

World Heritage Scanned Nomination

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UNESCO Region: ASIA AND THE PACIFIC

SITE NAME: Tropical Rainforest Heritage of Sumatra

DATE OF INSCRIPTION: 7th July 2004

STATE PARTY: INDONESIA

CRITERIA: N (ii) (iii) (iv)

DECISION OF THE WORLD HERITAGE COMMITTEE:

Excerpt from the Report of the 28th Session of the World Heritage Committee

Criterion (ii): The Tropical Rainforest Heritage of Sumatra represent the most important blocks of forest on the island of Sumatra for the conservation of the biodiversity of both lowland and mountain forests. This once vast island of tropical rainforest, in the space of only 50 years, has been reduced to isolated remnants including those centred on the three nominated sites. The Leuser Ecosystem, including the Gunung Leuser National Park, is by far the largest and most significant forest remnant remaining in Sumatra. All three parks would undoubtedly have been important climatic refugia for species over evolutionary time and have now become critically important refugia for future evolutionary processes.

Criterion (iii): The parks that comprise the Tropical Rainforest Heritage of Sumatra are all located on the prominent main spine of the Bukit Barisan Mountains, known as the 'Andes of Sumatra'. Outstanding scenic landscapes abound at all scales. The mountains of each site present prominent mountainous backdrops to the settled and developed lowlands of Sumatra. The combination of the spectacularly beautiful Lake Gunung Tujuh (the highest lake in southeast Asia), the magnificence of the giant Mount Kerinci volcano, numerous small volcanic, coastal and glacial lakes in natural forested settings, fumaroles belching smoke from forested mountains and numerous waterfalls and cave systems in lush rainforest settings, emphasise the outstanding beauty of the Tropical Rainforest Heritage of Sumatra.

Criterion (iv): All three parks that comprise the Tropical Rainforest Heritage of Sumatra are areas of very diverse habitat and exceptional biodiversity. Collectively, the three sites include more than 50% of the total plant diversity of Sumatra. At least 92 local endemic species have been identified in Gunung Leuser National Park. The nomination contains populations of both the world's largest flower (*Rafflesia arnoldi*) and the tallest flower (*Amorphophallus titanum*). The relict lowland forests in the nominated sites are very important for conservation of the plant and animal biodiversity of the rapidly disappearing lowland forests of South East Asia. Similarly, the montane forests, although less threatened, are very important for conservation of the distinctive montane vegetation of the property.

BRIEF DESCRIPTIONS

The 2.5 million hectare Tropical Rainforest Heritage of Sumatra site comprises three national parks: Gunung Leuser National Park, Kerinci Seblat National Park and Bukit Barisan Selatan National Park. The site holds the greatest potential for long term conservation of the distinctive and diverse biota of Sumatra, including many endangered species. The protected area is home to an estimated 10,000 plant species, including 17 endemic genera; more than 200 mammal species; and some 580 bird species of which 465 are resident and 21 are endemic. Of the mammal species, 22 are Asian, not found elsewhere in the archipelago and 15 are confined to the Indonesian region, including the endemic Sumatran orangutan. It also provides biogeographic evidence of the evolution of the island.

1.b State, Province or Region: Island of Sumatra

1.d Exact location: S2 30 00 E101 30 00

Submission for Nomination of
**TROPICAL RAINFOREST HERITAGE
OF SUMATRA**

by the Government of the Republic of Indonesia

to be included in the World Heritage List



PHKA

**Directorate General of Forest Protection and Nature Conservation
Ministry of Forestry**

January, 2003

Photos on cover by Alain Compost

Top (left to right): Great hornbill (*Buceros bicornis*), Sumatran elephant (*Elephas maximus sumatranus*), Malayan tapir (*Tapirus indicus*)

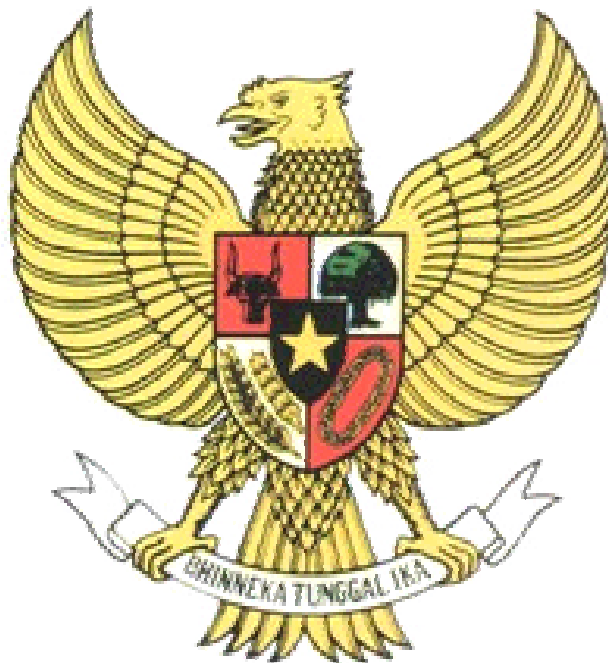
Middle (left to right): Sumatran rhino (*Dicerorhinus sumatraensis*), Rafflesia (*Rafflesia arnoldii*), Sumatran tiger (*Panthera tigris sumatrae*)

Bottom (left to right): Banded leaf monkey (*Presbytis melalophus*), Sumatran serrow (*Capricornis sumatraensis*), flat-headed cat (*Prionailurus planiceps*)

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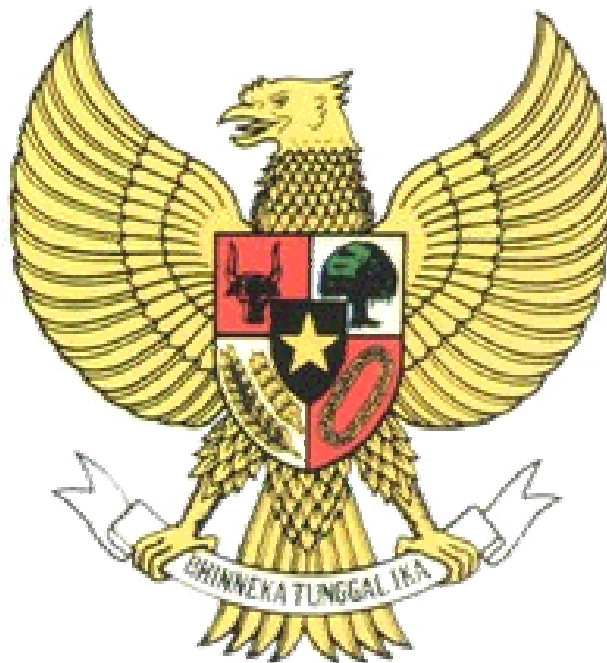
The Coordinating Minister for People's Welfare
Jusuf Kalla

Jakarta, January 2003

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The Minister of Forestry
M. Prakosa

Jakarta, January 2003

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Place

Date

**The Coordinating Minister for People's Welfare
Jusuf Kalla**

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Abbreviations

APBD Kabupaten	District Budget
APBD Provinsi	Provincial Budget
APBN	National Budget
AREAS	Asian Rhino and Elephant Action Strategy
BAKOSURTANAL	National Coordination Agency for Surveys and Mappings
BAPPEDA Kabupaten	District Development Agency
BAPPEDA Provinsi	Provincial Development Agency
BBSNP	Bukit Barisan Selatan National Park
BIPHUT	Forest Inventory and Mapping Agency
CEPF	Critical Ecosystem Partnership Fund
CI	Conservation International
CR	Critically Endangered
DEPDAGRI	Department of Internal Affairs
DPR	Parliament
DPRD Kabupaten	District Parliament
DPRD Provinsi	Provincial Parliament
EN	Endangered
FFI	Flora and Fauna International
FIMP-EU	Forest Inventory and Monitoring Programme-European Union
GEF	Global Environmental Facility
GNLP	Gunung Leuser National Park
GoI	Government of Indonesia
IFPT	Integrated Forest Protection Team
IUCN	International Union for Conservation of Nature and Natural Resources
KEHATI	Indonesian Biodiversity Foundation
KKD	Village Conservation Agreement
KSNP	Kerinci Seblat National Park
KS-ICDP	Kerinci Seblat-Integrated Conservation and Development Project
JNP	Jau National Park
LDP	Leuser Development Programme
LIF	Leuser International Foundation
LIPI	Indonesian Institute of Sciences
LMU	Leuser Management Unit
LNP	Lorentz National Park
LR	Lower Risk
NAD	Nanggroe Aceh Darussalam
NBC	National Biodiversity Commission
NGO	Non Governmental Organization
NSC	Northern Sumatra Corridor
PCU	Protection and Conservation Unit

PHKA	Directorate General of Forest Protection and Nature Conservation (under the Ministry of Forestry)
PKBI	Indonesian Rhino Conservation Programme
PSDH	Forest Resources Development Fund
RPU	Rhino Protection Unit
SPU	Special Protection Unit
TPU	Tiger Protection Unit
TYKHKKWS	Thung Yai Huai Kha Khaeng Wildlife Sanctuaries
TRHS	Tropical Rainforest Heritage of Sumatra
UNESCO	United Nations Educational, Scientific and Cultural Organization
VU	Vulnerable
WCS IP	Wildlife Conservation Society Indonesia Programme
WWF	World Wide Fund for Nature

Introduction

In recent years, conservation of tropical rainforest has become a world priority because the ecological services of intact forests have at last been acknowledged internationally (Van Schaik, 1996).

Intact tropical forests help filter and clean water, and help stabilize its flow over the seasons. Where still extensive, forests may play a major role in maintaining the stability of local climate. The forests clean polluted air and tie up carbon dioxide, therefore help improve air quality locally and globally. They protect the soil and keep the sediment load of rivers low, thus controlling erosion downstream and reducing the siltation of any reservoirs in the catchment. They also serve as genetic stocks and storehouse of knowledge that can be studied and sampled for propagation in intensive cultivation outside the forests.

Indonesia holds the largest track of tropical rainforests in Southeast Asia, and the world's second largest only to Brazil's. The forests are very rich in term of biodiversity. Although Indonesia occupies only 1.3 percent of the world's land area, it possesses about 10 percent of the world's flowering plant species; 12 percent of the world's mammal species, 17 percent of all reptiles and amphibian species; and 17 percent of all birds (BAPPENAS, 1993).

Because of its biological richness, Indonesia is recognized as one of the 7 megadiversity countries, with two of the world's 25 hotspots (areas of high diversity as defined by Conservation International (CI)). The country also has 18 of the WWF Global Ecoregions (the Earth's 200 most outstanding and diverse terrestrial, fresh water, and marine habitats: areas where the Earth's biological wealth is most distinctive and rich, where its loss will be most severely felt, and which deserve the highest priority and conservation effort): 11 terrestrial; 4 fresh water; and 3 marine.

Sumatra, stretching from latitude 6° South to 6° North and from longitude 95° to 106° East, is one of the main islands of Indonesia that still contains some of the most important tropical rainforests in the world. The island is part of the Sundaland hotspot, and it is where the Sumatran Islands Lowland and Montane Forest Ecoregion is located. Whitten *et al.* (2000) estimated that the natural area of the island comprises of approximately 5,680,000 Ha of montane forest; 25,154,000 Ha of tropical evergreen lowland forest; and some 16,493,000 Ha of tropical semi-evergreen lowland forest, ironwood forest, heath forest, peat swamp, fresh water swamp, mangrove forest and beach vegetation.

While providing ecological services locally as well as globally, the forests of Sumatra also harbor one of the highest biodiversity richness in the world. The flora diversity of the forests in the island is comparable to the richest forests of Borneo and New Guinea and is richer than the forests of Java, Sulawesi and other small islands (Meijer, 1981). Sumatra supports a broad altitudinal range of vegetation types, and some other distinctive vegetation types, characteristics of the soil or the topography on which they occur. It has

probably 10,000 plant species, at least 17 endemic genera of plants, and some unique and spectacular species, such as the largest flower in the world *Rafflesia arnoldii* and the tallest flower in the world *Amorphophalus titanum*. (Whitten *et al.*, 2000).

The island is also rich in term of its fauna diversity. It has at least 201 species of mammal and 580 species of bird (Ibid). Indeed, new mammal species are still being discovered or recognized. Sumatra has 15 species confined only to Indonesian region, including Sumatran orangutan *Pongo abelii*. The island also harbors 22 species of Asian mammals found nowhere else within Indonesia. In addition, Sumatra has an extremely rich bird species, including nine species of hornbills. Of its 580 species, 465 are residents and 21 are endemics.

Unfortunately, Sumatran forests are by no means free from disturbances. Population increase, agriculture expansion, and exploitations of other biological and physical resources of the forests, have put lots of pressure to the forests. In fact, surveys have confirmed that Sumatran montane and lowland forests have decreased in an alarming rate. By mid 1990's, Sumatran montane forests have lost an average of one third of their natural area, whereas between two-thirds and four-fifths of lowland forests have disappeared. The remaining area of montane forests in 1982 was 3,951,000 Ha or 69% of the natural area, and in 1996 was 3,426,000 Ha or 60% of the natural area. The remaining tropical evergreen lowland forests in 1982 was 8,716,000 Ha or 35% of the natural area, and in 1996 was 7,961,000 Ha or 32% of the natural area (FAO/MacKinnon, 1982, MacKinnon, 1997).

Although natural rainforests have disappeared from the more densely populated parts of Sumatra, large tracts of rainforest still cover the interior of the island. Gunung Leuser National Park (GLNP), Kerinci Seblat National Park (KSNP) and Bukit Barisan Selatan National Park (BBSNP) are the three national parks in Sumatra that still contain large intact tracts of Sumatran tropical rainforest. They are located on the chain of Bukit Barisan Mountain Range which, apart from minor interruptions runs the full length of the island, stretching northwest-southeast and determines the mainland form of the island. GLNP is situated in the northernmost of Bukit Barisan Selatan Mountain Range, KSNP in the middle, and BBSNP in the southernmost.

Each of the three Parks consists of different types of tropical rainforest which harbor the high flora and fauna biodiversity of the island. GLNP includes all the major rainforest types of Northern Sumatra, from the west coast sandy beach forests and peat swamp forests in Kluet, up to the alpine formation on the mountain complex, of Leuser, Kemiri, Simpali, and Bandahara. KSNP encompasses a spectrum of habitats from species-rich lowland rainforests through hill forests and unique highland wetland systems to montane forests and sub-alpine habitats on Sumatra's highest mountain, while BBSNP comprises coastal, lowland, highland and sub-montane forests.

The cluster nomination of GLNP, KSNP and BBSNP as Tropical Rainforest Heritage of Sumatra (TRHS) for a Natural World Heritage site is one of the efforts to protect and conserve Sumatran tropical rainforests and its biodiversity. The World Heritage status would provide due recognition and invaluable support to the Park Managements of each of the Parks consisting the site, the Government of Indonesia, and local governments, to ensure the continuing management and conservation of Sumatran biodiversity, one of the world's most important biodiversity assets. The World Heritage status as a cluster site would also provide opportunities for cooperation among of the three Parks to ensure management coherence among them.

The nomination of the three Parks as TRHS is in line with the outcome of the Policy Dialogue on World Heritage Forests held in Berastagi, Indonesia in December 1998. The Dialogue, sponsored by the Indonesian Ministry of Forestry, CIFOR and the World Heritage Center, and attended by a large number of organizations including major NGOs such as WWF, CI, TNC, FFI, as well as IUCN, endorsed the principal of applying the World Heritage Convention to protect clusters, rather than individual protected areas. The nomination of GLNP, KSNP and BBSNP as a cluster was one of the specific recommendation for future World Heritage nomination made by the Berastagi meeting.

The nomination of GLNP, KSNP and BBSNP as a cluster World Heritage is the best option rather than nominating them separately. TRHS cluster as a whole represents a maximum variety of ecological and biological process characterising the evolution of biodiversity in Sumatra. If nominated separately, the larger Parks like KSNP and perhaps GLNP may be included as World Heritage, but BBSNP, a much smaller Park, may not be accepted because it may not fulfil the criteria and integrity for the inscription. Further, nominating the three Parks sequentially will take much longer time and increase the risks of the integrity of one or more of the Parks being seriously undermined.

Summary

Tropical Rainforest Heritage of Sumatra (TRHS) which comprises GLNP, KSNP and BBSNP, is proposed as a cluster World Heritage because it fulfills the conditions of integrity and four criteria for inclusion in natural World Heritage list as set on the Operational Guidelines. The three Parks together represent a full complement of the biodiversity heritage of Sumatra, particularly those along the Bukit Barisan Mountain Range which is one of the principal geological and geomorphological features defining the island of Sumatra.

The conditions of integrity are met by the diverse of ecosystem and natural habitats for a large number of flora and fauna species, including threatened and endemic species of universal values found in each of the Parks, and also the elements essential for the long-term conservation of the ecosystems and biological diversity they contain. The elements range from the sufficient size of each Park, the diverse elevation above sea level, the soil types, the hydrologic condition, the ever-wet climate, the legal status supporting the establishment of the three Parks, and the presence of management authority and management plans.

All four criteria for inscription as World Heritage site are met by TRHS. Located on the spine of Bukit Barisan Mountain Range, the site is an area of outstanding examples of major changes in the Earth's history, with diverse ecosystems and a high flora and fauna diversity representing of Sumatra. It is complemented by superlative natural phenomena and areas of exceptional beauty, and contains Sumatra's significant and important natural habitats and threatened species of outstanding universal values from the point of view of science and conservation.

First, the site represents outstanding examples of major changes in the Earth's history. The uplift of Bukit Barisan Mountain Range, on which the three Parks are situated, as the result of the movement of the Indian Subcontinent towards the Asiatic Subcontinent since about 70 million years ago, are well represented in the topography and physiographic conditions of GLNP, KSNP, and BBSNP. Meanwhile, biodiversity richness in the site, especially the mammals, is one representation of the Sumatra's unique geological history. Records of life have been discovered in Tiangko Panjang cave within KSNP area., dating up to 10,000 years ago.

Second, the diverse ecosystems, and the flora and fauna diversity of GLNP, KSNP, and BBSNP, are the representation of the outstanding examples of significant on-going ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants and animals. The site contains a proportion of tropical rainforest lowland that is rich in species, as well as montane forests. The montane forest ecosystem which dominate the site shows the importance of the site as a water catchment area essential for conserving the site's rich biodiversity and for supporting the livelihood of communities living within and in the surrounding areas of the site.

Third, the site contains superlative natural phenomena and areas of exceptional beauty. GLNP is complemented by mountain *blang*, a superlative natural phenomena unique to the northern Sumatra area. Mountain *blang* was characterized by the presence of rather extensive flat or slightly sloping plains with heather-like short vegetation in the summit areas of the larger mountain complexes in the Gayo Land. Meanwhile, KSNP is complemented by Lake Gunung Tujuh (1,996 m asl), the highest lake of the Southeast Asia. The lake is surrounded by seven mounts and is one of the main tourist attraction in the Park area. The site also contains volcano and mounts, natural lakes, waterfalls, natural caves, as well as some natural sites essential for the fauna in the area.

Fourth, the site contains significant and important natural habitats, ranging from coastal, lowland, hill, sub-montane, peat swamp, montane to alpine forests, for in situ conservation of biological diversity, including threatened species of outstanding universal values from the point of view of science and conservation. They include mammal species such as Sumatran tiger *Panthera tigris sumatrae* (CR), Sumatran rhino *Dicerorhinus sumatraensis* (CR) Sumatran elephant *Elephas maximus sumatranus* (EN) Sumatran orangutan *Pongo abelii* (CR), and Sumatran hare *Nesolagus netscheri* (CR), bird species such as Rueck's blue fly-catcher *Cyornis ruckii* (CR), Sumatran ground cuckoo *Carpococcyx viridis* (CR), storms stork *Ciconia stormi* (EN) and white-winged duck *Cairina scutulata* (EN).



Forest of Gunung Leuser National Park (GLNP) (Leuser Development Programme (LDP)/PHKA)

TROPICAL RAINFOREST HERITAGE OF SUMATRA

A Nomination for Natural World Heritage Site

1. Identification of the property

a. Country

Indonesia

b. Province, district

The site is located in the following provinces and districts:

- 1). Nanggroe Aceh Darussalam (N.A.D)
Districts (*Kabupaten*) : Aceh Tenggara, Aceh Selatan
- 2). Sumatra Utara
Districts : Karo, Langkat
- 3). Jambi
Districts : Sarolangun, Merangin, Bungo Tebo, Kerinci
- 4). Sumatra Barat
Districts : Sawah Lunto, Sijunjung, Solok, Pesisir Selatan
- 5). Sumatra Selatan
District : Musi Rawas
- 6). Bengkulu
Districts : Rejang Lebong, Bengkulu Utara, Bengkulu Selatan
- 7). Lampung
Districts : Tanggamus, Lampung Barat

c. Name of property

Tropical Rainforest Heritage of Sumatra. The site comprises Gunung Leuser, Kerinci Seblat, and Bukit Barisan Selatan National Parks of Sumatra.

d. Exact location on map and indication of geographical coordinates

The site comprises a cluster of protected areas under the following coordinates:

Gunung Leuser National Park (GLNP):

Latitude : 2° 53' - 3° 50' North
Longitude : 96° 45' - 97° 35' East

Kerinci Seblat National Park (KSNP):

Latitude : 1° 7' 13'' - 3° 26' 14'' South
Longitude : 100° 31' 18'' - 102° 44' 1'' East

Bukit Barisan Selatan National Park (BBSNP):

Latitude : 4° 29' - 5° 57' South
Longitude : 103° 24' - 104° 44' East

e. Area

The site has a total area of 2,595,124.867 Ha (GLNP: 862,975 Ha; KSNP: 1,375,349.867 Ha; and BBSNP: 356,800 Ha).

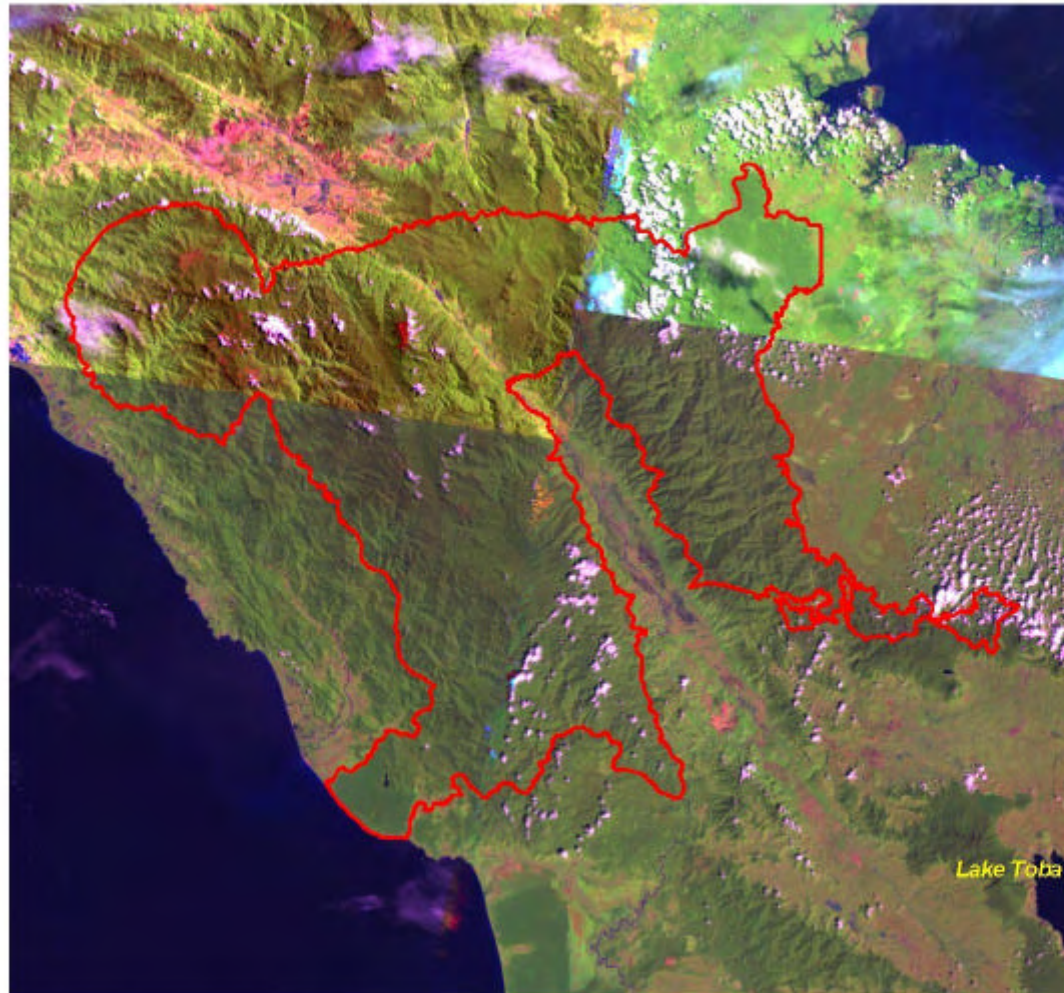
f. Maps and/or plans

- (1) Map of Tropical Rainforest Heritage of Sumatra (TRHS),
- (2) Map of Gunung Leuser National Park (GLNP)
- (3) Map of Kerinci Seblat National Park (KSNP)
- (4) Map of Bukit Barisan Selatan National Park (BBSNP)

TROPICAL RAINFOREST HERITAGE OF SUMATRA



Tropical Rainforest Heritage of Sumatra comprises Gunung Leuser National Park on the north, Kerinci Seblat National Park on the middle, and Bukit Barisan Selatan National Park on the south. Map by PIKA.



Landsat 7 imagery - Band 5,4,2 Acquired 2000 Coordinate system UTM WGS 84 Zone 47N

Gunung Leuser National Park

LEGEND

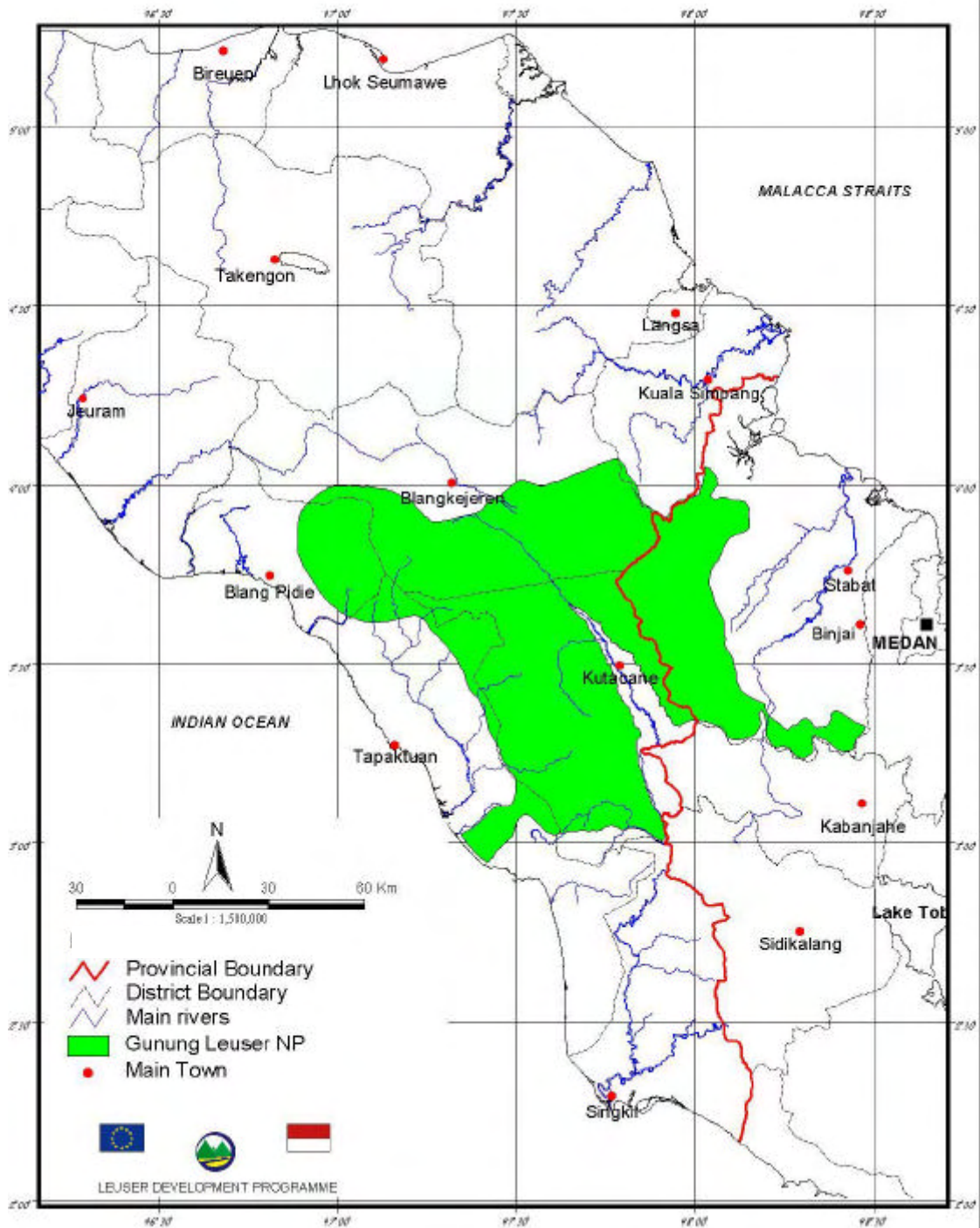
 Park Boundary

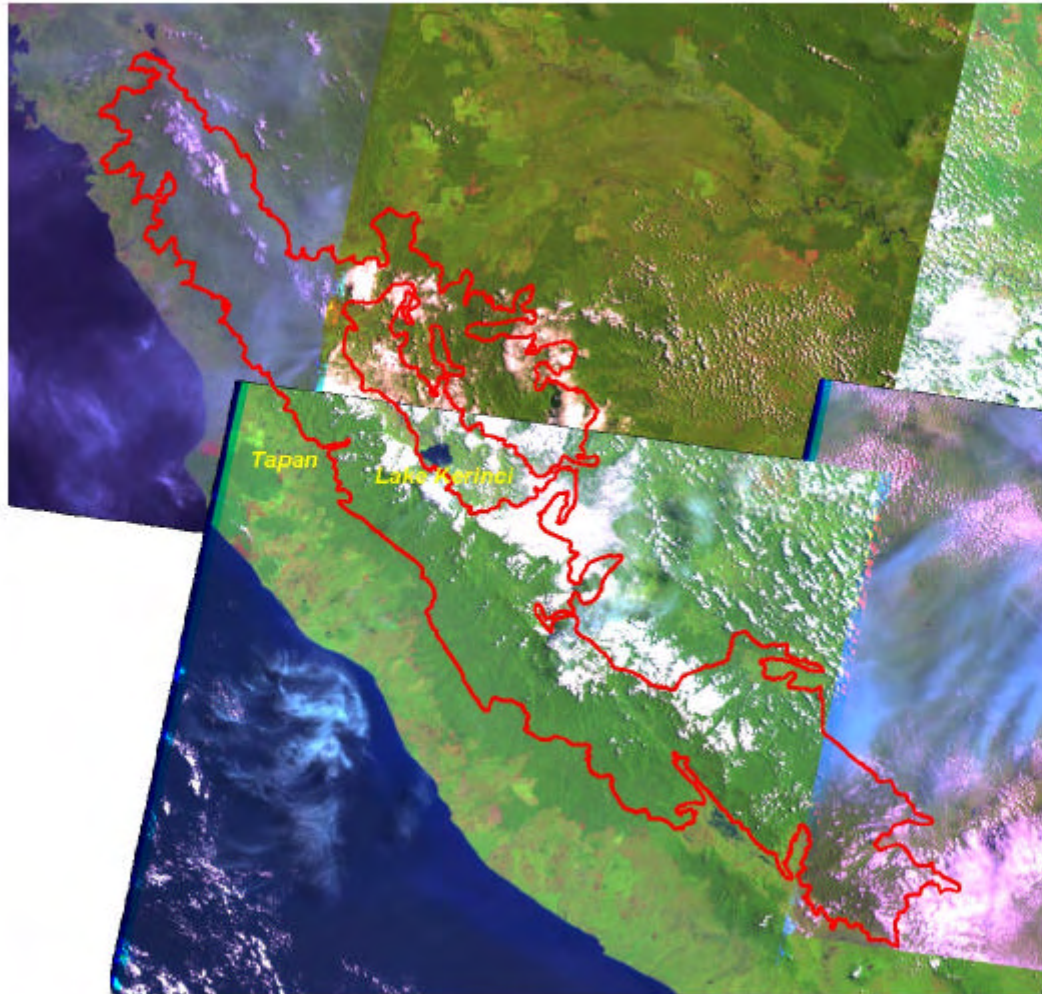


10 0 10 20 30 40 Kilometers



GUNUNG LEUSER NATIONAL PARK





Landsat 7 imagery - Band 5,4,2 Acquired 2000 Coordinate system UTM WGS 84 Zone 47S

Kerinci Seblat National Park

LEGEND

 Park Boundary



10 0 10 20 30 40 Kilometers



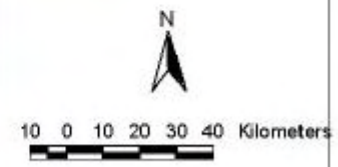


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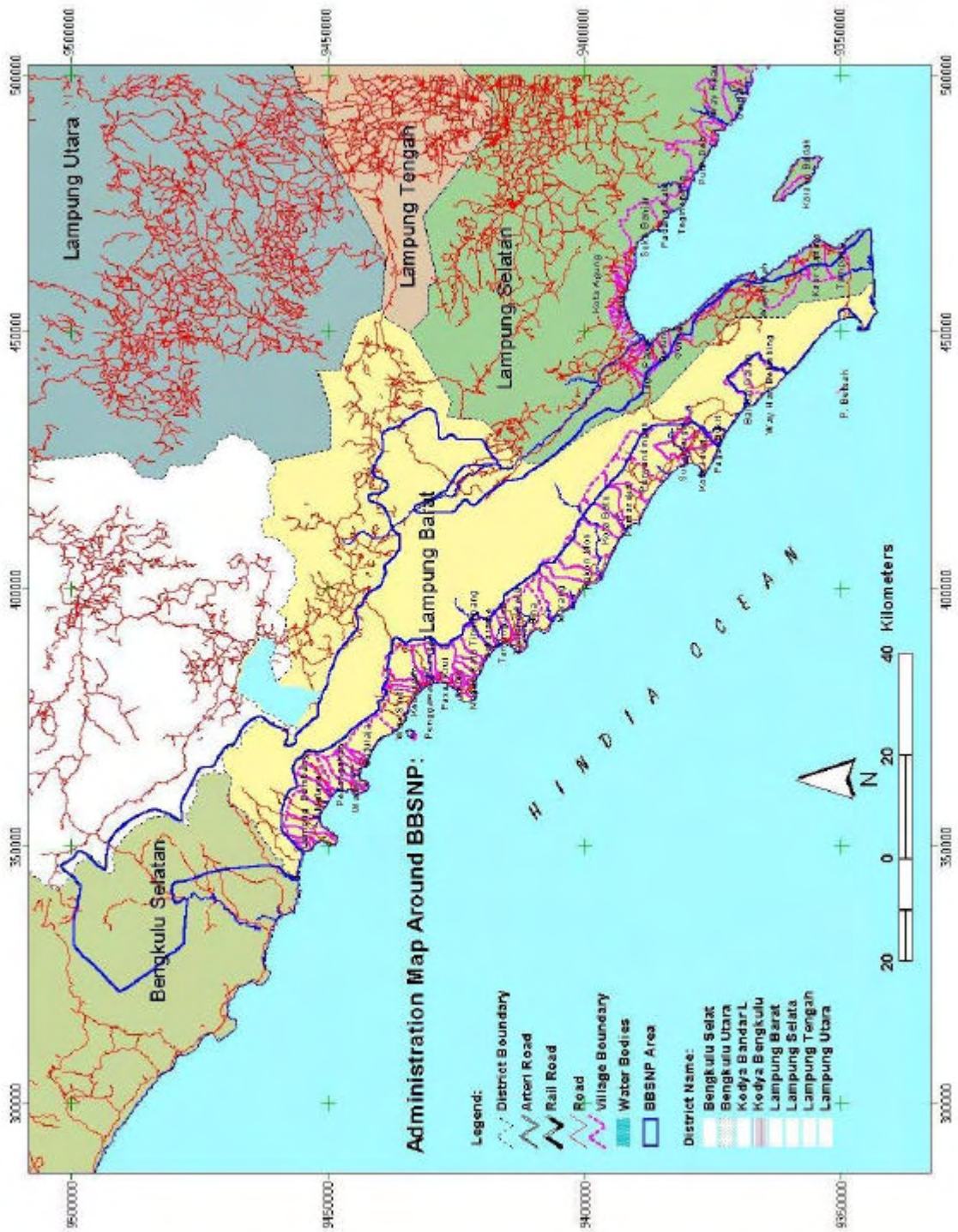
Bukit Barisan Selatan National Park

LEGEND

 BBSNP Boundary



BUKIT BARISAN SELATAN NATIONAL PARK



2. Justification for inscription

a. Statement of significance

Sumatra lies on the equator in a region experiencing high temperature throughout the year and within the wettest parts of Indonesian archipelago. These conditions and the island's geological and climatic history have encouraged speciation and high species diversity. Consequently, Sumatra supports some of the largest expanse of tropical rainforests in Southeast Asia, providing some of the species richest habitats on Earth.

Between 9,000 and 10,000 species of plant (MacKinnon *et al.*, 1996; Whitten *et al.*, 2000) have been identified in various habitats in Sumatra which range from the coastal forests and peat swamp forests, up to the alpine formation on the mountain complex. Such diverse habitats, the island's large size and also its past connection with the Asian mainland also contribute to the high Sumatran fauna diversity. The island provides habitats for at least 580 bird species, of which 465 are residents and 21 endemics, and up to 201 mammals (Whitten *et al.*, 2000). It also harbors an unidentified number of herpetofauna, ichthiofauna, and insects.



*The Rawas River, one of the rivers in KSNP, and the surrounding forest
(Alain Compost/PHKA)*

Gunung Leuser National Park (GLNP), Kerinci Seblat National Park (KSNP), and Bukit Barisan Selatan National Park (BBSNP) included in the nominated Tropical Rainforest Heritage of Sumatra (TRHS), are the three largest remaining Parks in Sumatra. All of the three Parks contains a remarkable flora and fauna diversity that characterises Sumatra, and therefore, is regarded as key areas to maintain the island biodiversity richness.

GLNP is argued to be the largest block of undisturbed wilderness in the northern Sumatra (MacKinnon, 1992). MacKinnon and MacKinnon (1986) gave it the highest conservation contribution score of all conservation areas in the Indo-Malayan Realm, which ranges from India in the west, to the Philippines in the northeast, and up to Sulawesi in the east. One of the ASEAN Heritage sites, KSNP was also described as one of the largest and most important tropical rainforest reserves in Asia (MacKinnon and MacKinnon, 1986). The Park safeguards the largest remaining blocks of tropical rainforest in the southern Sumatra. BBSNP is complemented by the last and the largest proportion of tropical lowland forest which ranks among the richest in biodiversity, among all National Parks in Sumatra

TRHS comprises a spectrum of ecosystems representative of Sumatra, ranging from sandy beach forests, species-rich lowland rainforests through hill forests and unique highland wetland systems to montane forests and sub-alpine habitats on Sumatran highest mountain. The ecosystems contain habitats harboring a remarkable Sumatran flora and fauna species, including threatened species of outstanding universal values from the point of view of science and conservation. The ecosystems also contain large water catchment areas important to maintain the biodiversity richness, as well as the livelihood of people within and surrounding of the site.

Flora richness in the site includes the *blang* forest species which characterize northern Sumatra habitats, a large number of Sumatran endemics, threatened species, such as *Hopea beccariana* (CR), *Shorea ovalis* ssp. *seicea* (CR), *Shorea ovata* (EN), *S.platyclados* (EN), *Vatica obovata* (CR *V.perakensis* (EN), and *V.obovata* (EN). It also includes spectacular species, such as the largest flower in the world *Rafflesia arnoldii*, described by the founder of Singapore and one-time Governor of Java Sir Stamford Raffles as "the greatest prodigy in the vegetable world" (MacKinnon, 1992), and the highest flower in the world *Amorphophallus titanum* which grows rapidly to a height of two meters.

Fauna richness in the site includes most of 201 mammals and 580 birds found in Sumatra, and an unidentified number of herpetofauna, ichtiofauna and insect species. Among the species are a significant number of Sumatran endemics, and threatened fauna species such as Sumatran orangutan *Pongo abelii* (CR), Sumatran tiger *Panthera tigris sumatrae* (CR), Sumatran rhino *Dicerorhinus sumatraensis* (CR), Sumatran hare *Nesolagus netscheri* (CR), Sumatran elephant *Elephas maximus sumatranus* (EN), Sumatran serow *Capricornis sumatraensis sumatraensis* (EN), Rueck's blue-flycatcher *Cyornis ruckii* (CR) and Sumatran ground-cuckoo *Carpococcyx viridis* (CR), white-winged duck *Cairina scutulata* (EN), Asian giant tortoise *Manouira emys* (EN), and sunburst turtle *Heosemys spinosa* (EN), .

b. Comparative analysis

The nominated TRHS is the largest and most comprehensive representation of the Sumatran biodiversity richness. It represent Sumatra which is richer than Java, Sulawesi and other small islands, and is comparable to the region's richest islands of Borneo and New Guinea, in terms of its biodiversity.

