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ANALYSIS OF THE BIOLOGICAL, GEOLOGICAL, GEOMORPHOLOGICAL AND CULTURAL LANDSCAPE VALUE OF KON KA KINH NATIONAL PARK

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Abstract. Kon Ka Kinh National Park is distributed in the core zone of the Kon Ha Nung Plateau Biosphere Reserve. From the perspective of landscape research, besides biological values, this area also has geological, geomorphological, and cultural potentials. The article is based on the method of document review, field survey, map, and geographic information system, especially biodiversity statistics on 77 standard plots. The study shows the biological value of Kon Ka Kinh National Park, with prominently mixed broad-leaved vegetation, several endemic and unique tree species, several rare species of birds, and primates such as *Garrulax konkakinhensis*, *Pygathrix cinerea*... The geological and geomorphological values are characterized by the interaction between ancient and current formations distributed within the Kon Tum Massif... The typical tangible and intangible cultural values of the Ba Na ethnic are associated with the use and conservation of forest resources.

Keywords: Biological value, geological value, cultural value, landscape, Kon Ka Kinh.

1. Introduction

Landscape is defined at the European Landscape Convention in Strasbourg "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe, 2000). In landscape research, the analysis of landscape values plays a crucial meaning and role, bridging the study of landscape features and the assessment of landscape for various purposes.

The term "landscape values" encompasses both intrinsic and non-intrinsic values. According to Zube (1987), landscape values depend on human needs and preferences [1]. Landscape values vary among stakeholders [2], over time, and due to the intrinsic characteristics of the landscape (Landscape Research Institute, 2021) [3]. Rolston and Coufal (1991) first identified ten fundamental landscape values, including support for life, economic, scientific, recreational, aesthetic, wildness, biodiversity, historical, spiritual, and intrinsic values [4]. Subsequently, Brown and Reed (2000) extended this framework to include 13 values, adding survival, cultural, and healing values [5]. Antrop (2012) divided landscape values into two groups: intrinsic values like natural, ecological, historical,

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archaeological, cultural, social, aesthetic, and symbolic values; and uses values for agriculture, housing, recreation, heritage, and tourism [6]. Additionally, the Landscape Research Institute (2021) defines nine factors that determine landscape values, including natural (geology, topography, flora and fauna), cultural (archaeological, historical), pristine nature, connections to events or famous figures, specificity, suitability for recreational activities, landscape beauty, wilderness, and functional capacity [3].

Overall, landscape values are studied from various angles, but they can be categorized into natural, cultural/social, cognitive, and aesthetic factors. Natural and cultural values are more objective, while cognitive and aesthetic values are greatly influenced by human subjectivity.

The Kon Ka Kinh National Park was recognized as an ASEAN Heritage Park in 2004. The entire core area of the park is located within the Kon Ha Nung Biosphere Reserve, which was awarded the UNESCO World Biosphere Reserve status in September 2021. International recognition highlights the significance of the region's biodiversity. Moreover, based on its geographical location, the Kon Ka Kinh National Park also exhibits other geographical and cultural values.

This article aims to clarify the core values of the landscape in the area, particularly the biological, geological, and cultural values of the Kon Ka Kinh National Park, by integrating landscape research methods. This serves as a scientific foundation for the protection of the landscape, linked to forest protection, biodiversity conservation, and the indigenous communities in the Kon Ha Nung Biosphere Reserve.

