processes, stakeholders' readiness, and the spatial extent of the area to be zoned. Furthermore, to

support the participatory and sustainable management of the HCVAs in Kelabba Madja, a cross-sectoral collaboration forum could be established, including government representatives, local community, academics, and development partners. The structure of this forum (Figure 6) was designed to ensure that each stakeholder group played a strategic role in the planning, implementation, monitoring, and evaluation of area management programs.

**Table 4.** Logical Framework Method

Activities	Indicators	Baseline	Target	Timeframe	Responsible Parties
Tourism zoning	Zoning document legalized	Not available	1 zoning document	6 months	Tourism Office
Patrol team decree	Patrol team decree issued	Not available	1 team	3 months	Relevant agencies
Environmental patrol team	Number of monthly patrols	0	At least 2 times/month	-	Community & NGOs
Waste management	Number of waste bin points Number of waste segregation bins	2 Points 0	6 points 6 bins	1 month	Local community/ Relevant agencies
Communication forum	Number of meetings per year	0	2 times/year		All stakeholders
MoU between parties	Number of MoUs signed	0	1 MoU	6 months	All stakeholders
Tourism training	Number of trainings held	0	Minimum 2 trainings/year		Universities/NGOs and Relevant agencies
Local homestay	Number of active homestays	0	5 homestays	2 years	Community/Relevant agencies
Creative local product	Number of local products developed	2 products	10 products	6 months	Local MSMEs
Community education	Number of participants	0	50 people	1 year	Tourism Awareness Group ( <i>Pokdarwis</i> )
Conservation bylaw/HCVAs/EEA	Bylaw enacted	None	1 regional bylaw	1 year	Local government & Regional Parliament



**Figure 6.** Structure of the HCVAs Management Forum in Kelabba Madja

Participatory governance played a key role in balancing conservation objectives and sustainable local livelihoods. Research on degraded rural landscapes showed that long-term restoration and conservation outcomes were more likely to be achieved when local communities participated meaningfully in governance processes, particularly through inclusive learning, capacity building, and equitable access to ecosystem services (Palmer et al. 2022). Therefore, participatory governance served as a critical foundation for connecting ecological protection with socio-economic sustainability.

### Conclusion

The Kelabba Madja tourist area includes three categories of HCVA, namely HCVA 3 (rare/threatened ecosystems), HCVA 5 (lands for basic needs fulfillment), and HCVA 6 (areas with high cultural and spiritual value). Human activities in this area, both tourism- and non-tourism-related, do not pose a direct threat, but potential risks exist, including grazing in sensitive areas and waste accumulation from tourists. The AHP analysis identified five priority management strategies, respectively, namely sustainable environmental management, improved coordination, multi-stakeholder collaboration, community welfare and education enhancement, and strengthened regulations. Therefore, the area's management must prioritize ecological protection and collaborative governance, with strict monitoring of activities, empowerment of local communities, and stronger local government policies. Further research is recommended to explore the social-ecological dynamics of the area in greater depth, including the interactions between human activities and ecosystem conditions, as well as their impacts over time. This research has several limitations, including reliance on expert judgment in the AHP analysis, which may introduce subjectivity, and the relatively short observation period used in behavioral mapping. Future research is expected to incorporate longer observation periods, quantitative ecological indicators, and broader stakeholder participation to strengthen community-based HCVA management strategies.

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