The rich Sumatran biodiversity is the result of the island's unique evolutionary history. Being the westernmost island of the Indonesian peninsula, Sumatra was in the past part of the Southeast Asian mainland that was separated by the increases of sea level during the interglacial periods. Hence, Sumatra still shares many of the faunal and floral features with the Southeast Asian mainland and even India.

Borneo was in the past also part of the Southeast Asian mainland. However, Borneo does not harbor species such as Sumatran rhino *Dicerorhinus sumatraensis*, Sumatran tiger *Panthera tigris sumatrae*, Sumatran elephant *Elephas maximus sumatranus*, Malayan tapir *Tapirus indicus*, Sumatran serow *Capricornis sumatraensis*, golden cat *Felis temmincki*, and white-handed gibbon *Hylobates lar*, that still survive in Sumatra. Meanwhile, New Guinea's biodiversity richness is somewhat different from Sumatra's. While Sumatra has more Asian influences, New Guinea has more affinities to Australasia.

The flora diversity of Sumatra is only a little lower in number than Borneo and New Guinea, and up above Java and Sulawesi. Sumatra has 9,000 to 10,000 plant species, while Borneo has between 10,000 and 15,000 species, and New Guinea between 15,000 and 20,000 plant species, Java around 4,500 plant species, and Sulawesi some 5,000 species. The endemism level of Sumatran flora is also high with about 12% of all species and 17 endemic genera, compared with 34% of the endemism level in Borneo and 59 endemic genera (MacKinnon & MacKinnon, 1986; Whitten *et al.*, 2000; MacKinnon *et al.*, 1996).

The fauna diversity of Sumatra is high. For mammal species, the island has up to 201 species (Whitten *et al.*, 2000). As a comparison, Borneo has 222 species, Java 183 species, Sulawesi 127 species and New Guinea 220 species (MacKinnon *et al.*, 1996). In relation to its size, Sumatra (476,000 km²) is considered richer than Borneo (738,986.3 km²) in mammal diversity although both share many of the same species (e.g. Malayan sunbear *Helarctos malayanus*, clouded leopard *Neofelis nebulosa*). The bird species of Sumatra is typically Asian species in origin and similar to those of Peninsular Malaysia and Borneo. Sumatra has 465 resident birds, compared with 420 species on Borneo, 340 on Java, and 240 on Sulawesi (Ibid).

In addition, Sumatra harbors not less than 31 Asian species which are not found on any other Indonesian islands, for example the great hornbills *Buceros bicornis* (FAO/MacKinnon and Wind, 1979). At the same time, it has 15 species confined only to the Indonesian region, including Sumatran orangutan *Pongo abelii*, which is found only in the northern Sumatra area.

Sumatra harbors 22 species of Asian mammal found nowhere else within Indonesia, such as Malayan tapir *Tapirus indicus*, golden cat *Felis temmincki*, Sumatran serow *Capricornis sumatraensis*, smooth-coated otter *Lutra perspicillata*, and siamang *Hylobates syndactylus* (Whitten *et al.*, 2000). Finally, Sumatra has population of several species that are virtually extinct in other parts of Indonesia: e.g. Sumatran rhinoceros *Dicerorhinus sumatraensis*, Sumatran tiger *Panthera tigris sumatrae* and Sumatran elephant *Elephas maximus sumatranus* (FAO/van der Zon, 1979).

Among the protected areas in Indonesia, TRHS is comparable in size to Lorentz National Park (LNP), a World Heritage site located in Indonesian Province of Papua (known previously as Irian Jaya Province). THRS (2,595,124.867 Ha) is slightly bigger in size than LNP (2,505,600 Ha), the largest single protected area in Southeast Asia. LNP's flora and fauna diversity has Australasia influences: at least 41 species of mammal, 150 species of amphibian and reptiles, and 100 species of freshwater fish.

At the world level, the tropical rainforests of THRS are comparable to the world's richest tropical rainforests of the Amazon areas in Latin America. With a total area of 2,595,124.867 Ha, TRHS covers a larger area than Jau National Park (JNP) in Brazil which areas size is 2,272,000 Ha. JNP is the largest national park in the Amazon Basin and one of the natural World Heritage sites protecting world's tropical rainforest. While JNP protects a large and representative sample of the Amazon central plain forest including the entire hydrological basin of the Jaú River, THRS protects a large and representative sample of the Sumatran tropical rainforests.

The tropical rainforests of JNP and TRHS harbor different species diversity characterising each area. JNP, attributed as one of the planet's richest region in term of biological diversity, protects fauna diversity comprising 120 mammal species, 411 bird species, 15 reptile species and 320 fish species. Numerous species of conservation concern in JNP include jaguar *Panthera onca* (VU), giant otter *Pteronura brasiliensis* (VU), and black caiman *Melanosuchus niger* (EN). In comparison, TRHS harbors most of 201 mammal species and 580 bird species found in Sumatra. Species of conservation concern in TRHS include Sumatran orangutan *Pongo abelii*, Sumatran tiger *Panthera tigris sumatrae*, Sumatran rhino *Dicerorhinus sumatraensis*, Sumatran hare *Nesolagus netscheri* and Sumatran elephant *Elephas maximus sumatranus*.

Some of the species inhabiting TRHS can also be found Thailand's cluster Natural World Heritage site Thung Yai - Huai Kha Khaeng Wildlife Sanctuaries (TYHKKWS). With an area of 622,200 Ha, TYHKKWS is the largest conservation area in the mainland of Southeast Asia, yet smaller than TRHS. Species of conservation concern found both TRHS and TYHKKWS include world's largest flower *Rafflesia* sp., clouded leopard *Neofelis nebulosa*, white-handed gibbon *Hylobates lar*, crab-eating macaque *Macaca fascicularis*, pig-tailed macaque *Macaca nemestrina*, wild dog *Cuon alpinus*, and Malayan tapir *Tapirus indicus*. TYHKKWS protects an estimated 120 mammal species, 400 bird species, 96 reptiles, 43 amphibians, and 113 freshwater fish species.

c. Integrity

The integrity of TRHS is represented by the Parks' legal basis, the diverse ecosystems and flora and fauna they contain, and the elements necessary for long-term conservation of the site: i.e. the parks' sufficient size, the diverse elevation above sea level, soil types, hydrologic conditions, the ever-wet climate, the park management authorities and management plans.

According to Indonesian law on biological resource conservation, *UU RI No.5 Tahun 1990*, a national park is defined as a conservation area managed through a zoning system for the sake of research, science, education, breeding enhancement, recreation, and tourism. A conservation area has three basic functions, namely to protect life support system, to preserve the diversity of plants, animals and ecosystems, and to provide a sustainable use of biological resources. The law is the foundation for the establishment of national parks in Indonesia.

Gunung Leuser area was formally established as a national park (GLNP) through the announcement of the Minister of Agriculture on 6 March 1980, which was strengthened by the decree of Directorate General of Forestry No. 719/DJ/VI/1/80 dated 7 March 1980. Kerinci Seblat area was officially declared as a national park (KSNP) through the decree of the Minister of Forestry No. 1049/Kpts-II/1992 on 12 November 1992. Bukit Barisan Selatan area was established as a national park (BBSNP) under the decree of the Minister of Agriculture No. 736/MENTAN/X/1982 dated 14 October 1982.

TRHS comprises diverse ecosystems representative of Sumatra, which range from sandy beach forests, species-rich lowland rainforests through hill forests and unique highland wetland systems to montane forests and sub-alpine ecosystems on Sumatra's highest mountain. Such diverse ecosystems contain habitats for a large number of flora and fauna species of mammals, birds, reptiles, amphibians, fishes and invertebrates which include threatened species of outstanding universal value.

The diverse ecosystems and biodiversity richness of the site are supported by elements essential for the long-term conservation of the ecosystems and the biological diversity they contain.

With the area of 2,595,124.867 Ha, TRHS has sufficient size to maintain its flora and fauna and key habitat diversity (each Park has between 356, 800 Ha and 1,375, 349.867 Ha). The site supports a diverse elevation above sea level, ranging from 0 m to up 3,400 m asl, with each zone having its biological diversity characteristics. This ensures the diverse ecosystems in the site and consequently ensure the high biodiversity richness of the site. The biodiversity of the site is also supported by the range of soil types found in the three Parks areas, which range from podzolic, latosol, litosol and andosol.

The hydrologic condition is another key element of the site's biodiversity as well as continuity. The site makes up large proportion of the water catchment areas which are important for the biodiversity and the livelihood within the Parks and the surrounding areas. The hydrologic conditions of the site are also characterized by the presence of lakes; hot springs and saltlicks.

The humid ever-wet climate, which imposes no limitation on the number of species that can be supported, is also an element essential to the site's biodiversity and continuity. Most areas in the site belongs to Type A climate (wet) in Schmidt and Ferguson classification with more than 9 wet month annually, and the rest belongs to Type B, which is drier than Type A and has around 7 wet month annually.

Another key element for the conservation of the site lies in the presence of the management authorities and management plans. Each of the three Parks are managed by a special management authority, namely *Balai Taman Nasional Gunung Leuser (GLNP Management)*, *Balai Taman Nasional Kerinci Seblat (KSNP Management)*, and *Balai Taman Nasional Bukit Barisan Selatan (BBSNP Management)*. To manage the Park, each Park Management uses its own management plans prepared in accordance to the law on biological resources conservation, *UU RI No.5 Tahun 1990*.

d. Criteria under which the inscription is proposed (and justification for inscription under the criteria)

Criterion (i): be outstanding example representing major stages of the Earth's history, including the record of life

Until about 280 million years ago, at the beginning of the Mesozoic era, the Earth's land mass formed a single continent called Pangea (MacKinnon *et al.*, 1996). About 250 million years ago, during the Triassic, Pangea rifted into two: Laurasia (North America, Europe and much of Asia) and Gondwanaland (India, Australia, Africa, South America, Antarctica and the rest of Asia). During the Jurassic, about 200 million years ago, Gondwanaland began to split into its separate parts, and India floated towards Asia.

About 70 million years ago, by the early Tertiary era, India and the plate on which it laid began to collide with and move under the Asian Plate. Its major thrust caused the uplift of the Himalayas, and one of the associated thrusts caused the uplift of the Bukit Barisan Mountains Range, which runs along Sumatra and is where GLNP, KSNP and BBSNP are located. The rocks of the Bukit Barisan Mountain Range are largely sedimentary and are laid down over about 100 million years between the late Palaeozoic and early Mesozoic areas up to 180 million years ago (Whitten *et al.*, 2000). The rocks also comprise alteration of different kinds of limestone, shale, schist, sandstone, quartzite, and breccias (Zwierzycki in van Beek, 1996).

The uplift of Bukit Barisan Mountain Range was followed by mountain building activity as the collision of the two subcontinental plates produced heat which melts the Earth's crust to produce molten rock or magma, creating volcanic belt (MacKinnon, 1992). A major upthrust occurred 20 million years ago and this mountain building activity was accompanied by considerable faulting and violent volcanic activities which little by little shaped the present form of Sumatra. One of the greatest volcanic eruptions occurred 75,000 years ago when the formation of Lake Toba in the northern Sumatra began. The ash ejected during the eruptions spread over 20,000-30-000 km² (Whitten *et al.*, 2000).

A final period of the mountain building activity occurred between the Pliocene and the Pleistocene about 3 million years ago, and some faulting, block faulting, creation of rift valleys and horizontal offsetting of land accompanied this. Some of the most important (normal) faults are the ones along the Graben (a relatively depressed fault block lying between normal faults with roughly parallel strikes) and parallel to the subduction zone. They form the Central Rift Valley, also called the Semangko Zone, which can be easily recognized over the full length of Sumatra and by the deep and longitudinal river valley (Ibid).

GLNP is situated on five physiographical units which are directly related to three most important parallel running longitudinal physiographic zones in the uplifted zone along Sumatra. Those five physiographical units are the West Coast Chain; West Barisan; West Alas Chain; Central Graben; East Barisan; and East Coast Chain (Van Beek, 1996). The West Alas Barat Chain is predicted to be formed in the Mesozoic era, and the rock formation consists of black shale to slate, siltstone, hard sand stone, minor grey wacke, conglomerates, banded and massive limestone and dolomite, and cherts.

According to the geological block, KSNP and its surrounding area are divided into geological blocks of Sungai Penuh-Ketaun; Muarabungo; Sarolangun; and Bengkulu (Kusnana *et al.*, 1993; Suwarna *et al.*, 1994). Geological conditions of the blocks are dominated by the quarter vulcan characterized Bukit Barisan Mountains Range. This formation is dominated by Qou Formation (inseparable volcanic breccias) and Qol Formation (lava). The volcanic materials are rich in plagioclase and generally have acid characteristic. Tertiary andesitic formations which are acid to very acid occur in the western coast area. This formation is dominated by Tomp Formation (Painan Formation), consisting mainly of conglomerates, and volcanic breccias; and Tomh Formation (Hulu Simpang Formation), consisting of lava, volcanic breccias, and tuf.

Preliminary studies in the BBSNP area have revealed that the Park is largely located on the Semangko Fault Zone. The studies have also confirmed that the Park area comprises sedimentary rocks (old Miocene, neogene, old Paleozoic, alluvium), volcanic rocks (recent, old quartz, old andesite, intermediate basalt) and plutonic rocks. The most widely spread is volcanic rocks which can be found in the mid and northern part of the Park.

Another example of the Earth's history in the nominated TRHS is described by Sumatran biodiversity, especially its fauna species, identified in the site. Sumatra, on which the three Parks are situated, is part of a zoogeographic unit, usually called the Malayan region. The mammal fauna within this region, comprising the Malay Peninsula, and the islands of Sumatra, Borneo, Java, Madura and Bali, have many common elements and some notable differences with the faunas of adjacent areas. The explanation lies in the reduction of the sea levels during the interglacial period in the late Tertiary and mid-Pleistocene. The reduction of sea levels provided land connections between various parts of the islands in the Malayan region, which allowed the migration of mammals across the region. Cooler climatic condition in Asia during the glacial periods encouraged animals to move southwards to the Greater Sunda islands (MacKinnon *et al.*, 1996).

The distribution of some mammal species in Sumatra also explains the geological history of the island. The distribution of Sumatran orangutan *Pongo abelii*, for example, is explained by the Toba tuff eruptions in the Pleistocene which appear to limit its distribution to the northern Sumatra and to have been a barrier for its dispersal in other parts of the island.

In addition to the above justification under this criterion, the site plays an important part in revealing the prehistory of Sumatra. Tiangko Panjang Cave in the western Jambi within KSNP area is one of about 10 sites in the southern Sumatra, discovered at the beginning of 21st century that has revealed stone and wood tools. Tiangko Panjang cave, a tunnel of 24 m long and 5-8 m high and wide, is about 13 m above the valley of Tiangko River, a tributary to Mesurai River. A few pits have been dug in the cave floor, and radiocarbon dating charcoal samples from different depths showed that man inhabited the cave at least 10,000 years ago when the cave floor was 135-160 cm below the present level.

The floor deposits contain hundreds of small stone flakes, many of which had been used as tools. This indicates a more advanced culture than that which produced large rough flakes (Palaeolithic), but not as advanced as that which produced, for example, smooth axe heads (Neolithic). Remains of vertebrate animals included a single human tooth, a few deer teeth, a few bone fragments (usually burned) from deer-sized animals, numerous bat bones, many turtle shell fragments, moderate numbers of vertebrae and long bones from small-chicken sized birds, a moderate number of fish vertebrae, and teeth of rat-sized rodents (Whitten *et al.*, 2000).

Exploration and analysis of data from Tiangko Panjang Cave has not been completed yet. Surveys, however, showed that it has many similarities to Niah Cave in Serawak, Malaysia, where considerable data have been collected (Ibid). The stage of man's development in Niah Cave has been described as Early Stone Age (30,000-60,000 years ago); Neolithic (about 4,000 years ago); Intermediate II (about 2,000 years ago) and Iron Age (about 1,300 years ago).

Criterion (ii): be outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants and animals

TRHS has an important role in maintaining the biodiversity richness of Sumatra, one of the world's richest areas of biodiversity. This has been supported, for example, by the fact that the northern part of Sumatra, including the GLNP area, has been identified as one part of Sumatran Islands Lowland and Montane Forests Ecoregion, one of the 18 Ecoregions located in Indonesia out of 200 WWF Global Ecoregions. The highly diverse forests in this area are considered to represent the opportunity to conserve a number of endangered and charismatic species, such as Sumatran orangutan, Sumatran tiger and Sumatran rhino, while simultaneously saving unique forests that are rich in lesser known plants and animals.

By mid 1990s, Sumatran montane forests have lost an average of one third of their natural areas, whereas between two thirds and four fifths of lowland forests have disappeared (FAO/MacKinnon, 1982; MacKinnon, 1997). GLNP, KSNP and BBSNP, which form THRS, are the three largest Parks of the nine Parks occupying most of the remaining forest area in the island.

With the increasing commitment from the government to protect national parks in the recent years and the Park Managements efforts to involve local community in the sustainable forest management, TRHS has served as a safe haven for the island's key habitats, and flora and fauna representatives of Sumatra which include a significant number of globally treated species, and has prevented them from extinction.

The characteristics of the vegetation and floristic composition of TRHS in particular and Sumatra in general agree with those of the rest of West Malesia, the floristic region reaching from Southern Thailand to Papua New Guinea, and including all of Indonesia and Malaysia. Sumatra's northern proportion, however, possesses its own distinctness due mainly to the gigantic Toba tuff eruptions, in the Pleistocene (some 75,000 years ago) (de Wilde, 1993).

The fauna, especially the mammals of THRS in particular and Sumatra in general is part of the zoographic unit of Malayan region, a part of Oriental faunal region. The mammal faunas within this area, comprising the Malay Peninsula, and the islands of Sumatra, Borneo, Java, Madura, and Bali, has a clearly recognizable character with a dominance of typical rainforest species (van Strien, 1996). However, despite the general character of the habitat and climate is fairly uniform throughout the region and the separation of the islands from the mainland is only a few thousand years old, the fauna is not equally distributed in the Sumatra Island. There is an obvious difference in the mammal fauna in the mountain and lowland areas of Sumatra. There is also a remarkable difference in the mammal fauna between the north and south of the island due to the gigantic Toba tuff eruptions in the Pleistocene and between the areas separated by geographic barriers, such as large rivers.

The biodiversity richness of TRHS has resided within the diverse ecosystems in each of the three Parks. GLNP includes all the major rainforest types of northern Sumatra, from the west coast sandy beach ecosystem and the peat swamp ecosystem of Kluet, tropical forest, sub-montane forest, montane forest, up to the sub-alpine ecosystem on the mountain complex of Leuser, Kemiri, Simpali and Bandahara. KSNP consists of different types of ecosystem, ranging from lowland forest ecosystem in the districts of Bengkulu Utara, Pesisir Selatan, and Musi Rawas; hill forest ecosystem; sub-montane forest ecosystem; montane forest ecosystem, comprising smaller ecosystems of lower montane forest, mid-montane forest, and upper montane forest, as well as swamp forest; to sub-alpine thicket ecosystem. BBSNP includes different types of ecosystem, ranging from coastal forest ecosystem, lowland forest ecosystem, highland forest ecosystem, sub-montane forest ecosystem and montane forest ecosystem.

Since GLNP, KSNP and BBSNP are largely situated on the spine of Bukit Barisan Mountain Range which runs along Sumatra, the largest part of the three Parks are located on the mountainous area. In GLNP, while the lowland area with altitude between 0 m and 600 m asl occupies around 12% of the Park area, up to 88% of the Park's area is located at altitude higher than 600 m asl. In KSNP, the Park is characterized by its chains of hills and mountains occupying up to 70% of the Park area. Of the three Parks, BBSNP has the largest proportion of lowland area. Up to 45% of the Park area is located on the lowland, while the rest of the Park area is located on the hilly and mountainous area.

Lowland tropical rainforest ecosystem is known to have the highest biodiversity richness of all ecosystems. MacKinnon (1992) argues that overall biodiversity richness declines as the altitude increases, although, of course, certain groups are better represented or even restricted to higher altitude. However, the fact does not undermine the importance of a large proportion of mountainous ecosystems in the site to the livelihood in the lowland areas, both inside and outside the Park.

Mountains play a central role in collecting and storing the single most precious element for life on Earth: fresh water. The rivers and streams that flow from mountain slopes are living bonds connecting mountain and the livelihood in the lowland. When montane forests are cut unsustainably or land is excessively cleared for farming, ranching or mining, the water that normally flows into mountain watersheds washes over barren slopes. The resulting erosion transforms the promise of life, which is contained in mountain soils, into threats of deadly avalanches, landslides and flooding. As fertile soil and forests are lost, rivers begin to silt up and rare species of plants and animals can face extinction. This environmental degradation threatens not only flora and fauna species, but also human. It often means increasing poverty and hunger for people living in the mountainous areas, and as the resources become scarce, conflicts over their use will rise. The large proportion of mountainous ecosystems in TRHS is an important watershed to sustain the rich biodiversity in the lowland areas, and the livelihood of millions of people living within and outside the site, who depend much on freshwater for agriculture irrigation and fresh-water fish. The protection of the mountain ecosystem within the site will prevent disaster, not

only for the site's flora and fauna richness, but also for the livelihood of human population within and in the surrounding areas of the site.

In regard to the protection of ecosystems and flora and fauna diversity they contain, the nomination of GLNP, KSNP and BBSNP as a cluster is the best option rather than nominating them separately. TRHS cluster as a whole represents a maximum variety of ecological and biological process characterising the evolution of biodiversity in Sumatra. If nominated separately, the larger Parks like KSNP and perhaps GLNP may be included as World Heritage, but BBSNP, a much smaller Park, may not be accepted because it may not fulfil the criteria and integrity for the inscription. Hence the declaration of all three Parks as a single World Heritage site at the same time rather than sequentially (one after the other) is the best option. Further, nominating the three Parks sequentially will take much longer time and increase the risks of the integrity of one or more of the Parks being seriously undermined.

Criterion (iii): contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

TRHS is is complemented by Lake Gunung Tujuh (1,996 m asl), a superlative natural phenomena of exceptional natural beauty found in the KSNP area. The lake, one of the most visited sites in KSNP by tourists, is a caldera lake of about 4.5 km long and about 3 km wide, and is the highest lake in the Southeast Asia. It is surrounded by 7 mounts with Mt. Jujuhan (2,732 m asl) as the highest peak.



Lake Gunung Tujuh, the highest lake in Southeast Asia (KSNP/PHKA)

The Lake Gunung Tujuh is located in an extinct volcanic crater, situated in Palompek Village near Mt. Kerinci. It was formed when the exhausted volcanic cone was filled with water. As a mountain lake, Lake Gunung Tujuh has never been connected to the sea or any big rivers and consequently does not contain many species of fish. The

lake, however, supports an interesting fauna with many frogs and insects (MacKinnon, 1992), and is often visited by wild animals. Visitors come to Lake Gunung Tujuh for photo hunting, bird and other wild animal watching, trailing, and canoing. The mythical '*orang pendek*,' whose presence continues to be a debate, has been reported to be seen around this lake.

Meanwhile, mountain *blang*, a superlative natural phenomenon unique to Sumatra, is found in GLNP. It is characterized by the presence of the rather extensive flat or slightly sloping plains with heather-like short vegetation in the summits areas of the larger mountain complexes in the Gayo Lands.



*The vegetation of mountain blang forest at Mt. Perkinson in GLNP
(Leuser Development Programme (LDP)/PHKA)*

Following a series of debate on the reasons of the presence of blang forest, de Wilde and Duyfjes (1996) concluded that the cause and character of the high mountain *blang* areas in the Gayo Lands is complex, and largely set by various circumstances that make them unique to the northern Sumatra area. These are: 1) the poor soils mainly quartzic rock and shales of the cold top zones of the old non-volcanic, high mountain complexes; 2) the old impermeable kaolinitic platy-like soil of very low fertility, on which low heath-like vegetation, partly forming thick water-soaked layers of peat soil could develop; 3) the absence in Malesia Region of (sub) alpine tree species which can stand the permanent inundation condition of these peaty lands; 4) the regular or incidental burying in places of the low forest and ericoid scrub-vegetation, or poor soils, with the washing off of the top soil layer with minerals, leaving either a thin fine whitish quartzic sand layer, or bare rock; 5) a distinct, physiognomically characteristic type of low heathlike vegetation, with a characteristic floristic composition, including special like-forms such as 'polster' plants, ringshaped

growth-forms, 'spalier' shrublets, windforms, and also a comparatively high number of distinct endemic plant species, unique to this particular area.

Many interesting mounts are also found in TRHS. Mt. Kerinci (3,805 m asl), located in KSNP, for example, is the highest active volcano in Indonesia and the highest peak in Sumatra. It is known for its abundance of bird species and its different types of vegetation, including the magnificent edelweiss *Anaphalia javanica*, one of the very few plants confined to volcanoes. Another mount, Mt. Leuser (3,404 m asl), located in GLNP, has an interesting landscape and pristine forests. Its attraction lies in different types of vegetation it harbors, including moss forests. Mt. Kemiri (3,314 m asl), the second highest peak in GLNP, is known with its shallow lake in glacial hollows. The lake is characterized by the moss *Sphagnum*, which is sometimes also found in moss forests (Whitten *et al.*, 1997).

Tampang-Blimbing area, located in the southernmost area of BBSNP, has a natural landscape, comprising of coastal forest ecosystems, lowland tropical rainforest ecosystems, and estuarine peat swamp ecosystems. Sambar deer *Cervus unicolor*, Barking deer *Muntiacus muntjak*, Sumatran tiger *Panthera tigris sumatrae*, and white-winged duck *Cairina scutulata* are species that might be encountered in this area. Tampang-Belimbing area also harbors sea turtles habitats: i.e. in Menjukut-Blambangan-Penipahan and Way Kawat (Pamekahan). Lake Menjukut, separated from the sea by approximately 30 m of beach sands, and a 79 m high lighthouse tower called Mercusuar Belimbing, which was built under the Dutch Colonial era in 1878, are also located in this area.

KSNP harbors natural sites for wild animal watching, such as Rawa Ladeh Panjang (1,950 m asl), the highest peat swamp in Sumatra; Kasah Cave; Bukit Tapan; Talang Kemuning; Tanah Teraleh; Mt. Masurai; Muara Sako; Bukit Gedang Seblat; Bukit Kayu Embun; and Rawa Ulu Lakitan. In these sites, visitors might see wild animals, such as Sumatran tiger *Panthera tigris sumatrae*, Sumatran rhino *Dicerorhinus sumatraensis*, Sumatran elephant *Elephas maximus sumatranus*, sun bear *Helarctos malayanus*, Malayan tapir *Tapirus indicus*, Sumatran hare *Nesolagus netscheri* and different species of primates. In Mt. Seblat, visitors might encounter the largest flower in the world, *Rafflesia arnoldii*.

In addition, TRHS is complemented by natural lakes, waterfalls, and natural caves. Some of the natural lakes found in the site are Laut Bangko (10 Ha) and Marpunga (6 Ha) (GLNP); Lake Belibis, a 2 Ha crater lake; Lake Duo (10 Ha); Lake Pauh (52 Ha) and Depati Empat Lake (67 Ha) (KSNP); Asam (160 Ha), Lebar (60 Ha), Minyak (10 Ha), and Belibis (3 Ha) (BBSNP). Some of the natural caves found in the site are Sei Buluh Cave and Bukit Kapal Cave (GLNP); Napal Licin Cave (KSNP); and seven natural caves located in Muara Pemerihan–Menanga (BBSNP). Some waterfalls in the site include Telun Berasap Waterfalls (50 m), Mendikit Waterfalls (75 m), Sungai Mentilin Waterfalls (10-15 m), Pancaro Raya and Picuran Gading Waterfalls, Sungai Ampar Waterfalls, and Sungai Kerali Waterfalls (25 m) (KSNP); Sepapa Kanan (20 m), and Sepapa Kiri (60 m) (BBSNP).

Criterion (iv) : contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science and conservation

TRHS, comprising GLNP, KSNP, and BBSNP, contains samples of all key habitats that characterize the Sumatran biodiversity.



World's largest flower Rafflesia arnoldii (Alain Compost/PHKA)

GLNP includes all the major rainforest habitat types of the northern Sumatra, from the west coast sandy beach and peat swamp, tropical forest, sub-montane forest, montane forest, up to the sub-alpine habitat. KSNP consists of different types of habitat, ranging from lowland forest; hill forest; sub-montane forest; montane forests, comprising lower montane forest, mid-montane forest, upper montane forest, and swamp forest; to sub-alpine thicket. BBSNP includes different types of habitat, ranging from coastal forest, lowland forest, highland forest, sub-montane forest and montane forest.

These habitats harbor flora and fauna characteristics of Sumatra, which is attributed as part of the Sundaland Hotspot, one of the two hotspots (areas of high biodiversity as defined by Conservation International) located in Indonesia out of world's 25 hotspots. The flora and fauna diversity includes a significant number of globally treated species of outstanding universal value from the point of view of science and conservation.

At least 4,000 plant species out of 10,000 plant species in Sumatra have been identified in various habitats within GLNP (Willem de Wilde quoted in Wind, 1996). Up to 92 species have so far been identified as local endemic plant species (de Wilde & Duyfjes, 1996). In addition, the Park also contains habitats for spectacular species such as, the largest flower in the world *Amorphophallus titanum* and the tallest flower in the world *Rafflesia arnoldii*.



Sumatran tiger Panthera tigris sumatrae is found in GLNP, KSNP and BBSNP,
(Alain Comnost/PHKA)

The varied habitats within the GLNP area also harbor a high diversity of Sumatran fauna. At least 174 mammals have been identified in the Park (Van Strien, 1996), including threatened mammal species of outstanding universal value from the point of view of science and conservation. These include at least 3 Sumatran endemic species and 21 threatened species under the 2000 IUCN Red List of Threatened Species, such as *Pongo abelii* (CR), *Dicerorhinus sumatrensis* (CR), *Panthera tigris sumatrae* (CR), *Elephas maximus sumatranus* (EN), *Capricornis sumatraensis sumatraensis* (EN), *Cynogale bennettii* (EN), *Neofelis nebulosa* (VU), *Cuon alpinus* (VU), and *Macaca nemestrana* (VU).

GLNP also provides important habitats for key bird species of Sumatra. Up to 380 bird species in total have been identified, including 15 Sumatran endemic species and 53 threatened species under the 2000 IUCN Red List of Threatened Species, for examples *Cyornis ruckii* (CR), *Cairina scutulata* (EN), *Spizaetus nanus* (VU), *Lophura hoogerwerfi* (VU), *Lophura inornata* (VU), *Treron capellei* (VU), *Pitta schneideri* (VU), *Cochoa beccarii* (VU), *Pycnonotus tympanistrigus* (LR), and *Chloropsis venusta* (LR).

In KSNP, there are up to 4,000 plant species, including 300 species of orchids. *Rafflesia arnoldii*, is often found in the Park's Bengkulu forests, while both *Amorphophallus titanum* and *Amorphophallus gigas* are often encountered in the Park at altitude below 900 m asl. The Park also contains threatened flora species under the 2000 IUCN Red List of Threatened Species, such as *Hopea beccariana* (CR), *Shorea ovalis* ssp. *seicea* (CR), *Vatica obovata* (CR), *Shorea ovata* (EN), *S. platyclados* (EN), *Horsfieldia triandra* (VU), *H. mecilenta* (VU), and *H. macrothyrsa* (LR).



Great hornbill Buceros bicornis, one of the nine hornbill species of Sumatra, is identified in KSNP and GLNP (Alain Compost/PHKA)

The diverse ecosystems within KSNP area also contain the most important and significant habitats to sustain the high fauna diversity. On the whole, the Park provides significant natural habitats for at least 85 mammal species, including 5 Sumatran endemic species and at least 23 threatened species under the 2000 IUCN Red List of Threatened Species, such as *Hylomys parvus* (CR), *Nesolagus netscheri* (CR), *Panthera tigris sumatrae* (CR), *Dicerorhinus sumatrensis* (CR), *Crociodura beccarii* (EN), *Elephas maximus sumatranus* (EN), *Neofelis nebulosa* (VU), *Tapirus indicus* (VU), and *Naemorhedus sumatrensis* (VU).

KSNP also provides important habitats for 370 bird species. They include at least 13 Sumatran endemic species and 58 threatened species under the 2000 IUCN Red List of Threatened Species, such as *Carpococcyx viridis* (CR), *Cairina scutulata* (EN), *Lophura inornata* (VU), *Heliopais personata* (VU), *Treron capellei* (VU), *Alcedo euryzona* (VU), *Pitta schneideri* (VU), *P. venusta* (VU), *Cochoa beccarii* (VU), *Harpactes duvaucelli* (LR), *Actenoides concretus* (LR) *Anthracoceros malayanus* (LR), *Buceros rhinoceros* (LR), *B. bicornis* (LR), and *B. (Rhinoplax) vigil* (LR).



Sumatran elephant *Elephas maximus sumatranus* (Alain Compost/PHKA)

While more extensive researches on the flora diversity within BBSNP are required, preliminary surveys in the Park have identified at least 514 plant species, including 126 orchid species, 26 rattan species, 15 bamboo species, different plant species having traditional use value, such as *Shorea javanica*, *Shorea ovalis*, and *Dyera* sp., and *Rafflesia* sp., *Amorphophallus titanum*, and *A. deculsivae*. The Park also contains threatened flora species under the 2000 IUCN Red List of Threatened Species, such as *Vatica obovata* (CR), *Anisoptera costata* (EN), *Shorea ovata* (EN), *Dipterocarpus retusus* (VU), *Saurauia cauliflora* (VU), *Casearia flovovirens* (VU), *Aglaia edulis* (LR), and *Knema intermedia* (LR).

The forests of BBSNP also provides habitats for maintaining the fauna diversity of the Park, including threatened species. BBSNP contains 98 mammal species, including at least 1 Sumatran endemic species and 25 threatened mammal species under the 2000 IUCN Red List of Threatened Species, such as *Dicerorhinus sumatrensis* (CR), *Panthera tigris sumatrae* (CR), *Nesolagus netscheri* (CR), *Elephas maximus sumatranus* (EN), *Capricornis sumatraensis sumatranensis* (EN), *Cynogale bennetti* (EN), *Macaca nemestrina* (VU), *Lutrogale perspicillata* (VU), *Prionailurus planiceps* (VU), and *Hystrix brachyura* (VU).

BBSNP also provides habitats for a rich avian community. Up to 379 bird species, including 67 threatened species under the 2000 IUCN Red List of Threatened Species and 7 Sumatran endemic species, have been identified in the Park. Threatened species identified include *Cyornis ruckii* (CR), *Carpococcyx viridis* (CR), *Cairina scutulata* (EN), *Ciconia stormi* (EN), *Alcedo euryzona* (VU), *Spizaetus nanus* (VU), *Mycteria cinerea* (VU), *Treron capellei* (VU), *Pitta venusta* (VU), *Pycnonotus squamatus* (LR), *Alcippe brunneicauda* (LR), *Eupetes macrocerus* (LR), *Malacocincla malaccense* (LR), *Macronous ptilosus* (LR), and *Dicurus sumatranus* (LR).

Preliminary surveys on herpetofauna in BBSNP reveal that the Park harbors at least 59 species of reptile and amphibian, including threatened turtle species, such as *Manouira emys* (EN), *Heosemys spinosa* (EN), *Orlitia borneensis* (EN) and *Notochelys platynota* (VU).

Little is known about fish and insect within TRHS in particular and in the island of Sumatra in general as no extensive research have been conducted on the subject. However, from the surveys conducted on mammal and bird species as well as general studies on flora species, it can be concluded that the assemblage of plants and animals identified in the diverse habitats within the nominated site shows a very high endemism and biodiversity in a relatively unaltered setting. The nominated site is therefore of outstanding universal value for studies of biological and ecological processes in the tropical rainforests as well as for conservation of the world's biodiversity richness.

3. Description

a. Description of the property

a. 1. Physical feature

a. 1. 1. Climate

The climate in Tropical Rainforest Heritage of Sumatra (TRHS) varies with the topography in each of the three Parks. On the whole, it is generally characterised by abundant rainfall moderately well distributed through the year.

In Gunung Leuser National Park (GLNP), the areas at low altitude belong to the wet tropical climate, while the higher areas belong to the montane or subalpine climate. However, on the whole, most GLNP area belong to Type A climate (wet) in Schmidt and Ferguson classification with more than 9 wet month annually. The average annual rainfall in the area is high. The rainfall in Ketambe, the northern area of the Park, reaches 3,000 mm, while in Bukit Lawang/Bahorok in the southern area reaches 4,657 mm. The temperature ranges from 21 to 28 degrees centigrade. The air relative humidity is above 60%, especially in the areas situated on 1,700 m asl and above.

Most Kerinci Seblat National Park (KNSP) area belongs to Type A climate (wet) in Schmidt and Ferguson classification. The average annual rainfall in KNSP is 2,991 mm, with fewer than two dry months annually. The temperature ranges from 16 to 28 degrees centigrade. The air relative humidity is from 77% to 92%, and is constant for the whole year. The wind speed varies between 15 km per day in the eastern lowland area, and 85 km per day in the mountain areas.

Bukit Barisan Selatan National Park (BBSNP) has two climate zones (Oldeman *et al.*, 1979). The western part of the Park belongs to Type A climate (wet) in Schmidt and Ferguson classification with more than 9 wet months annually, while the eastern part belongs to Type B which is drier than Type A and has around 7 wet months annually. The rainy season takes place from November to May during the wet west monsoon, and dry season takes place from June to August as a result of east monsoon wind. The average annual rainfall in the Park is between 2,500 mm and 3,000 mm in the western part and between 3,000 mm and 4,000 mm in the eastern part, while the temperature ranges from 20 to 28 degrees centigrade.

a. 1. 2. Geography

TRHS is largely located on the spine of the Bukit Barisan Mountain Range which runs along Sumatra Island. GLNP stretches approximately 100 km along the northern part of the mountain range. KNSP elongates almost 350 km from northwest to southwest between GLNP and BBSNP on the chain of the mountains, with average 50 km wide in the southern half of the mountain range. BBSNP largely lies on the southernmost area of the mountain range, straddling along the south west coastal area

of Sumatra, covering almost the whole area of the peninsula from Tanjung Cina (China Hope) to Teluk Bengkuntat (Bengkuntat Bay).

Each of the Parks consisting TRHS is divided into several altitudinal zones. Van Steenis (1972; 1984) divided GLNP into four altitudinal zones: 1) tropical zone (0-1,000 m asl, comprising of lowland zone (0-(300)-500 m asl) and colline zone (500-1,000)); 2) sub-montane zone (1,500-2,400 m asl); 3) montane zone(1,600-2,400(-2,500) m asl); and 4) sub-alpine zone (2,500-3,400 m asl). A large part of GLNP (40%) is situated in the mountains range with altitude between 1,500 and 2,400 m asl (35%) and above 2,400 m asl (5%). The northern part of Gunung Leuser Reserve and part of Bendahara are fallen in this area. Almost half of GLNP area (48%) is located in the altitude between 600 to 1,500 m asl, including the area in the southern part of Gunung Leuser, Kappi and the eastern part of Sekundur and Langkat. Only a small part of the Park (12%) is located in the lowland area (< 600 m asl), covering the areas of Sekundur, Bengkong and Kluet.



Mt Kerinci (3,805 m asl) in KSNP is the highest volcano in Indonesia and the highest peak in Sumatra (Alain Compost/PHKA)

As a large part of GLNP is situated on the mountainous areas, the Park comprises mostly of chains of hills and mountains. Consequently, GLNP is characterized by moderate to steep slopes (more than 40% in approximately 80% of the Park area). At least 33 hills and mounts, have been identified in the Park area. Some of the highest peaks include Mt. Blang Beke (2,729 m), Mt. Perkinson (2,828 m), Mt. Dedalu (2,858 m), Mt. Bipak III (3,009 m), Mt. Bendahara (3,012 m), Mt. Loser (3,119 m), Mt. Ketambe (3,120 m), Mt. Karang Putih (3,370 m), Mt. Kemiri (3,314 m), Mt. Simpali (3,383 m). The highest peak is Mt. Leuser (3,466 m).

The rift valleys separate the Bukit Barisan Mountain Range in the KSNP into two parallel ranges. The west side is more or less continuous range of the mountains with altitude about 2,000 m asl, while the eastern side has lower mountains, with altitudes between 800-1,500 m asl (Laumonier, 1994). With its chains of hills and mountains, the Park is characterized by steep slopes (60%) in more than 70% of the area. Mt Kerinci (3,805 m asl) is the highest peak in KSNP, the highest peak in Sumatra, as well as the highest volcano in Indonesia.

BBSNP comprises altitudes varying between 0 and 600 m asl in the coastal area and up to 1,000 m asl in the hilly parts of the southern area of the peninsula, and part of Bukit Barisan Mountain Range in the middle and northern parts with altitude between 1,000 and 2,000 m asl. The southeastrn, southern and northern side of the Park are surrounded by the sea, Semangka Bay, China Hope and Indian Ocean. The eastern part of BBSNP is characterized with moderate slopes (20% to 45%). Steep slopes (up to 80%) are found in the northern area; while the western and southern parts are relatively flat (3% to 5%). Peaks of more than 1,500 m asl include Bukit Napalan (1,526 m asl), Bukit Gedang (1,627 m asl), Bukit Pandan (1,678 m asl), Mt. Balirang (1,703 m asl), Mt. Sekincau (1,738 m asl), and Mt. Pulung (1,964 m asl).

a. 1. 3. Hydrology

The hydrology of TRHS is characterized by large catchment areas and many rivers and streams, lakes, hot water springs, and saltlicks.