2. Content

2.1 Data and Research Methods

2.1.1 Study area

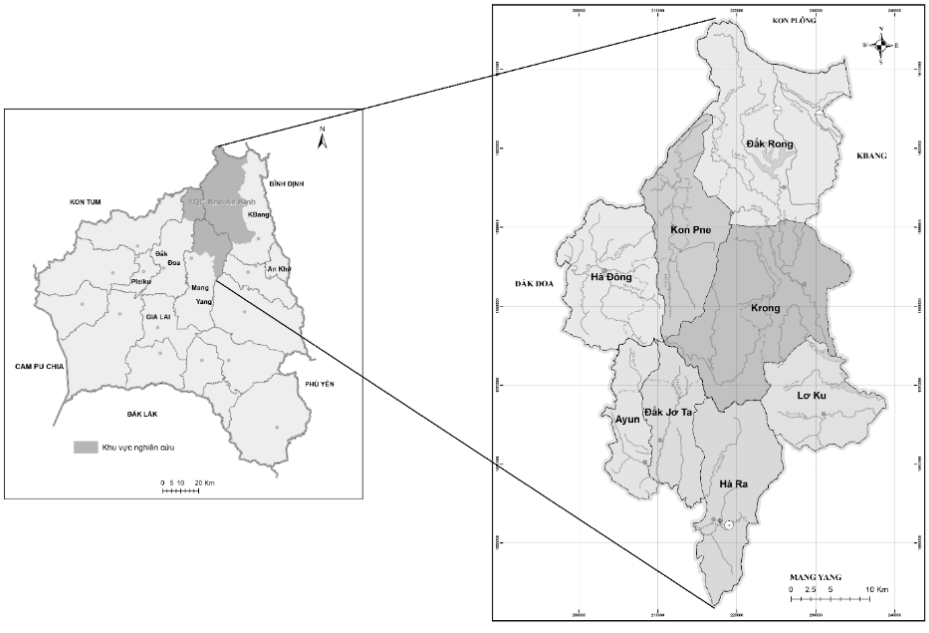

Figure 1. Geographic Location and Standard Plot Position

The buffer zone and core area of the Kon Ka Kinh National Park are situated in the northeastern part of Gia Lai Province. The territory encompasses the entire administrative boundaries of 8 communes, spanning 3 districts: Kbang, Mang Yang, and Đak Đoa, with a total area of 1,549.24 km^2. This includes the core area (417.8 km^2) and the buffer zone (1,131.44 km^2).

The landscape characters exhibit differentiation based on both territorial and geological structures. The landscape within the volcanic basalt rocks of the Dai Nga and Tuc Trung volcanic plateau, distributed in the central and northeastern regions, is characterized by a relatively flat surface. This ecologically favorable condition has led to the development of red and yellow soils on the basalt, along with a rich diversity of indigenous and secondary vegetation types.

The landscape formed over intrusive igneous rocks belonging to the Van Canh, Ben Giang - Que Son complex, forming robust dome-shaped mountains located in the southern region. The geological structure, ranging from moderate to strong uplift, gives rise to lower to medium-sized mountains. In these elevated areas, red or yellow-red soils develop on acidic magma rocks, accompanied by natural vegetation and tropical and subtropical ecosystems.

The landscape develops on sedimentary rocks associated with acid eruptions, primarily from the Mang Yang geological strata, forming an extensive mountain range extending from the northwest to the southeast of the territory. The average elevation of these mountains exceeds 1000 meters, giving rise to red and yellow soils and subtropical vegetation. The landscape emerging on metamorphic rocks, particularly from the Đak Long, Tak Po, Xa Lam Co, Kon Kbang geological strata, is quite common. Terrain formed on metamorphic rocks typically has lower elevations compared to acid magma and sedimentary rocks, and it frequently comprises low hills and mountains. The predominant soil type is red-yellow ferralit, characterized by a high level of human influence, leading to the development of specific secondary vegetation.

2.1.2. Research methods

The research involved collecting, analyzing, and synthesizing data related to biodiversity, geology, geomorphology, and the cultural aspects of the Kon Ka Kinh National Park and its surroundings from reviewed documents. Field surveys were conducted to differentiate the landscape while also recording and supplementing biodiversity, geological, and cultural values in comparison to the compiled sources. The research results and surveys were mapped and analyzed using geographical information systems.

Specifically, the study utilized data from 77 standard plots provided by the Forest Inventory and Planning Institute (FIPI, 2014). The statistical indices based on these standard plots included the Shannon diversity index (H), Simpson dominance index (Cd), Important Value Index (IVI), Relative Density (RD), Relative Frequency (RF), Relative Coverage (RC), and Relative Basal Area (RBA) for each species, as well as the spatial distribution pattern (A/F).

The formulas for calculating these specific indices are as follows:

Relative Density (RD): The ratio of the average density of the studied species to the total density of all species.

Relative Frequency (RF): The percentage ratio of the frequency of occurrence of a studied species.

Relative Basal Area (RBA): The ratio of the total basal area of each species to the total basal area of all species.

Important Value Index (IVI): IVI = RD + RF + RBA (adapted from [7]).

Species richness (A): The ratio of the total number of individuals present on all standard plots to the number of standard plots where the studied species appears.

Spatial distribution pattern (A/F): The ratio of species richness (A) to frequency (F) for each species.

Species diversity index H:

$$H = -\sum_{i=1}^{n}\left(\frac{Ni}{N}\right)\log_2\left(\frac{Ni}{N}\right)$$

Where: H is the Shannon diversity index; Ni is the number of individuals of the i-th species; N is the total number of individuals of all species.

The Simpson dominance index Cd (also known as Simpson's Concentration Index or Dominance Index) is calculated as follows:

$$Cd = \sum_{i=1}^{n}\left(\frac{Ni}{N}\right)^2$$

Where: Cd is the Simpson dominance index; Ni is the number of individuals of the i-th species; N is the total number of individuals of all species.

A total of 77 standard plots were distributed across natural vegetation landscapes. Agricultural and cultivated forest landscapes were primarily located in the buffer zone and were not included in the standard plot analysis. The highest number of standard plots was found in Đak Rong and Kon Pne communes, primarily due to the presence of extensive forest areas. In contrast, the number of standard plots in Ha Đong and Lo Ku communes was significantly lower.

2.2. Results and discussions

2.2.1. Biological values

Plant values

The plant biodiversity in the entire Kon Ka Kinh National Park is relatively high. As of 2011, the total number of plant species was 1022, belonging to 568 genera and 158 families [8, 9]. Among these 158 plant families, only four families had a significant number of species (ranging from 31 to 62 species), namely the Legume family (Fabaceae), Orchid family (Orchidaceae), Spurge family (Euphorbiaceae), and Coffee family (Rubiaceae). In contrast, a considerable proportion of families, 44.3% or 70 families, had only 1-2 species each.

The average species diversity index (H) across districts ranged from 3.2 to 4.3, with Lo Ku district having lower species diversity compared to the others. Đắk Jơ Ta district had the highest species diversity (H = 4.325, reaching the maximum value, Cd = 0.067, the minimum value). The highest Shannon index was 4.95 (indicating near-maximum

species diversity) at Standard Plot 52, located in the landscape of tropical evergreen broadleaf forest on red-yellow ferralit soil (in Kon Pne district).

The Simpson's dominance index Cd was used to assess species diversity, and its value is inversely related to the Shannon index (H). The value of Cd varied from 0.04 at Standard Plot 22 to 1.15 at Standard Plot 2, with an average value of 0.1159.

The number of plant species within the standard plots varied from 9 to 40 species, with an average of 23 species, and some standard plots (34 in total) had more species than the average. Standard plots 64, 59, 18, 61, and others had the least number of species, typically located in landscapes on low hills, and in recovering tropical evergreen forests. On the other hand, standard plots 52, 35, 8, 33, 22, and others had the most species, typically found in landscapes on mid-level hills, and in tropical evergreen broadleaf forests. Therefore, there was a clear pattern of species variation within standard plots based on terrain, elevation, and vegetation type.

The number of individuals (N) within the standard plots varied widely, ranging from 15 to 110 individuals, with an average of 73 individuals. Standard plots 23, 59, 45, 17, and others had the highest number of individuals and were typically located in landscapes on nutrient-rich soil derived from both acidic and basaltic magma, in subtropical vegetation at elevations above 1000m. The lowest number of individuals was typically found in standard plots 64, 12, 66, 18, 34, and others, which were situated on hilltops and low mountain slopes in the buffer zone. Therefore, the number of individuals within standard plots varied according to conservation levels, distributed across the buffer zone and core zone.