GLNP's hydrology is represented by three catchement areas for at least 92 rivers and streams in the two provinces. First is the river catchement area at the slopes of Mt. Leuser, Mt. Mamas, and Mt. Kemiri. Second is the river catchement area at the slope of Mt. Segama, and third is the river catchement area at the slope of Mt. Bendahara, and Mt. Perkinson. The most important rivers are the Alas, Tamiang, Kluet and Tripa in Nangroe Aceh Darussalam Province, and the Sei Besitang, Sei Wampu, and Sei Batang Serangan in Sumatra Utara Province. Apart from the rivers, the hydrology of the Park is characterized by the presence of two lakes, namely Laut Bangko (10 Ha) and Marpunga (6 Ha); hot springs, such as those situated in Lawe Gerger and Air Panas; and saltlicks, found in Muara Renun, and Kappi.

KSNP's hydrology is characterized by a large proportion of the river catchement area for 23 major rivers in the four provinces. The most important rivers are the Batang Hari in Jambi, the Ketahun in Bengkulu, and the Musi in South Sumatra. The hidrology of the Park is also characterized by several lakes, among others are Lake Gunung Tujuh, Depati Empat, and Belibis, and several hot springs located in Ladeh Panjang area.

BBSNP's hydrology is characterized a large proportion of the catchment areas for most of the rivers in the two provinces. The most important rivers are the Nasal Kiri, Nasal Kanan, Menula, Simpang and Lali in the norther part of the Park; Tenumbang, morong, Ngambur Bunuk, Tembuti, Ngaras, Pemerihan, Semuang, and Semangka in

the middle; and Canguk, Menangka Kiri, Menangka Kanan, Paya, Kejadian Sulaiman, and Belambangan in the south. Another characteristic of the Park's hydrology is the presence of Lake Menjuket (150 Ha), Lake Asam (160 Ha), Lake Lebar (60 Ha), Lake Minyak (10 Ha) and Lake Belibis (3 Ha).



View of Bengkumat River, one of the rivers within BBSNP (WCS-IP/PHKA)

a. 1. 4. Soil types

The soil in the three Parks consisting TRHS is varied with podzolic being the dominant type.

GLNP has at least 11 types of soils. The three most dominant are complex brown podzolic, podzolic and litosal, covering 423,949 Ha (38,41% of the Park's total surface); complex red-yellow podzolic, latosol, and litosal, covering 350,133 Ha (31, 97% of the Park's total surface); and andosol, covering 150,698 Ha (13,76% of the Park's total surface). Complex brown podzolic, podzolic, and litosal is found at the area from the eastern part of Alay Valley to Kappi, and the western part of the mid Alas Valley. Complex red-yellow podzolic, Latosol, and Litosol are identified at the large part of the western area of Alas Valley, the eastern part of GLNP and Blang Pidie. Andosol is identified at the top of Mt. Kemiri and the slopes of Mt. Leuser (data from Soil Research Institution quoted in GLNP Management Plan).

The three dominant soil types identified in KSNP are podzolic, latosol and andosol, with podzolic being the most dominant. Latosol, characterized by its relatively moderate fertility, is mostly identified at lowland areas of KSNP. The distribution includes the lowland at the western slope of Bukit Barisan, elongating from Painan area to northern Muko-muko; Lubuk Gadang area; and Muarasiau area. Andosol,

characterized by its relatively moderate to high fertility, is identified at volcanic mountain areas, including the area elongating from Lake Kerinci, Depatiampat Lake to Muaraanam area, and from Lake Gunung Tujuh to Sitinjaulaut area. Podzolic, that is relatively low fertility and highly susceptible to erosion, is identified at the area around Air Hangat to Muko-muko Selatan area, the area around Rawas Ulu to Lubuklingau.

Most of BBSNP area has podzolic soils that are relatively low in fertility and highly susceptible to erosion.

a. 2. Biological Feature

a. 2. 1. Flora

In general, the characteristics of the vegetation and floristic composition of Sumatra show similarities to those of the rest of West Malesia, the floristic region reaching from Southern Thailand to Papua New Guinea, and including all of Indonesia and Malaysia. While the flora within Sumatra is generally homogenous, the island's northern proportion possesses its own distinctness (de Wilde, 1993) and represents a separate plant-geographical unit within the West Malesia region (de Wilde & Duyfjes, 1996). This distinction is evident in the floristic composition of all vegetation formations, but is most pronounced in the montane and subalpine low forest and scrub vegetation and especially in the high mountain *blang* forest.



*Carnivore plant Nepenthes sp., one of the flora richness of the site
(Alain Compost/PHKA)*

The explanation lies largely in the gigantic Toba tuff eruptions, in the Pleistocene (some 75,000 years ago), which smothered existing plant growth, blocked dispersal, and, later on, offered new and different soils with opportunities for plant settlement and possible species formation (de Wilde & Duyfjes, 1996). The relatively dry, seasonal climatic condition of the remote north Aceh (outside Leuser area) may also account in part for the floristic distinctness of the northern Sumatra.

- **Flora of GLNP**

De Wilde & Duyfjes (1996) divided the vegetation in GLNP into the five main types as follow:

Coastal vegetation occurs only sporadically in the Park, i.e. only on the west coast where the Kluet part borders the sea. This type of vegetation is found at the sandy beach, sand dunes, lagoon and coastal swamp, levee of the rivers near the coast and rocky sea shores. The vegetation is characterized by *Casuarina*, and *Barringtonia*-formation (named after the typical *Barringtonia asiatica*), *Pandanus* sp., *Nypa fruticans*, *Salix tetrasperma* and *Pericampylus glaucus*.

Vegetation of the tropical zone (0-1,000 m asl) occurs in the lowland forest; fresh-water swamp forest; peat swamp forest; dryland mixed dipterocarp forest; levee forest; riverside forest; alluvial forest; forest over limestone; forest of the sub-colline zone; riverine and lowest terrace, alluvial forest; ridge forest; colline forest. Lowland and colline forests cover the largest area in this zone.

Lowland forest ((0-)10-300 m asl) occupies less than 5% of the Park's total surface. It mainly concerns mixed dipterocarp forest, and contains relatively abundant *Ficus*, *Annonaceae*, *Meliaceae*, and above all many species of *Euphorbiaceae*.

Colline Forest ((400-) 500-1,000 (-1,300) m asl) occupies approximately 20% of the surface of the Park, covering all the steep (foot-hills) slopes of the high mountains, and is mainly located towards the borders of the ark. The forest is characterized by the presence of *Cheiropleuria bicuspis*, *Argostemma uniflorum*, *Calamus manau*, and *Burmannia* sp.

Vegetation of the sub-montane zone (1,000-1,500 m asl) covers approximately 30% of the surface of the Park. The forest is rich in *Lauraceae* and *Fagaceae*. *Sanicula europaea*, *Lobelia montana*, *Viola* sp., *Anemone sumatrana*, and *Lysimachia montana*.

Vegetation of the montane zone (1,500-2,400 (-2,600) m asl) is classified into lower montane forest (1,500-2,000 m) and upper montane forest (2,000-2,400 (-2,600)m). Lower forest covers 15% of total surface in the Park and is rich in rattans and some other lower palms, and *Fagaceae*, *Rodoleia*, *Exbuclandia*, and mosses. Upper montane forest covers 20% of the total surface of the Park. *Diplicisia*, *Gaultheria*, *Podocarpus*, *Rhodendron*, and *Vaccinium* are found here.

Vegetation of the sub-alpine zone (2,400 m asl and above) comprises of sub-alpine low forest and ericoid scrub (2,400-3,400 m asl). The vegetation of this zone is composed of relatively few species; most often ericoid leaves, and includes several Ericaceae and Myrtaceae, mainly *Leptospermum flavescens*. Toward and on the ridges still higher up the vegetation in general becomes scrubby and ericoid.

In addition, *blang* forest (2,600-3,000 (-3,400) m asl) is a unique feature of GLNP. It is a rather extensive flat or slightly sloping plain with heather-like short vegetation in the summit areas of the larger mountains complexes in the Gayo Lands. This forest covers about 3% of the total surface of the Park. There are two types of the mountain *blang*, a wet peaty and a dry stony-sandy type, with a different aspect and soil type, but floristically their distinction is yet unclear. The area is characterized by the presence of *Xyris*, *Eriocaulon*, and *Potentilla*, as well as *Rhododendron sumatranum*.

A full list of plant species identified in each of the forests in GLNP can be seen in Appendix I.

- **Flora of KSNP**

Laumonier (1994) reviewed studies on KSNP flora, conducted his own field study, and classified the forests of KSNP based on floristic composition that changes along altitudinal gradients, and generally divided them into the following seven types:

Lowland forest (150-200 m asl): The forest is characterized by *Dipterocarpus* sp., *Shorea atrinervosa*, and *S. multiflora*. Small areas of lowland forest are confined to North Bengkulu, Pesisir Selatan, and Musi Rawas Districts.

Hill forest (300-800 m asl): The forest occurs on the western side of the Barisan Mountains range and is characterized by abundant emergent species *Sterculia* sp. Lower hill forest (150-450 m asl) and upper hill forest (450-800 m asl) on the volcanic bedrock of the eastern Bukit Barisan are characterized by Dipterocarpaceae, Fagaceae and Burseraceae. The most abundant species is *Hopea* cf. *beccariana*

Sub-montane forest (800-1,400 m asl): The forest is characterized by Myrtaceae and Fagaceae. Two forest facies variations occur in sub-montane forest, namely Bamboo and Garciana. The tallest flowers in the world, *Amorphophallus titanum*, and *A. gigas*, both species are often encountered in the Park at altitude below 900 m asl.

Lower montane forest (1,400-1,900 m asl): The forest is characterized by Fagaceae, Lauraceae, Myrtaceae, Theaceae, and a number of Sapotaceae. The undergrowth is particularly rich in Myrsinaceae.

Mid-montane forest (1,900-2,400 m asl): The forest is characterized by *Quercus oidocarpa*, *Vermonia arborea*, *Symingtonia populnea*, *Drypetes subsymetrica*, *Gordonia buxifolia*, *Weinmannia blumet* and *Polysma integrifolia*, *Olea javanica*,

Archidendron clypearia, *Platea excelsea*, *Lithocarpus pseudomoluccus* and *Myrsine hasseltii*.

Upper montane forest (2,400-2,900 m asl): The forest is characterized by *Symplocos cochinchinensis* var. *sessifolia*, *Ilex pletobrachiata*, *Ardisia laevigata*, *Meliosma lanceolata*, and *Cyathea trachypoda*.

Sub-alpine thicket (2,900 m asl and above): This vegetation type is dominated by Ericaceae (*Rhodendron retusum*, *Vaccinum miquelli* and *Gaultheria nummularoides*) and Symplocaceae (*Symplocos cochinchinensis*).

Karst forest is identified in Sebelah Hill near Dareh River, Sawah Lunto Sijunjung, in the Park area. The karst forest is situated in the hill slopes of 500 m elevation, and is dominated by *Aglalia argentea*, *A. gonggo*, *Dysoxylum macrocarpum*, *Cratoxylum sumatranum*, *Schoutenia furfuracea*, *Dracontomelon dao*, *Margaritaria indica*, *Macaranga tanarius*, *Ryparosa javanica*, *Dyospyros toposoides*, *D. apiculata*, *Celtis philippensis*, and *Vatica* cf. *cinerea*, *Picrasma javanica*, *Casearia tuberculata*, *Drimycarpus luridus*, *Stelechocarpus cauliflorus*, *Cyathocalyx sumatranus* and *Paranephlicum xestophyllum*.

In addition to the dry land forests, several forested wetlands are found in KSNP, such as Bento swamps and Ladeh Panjang swamp. Bento swamps consists of dwarf peat swamp woodland, some smaller areas of sedge-grass peat swamp, and several tiny lakes. Ladeh Panjang swamp consists entirely of dwarf peat swamp woodland, with many tussock forming sedges and grasses.

The list of vegetation and tree flora of KSNP according Laumonier (1994) can be seen in Appendix II.

- **Flora of BBSNP**

Although, research on flora species of BBSNP has not been completed yet, preliminary surveys carried have revealed that the Park is rich in terms of flora diversity. The vegetation and floristic composition can generally be divided into the following five forest types:

Coastal forest covers around 1% of total Park area (3,568 Ha). Plant species commonly found in this forest type are *Terminalia cattapa*, *Hibiscus* sp., *Barringtonia asiatica*, *Callophyllum inophyllum*, *Casuarina* sp., *Pandanus* sp. and *Ficus septica*

Lowland forest (0-600 m asl) is known for its high biological diversity. It covers the largest part of the Park that is 45% (160,560 Ha) of the total Park area. The lowland forest is dominated by *Shorea* sp., *Dipterocarpus* sp., and *Hopea* sp., with shrub trees such as *Urophyllum* sp., *Phyrnium* sp., *Korthalsi* sp., and *Calamus* sp.. Algae species found in coastal area of the Park include *Sargassum gracillum*, *Acanthopora*

specisfesa, *Hypnea musciformis*, *Sargassum echinocarpum*, *Turbinaria ornata*, and *Thalassia* sp..

Highland forest (600-1,000 m asl) covers 34% of the Park surface (121,312 Ha). Plant families dominant in the highland forest are Dipterocarpaceae, Lauraceae, Myrtaceae and Annonaceae, with shrub trees such as *Neolotsia cassianeforia*, *Psycotria rhinoceritos*, *Areca* sp. and *Globba pendella*.

Sub-montane forest (1,000-1,500 m asl) covers 17% of the Park surface (60,656 Ha). Plant species from the tree families of Lauraceae, Myrtaceae, Dipterocarpaceae and Fagaceae, such as *Magnolia* sp., *Quercus* sp., and *Garcinia* sp., are found in the sub-montane forest.

Montane forest (1,500 m asl and above) covers about 3% of the Park surface (10,704 Ha). *Eugenia* sp. and *Castanopsis* sp. are dominant species in the montane forest.

The result of preliminary inventory of flora species, including list of orchid, rattan, and bamboo species, in BBSNP, can be seen in Appendix III.

a. 2. 2. Fauna

TRHS in particular and Sumatra in general is part of the zoographic unit of Malayan region, a part of Oriental faunal region. The mammal fauna within this area, comprising the Malay Peninsula, and the islands of Sumatra, Borneo, Java, Madura, and Bali, have many common elements and some notable difference with the fauna of the adjacent areas. The explanation lies in the fact that the seas separating the islands from the mainland were shallow (called Sunda shelf), and several times in the past, during sea regressions in the 'ice-ages', land connections existed between the various parts, allowing animals to migrate to and from the islands.

The Malayan mammal fauna has a clearly recognizable character with the dominance of typical rainforest species (van Strien, 1996). But, although the general character of the habitats and climate is fairly uniform throughout the region and the separation of the islands from the mainland is only a few thousand years old, there are also major difference in the mammal faunas of the main parts. Even within Sumatra, the fauna is not equally distributed.

There is an obvious difference in the mammal fauna between the mountain and the lowland areas of Sumatra. There is also a remarkable difference in the mammal fauna between the north and the south of the island. The gigantic Toba tuff eruptions, in the Pleistocene (some 75,000 years ago), appears to have been a barrier for the dispersal of several mammals species (van Strien, 1996). The orangutan, for example, occurs only in the north of Toba. In addition, in some groups of mammals (e.g. tupaia, leaf monkeys, squirrels), there are geographic races that can be recognized in the central and southern parts of Sumatra, where sub-species are separated by large rivers and Bukit Barisan Mountain Range.

These differences have made the Sumatran mammal fauna one of the richest of the world. Some of the most important species found in TRHS are Sumatran rhino *Dicerorhinus sumatraensis*, Sumatran tiger *Panthera tigris sumatrae*, Sumatran hare *Nesolagus netscheri*, Sumatran elephant *Elephas maximus sumatranus*, Sumatran serow *Capricornis sumatraensis sumatraensis*, clouded leopard *Neofelis nebulosa*, Malayan tapir *Tapirus indicus* and Asian wild dog *Cuon alpinus* (mammals); and Sumatran ground-cuckoo *Carpococcyx viridis*, Rueck's fly-catcher *Cyornis ruckii*, storms stork *Ciconia stormi*, and white-winged duck *Cairina scutulata* (birds).

- **Fauna of GLNP**

One can expect to find almost all of the northern Sumatran species and subspecies in GLNP, because the Park is virtually a cross section of northern Sumatra, from the west coast, over the highest mountains, almost to the east coast of the island (van Strien, 1996). Unfortunately, except some of the larger mammals (rhino, elephant, monkeys) which have been the subject of ecological studies, very little material and information are available about many other species especially from the smaller species (bats, treeshrews, squirrels, rats).



Sumatran orang utan Pongo abelii, one of the critically endangered species of GLNP (Conservation International Indonesia/PHKA)

Survey results have revealed that GLNP contains fauna species ranging from mammals, birds, reptiles, amphibians, fishes and invertebrates. At least 174 mammal species have been recorded in GLNP under the family names of Erinaceida, Soricidae, Tupaiidae, Cynocephalidae, Pteropodidae, Rhinopomatidae, Rhinolophidae, Hipposideridae, Vespertilionidae, Lorisidae, Cercopithecidae, Hylobatidae, Canidae, Ursidae, Mustelidae, Viverridae, Herpestidae, Felidae, Elephantidae, Rhinocerotidae, Suidae, Tragulidae, Cervidae, Bovidae, Sciuridae, Muridae, and Hystricidae (Van Strien, 1996).

Twenty-one mammal species under the 2000 IUCN Red List of Threatened Species have been identified in GLNP. They are *Macaca fascicularis* (LR), *M. nemestriana* (VU), *Presbytis thomasi* (LR), *Hylobates lar* (LR), *H. syndactylus* (LR), *Pongo abelii* (CR), *Cuon alpinus* (VU), *Helarctos malayanus* (DD), *Aonyx cinerea* (LR), *Lutra lutra* (VU), *Cynogale bennettii* (EN), *Neofelis nebulosa* (VU), *Panthera tigris sumatrensis* (CR), *Elephas maximus sumatranus* (EN), *Dicerorhinus sumatraensis* (CR), *Capricornis sumatraensis* (VU), *C. sumatraensis sumatraensis* (EN), *Lariscus niobe* (LR), *Maxomys hylomoides* (LR), *Rattus hoogerwerfi* (VU), and *Hystrix bracyura* (VU).

The Park also harbors 3 Sumatran endemic mammals (after the list of Whitten *et al.*, 1997): *Presbytis thomasi*, *Maxomys hylomoides*, and *Rattus hoogerwerfi*.

Although the knowledge of bird species occurrence in GLNP is not indepth, surveys have identified at least 380 bird species in total. The list includes up to 80 % of Sumatra's 438 resident breeding species (Marle and Voous, 1988). GLNP has at least 53 bird species under the 2000 IUCN Red List of Threatened Species as follow:

<i>Ichthyopaga ichthyaetus</i> (LR)	<i>P. squamatus</i> (LR)
<i>Spizaetus nanus</i> (VU)	<i>P. eutilotus</i> (LR)
<i>Cairina scutulata</i> (EN)	<i>Chloropsis cyanopogon</i> (LR)
<i>Rollulus rouloul</i> (LR)	<i>C. venusta</i> (LR)
<i>Lophura hoogerwerfi</i> (VU)	<i>Enicurus ruficapillus</i> (LR)
<i>L. inornata</i> (VU)	<i>Cochoa beccarii</i> (VU)
<i>Treron oxyura</i> (LR)	<i>Eupetes macrocerus</i> (LR)
<i>T. capellei</i> (VU)	<i>Trichastoma malacocinclia</i> (LR)
<i>T. fulvicollis</i> (LR)	<i>T. bicolor</i> (LR)
<i>Ptilinopus jambu</i> (LR)	<i>Malacopteron affine</i> (LR)
<i>Harpactes reinwardtii</i> (LR)	<i>M. magnum</i> (LR)
<i>H. duvaucelli</i> (LR)	<i>Napothera macrodactyla</i> (LR)
<i>Actenoides concretus</i> (LR)	<i>Stachrys maculate</i> (LR)
<i>Anthracoseros malayanus</i> (LR)	<i>S. leucotis</i> (LR)
<i>Buceros rhinoceros</i> (LR)	<i>S. nigricollis</i> (LR)
<i>B. bicornis</i> (LR)	<i>Macronous ptilosus</i> (LR)
<i>Rhinoplax vigil</i> (LR)	<i>Alcippe brunneicauda</i> (LR)
<i>Megalaima rafflesii</i> (LR)	<i>Rhinomyias umbratilis</i> (LR)
<i>M. mystocophanus</i> (LR)	<i>Ficedula dumetoria</i> (LR)
<i>M. heinricii</i> (LR)	<i>Cyornis ruckii</i> (CR)
<i>Indicator archipelagicus</i> (LR)	<i>C. turcosus</i> (LR)
<i>Dinopium rafflesii</i> (LR)	<i>Philentoma velatum</i> (LR)
<i>Meiglyptes tukii</i> (LR)	<i>Anthreptes rhodolaema</i> (LR)
<i>Eurylaimus ochromalus</i> (LR)	<i>Dicrurus sumatranus</i> (LR)
<i>Pitta schneideri</i> (VU)	<i>Platylophus galericulatus</i> (LR)
<i>P. granatia</i> (LR)	<i>Platysmurus leucopterus</i> (LR)
<i>Pycnonotus tympanistrigus</i> (LR)	

GLNP has 15 Sumatran endemic bird species (after the list of Mackinnon & Phillipps, 1993). They are *Arborophila rubrirostris*, *Lophura hoogerwerfi*, *L. inornata*, *Polyplectron chalcurom*, *Pitta schneideri*, *Pycnonotus leucogrammicus*, *P. tympanistrigus*, *Chloropsis venusta*, *Cochoa beccarii*, *Myophonus melanurus*, *Trichastoma buttikoferi*, *T. vanderbilti*, *Cyornis ruckii*, *Dicrurus sumatranus*, and *Dendrocitta occipitalis*

Little is known about the diversity of herpetofauna in GLNP as no extensive surveys have been conducted of their presence in the Park. The only available data for herpetofauna in the area is the list extracted from books and specimens at the Bogor Zoological Museum and collections of surveys in 1980 conducted by Supriatna and Sidik (Supriatna & Sidik, 1996), which resulted in 57 species under the family names of Crocodylidae, Trionychidae, Testudinata, Agamidae, Geckonidae, Scincidae, Varanidae, Typhlopidae, Boidae, Colubridae, Crotalidae, Elapidae, Pelobatidae, Buffonidae, Ranidae, Rhacophoridae, and Caeciliidae.

A full list of fauna species identified in GLNP can be seen in Appendix I.

- **Fauna of KSNP**

KSNP is also rich in term of fauna. Survey results have revealed not less than 85 mammal species under the family names of Erinaceidae, Soricidae, Tupaiidae, Pteropodidae, Molossidae, Emballonuridae, Rhinolophidae, Vespertilionidae, Manidae, Lorisidae, Tarsiidae, Leporidae, Cercophithecidae, Hylobatidae, Scuridae, Muridae, Hystricidae, Ursidae, Caniidae, Mustelidae, Viverridae, Felidae, Elephantidae, Tapiridae, Rhinocerotidae, Suidae, Tragulidae, Bovidae, and Cervidae.



Sumatran rhino *Dicerorhinus sumatraensis*, one of Sumatra's critically endangered species found in GLNP, KSNP and BBSNP (Alain Compost/ PHKA)

Twenty-three mammal species under the 2000 IUCN Red List of Threatened Species have been identified in KSNP:

<i>Hylomys parvus</i> (CR)	<i>Cuon alpinus</i> (VU)
<i>Crocidura beccarii</i> (EN)	<i>Aonyx cinerea</i> (LR)
<i>Manis javanica</i> (LR)	<i>Panthera tigris sumatrae</i> (CR)
<i>Presbytis melalophus</i> (LR)	<i>Neofelis nebulosa</i> (VU)
<i>Macaca fascicularis</i> (LR)	<i>Pardofelis marmorata</i> (DD)
<i>M. nemestrina</i> (VU)	<i>Catopuma temminckii</i> (LR)
<i>Hylobates agilis</i> (LR)	<i>Elephas maximus sumatranus</i> (EN)
<i>H. syndactylus</i> (LR)	<i>Dicerorhinus sumatrensis</i> (CR)
<i>Nesolagus netscheri</i> (CR)	<i>Panthera tigris sumatrae</i> (CR)
<i>Maxomys hylomoides</i> (LR)	<i>Tapirus indicus</i> (VU)
<i>Hystrix brachyura</i> (VU)	<i>Naemorhedus sumatrensis</i> (VU)
<i>Helarctos malayanus</i> (DD)	

At least 5 species in the Park are identified as Sumatran endemic mammals (after the list of Whitten *et al.*, 2000): *Hylomys parvus*, *Nesolagus netscheri*, *Mus crociduroides*, *Maxomys inflata*, and *M. hylomoides*.



Schneider's pitta *Pitta schneideri* is found in GLNP and KSNP
(Jeremy Holden-FFI/PHKA)

KSNP has a rich bird diversity. Up to 370 bird species occurs in the Park. They include nine species of hornbills: *Anthraceros albirostris*, *A. malayanus*, *Anorhinus galeritus*, *Aceros undulates*, *A. corrugatus*, *A. comatus*, *Buceros rhinoceros*, *B. bicornis*, and *B. (Rhinoplax) vigil*.

KSNP has up to 58 bird species under the 2000 IUCN Red List of Threatened Species:

<i>Cairina scutulata</i> (EN)	<i>Pitta schneideri</i> (VU)
<i>Rollulus roulul</i> (LR)	<i>P. caerulea</i> (LR)
<i>Lophura inornata</i> (VU)	<i>P. venusta</i> (VU)
<i>Polyplectron chalcurom</i> (LR)	<i>Pericrocotus igneus</i> (LR)
<i>Heliopais personata</i> (VU)	<i>Aegithina viridissima</i> (LR)
<i>Treron oxyura</i> (LR)	<i>Chloropsis cyanopogon</i> (LR)
<i>T. capellei</i> (VU)	<i>C. venusta</i> (LR)
<i>Ptilinopus jambu</i> (LR)	<i>Pycnonotus tympanistrigus</i> (LR)
<i>Psittacula longicauda</i> (LR)	<i>P. melanoleucos</i> (LR)
<i>Phaenicophaeus diardi</i> (LR)	<i>P. squamatus</i> (LR)
<i>P. sumatranus</i> (LR)	<i>P. cyaniventris</i> (LR)
<i>Carpococcyx viridis</i> (CR)	<i>P. eutilotus</i> (LR)
<i>Caprimulgus pulchellus</i> (DD)	<i>Iole olivacea</i> (LR)
<i>Harpactes diardii</i> (LR)	<i>Ixos malaccensis</i> (LR)
<i>H. duvaucelli</i> (LR)	<i>Dicurus sumatranus</i> (LR)
<i>Alcedo euryzona</i> (VU)	<i>Trichastoma bicolor</i> (LR)
<i>Actenoides concretus</i> (LR)	<i>Malacocincla malaccense</i> (LR)
<i>Aceros comatus</i> (LR)	<i>Malacopteron affine</i> (LR)
<i>A. corrugatus</i> (LR)	<i>Stachrys maculate</i> (LR)
<i>Anthracoseros malayanus</i> (LR)	<i>S. leucotis</i> (LR)
<i>Buceros rhinoceros</i> (LR)	<i>Macronous ptilosus</i> (LR)
<i>B. bicornis</i> (LR)	<i>Alcippe brunneicauda</i> (LR)
<i>Rhinoplax vigil</i> (LR)	<i>Eupetes macrocerus</i> (LR)
<i>Megalaima mystacophanos</i> (LR)	<i>Enicurus ruficapillus</i> (LR)
<i>M. heinricii</i> (LR)	<i>Cochoa beccarii</i> (VU)
<i>Indicator archipelagicus</i> (LR)	<i>Rhynomyias umbratilis</i> (LR)
<i>Dinopium rafflesii</i> (LR)	<i>Ficedula dumetoria</i> (LR)
<i>Meiglyptes tukkii</i> (LR)	<i>Philentoma velatum</i> (LR)
<i>Eurylaimus ochromalus</i> (LR)	<i>Anthreptes rhodolaema</i> (LR)

The Park has at least 13 Sumatran endemic bird species (after the list of MacKinnon & Phillipps, 1993): *Arborophila rubrirostris*, *Lophura inornata*, *Polyplectron chalcurom*, *Pitta schneideri*, *P. venusta*, *Chloropsis venusta*, *Pycnonotus leucogrammicus*, *P. tympanistrigus*, *Dicurus sumatranus*, *Dendrocitta occipitalis*, *Napothera rupifectus*, *Cochoa beccarii*, and *Myiophoneus melanurus*.

Little is known about the diversity of reptiles and amphibians. Preliminary surveys by Fauna & Flora International (FFI) in partnership with Indonesian Institute of Sciences (LIPI) discovered almost 40 species of toad (anurid), some yet to be specifically identified (Holden, J/FFI, www.kerinci.org).

The complete list of mammal and bird species of KSNP can be seen in Appendix II.

- **Fauna of BBSNP**

Preliminary surveys have revealed that BBSNP harbors up to 98 mammal species under the family names of Erinaceidae, Tupaiidae, Cynocephalidae, Pteropodidae, Hipposideridae, Vespertilionidae, Mollosidae, Lorisidae, Cercopithecidae, Hylobatidae, Manidae, Sciuridae, Pteromyidae, Muridae, Hystricidae, Caniidae, Ursidae, Mustelidae, Viverridae, Herpestidae, Felidae, Elephantidae, Tapiridae, Rhinocerotidae, Suidae, Tragulidae, Cervidae, Bovidae and Leporidae.

Twenty-five mammal species under the 2000 IUCN Red List of Threatened Species have been identified:

<i>Manis javanica</i> (LR)	<i>Prionailurus viverrinus</i> (LR)
<i>Cheiromeles torquatus</i> (LR)	<i>P. planiceps</i> (VU)
<i>Nycticebus coucang</i> (DD)	<i>Catopuma temmincki</i> (LR)
<i>Macaca nemestrina</i> (VU)	<i>Pardofelis marmorata</i> (DD)
<i>M. fascicularis</i> (LR)	<i>Neofelis nebulosa</i> (VU)
<i>Presbytis melalopus</i> (LR)	<i>Panthera tigris sumatrae</i> (CR)
<i>Hylobates agilis</i> (LR)	<i>Elephas maximus sumatranus</i> (EN)
<i>H. syndactylus</i> (LR)	<i>Tapirus indicus</i> (VU)
<i>Cuon alpinus</i> (VU)	<i>Dicerorhinus sumatrensis</i> (CR)
<i>Helarctos malayanus</i> (DD)	<i>Capricornis sumatraensis</i>
<i>Lutrogale perspicillata</i> (VU)	<i>sumatranensis</i> (EN)
<i>Aonyx cinerea</i> (LR)	<i>Hystrix brachyura</i> (VU)
<i>Cynogale bennettii</i> (EN)	<i>Nesolagus netscheri</i> (CR)



A Sumatran hare Nesolagus netscheri (CR) caught in a camera trap. The Sumatran endemic is found in BBSNP and KSNP(WCS-IP/PHKA)

The Park has at least one Sumatran endemic mammal species (after the list of Whitten *et al.*, 2000): *Nesolagus netscheri*.

The survey results have also confirmed that the Park is a safe haven for around 370 bird species, including 9 hornbill species, namely *Anorrhinus galeritus*, *Aceros comatus*, *A. corrogatus*, *A. undulates*, *Anthracoceros albirostris*, *A. malayanus*, *Buceros bicornis*, *B. rhinoceros*, and *B. (Rhinoplax) vigil*.

The Park harbors at least 67 bird species under the 2000 IUCN Red List of Threatened Species:

<i>Actenoides concretus</i> (LR)	<i>Anthreptes rhodolaema</i> (LR)
<i>Alcedo euryzona</i> (VU)	<i>Rhizothera longirostris</i> (LR)
<i>Cairina scutulata</i> (EN)	<i>Dinopium rafflesii</i> (LR)
<i>Ichthyophaga ichthyaetus</i> (LR)	<i>Meiglyptes tukkii</i> (LR)
<i>Spizaetus nanus</i> (VU)	<i>Eurylaimus ochromalus</i> (LR)
<i>Lophura ignita</i> (LR)	<i>Rollulus rouloul</i> (LR)
<i>Rhizothera longirostris</i> (LR)	<i>Pitta venusta</i> (VU)
<i>Aceros comatus</i> (LR)	<i>P. caerulea</i> (LR)
<i>A. corrogatus</i> (LR)	<i>P. granatia</i> (LR)
<i>Anthracoceros malayanus</i> (LR)	<i>Psittacula longicauda</i> (LR)
<i>Buceros rhinoceros</i> (LR)	<i>Iole olivacea</i> (LR)
<i>Rhinoplax vigil</i> (LR)	<i>Ixos malaccensis</i> (LR)
<i>Megalaima rafflesii</i> (LR)	<i>Pericrocotus igneus</i> (LR)
<i>M. mystacophanos</i> (LR)	<i>Aegithina viridissima</i> (LR)
<i>M. henricii</i> (LR)	<i>Chloropsis cyanopogon</i> (LR)
<i>M. rafflesii</i> (LR)	<i>Pycnonotus cyaniventris</i> (LR)
<i>Chloropsis cyanopogon</i> (LR)	<i>P. eutilotus</i> (LR)
<i>C. venusta</i> (LR)	<i>P. melanoleucos</i> (LR)
<i>Mycteria cinerea</i> (VU)	<i>P. squamatus</i> (LR)
<i>Ciconia stormi</i> (EN)	<i>Alcippe brunneicauda</i> (LR)
<i>Treron capellei</i> (VU)	<i>Eupetes macrocerus</i> (LR)
<i>Ptilinopus jambu</i> (LR)	<i>Malacocincla malaccense</i> (LR)
<i>Macropygia ruficeps</i> (LR)	<i>Macronous ptilosus</i> (LR)
<i>Platylophus galericulatus</i> (LR)	<i>Malacopteron affine</i> (LR)
<i>Platysmurus leucopterus</i> (LR)	<i>M. magnum</i> (LR)
<i>Carpococcyx viridis</i> (CR)	<i>Stachrys maculata</i> (LR)
<i>Phaenicophaeus diardi</i> (LR)	<i>S. leucotis</i> (LR)
<i>Dicurus sumatranus</i> (LR)	<i>S. nigricollis</i> (LR)
<i>Indicator archipelagicus</i> (LR)	<i>Napothera macrodactyla</i> (LR)
<i>Philentoma velatum</i> (LR)	<i>Harpactes diardi</i> (LR)
<i>Cyornis ruckii</i> (CR)	<i>H. duvaucelli</i> (LR)
<i>C. turcosa</i> (LR)	<i>Enicurus ruficapellus</i> (LR)
<i>Rhinomyias umbratilis</i> (LR)	<i>Trichixos pyrhopogus</i> (LR)
<i>Ficedula dumetoria</i> (LR)	<i>Threskiornis melanocephalus</i> (LR)

BBSNP has at least 7 Sumatran endemic bird species (after the list of MacKinnon & Phillipps, 1993): *Chloropsis venusta*, *Dendrocitta occipitalis*, *Dicurus sumatranus*, *Cyornis ruckii*, *Polyplectron chalcurum*, *Pitta venusta*, and *Malacocincla vanderbilti*.

The Park supports a herpetofauna diversity comprising at least 59 species under the following family names: Agamidae, Bufonidae, Colubridae, Elapidae, Emydidae, Geckonidae, Lacertidae, Microhylidae, Pelobatidae, Rachophoridae, Ranidae, Scincidae, and Viperidae. They include four threatened turtle species: *Manouira emys* (EN), *Heosemys spinosa* (EN), *Orlitia borneensis* (EN) and Malayan *Notochelys platynota* (VU).

A full list of fauna species identified in the Park can be seen in Appendix III.

a. 3. Local Community

The nominated TRHS comprises various ethnics and sub-ethnics, ranging from Gayo, Batak, Aceh, Pakpak, Alas, Singkil, Melayu, Minangkabau, Kerinci, Ipuh, Rejangin, Lampung, Java, Sunda, Bali, Madura, and Bugis. Each of the ethnics and sub-ethnics contribute to the site's rich-culture.

- **GLNP**

According to Griffith (1992), at least seven different tribes or ethnic groups are inhabiting the areas surrounding GLNP and within the boundaries of the Park. They come from different homelands, each has its own language and special culture. They are Gayo, Batak, Aceh, Pakpak, Alas, Singkil, and Melayu ethnic groups.

Gayo people mostly live in the hill country to the north of the Park. They are skilful farmers, growing tobacco and coffee, traditionally on the lower slopes but as pressures for land increases they are clearing higher and higher up the mountains. The Gayo follow a complex set of traditional customs but they also adhere to Islam and are sided with their Achenese neighbours in the long war against the Dutch.

Batak, predominantly the Karo and Toba groups, are also typically highlanders, but their land extend well to the south of the Park and are centred around Lake Toba and the Karo highlands. In the last few decades they have expanded into the Alas Valley in the centre of the Park.

Aceh was where Islam first reached Indonesia's shores. The Acehnese mainly live adjacent to the Park along the west and in the northeast.

Pakpak is an ethnic group that until very recently adhered to animistic beliefs. The Pakpak are hill farmers, relying on swidden agriculture. They are avid collectors of forest products, such as wild honey and *petai* beans and hunters of wildlife. The Pakpak border the Park in the area between Sidikalang and Sebulusalam and into the Alas Valley.

Alas is a small tribal group which is restricted to the Alas Valley from where the river flows out of the Park to the entrance to the Alas Gorge. They farm extensive rice *sawahs* and rely heavily on the Alas River for fish. Together with the Gayo, they have developed a small handicraft industry producing finely woven mats, *tikar*, made from pandanus leaves.

Singkil people live downstream of their Alas neighbours and are separated from them by the Alas Gorge. They exploit the forests around the Park, gathering rattan, *damar* resin and sometimes carving out river-side settlements along the Alas River. The Singkil are also expert fishermen.

The Melayu are the original coastal dwellers on the eastern shores of Sumatra. In northern Sumatra, they have spread far inland and some settlements border the Park in Besitang Sekundur area.

In addition to those seven ethnic groups, there is Java ethnic group. The Javanese were indentured as plantation labourers by the Dutch colonial government between 1860 and 1930. Presently, they still live close by or inside the plantation settlements beyond the eastern side of the Park.

- **KSNP**

Several indigenous ethnic and sub-ethnic groups are living in the buffer zone area of KSNP, such as Minangkabau ethnic in the north, Kerinci sub-ethnic in the middle, Ipuh sub-ethnic along the west coast, and Rejangin sub-ethnic in the south. In some villages, the native people have mixed with other ethnics groups, such as Javanese, Batak, and Sundanese.



Village people in KSNP buffer zone area (Alain Compost/PHKA)

More than 70% of the people around the Park rely on agriculture as their source of living. Based on the period of harvesting, the crops can be classified into three groups: 1) short-lived crops, such as vegetables, wet rice, and dry rice; 2) medium-lived crops, such as coffee; and long-lived crops, such as rubber, oil palm, and cinnamon.

Some indigenous ethnic and sub-ethnic groups have developed traditional system governing their use of natural resources. For example, the residents of Rantau Kermas in Jangkat Sub-District of Merangin District have agreed not to sell any land in the village to prevent land shortage that would increase pressure on the forest area. Similar values in different systems can be found in other villages surrounding the Park. The values are currently threatened by negative values from outside. If the intervention of outside values are not stopped, such traditional values will be challenged and weakened.

Some of the people living in the buffer zone area are still living traditionally and retain their traditions. In Kerinci District, for example, one can still see at least 7 traditional costumes; traditional dances, such as Asyiek Dance, Rangguk Dance, Iyo-Iyo Dance, and Tanoh Dance; traditional Larik Panjang House, a wooden house of 200 m long inhabited by several families; folklores; and some antiquities, such as swords and old scripts written on animal's horns, dated up to hundreds years ago.

- **BBSNP**

The community living in the surrounding areas of BBSNP and within the four enclaves can generally be divided into indigenous Lampung ethnic and migrant ethnics, comprising Java ethnic, Sunda ethnic, Bali ethnic, Minangkabau ethnic, Madura ethnic, and Bugis ethnic. Migrant ethnics count up to 85% of total inhabitants in the buffer zone areas, whereas Lampung ethnic count 15%.

Lampung people follow a patrilineal pattern in their daily life. Java ethnic and Sunda ethnic, the dominant groups among the migrant ethnics, have started to inhabit the area since the Dutch colonial era as part of the transmigration programme. The first transmigration was conducted in 1922 in Semangka Bay area.

b. History and development

- **GLNP**

The establishment history of GLNP started in 1914 when local Acehnese leaders asked the Dutch colonial government to protect the forest of Singkil and Alas Landen, and not to allow logging there. In 1928 a Dutch rubber planter Dr. F.C. van Heurn made a first proposal for a reserve. In 1932 Van Heurn's revised the proposal that led to the establishment of the wildlife reserve of Gunung Leuser in 1934. The reserve endorsed by the then governor of Aceh, Van Aken, comprised of an area of 416,500 Ha. In 1936, the Kluet Swamps (20,000 Ha) were added to the reserve, and two years

later, Sekundur (79,100 Ha), Langkat Barat and Langkat Selatan (127,075 Ha) reserves were established.