Table 1. Structure of Vegetation Cover Distribution in Kon Ka Kinh National Park

Plant species	RD	RF	A	IVI	A/F
Lithocarpus ducampii	9.731	3.346	0.097	24.688	0.029
Syzygium wightianum	7.419	3.569	0.074	19.497	0.021
Phoebe tavoyana	6.155	3.179	0.062	15.293	0.019
Litsea cubeba	5.195	3.402	0.052	12.976	0.015
Schima superba	2.046	1.339	0.021	8.461	0.015
Gironniera subaequalis	3.078	2.287	0.031	6.880	0.014
Placolobium ellipticum	2.224	2.398	0.022	6.392	0.009
Garcinia oblongifolia	2.064	2.398	0.021	6.235	0.009

Source: The result of data processing

Some plant species have high abundance, such as *Lithocarpus ducampii* (0.0973), *Syzygium wightianum* (0.074), *Phoebe tavoyana* (0.061), *Litsea cubeba* (0.051), *Gironniera subaequalis* (0.03), *Placolobium ellipticum*, etc. The Important Value Index (IVI) reveals the dominance hierarchy within the plant community. Dẻ had the highest dominance (24.68), followed by *Syzygium wightianum* (19.49), *Phoebe tavoyana* (15.29), etc. However, the level of dominance among species within the standard plots was not so high that one or two species dominated the IVI values out of a total of 300 species.

The spatial distribution pattern of species within the plant community was assessed using the A/F ratio. The majority of species exhibited a continuous distribution pattern

(A/F < 0.025). Some species had random distribution patterns (0.025 < A/F < 0.05), such as *Lepisanthes rubiginosa* (Roxb.) Leenh, *Dipterocarpus obtusifolius, Lithocarpus ducampii,* etc.

Landscape areas with high species diversity (H>4) were mainly associated with tropical evergreen rainforest vegetation and were concentrated in the upper reaches of the Ayun River, Đak Pne River, and the high plateau of Kon Ha Nung.

Of the 77 standard plots collected, landscapes with large-diameter trees were similar to landscapes with high Shannon diversity indices (plots 3, 24, 38, 62, 68). Tree species and their stem diameters in these standard plots, such as *Phoebe tavoyana* (92.3cm), *Schima superba* (82.16cm), *Michelia tonkinensis* (79.61cm), were preferred by tourists. Therefore, landscapes with large-diameter trees have tourism potential.

Kon Ka Kinh National Park has 32 rare and endangered plant species listed in the Red Data Book of Vietnam 2007 and Government Decree 06/2019, as well as the IUCN Red List 2020 [9]. Among these, 9 species are listed in Government Decree 06 of 2019, 17 species in the Red Data Book of Vietnam 2007, and 17 species in the IUCN Red List 2020. Kon Ka Kinh is a location where the mixed broadleaf and coniferous forest ecosystem is distributed, featuring a variety of rare understory plant species, most notably the Pơmu community thriving at an altitude of 1500 meters. These landscapes serve as the basis for landscape assessment and proposals for exploitation, conservation, and management.

Animal values

The research on the animal kingdom (mammals, birds, reptiles, frogs, and insects) in Kon Ka Kinh National Park has revealed a high diversity of species, totaling 1,927 species belonging to 328 families and 44 orders [10].

The distribution of animals depends on three factors: vegetation, water sources, and elevation within the landscapes of Kon Ka Kinh National Park. However, the degree of influence varies among different animal classes. The elevation has a limited effect on the distribution of mammals such as *Pygathrix cinerea*, monkeys, and squirrels. Natural forest landscapes usually provide food sources, resulting in a higher number of mammal species, with tropical evergreen rainforests accounting for the majority (98.73% of species).

Bird species are distributed throughout the park, with the majority found in the central areas of natural forests, especially in landscapes recovering from slash-and-burn agriculture, where insects are abundant as a food source. Frogs are often concentrated in areas near streams or in moist habitats within the tropical evergreen rainforest landscapes. Reptiles tend to be distributed in natural forests, including bamboo forests, with a high encounter frequency (95.35%). Reptiles are less concentrated near water bodies compared to frogs.

Many animal species in Kon Ka Kinh National Park are under conservation efforts, including the Northern Buff-cheeked Gibbon (*Nomascus annamensis*) and Gray-shanked Douc (*Pygathrix cinerea*). *Pygathrix cinerea* is an endemic and critically endangered primate species in Vietnam and one of the world's 25 most endangered primates. There are only about 1,000 individuals left in the world, with Kon Ka Kinh National Park having the largest population in Vietnam, estimated at around 250 individuals [10]. Conserving

these species could have great potential for ecotourism if managed based on scientific principles.

In the realm of bird diversity, Kon Ka Kinh National Park is part of the North Central Highlands Endemic Bird Area, recognized by BirdLife International. Three bird species endemic to Vietnam have been recorded, including the Black-crowned Barwing (*Garrulax milleti*), White-cheeked Laughingthrush (*Jabouilleia danjoui*), and a new species discovered in Kon Ka Kinh, the Kon Ka Kinh Laughingthrush (*Garrulax konkakinhensis*) [8, 9].

The reptile diversity in Kon Ka Kinh National Park includes four species that are endemic to the region and to Vietnam: *Sphenomorphus buonluoicus* (endemic to the southern Trường Sơn region in Laos) and the Vietnamese endemics *Scincella rufocaudata, Rana chapaensis, and Rana verrucospinosa* [9]. These species hold conservation and ecotourism value.

2.2.2. Geological and geomorphological value

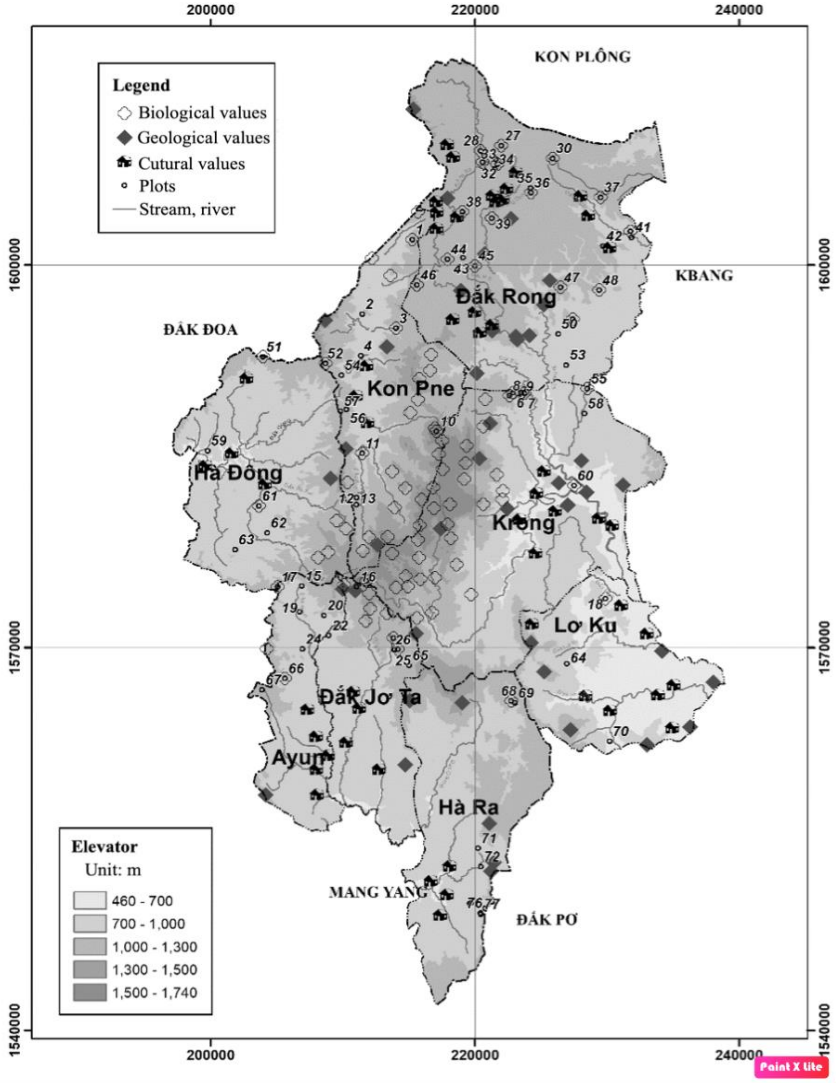

Figure 2. Distribution of landscape values

In addition to its rich biological resources, another distinctive feature of Kon Ka Kinh National Park lies in its geological and geomorphological value. The region contains a super high-grade metamorphic rock area with an age dating back to approximately 2.5 billion years ago (Kanak complex), belonging to the Kon Tum plateau - one of the two areas with the oldest rocks in Vietnam. This complex is accompanied by coeval super mafic and acidic intrusive rocks, as well as the Kon Cot, Song Ba, and Pleimanko complexes. The area also hosts lower-grade metamorphic rocks from the Paleoproterozoic era (around 2,500 to 1,500 million years ago), along with younger metamorphic rocks from the Cambrian-Silurian period (around 450-400 million years ago) in the upper reaches of the Ba river landscape [11]. In addition, the territory also contains basalt rocks of the Quaternary age. As a result, this area stands out as one of the few places in Vietnam with an extended geological history, spanning from the Archean Eon, passing through the Proterozoic, Paleozoic, Mesozoic, and Cenozoic eras.

Numerous types of rocks in the Precambrian era have been named after the geographical locations in Gia Lai, highlighting the unique nature of this region. The Kon Tum uplift rock, named after the Ka Nak complex, is derived from the former name of the district town Kbang. In Ka Nak, geologists discovered the clearest and most beautiful part of the uplifted rock. The Kon Cot rock formation, dating back to 2.5 billion years, which is prevalent in the upper reaches of the Sông Ba river, is named after a Ba Na village in the Kbang district.

Flat land surfaces serve as evidence of predominant exogenic and endogenic activities within a specific timeframe. The researched land surfaces belong to a type of pediment formation, including erosion and accumulation pediments, originating from the Pliocene era, and they are commonly found at elevations of 1200-1300 m above sea level within the mountainous landscape layer. Some of these surfaces are covered by young basaltic rock within the highland landscape layer [12]. Among the various flat land surfaces identified in the region, the most significant one is situated at the core of Kon Ka Kinh National Park, covering an area of approximately 50 km^2. This flat land surface is overlaid with basalt rock belonging to the sub-layer of the highland landscape, referred to as the Tuc Trung formation. It is considered to have the largest area among surfaces at the same elevation and altitude level [12]. This flat land surface, located at an altitude of 1500 m, is often described as the core of the national park, where a strict conservation effort is in place to protect a significant population of *Fokienia hodginsii* population. The presence of high-altitude magma rock formations in such unique terrain is rare in Vietnam and is typically found only in a few large plateaus like Da Lat and Kon Plong.