More than three decades later, two stations which later played a vital role in the development of research, protection and ecotourism of GLNP were established. In 1972, the Dutch couple, Herman and Ans Rijksen, started an orangutan rehabilitation cum annex research station at the Ketambe River. A year later, another orangutan rehabilitation center was started by Monica Borner and Regina Frey at the Bahorok River in Langkat. In 1976 the Government of Indonesia established *Suaka Margasatwa* (wildlife reserve) Kappi (150,000 Ha).

All the reserves in Gunung Leuser area were later fused. On 6 March 1980, the Government through the Ministry of Agriculture formally announced the establishment of Gunung Leuser National Park, one of the first five Parks to be declared officially in Indonesia, with an area of 792, 675 Ha. In 1984, a formal letter of Directorate General of Forest Protection and Nature Conservation stated that the area of the Park was expanded to 862, 975 Ha to include 5 wildlife reserves: Gunung Leuser, Kappi, Langkat, Kluet, Sikundur; 1 forest recreation area: Lawe Gurah; and 2 protection forests: Serbolangit and Sembabala.

- **KSNP**

Prior to its announcement as a national park, KSNP was forest areas with different status, e.g. protection forests, nature reserves, wildlife reserve.

In 1921, while the country is under the Dutch Government, a nature reserve status was given to Indrapura and Bayang forests (205,550 Ha) in Pesisir Selatan, and Solok Districts. In the same year, Merangin Alai forests in Bungo Tebo and Sarko Districts (24,287 Ha) were given protection forest status, and Sangir, Jujuhan and Kambang forests in Solok, Sijunjung and Pesisir Selatan Districts (40,800 Ha) were given production forest/limited production forest status. Subsequently, in 1929, Vick van Inderapura and Bukit Tapan forests in Kerinci and Bungo Tebo Districts (279,550 Ha) were given nature reserve status. Protection forest status were given in 1936 to Batanghari I, Lubuk Nyiur and Kambang forests (129,580 Ha) in Pesisir Selatan District.

Under the Government of Indonesia, Rawas Ulu Lakitan forests in Musi Rawas District (281,120 Ha) received wildlife reserve status in 1979. During 1980 and 1981, Bukit Kayu Embun and Bukit Gedang forests in Bengkulu Utara and Rejang Lebong Districts (154,750 Ha) also received wildlife reserve status. In 1982 after extensive field surveys done earlier by FAO and PHPA (now PHKA, the Directorate General of Forest Protection and Nature Conservation), under the Ministry of Forestry, the forests under different status in Kerinci Seblat areas were nominated as national park by the Ministry of Agriculture.

The nominated Park consisted of about 1.48 million Ha, including 0.3 million Ha of lowland forest below 600 m asl, and constituted a complex of 17 gazetted and proposed wildlife and nature reserves, protection forests, and intervening areas between these separated blocks. The Park area size was, however, reduced to approximately 1.3 million Ha in the first revision to the boundaries of KSNP in 1985, and was officially gazetted later in 1999 with the present size of 1, 375, 349.867 Ha.

- **BBSNP**

The history of establishment of BBSNP dated in 1935, when the then Dutch colonial government gave a wildlife reserve status to the area known formerly as Sumatra Selatan 1 (or SS1). On 1 April 1979, under the Government of Indonesia, the wildlife reserve status of the area was replaced by a nature reserve status. In 1982, under the decree of the Minister of Agriculture, the area was given a status as national park. The name Bukit Barisan Selatan was given in 1984. The decree of the Minister of Forestry No. 71/Kpts-II/1990 dated 15 February 1990 established Bukit Barisan Selatan Marine Reserve, covering an area of 21,600 Ha. From then onward, the marine reserve has become an integral part of BBSNP and is under the BBSNP Management.

c. Form and date of most recent records of property

Records of property in the three Parks included in TRHS are largely conducted in coordination with NGOs operating in each of the Park areas.

- **GLNP**

From mid 1980's to mid 1990's there had been several activities to record the inventory of GLNP involving the World Wide Fund for Nature Indonesia (WWF Indonesia). They include flora and fauna inventories within the Park, especially in Kluet Wildlife Reserve, Lawe Gurah Forest Recreation, and Bahorok area; census, habitat and population surveys of Sumatran rhino in Kappi Wildlife Reserve, and Gunung Leuser Wildlife Reserve, and Kappi Wildlife Reserve; census and habitat rehabilitation of Sumatran elephant in Sekundur Wildlife Reserve; Sumatran tiger census in Kluet Wildlife Reserve.

- **KSNP**

In KSNP, records of the property are conducted by the Park Management in coordination with the Flora and Fauna International (FFI) and WWF Indonesia. The Park Management in coordination with the FFI conducted mammal and avifauna inventory and revise the lists regularly. In 2000, the Park Management conducted an assessment of the change of forest cover and the forest loss by analyzing a landsat imagery of the KSNP area.

- **BBSNP**

In BBSNP, records of the property are conducted in coordination with the Wildlife Conservation Society-Indonesia Program (WCS-IP), WWF Indonesia and the Forest Inventory and Monitoring Programme-European Union (FMIP-UE).

From 1997 to 1998, BBSNP Management in coordination with the FMIP-EU conducted mammal, avifauna, and herpetofauna inventory. From September 1998 to July 2002, BBSNP Management in coordination with WCS-IP conducted camera trap surveys for tiger and 9 prey species, and during 2000 to 2001, they conducted mammal and avifauna census (every beginning of the month) using a line transect method, an ichtiofauna inventory, as well as a flora inventory.

d. Present state of conservation

- **GLNP**

Satellite imagery analysis of GLNP area carried out by Leuser Development Programme (LDP) in 2000 which was renewed in February 2002 reveal that the area of primary forest, degraded forest, and non-forested area in 1985 and 2000. In 1985 the total area of primary forest in the Park area was 908,280.13 Ha (96.30%). In 2000, the primary forest area has reduced to 819,913.06 Ha (86.93%). This means that during the 15 year period GLNP lost 88,367.07 Ha (9.37%) of the primary forest area. On the other hand, the size of degraded forest and non-forested area (cultivated area, field, and plantation) has increased. While the areas of degraded forest and non-forested area in 1985 were each 30,405.47 Ha (3.22%) and 4,536.78 Ha (0.48%), the areas in 2000 have increased to each 88,523.28 Ha (9.39%) and 34,786.04 Ha (3.69%).

- **KSNP**

According to data from the landsat imagery analyzed by KSNP Management, total forest area in the nine districts within the park boundary by 2000 was 1,156,964 Ha, compared to 1,161,540 Ha in 1998. This means that the forest area in the Park during the period has reduced to 4.8 percent or 4,576 Ha. Sawah Lunto/Sijunjung District has the highest percentage of forest lost (1.9 percent or 39 Ha). However, Pesisir Selatan District recorded the largest forest loss in the two year period (0.6 percent or 1,573 Ha), followed by Solok (1.3 percent or 951 Ha), Rejang Lebong (0.6 percent or 759 Ha), Kerinci (0.3 percent or 724 Ha), Musi Rawas (0.1 percent or 220 Ha), Bengkulu Utara (0.1 percent or 193 Ha), Merangin (0.1 percent or 116 Ha), Sawah Lunto/Sinjunjung (1.9 percent or 39 Ha), and Bungo Tebo (0 Ha).

- **BBSNP**

In 1997, extensive fires raged through the large islands of Indonesia, in particular Kalimantan, Sumatra, and Irian Jaya. In Sumatra, the areas damaged by the fires included BBSNP. The fires were caused by small scale burning of agricultural lands

in and adjacent to the Park by unattended campfires built within the Park. The fires burning from September to October 1997 damaged an estimated 1,500 to 2,000 Ha of the forests in the southern portion of the Park, including the portions of the Way Canguk research area (O'Brien & Kinnaird, 1998).

The lack of carcasses in the burn areas indicated that birds and mammals were able to escape the fires. However, forest lizards, such as skinks (*Mabuya* spp., *Sphenomorphus* spp.), gecko (*Cnemaspis* spp., *Peropus* spp.) and flying lizards (*Draco* spp.) were absent even one month after the fires, an indication that reptile mortality may have been substantial (Ibid). The effect of fires on food supply was most apparent for birds. Although the species richness and total number of individual of all species was similar before and after the burn, the fires affected the composition of avian community. The loss of fruit tree also reduces food availability to a large number of omnivorous species, such as primates, squirrels, sun-bear, civets and ungulates (Ibid).

e. Policies and programmes related to the presentation and promotion of the property

GLNP, KSNP, and BBSNP Managements have recognized the need to build a coordinated programme to better present and promote TRHS in the future. In fact, a coordinated programme to promote the ecotourism as a cluster World Heritage site with common policy and marketing, and the environmental education and public awareness to the stakeholders, especially local governments and communities, would be one of the programmes prioritized under the coordinating mechanism that would be set after the site is inscribed as a World Heritage site (See Section 4j. Property management plan and statement of objectives). The World Heritage status would undoubtedly help promoting and presenting the three Parks as one cluster for ecotourism, education and awareness building purposes.

At present, the three Parks included in TRHS have separate policies and programmes related to the presentation and promotion of the property.

- **GLNP**

GLNP Management has conducted several programmes related to the presentation and promotion of the Park. They include advisory on living environment and *bina cinta alam* (environmental education) in 23 locations, development and conservation exhibitions in 15 locations, speeches and discussion in 21 locations, courses on conservation for young people and nature lovers club (100 people), pamphlet making, and education and training for tour guides. One of the most recent activities to promote the Park was Leuser Forest Rally (Leuser Wana Rally) in Lawe Gurah Recreational Forest in June 2001. The event involved students, teachers, local governments, journalists, NGOs, and at the same time helped promoting local cultural attractions to the public.

- **KSNP**

KSNP Management has conducted public awareness campaigns to increase awareness of the functions of the park among political decision makers and the general public. The activities include: (1) production of brochures, leaflets, booklets and posters emphasizing the functions and benefits of the park, (2) extension services to villagers through the establishment of Communication, Information, and Promotion section to allow more frequent extension service to villagers, (3) development of cooperation with schools and local youth clubs in the villages and districts, (4) development of cooperation with nature conservation NGOs, (5) meetings and dialogues with local government and parliament, (6) maintaining and developing links with journalists, and (7) maintain and upgrade the park's website (www.kerinci.org).

- **BBSNP**

BBSNP has conducted several programmes related to the presentation and promotion of the Park. The activities include: (1) conservation education for local communities, (2) bulletin and leaflet making, and (3) exposures on BBSNP activities through media (print and electronics) and related agencies.

4. Management

a. Ownership

The Republic of Indonesia

b. Legal status

- **GLNP**

The announcement of Gunung Leuser National Park (GLNP) was based on the declaration of Ministry of Agriculture dated 6 March 1980, which was strengthened by the decree of Directorate General of Forest No. 719/DJ/VI/1/80 dated 7 March 1980. According to the announcement, GLNP comprised an area of 794,675 Ha and was Indonesia's first five national parks. The announcement was renewed in 1984 by the decree of Directorate General of Forest Protection and Nature Conservation (PHKA) which stated that GLNP comprises a total area of 862,975 Ha in 4 *Kabupatens* (district), namely Aceh Selatan, Aceh Tenggara, Langkat and Karo, in two Provinces: Aceh Nangroe Darussalam (N. A.D.) and Sumatra Utara.

- **KSNP**

Kerinci Seblat National Park (KSNP) was officially declared a national park by Decree of Minister of Forestry No. 1049/Kpts-II/1992 on 12 November 1992. Subsequently, the decree of the Minister of Forestry No. 192/Kpts-II/1996 provisionally set the size of the Park as +/- 1,368,000 Ha. Following boundary surveys, the Park was officially gazetted by the decree of the Minister of Forestry and Estate Crops No. 901/Kpts-II/1999, with a size of 1,375, 349.867 Ha. KSNP is thus the first national park in Indonesia to have completed the legal procedures required to receive official gazettement.

- **BBSNP**

Bukit Barisan Selatan National Park (BBSNP) was established as a national park under the decree of the Minister of Agriculture No. 736/MENTAN/X/1982 dated 14 October. The existence of the Park was strengthened by the decree of the Minister of Forestry No. 096/Kpts-II/1984 dated 12 May 1984. Under the same decree, the Park's name was changed from Sumatra Selatan 1 (SS1) National Park to Bukit Barisan Selatan National Park. The Park covers an area of 356,800 Ha. The area and borders of the Park have never changed since it area has been established as a wildlife reserve under the Dutch colonial government in 1935. Under the decree of Ministry of Forestry No. 71/Kpts II/1990 dated 15 February 1990, the Marine Natural Reserve or *Cagar Alam Laut* (CAL) was included in the management of BBSNP.

c. Protective measures and means of implementation

GLNP, KSNP, and BBSNP Managements have acknowledged the needs of a coherence and coordinated protection measures among the three Parks to better protect TRHS and guarantee its continuity. A coherence and coordinated protection of flora and fauna, particularly threatened species, and ecosystems of the site, especially against encroachment, illegal logging, poaching and forest fires, will in fact be one of the programmes prioritized under a coordinating mechanism that will be set after the the site is inscribed as a World Heritage site (See Section 4j. Property management plan and statement of objectives).

At present, while some coordinations involving the Parks in Sumatra, such as the anti poaching coordination, have been made, the protection measures in each of the three Parks consisting TRHS are prioritized to enhance the protection system in each of the Parks. The main duty lies in the hand of each of the three Park Management authorities: GNLP Management, KSNP Management and BBSNP Management.

Under the three Park Managements, protective measures are basically divided into two approaches: first, direct preventive and curative measures against any disturbance to habitats, and flora and fauna diversity through "policing" activities; and second, controlling measures to the source of disturbance, e.g. through programmes to develop the buffer zone areas. The first approach is direct preventive and curative measures aimed to counter disturbances to habitat, and flora and fauna diversity caused, especially, by inhabitants in the areas surrounding the Parks. Policing activities are believed to be a key solution to such disturbances. They include:

1). Increasing the effectiveness of rangers

This is conducted through simultaneous efforts such as training; changing the management style and structure; supplying necessary equipment including vehicle, river patrol boats, and guns; and construction or rehabilitation of strategically located monitoring posts and houses. Monitoring posts are placed in many points in the vast areas of the Parks to protect the boundaries, to prevent disturbances caused by illegal loggers, poachers, as well as fires. Monitoring posts in the Parks are equipped with vehicles for forest police, and a long distance communication system.

2). Advisory and law enforcement

Teams for advisory and law enforcement are allocated in the areas prone to disturbances to investigate the activities of groups in the community who often caused disturbances to the Parks and approach them through advisory activities on the importance of the Parks. The effort is also aimed to develop cooperation with local communities. It is aimed at making the villagers to take responsibility for the protection of the neighboring Parks forests, and to encourage them to request for assistance from the Parks authorities should there are problems related to law enforcement that they cannot handle.

3). Patrol

Patrol is conducted to monitor the security condition of the Parks. In GLNP, patrol activities are conducted routinely involving GLNP Management and the related agencies. Members of patrol squad work according to specific job description related to the problems they face on conducting the patrolling activities.

In KSNP, the Park Management has established Protection and Conservation Units (PCU) as the most efficient way to utilize the limited number of park rangers (polisi hutan) available. PCU is a mobile unit comprising a minimum of five rangers. There are two PCUs operating in each of the nine districts within the Park. The personnel conduct routine patrols and special operations wherever needed in their district. In addition, Special Protection Units (SPU), such as Rhino Protection Units (RPU) and Tiger Protection Units (TPU), has been in operation in KSNP. The SPUs are similar to PCUs but operate out of the Park headquarters. They can be quickly mobilized to operate anywhere in the Park to assist or backup other enforcement operations.

4). Special operation to protect the forests, and flora and fauna richness

Special operation for securing the forest is aimed for two types of disturbances. The first type are disturbances within the Parks which are mainly caused by natural phenomena, such as natural disaster (erosion, flood, fire, and slide/embankment). The second type are disturbances coming from outside the Parks areas which generally are caused by non-natural causes, such as attitude of inhabitants living in the areas surrounding the Parks or outside of those areas. Such non-natural disturbances include hunting, illegal logging, other non-forest product theft.

BBSNP Management has taken specific measures against forest fires. The measures include identification of sources of fires and areas prone to fires; conducting patrols by park rangers in the areas prone to fires, especially the areas close to human activities; conducting training to prevent and deal with forest fires for villagers and establishment of Forest Fires Prevention Squad (*Satuan Tugas Penanggulangan Kebakaran*), comprising of 300 villagers from 7 villages prone to fires in the areas surrounding the Park.

KSNP Management has taken specific measures against forest fragmentation, the most serious threat facing the Park in a long term is posed by fragmentation of currently intact forest block, with road construction as the principal cause. Public awareness program is conducted to give a clear understanding of the Park's watershed and biodiversity values that necessitate the prohibition of the road development, while, contacts with conservation NGOs, concerned politicians, and media are maintained. To prevent forest fires in KSNP, patrols in dry season are directed in the areas prone to fires, especially areas bordering to the villages or people activities. To prevent flooding, KSNP Management has prepared rehabilitation activities in disturbed forests areas.

5). Coordination in dealing with disturbances

Disturbances against the Parks usually do not stand alone (complex) and cannot be solved only by policies from the Park Managements. To deal with them often requires coordination with different agencies, such as: central government, local government, security apparatus, local community leaders, etc. Coordination in securing and protecting the Parks come in the forms of special operations to secure the forests and biodiversity richness, advisory programmes and law enforcement, the development of buffer zones around the Parks, etc. In KSNP, Integrated Forest Protection Teams (IFPT) have been established in eight districts around the Park since 2001. The teams are mainly concerned with stopping illegal logging.

The second approach is controlling measures to the sources of disturbance. The measures are conducted by developing buffer zone areas outside the Parks. The development of such buffer zone areas comprises activities to securing and protecting the habitats, diversity and species composition in the areas designated as buffer zone areas. The objectives are to stop the negative influences coming into the Parks areas: population pressures, exploitation of forest natural and non-natural resources, and misunderstandings on boundary lines and land use systems. Examples of controlling measures are mentioned in Section 4f. Agreed Plans Related to the Property.

d. Agency/agencies with management authority

Each of the Parks included in the nominated site is managed by a special management authority, namely *Balai Taman Nasional Gunung Leuser* or BTNGL (GLNP Management), *Balai Taman Nasional Kerinci Seblat* (KSNP Management), and *Balai Taman Nasional Bukit Barisan Selatan* (BBSNP Management). The Heads of GLNP Management, KSNP Management, and BBSNP Management are each also the Heads of the Parks. They report directly to Directorate General of Forest Protection and Forest Conservation (PHKA) within the Ministry of Forestry.

e. Level at which management is exercised and name and address of responsible person for contact purpose

The park management is exercised on each of the three Parks consisting TRHS and the surrounding area under the coordination with related agencies, namely *Badan Litbang Kehutanan* (Forestry Research and Development Agency); *BAKOSURTANAL* or *Badan Koordinasi Survey dan Pemetaan Nasional* (National Coordination Agency for Surveys and Mappings); *BAPPEDA* or *Badan Perencanaan Pembangunan Daerah Provinsi* and *BAPPEDA Kabupaten* (Provincial and District Development Planning Agency); *BIPHUT* or *Badan Inventarisasi dan Perpetaan Hutan* (Forest Inventory and Mapping Agency); *Badan Pertanahan Nasional* (National Land Agency); *LIPI* or *Lembaga Ilmu Pengetahuan Indonesia* (Indonesian Institute of Sciences); National Biodiversity Commission (NBC); *Kementerian Kebudayaan dan Turisme* (Ministry of Culture and Tourism); Police; *Ditjen Perla* (Directorate General of Sea Affairs); *Ditjen Perikanan* (Directorate General of

Fisheries); *Ditjen Transmigrasi dan Pemukiman* (Directorate General of Transmigration and Settlement); *DEPDAGRI* or *Departemen Dalam Negeri* (Department of Internal Affairs); *Departmen Pertanian* (Department of Agriculture) and *Departemen Pemukiman & Pembangunan Prasarana Wilayah* (Department of Settlement and the Development of Areas Infrastructure).

Names and addresses of responsible persons for the Park Managements of the three Parks are as follow:

Mr. Hart Lamer Susetyo (Head of GLNP)

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Ms. Listya Kusumawardhani (Head of KSNP)

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Mr. Trio Santosa, M.Sc (Head of BBSNP)

Contact Address:

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Lampung, Indonesia
Telp/Fax : +62-722-21064

f. Agreed plan related to the property

- **GLNP**

a) Less Developed Village Programme (*Inpres Desa Tertinggal*)

Less Developed Village Programme is a programme designated for under developed villages in the surrounding areas of the Park. This has the objectives to raise the villagers' welfare and at the same time to reduce pressures to the Park through activities such as, advisory and development of small industries, and agricultural intensification and diversification. It is joint program with the local governments.

b) Enclave Development Programme

Enclave Development Programme is a program aimed at gathering small groups of people living in the Park and move them to an area outside the Park. In the new places, those people are then trained to develop their community so that they no longer cause disturbance to the Park. This programme is conducted by GLNP Management under the surveillance from the local governments.

c) Conservation Development Programme

The programme was a technical cooperation between the WWF Indonesia and the Directorate General of Forest Protection and Nature Conservation (PHKA) in GLNP areas. It was aimed at building activity model in community based natural resources management as an alternative solution for the conflicts between local community and the Park.

d) Leuser Development Programme (LDP)

LDP is a partnership project between the Government of Indonesia (GoI) and the European Union (EU) in conserving the Leuser Ecosystem area, an area of approximately 2.5 million hectares of tropical rainforest. It encompasses GNLP of 862,975 Ha, as well as extensive areas of protection and production forest in the border of North Sumatra and the Nanggroe Aceh Darussalam (NAD). LDP is run by the Leuser Management Unit (LMU), a management unit funded jointly by the GoI and EU. LMU was established because the Leuser International Foundation (LIF), an NGO assigned by the GoI to manage the conservation of Leuser Ecosystem for seven years period until 2002 which is extended to 2004, has not yet had the necessary technical expertise. During the nine years period, the LDP oversees the management of the Leuser Ecosystem and strengthens the necessary technical expertise of the LIF to ensure a smooth handover of the management to the NGO.

e) Conservation International (CI) - Indonesia

In 2001, CI Indonesia has started its Orangutan Project in GLNP area. The project consists of awareness building program and law enforcement training. Starting in 2003, CI Indonesia will start another project: Northern Sumatra Corridor (NSC), a project to establish a corridor between protected areas of Angkola, Leuser and Seulawah. Meanwhile, CI's Critical Ecosystem Partnership Fund (CEPF), which provides funding and technical assistance to civil society in Earth's biodiversity hotspots, has focusses on Seulawah-Leuser-Angkola; Siberut Island; Tesso Nilo-Bukit Tigapuluh; and Bukit Barisan Selatan. In Sumatra, the CEPF supports projects at the district level and below, with the aim of building alliances among conservation-minded individuals, nongovernmental organizations and private sector interests. It focuses primarily on enabling key actors at local levels to practice good forest stewardship with adequate skills, coordination, collaboration, incentives and political voice.

- **KSNP**

a) Kerinci Seblat-Integrated Conservation and Development Project (KS-ICDP)

KS-ICDP is a six-year project (1996-2002) financed by the World Bank, Global Environmental Facility (GEF), and the Government of Indonesia. The overall objective of KS-ICDP is to secure the biodiversity of KSNP and to stop further habitat fragmentation by improving park protection and management, especially by increasing the participation of local communities; and promoting sustainable management of the Park's biodiversity and supporting the maintenance of permanent forest cover in the remaining bufferzone forest concession areas. The project is designed around four core components: park management; area/village development; monitoring and evaluation; and training support. There are various organization participating in KS-ICDP, including Government agencies, local and international NGOs, research groups, local communities, and donor agencies. Participating NGOs include: Flora and Fauna International (FFI), WWF Indonesia, the Indonesian Biodiversity Foundation (Kehati), and Warsi.

b) Village Conservation Agreement (*Kesepakatan Konservasi Desa --KKD*)

Village Conservation Agreement is used by KS-ICDP as a means of linking the Park biodiversity conservation objectives directly with development benefits. The project legalizes village access to resources in the Park and its buffer zones, and guarantees specified development assistance in return for community cooperation in Park protection and biodiversity conservation on village lands. Before receiving development assistance, a village has to produce a Village Decree agreeing to respect the Park boundary; to monitor the border for intrusion by outsiders; and to develop a sustainable land use pattern in the bufferzone following soil and water conservation principles. Up to now, 72 KKD have been formalized. Apart from KKD, some villages within KSNP have tried to revive *adat* sanction (local customary based

sanction) to those violating efforts to conserve the Park. In Kebun Baru Village, in Kerinci District, for example, villagers who violate the *adat* law regarding the forest in the Park will be punished according to local sanction before being brought to local apparatus. The *adat* sanction varies from fine, comprising of 100 gantang (1 *gantang* = 12 liter) of rice and one buffalo, to expulsion from the village.

c) *Adat Village Forest* (local customary based village forest)

Intact forest areas have been identified within the buffer zone village areas. Surveys conducted in such forests reveal that the forests contain important flora and fauna species. *Adat Village Forest* is an agreement between KSNP Management and village communities to conserve such forests and maintain the ecological services by establishing local customary based sanction to protect them. The management of *adat* village forest lies in the hand of *adat* village working group, comprising elected people in the village, and only sustainable uses of forest resources are allowed. Twenty villages in the buffer zone areas of KSNP have so far declared their forest areas as *adat* village forest. Pangkalan Baru New Village, for example, has declared its forest area of 754 Ha as *adat* village forest in 1993. The establishment of *adat* forest village has been an effective way to reduce pressures to the Park.

d) Support for Sipurak Hook Inclusion into KSNP

Through a letter No. 050/136/II/Bapeda dated 29 April 2002, *Bupati* (Sub-district Head) of Merangin, Rotani Yutaka, stated his support for the inclusion of the Sipurak Hook area into KSNP. The Sipurak Hook is a buffer zone area of 13,500 Ha within the Merangin Sub-district. It is located within the production forest which belongs to PT Serestra, a company owning forest concession rights in the area. The Sipurak Hook has been known for its biodiversity richness and ecological values. It contains primary lowland forest of less than 800 m asl and supports a large water catchment area. At the same time, the area is an important habitat for Sumatran rhino and Sumatran tiger, as well as important flower species of *Amorphophallus* sp. and *Rafflesia* sp..

e) Note of Agreement on Protection and Conservation of KSNP (*Nota Kesepakatan Bersama tentang Perlindungan, Pengamanan dan Pelestarian TNKS*)

The note of agreement was signed on 27 February 2002 by four Governors and 9 *Bupati* (District Head) whose areas are within the Park, and Head of District Parliament (*DPRD Kabupaten*). It stated that (1) all parties will work together to protect, secure and conserve KSNP, (2) all parties agree to fill a law suit and give administrative sanction according to the present law to any party who directly or indirectly cause disturbance to the Park (encroachment, non-timber forest product theft, mining, establishing sawmill, causing fires, etc), and (3) central and local governments will review the laws that contradict with efforts to conserve KSNP.

- **BBSNP**

- a) Wildlife Conservation Society - Indonesia Programme (WCS-IP)**

WCS-IP has helped the management of BBSNP since 1997. The activities of WCS-IP in BBSNP include:

1. The establishment of the Way Canguk Research Station and Conservation Education Center.
2. Research and conservation of Sumatran tiger. WCS-IP is working together with Indonesian Rhinoceros Conservation Program (*Program Konservasi Badak Indonesia --PKBI*) to create Tiger Protection Unit (TPU). TPU conducts anti-poaching patrol activities for tiger protection, and monitors the distribution and population of the threatened species.
3. Research and conservation of the Asian elephant.

- b) World Wide Fund for Nature (WWF) Indonesia**

WWF Indonesia has started its activities in BBSNP since 2000 by establishing the WWF AREAS (Asian Rhino and Elephant Action Strategy), a programme prioritized for saving Sumatran rhino and Sumatran elephant. The target of the programme is to maintain the population of Sumatran rhino and Sumatran elephant in BBSNP. It is expected that by 2010 the population will be stable and, if possible, increase. The activities include ensuring the level of protection of Sumatran rhino so that no more Sumatran rhino and Sumatran elephant are hunted or traded; helping the Park management to improve the Park Management and ensure the Park's integrity; and facilitating the local government to revise the District Spatial Plan and create a more conservation based District Spatial Plan.

- c) Indonesian Rhino Conservation Programme (PKBI)**

PKBI is an NGO working to conserve and rescue Sumatran rhino through the establishment of Rhino Protection Unit (RPU). The main activity of RPU is to conduct anti-poaching patrol for Sumatran rhino, and to monitor their population and distribution.

- d) PT Sac Nusantara**

This is a private agency that manages the nature tourism in the Utilization Zone (*Zona Pemanfaatan*) of Tampang - Belimbing which comprises a total area of 100 Ha. PT Sac Nusantara has been operating since 1993 with 30 year concession time.

g. Sources and Levels of Finance

With the exception of KSNP which received the finance largely from abroad, the Parks included in the nominated site receive most of the fundings from the Government of Indonesia.

- **GLNP**

In GLNP, the source of finance largely comes from the Government of Indonesia, mainly from the National Budget (*Anggaran Pendapatan dan Belanja Nasional* or APBN). Over a decade from the budget year of 1984/1985 to 1994/1995, GLNP received a total budget of IDR 6,348,423,000, of which IDR 4,403,969,000 (in 1994 1US\$=IDR 2,144) came from the APBN. The rest came from other sources, such as the Government's Reforestation Fund (*Dana Reboisasi*). During the 2000 budget year, GLNP Management received a total sum of IDR 1,914,823,000 from the Government of Indonesia, of which IDR 958,527,000 came from the APBN (in 2000 1US\$=IDR 8,092); IDR 135,496,000 came from the Gunung Leuser Management Strengthening Project (*Dana Pemantapan Pengelolaan TNGL*) of the APBN's Development Spending; IDR 348,850,000 came from the Forest Resource Development Fund (*Dana Pengembangan Sumberdaya Hutan* or PSDH); and IDR 471,950,000 came from the Reforestation Fund.

- **KSNP**

In KSNP, with the establishment of Kerinci Seblat-Integrated Conservation and Development Project (KS-ICDP) (1996-2002), the management funding come largely from abroad, mainly grants through KS-ICDP. The total cost of KS-ICDP project are US\$46 million, of which US\$12 million is financed by the Government of Indonesia and US\$15 million by the Global Environmental Facility (GEF) as grant for biodiversity conservation, and US\$19 million from the World Bank as loan for development and planning activities (in 1996 1US\$=IDR 2,330; in 2001 1US\$=IDR 9,937). With the end of KS-ICDP in 2002, an important task for the Head of the Park will be working with Directorate General of Forest Protection and Nature Conservation (PHKA) within the Ministry of Forestry to locate and secure funds from alternative sources. These will include international NGOs as well as bilateral government funding agencies and international development projects.

- **BBSNP**

The sources of finance for BBSNP management activities come from the Government of Indonesia through the National Budget (APBN) and other government funding sources, such as the Provincial Budget (APBD), the District Income and Expenses Budget, and the Reforestation Fund. The biggest contributor is the APBN. It contributes up to 75% of the total source finance. For the year of 2001 BBSNP received a total sum of IDR 2,389,352,035 (in 2001 1US\$=IDR 9,937), of which IDR 1,497,726,971 came directly from the APBN; IDR 195,408,214 from the Natural

Resources Development Fund (PSDH); IDR 74,190,000 from the APBN through BBSNP Management Strengthening Fund (*Dana Pemantapan Pengelolaan TNBBS*); and IDR 622,026,850 from the Government's Reforestation Fund (*Dana Reboisasi*).

h. Sources of expertise and training in conservation and management techniques

Regular trainings offered by the Government, especially through the Ministry of Forestry, and NGOs are the main source of expertise and training in conservation and management techniques in the three Parks consisting the nominated site.

- **GLNP**

In GLNP, the trainings attended by the Park Management staffs includes areas such as project management, finance administration, advisory, tourism, speleology, forest inventory, forest protection, plants inventory, Geographical Information System (GIS), forest fire, shooting, elephant training, and flora-fauna traffic monitoring.

- **KSNP**

KSNP has designated several areas where the Park Management should concentrate its training efforts, namely law enforcement; conservation management; management of nature tourism; communication, information and promotion; office administration; financial management; and personnel management.

- **BBSNP**

Areas of training attended by BBSNP Management staffs include conservation area management, project management, visitor management techniques, forest protection management, forest fires prevention, guide training, office administration, nature reserve conservation management, species conservation techniques, wetland conservation assesment and management, and park ranger training.

i. Visitor facilities and statistics

Visitor Facilities

The following are the visitor facilities that can be found in the three Parks:

GLNP: accommodation, restaurant, visitor center/tourist information center, trail, camping ground, tower, shelter, and guides.

KSNP: accommodation (home stay at local village houses), trail, gate, interpretation boards.

BBSNP: cottage (4), guest house (1), dock (1), speedboat (2), toilet (2), camping ground (3 Ha), shelter (2), information center (1), trail (3 km).

Visitor statistics

- **GLNP**

Total number of visitors to GLNP from 1997/1998 to 2001 reached 77,452 visitors, of which 36,074 are domestic visitors and 41,378 are foreign visitors. The highest number of visitor to the Park was recorded in 1997/1998 when 24,057 visitors, comprising 10,645 domestic visitors and 13,113 foreign visitors. The political instability in the area is believed to be the reason behind the significant reduction in number of visitor to the Park.

Table: Visitor to GLNP from 1997/1998 to 2001:

Year	Visitor (person)		Total (person)
	Domestic Visitor	Foreign Visitor	
1997/1998	10,645	13,112	24,057
1998/1999	8,188	7,911	16,099
1999/2000	3,128	4,675	7,803
2000	5,463	9,976	15,439
2001	8,650	5,704	14,354
Total	36,074	41,378	77,452
Average/Year	7,214.8	8,275.6	15,490.4

Source: GLNP Management

- **KSNP**

Total number of visitors to KSNP from 1993/1994 to 2001 reaches 34,193 visitors, of which 29,402 are domestic visitors and 4,791 are foreign visitors. The highest number of visitor to the Park was recorded in 1996/1997 with a total of 5,317 visitors, comprising 3,848 domestic visitors and 1,469 foreign visitors.

Table: Visitor to KSNP during the period of 1993/1994 to 2001:

Year	Visitor (person)		Total (person)
	Domestic Visitor	Foreign Visitor	
1993/1994	1,094	330	1,424
1994/1995	3,262	539	3,891
1995/1996	3,029	672	3,701
1996/1997	3,848	1,469	5,317
1997/1998	2,611	782	3,393
1998/1999	3,679	342	4,021
1999/2000	3,849	193	4,087
2000	4,703	327	5,030
2001	3,282	137	3,419
Total	29,402	4,791	34,193
Average/Year	3,266.9	532.3	3,799.2

Source: KSNP Management

- **BBSNP**

Total number of visitor to BBSNP from 1995 to 2001 reaches 2,320 visitors, of which 1,864 are domestic visitor and 456 are foreign visitors. The highest number of visitor to the Park was recorded in 1997 with 650 visitors, comprising 507 domestic visitors and 143 foreign visitors.

Table: Visitor to BBSNP during the period of 1995-2001

Year	Visitor (person)		Total (person)
	Domestic Visitor	Foreign Vistor	
1995	326	23	349
1996	161	72	233
1997	507	143	650
1998	192	131	323
1999	348	41	389
2000	129	42	171
2001	201	4	205
Total	1,864	456	2,320
Average/Year	226.3	65.1	331.4

Source: BBSNP Management

j. Property management plan and statement of objectives

GLNP, KSNP, and BBSNP have recognized the need to coordinate the management of the three Parks. Indeed, the World Heritage status is expected to help the process of developing a coordinating mechanism that would be started after the site is inscribed as a World Heritage site. The programmes prioritized under the coordinating mechanism would range from the protection of the site; research, monitoring and assessment; promotion of ecotourism; environmental education and public awareness (See details in the subsection Coordination of management below).

At present, each Park owns a management plan and statement of objective written in accordance to Indonesian law on biological resource conservation, *UU RI No.5 Tahun 1990*. The law states that a national park is a conservation area managed through a zoning system for the sake of research, science, education, breeding enhancement, recreation, and tourism. Still according to the law, a conservation area has three basic functions: protection of life support system, preservation of the diversity of plants, animals and ecosystems, and provision of sustainable uses of biological resources.

The management plans are written based on the specific conditions and potentials in each of the Parks, referring hierarchically to higher plans, such as National Forestry General Plan (*Rencana Umum Kehutanan Nasional*), and Provincial Forestry Plan (*Rencana Kehutanan Provinsi*), and receiving inputs from other Forestry Management Unit Plan (*Rencana Unit Pengelolaan Kehutanan*). The curent GLNP Management Plan was written in 1995, KSNP Management Plan in 1995, and

BBSNP Management Plan in 1999. All is long term plans designed for a period of 25 years (open for any revision).

- **GNLP**

The objectives of GLNP Management is to protect and conserve different species of flora and fauna as well as the ecosystems in GLNP areas; to protect the Park areas from natural and artificial disturbances; to stimulate study, research and investigation on flora, fauna and the ecosystems in the Park; and to raise community awareness in securing the richness within the Park areas and to bring into reality a harmonic condition through sustainable uses of the natural resources in the Park.

GLNP Management has set some programmes to achieve the above objectives.

- 1) Consolidation of the Park area: to collect data and information regarding the physical conditions of the GLNP necessary to establish zonation areas and boundaries. Activities: (1) park boundary strengthening, (2) zonation: valuing area potentials, setting up criteria for zonation, zone and boundary zone divisions, and activities to consolidate the Park area.
- 2) Managing the Park carrying capacities: to increase and develop capacity, quality and quantity of the flora and fauna population in the Park, the habitats and ecosystems, through rehabilitation, relocation, reforestation, etc. Activities: (1) managing natural resource and ecosystem carrying capacities, (2) managing core physical carrying capacities.
- 3) Protection of the flora, fauna, and ecosystems of the Park: to protect the Park's biodiversity through disturbances prevention activities, monitoring, policing activities, as well as buffer zone development. Activities: (1) direct prevention and handling of disturbances, (2) buffer zone development programme.
- 4) Sustainable uses of the natural resources within the Park area: to encourage sustainable uses of the natural resources, especially through eco-tourism sites development, and to encourage study and research related to the Park. Activities: (1) encouraging eco-tourism activities: eco-tourism site management; visitor, activities, facilities and managements, and entrepreneurship management; (2) encouraging other activities: limited forest products harvesting, study, research and education, *Bina Cinta Alam* (environmental education) and interpretation activities; (3) identifying forbidden activities: mining and energy exploitation.
- 5) Organization strengthening: to develop an effective park management organization and system through education, training, discipline improvement. Activities: (1) organization: organization mission and working arrangements, (2) personnel: expert, administrative staff, field staff, (3) working areas management

- 6) Coordination: to build coordination with local government, other government agencies and NGOs. Activities: (1) coordination with local governments of Aceh Selatan, Aceh Tenggara, and Langkat, and other stakeholders, (2) identifying activities requiring coordination: upstream area protection, including improvement and management of carrying capacities as the water catchment area; controlling non-forest occupation and penetration activities into the forest area; managing and balancing flora and fauna populations and ecosystems; developing and improving tourism activities; protecting and conserving the habitats and life zones of fauna in the Park against any disturbance and destruction.
- 7) Community participation: to involve the communities living in the areas surrounding the Park in the efforts to protect and conserve the Park. Activities: (1) activities targeting communities: awareness on the presence of the Park, reforestation, population control in the areas surrounding the Park, (2) improving the role of NGOs.
- 8) Research and development: to stimulate and encourage research activities either by universities, NGOs, or the personnel of the Park Management, which support the efforts to conserve the Park. Activities: (1) study and research, (2) making use of the study and research results.
- 9) Facility and infrastructure: to provide and maintain the facilities and infrastructures necessary to conduct the activities of the Park Management. Activities: (1) structure and infrastructure management, (2) development of prioritized structure and infrastructure.
- 10) Monitoring and evaluation: to make reasonable judgments about the Park Management's programmes, effort, efficiency, and success with the objectives of using these judgments to improve the effectiveness of the Park Management. Activities: (1) identifying areas of monitoring and evaluation, (2) information system management, (3) evaluation report making.

- **KSNP**

The objectives of KSNP Management is to develop the Park as an effective conservation area that will provide essential ecological support systems for the people around the park, preserve biodiversity, and provide recreational opportunities. In the draft review, KSNP Management has also described planned programmes for the next five years to achieve such long term management objectives.

- 1) Organization strengthening: to develop an affective park management organization and system. Activities: (1) restructuring the staff organization, (2) redefining the authority and responsibility, (3) work plans and reporting procedures, (4) budget planning and accountability, (5) staffing, and (6) training.