The Kon Ka Kinh Mountain Landscape class is situated on the periphery of the Kon Tum Plateau, at an elevation ranging from 1600 to 1700 m.. The Kon Ka Kinh area and its vicinity have experienced significant tectonic activities during the Cenozoic period, leading to the deformation of the Earth's lithosphere and the formation of numerous fractures, primarily along an east-west axis. During the late Neogene and early Quaternary, basaltic volcanic eruptions occurred, with the lava flowing through fissures and fault lines, filling ancient valleys, plains in front of mountains, and intermountain basins. Multiple successive eruptions contributed to the formation of a complex Cenozoic structure, characterized by lava flows and various volcanic features like volcanic bombs.

The intermittent eruptions of basaltic lava created distinct terraced waterfalls, as evidenced by the presence of characteristic basaltic vesicular holes between solidified basalt layers, marking the periods of volcanic activity cessation. These eruptions rejuvenated river and stream systems, giving rise to natural waterfalls and spectacular rock columns, adding aesthetic and topographic value to the region. The most famous and impressive among them is the 45 m high Kon Bong Waterfall with its four cascades, which flows continuously even during the dry season. Other waterfalls like Ha Đung, Kon Lok, and Ba Tang contribute to the majestic landscape, featuring relatively even cascades that are convenient for tourists to visit and bathe. In addition to the waterfalls, columnar basalt formations (resulting from thermal contraction) contribute to the impressive geological and topographic features of the region, making it worthy of inclusion in the list of natural heritage sites.

In the valley landscape class, the Song Ba deep- fault and geological events in various geological epochs, such as magma activity, the formation of the Song Ba Basin, and the accumulation of sediments in different geological periods, have created a natural museum suitable for organizing events to explore the Earth's geological history. Magma rocks with a relatively common acidic composition are present in the region and have value as construction materials. When utilized for tourism purposes, these geological heritage points are suitable for exploratory and educational tourism activities to understand the area's geological and topographic development history. One of the prominent geological heritage sites is the Đa Trang peak, a part of the Van Canh complex, composed of gray-white biotite granite rocks with medium to large-sized crystals, located about 7 km from the main headquarters at an elevation of over 1,400 m. This geological heritage site is also a scenic spot where visitors can enjoy the mountainous landscape and observe the diverse biodiversity, as it is a habitat for the gray-shanked douc langur.