- 2) **Boundary maintenance:** to maintain the Park boundary and increase awareness and acceptance of the boundary among all stakeholders. Activities: (1) boundary patrolling, (2) socialization of the precise Park boundaries to other government agencies, (3) maintenance of boundary markers using a participatory method involving local people, and (4) reconstruction of the boundary.
- 3) **Zonation:** to implement a zoning system that will protect the Park from forest fragmentation, alleviate boundary conflicts, and to use a co-management approach to allow and control certain activities within the defined areas in the Park. KSNP is divided into five zones: core zone; wilderness zone; special use zone; traditional use zone; and recreational use zone. Activities: (1) socialization and implementation of the Park zoning plan, (2) implementation of co-management in special, traditional, and recreational use zones, and (3) management of the existing roads and trails within the Park.
- 4) **Conservation of additional forest areas within the Kerinci-Seblat ecosystem:** to safeguard critical parts of the ecosystem that lies outside of the Park boundary but which are essential for long-term conservation efforts within the park boundary. Activities: (1) proposal development, and (2) socialization and lobbying.
- 5) **Awareness campaign:** to increase awareness of the functions of the Park among political decision-makers and the general public. Activities: (1) production of brochures, leaflets, booklets, and posters emphasizing the functions and benefits of the Park, (2) extension services to villagers, (3) development of cooperation with schools and local youth clubs in villages and districts, (4) development of cooperation with nature conservation NGOs, (5) meetings and dialogues with local governments and parliament, (6) maintain and develop links with journalist, and (7) the Park's website maintenance and upgrading.
- 6) **Resource management:** to ensure biodiversity richness while allowing sustainable harvest of certain traditional resources within the Park by means of zonation and co-management, and to prevent or control the exploitation of non renewable resources. Activities: (1) controlling gold mining in the Park, (2) preventing coal mining in the Park, (3) managing harvest of swiftlet nests, and (4) managing non-timber forest resources harvesting.
- 7) **Park protection:** to protect the Park from illegal logging, poaching and new encroachment. Activities: (1) increasing the effectiveness of park rangers, (2) development of protection systems, (3) development of cooperation with local communities, (4) improvement of cooperation with related law enforcement organizations, and (5) prevention of forest fragmentation.
- 8) **Eco-tourism support:** to develop eco-tourism in ways that will not damage the Park values while generating local income, providing recreational opportunities for national and international visitors, and improving conservation awareness among Indonesians. Activities: (1) cataloging of potential nature tourism sites

with general management guidelines, (2) production of site plans for recreational use zone, (3) recommendations for development of tourism infrastructure outside the Park, (4) production and dissemination of printed promotional materials for nature tourism sites within the Park, (5) development of tour packages in cooperation with related organizations and local communities, (6) development of cooperation with investors, (7) development of local institutions, and (8) development of human resources.

- 9) Research development: to improve the quality, quantity, and relevance to management of research in the Park through collaboration with national and international research institutions and conservation organizations. Activities: (1) compiling basic inventories, (2) providing sound recommendations for the management of non-timber forest products, and (3) providing data needed to formulate the Park management policies.
- 10) Infrastructure and equipment management: to provide and maintain the infrastructure and equipment necessary to conduct the activities of the Park Management. Activities: (1) providing and maintaining the infrastructure and equipment necessary to conduct protection activities, (2) providing and maintaining the infrastructure and equipment necessary for nature tourism activities, (3) providing and maintaining the infrastructure and equipment necessary for communication, information and promotion activities, (4) providing and maintaining the infrastructure and equipment necessary for offices activities, and (5) providing and maintaining the infrastructure and equipment necessary for care and maintenance activities
- 11) Monitoring and evaluation: to make reasonable judgments about management programmes, effort, efficiency, and success with the objective of using these judgments to improve the effectiveness of the park managements. Activities: (1) analyzing satellite imagery, (2) conducting fixed point photography, (3) recording entry permits, (4) compiling data from tour agents, (5) inventory research, (6) biodiversity transects, (7) recording instances of research result contributing to management activities, (8) compiling records from patrols, (9) monitoring the number and results of court cases, (10) compiling records on the number and turnover of personnel, (11) verifying fulfillment of plans, (12) monitoring special use zone agreements, and (13) conducting socioeconomic surveys.

- **BBSNP**

BBSNP Management has the objectives to establish a sustainable and unique nature conservation area aimed to protect and preserve the diversity of the plants, animals and habitats, as well as the genetic richness and hydrological functions of the areas; and to formulate a sustainable use of biological resources through conservation-based education, research and tourism. The planned programmes to achieve the objectives are as follow:

1. Area consolidation. Activities: (1) boundaries strengthening, (2) zonation: valuing area potentials, setting up criteria for zonation, zone and boundary zone divisions, and activities to consolidate the Park area. BBSNP Management has proposed to divide the Park into six zones: core zone; wilderness zone; special use zone; traditional use zone; rehabilitation zone, and cultural and history zone.
2. Management of the life support system. Activities: (1) managing the Park's flora, fauna, and ecosystem: population, species, and distribution inventory; species relocation; species recovery; enriching local species; habitat management, (2) wildlife management, (3) hydrology management, and (4) area rehabilitation: reforestation and soil conservation.
3. Sustainable use of the Park area. Activities: (1) eco-tourism development: eco-tourism site management, visitor management, activities, facilities, and entrepreneurship management, (2) *Bina Cinta Alam* (conservation education) and interpretation activities.
4. Conservation and protection of the Park area. Activities: (1) prevention and handling: forest fires, disease and pest, disturbances caused by human activities (over harvesting of forest products, erosion and embankment, development of agriculture within the Park, non-agriculture activities within the Park --poaching, illegal logging, rattan and timber harvesting, development of park facilities, road development and settlement development, exotic species introduction, environment problem), (2) coordination in protecting and conserving the Park.
5. Organization management: aimed at strengthening organization structure; improving the quality of personnel (education and training); and enhancing the laws and disciplines. Activities: (1) organization strengthening: structure; duty, responsibility and authority, (2) personnel: qualification and needs, education and training, (3) discipline.
6. Coordination. Activities: (1) coordination within the Ministry of Forestry, (2) coordination with the related agencies in the central government as well as local government, (3) coordination with NGOs working in the Park area.
7. Development of facilities and infrastructures. Activities: (1) development of management facilities, (2) development of facilities to sustainably use the Park.
8. Community participation. Activities: (1) programmes to improve community welfare (agroforestry, intensive agriculture, the development of eco-tourism, and development of accessibility); and (2) programmes to raise community awareness (promotion and exhibition of natural resources, leaflet/brochures distribution, promotion through print/electronics media, special events, and developing nature tourism information networks).

9. Research development. Subjects: (1) natural resources and ecosystem, (2) sustainable use and cultivation of the Park resources, and (3) management.
10. Monitoring and evaluation to improve the effectiveness of the park management. Indicators (1) the rate of illegal logging and encroachment, (2) the change of forest cover, (3) the abundance of key species, and (4) the number of visitors.

- **Coordination of management**

By nominating GLNP, KSNP, and BBSNP as TRHS, Indonesia is for the first time adopting a multi-sites approach to nominate different protected areas as one cluster natural World Heritage site. The nomination is expected to bring more international support and cooperation for developing projects and programmes to facilitate the coordination among the three Parks. Indeed, the World Heritage status as a cluster site is believed to be a useful tool to bring together local governments, NGOs and other stakeholders to cooperate with the national authority and international partners to apply the strategy of eco-region or other landscape level approaches for biodiversity conservation and protected area management.

In Indonesia, now under the decentralization era when most administrative elements are handed to district levels, as stipulated in the Act No. 22 of 1999 concerning the government autonomy, national parks and also conservation issues in general are still being held by the central authority. However, the central authority requires the cooperation and support from local governments in conserving the Parks and dealing with the conservation issues because the decentralization scheme does not guarantee that local governments will prioritize the central government's programmes. While bringing together the local governments and the central authority, the cluster World Heritage status would provide an important tool and instrument to help solving the problems threatening the nominated site, and facilitating the cooperation at the local and national levels.

As described in the previous sub-section, the management of GLNP, KSNP and BBSNP are provided by the management plans prepared separately based on specific conditions and potentials of each Park under the law on biological resources conservation, *UU RI No. 5 Tahun 1990*. Through the process of preparing this nomination dossier, management weakness and gaps of each of the three Parks have been identified and the outcome of this process may be used to revise or improve the management plans in the future. Once TRHS is inscribed as a World Heritage site, the status shall be used principally to enhance the current activities to implement coherent and coordinated management plans for the three Parks.

With the nomination of the three Parks as one cluster World Heritage site, the importance of coordination and cooperation among the three Park Managements is deeply acknowledged. Such coordination and cooperation would strengthen the Park Managements, and harmonise the objectives and actions of each Park. It also would

ensure an effective protection of the site's World Heritage values and full benefit of the World Heritage status.

Before creating a coordinating mechanism socialization workshops would be conducted locally and nationally. The local workshops would be held by July 2003 in Medan (for GLNP), Padang (for KSNP), and Tanjung Karang of Bandar Lampung (for BBSNP), all involving local stakeholders. The workshops would be aimed at informing the World Heritage nomination and progress for each of the three Parks to the local stakeholders, and discussing the mechanism for establishing a coordinating mechanism. The national workshop, involving representatives of local stakeholders, and national stakeholders such as PHKA, UNESCO, and NGOs, would be held before the end of 2003. This very much depends on the availability of funding for the workshop.

As the basis of the coordination and cooperation, common concept, strategy and actions would be developed under a 3-year follow up strategy plan for the cluster World Heritage site that would be prepared after the site is inscribed in the World Heritage list. Under this strategy plan, a coordinating structure that would be named *Badan Koordinasi Pengelolaan Warisan Dunia Hutan Hujan Tropis Sumatra* (Coordinating Body for the Management of the Tropical Rainforest Heritage of Sumatra World Heritage Site) would be established.

The coordinating body would meet each three or six months to discuss issues and problems that the three Park Managements may encounter, as well as possibilities for cooperation and coordination among the Parks consisting the site. The body may comprise the representatives of NGOs, UNESCO, and Directorate General of Forest Protection and Nature Conservation (PHKA), and the heads of the Park Managements of the three Parks who would represent the collaborative management board in each of the Parks. The collaborative management board of each of the Parks would comprise representatives of local governments, local NGOs, and local communities.

Main areas of initial cooperation and coordination that were generally agreed by the three Park Managements so far are as follow:

- Protection of flora and fauna, particularly threatened species of universal values, and ecosystems of the site against disturbances, especially encroachment, illegal logging, poaching and forest fires.
- Research, monitoring and assessment, and particularly building up a joint data base system with information linkage on flora, fauna, ecosystems and illegal activities.
- Promotion of ecotourism as a cluster World Heritage site with common policy and marketing.

- Environmental education and public awareness for stakeholders, especially local governments and communities.

To encourage these actions, information exchanges and capacity building for conservation, park management and sustainable development would be undertaken among the three Park Managements through regular meetings, email communication, staff exchange and training courses. For each areas mentioned above, a joint taskforce would be established when necessary.

Cooperation with NGOs and donor agencies would be required to launch some projects for the nominated site, supporting and linking the conservation and management of the three Parks. Therefore, while the possibilities of developing a financial support system are explored to secure funds for the coordination, partnerships with various stakeholder groups and participation of local communities shall be further promoted to ensure long-term commitment and support for the protection of the cluster World Heritage site.

In the future, the proposed coordinating body is expected to have more important roles and functions to discuss and promote regional conservation matters, such as on the the extension of the World Heritage site to other protection/conservation areas, and to develop a common or coordinated management plans as a cluster World Heritage site if appropriate.

k. Staffing Levels

The highest position in the park managements in Indonesia is head of the park. Under the head of the park are two sections, namely conservation and administration, each led by head of conservation section and head of administration section. The conservation section handles technical aspects of the park, while administration section deals with administrative matters. Under the head of conservation is head of conservation areas sub-section or regional conservation sub-section. Each of the Parks included in the nominated site has different number of head of conservation areas sub-section or regional conservation sub-section, depending on the number of the conservation areas sub-section or regional conservation sub-section within the Parks. In their duties each head of conservation area sub-section or regional conservation sub-section is helped by park rangers and technicians.

- **GLNP**

In GLNP, there are four heads of conservation areas sub-section, each is in charge of the Conservation Areas Sub-section of Alas Gayo in Blangkejeren, Aceh Selatan in Tapaktuan, Langkat Selatan in Bukit Lawang, and Langkat Sekundur in Besitang. GLNP Management is currently supported by 237 personnel, comprising of 7 personnel with structural position; 124 personnel with non-structural position; and 106 personnel with functional position, namely park ranger (82 personnel) and forestry technicians (24 personnel).

- **KSNP**

In KSNP, there are also four heads of regional conservation sub-section, each is in charge of the Regional Conservation Subsection of Jambi, Bengkulu, Sumatra Barat and Sumatra Selatan. KSNP Management is supported by 162 personnel, of which 105 are park rangers. Forty-nine personnel work in Sungai Penuh Head Office, 45 personnel in the Regional Conservation Sub-section of Jambi, 28 personnel in Bengkulu, 28 personnel in Sumatra Barat and 22 personnel in Sumatra Selatan.

- **BBSNP**

There are three heads of conservation areas sub-section in BBSNP, each is in charge of the Conservation Areas Subsection of Sukaraja, Krui, and Liwa. BBSNP Management structure comprises of 127 personnel: 6 personnel with structural position, 42 personnel with non-structural position, 8 forest technicians, 61 park rangers and 10 hired workers.

5. Factors affecting the property

a. Development pressures

- **Encroachment**

Encroachment is one of the most serious problems in the three Parks included in the nominated Tropical Rainforest Heritage of Sumatra (TRHS). In Gunung Leuser National Park (GLNP), the most serious edge encroachment, such as in the Langkat, Sekundur, and Alas Valley, was related to a system of small logging operations (HPHH leases), which were most active in the period of 1976-1988. Recent encroachments in the areas, such as Simpung, Marpunge, Jumalada, Sei Kerapuh, Sei Lapan, and Sei Minyak, are mainly in smaller scale and conducted by individuals or small groups aiming to convert areas in the Park into agriculture. GLNP Management has made several efforts to deal with the problem, such as persuading the individuals to leave the Park area, coordinating with local government to relocate them, and filing suits against those coordinating the encroachment, e.g. in Jumalada.

Kerinci Seblat National Park (KSNP) is especially vulnerable to encroachment because of its elongated and irregular shape. Maintaining and patrolling the approximately 2,600 km boundary is an enormous task for the Park Management. Despite the Park's long history of establishment, in many places people have not respected the Park border. In some other cases, people unknowingly have encroached within the Park or have settled within the Park before the establishment of KSNP. Many people cultivate the land and build houses within the Park, along the boundary, and sometimes far inside. The creation of cinnamon (*Cassiavera*) gardens and plantations in Kerinci and Merangin Districts have been one of the major forms of encroachment. Satellite images show that forest clearing has taken place in many areas within the Park, where relatively flat land borders human inhabitants. Only very steep slopes tend to slow the encroachment.

In Bukit Barisan Selatan National Park (BBSNP), the forest areas are converted into coffee plantations and *padi* (rice) fields, creating disturbance patches in the Park area. Serious edge encroachment in many parts of the Park by small logging operations (HPHH leases) also contribute significantly to the destruction in the Park area. PT Tanjung Jati, for example, was given permission to log the area outside the Park. In practice, however, PT Tanjung Jati logged the forest within the Park area from 1970 to 1980. The development of logging roads by PT Tanjung Jati caused further destruction to the Park and triggered illegal settlements within the Park area. Total area encroached in BBSNP reaches 24,267.50 Ha, spreading mostly around the boundary lines (642.5 Ha in Sukaraja Conservation Areas Subsection; 5,190 Ha in Krui Conservation Areas Subsection; and 18,435 Ha in Liwa Conservation Areas Subsection).

- **Illegal logging**

Illegal logging in the nominated site is a problem that is especially hard to deal with because there is often a lack of political will to enforce the law. Illegal logging has developed strong networks involving many powerful men. *Oknum* (corrupt personnel) of the police, army, other government offices, and parliament work together with strong businessmen (*cukong, tauke*) such as timber exporters and owners of illegal sawmills. They create a perception among local people that cutting timber within protected forests is an acceptable way of earning a living, and they motivate villagers to oppose law enforcement efforts. The situation is faced by GLNP, KSNP as well as BBSNP.



*Illegal logging is one of the major threats to the site's integrity
(Alain Compost/PHKA)*

The three Park Managements have made several efforts to deal with the problem, such as intensifying patrols, conducting special operations involving the police, and villagers to halt trucks used to carry the logs at the Parks borders, confiscating illegal logs, bringing the case to court, destroying the logging camps, and opening dialogue with the people living in the bufferzone villages.

In GLNP, the Park Management has conducted several operations to counter illegal logging, such as January 2000 Special Operation in Aceh Tenggara-Tanah Karo border, which confiscated 164.65 m³ of timber, arrested 10 people; July-August 2000 Special Operation in Lawe Gurah Recreational Forest, which confiscated at least 60 m³ of timber and arrested some violators; August 2000 Special Operation in Lawe Bengkung area which confiscated 425 m³ of logs; October 2000-March 2001 Operation in Lawe Gurah area; and May 2001 Monitoring, which identified at least 17 illegal sawmills in Aceh Tenggara District.

In KSNP, during the period between April 1998 and February 2001, 12,522 m³ of timber confiscated by the park rangers in Kerinci, Sarko/Merangin, Bungo Tebo, Solok/Sawah Lunto, Sijunjung, Pesisir Selatan, Rejang Lebong, Bengkulu Utara, and Musi Rawas Districts. Meanwhile, in January 2002, the Minister of Forestry sent a letter to the Governor of Jambi and Governor of Sumatra Barat, ordering concession areas in the bordering area of KSNP in both provinces, namely Serestra II and Duta Maju Timber, not to log trees within 3 km of their areas which border the Park area. In December 2001, KSNP Management has coordinated with Indonesia Police and Navy to form special teams (*Tim Wanalaga* and *Tim Wanabahari*) to counter illegal logging activities.

To monitor and protect BBSNP area, the Park Management has increased the protection of the Park through patrol and special operation; prosecuted those conducting illegal logging and encroachment in the Park area; secured the evidences, e.g. chainsaw; and to relocate illegal inhabitants within the Park area into the area outside the Park. In the operations during the year of 2001, BBSNP Management arrested 10 people, and confiscated 19.704 m³ of timber and 4 chainsaws.

- **Mining**

Mining threats to GLNP have been minor thus far. Oil drilling in Sekundur in the 1970s has not so far gone beyond the exploratory stage. Small exploratory mining of marble stones near Kungke along the Kutacane-Blangkejeren road has been halted. Plans for establishment of a cement producing factory near Bahorok became a serious threat in 1991/92. The plan showed an overlap with the Park area. However, following the criticism from NGO Leuser Lestari Foundation, the Ministry of Environment and several other parties, the Minister of Forestry has explained that no permits would be issued if the area overlapped with the Park.

In KSNP, small-scale illegal mining of gold using traditional methods in and around the Park has occurred for a long time; some started since the Dutch colonial time. The direct impacts of traditional mining activities to the Park area are not significant. However, access to mining area inside the Park may be used for other illegal purposes, such as poaching and illegal logging. Concern with the threat of mining activities to the Park and the exploration activities for coal mines in Pesisir Selatan District, at the end 2001, the Minister of Forestry sent a letter to the Minister of Mineral and Energy Resources, expecting the cancellation of all exploration and exploitation permits for mining activities which overlap with KSNP area.

- **Road Development**

The local government of the Nangroe Aceh Darussalam (NAD) Province has recently agreed to build a network of road across GLNP. Ladiagalaska (Laut India (Indian Ocean)-Gayo-Alas-Selat Malaka) Road Project is a project to build a network of road that will connect isolated areas in the NAD Province. The project was pushed to stop in 1997 due to economic crisis which shattered the national economy. It, however,

has restarted in 2002 and is targeted to connect Aceh Tengah District–Gayo Lues-Lokop, Aceh Timur District. The road development project, predicted to finish in three years time, is feared to cause further fragmentation to the forests in the GLNP area. Strong oppositions have come, especially by NGOs.

The development of short-cut road across BBSNP (from Sanggi to Bengkumat; Liwa to Krui; Pugung Tampak to Way Menula) has also put the Park in the great danger of fragmentation. As the Park area is divided into smaller parts, isolated condition for the wildlife, especially mammals, in terms of home range and migration mobility, is created, leading to local extinction. The road development across BBSNP also increases the possibility and opportunity for disturbance and population pressures from the areas outside the Park into every zone of the Park.

- **Poaching**

Poaching is one of the most serious problems faced by KSNP Management. Despite regular patrol activities by the park rangers and special operations involving the Police and NGOs, poaching networks still operate in parts of the Park and place particular strain on the critically endangered Sumatran rhino and Sumatran tiger. During 2001, at least 10 Sumatran tiger were killed by poachers. Other animals targeted by poachers are Sambar deer, wild pig, and birds.

Poaching, using fire arms and poison, has been a problem in BBSNP. This illegal activity threatens the conservation efforts of large mammals such as Asian elephant, Sumatran tiger, Sumatran rhinoceros, Sambar deer, and several species of birds. Surveys conducted in BBSNP shows that 32 tigers were killed during the period between 1998 and 2001 (Kompas, 1998; data WWF). This means that more than 8 tigers were killed each year during the period. To reduce the pressures of poaching activities, WCS-IP has worked together with Indonesian Rhinoceros Conservation Program (*Program Konservasi Badak Indonesia or PKBI*) to create Tiger Protection Unit (TPU). TPU conducts anti poaching patrol activities for tiger protection, and monitors the distribution and population of the threatened species.

b. Environmental Pressures

No significant case relating to environmental pressures has been reported in GLNP, KSNP and BBSNP.

c. Natural disasters and preparedness

Forest disturbances, especially agriculture expansion and encroachment, have increased the risk of fires in the protected areas in Indonesia. The largest and most recent fires in Sumatra happened from September to December 1997. A remote sensing assessment of the area burned in 1997 indicated that approximately 1.5 million Ha was affected in Sumatra (Schweithelm, 1999). In BBSNP the fires caused

the destruction of approximately 1,645 Ha forest area in Sekincau, Sumberejo-Way Canguk, and Kaur Gading.

As the case with Kalimantan, the prolonged dry season caused by the El Nino climatic phenomenon created the conditions for the conflagration in Sumatra. However, the fires were mostly caused by human activities (Barber and Schweithelm, 2000; Kinnaird and O'Brien, 1998). Twenty-nine plantation, timber, and transmigration land clearing firms were suspected of deliberate large scale burning within their work areas, and their license were revoked by the Government (Schweithelm, 1999).

Most of the preparedness for natural disaster, especially forest fires and Earthquake, in GNLP, KSNP and BBSNP have been included in the protection measures of each of the Park Management Plans (See section 4c. Protective measures and means of implementation).

d. Visitor/tourism pressures

There has been very limited development of tourism within GLNP, KSNP and BBSNP.

In GLNP, the highest growth of development of tourism within the Parks is around the Orangutan Rehabilitation Project in Bukit Lawang, the lower Alas Valley, and in Ketambe/Lawe Gurah. Since 1978, specialized eco-tourism activities, such as jungle trekking and river rafting have developed steadily, although they remains small-scale by international standards. However, the eco-tourism development has as yet not led to increased encroachment on the Park land or increased harvesting of forest products by local people (Elliot & Desrochers, 1996).

In KSNP, there is no report indicating that visitor/tourism has led to increased encroachment on the Park land or increased harvesting of the forest products by local people so far.

The same situation occurs in BBSNP, where numbers of visitor to from 1995 to 2001 is relatively stable and much lower than GLNP and KSNP (see Section 4i. Visitor Facilities and Statistics). Indeed, no pressure related to visitor or tourism activities has been reported to occur in BBSNP.

e. Number of inhabitants within property, buffer zone

- **GLNP**

GLNP is surrounded by 31 buffer zone sub-districts (*kecamatan*), located in the four districts (*kabupaten*) of Aceh Tenggara and Aceh Selatan in the Nangroe Aceh Darussalam (NAD) Province, and Langkat and Karo in Sumatra Utara Province. The number of inhabitants living in the 31 buffer zone sub-districts continues to increase.

A total number of 583,219 inhabitants was reported to live there in 1970. In 1980, the number rose to 751,658 people, and according to National Census in 1990, the number grew to 867,192 people. Ten sub-districts with the highest population density among the 31 sub-districts are Lawe Singgala, Babel, Babussalam, Tapaktuan, Manggeng, Sungai Bingei, Kuala, Simpang Ampat and Payung.

The development of inhabitants also happens within GLNP boundary. By 1990 several enclaves, namely Tebah, Wampu, Gumpang, Sembelin, Liang Lebah and Marpunga, comprising of small number of people, were found in the Park. GLNP Management has tried to solve the problem by creating Enclave Development Programme, aiming at gathering small groups of people living in the Park to an area outside the Park. In the new places, those people are then trained to develop their community so that they no longer cause disturbance to the Park. This programme is conducted by GLNP Management under the surveillance from the local governments.

- **KSNP**

In KSNP, the total population around the Park area in 9 buffer zones districts in 1996 was 3,647,241 inhabitants, compared to 3,062,026 inhabitants in 1986. Musi Rawas District has the highest population of all districts in 1996 with 596,156 inhabitants. Rejang Lebong, Kerinci, and Pesisir Selatan Districts have the highest population density in 1996 with each having 102.5 individu/km², 70.2/km², and 69.1/km². Coupled with its high population growth rate, Rejang Lebong District also has the highest population density of all KSNP districts, followed by Kerinci, Pesisir Selatan and Solok Districts.

- **BBSNP**

BBSNP is surrounded by 20 buffer zone sub-districts located in the 4 districts of Tanggamus and Lampung Barat in the Lampung Province; Bengkulu Selatan in Bengkulu District; and Ogan Komering Ulu in the Sumatra Selatan Province. Meanwhile, 4 enclaves are located in the Lampung Barat District within the Park boundary, namely Way Haru (4,900 Ha), Pengekahan (671 Ha), Kubu Perahu (100 Ha), and Suoh (15,000 Ha). Way Pamekahan and Way Haru have been established since a century ago, long before the area was given the national park status. According to data from BBSNP Management and WWF in 2001, the total number of inhabitants in the 20 buffer zone sub-districts, including the 4 enclaves, was 225,471.

The 11 sub-districts of Lampung Barat District, including Pengekahan and Way Haru enclaves in Bengkuntan sub-district; Kubu Perahu enclave in Balik Bukit sub-district; and Suoh enclave in Suoh sub-district, comprise 148,208 people, inhabiting a total area of 276,953 Ha. The four buffer zone sub-districts in Tanggamus District comprises of 48,536 people, inhabiting a total area of 28,761 Ha; the two bufferzone sub-districts in Ogan Komering Ulu District comprise 19,777 people, inhabiting a total area of 69,173 Ha; and the three bufferzone sub-districts in Bengkulu Selatan District comprise 8,950 people, inhabiting a total area of 20,500 Ha.

f. Changing governance structure

With the fall of the centralized Soeharto's regime in 1998, Indonesia has moved towards a decentralized era. Most administrative elements are now handed to district levels as stipulated in the Act No. 22 of 1999 concerning the government autonomy. However, protected areas and conservation issues in general are determined to still be under the central government. One of the arguments for excluding the protected areas from the autonomy system is that many of them are located across district or even provincial boundary, and, therefore, it would be difficult and risky for the central government to transfer the park administration into local level. Some of the district government also appear to be reluctant to manage the protected areas, as it may not produce lucrative revenue.

While the transformation to decentralisation has brought positives influences, it has also brought difficulties. On the one hand, the pressures towards decentralisation help building the awareness of the local stakeholders on the importances of protected areas. In KSNP, for example, four Governors and 9 *Bupati* (District Head) whose areas overlap with the Park area, and Head of District Parliament (*DPRD Kabupaten*) signed the Note of Agreement on Protection and Conservation on 27 February 2002. The agreement stated that all parties will work together to protect, secure and conserve KSNP; fill a law suit and give administrative sanction according to the present law to any party who directly or indirectly causes disturbance to the Park, and review the laws that contradict with efforts to conserve KSNP.

On the other hand, the decentralisation makes the central government more dependent on the support and cooperation by the local authorities to conserve the protected areas and deal with the conservation issues because the scheme does not guarantee that local governments will prioritize the central government's programmes. The pressures towards decentralisation are actually shifting decision making power from the central authority to the provincial and local authorities who sometimes focus primarily on economic activities, which might threaten the protected areas in their areas. In this context, the framework of cluster World Heritage status would provide an important tool and instrument to help bringing together local, national, and international stakeholders, and help solving the problems threatening the nominated site, as well as facilitating cooperation at all levels.

6. Monitoring

The monitoring of the Parks consisting the nominated site is currently conducted by each of the three Park Managements.

After the inscription of TRHS as one cluster natural World Heritage, steps would be taken to develop a coordinating mechanism among the three Park Managements. The coordinating body would consist of the representatives of NGOs, UNESCO, and Directorate General of Forest Protection and Nature Conservation (PHKA), and the the Park Managements of the three Parks who would represent the collaborative management board in each of the Parks. Each collaborative management board of the Parks would consist of representatives of local governments, local NGOs, and local communities (see subsection Coordination of management under the section 4j. Property management plans and statement of objectives).

The presence of a coordinating mechanism would strengthen the Park Managements, and harmonise the objectives and actions of each Park. The coordinating body would meet each three or six months to discuss issues and problems that the three Park Managements may encounter, as well as possibilities for cooperation and coordination among the Parks consisting the site. This mechanism would also ensure an effective protection and monitoring of the site, involving the stakeholders mentioned above.

a. Key indicators for measuring state of conservation

At present, monitoring and evaluation activities in the Parks included in the nominated site are aimed at assessing the achievement of the Park Managements programmes by employing a number of predetermined criteria, with the objective of using the assessment to improve the effectiveness of management.

Key indicators for measuring the state of conservation are as follow:

- Forest loss. Criteria assessed: protection of watersheds, preservation of biodiversity, protection of endangered species, and stabilization of climate.
- Abundance of indicator species. Criteria assessed: preservation of biodiversity, protection of endangered and endemic species.
- Number of research projects and publications produced. Criteria assessed: promotion of research, education and training.
- Number of visitors. Criteria assessed: provision of nature recreation.
- Management policies implemented based on research results. Criteria assessed: improvement of park management capacity.

- Arrest and prosecutions. Criteria assessed: improvement of park management capacity.

e. Administrative arrangements for monitoring property

In the current system, the Heads of GLNP Management, KSNP Management, and BBSNP Management report directly to Directorate General of Forest Protection and Forest Conservation (*Direktorat Jendral Perlindungan Hutan dan Konservasi Alam* or *PHKA*) within the Ministry of Forestry. The mechanism requires each of the Park Managements to write Monthly Report (*Laporan Bulanan*), Trimester Report (*Laporan Triwulan*), Semester Report (*Laporan Semester*), Annual Report (*Laporan Tahunan*), and Accountability Report (*Laporan Akuntabilitas*) and submit them to *PHKA*.

Monthly Report comprises assesment on functional operations for forest protection; disturbance controlling; number of visitor; forest fires occurrence; and forest fires recapitulation.

Trimester Report comprises assesment on weeds, pests, and disease prevention and controlling; orangutan rehabilitation activities; elephant training center condition; protected plant propagation; protected wild animal breeding; non-protected wild animal breeding; wild animal encounter occurrence; non-wild animal encounter occurrence; problems faced by the area; domestic cooperation realisation; abroad technical cooperation realisation; inventory goods mutation; staff distribution recapitulation (based on education levels, and spatial grouping).

Semester Report comprises assesment on functional operations in the conservation area; conditions of forest protection personnel; conditions of forest protection equipments; ecotourism development planning; ecotourism potential conditions; ecotourism entrepreneurship conditions, community empowerment in ecotourism activities; research and education at ecotourism sites; tourism accident occurrence; list of NGOs in nature conservation in the area; conservation cadre activities; buffer zone management activities; conservation area uses for non-forestry activities; life support system area and wet land ecosystem study/monitoring; information materials list; and conditions of forest fires controlling equipments.

Annual Report comprises annual assesment on list of nature clubs; size development and area function; area boundary system; zonation system; inventory equipment conditions.

Meanwhile, Accountability Report is an annual responsibility report by the Head of the Parks, describing problems encountered by the park management and the Parks' achievements in efforts to protect and conserve the areas during the year. The report serves as evaluation for further improvement in the park management in the years to come.

f. Results of previous reporting exercises

The following is a resume of some of the most recent reporting exercises included in Accountability Report 2001 by the three Parks Managements:

1) Problems in park management

This section explores the problems faced by the Park Managements. GLNP Management underlines problems such as human resources quality, insufficient personnel to protect the Park (1 personnel for 4,000 Ha), *oknum*s (corrupt people) supporting and encouraging encroachment within the Park, and socio-economic conditions of local community which are badly influenced by economic crisis. The problems underlined by KSNP Management are forest cover loss by 10% from 1998 to 2000, illegal logging activities, and threats to the Park's staffs. The problems underlined by BBSNP Management are the elongated form of the Park which increases disturbances, especially encroachment, poaching, road development, weak coordination with related agencies, and misperception about the role of the Park.

2) Efforts taken or achievements

To counter the problems, GLNP Management has taken several measures, including improvement of the staff quality through trainings and staff exchanges with other agencies, boundary reconstruction, socialization and advisory on the conservation area to local communities, coordination to improve law enforcement, and buffer zone management. Measures taken by KSNP Management include coordination with related agencies. This resulted in official letter dated December 2001 by the Minister of Forestry to the Minister of Mining and Energy to halt permission to make exploration and exploitation within the Park area. In July 2001, a special team was established to protect the Park. In December 2001, Directorate General of Forest Protection and Nature Conservation (PHKA) signed a cooperation with Indonesian Police and Navy to establish special team to counter illegal logging in KSNP. BBSNP Management has taken several measures: optimalization of the Park protection and conservation by increasing patrol activities, proposing activities to improve local economy, advisory and coordination; rehabilitation of disturbed areas; and awareness campaigns.

3) Community outreach

During 2001, GLNP, KSNP, and BBSNP Managements conducted community outreach through activities/programmes such as less developed village program, enclave development program *bina cinta alam* activities (conservation education activities), leaflet distribution, and Wana Rally in GLNP; village conservation agreement, conservation education (e.g. drawing contest), information dissemination through advisory, the Park's website www.kerinci.org in KSNP; conservation education, bulletin and leaflet distribution, and expose in BBSNP. See also Section

3e. Policies and Programmes Related to the Presentation and Promotion of the Property and 4f. Agreed Plan Related to the Property.

4) Capacity building

See Section 4h. Source of expertise and training in conservation management techniques.

5) Research

GLNP Management has coordinated with universities to encourage research on the subjects that support the conservation of the Park. The presence of two stations at the Ketambe River and Bahorok River in Langkat has played a vital role in the development of research, protection and ecotourism of GLNP since their establishment in 1972 and 1976. In fact, the number of researcher coming to GLNP is increasing: in 1999/2000, 34 researchers comprising 12 Indonesians and 22 foreigners visit the Park, and in 2000, the number rose to 60 researchers, comprising 45 Indonesians and 15 foreigners.

Research activities conducted in KSNP during 2001 were dominated by researchers receiving small-scale fund from Kerinci Seblat-Integrated Conservation and Development Project (KS-ICDP). Up to 2001, KS-ICDP funded 30 research titles for researchers in the four provinces surrounding the Park.

During 2001, not least than 15 research activities were conducted in BBSNP by students from various universities. The activities range from 36 days to 6 months in duration, and covers topics such as population and daily activities of siamang; Sukaraja Village community life pattern towards BBSNP; forest fires prevention and controlling; factors influencing social interactions in the buffer zone areas, bird monitoring; and green turtle behaviour.

6) Tourism

See Section 4i. Visitor facilities and statistics, and 5d. Visitor/tourism pressures.

7) Partnership

GLNP Management receives supports from the government agencies and NGOs: the World Wide Fund for Nature (WWF) Indonesia, Leuser Development Programme (LDP), and the Conservation International Indonesia (CI Indonesia). KSNP receives supports from the government agencies, and NGOs: the Flora and Fauna International (FFI), WWF Indonesia, and the Indonesian Biodiversity Foundation (Kehati). BBSNP Management receives supports from Government agencies and NGOs: the Wildlife Conservation Society Indonesia Programme (WCS-IP), WWF Indonesia, Indonesian Rhino Conservation Program (PKB), and PT. Sac Nusantara.

See also Section 4e. Level at which the management is exercised and names and addresses of responsible person for contact purpose and 4f. Agreed plan related to the property.

8) Source of finance

See Section 4g. Sources and levels of finance.

9) Flora and fauna inventory

GLNP Management conducted an inventory of flora and fauna in the Park area. The inventory succeeded in identifying key species of the Park, such as *Panthera tigris sumatrae*, *Dicerorhinus sumatrensis*, *Pongo abelii*, *Elephas maximus*, *Presbytis thomasi*, *Rattus hoogerwerfi*, *Cuon alpinus*, and *Helarctos malayanus*.

KSNP Management conducted records of the Park's flora and fauna diversity in accordance with the Flora and Fauna International (FFI) and World Wild Fund for Nature (WWF) Indonesia. In April 2002, KSNP Management through Integrated Conservation and Development Project has revised an inventory of fauna in the Park, especially for mammals and birds. The result can be seen in Appendix III.

BBSNP Management conducted survey and inventory of key mammal species within the Park area in coordination with NGOs working in the area (WCS-IP and WWF) and Forest Inventory and Monitoring Programme (FMIP)-European Union Project. BBSNP Management and FMIP-EU Project assessed mammal, bird, and herpetofauna of the Park in two phases: 1) November 1997-March 1998 in the areas of Sukaraja, Pemerihan, Kubu Perahu and Rataagung; 2) August 1998 in Air Sambat area. During the year 1997 and 2001, BBSNP Management also worked together with WCS-IP to conduct surveys on mammal, bird and plant species of the Park. The inventory succeeded in identifying key species of the Park, such as *Panthera tigris sumatrae*, *Dicerorhinus sumatrensis*, *Pongo abelii*, *Elephas maximus*, *Presbytis thomasi*, *Rattus hoogerwerfi*, *Cuon alpinus*, and *Helarctos malayanus*

10) Arrest and prosecution

GLNP, KSNP, and BBSNP Managements have conducted regular monitoring, and special operation in coordination with related agencies (local governments, Indonesian Army, and NGOs) to halt illegal activities in the Parks areas.

Some of the operations in the GLNP area have resulted in several arrests and prosecution processes are as follow:

- January 2000 Special Operation in Aceh Tenggara-Tanah Karo border. Ten trucks carrying 164.65 m³ of timber are halted. The 10 drivers are taken to court and the timbers were auctioned.

- July-August 2000 Special Operation in Lawe Gurah Recreational Forest. Illegal logging activities in the area are halted. At least 60 m³ of timber are destroyed, and the violators are prosecuted.
- August 2000 Special Operation in Lawe Bengkung area. Illegal logging activities in the area are halted and 425 m³ of logs are confiscated.
- October 2000-March 2001 Operation in Lawe Gurah area. Logs and other evidences of illegal logging activities were destroyed.
- May 2001 Monitoring identified at least 17 illegal sawmills in Aceh Tenggara District.

According to the law enforcement data of KSNP Management, during the period between 8 January 2001 and 7 December 2001, KSNP Management conducted 20 special operations following information from the park rangers. The evidences confiscated during the operations included 35.612 m³ of logs, 3,170 pieces of manau rattan, 13 chainshaws, 5 trucks and 1 pick-up L-300, 1 fire arm and 11 bullets, and 75 people were arrested.

To monitor and protect the Park area, BBSNP Management has increased the protection of the Park through patrol and special operation; prosecuted those conducting illegal logging and encroachment in the Park area; secured the evidences, e.g. chainshaw; and relocated illegal inhabitants within the Park area into the area outside the Park. In the operations during the year of 2000, the Park Management arrested 7 people, all brought to court, and confiscated 15.95 m³ of logs, 4 chainshaws, 3 manual chains, 2 swords, and 1 plastic tent.

7. Documentation

a. Photographs

Photographs of the landscapes and species diversity in each of the three Parks forming TRHS can be seen in the CD attached.

b. Copies of property management plans and extracts of other plans relevant to the property

Copies of the following plans are attached to this nomination dossier:

- GLNP Management Plan
- KSNP Management Plan
- KSNP Management Framework
- BBSNP Management Plan
- Law on the Biological Resources Conservation No. 5 Year 1990
- Law on the Forestry No. 41 Year 1999
- Government Regulation on the Nature Reserve and Nature Protection No. 68 Year 1998

c. Address where inventory, records and archives are held:

- **Gunung Leuser National Park (GLNP)**

Jl. Tanah Merah, Kutacane
Aceh Tenggara
Nangroe Aceh Darussalam, Indonesia
Telp: +62-629-21358
Fax : +62-629-21016

- **Kerinci Seblat National Park (KSNP)**

PO Box 40 Sungai Penuh,
Kerinci 37101
Jambi, Indonesia
Telp: +62-748-22250, 22240
Email: btnks@kerinci.org
Homepage: www.kerinci.or.id

- **Bukit Barisan Selatan National Park (BBSNP)**

Jl. Ir. H. Juanda No. 19
Kotaagung - Tenggamus 35751
Lampung, Indonesia
Telp/Fax : +62-722-21064

- **Directorate General of Forest Protection and Nature Conservation (PHKA)**

Ministry of Forestry - Republic Indonesia
Manggala Wanabhakti Block VII, 7th Floor
Jl. Jend. Gatot Subroto
Jakarta 10270, Indonesia
Telp/Fax: +62-21-5720229

- **Indonesian Institute of Science (LIPI)**

Jl. Jend. Gatot Subroto No. 10
Jakarta 12710, Indonesia
Telp: +62-21-5251831, 5255641
Fax: +62-21-5257226, 5225709, 5255085
Homepage: www.lipi.go.id

- **The Indonesian Biodiversity Foundation (KEHATI)**

Yayasan KEHATI
Patra Jasa Building
Jl. Gatot Subroto Kav. 32-34
Jakarta 12950, Indonesia
Telp: +62-21-5228031, 5228032
Fax: +62-21-5228033
Email: kehati@indo.net.id

- **Conservation International (CI) Indonesia**

Jl. Taman Margasatwa No. 61
Jakarta Selatan 12540, Indonesia
Telp: +62-21-78838624, 78838626
Homepage: www.conservation.or.id

- **Flora and Fauna International (FFI)**

P.O. Box 42
Sungai Penuh, Kerinci
Jambi 12007, Indonesia
Telp/Fax: +62-748-22267

- **Leuser Development Programme (LDP)**

Jl. Dr. Mansyur 68
Medan 20154, Indonesia
Telp: +62-61-8216800
Email: leuser@eu-ldp.co.id

- **Warsi**

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**APPENDIX I:
SPECIES LISTS OF GUNUNG LEUSER NATIONAL PARK (GLNP)**

I-1. Mammal species recorded in GLNP or near the border of the Park (Van Strien, 1996):

Family	Scientific name
Erinaceida	<i>Echinosorex gymnurus</i> <i>E. gymnurus gymnurus</i> <i>Hylomys suillus</i> <i>H. suillus maxi</i>
Soricidae	<i>Crocidura attenuate</i> <i>C. attenuate aequicauda</i>
Tupaiaidae	<i>Tupaia glis</i> <i>T. glis demissa</i> <i>T. glis jacki</i> <i>T. javanica</i> <i>T. tana</i> <i>T. tana tana</i>
Cynocephalidae	<i>Cynocephalus variegates</i> <i>C. variegates temminckii</i>
Pteropodidae	<i>Chironax melanocephalus</i> <i>C. melanocephalus melanocephalus</i> <i>Cynopterus brachyotis</i> <i>C. brachyotis brachyotis</i> <i>C. horsfieldii</i> <i>C. horsfieldii lyoni</i> <i>C. minutes</i> <i>C. sphinx</i> <i>C. sphinx angulatus</i> <i>C. titthaechleilus</i> <i>Pteropus vampyrus</i> <i>P. vampyrus malaccensis</i>
Rhinopomatidae	<i>Emballonura monticola</i> <i>E. monticola monticola</i> <i>Saccolaimus saccolaimus</i> <i>S. saccolaimus saccolaimus</i>
Rhinolophidae	<i>Rhinolophus acuminatus</i> <i>R. acuminatus sumatranus</i> <i>R. acuartus</i>
Hipposideridae	<i>Hipposideros diadema</i> <i>H. diadema masoni</i> <i>H. larvatus</i> <i>H. larvatus neglectus</i>
Vespertilionidae	<i>Myotis muricola</i>

	<i>M. muricola muricola</i> <i>Tylonycteris robustula</i> <i>T. robustula robustula</i> <i>Miniopterus pusillus</i> <i>M. pusillus pusillus</i>
Lorisidae	<i>Nycticebus coucang</i> <i>N. coucang coucang</i>
Cercopithecidae	<i>Macaca fascicularis</i> <i>M. nemestrina</i> <i>M. nemestrina nemestrina</i> <i>Presbytis cristata</i> <i>P. cristata cristata</i> <i>P. thomasi</i> <i>P. thomasi thomasi</i> <i>P. thomasi margae</i> <i>P. thomasi nubile</i>
Hylobatidae	<i>Hylobates lar</i> <i>H. lar vestitus</i> <i>H. syndactylus</i> <i>H. syndactylus syndactylus</i> <i>Pongo pygmaeus</i> <i>P. pygmaeus abelii</i>
Canidae	<i>Cuon alpinus</i> <i>C. alpinus sumatrensis</i>
Ursidae	<i>Helarctos malayanus</i> <i>H. malayanus malayanus</i>
Mustelidae	<i>Martes flavigula</i> <i>M. flavigula lasiotis</i> <i>Mustela nudipes</i> <i>Arctonyx collaris</i> <i>A. collaris hoevenii</i> <i>Aonyx cinerea</i> <i>A. cinerea cinerea</i> <i>Lutra lutra</i> <i>L. lutra barang</i> <i>L. perspicillata</i> <i>L. perspicillata perspicillata</i>
Viverridae	<i>Prionodon linsang</i> <i>P. linsang linsang</i> <i>Viverra zangalungan</i> <i>V. zangalungan zangalungan</i> <i>V. indica athinensis</i> <i>Arctitis binturong</i> <i>A. binturong binturong</i> <i>Paguma larvata</i> <i>P. larvata leucomystax</i> <i>Paradoxurus hermaphroditus</i> <i>P. hermaphroditus musanga</i> <i>Cynogale bennettii</i>

	<i>C. bennettii bennettii</i>
Herpestidae	<i>Herpestes brachyurus</i> <i>H. brachyurus brachyurus</i>
Felidae	<i>Felis bengalensis</i> <i>F. bengalensis sumatrana</i> <i>F. temminckii</i> <i>F. temminckii temminckii</i> <i>Neofelis nebulosa</i> <i>Panthera tigris sumatrae</i>
Elephantidae	<i>Elephas maximus</i> <i>E. maximus sumatranus</i>
Rhinocerotidae	<i>Dicerorhinus sumatrensis</i> <i>D. sumatrensis sumatrensis</i> <i>Rhinoceros sondaicus sondaicus</i>
Suidae	<i>Sus scrofa</i> <i>S. scrofa vittatus</i>
Tragulidae	<i>Tragulus javanicus</i> <i>T. javanicus kanchil</i> <i>T. napu</i> <i>T. napu napu</i>
Cervidae	<i>Cervus unicolor</i> <i>C. unicolor equinus</i> <i>Muntiacus muntjak</i> <i>M. muntjak montanus</i>
Bovidae	<i>Capricornis sumatraensis</i> <i>C. sumatraensis sumatraensis</i>
Sciuridae	<i>Callosciurus albescens</i> <i>C. albiculus</i> <i>C. nigrovittatus</i> <i>C. nigrovittatus acraeus</i> <i>C. nigrovittatus bocki</i> <i>C. notatus</i> <i>C. notatus tapanulius</i> <i>C. prevostii</i> <i>C. prevostii piceus</i> <i>Lariscus insignis</i> <i>L. insignis atchinensis</i> <i>L. niobe</i> <i>Ratufa bicolor</i> <i>R. bicolor palliata</i> <i>Rhinosciurus laticaudatus</i> <i>R. laticaudatus saturatus</i> <i>Sundasciurus altitudinis</i> <i>S. hippurus</i> <i>S. hippurus hippurus</i> <i>S. lowii</i> <i>S. lowii humilis</i>

S. tenuis
S. tenuis tenuis
S. tenuis modestus
S. tenuis surdus
Petaurista elegans
P. elegans sumatranus
P. petaurista
P. petaurista batuanus

Muridae

Rhizomys sumatrensis
R. sumatrensis insularis
Leopoldamys edwardsi
L. edwardsi setiger
Maxomys hylomyoides
M. rajah
M. rajah lingensis
M. rajah pallax
M. rajah similes
M. whiteheadi
M. whiteheadi batus
Niniventer bukit
N. bukit jacobsoni
N. rapit
N. rapit fraternus
Rattus argentiventer
R. exulans
R. exulans ephippium
R. hoogerwerfi
R. rattus
R. rattus diardii
R. tiomanicus
R. tiomanicus blangorum
Sundamys infraluteus
S. infraluteus atchinus
S. muelleri

Hystricidae

Hystrix brachyura
H. brachyuran brachyuran
H. sumatrae
Trichys fasciculata

I-2. Bird list of GLNP (J. Wind; June 1993)

Scientific Name

Ardea purpurea
Bubulcus ibis
Butorides striatus
Nycticorax nycticorax
Gorsachius melanolopus
Ixobrychus cinnamomeus
Pernis ptilorhynchus
Macheiramphus alcinus
Ichthyophaga humilis
I. ichthyaetus
Spilornis cheela
Accipiter trivirgatus
A. virgatus
Ictinaetus malayensis
Hieraaetus kienerii
Spizaetus cirrhatus
S. alboniger
S. nanus
Microhierax fringillarius
Falco perenigrus
Dendrocygna javanica
Cairina scutulata
Melanoperdix nigra
Coturnix chinensis
Arborophila orientalis
A. rubrirostris
Rollulus rouloul
Lophura hoogerwerfi
L. ignornata
L. ignita
Gallus gallus
Polyplectron chalcureum
Argusianus argus
Turnix suscitator
Amaurornis phoenicurus
Gallinula chloropus
Heliopais personata
Rostratula benghalensis
Actitis hypoleucos
Gallinago stenura
Scolopax saturata
Treron oxyura
T. sphenura
T. capellei
T. curvirostra
T. fulvicollis
T. olax
T. vernans
Ptilinopus jambu
Ducula aena
D. badia
Macropygia unchall

M. ruficeps
Streptopelia chinensis
Geopelia striata
Chalcophaps indica
Psittacula longicauda
P. cyanurus
Loriculus galgulus
Clamator coromandus
Cuculus sparveroides
C. vegans
C. micropterus
C. saturatus
Cacomantis merulinus
Chrysococcyx xanthorhynchus
C. minutillus
Surniculus lugubris
Eudynamis scolocapea
Rhopodytes diardi
R. sumatranus
R. tristris
Rinortha chlorophea
Zanlotomus javanicus
Rhamphococcyx curvirostris
Carpococcyx radiceus
Centropus sinensis
C. bengalensis
Phodilus badius
Otus spilocephalus
O. brookii
O. lempiji
Bubo sumatranus
Ketupa ketupu
Glaucidium brodiei
Ninox scutulata
Strix leptogrammica
Batrachostomus poliophus
Eurostopodus temminckii
Caprimulgus macrurus
C. affinis
C. pulchellus
Aerodromus fuchipagus
Callocalia esculenta
C. linchi
Hirundapus cochinchinensis
H. giganteus
Raphidura leucopygialis
Apus affinis
Cypsirius balasiensis
Hemiprocne longipennis
H. comata
Harpactes reindwardtii
H. kasumba
Harpactes diardii
H. orrhophaeus

H. duvaucelii
H. oreskios
H. erythrocephalus
Alcedo atthis
A. meninting
A. euryzona
Ceyx erithacus
Pelargopsis capensis
Lacedo pulchella
Halcyon smyrnensis
H. pileata
H. chloris
Actenoides concretus
Merops leschenaultia
M. viridis
Nyctyornis amictus
Eurystomus orientalis
Berenicornis comatus
Anorrhinus galeritus
Rhyticeros corrugatus
R. undulates
Anthracoceros malayanus
A. albirostris
Buceros rhinoceros
B. bicornis
Rhinoplax vigil
Psilopogon pyrolophus
Megalaima chrysopogon
M. rafflesii
M. mystacophanus
M. oorti
M. henricii
M. australis
M. haemacephala
Calorhamphus fuliginosus
Indicator archipelagicus
Picumnus innominatus
Sasia abnormis
Celeus brachyurus
Picus canus
P. flavinucha
P. mentalis
P. chlorolophus
P. pinuceus
P. miniaceus
Dinopium rafflesii
Meiglyptes tristis
M. tukii
Dryocopus javanensis
Dendrocopos canicapillus
D. moluccensis
Hemicircus concretus
Blythipicus rubiginosus
Reindwardtipicus validus
Corydon sumatranus
Cyambirhynchus macrorhynchus
Eurylaimus javanicus
E. ochromalus
Serilophus lunatus
Psarisomus dalhousiae
Calyptomena viridis
Pitta schneideri
P. granatina
P. guajana
P. sordida
P. moluccensis
Hirundo rustica
H. tahitica
Delichon dasypus
Dendronanthus indicus
Motacilla cinerea
Anthus noevaeseelandiae
Coracina larvata
C. striata
C. fimbriata
Lalage nigra
Pericrocotus divaricatus
P. solaris
P. miniatus
P. flemmeux
Hemipus picatus
H. hirundinaceus
Tephrodornis gularis
Pycnonotus zeylanicus
P. leucogrammicus
P. tympanistrigus
P. melanoleucos
P. atriceps
P. melanicterus
P. squamatus
P. eutilotus
P. nieuwenhuisii
P. bimaculatus
P. goavier
P. plumosus
P. simplex
P. brunneus
P. erythroptalmos
Criniger ochraceus
Criniger. bres
C. phaeocephalus
Hypsipetes charlottae
H. criniger
H. malaccensis
H. virescens
H. flavala
Aeghetina tiphia
Chloropsis sonnerati
C. cyanopogon
C. cochinchinensis
Chloropsis aurifrons
C. venusta

Irena puella
Lanius tigrinus
L. cristatus
L. schach
Brachypteryx leucophrys
B. montana
Copsychus saularis
C. malabaricus
C. pyropygus
Cinclidium diana
Enicurus velatus
E. ruficapillus
E. leschenaulti
Cochoa beccarii
Monticola solitarius
Myophonus melanurus
M. glaucinus
M. caeruleus
Zoothera siberica
Z. andromedae
Z. dauma
Turdus poliocephalus
Eupetes macrocerus
Pellorneum capistratum
Trichastoma buttikorferi
T. malaccense
T. bicolor
T. sepiarium
T. abbotti
T. vanderbilti
Malacopteron magnirostre
M. affine
M. cinereum
M. magnum
Pomatorhinus montanus
Rimator malacoptilus
Naphothera macrodactyla
N. marmorata
N. epilepidota
Pnoepyga pusilla
Stachryis rufifrons
S. chrysaea
S. nigriceps
S. poliocephala
S. striolata
S. maculata
S. leucotis
S. nigricollis
S. erythroptera
Macronous gularis
M. ptilosus
Garullax palliatus
G. leucolophus
G. lugubris
Garullax mitratus
Leiothrix argentauris
Pteruthius flaviscapis
Alcippe brunneicauda
Heterophasia picaoides
Yuhina zantholeuca
Cettia vulcania
Locustella lanceolata
L. certhiola
Cisticola juncidis
Prinia atrogularis
P. flaviventris
Orthotomus cuculatus
O. atrogularis
O. sericeus
O. ruficeps
Phylloscopus borealis
P. coronatus
P. trivirgatus
Seicercus montis
Abroscopus superciliaris
Rhinomyias olivacea
R. umbratilis
Muscicapa sibirica
M. daurica
M. ferruginea
Eumyias thalassina
E. indigo
Ficedula mugimaki
F. solitaria
F. hyperthya
F. dumetoria
F. westermanni
Niltalva grandis
N. sumatrana
Cyornis concretus
C. ruckii
C. unicolor
C. turcosus
C. rufigastra
Muscicapella hodgsoni
Culicicapa ceylonensis
Gerygone sulphurea
Philentoma pyrhopterum
P. velatum
Hypothymis azurea
Terpsiphone paradisi
T. atrocaudata
Rhipidura albicollis
R. perlata
Pachycephala grisola
Parus major
Sitta frontalis
S. azurea
Prionochilus maculatus
P. percussus
Dicaeum agile
D. chrysorrheum

D. trigonostigma
D. concolor
D. ignipectus
D. cruentatum
Anthreptes simplex
A. malaccensis
A. rhodolaema
A. singalensis
Hypogramma hypogrammicum
Nectarinia sperata
Aethopyga siparaja
A. temminckii
Arachnothera longistrota
A. crassirostris
A. robusta
A. flavigaster
A. chrysogenys
A. affinis
Zosterops palpebrosus
Z. atricapilla
Z. montanus
Serinus estherae
Erythura prasina
Lonchura striata

L. punctulata
L. malacca
L. maja
Passer montanus
Ploceus philippinus
Aplonis panayensis
Sturnus sturninus
Acridotheres javanicus
Gracula religiosa
Oriolus xanthonotus
O. chinensis
O. cruentus
Dicurus annectans
D. aeneus
D. remifer
D. sumatranus
D. paradiseus
Artamus leucorhynchus
Platylophus galericulatus
Platysmurus leucopterus
Cissa chinensis
Dendrocitta occipetalis
Corvus enca

I-3. Vegetations of GLNP (de Wilde & Duyfjes):

Coastal Vegetations

Sandy Beach:

Canavalia maritima
Casuarina equisetifolia
Ipomoea pes-caprae
Scaevola sericea

Sand dunes:

Casuarina equisetifolia
Glochidion sp.
Pandanus sp.

Barringtonia formation (mostly outside Kluet):

Barringtonia asiatica
Collophylum inophyllum
Terminalia catappa

Nypa palm swamp (lagoon) and coastal swamp:

Acrostichum aureum
Nypa fruticans
Metroxylon sagu
Hanguana malayana

Levee of the rivers near the coast:

Salix tetrasperma

Rocky sea shore (partly limestone):

Pericampylus glaucus
Pyrrosia lanceolata
Paphiopedilum sp.

Vegetation of the tropical zone, 0-1,000 m asl

Lowland vegetation:

Ficus sp.
Annonaceae sp.
Meliaceae sp.
Euphorbiaceae sp.
Nypa sp.
Elatostema sp.
Cryptandra sp.

Fresh-water swamp forest:

Aracea sp.
Cyperaceae sp.
Barringtonia sp.
Cryptocoryne moehlmanni
Hydrostemma (*Barclaya*) sp.
Lasia spinosa

Peat swamp:

Cyperaceae sp.
Freycinetia sp.
Lecananthus cf. *rubescens*
Licuala sp.
Livistona sp.
Nepenthes ampularia
Pandanus sp.
Scirpodendron ghaeri

Dryland mixed Dipterocarp forest:

Acranthera cf. *mutica*
Acrotrema costatum
Aeginata mirabilis
Aglaonema rotundatum
Amorphophallus sp.
Biophytum adianthoides
Bischofia javanica
Burmannia championi
Cryptocoryne amicorum
Cryptandromoea cf. *grandis*
Dryobalanops aromatica
Drypetes sp.
Durio acutifolius
Durio sp.
Endocomia canarioides
Epirixanthus elongates
Ganua sp.
Gymnacranthera bancana
Harmandia mekongensis
Hydnocarpus nana
Hydrostemma sp.
Johannesteysmannia altifrons
Knema hookeriana
Knema losirensis
Lecanopteris crustacea
Lecanorchis sp.
Lerchea corymbosa
Maducha sp.
Orophea leuseri
Pandanus dorystigma
Pentaphragma sp.
Pentastemona sumatrana
Salacca cf. *conferta*
Sarcotheca laxa var. *brigitiae*
Scrotochloa (*Leptaspis*) *urceolata*
Thismia clavigera
Thottea reniloba
Thottea sp.
Trevisia burckii
Xanthophyllum brigittae

Levee forest (10-20 m asl); riverside forest (Alas River); alluvial forest (50-200 m asl):

Alsomitra macrocarpa
Biophytum adianthoides
Burkilanthus malaccensis
Callerya (Whitfordiodendrum) cf sumatranum
Cryptocoryne moehimannii
Didymoplexis pallens
Endocomia canariodes
Hodgesonia macrocarpa
Homonium riparia
Lepisanthes senegalensis
Luerussia kendingiana
Mattaea sancta
Myristica elliptica
Naravelia laurifolia
Oryza meyeriana var. meyeriana
Paranephelium xestophyllum
Phragmites australis
Pometia pinnata
Saccharum spontaneum
Streblus ilicifolius
Tacca integrifolia
Wetria insignis
Zippelia begoniifolia

Forest over limestone:

Aristolochia foveolata
Homalomena nigrescens
Monophyllaea sp.
Peliosanthes teta
Psychotria probably sp.
Raphis sp.
Rhizanthus lowii
Sumbaviopsis albicans

Riverine and lowest terrace, alluvial forest (mainly along Middle Alas River):

Alangium scandens
Amesiodendron chinense
Broussonetia kurzii
Calanthe triplicate
Carex teinogyna
Citrus cf. macroptera
Coelogyne asperata
Crataeva magna
Erythralium scandens
Ficus quercifolia
Ficus sp.
Hodgesonia macrocarpa
Knema losirensis sp.
Koompassia sp.
Mangifera cf. foetida
Myristica elliptica
Planchonia valida

Pometia pinnata
Pilotum cf. complanatum
Rhizanthus lowii
Tacca integrifolia
Tinomiscium phytocrenoides

Forest of higher terraces and of lower slopes of foot-hills:

Aeginetia mirabilis
Aeschinanthus albidus
A. longiflorus
Aglaia sp.
Amorphophallus sp.
Aporosa lucida var. ellipsoidea
Archidendron ellipticum
Ardisia clarissima
Antiaris toxicaria
Artocarpus elasticus
Azadirachta excelsa
Baccaurea cf. maingayi n. var.
Baccaurea sp.
Bischofia javanica
Boesenbergia sp.
Canarium denticulatum f. fissistipulum
C. karoense
Christensenia aesculifolia
Claoxylon tenuiflorum
Corymborkis veratrifolia var. veratrifolia
Costus speciosus
Dacryodes rugosa
Dapania racemosa
Dendrobium crumeatum
Dracontomelum costatum
Drypetes dewildei
Durio carinatus
D. cf. oxyleyanus
Elatostema sp.
Epirixanthes elongate
Erycibe cf. albida
Euonymus wrayi
Fragaria racemosa
Ficus araneosa
F. sumatrana
Genianthus blumei
Gomphandra subrostrata
Hydnophytum sp.
Impatiens sp.
Iodes yatesii
Jasminum crassifolium
Leea simplicifolia
Magnolia candollii var. candollii
Mallotus sphaerocarpus
Mangifera foetida
Monophyllaea leuserensis
Neuwiedia zollingeri var. singaporeana
Oncosperma sp.

Parkia sp.
Piper sp.
Rafflesia micropylorum
Rhizanthus lowii
Rhynchoglossum obliquum
Rhinorea anguifera
Saraca declinata
Scrotochloa urceolata
Stauranthea grandifolia
Stereosandra sp.
Thismia sp.
Thottea macrophylla
Turpinia sphaerocarpa
Typhonium blumei
Vrijdagzjnia sp.
Xanthophyllum brigittae
Xanthophyllum forbesii
Zippelia begoniifolia

Ridge forest of low altitude hills:

Apostasia wallichii
Cynometra prob. sp.
Ficus sp.
Tristania cf. *whiteana*

Colline forest at (400-) 500-1,000 (-1,300):

Albertisia cf. *papuana*
Aphyllorchis sp.
Argostemma uniflorum
Aristolochia sp.
Balanophora sp.
Burmannia sp.
 cf. *Calamus 'manau'*
Calanthe ceciliae
Cheiropleuria bicuspis
Chirita asperifolia
Christensia aesculifolia
 cf. *Cystorchis* sp.
Dacryodes rugosa
Didymocarpus sp.
 cf. *Didymoplexis*
Drypetes dasyneura
Engelhardia spicata
Erycibe cf. *albida*
Eunymus wrayi
Gomphandra cf. *dolichocarpa*
Gymnosiphon sp.
Hydnocarpus ilicifolia
Hydrangea oblongifolia
Impatiens acehensis sp.
Koilodepes hainanense
Lecanorchis sp.
Lycianthes prob. sp.
Melanochyla densiflora
Musa sp.
Ophioglossum pendulum

Pandanus korthalsii
Paraboea leuserensis
P. paniculata
Phyllagathis sp.
Rhododendron vinicolor
Sanicula europae subs. *elata*
Stemonurus malacceensis
Tacca integrifolia

**Vegetation of the sub-montane zone,
1,000-1,500 m asl**

Agalmyla parasitica
Anemone sumatrana
Anneslea fragrans
Aristolochia singalagensis
Balanophora sp.
Burmannia sp.
Cardamine africana
Carex baccans
C. cruciata var. *rafflesiana*
Chikusichloa aff. *mutica*
Cinnamomum penninervia
Chloranthus erectus
Clematis smilacifolia
Cyrtandromoea sp.
Curculigo capitulate
Didymoplexis sp.
Didymocarpus sp.
Disepalum platypetalum
Disporum cantoniense
Euchresta horsfieldii
Eugenia spicata
Gymnosiphon sp.
Hynodendron sp.
Ilex ketambensis
Illicium sp.
Impatiens achensis
I. vitellina sp.
Knema andamanica subs. *nicobarica*
 Cf. *lecanorchis*
Leea simplicifolia
Lobelia zeylanica
Lonicera pulcherrima
L. sumatrana
Lycopodium sp.
Lysimachia
Magnolia candollii var. *candollii*
M. macklottii var. *beccariana*
Mapania sp.
Michelia salicifolia
Ophioglossum pendulum
Ophiopogon caulescens
Pandanus korthalsii
Panicum hayatae

Peliosanthes teta
Pinus merkusii
Plectranthus sp.
Polygala venenosa subs.pulchra
Premna prob.sp
Radermachera gigantean
Rhaphidophora kortalsii
Rhazanthus lowii
Rodendron jasminiflorum var.heusseri
Rhododendron malayanum
Sambucus canadensis
S. javanica
Sanicula europae subs. *elata*
Sarcandra glavra var. *glabra*
S. glavra var. *melanocarpa*
Sarcopyramis napalensis
Schoepfia fragrans
Sciaphila secundiflora
Sonerila sp.
Sophora wightii
Trigonobalanus verticillata
Viburnum sp.
Viola sp.

**Vegetation of the montane zone,
1,500-2,400 (-2,600) m asl**

Lower montane forest (1,500-2,000 m asl):

Acanthopanax malayanus
Anemone sumatrana
Angiopteris sp.
Anneslea fragrans
Argostemma sp.
Boeninghausenia albiflora
Burmanna longifolia
Carex perakensis var. *vansteenisii*
Chloranthus glabra
Cinnamomun dewildei
C. parvifolium
Cheiroleuria bicuspidata
Clethra sumatrana
Coelogyne sp.
Corybas sp.
Costera sp.
Crawfordia fasciculata
Curculigo sp.
Diplycosia atjehensis
D. brachyantha
Diplycosia glauciflora
Epirixanthes cylindrical
Erianthus beccarii
Eriocaulon cf. *longifolium*
Exbucklandia populaea
Gahnia javanica
Gomphandra tomentella
Gunnera macrophylla

Habenario or (*Platanthera*) sp.
Hydrangea aspera
Hypnodendron sp.
Ilex ketambensis
Illicium sp.
Impatiens junghuhnii
Impatiens sp.
Isachne kinebaluensis
Lecanorchis sp.
Lysimachia sp.
Metonia pectinata
Microtropis valida
Monophyllaea caulescens
M. wildeana
Nepenthes tobaica
Ophioglossum pendulum
Oreobolus kukenthalii
Pandanus sp.
Petrosavia sp.
Podocarpus neriifolius
Polygala venenosa subs.pulchra
Pteris deltodon
Rhododendron malayanum
Rhodoleia championi
Scirpus mucronatus
S. subcapitatus
Sebastiania remota
Strobilanthes sp.
Symplocos arjehensis
Tetractomia tetranda
Vaccinium bartlettii
V. gracilipes
V. lauriflorum var. *glanduligerum*
V. varingiaefolium var. *calcaratum*
Viola sp.

Upper montane (2,000-2,400 (-2,600) m asl):

Acanthopanax malayanus
Acer laurinum
Agrostis rigidula var. *remota*
Ainsliaea pteropoda
Anemone sumatrana
Aniselytron teutleri
Arisaema sp.
Balanophora cf. *fungosa*
Begonia sp.
Boeninghausenia albiflora
Carex perakensis var. *vansteenisii*
Carex sp.
Cheilothea (Monotropastrum) humile
Claoxylon physocarpum
Clethra sumatrana
Coelogyne sp.
Crawfordia trinervis
Curculigo sp.

Dacrydium elatum
Dianella ensifolata
Diplicisia cf. *atjehensis*
D. brachyantha
D. cinnabarina
Diplicisia sp.
Dipteris conjugate
Eriocaulon sp.
Eurya sp.
Gahnia javanica
Gaultheria kemiriensis
G. losirensis
Haloragis philiphenensis
Helicia attenuata
Hymenophyllaceae
Impatiens calendulina sp.
I. rubriflora sp.
I. steenisii sp.
Isachne albens
Juncus sp.
Kobresia kobresioidea
Korthalsella sp.
Leptospermum flavescens
Litsea steenisii
Lysimachia laxa
L. montana
Lysimachia mucrotana
Magnolia macklottii var. *beccarii*
Meliopis sp.
Micromelis corymbifera
Microstegium geniculatum
Microtropis valida
Nepenthes tobaica
Ophiopogon sp.
Oreobolus kukeuthalii
Patersonia lowii
Peliosanthes javanica
Pentaphragax euryoides
Pholidota longilabrumm
Photinia integrifolia var. *sublanceolata*
Pinus merkusii
Podocarpus imbricatus
P. neriifolius
Prunus arborea
Prunus cf. *grisea* var. *grisea*
Pyrola sumatrana
Rhododendron atjehense
R. malayanum
R. sumatranum
R. vanderbiltianum
R. varilepidotum
Rhodoleia championi
Rhopalocnemis phalloides
Rhus succedanea
Sanicula europaea subs. *eleta*
Scirpus mucronatus

Swertia piloglandulosa
Symplocos aff. *cerasifolia*
Tetraplodon mnioides
Vaccinium bartlettii
V. aff. dialypetalum sp.
V. rigidifolium
Vernonia arborea
Viburnum sp.
Viola sp.
Weinmannia blumei
Wikstroemia tenuiramis
Xyris sp.

**Vegetation of the sub-alpine zone,
2,400 and up m asl**

Subalpine low forest and ericoid scrub
(2,400-3,400 m asl):

Ainsliaea pteropoda
Anemone sumatrana
Aniselytron teutleri
Arisaema sp.
Barberis wallichiana
Burmannia longifolia
Cardamine sp.
Clethra sumatrana
Crawfordia trinervis
Dacrycarpus imbricatus var. *curvulus*
Diplycosia atjehensis
Exbucklandia populnea
Gaultheria sp.
Gentiana cf. *sumatrana*
Gordonia prob. sp.
Hymenophyllaceae
Hypericum leschenaultia
Korthalsella opunta
Leptospermum flavescens
Lichenes, including *Usnea* sp.
Lithocarpus atjehensis
L. orbicularis
Litsea steenisii
Lycopodium serratum
Lysimachia laxa
Magnolia macklottii var. *beccariana*
Medinilla sp.
Micromeles corymbifera
Microtropis wallichiana
Orchidaceae; several genera
Photinia integrifolia var. *sublanceolata*
Platanthera (or *Habenaria*) sp.
Podocarpus neriifolius
Prenanthes prob. sp.
Primula prolifera
Pyrola sumatrana
Quercus steenisii
Rhododendron adinophyllum

Rhododendron atjehense
R. sumatranum
R. vanderbiltianum
Sanicula europaea subs.*elata*
Saurauia sp.
Schefflera sp.
Schima brevifolia
Schoepfia fragrans
Senecio sumatrana
Smilax menispermoidea
Strobilanthus sp.
Symplocos adenophylla
S. atjehensis
Symplocos sumatrana
Utricularia steenisii
Vaccinium bartlettii
V. cinnabaricum
V. sp. close to *V. dialypetalum*
V. korinchense var.*losirensis*
V. rigidifolium
V. varingiaefolium
Viburnum sp.
Viola sp.

Species of sub-alpine low forest:

Anemone sumatrana
Aniselytron teutleri
Astilbe rivularis
Blechnum fluviatile var.*luzoniense*
Carex oedorrhampa
Galium barycholos
Lycopodium serratum
Prenanthes prob.sp.
Ranunculus javanicus
Sanicula europaea subs.*elata*
Thalictrum javanicum
Youngia (or *Lactuta*) sp.

Mountain blang vegetation (2,600-3,000 (-3,400) m asl):

Agrostis rigidula var.*remota*
Ainsliaea pteropoda
Aletris foliolosa
Anemone cf.*rivularis*
Anemone sumatrana
Anthoxanthum horsfieldii var. *sumatranum*
Calostoma sp.
Carex capillacea
Carex echinata
Centrolepis fascicularis
Coelachne simpliciuscula
Cymbidium hartiahianum
Dacrycarpus imbricatus var.*curvulus*
Danthonia (*Monostachya*) *oreoboloides*
Daphniphyllum woodsonianum
Deyeuxia atjehensis

Diplycosia atjehensis
D. brachyantha var.*brachyantha*
D. cinnabarina
D. tetramera
Dipteris conjugate
Drosera spathulata
Epigeneium pulchellum
Eriocaulon hookerianum
Festuca sumatrana
Garnotia spadicea
Gaultheria acroleia
G. atjehensis
G. kemiriensis
G. leucocarpa cf.*scandens*
G. losirensis
Gahnia javanica
Gentiana pachyphylla
G. cf. sumatrana
G. ulmeri
Gleichenia vulcanica
Habenaria
Haloragis micrantha
H. philippensis
Helictotrichon junghuhnii
Hypericum beccarii subs.*steenisii*
Isachne pangerangensis
Juncus effuses
Kobresia kobresioidea
Lactuca aff.*laevigata*
Lepidosperma chinense
Leptospermum flavescens
Lobelia (*Pratia*) *montana*
L. sumatranum
Lycopodium clavatum
L. aff. inundatum
Myriactis javanica
Neillia thyrsoiflora var.*fallax*
Nephenthes tobaica
Nephenthes sp.
Oreobolus kukenthalii
Parnassia aff.*wightiana*
Patersonia lowii
Pholidota longilabrum
Platanthera (or *Habenaria*) *angustata*
Pleiocraterium gentianifolia
Podocarpus nerioifolius
Potentilla borneensis
Prenanthes sp.
Primula prolifera
Pyrola sumatrana
Rhododendron adinophyllum
R. atjehense
R. retusum var.*trichostylum*
R. sumatranum
R. vanderbiltianum
Rhynchospora rugosa

Sanicula europaea subs.*elata*
Schefflera sp.
Schoenus maschalinus
Schoepfia fragrans
Scirpus beccarii
S. junghuhnii
S. subcapitatus
Senecio sumatranus
Senecio sp.
Sphagnum sp.
Stereocaulon sp.

Swertia javanica subs. *steenisia*
S. piloglandulosa
Thalictrum javanicum
Utricularia steenisii
Vaccinium bartlettii
V. miquelii var. *atjehense*
V. rigidifolium
Viola biflora
Viola sp.
Xyris sp.

**APPENDIX II:
SPECIES LISTS OF KERINCI SEBLAT NATIONAL PARK (KSNP)**

II-1. Mammal list in KSNP (Component D, ICDP-TNKS, 2002):

Scientific Name	Location
<i>Hylomys parvus</i>	Gunung Kerinci
<i>Suncus murinus</i>	Sungai Penuh
<i>Crocidura attenuate</i>	Gunung Kerinci/Gunung Tujuh
<i>C. beccarii</i>	Gunung Tujuh
<i>Tupaia glis</i>	Sipurak
<i>T. montana</i>	Gunung Tujuh/Gunung Kerinci
<i>T. tana</i>	Tandai/Tapan
<i>Pteropus vampyrus</i>	Widespread
<i>Cheiromeles torquatus</i>	Tandai
<i>Taphozous saccolaimus</i>	Sungai Penuh
<i>Rhinopholus</i> sp	Gunung Kerinci
<i>Kerivoula pellucida</i>	Sipurak
<i>Myotis</i> sp.	Tandai
<i>Pipistrellus</i>	Sungai Penuh
<i>Tylonycteris robustula</i>	Sipurak
<i>Manis javanica</i>	Tandai
<i>Cynocephalus variegatus</i>	Bengkulu
<i>Nycticebus coucang</i>	Bukit Tapan/Sipurak
<i>Tarsius bancanus</i>	
<i>Presbytis cristata</i>	Sipurak/Pulau Pandan
<i>P. melalophus</i>	Muara Hemat
<i>Macaca fascicularis</i>	Muara Sako
<i>M. nemestrina</i>	Tandai/Tapan
<i>Hylobates agilis</i>	Tandai/Sipurak
<i>H. syndactylus</i>	Sipurak/Gunung Tujuh
<i>Nesolagus netscheri</i>	Gunung Tujuh/Sipurak
<i>Ratufa affinis</i>	Gunung Kerinci
<i>R. bicolor</i>	Sipurak
<i>Callosciurus prevosti</i>	Tandai
<i>C. notatus</i>	Sipurak
<i>Sundasciurus hippurus</i>	Tapan/Tandai
<i>S. lowii</i>	Gunung Kerinci
<i>S. tenuis</i>	Gunung Kerinci
<i>Lariscus insignis</i>	Gunung Tujuh/Gunung Kerinci
<i>Nannosciurus melanotis</i>	Sipurak
<i>Aeromys tephromelas</i>	Tapan
<i>Petaurista elegans</i>	Gunung Kerinci
<i>P. petaurista</i>	Bengkulu
<i>Mus crociduroides</i>	Gunung Kerinci
<i>M. musculus</i>	Sungai Penuh
<i>Rattus tiomanicus</i>	Gunung Kerinci
<i>R. muelleri</i>	Sipurak
<i>Sundamys infraluteus</i>	Gunung Kerinci
<i>Rattus exulans</i>	Sungai Penuh
<i>Maxomys inflatus</i>	Gunung Kerinci
<i>M. hylomoides</i>	Gunung Kerinci
<i>M. whiteheadi</i>	Gunung Kerinci

<i>Niviventer rapit</i>	Gunung Kerinci
<i>Lenothrix canus</i>	Tapan
<i>Leopoldamys sabanus</i>	Gunung Tujuh/Tapan
<i>Chiropodomys gliroides</i>	Sipurak
<i>Hystrix brachyura</i>	Tapan/Tandai/Sipurak
<i>Trichys fascicularis</i>	Biruen
<i>Helarctos malayanus</i>	Gunung Kerinci/Sipurak
<i>Cuon alpinus</i>	Tandai/Tapan
<i>Martes flavigula</i>	Gunung Kerinci/Sipurak
<i>Mustela nupides</i>	Gunung Tujuh
<i>M. lutreolina</i>	Gunung Kerinci
<i>Mydaus javanensis</i>	Tandai
<i>Arctonyx collaris</i>	Gunung Tujuh
<i>Lutra perspicillata</i>	Tapan
<i>Aonyx cinerea</i>	Danau Gunung Tujuh
<i>Arctitis binturong</i>	Tandai/Sipurak
<i>Arctogalidia trivirgata</i>	Masego
<i>Paguma larvata</i>	Gunung Tujuh
<i>Paradoxurus hermaphroditus</i>	Sungai Penuh/Tapan
<i>Hemigalus derbyanus</i>	Tapan
<i>Prionodon linsang</i>	Tapan/Gunung Tujuh
<i>Panthera tigris sumatrae</i>	Tapan/Sipurak/Landai
<i>Neofelis nebulosa</i>	Tapan/Gunung Tujuh
<i>Pardofelis marmorata</i>	Tapan/Gunung Tujuh
<i>Catopuma temminckii</i>	Tandai/Gunung Kerinci
<i>Prionailurus planiceps</i>	Tapan/Biruen
<i>P. bengalensis</i>	Tapan/Tandai
<i>Felis viverrina</i>	Tapan
<i>Elephas maximus</i>	Sipurak/Bengkulu
<i>Dicerorhinus sumatrensis</i>	(guarded locations)
<i>Tapirus indicus</i>	Sipurak/Tapan/Tandai
<i>Sus scrofa</i>	Widespread
<i>S. barbatus</i>	Tapan/Tandai/Sipurak
<i>Tragulus napu</i>	Tapan/Tandai
<i>T. javanicus</i>	Tapan
<i>Muntiacus muntjak</i>	Widespread
<i>Cervus unicolor</i>	Sipurak/Tandai/Tapan
<i>Naemorhedus sumatrensis</i>	Bukit Tapan/Sipurak

II-2. Bird list in KSNP (Component D, ICDP-TNKS, 2002):

Scientific Name	Location
<i>Ardea purpurea</i>	Sungai Sindang/Sungai Penuh
<i>Butorides striatus</i>	Sungai Lunang/Sungai Penuh
<i>Bubulcus ibis</i>	Sungai Penuh
<i>Egretta alba</i>	Punggut
<i>E. intermedia</i>	Sungai Penuh
<i>Nycticorax nycticorax</i>	Sungai Penuh
<i>Ixobrychus eurhythmus</i>	Bukit Tapan/Sungai Penuh
<i>I. sinensis</i>	Sungai Penuh
<i>I. cinnamomeus</i>	Sungai Penuh
<i>Dupetor flavicollis</i>	Air Dikit
<i>Mycteria cinerea</i>	Sungai Penuh
<i>Ciconia episcopus</i>	Tapan/Muara Sako
<i>Dendrosygna javanica</i>	Lake Kerinci
<i>Anas superciliosa</i>	Lake Belibis/Sungai Penuh
<i>Cairina scutulata</i>	Sungai Sindang
<i>Pandion haliaetus</i>	Ipuh
<i>Pernisptilorrhynchus torquatus</i>	Tandai
<i>Machaeramphus alcinus</i>	Muara Sako/Muara Hemat
<i>Elanus caeruleus</i>	Sungai Penuh
<i>Haliastur indus</i>	Lake Gunung Tujuh
<i>Haliaeetus leucogaster</i>	Lake Gunung Tujuh
<i>Spilornis cheela</i>	Tandai
<i>Circus melanoleucos</i>	Sungai Penuh
<i>Accipiter gularis</i>	Padang Aro
<i>A. trivirgatus</i>	Tandai
<i>Ictinaetus malayensis</i>	Tandai
<i>Hieraeetus malayensis</i>	Tandai
<i>H. kienerii</i>	Tandai
<i>Spizaetus cirrhatus</i>	Letter W
<i>S. alboniger</i>	Bukit Tapan
<i>Microchierax fringillarius</i>	Tandai
<i>Falco peregrinus</i>	Sungai Penuh
<i>Rizothera longirostris</i>	Sipurak
<i>Coturnix chinensis</i>	Kersik Tuo
<i>Arborophila rubrirostris</i>	Montane forest Gunung Tujuh
<i>Caloperdix oculea</i>	Sipurak/Bukit Tapan
<i>Rollulus roulul</i>	Lowland forest Tapan/Sipurak
<i>Lophura inornata</i>	Gunung Kerinci
<i>Gallus gallus</i>	Tandai
<i>Polyplectron chalcurom</i>	Bukit Bontak/Gunung Kerinci
<i>Argusianus argus</i>	Tapan/Sipurak
<i>Turnix suscitator</i>	Gunung Kerinci
<i>Gallirallus striatus</i>	Lake Kerinci/Sungai Penuh
<i>Porzana pursilla</i>	Sungai Penuh
<i>P. fusca</i>	Sungai Gambir/Sungai Penuh
<i>P. cinerea</i>	Lake Kerinci
<i>Amaurornis phoenicurus</i>	Sungai Penuh
<i>Gallinula chloropus</i>	Sungai Penuh
<i>Porphyrio porphyrio</i>	Lake Kerinci
<i>Helipais personata</i>	Tandai
<i>Hydrophasianus chirurgus</i>	Lake Kerinci