Moreover, Mang Yang Pass, a renowned location known as the "Cong Troi" (Heaven's Gate) by the Ba Na ethnic, offers spectacular scenery with numerous aesthetically appealing outcrops of geological formations. Along with granitoids and the intrusion of magma rocks from the Ben Giang-Que Son complex (P_{2-3}), the metamorphosed rocks of the Tac Po layer, which are older (Proterozoic), exhibit complex geological structures and ancient ages. The formation process of the Bến Giằng-Quế Sơn complex ($\gamma\delta P_{2-3}$ *bq*) reflects the geological context of active continental margin tectonics related to the Indosinian orogenic belt of the Truong Son fold-thrust belt.

2.2.3. Cultural values

The buffer zone of Kon Ka Kinh national park is the population concentration of over 80 villages, with some villages like Kon Bong, Kon Loc in Đak Rong commune, Tung village, Gut village in Krong commune, Kon Jot, Konphram village in Hà Đông commune, and more, where up to 99% of the community consists of Ba Na ethnic. Therefore, the article primarily focuses on the cultural values of the Ba Na ethnic group.

In the buffer zone, the Ba Na ethnic inhabit high plateaus, hills, and valleys. This region is closely linked to culturally significant places like Mang Yang (Heaven's Gate), Kbang - a land of legends, with Nup hero, and the Ba River basin, which holds exceptional archaeological value for the study of the prehistoric settlement of the people. These areas provide valuable resources for the development of tourism.

The Ba Na culture exhibits unique characteristics distinct from other ethnic groups. The Ba Na ethnic are known for their patriotism and resistance against foreign invaders, as well as for preserving a rich cultural heritage that combines elements of Dong Son culture and represents the Mon-Khmer linguistic groups of the Central Highlands and Vietnam.

The intangible cultural heritage of the Ba Na ethnic in this region is diverse and ecologically oriented. In terms of beliefs, like other long-standing ethnic groups in the Central Highlands, the Ba Na people are influenced by their indigenous beliefs (animism), believing in the existence of various deities known as "Yang." They hold these deities in high regard as creators of the earth, nature, and various professions. The deities in the Ba Na agricultural system include the deity of rice (Yang Hri), the deity of water (Yang Dak), and the deity of mountains (Yang Kong). Alongside traditional beliefs, residents have also adopted various new religions, notably the Christian faith introduced to Gia Lai in 1938. Some prominent festivals and rituals include: 1) The Thanksgiving Festival to the Rice Deity (Sré Yang); 2) The Puh Ho Drih Festival (a prosperity ritual); 3) The Squirrel Festival; 4) The Village Land Offering Ceremony; 5) The New Rice Celebration; 6) The Nuoc Giot Festival; 7) The Funeral Ceremony; 8) Wedding Ceremonies. Due to their animistic beliefs, several sacred forests and valuable tree species are well-preserved, containing scientific and aesthetic values.

Material culture is expressed in various aspects, with distinctive architecture and art, such as the communal Rong house and stilt houses that carry significant cultural and human ecological values. The Ba Na community typically builds the Rong house in the center of the village or next to the main entrance gate. The Rong house serves as a gathering place for village elders to discuss important matters, as accommodation for young people, and as the venue for community events. The architecture of the Ba Na Rong house is unique, adorned with various carvings, including human figures, buffalo horns, bronze drums, monkeys, and more. The frame of the house is typically made of quality wood such as ironwood, dipterocarp, and other local hardwoods, with the roof traditionally thatched with elephant grass (though nowadays, metal roofing is more common). The decorative motifs often feature carvings of animals like birds, turtles, pangolins, and fish. Besides the communal Rong house, Ba Na families live in stilt houses, which remain a preference of most Central Highland residents, given their convenience and durability. The unique structure of these houses holds cultural significance and can be integrated into eco-tourism activities and local cultural exploration.

The Ba Na ethnic are a major group within the Mon-Khmer linguistic family in the South Central Highlands. They have a strong sense of community and have developed a culture that harmonizes with nature. According to traditional farming practices, cultivation activities are calculated from the blossoming of rice flowers in March and continue for the next nine lunar months. The Ba Na ethnic also harvest a variety of forest products, including precious medicinal plants like "Drynaria fortune", agarwood, cinnamon, tamarind, and more. They engage in beekeeping, gathering wild honey, collecting wild vegetables, bamboo shoots, mushrooms, bananas, hazelnuts, and pandanus nuts. In addition to these practices, they have developed traditional crafts such as weaving, basketry, carpentry, blacksmithing, and pottery.

2.2.4. Exploring landscape values

Prominent ecological and biodiversity values provide the foundation for the development of tourism in Kon Ka Kinh National Park, integrating conservation efforts with community livelihood improvement. The landscape features a mixed broadleaf and coniferous forest ecosystem, with the distribution of species such as Dacrycarpus imbricatus, Dacrydium elatum, Fokienia hodginsii, and Pinus dalatensis, particularly at an altitude of 1500 meters. This landscape can be exploited for forest trekking activities, catering to nature-loving tourists. Additionally, Kon Ka Kinh is a concentrated habitat for the Gray-shanked Douc Langur, a rare and endemic primate species in Vietnam, with a relatively low population. Kon Ka Kinh has the advantage of organizing tours for observing Gray-shanked Douc Langurs in their natural habitat, studying their behaviors and activities.

In terms of geological and topographical values, Kon Ka Kinh is suitable for establishing adventurous and exploratory tourism routes. For instance, the summit conquering route of Kon Ka Kinh, with its peak rising to 1748 meters, is often referred to as the "roof of Gia Lai province." Another example is the route exploring the Earth's history along the Ba River, to explore the diverse modern geological formations dating back over 2 billion years. Additionally, the waterfall complex in Dak Rong commune, located near the Ba Na ethnic village, can guide the development of community tourism in this area.

Cultural values of the Ba Na community reflect their connection with the surrounding environment. Indigenous knowledge of the community can be utilized in biodiversity conservation and tourism development. Annually, the buffer zone villages of the national park receive forest protection incentives, with an allocation of approximately 400,000 VND per hectare per year, aiming to engage the community in forest protection. Moreover, the community benefits from the biological resources of the forest through the sustainable exploitation of non-timber forest products such as mushrooms, bamboo shoots, honey, and orchids. The Rong House and the architectural and cultural values within the Ba Na people's homes can be incorporated into a combined approach of ecotourism and local cultural exploration.

3. Conclusion

Kon Ka Kinh National Park holds a diverse range of biological, geological, and topographic values that serve conservation and sustainable development. The natural forest cover within the park is well-preserved, covering a significant area, and is characteristic of the mixed broadleaf and coniferous forest ecosystem. This forest includes many rare and precious hardwood tree species, with the most notable being the *Fokienia hodginsii* population that thrives at altitudes above 1500 m. In addition, the park is home to unique and rare wildlife species, including the Kon Ka Kinh pheasant and the gray-shanked douc langur.

The remarkable geological value of the landscape is related to the presence of ancient metamorphic formations from the Archean era along the Ba river valley. This feature makes the region one of the few places in Vietnam with a geological age extending from the ancient Precambrian era to the present. The development of flat surfaces, particularly within the high-altitude Kon Ka Kinh landscape, where Tuc Trung strata overlay basalt

at an altitude of 1500 meters, is extremely limited in Vietnam. The tectonic activities and basaltic eruptions have created breathtaking landscapes with high mountain peaks, steep passes, numerous waterfalls, and rivers flowing through terraced terrain containing hexagonal basalt columns and colorful minerals. The upper reaches of the Ba river valley are rich in geological heritage, representing a typical example for the entire region.

The local population living in this area consists predominantly of the Ba Na people group, comprising over 90% of the population. Their way of life bears a strong influence on forest culture. The intrinsic values of the landscape interact with the cultural activities of the local community, creating a region of scientific value that holds heritage significance in Vietnam.

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