<i>Rostratula benghalensis</i>	Bukit Tapan/Sungai Penuh
<i>Pluvialis fulva</i>	Sungai Penuh
<i>Tringa stagnatilis</i>	Tapan
<i>T. glareola</i>	Sungai Penuh
<i>T. hypoleucos</i>	Sungai Penuh
<i>Gallinago stenura</i>	Kayu Aro
<i>Scolopax saturate</i>	Gunung Tujuh/Gunung Kerinci
<i>Treron oxyura</i>	Gunung Tujuh/Gunung Kerinci
<i>T. sphenura etorques</i>	Gunung Tujuh/Gunung Kerinci
<i>T. curvirostra</i>	Tandai
<i>T. vernans</i>	Batanghari Liko
<i>T. capellei</i>	Muara Sako
<i>Ptilinopus jambu</i>	Muara Sako
<i>P. porphyreus</i>	Gunung Tujuh/Kayu Aro
<i>Ducula Aenea</i>	Tandai
<i>D. badia</i>	Tandai
<i>Macropygia unchall</i>	Gunung Tujuh/Gunung Kerinci
<i>M. ruficeps</i>	Sikinjang Tandai
<i>Streptopelia chinensis</i>	Widespread
<i>Chalcophaps indica</i>	Tapan
<i>Psittacula longicauda</i>	Sungai Batang/Sindang/Bengkulu
<i>Loriculus galgalus</i>	Tandai
<i>Cuculus sparverioides</i>	Bukit Tapan
<i>C. micropterus</i>	Tandai
<i>C. saturatus</i>	Gunung Tujuh/Gunung Kerinci
<i>Cacomantis sonneratii</i>	Tandai
<i>C. merulinus</i>	Sikinjang/Tandai
<i>C. sepulcralis</i>	Gunung Tujuh
<i>Chrysococcyx xanthorhynchus</i>	Tandai
<i>Surniculus lugubris</i>	Tandai
<i>Phaenicophaeus diardi</i>	Tandai
<i>P. sumatranus</i>	Tapan
<i>P. tristis</i>	Gunung Tujuh
<i>P. chlorophaeus</i>	Tandai
<i>P. javanicus</i>	Tandai
<i>P. curvirostris erythrognatus</i>	Tandai
<i>Carpococcyx viridis</i>	(Historical report Muara Sako)
<i>Centropus sinensis</i>	Tandai
<i>C. bengalensis</i>	Sungai Penuh
<i>Tyto alba</i>	Sungai Penuh
<i>Otus spilocephalus</i>	Gunung Kerinci/Gunung Tujuh
<i>O. brookii</i>	Gunung Kerinci
<i>Bubo sumatranus</i>	Sungai Landai
<i>Ketupa ketupu</i>	Tandai
<i>Glaucidium brodiei</i>	Gunung Kerinci
<i>Strix leptogrammica</i>	Gunung Tujuh
<i>Batrachostomus stellatus</i>	Sungai Gambir
<i>B. poliolotus</i>	Gunung Tujuh
<i>Eurostopodus temminckii</i>	Tandai, Sipurak
<i>Caprimulgus affinis</i>	Ipuh
<i>C. pulchellus</i>	Gunung Kerinci
<i>Hydrochous gigas</i>	Letter W/Lake Gunung Tujuh
<i>Collocalia fuciphaga</i>	Muara Hemat
<i>C. maxima</i>	Muara Hemat
<i>Collocalia esculenta</i>	Sikinjang/Bukit Tapan
<i>Hirundapus giganteus</i>	Tapan

<i>Raphidura leucopygialis</i>	Bedeng Tujuh/Gunung Kerinci
<i>Apus pacificus</i>	Gunung Tujuh
<i>Cypsiurus balasiensis</i>	Tapan
<i>Hemiprocne longipennis</i>	Tandai
<i>H. comata</i>	Tandai
<i>Harpactes reindwadtii</i>	Gunung Kerinci/Gunung Tujuh
<i>H. diardii</i>	Tandai
<i>H. duvaucelli</i>	Tandai
<i>H. erythrocephalus</i>	Tandai
<i>Alcedo atthis</i>	Tandai
<i>A. meninting</i>	Tapan
<i>A. euryzona</i>	Tandai
<i>Ceyx rufidorsa</i>	Tandai
<i>Pelargopsis capensis</i>	Tandai
<i>Lacedo pulchella</i>	Tandai/Sipurak
<i>Halcyon coromanda</i>	Muko-muko
<i>H. smyrnensis</i>	Sindang/Sungai Penuh
<i>H. pileata</i>	Sindang, Lunang/Ipuh
<i>Todirhanphus chloris</i>	Sungai Penuh
<i>Actenoides concretus</i>	Tandai
<i>Merops leschenaultia</i>	Ipuh
<i>M. viridis</i>	Ipuh, Sungai Gambir
<i>Nyctornis amictus</i>	Tandai
<i>Anorrhinus galeritus</i>	Tandai
<i>Aceros comatus</i>	Tandai/A. Ikan
<i>A. currugatus</i>	Sungai Sindang, Lunang
<i>A. undulates</i>	Tandai/Sipurak/Gunung Kerinci
<i>Anthracosceros malayanus</i>	Tandai/A.Ikan/Sungai Sindang
<i>A. albitrostis</i>	A.Ikan/Ipuh (beach forest)
<i>Buceros rhinoceros</i>	Tandai/A.Ikan/Sindang
<i>B. bicornis</i>	Sungai Air Ikan/Tapan
<i>B. vigil</i>	Sipurak/Tandai
<i>Psilopogon pyrolophus</i>	Gunung Tujuh/Gunung Kerinci
<i>Megalaima chrysopogon</i>	Tandai
<i>M. mystacophanos</i>	Tandai
<i>M. oorti</i>	Letter W
<i>M. henricii</i>	Tandai
<i>M. australis</i>	Tandai
<i>M. haemacephala</i>	Gunung Kerinci
<i>Calorhampus fuliginosus</i>	Tandai
<i>Indicator archipelagicus</i>	Sipurak/Tapan
<i>Picumnus innominatus</i>	Sipurak
<i>Sasia abnormis</i>	Tandai
<i>Caleus brachyurus</i>	Tandai, Pauh
<i>Picus canus</i>	Gunung Tujuh
<i>P. flavinucha</i>	Gunung Tujuh
<i>P. chlorolophus</i>	Gunung Tujuh
<i>P. mentalis</i>	Tandai
<i>P. miniaceus</i>	Tandai
<i>Dinopium rafflesii</i>	Tandai
<i>Meiglyptes tristis</i>	Tandai
<i>M. tukki</i>	Tandai
<i>Dendrocopus canicapillus</i>	Gunung Tujuh
<i>Hemicircus concretus</i>	Tandai
<i>Blythipicus rubiginosus</i>	Bukit Bontak
<i>Reindwardtipicus validus</i>	Tandai

<i>Corydon sumatranus</i>	Tandai
<i>Cymbirhynchus macrorhynchus</i>	Sungai Sindang
<i>Eurylaimus javanicus</i>	Tandai
<i>E. ochromalus</i>	Tandai
<i>Serilophus lunatus</i>	Gunung Tujuh
<i>Psarisomus dalhousiae</i>	Tandai/Sipurak
<i>Calyptomena viridis</i>	Tanda/Sagedang
<i>Pitta schneideri</i>	Gunung Kerinci/G.Tujuh/G. Sumbing
<i>P. caerulea</i>	Tandai
<i>P. venusta</i>	Tandai/Bukit Tapan/Masego
<i>P. sordida</i>	Sungai Gambir
<i>P. guajana</i>	Perentak
<i>Hirundo rustica</i>	Sungai Penuh
<i>H. tahitica</i>	Tapan
<i>Hemipus picatus</i>	Gunung Kerinci/Gunung Tujuh
<i>H. hirundinaceus</i>	Tandai
<i>Tephrodornis gularis</i>	Tandai
<i>Coracina larvata</i>	Gunung Tujuh
<i>C. fimbriata</i>	Tandai
<i>Lalage nigra</i>	Muko-muko
<i>Pericrocotus igneus</i>	Tapan
<i>P. solaris</i>	Tandai
<i>P. miniatus</i>	Gunung Tujuh/Gunung Kerinci
<i>P. flammeus</i>	Tandai
<i>Aegithina viridissima</i>	Tapan
<i>A. tiphia</i>	Sikinjang
<i>Chloropsis cyanopogon</i>	Tandai
<i>C. sonnerati</i>	Tandi
<i>C. aurifrons</i>	Tandai
<i>C. cochinchinensis</i>	Tandai
<i>C. venusta</i>	Letter W
<i>Pycnonotus zeylanicus</i>	Sipurak/Tandai
<i>P. leucogrammicus</i>	Bukit Tapan
<i>P. tympanistrigus</i>	Letter W/Bukit Tapan
<i>P. melanoleucos</i>	Tapan
<i>P. atriceps</i>	Tandai
<i>P. melanicterus</i>	Muara Hemat
<i>P. squamatus</i>	Tandai
<i>P. cyaniventris</i>	Tandai
<i>P. aurigaster</i>	Tandai
<i>P. eutilotus</i>	Tandai
<i>P. bimaculatus</i>	Gunung Tujuh/Gunung Kerinci
<i>P. goiavier</i>	Sikinjang
<i>P. plumasus</i>	Ipuh
<i>P. simplex</i>	Tandai
<i>P. brunneus</i>	Tandai
<i>P. erythroptalmus</i>	Tandai
<i>Alophoixus bres</i>	Tandai
<i>A. phaeocephalus</i>	Tandai
<i>Tricholestes criniger</i>	Tandai
<i>Iole olivacea</i>	Bukit Tapan
<i>I. viriscens</i>	Gunung Tujuh
<i>Ixos malaccensis</i>	Tandai
<i>Hypsipetes flavala</i>	Tandai
<i>Dicrurus macrocercus</i>	Gunung Tujuh
<i>D. leucophaeus</i>	Gunung Tujuh

<i>D. aeneus</i>	Tandai
<i>D. remifer</i>	Tandai
<i>D. sumatranus</i>	Tandai/Tapan
<i>D. paradiseus</i>	Sungai Sindang/Lunang
<i>Oriolus xanthonotus</i>	Tandai
<i>O. cruentus</i>	Gunung Tujuh
<i>Irena puella</i>	Tandai
<i>Platylophus galericulatus</i>	Tandai
<i>Cissa chinensis</i>	Gunung Tujuh, Gunung Kerinci
<i>Dendrocitta occipitalis</i>	Bukit Bontak
<i>Platysmurus leucopterus</i>	Sipurak
<i>Corvus enca</i>	Tandai
<i>C. macrorhynchos</i>	Tandai/Ipoh
<i>Parus major</i>	Gunung Tujuh
<i>Sitta frontalis</i>	Gunung Tujuh
<i>S. azurea</i>	Gunung Tujuh
<i>Peltophaga capistratum</i>	Tandai
<i>Trichastoma bicolor</i>	Tandai
<i>Malacocincla malaccense</i>	Tandai
<i>M. sepiarum</i>	Bukit Bontak
<i>Malacopteron magnirostre</i>	Tandai
<i>M. affine</i>	Tandai
<i>M. cinereum</i>	Tandai
<i>Pomatorhinus montanus</i>	Tandai
<i>Rimator malacoptilus</i>	Gunung Kerinci
<i>Napothera rufipectus</i>	Gunung Kerinci
<i>N. marmorata</i>	Bukit Tapan
<i>N. epilopidota</i>	Tandai
<i>Pnoepyga pussilla</i>	Gunung Kerinci/Gunung Tujuh
<i>S. rufifrons</i>	Tandai
<i>S. chrysaea</i>	Gunung Tujuh
<i>S. nigriceps</i>	Bukit Bontak
<i>S. poliocephala</i>	Tandai
<i>S. striolata</i>	Tandai
<i>S. maculata</i>	Tandai
<i>S. leucotis</i>	Sungai Gambir
<i>S. erythroptera</i>	Tandai
<i>Macronous gularis</i>	Tandai
<i>M. pilosus</i>	Tandai
<i>Garrulax palliatus</i>	Bukit Bontak/Punggut
<i>G. leucolophus</i>	Bukit Bontak
<i>G. lugubris lugubris</i>	Gunung Raya/Gunung Tujuh
<i>G. mitratus</i>	Gunung Tujuh
<i>Leiothrix argentauris</i>	Gunung Tujuh/Sipurak/Gunung Raya
<i>Pteruthius flaviscapis</i>	Gunung Tujuh/Gunung Kerinci
<i>Alcippe brunneicauda</i>	Tandai
<i>Heterophasia picoides</i>	Gunung Tujuh
<i>Eupetes macrocerus</i>	Tandai
<i>Brachypterix leucophrys</i>	Tandai
<i>B. montana saturata</i>	Gunung Tujuh/Gunung Kerinci
<i>Erithacus cyane</i>	Gunung Kerinci/Gunung Tujuh
<i>Copsychus saularis</i>	Sungai Penuh
<i>C. malabaricus</i>	Tandai
<i>Trichixos pyrrhopygus</i>	Tandai
<i>Cinclidium diana</i>	Gunung Tujuh
<i>Enicurus velatus</i>	Bukit Bontak

<i>E. ruficapillus</i>	Tandai
<i>E. leschenaultia</i>	Tandai
<i>Cochoa beccarii</i>	Gunung Kerinci
<i>Myiophoneus melanurus</i>	Gunung Tujuh/Gunung Kerinci
<i>M. castaneus</i>	Gunung Tujuh
<i>Myiophoneus caeruleus</i>	Sipurak
<i>Zoothera andromedae</i>	Gunung Tujuh
<i>Z. sibirica</i>	Gunung Kerinci/Bukit Tapan
<i>Z. dauma</i>	Gunung Tujuh
<i>Turdus obscurus</i>	Tandai
<i>T. poliocephalus</i>	Gunung Kerinci
<i>Seicercus castaniceps</i>	Sipurak
<i>S. grammiceps</i>	Gunung Tujuh/Gunung Kerinci
<i>S. montis</i>	Ranah Kayu Rembun
<i>Phylloscopus inornatus</i>	Gunung Kerinci
<i>P. borealis</i>	Tandai
<i>P. coronatus</i>	Tandai
<i>P. trivirgatus</i>	Gunung Tujuh/Gunung Kerinci
<i>Acrocephalus orientalis</i>	Lake Kerinci
<i>Locustella certhiola</i>	Sungai Penuh
<i>Orthomus atrogularis</i>	Tandai
<i>O. ruficeps</i>	Tandai
<i>O. sericeus</i>	Tandai
<i>O. cuculatus</i>	Gunung Tujuh
<i>Prinia atrogularis</i>	Gunung Tujuh
<i>P. flaviventris</i>	Ulu Jernih/Tandai
<i>P. familiaris</i>	Tapan
<i>Cisticola juncidis</i>	Lake Kerinci
<i>Cettia vulcania</i>	Gunung Tujuh
<i>Rhinomyias olivacea</i>	Sipurak
<i>R. umbratilis</i>	Tandai
<i>Muscicapa dauurica</i>	Gunung Tujuh
<i>Eumyias thalassina</i>	Tandai
<i>E. indigo</i>	Tandai
<i>Ficedula mugimaki</i>	Tandai
<i>F. solitaria</i>	Sipurak
<i>F. hyperythra</i>	Gunung Tujuh/Gunung Kerinci
<i>F. dumetoria</i>	Tandai
<i>F. westermanni</i>	Gunung Tujuh/Gunung Kerinci
<i>Niltava grandis</i>	Letter W
<i>N. sumatrana</i>	Gunung Tujuh
<i>Cyornis concretus</i>	Tandai
<i>C. banyumas</i>	Tandai
<i>C. rufigastra</i>	Sungai Gambir
<i>Muscicapella hodgsoni</i>	Gunung Tujuh/Gunung Kerinci
<i>Culicicapa ceylonensis</i>	Bukit Bontak/Tandai
<i>Rhipidura albicollis</i>	Gunung Tujuh
<i>R. perlata</i>	Tandai
<i>Hypothymis azurea</i>	Tandai
<i>Philentoma velatum</i>	Tandai
<i>P. phyrhopterum</i>	Tandai
<i>Terpsiphone paradisi</i>	Tandai
<i>Motacilla cinerea</i>	Tandai
<i>M. flava</i>	Kayu Aro/ Sungai Penuh
<i>Dendronanthus indicus</i>	Tapan
<i>Anthus novaeseelandiae</i>	Tamiai

<i>Artamus leucorhynchus</i>	Kayu Aro
<i>Lanius cristatus</i>	Tandai
<i>L. tigrinus</i>	Tandai
<i>L. schach</i>	Ulu Jernih
<i>Acridotheres tristis</i>	Sungai Penuh
<i>Gracula religiosa</i>	Ipuh
<i>Anthreptes simplex</i>	Tandai
<i>A. malacensis</i>	Tandai/Tapan
<i>A. rhodolaema</i>	Tandai
<i>A. singalensis</i>	Tandai
<i>Hypogramma hypogrammicum</i>	Tandai
<i>Nectarinia sperata</i>	Tandai
<i>Aethopyga temminckii</i>	Gunung Tujuh/Gunung Kerinci
<i>A. siparaja</i>	Muara Sako
<i>Arachnothera longirostra</i>	Tandai
<i>A. crassirostris</i>	Tandai
<i>A. robusta</i>	Tandai
<i>A. flavigaster</i>	Tandai
<i>A. chrysogenys</i>	Tandai
<i>A. affinis</i>	Tandai
<i>Prionochilus maculatus</i>	Tandai
<i>P. percussus</i>	Tandai
<i>Dicaeum chrysorrheum</i>	Tandai
<i>D. trigonostigma</i>	Tandai
<i>D. cruentatum</i>	Muara Sako
<i>D. ignipectus</i>	Bukit Tapan
<i>Zosterops palpebrosus</i>	Bukit Bontak
<i>Z. atricapilla</i>	Gunung Kerinci
<i>Z. montanus</i>	Gunung Kerinci
<i>Passer montanus</i>	Sungai Penuh
<i>Ploceus philippinus</i>	Sungai Penuh
<i>Erythrura prasina</i>	Sungai Gambir
<i>Lonchura striata</i>	Tandai
<i>L. punctulata</i>	Sungai Penuh
<i>L. maja</i>	Lake Kerinci

II-3. The vegetation and tree flora of KSNP (Yves Laumonier, Tropical Biodiversity 2(1), 1994):

The most common species in the canopy and lower canopy of hill forests on the eastern slopes of the Barisan

CANOPY

Family	Species
Aceraceae	<i>Acercaestum</i>
Anacardiaceae	<i>Buchananta sessilifolia</i> <i>Drymicarpus luridus</i>
Burseraceae	<i>Canarium patentinervium</i> <i>C. caudatum</i> <i>Santeria laevigata</i>
Clusiaceae	<i>Calophyllum flavo-ramulum</i> <i>C. pulcherrimum</i>
Dipterocarpaceae	<i>Hopea</i> cf. <i>beccariana</i> <i>Shorea platyclados</i> <i>S. ovalis</i> ssp. <i>seicea</i> <i>S. ovata</i>
Fagaceae	<i>Lithocarpus</i> cf. <i>pseudomoluccus</i> <i>L.</i> cf. <i>enclisacarpus</i> <i>L. lucidus</i> <i>Quercus argentata</i> <i>Q. subsericea</i>
Lauracea	<i>Cinnamomum porrectum</i>
Myrtaceae	<i>Eugenia magnoliaefolia</i>
Sapindaceae	<i>Nephelium ramboutan-ake</i>
Sapotaceae	<i>Ganua</i> cf. <i>palembanica</i>

LOWER CANOPY

Family	Species
<i>Euphorbiaceae</i>	<i>Aporuosa frutescens</i> <i>Baccaurea pyriformis</i> <i>Drypetes</i> cf. <i>polyneura</i>
Fagaceae	<i>Castanopsis</i> cf. <i>johorensis</i> <i>Ptycopyxis javanica</i>
Flacourtiaceae	<i>Hydnocarpus kunstleri</i>
Meliaceae	<i>Aglaia elliptica</i>
Proteaceae	<i>Helicia serrata</i>
Rhamnaceae	<i>Ziziphus angustifolius</i>
Rubiaceae	<i>Lasianthus chrysotrichus</i>
Rubiaceae	<i>Urophllum arboreum</i>
Rutaceae	<i>Euodia</i> cf. <i>aromatica</i>
Theaceae	<i>Gordonia excelsa</i>

The most common species in the canopy, lower canopy, and understory of hill forests on the western slopes of the Bukit Barisan Mountain Range.

CANOPY

Family	Species
Anacardiaceae	<i>Dracontomelon costatum</i>
	<i>D. dao</i>
Bignoniaceae	<i>Radermachera glandulosa</i>
Burseraceae	<i>Canarium denticulatum</i>
	<i>C. dichotomum</i>
	<i>C. caudatum</i>
Dipterocarpaceae	<i>Hopea</i> sp. Nov. (aff. <i>auriculata</i>)
	<i>Shorea assamica</i>
	<i>S. platyclados</i>
Juglandaceae	<i>Engelhardia spicata</i>
Lauraceae	<i>Beilschmiedia assamica</i>
	<i>Cinnamomum paretum</i>
Sapindaceae	<i>Pometia pinnata</i>
Staphyleaceae	<i>Turpinia</i> sp.
	<i>Octomeles sumatrana</i>
Sterculiaceae	<i>Sterculia</i> sp.
Combretaceae	<i>Terminalia</i> spp.
	<i>T. subspathulata</i>

LOWER CANOPY

Family	Species
Clusiaceae	<i>Calophyllum exiticostatum</i>
	<i>C. venulosum</i>
Cornaceae	<i>Mastixia trichotoma</i>
Dipterocarpaceae	<i>Vatica perakensis</i>
	<i>V. cinerea</i>
	<i>V. abovata</i>
Euphorbiaceae	<i>Blumeodendron kurzii</i>
	<i>Neoscortechinia forbesii</i>
	<i>Ptychopyxis bacciformis</i>
Hamamelidaceae	<i>Distylium stellare</i>
Meliaceae	<i>Aglaiia</i> cf. <i>ganggo</i>
	<i>A. eximia</i>
	<i>A. teijsmanniana</i>
	<i>A. argentea</i>
	<i>A. odoratissima</i>
	<i>Chisocheton macrophyllus</i>
	<i>Dysoxylum</i> cf. <i>cauliflorum</i>
	<i>D. densiflorum</i>
	<i>D. alliaceum</i>
	<i>Sandoricum koetjape</i>
Myristicaceae	<i>Horsfieldia triandra</i>
	<i>H. majuscula</i>
Styracaceae	<i>Styrax serrulatum</i>
	<i>S. paralleloneurum</i>
Clusiaceae	<i>Garcinia parvifolia</i>

Crypteroniaceae	<i>G. scortechinii</i>
Euphorbiaceae	<i>Crypteronia paniculata</i>
	<i>Antidesma montanum</i>
	<i>Baccaurea</i> cf. <i>parviflora</i>
	<i>B.</i> cf. <i>racemosa</i>
	<i>B. lanceolata</i>
	<i>B. parviflora</i>
	<i>B. sumatrana</i>
	<i>Botryophora geniculata</i>
	<i>Drypetes</i> cf. <i>minahassae</i>
	<i>Glochidion</i> cf. <i>lutescens</i>
Proteaceae	<i>Heliciopsis</i> cf. <i>insisa</i>
	<i>Helicia serrata</i>
Rhizophoraceae	<i>Anisophyllea griffithii</i>
	<i>Carallia brachiata</i>
Rafflesiaceae	<i>Rafflesia arnoldi</i>
	<i>Rhizanthus zippelii</i>
Tiliaceae	<i>Grewia laurifolia</i>

The most common canopy and lower canopy tree species in hill forests found on volcanic tuffs.

CANOPY

Family	Species
Anacardiaceae	<i>Dracontomelon costatum</i>
Fagaceae	<i>Quercus argentata</i>
Meliaceae	<i>Dysoxylum acutangulum</i>
Sapindaceae	<i>Pometia pinnata</i>
Sterculiaceae	<i>Pterospermum javanicum</i>
Simaroubaceae	<i>Irvingia malayana</i>
Podocarpaceae	<i>Podocarpus wallichianus</i>
Lauraceae	<i>Alseodaphne oblanceolata</i>
Meliaceae	<i>Chisocheton ceramicus</i>
Rubiaceae	<i>Neonauclea calycina</i>

LOWER CANOPY

Family	Species
Annonaceae	<i>Polyalthia rumphii</i>
	<i>Stelechocarpus cauliflorus</i>
Euphorbiaceae	<i>Aporusa frutescens</i>
	<i>Baccaurea pyriformis</i>
Meliaceae	<i>Aglaia crassinervia</i>
	<i>A.</i> cf. <i>speciosa</i>
	<i>Lansium domesticum</i>
Moraceae	<i>Artocarpus anisophyllus</i>
Myristicaceae	<i>Knema sumatrana</i>
	<i>Myristica crassa</i>
Rubiaceae	<i>Neonauclea lanceolata</i>
Sapindaceae	<i>Nephelium lappaceum</i>
	<i>Paranephelium xestophyllum</i>
Sapotaceae	<i>Ganua</i> cf. <i>kingiana</i>

Ulmaceae *Payena* cf. *dantung*
Celtis rigescens

The most common canopy and lower canopy tree species in the submontane forests.

Family	Species
Araliaceae	<i>Arthrophyllum javanicum</i>
Clusiaceae	<i>Calophyllum venulosum</i> <i>Garcinia</i> spp
Cornaceae	<i>Mastixia rostrata</i>
Daphniphyllaceae	<i>Caphniphyllum glaucescens</i>
Fagaceae	<i>Lithocarpus javensis</i>
Icacinaeae	<i>Platea latifolia</i>
Lauraceae	<i>Beilschmiedia gemmiflora</i> <i>Cryptocarya ferrea</i> <i>Endiandra macrophylla</i> <i>E. rubescens</i> <i>Lindera subumbelliflora</i> <i>Litsea angulata</i> <i>L. meijerii</i> <i>L. resinosa</i>
Meliaceae	<i>Aglata malaccensis</i> <i>A. sp. aff. eximia</i> <i>A. aspera</i> <i>A. elliptica</i> <i>A. odoratissima</i> <i>Dysoxylum cauliflorum</i> <i>D. cf. macrocarpum</i>
Myrtaceae	<i>Acmena acuminatissima</i> <i>Decaspermum</i> sp. <i>Eugenia</i> spp.
Magnoliaceae	<i>Magnolia mackloitii</i>
Myristicaceae	<i>Horsfieldia</i> cf. <i>macilenta</i> <i>H. cf. macrothyrsa</i> <i>Knema glauca</i> <i>K. sumatrana</i>
Rosaceae	<i>Prunus polystachyus</i>
Rubiaceae	<i>Canthium glabrum</i> <i>Neonauclea lanceolata</i> <i>Urophyllum</i> sp.
Rutaceae	<i>Acronychia laurifolia</i>
Sabiaceae	<i>Meliosma pinnata</i>
Sapindaceae	<i>Nephelium juglandifolium</i> <i>N. lappaceum</i>
Styracaceae	<i>Styrax paralleloneurum</i>
Theaceae	<i>Adinandra acuminata</i> <i>Eurya acuminata</i> <i>Gordonia axcelsa</i>
Tiliaceae	<i>Pentace polyantha</i>

The most common understorey tree species in the submontane forests.

Family	Species
Clusiaceae	<i>Garcinia urophylla</i>
Connaraceae	<i>Elliphanthus tomentosus</i>
Ebenaceae	<i>Diospyros surbhomboidea</i>
Euphorbiaceae	<i>Phyllanthus accrescens</i> <i>Suregada glomerulata</i>
Flacourtiaceae	<i>Benettiodendron leprosipes</i> <i>Flacourtia rukam</i>
Icacinaceae	<i>Gompharda fusiformis</i> <i>G. javanica</i> <i>Stemonurus secundiflorus</i>
Lauraceae	<i>Cinnamomum cuspidatum</i> <i>Dehaasta sumatrana</i> <i>Lindera subumbelliflora</i>
Myrsinaceae	<i>Ardisia blunii</i> <i>A. ondotohylla</i> <i>A. javanica</i> <i>A. vastita</i>
Proteaceae	<i>Helicia serrata</i>
Rubiaceae	<i>Canthium horridum</i> <i>Lasianthus rigidus</i> <i>Mycetia cauliflora</i> <i>Saprosma arboreum</i>
Rutaceae	<i>Glycosmis pentaphylla</i> <i>Zantoxylum acanthopodium</i>
Symplocaceae	<i>Symplocos fasciculata</i>

**APPENDIX III:
SPECIES LISTS OF BUKIT BARISAN SELATAN NATIONAL PARK
(BBSNP)**

III-1. Mammal species of BBSNP (after surveys by WCS-IP during the 1997-2001 and surveys by FMIP-UE (Forest Inventory and Monitoring Programme-European Union) Project in 1997-1998):

Family	Scientific name
Erinaceidae	<i>Echinosorex gymnurus</i>
Tupaiidae	<i>Tupaia glis</i> <i>T. gracilis</i> <i>T. minor</i> <i>T. picta</i> <i>T. tana</i>
Cynocephalidae	<i>Cynocephalus variegates</i>
Pteropodidae	<i>Aethalops alecto</i> <i>Balyonictis macculata</i> <i>Chironax melanocephalus</i> <i>Cynopterus brachyotis</i> <i>C. horfieldii</i> <i>C. sphinx</i> <i>Megaerops eucaudatus</i> <i>Penthetor lucasi</i> <i>Pteropus vampirus</i> <i>Rousettus amplexicaudatus</i>
Hipposideridae	<i>Hipposideros diadema</i> <i>H. galeritus</i> <i>H. larvatus</i>
Vespertilionidae	<i>Harpiocephalus harpia</i> <i>Tylonicterys pachypus</i> <i>Glischropus tylopus</i> <i>Philetor brachypterus</i> <i>Kerivoulia papillosa</i>
Mollosidae	<i>Cheiromeles torquatus</i>
Lorisidae	<i>Nycticebus coucang</i>
Cercopithecidae	<i>Macaca nemestrina</i> <i>M. fascicularis</i> <i>Presbytis melalophos</i> <i>Trachypithecus cristatus</i>
Hylobatidae	<i>Hylobates agilis</i> <i>H. syndactylus</i>

Manidae	<i>Manis javanica</i>
Sciuridae	<i>Ratufa affinis</i> <i>R. bicolor</i> <i>Callosciurus notatus</i> <i>C. prevostii</i> <i>C. nigrovittatus</i> <i>Lariscus insignis</i> <i>Nannosciurus melanotis</i> <i>Rhinosciurus laticaudatus</i> <i>Sundasciurus hippurus</i> <i>S. lowii</i> <i>S. tenuis</i>
Pteromyidae	<i>Aeromys lephromelas</i> <i>Petaurista petaurista</i> <i>Petinomys genibarbis</i>
Muridae	<i>Leopoldamys sabanus</i> <i>Maxomys rajah</i> <i>M. surifer</i> <i>M. whiteheadi</i> <i>Niviventer cremoriventer</i> <i>N. rapit</i> <i>Rattus argentiventer</i> <i>R. exulans</i> <i>R. tiomanicus</i> <i>Sundamys muelleri</i> <i>Chiropodomys sp.</i>
Hystricidae	<i>Hystrix brachyura</i> <i>Trichys fasciculata</i>
Caniidae	<i>Cuon alpinus</i>
Ursidae	<i>Helarctos malayanus</i>
Mustelidae	<i>Mustela nudipes</i> <i>Martes flavigula</i> <i>Mydaus javanicus</i> <i>Lutra sp</i> <i>Lutrogale perspicillata.</i> <i>Lutrogale. sp</i> <i>Aonyx cinerea</i> <i>Aonyx. sp.</i>
Viverridae	<i>Viverra zangalunga</i> <i>Prionodon linsang</i> <i>Paradoxurus hermaphroditus</i> <i>Paguma larvata</i> <i>Arctitis binturong</i> <i>Arctogalidia trivirgata</i> <i>Hemigalus derbyanus</i> <i>Cynogale bennettii</i>

Herpestidae	<i>Herpestes semitorquatus</i>
Felidae	<i>Prionailurus bengalensis</i> <i>P. viverrinus</i> <i>P. planiceps</i> <i>Catopuma temmincki</i> <i>Pardofelis marmorata</i> <i>Neofelis nebulosa</i> <i>Panthera tigris sumatrae</i>
Elephantidae	<i>Elephas maximus sumatranus</i>
Tapiridae	<i>Tapirus indicus</i>
Rhinocerotidae	<i>Dicerorhinus sumatrensis</i>
Suidae	<i>Sus barbatus</i> <i>S. scrofa</i>
Tragulidae	<i>Tragulus javanicus</i> <i>T. napu</i>
Cervidae	<i>Cervus unicolor</i> <i>Muntiacus muntjak</i>
Bovidae	<i>Capricornis sumatraensis sumatraensis</i>
Leporidae	<i>Nesolagus netscheri</i>

III-2. Birds species of BBSNP (after surveys by WCS-IP during the 1997-2001 and surveys by FMIP-UE (Forest Inventory and Monitoring Programme-European Union) Project in 1997-1998):

Family	Scientific name
Pelicanidae	<i>Pelicanus conspicillatus</i>
Fregatidae	<i>Fregata adrewisi</i> <i>F. ariel</i>
Ardeidae	<i>Ardea purpurea</i> <i>Butorides striatus</i> <i>Egretta sacra</i> <i>E. intermedia</i> <i>E. garzetta</i>
Ciconiidae	<i>Mycteria cinerea</i> <i>Ciconia episcopus</i> <i>C. stormi</i> <i>Leptoptilus dubius</i> <i>L. javanicus</i> <i>Dupetor flavicollis</i>
Threskiornithidae	<i>Threskiornis melanocephalus</i>
Anatidae	<i>Dendrocygna arcuata</i> <i>Cairina scutulata</i>
Pandionidae	<i>Pandion heliaetus</i>
Accipitridae	<i>Aviceda jerdoni</i> <i>Macheiramphus alcinus</i> <i>Heliastur indus</i> <i>Haliaeetus leucogaster</i> <i>Ichthyophaga ichthyaetus</i> <i>Spilornis cheela</i> <i>Accipiter trivirgatus</i> <i>Ictinaetus malayensis</i> <i>Hieraetus kiernii</i> <i>Spizaetus cirrhatus</i> <i>S. alboniger</i> <i>S. nanus</i>
Falconidae	<i>Microhierax fringillarius</i>
Phasianidae	<i>Coturnix chinensis</i> <i>Rollulus rouloul</i> <i>Lophura ignita</i> <i>Gallus gallus</i> <i>Argusianus argus</i> <i>Polyplectron chalcurum</i> <i>Rhizotera longirostris</i>

Rallidae	<i>Porzana fusca</i> <i>P. cinerea</i> <i>Amaurornis phoenicurus</i>
Rhipiduridae	<i>Rhipidura albicollis</i> <i>R. perlata</i>
Scolopacidae	<i>Numenius arquata</i> <i>N. phaeopus</i> <i>Tringa hypoleucos</i> <i>Arenaria interpres</i> <i>Calidris ferruginea</i> <i>C. alba</i> <i>Philomachus pugnax</i>
Burhinidae	<i>Esacus magnirostris</i>
Sternidae	<i>Chilodoniastrea hybridus</i> <i>Sterna hirundo</i> <i>S. albifrons</i> <i>Anous stolidus</i>
Columbidae	<i>Treron curvirostra</i> <i>T. olax</i> <i>T. vernans</i> <i>T. capellei</i> <i>Ptilinopus jambu</i> <i>Ducula aenea</i> <i>D. bicolor</i> <i>D. badia</i> <i>Macropygia ruficeps</i> <i>M. unchall</i> <i>Streptopillia chinensis</i> <i>Geopelia striata</i> <i>Chalcophaps indica</i>
Psittacidae	<i>Psittacula alexandri</i> <i>P. longicauda</i> <i>Psittinus cyanurus</i> <i>Loriculus galgulus</i>
Cuculidae	<i>Clamator coromandus</i> <i>Cuculus sparverioides</i> <i>C. fugax</i> <i>C. micropterus</i> <i>Cacomantis merulinus</i> <i>C. sepulcralis</i> <i>C. sonnerati</i> <i>C. variolosus</i> <i>Carpococcyx viridis</i> <i>Chrysococcyx macculata</i> <i>C. xanthorhynchus</i> <i>Cuculus fugax</i> <i>C. micropterus</i> <i>Cuculus sparverioides</i> <i>Surniculus lugubris</i>

	<i>Eudynamys scolopacea</i>
	<i>Phaenicophaeus diardi</i>
	<i>P. sumatranus</i>
	<i>P. tristis</i>
	<i>P. chlorophaeus</i>
	<i>P. javanicus</i>
	<i>P. curvirostris</i>
	<i>Centropus sinensis</i>
	<i>C. bengalensis</i>
Strigidae	<i>Ketupa ketupu</i>
	<i>Otus lempiji</i>
	<i>O. rufescens</i>
	<i>Bubo sumatranus</i>
	<i>Ninox scutulata</i>
	<i>Phodilus badius</i>
Podargidae	<i>Batrachostomus cornutus</i>
Camprimulgidae	<i>Eurpstopodus temmnickii</i>
Apodidae	<i>Collocalia fuciphaga</i>
	<i>C. esculenta</i>
	<i>C. maxima</i>
	<i>Hirundapus cochinchinensis</i>
	<i>Rhapidura leucopygialis</i>
	<i>Apus pacificus</i>
	<i>A. affinis</i>
	<i>Cypsiurus balasiensis</i>
Hemiprocnidae	<i>Hemiprocne longipennis</i>
	<i>H. comata</i>
Trogonidae	<i>Harpactes kasumba</i>
	<i>H. diardii</i>
	<i>H. duvaucelii</i>
	<i>H. oreskios</i>
	<i>H. erythrocephalus</i>
Alcedinidae	<i>Alcedo atthis</i>
	<i>A. meninting</i>
	<i>A. euryzona</i>
	<i>Ceyx erithacus</i>
	<i>C. rufidorsa</i>
	<i>Pelargopsis capensis</i>
	<i>Lacedo pulchella</i>
	<i>Halcyon smyrnensis</i>
	<i>H. pileata</i>
	<i>Todirhamphus chloris</i>
	<i>Actenoides concretus</i>
Meropidae	<i>Merops viridis</i>
	<i>M. leschenaultia</i>
	<i>M. philippinus</i>
	<i>Nyctyornis amictus</i>

Coraciidae	<i>Eurystomus orientalis</i>
Bucerotidae	<i>Anorrhinus galeritus</i> <i>Aceros comatus</i> <i>A. corrogatus</i> <i>A. undulatus</i> <i>Anthracoceros albirostris</i> <i>A. malayanus</i> <i>Buceros bicornis</i> <i>B. rhinoceros</i> <i>B. vigil</i>
Capitonidae	<i>Megalaima chrysopogon</i> <i>M. rafflesii</i> <i>M. mystacophanos</i> <i>M. ortii</i> <i>M. henrici</i> <i>M. australis</i> <i>M. haemacephala</i> <i>Calorhamphus fuliginosus</i>
Indicatoridae	<i>Indicator archipelagicus</i>
Picidae	<i>Celeus brachyurus</i> <i>Sasia abnormis</i> <i>Dinopium rafflesii</i> <i>Picoides macei</i> <i>Picus canus</i> <i>P. puniceus</i> <i>P. mentalis</i> <i>P. miniaceus</i> <i>P. flavinucha</i> <i>Meiglyptes tristis</i> <i>M. tuckii</i> <i>Mulleripicus pulverulentus</i> <i>Hemicircus concretus</i> <i>Dryocopus javensis</i> <i>Dendrocopos moluccensis</i> <i>Blythipicus rubiginosus</i> <i>Reinwardtipicus validus</i>
Eurylaimidae	<i>Corydon sumatranus</i> <i>Cymbirhynchus macrorhynchos</i> <i>Eurylaimus javanicus</i> <i>E. ochromalus</i> <i>Serilophus lunatus</i> <i>Psarisomus dalhousie</i> <i>Calyptomena viridis</i>
Pittidae	<i>Pitta caerulea</i> <i>P. granatina</i> <i>P. venusta</i> <i>P. sordida</i> <i>P. guajana</i>
Hirundinidae	<i>Hirundo</i> sp.

	<i>H. rustica</i> <i>H. tahitica</i> <i>Delichon dasypus</i>
Campephagidae	<i>Hemipus hirundinaceus</i> <i>H. picatus</i> <i>Tephrodonis gularis</i> <i>Coracina striata</i> <i>C. fimbriata</i> <i>Lalage nigra</i> <i>Pericrocotus cinnamoneus</i> <i>P. divaricatus</i> <i>P. flammeus</i> <i>P. solaris</i> <i>P. igneus</i>
Chloropseidae	<i>Aegithina viridissima</i> <i>A. tiphia</i> <i>Chloropsis cyanopogon</i> <i>C. sonnerati</i> <i>C. cochinchinensis</i> <i>C. venusta</i>
Pycnonotidae	<i>Alophoixus bres</i> <i>A. ochraceus</i> <i>A. phaeocephalus</i> <i>Criniger finschii</i> <i>Hypsipetes flavala</i> <i>Iole (Hypsipetes) olivacea</i> <i>Ixos (Hypsipetes) malaccensis</i> <i>Pycnonotus atriceps</i> <i>P. aurigaster</i> <i>P. brunneus</i> <i>P. cyaniventris</i> <i>P. erythrophthalmos</i> <i>P. eutilotus</i> <i>P. goiavier</i> <i>P. melanicterus</i> <i>P. melanoleucos</i> <i>P. cyaniventris</i> <i>P. plumosus</i> <i>P. simplex</i> <i>P. squamatus</i> <i>P. zeylanicus</i> <i>Tricholestes criniger</i>
Dicruridae	<i>Dicrurus leucophaeus</i> <i>D. aeneus</i> <i>D. anectant</i> <i>D. remifer</i> <i>D. hottentattus</i> <i>D. macrocerus</i> <i>D. sumatranus</i> <i>D. paradiseus</i>

Oriolidae	<i>Oriolus chinensis</i> <i>O. xanthonotus</i> <i>Irena puella</i>
Corvidae	<i>Platylophus galericulatus</i> <i>Dendrocitta occipitalis</i> <i>Platysmurus leucopterus</i> <i>Cissa chinensis</i> <i>Corvis enca</i> <i>Corvus macrorhynchus</i>
Sittidae	<i>Sitta frontalis</i>
Timaliidae	<i>Alcippe brunneicauda</i> <i>Eupetes macrocerus</i> <i>Macronous gularis</i> <i>M. ptilosus</i> <i>Malacocincla abbotti</i> <i>M. sepiarum</i> <i>M. (Trichastoma) vanderbilti</i> <i>Malacopteron affine</i> <i>M. cinereum</i> <i>M. magnirostre</i> <i>M. magnum</i> <i>Pellorneum capistratum</i> <i>Pomatorhinus montanus</i> <i>Stachyris erythroptera</i> <i>S. leucotis</i> <i>S. maculata</i> <i>S. nigricollis</i> <i>S. poliocephala</i> <i>S. rufifrons</i> <i>S. nigriceps</i> <i>S. striolata</i> <i>S. rufifrons</i> <i>S. nigriceps</i> <i>S. striolata</i> <i>Trichastoma bicolor</i> <i>T. rostratum</i> <i>Napothera macrodactyla</i> <i>Garullax leucolophus</i> <i>G. ingubris</i> <i>G. palliatus</i> <i>Leiothry argentarius</i> <i>Pteruthius flaviscapis</i> <i>Heteropahasia picaoides</i>
Turdidae	<i>Copsychus malabaricus</i> <i>C. saularis</i> <i>Trichixos pyrrhopygus</i> <i>Enicurus leschenaulti</i> <i>E. ruficapillus</i> <i>Myiophoneus glauciurus</i> <i>M. caeruleus</i>

Sylviidae	<i>Abroscopus superciliaris</i> <i>Gerygone sulphurea</i> <i>Locustella lanceolata</i> <i>Orthotomus atrogularis</i> <i>O. ruficeps</i> <i>O. sericeus</i> <i>O. sutorius</i> <i>Phylloscopus borealis</i> <i>P. inornatus</i> <i>P. coronatus</i> <i>Prinia atrogularis</i> <i>P. flaviventris</i> <i>P. familiaris</i> <i>Cisticola juncidis</i>
Muscicapidae	<i>Culicicapa ceylonensis</i> <i>Cyanoptila cyanomelana</i> <i>Cyornis ruckii</i> <i>C. turcosa</i> <i>C. unicolor</i> <i>Eumyias thalassina</i> <i>E. indigo</i> <i>Ficedula dumetoria</i> <i>F. hyperithra</i> <i>F. mugimaki</i> <i>F. solitarius</i> <i>F. zanthopygia</i> <i>Hypothymis azurea</i> <i>Muscicapa dauurica</i> <i>M. ferruginia</i> <i>M. sibirica</i> <i>Niltava grandis</i> <i>Philentoma pyrhopterum</i> <i>P. velatum</i> <i>Rhinomyias umbratilis</i> <i>R. olivacea</i> <i>Terpsiphone paradisi</i> <i>Rhipidura perlata</i>
Motacillidae	<i>Motacilla cinerea</i> <i>M. flava</i> <i>Anthus novaeseelandie</i>
Laniidae	<i>Lanius tigrinus</i>
Sturnidae	<i>Gracula religiosa</i> <i>Aplonis panayensis</i>
Nectarinidae	<i>Aethopyga mysticalis</i> <i>A. siparaja</i> <i>A. temminckii</i> <i>Anthreptes malaccensis</i> <i>A. rhodolaema</i> <i>A. simplex</i> <i>A. singalensis</i> <i>Arachnotera affinis</i>

	<i>Arachnotera chrysogenys</i>
	<i>A. crassirostris</i>
	<i>A. flavigaster</i>
	<i>A. longirostra</i>
	<i>A. robusta</i>
	<i>Hypogramma hypogrammicum</i>
	<i>Nectarinia calcostetha</i>
	<i>N. jugularis</i>
	<i>N. sperata</i>
Dicaeidae	<i>Dicaeum agile</i>
	<i>D. chrysorrheum</i>
	<i>D. concolor</i>
	<i>D. ignipectus</i>
	<i>D. cruentatum</i>
	<i>D. trigonostigma</i>
	<i>D. trochileum</i>
	<i>Prionochilus flammeus</i>
	<i>P. maculatus</i>
	<i>P. percussus</i>
Zosteropidae	<i>Zosterops palpebrosus</i>
Ploceidae	<i>Lonchura leucogastroides</i>
	<i>Passer montanus</i>
	<i>Lonchura malacca</i>
	<i>L. maja</i>
	<i>L. striata</i>

III-3. Herpetofauna species of BBSNP surveys by FMIP-UE (Forest Inventory and Monitoring Programme-European Union) Project in 1997-1998):

Family	Scientific name
Agamidae	<i>Bronchocela jubata</i> <i>Draco quinquefasciatus</i> <i>D. maximus</i> <i>D. melanopogon</i> <i>D. volans</i> <i>Gonycephalus sumatranus</i>
Bufoidea	<i>Leptophryne borbonica</i> <i>Bufo asper</i> <i>B. melanostictus</i>
Colubridae	<i>Amphiesma inas</i> <i>Boiga cynodon</i> <i>B. dendrophila</i> <i>B. jaspidea</i> <i>B. nigriceps</i> <i>Dendrelaphis pictus</i> <i>Gonyosoma oxycephalum</i> <i>Lycodon subcinctus</i> <i>Macrophistodon rhodomelas</i> <i>Pareas malaccanus</i> <i>Psammodynastes pulverulentus</i> <i>Rhabdophis chrysargus</i> <i>Sinonatrix trianguligera</i>
Elapidae	<i>Bungarus flaviceps</i> <i>Naja naja sputatrix</i>
Emydidae	<i>Heosemys spinosa</i> <i>Tryonix cartilagineus</i> <i>Notochelys platynota</i> <i>Orlitia borneensis</i> <i>Manouria emys</i>
Geckonidae	<i>Gymnodactylus pelagicus</i> <i>Ptychozoon kuhli</i>
Lacertidae	<i>Tachydromus sexlineatus</i>
Microhylidae	<i>Kalophrynus pleurostigma</i> <i>Kaloula pulchra</i> <i>Microhyla heymonsi</i>
Pelobatidae	<i>Megophrys montana</i> <i>M. nasuta</i>
Rachophoridae	<i>Polypedates macroti</i> <i>Rhacophorus appendiculatus</i> <i>R. nigropalmatus</i> <i>R. pardalis</i>

	<i>R. reindwardtii</i> <i>Polypedatus otilophus</i>
Ranidae	<i>Amolops jerboa</i> <i>Occidozyga baluensis</i> <i>O.(Limnoctes) blythi</i> <i>Rana chalconota</i> <i>R. hosei</i> <i>R. kuhlii</i> <i>R. macrodon</i> <i>R. microdisca</i> <i>R. picturata</i> <i>R. signata</i> <i>Rana. sp.</i>
Scincidae	<i>Mabuya multifasciata</i> <i>M. rudis</i> <i>Spenomorphus sp.</i>
Viperidae	<i>Trimeresurus puniceus</i> <i>T. sumatranus</i>

III-4. Tree species identified in Way Canguk area of BBSNP (WCS – IP):

Family	Scientific name
Actinidiaceae	<i>Saurauia cauliflora</i>
Alangiaceae	<i>Alangium javanicum</i> (K. et V.) Wang
Anacardiaceae	<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe <i>Mangifera griffithii</i> Hooker.f. <i>Melanochyla caesia</i> (Bl.) Ding Hou <i>Parishia maingayi</i> Hook.f. <i>Semecarpus heterophyllus</i> Bl.
Annonaceae	<i>Alphonsea elliptica</i> Hook.f. & Thoms <i>Cananga odorata</i> Baill. <i>Goniothalamus macrophyllus</i> <i>G. sumatranus</i> Miq. <i>Meiogyne virgata</i> Miq. <i>Mitrephora polypyrena</i> (Bl.) Miq. <i>Neouvaria acuminatissima</i> (Miq.) Airy Shaw <i>Polyalthia beccarii</i> <i>P. canangioides</i> <i>P. curtisii</i> Ridl. <i>P. grandiflora</i> <i>P. grandifolia</i> Elm. <i>P. lateriflora</i> King <i>P. macrocarpa</i> Boerl. <i>P. rumphii</i> (Bl.) Merr. <i>P. subcordata</i> Blume <i>Popowia bancana</i> Scheff. <i>Pseudovaria reticulata</i> (Bl.) Miq. <i>Saccopetalum horsfieldii</i> Benn <i>Sageraia lanceolata</i> <i>Stelechocarpus burahol</i> Bl. <i>Alstonia scholaris</i> R.Br. <i>Kibatalia maingayi</i> (Hook.f.) Woodson
Bombacaceae	<i>Bombax valetonii</i>
Burseraceae	<i>Canarium</i> sp. <i>C. denticulatum</i> Bl. <i>Dacryodes</i> sp. <i>D. incurvata</i> (Engl.) H.J.Lam <i>D. rostrata</i> (Bl.) H.J.Lam <i>D. rugosa</i> (Bl.) H.J.Lam
Celastraceae	<i>Bhesa paniculata</i> Arn. <i>Lophopetalum javanicum</i> Turz <i>Siphonodon celastrineus</i> Griff.
Clusiaceae	<i>Cratoxylum sumatranum</i> (Jack) Dyer ssp. <i>sumatranum</i> <i>Garcinia laterifolia</i> Bl. <i>G. parvifolia</i> (Miq.) Miq. <i>Mammea malayana</i> Kosterm.

Combretaceae	<i>Terminalia bellirica</i> (Gaertn.) Roxb. Ex Hem. <i>Terminalia citrina</i> (Gaertn.) Roxb. et Hem.
Datiscaceae	<i>Octomeles sumatrana</i> <i>Tetrameles nudiflora</i> R.Br.
Dilleniaceae	<i>Dillenia excelsa</i> (Jack) Gilg <i>D. sumatrana</i> Miq.
Dipterocarpaceae	<i>Anisoptera costata</i> v.Slooten <i>Dipterocarpus palembanicus</i> v.Slooten <i>D. retusus</i> <i>Shorea ovalis</i> (Korth.) Blume <i>S. ovata</i> Dyer ex Brandis <i>Vatica obovata</i> v.Slooten
Ebenaceae	<i>Diospyros aurea</i> T. et B. <i>D. bantamensis</i> Kds. et Val. <i>D. buxifolia</i> (Bl.) Hiern. <i>D. cauliflora</i> Bl. <i>D. curranii</i> Merr. <i>D. daemona</i> Bakh. <i>D. frutescens</i> Bl. <i>D. korthalsiana</i> Hieron <i>D. macrophylla</i> <i>D. malabarica</i> (Desr.) Kostel. <i>D. malam</i> Bakh. <i>D. polyalthioides</i> Korth. ex Hiern. <i>Diospyros</i> sp.1
Elaeocarpaceae	<i>Elaeocarpus glaber</i> Bl. <i>E. littoralis</i> T. & B. <i>E. macrophyllus</i> Bl. <i>E. obtusus</i> Bl.
Euphorbiaceae	<i>Antidesma montanum</i> Blume <i>Aporosa arborea</i> (Bl.) Miq. <i>A. falcifera</i> Hook.f. <i>A. lunata</i> Kurz <i>A. whitmorei</i> Airy Shaw <i>Baccaurea javanica</i> <i>B. lanceolata</i> Muell. Arg. <i>B. sumatrana</i> <i>Blumeodendron tokbrai</i> Kurz <i>Bridelia glauca</i> Blume <i>B. monoica</i> (Lour.) Merr. <i>Chaetocarpus sumatranus</i> <i>Cleistanthus myrianthus</i> Kurz <i>Croton argyratus</i> Blume <i>Drypetes</i> <i>Drypetes longifolia</i> Pax et Hoffm. <i>D. macrophyllus</i> Pax et Hoffm. <i>D. mucronata</i> Pax et Hoffm. <i>D. neglecta</i> Pax et Hoffm. <i>Drypetes</i> . sp.1

	<i>Drypetes</i> . sp.2
	<i>Drypetes</i> . sp.3
	<i>Drypetes</i> -3 (?neglecta)
	<i>Elateriospermum tapos</i> Bl.
	<i>Galearia filiformis</i>
	<i>Gelonium glomerulatum</i> Hassk.
	<i>Glochidion arborescens</i> Blume
	<i>G. obscurum</i>
	<i>Mallotus echinatus</i> Merr.
	<i>M. floribundus</i> Muell. Arg.
	<i>M. peltatus</i> (Geisel) M.A.
	<i>Neoscortechinia nicobarica</i>
	<i>Ostodes macrophylla</i>
	<i>Ptychopyxis costata</i> Miq.
Fabaceae	<i>Archidendron bubalinum</i> (Jack) Nielsen
	<i>A. ellipticum</i> (Bl.) Nielsen
Fabaceae	<i>Dialium</i> sp.
	<i>D. patens</i> Baker
	<i>Ormosia sumatrana</i> (Miq.) Prain
	<i>Sindora leiocarpa</i> Baker
	<i>Dialium platysepalum</i> Backer
Fagaceae	<i>Castanopsis</i>
	<i>C. inermis</i> (Lindl. ex Wall.) B & H.
	<i>C. rhamnifolia</i> (Miq.) A.DC.
	<i>Lithocarpus gracilis</i> (Korth.) Rehd.
	<i>L. hystrix</i> (Korth.) Rehd.
	<i>Lithocarpus</i> sp.
	<i>L. spicatus</i> (Sm.) Rehd. et Wils.
Flacourtiaceae	<i>Casearia flavovirens</i> Bl.
	<i>C. grewiifolia</i> Vent
	<i>Homalium foetidum</i> (Roxb.) Benth.
	<i>H. grandifolium</i> Benth.
	<i>H. sumatranum</i> Miq.
	<i>Hydnocarpus gracilis</i> (v.Slooten) Sleumer
	<i>Hydnocarpus</i> sp1.
Lauraceae	<i>Actinodaphne</i> ?
	<i>Alseodaphne</i>
	<i>A. albiramea</i> Kosterm.
	<i>A. bancana</i> Miq.
	<i>A. ceratoxylon</i> Kosterm.
	<i>A. falcata</i> Bl.
	<i>A. helophila</i> Kosterm.
	<i>Beilschmiedia dictioneura</i>
	<i>B. lucidula</i> (Miq.) Kosterm.
	<i>Cinnamomum iners</i> Reinw.
	<i>Cryptocarya ferrea</i> Bl.
	<i>C. infectoria</i> (Bl.) Miq.
	<i>Cryptocarya</i> sp.1
	<i>Dehaasia caesia</i> Blume
	<i>D. incrassata</i>
	<i>D. microsepala</i> Kosterm.
	<i>Endiandra rubescens</i> Miq.

	<p><i>Litsea angulata</i> Bl. <i>L. diversifolia</i> Bl. <i>L. noronhae</i> Bl. <i>L. oppositifolia</i> (Bl.) Vill. <i>L. robusta</i> Bl. <i>Litsea</i>. spp. <i>Litsea umbellata</i> (Lour.) Merr. <i>Litsea velutina</i> (Bl.) Boerl. <i>Phoebe grandis</i> (Nees) Merr.</p>
Lecythidaceae	<p><i>Barringtonia gigantostachya</i> Koord. & Val. <i>Chydenanthus excelsus</i> (Bl.) Miers <i>Planchonia valida</i> (Blume) Blume</p>
Linaceae	<p><i>Ixonanthes icosandra</i> Jack</p>
Lythraceae	<p><i>Lagerstroemia ovalifolia</i> T. et B.</p>
Magnoliaceae	<p><i>Magnolia gigantifolia</i> (Miq.) Noot. <i>Michelia champaca</i> L.</p>
Melastomataceae	<p><i>Pternandra caerulea</i> Jack.</p>
Meliaceae	<p><i>Aglaia</i> sp. <i>A. aquea</i> <i>A. argentea</i> Bl. <i>A. cauliflora</i> Kds. <i>A. dookoo</i> Griff. <i>A. edulis</i> (Roxb.) Wall <i>A. elliptica</i> Blume <i>A. odoratissima</i> Blume <i>A. parasitica</i> (Osb.) Kosterm. <i>A. tomentosa</i> T. et B. <i>Aphanamixis humile</i> (Hoch.) Kosterm. <i>Chisocheton divergens</i> Bl. <i>C. sandoricocarpus</i> K. et V. <i>Dysoxylum alliaceum</i> Blume <i>D. arborescens</i> (Bl.) Miq. <i>D. caulostachyum</i> <i>D. densiflorum</i> (Bl.) Miq. <i>D. excelsum</i> Blume <i>D. gaudichaudianum</i> <i>D. macrocarpum</i> Blume <i>D. mollissimum</i> Bl. <i>Dysoxylum</i> sp. <i>Melia azadarach</i> <i>Toona sureni</i> Merr.</p>
Monimiaceae	<p><i>Kibara coriacea</i> (Bl.) Tul.</p>
Moraceae	<p><i>Artocarpus dadah</i> Miq. <i>A. glauca</i> Bl. <i>Ficus albifila</i> (Miq.) King <i>F. caulocarpa</i> Miq. <i>F. forstenii</i> <i>F. hispida</i> Linn.f.</p>

	<p><i>Ficus</i> sp.3 <i>F. stupenda</i> <i>Ficus</i> sp.6 <i>F. altissima</i> Bl. <i>F. depressa</i> <i>F microcarpa</i> Linn.f.</p>
Myristicaceae	<p><i>Gymnacranthera</i> <i>Horsfieldia</i> <i>H. macrocoma</i> (Miq.) Warb. <i>Knema intermedia</i> (Bl.) Warb. <i>K. laurina</i> (Bl.) Warb. <i>Myristica</i> <i>Ardisia</i> sp.</p>
Myrtaceae	<p><i>Eugenia</i> <i>E. acuminatissima</i> Kurz <i>E. clavimyrthus</i> K. et V. <i>E. jamboloides</i> K. et V. <i>E. javanica</i> Lamk. <i>E. opaca</i> <i>E. sandakanensis</i> Merr. <i>E. sexangulata</i> K. et V. <i>E. spicata</i> Duthie <i>E. zollingeriana</i> Miq. <i>Syzygium</i> <i>S. acuminatissimum</i> (Bl.) Kurz <i>S. antisepticum</i> (Bl.) Merr. & Perry <i>S. fastigiatum</i> Merr. & Perry <i>S. javanicum</i> Miq. <i>Eugenia paucipunctata</i> K. et V.</p>
Olacaceae	<p><i>Strombosia ceylanica</i> Gardn. <i>S. javanica</i> Bl.</p>
Polygalaceae	<p><i>Xanthophyllum affine</i> Miq. <i>X. eurynchum</i> Miq. <i>X. flavescens</i> Roxb.</p>
Proteaceae	<p><i>Helicia</i> sp.</p>
Rhamnaceae	<p><i>Zizyphus angustifolius</i> (Miq.) Hats.</p>
Rosaceae	<p><i>Atuna racemosa</i> Raf. <i>Parastemon urophyllus</i> A.DC.</p>
Rubiaceae	<p><i>Adina polycephala</i> Benth. <i>Antocephalus chinensis</i> (Lamk.) A.Rich. & Wall. <i>Hypobathrum frutescens</i> Blume <i>Nauclea officinalis</i> (Pitard) Merr. <i>Plectronia converta</i> <i>P. didyma</i> Kurz <i>Randia reinwardtiana</i> (Bl.) Backer <i>Zuccarinia macrophylla</i></p>
Rutaceae	<p><i>Evodia</i></p>

	<i>Glycosmis pentaphylla</i> Corr.
Sapindaceae	<i>Lepisanthes</i> <i>Nephelium cuspidatum</i> Blume <i>Nephelium</i> sp. <i>Paranephelium nitidum</i> King <i>Pometia pinnata</i> J.R. & G.Forst <i>Xerospermum noronhianum</i> (Blume) Blume
Sapotaceae	<i>Madhuca malaccensis</i> (Clarke) H.J.L. <i>M. palembanica</i> (Miq.) P.C.Yii & P.Chai <i>M. pallida</i> (Burck) Boehm. <i>Maduca</i> spp <i>Palaquium hexandrum</i> Engl. <i>Payena acuminata</i> <i>Payena</i> sp.1 <i>Pouteria malaccensis</i> (Clark) Ltb.
Sterculiaceae	<i>Heritiera javanica</i> <i>H. littoralis</i> Dryand. <i>Pterocymbium javanicum</i> R.Br. <i>P. diversifolium</i> <i>P. javanicum</i> <i>Sterculia rubiginosa</i> Vent. <i>Sterculia</i> . Sp.
Symplocaceae	<i>Symplocos cerasifolia</i> Wall.
Theaceae	<i>Pyrenaria serrata</i> Bl.
Thymelaceae	<i>Gonystylus macrophyllus</i> (Miq.) Airy Shaw
Tiliaceae	<i>Grewia</i> sp1. <i>Microcos florida</i> (Miq.) Burret <i>Microcos</i> sp.1 <i>Microcos</i> sp.2 <i>Microcos</i> sp.3 <i>Pentace polyantha</i> Hassk. <i>Pentace</i> sp.1 <i>Pentace triptera</i> Mast.
Ulmaceae	<i>Gironniera subaequalis</i> Planch <i>Trema orientalis</i> (L.) Blume <i>Celtis rigescens</i> (Miq.) Planch
Verbenaceae	<i>Teijsmanniodendron</i> <i>Clerodendrum laevifolium</i> Bl.
Violaceae	<i>Rinorea lanceolata</i> (Wall) O.K.

III-5. Rattan species identified in BBSNP in a survey conducted by BBSNP Management, FMIP (Forest Inventory and Monitoring Project EU-INTAG), WWF-BBS, WCS-IP/BBS:

Family	Scientific name
Calamus	<i>Calamus hispidulus</i> Becc. <i>C. javensis</i> Blume <i>C. ornatus</i> Blume <i>C. manna</i> Miq. <i>C. cf corrugatus</i> Becc. <i>C. caesius</i> Blume <i>Calamus</i> sp. 1 <i>Calamus</i> sp. 2
Khortalsia	<i>Kolthalsia rostrata</i> Blume <i>K. debilis</i> Blume <i>K. robusta</i> Blume <i>K. hispidia</i> Becc. <i>K. rigida</i> Blume
Daemonorops	<i>Daemonorops didymophylla</i> Becc. <i>D. rubra</i> Blume <i>D. sabut</i> Becc. <i>D. fissa</i> Blume <i>Daemonorops</i> sp. 1 <i>Daemonorops</i> sp. 2 <i>Daemonorops</i> sp. 3 <i>D. cf. rutilis</i> Becc. <i>D. csection Cymbospatha</i> aff <i>D. Monticola</i> Becc. <i>D. kortlsii</i> Blume <i>D. sepal</i> Becc. <i>D. palembanicus</i>

III-6. Orchid species identified in BBSNP in a survey conducted by BBSNP Management, FMIP (Forest Inventory and Monitoring Project EU-INTAG), WWF-BBS, WCS-IP/BBS:

Family	Scientific name
Orchidaceae	<i>Acriopsis javanica</i>
	<i>Adenoncus</i> sp.
	<i>A. sumatrana</i>
	<i>Agrostophyllum bicuspidatum</i>
	<i>A. majus</i>
	<i>Appendicula torta</i>
	<i>A. undulate</i>
	<i>A. cornuta</i>
	<i>Arachnis</i> sp.
	<i>Bromheadia aporoides</i>
	<i>Bulbophyllum odoratum</i>
	<i>B. membraceum</i>
	<i>B. lobii</i>
	<i>B. lepidum</i>
	<i>B. purpurascens</i>
	<i>B. immobile</i>
	<i>B. macceabthum</i>
	<i>Claderia viridiflora</i>
	<i>Cimbidium bicolor</i>
	<i>Calanthe cecilia</i>
	<i>C. veratriflora</i>
	<i>Coelogyne foerstermanii</i>
	<i>Cleisiosstoma</i> sp.
	<i>Coelogyne asperata</i>
	<i>C. incrassate</i>
	<i>C. dayana</i> +
	<i>C. roschussenii</i>
	<i>Corymborchis veratrifolia</i>
	<i>Cordiglottis bresviscapa</i>
	<i>Dendrobium truncatum</i>
	<i>D. paphyllum</i>
	<i>D. tenellum</i>
	<i>D. rosellum</i>
	<i>D. confusum</i>
	<i>D. leoris</i>
	<i>D. aloifolium</i>
	<i>D. concinnum</i>
	<i>D. crumenatum</i>
	<i>D. invisium</i>
	<i>D. quadringulare</i>
	<i>D. lammelatum</i>
	<i>D. linguella</i>
	<i>D. spurium</i>
	<i>D. aureum</i>
	<i>D. concinum</i>
	<i>D. subulatum</i>
	<i>Dipodium scanden</i>
	<i>Eria javanica</i>
	<i>E. flavescens</i>
	<i>E. leiophylla</i>

E. monostachya
E. multiflora
E. neglecta
E. plifera
E. nutans
E. moluccana
E. vestita
E. ornata
E. latifolia
E. pulchella
Flickingeria padangese
F. frimbricata
Goodyera sp.
Gramatohyllum speciosum
G. stapellifloru
Grosaurdya appendiculata
Liparis condylobullon
L. lacerate
L. pigmaea
L. planiuble
L. compressa
L. pallida
L. condaylobulbon
L. parviflora
Luisisa zolingere
Malleola insectifera
Malaxis latifolia
Macrochantus sp.
Micropera
Nephelaphyllum pulchrum
N. plicata
N. latilabre
Nervilia araguana
N. discolor
N. plicata
Neuwedia zollinere
Oberonia anceps
Pterocera teres
Panatocalpa kuntsleri
Podochilus
Phreatia sp.
Plocoglottis javanica
Polystachya sp.
Phalidota articulato
Pholidota imbricate
Phalaenopsis cornu-cervi
P. sumatrana
P. amabilis +
Polystchya concreata
Pamatocalpa latifora
Pholidota articulate
P. gibbosa
Phaieus tankervilleae
Plocoglottis sp.
Renanthera elongata
Robiquetia spathulata

Rhynchostylis retusa
Sarianthus sp.
Spatoglottis plicata
Trixspermum arachnites
Thainiophyllum sp.
Thecostele alata
Trichoglottis lanceolaria
Trichoglottis retusa
Taeniophyllum
Trichotosia velutina
Thelasis micrantha
Tamia sp.
Trixspermum acuminastismu
T. arantiacum
T. calceolus
Trichotosia pauciflora
T. vestita
Vanda helvoa
Vanilla sp.

III-7. Bamboo species identified in BBSNP in a survey conducted by BBSNP Management, FMIP (Forest Inventory and Monitoring Project EU-INTAG), WWF-BBS, WCS-IP/BBS:

Family	Scientific name
Bambusa	<i>Bambusa vulgaris</i>
Dendrocalamus	<i>Dendrocalamus asper</i> <i>D. buar Widjaja</i>
Dinochloa	<i>Dinochloa glabrescens</i>
Gigantochloa	<i>Gigantochloa atter</i> <i>G. atroviolacea</i> <i>G. apus</i> <i>G. haskarliana</i> <i>G. robusta</i> <i>G. aliata</i> <i>G. denticulate</i>
Schizostachyum	<i>Schizostachyum brachycladum</i> <i>S. bracteum</i> <i>S. bamban</i> <i>S. zollinger</i>





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Pemandangan alam, kali Alas di Agusan Blangka Jeren, Kabupaten Aceh Tenggara (Foto: Aerial).



Alas River (Foto: Aerial)





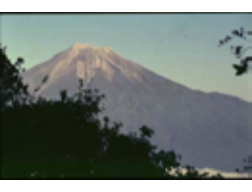
Pemandangan alam air panas di Gurah Kutacane Kabupaten Aceh Tenggara (Foto: Asriadi).



Batas di gunung Gunung Perkaban (Foto: Mihar)





















WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION
TROPICAL RAINFOREST HERITAGE OF SUMATRA (INDONESIA) ID N°1167

1. DOCUMENTATION

- i) **IUCN/WCMC Data Sheet:** Two references.
- ii) **Additional Literature Consulted:** De Wilde, W.J.J.O. and Duyfjes, B.E.E. 1996. **Vegetation, Floristics and Plant Biogeography in Gunung Leuser National Park, in Leuser: A Sumatran Sanctuary**, Yayasan Bina Sains Hayati Indonesia; Flora and Fauna International, 2003, **The Ecological and Subsequent Social-Economic Impacts of Ladia Galaska**, Technical Memorandum, Sumatran Elephant Conservation Programme, FFI; Marshall, A.J., Jones, J.H., Wrangham R.W. 2000, **The plight of the apes: a global survey of ape populations**. Briefing paper. Department of Anthropology, Harvard University; Thornton, I. 1997, **Krakatau: The destruction and reassembly of an Island Ecosystem**, Harvard University Press; Whitten, T., Sengli J. Damanik, Jazanul Anwar, Nazzaruddin Hisyam, 2000, **The Ecology of Sumatra**, The Ecology of Indonesia Series, Vol. I Periplus.
- iii) **Consultations:** Five expert reviewers. Ten external reviewers consulted. The mission met with experts and high-level representatives from the Directorate of Forest Protection and Nature Conservation (PHKA), Jakarta; the Ministry for Environment; Jakarta Office of UNESCO; Leuser Development Programme; North Sumatra Planning Board; Flora and Fauna International, Sumatran Elephant Programme; National Park staff; Provincial authorities; Office for Investment, Culture and Tourism of Lampung Province.
- iv) **Field Visit:** Peter Hitchcock, January, 2004.

2. SUMMARY OF NATURAL VALUES

The Tropical Rainforest Heritage of Sumatra (TRHS) nomination comprises three widely separated protected areas on the island of Sumatra, one of the larger islands and westernmost of the Indonesian archipelago of some 17,000 islands.

By way of introduction, Indonesia occupies only 1.3% of earth's land surface, its 17,000 islands include more than 10% of the world's flowering plants, 12% of the world's mammal species, 17% of all reptiles and amphibians and 17% of the world's bird species (BAPPENAS 1993). This extraordinary biological richness is the reason why Indonesia is recognised as one of the 7 megadiverse countries, containing 2 of the world's 25 'hotspots' (areas of high diversity as defined by Conservation International – CI). Of the 200 WWF Global Ecoregions, 18 are located in Indonesia – 11 terrestrial, 4 freshwater and 3 marine.

Sumatra comprises part of the WWF "Sundaland" hotspot and is the location of the 'Sumatran Islands Lowland and Montane Forests Ecoregion'. Whitten (2000) estimated the original vegetation cover of Sumatra to include 5,680,000 ha of montane forest and 25,154,000 ha of tropical evergreen lowland forest. The lowland tropical forests have been largely destroyed in recent decades (circa 20% remaining, mostly as small remnants) and montane forest is increasingly threatened by logging and agricultural encroachment.

The biodiversity of the forests of Sumatra is exceptional. There are an estimated 10,000 species of plants, including 17 endemic genera. This very diverse flora is in large part shared

with other parts of the West Malesian region that extends from southern Thailand to the island of New Guinea. The part of Sumatra north of Lake Toba includes a distinctive Sumatran flora (de Wilde and Duyfjes 1996), most distinctive in the montane and sub-alpine vegetation, especially the '*blang*' forest.

Animal diversity in Sumatra is also impressive, with more than 200 mammal species and some 580 bird species of which 465 are resident and 21 are endemics. Of the mammal species, 22 are Asian species not found elsewhere in the Indonesian archipelago and 15 are confined to the Indonesian region, including the endemic Sumatran orangutan.

Geologically, Sumatra is located on the southern edge of the Asian tectonic plate adjacent to the oceanic floor section of the Austro-Indian plate that downthrusts beneath the island. The collision of the two plates has created the uplifted mountain range, the Bukit Barisan Range, extending the full 1680 km length of the island with many active volcanoes. Climatically, GLNP, KSNP and the western part of BBSNP fall within Type A (wet) of the Schmidt and Fergusson climate classification. The southern part of BBSNP is drier and is akin to a Type B climate, with an annual dry season of 5 months.

Turning now to the nomination, this has total core area of **2,595,125** hectares, the nomination comprises three national parks (Taman Nasional) established under national legislation of the Republic of Indonesia:

- Gunung Leuser National Park (GLNP) (established in 1980) 862,975 ha.
- Kerinci Seblat National Park (KSNP) (established in 1992) 1,375,350 ha.
- Bukit Barisan Selatan National Park (BBSNP) (established in 1982) 356,800 ha.

All three parks are located on Bukit Barisan range, that runs from Aceh in the north-west to Bandar Lampung in the south-east. Together they represent whole or part of the three most significant remnant 'islands' of the once vast Sumatran forests.

The nomination includes the highest mountain in Sumatra, Gunung Kerinci (3,800 m). This is also Indonesia's highest volcano and remains very active. Since both GLNP and BBSNP have minor frontages to the Indian Ocean, the altitudinal range of the nomination extends from the highest mountains on Sumatra to sea level. Thus all three protected areas in the nomination exhibit a wide altitudinal zonation of vegetation, from lowland rainforest to montane forest, extending to sub-alpine low forest, scrub and shrub thickets in GLNP and KSNP. But most of the nominated parks are mountainous with only small lowland areas (for example, 12% of GLLNP is below 600m). The nominated areas are therefore more characteristic of the Bukit Barisan Mountain Range than of Sumatra as a whole, which is otherwise predominantly lowland with very extensive floodplains.

GLNP is a part of one of 18 regions in Indonesia classified by the WWF as part of the 200 Global Ecoregions of importance for conservation of the world's biodiversity. The distribution of some species of animals in Sumatra is believed to provide evidence of the role played by the Toba tuff eruptions 75,000 years ago. For example, the Sumatran orangutan is not found south of Lake Toba and the tapir is not found north of it. Further, the high level of endemism in the mammals and birds is presented as evidence of the bridge-barrier relationship between the Sumatra biota and that of mainland Asia as a consequence of sea level changes. Despite periodic land bridges to Asia, Sumatra has developed a high endemism, an important natural process well represented in the nominated sites. The altitudinal range and connectivity between diverse habitats in the nominated sites, in particular in GLNP and KSNP, would have facilitated on-going ecological and biological evolution.

There are no formal buffer zones included in the nomination. However, GLNP is the core of a tract of protected lands comprising the Leuser Ecosystem. This is of great conservation significance in itself but is also a critically important buffer zone to the park. There are other protected lands adjoining KSNP and BBSNP presently representing effective buffers but due to extensive illegal logging and encroachment, these can no longer be assumed to be permanent buffers.

3. COMPARISONS WITH OTHER AREAS

The geology of the TRHS is typical of the region. The TRHS includes two sample transects across the Sumatran subduction zone with largely intact naturally vegetated landscapes, incorporating sections of the uplift, rifting and volcanic zones. KSNP provides a transect with a very clearly defined rift valley and associated volcano, the largest in Indonesia. Whilst these represent important earth science values, they are features that are widespread throughout the region, and are not the basis of a distinctive claim for outstanding universal value.

From a biodiversity and ecological perspective, there is no comparable area within Indonesia, although a cluster forest site in Borneo has been nominated for examination in 2004/2005. However, the TRHS has significantly higher mammal diversity than the island of Borneo, which lacks many of the larger Sumatran mammals, which are endemic to that island.

Although many of the Asian mammals once extended further east in the archipelago, extensive clearing, intensive agriculture and other human activity has progressively eliminated at least the larger mammals and their habitat from Bali and Java. The only other existing large World Heritage site in Indonesia is Lorentz National Park in Papua which is located in a completely different biogeographic realm (Australian realm).

Although Ujung Kulon National Park World Heritage site is just across the Sunda Strait from BBSNP, its very much smaller size and lesser biodiversity, means that it does not compare with either BBSNP or the TRHS nomination as a whole. There is also little basis for comparison with the Komodo National Park World Heritage site in eastern Indonesia where the primary values are the endangered 'komodo dragon' species and adjacent marine areas. Looking more widely, none of the mainland Asian sites exhibits the effect of sea-level oscillations on the on-going biological evolution, evidenced by the high level of endemism in Sumatra. Indeed, the TRHS needs to be compared with other places in the South Eastern Asian biogeographic region, as well as elsewhere in the tropical world. At the global level, the biodiversity of the TRHS nomination compares very favourably with that of other World Heritage sites. The best test of comparison is to compare like-with-like, using Manu National Park (Peru) and the Central Amazon Conservation Complex (CACC, Brazil), which includes Jau National Park, in the high biodiversity Amazon forests of Brazil, as shown in Table 1 below.

Table 1: Comparison of biodiversity between the nominated site and other World Heritage sites

Biodiversity class	Mammals	Birds	Reptiles & Amphibians	Fish
Protected Area				
TRHS (nominated area) 2,595,124 ha	Circa 180	Circa 450	Circa 200	30+
Manu NP (Peru) 1,532,806 ha	99	850	120	Circa 200
CACC, Brazil 5,232,018 ha	120	411	Circa 150	320
Thungyai-Huai Kha Khaeng, Thailand 622,200 ha	120	400	139	113
Lorentz NP, Indonesia 2,350,000 ha	41	274+	150+	Circa 100

The nominated site clearly excels in the high biodiversity of mammals when analysed at a global scale and one of the highest biodiversity of birds only after Manu National Park that protects 15% of all the birds species of the world. The broadly comparable diversity when compared with the much larger CACC is not surprising, given the much greater altitudinal range and hence habitat diversity of the Sumatran sites.

The large mammals of the TRHS (tiger, elephant, rhinoceros, tapir, sunbear and orangutan) are indicators of the Asian realm. The regions that need to be directly compared are the island of Java, peninsular Malaysia, Thailand, Myanmar, Borneo, Vietnam and Laos. Both Java and Sumatra have been periodically linked by land bridges in a geological timescale to Asia. However, Sumatra demonstrates an evolutionary divergence in response to longer isolation.

The Sumatran sites are distinguished by the high level of endemism, including the three Sumatran endemic large mammals. However, at the generic level, the most comparable sites are several in Malaysia and Thailand which share with the TRHS several large mammals, including the tiger and elephant, but lack the high plants and animals endemism of the Sumatran taxa, among montane biota.

In summary, the features of the TRHS that make it globally and regionally distinct from other existing World Heritage sites in biodiversity terms are:

- Very high fauna biodiversity rating at the global level;
- In SE Asia, overall fauna and flora biodiversity comparable only with some Borneo prospective sites.(e.g. 4,000 + plant species);
- The highest mammal diversity in insular SE Asia (incl. 22 Asian species not found elsewhere in insular SE Asia);
- Critically important habitat for many rare and threatened faunal species.(e.g. 58+ birds on 2000 IUCN Red List of Threatened Species);
- Critically important habitat for four threatened large mammals , three of which are Sumatran endemics (tiger, elephant, orangutan);
- Outstanding climatic refugial value for many species, and outstanding habitat diversity over a large altitudinal range (from sea level to 3,800 m);
- The presence of outstanding diverse and distinctive 'Asian' montane biota.

Finally, in terms of landscape and natural beauty, the TRHS cluster differs from the distinctive landscapes of both Kinabalu Park and Gunung Mulu National Park in Malaysian Borneo. It differs too from Taman Negara in peninsular Malaysia and the Thungyai - Huai Kha Khaeng Wildlife Sanctuaries (Thailand). All the above lack the volcanic component of the TRHS. Unlike Kinabalu Park and Gunung Mulu National Park, the natural beauty of the TRHS is mostly dispersed and often of a smaller scale, including many individual beautiful features, such as alpine landscapes, waterfalls, lakes, caves and rivers. Although Ujung Kulon National Park includes the remains of one of the world's most famous volcanoes, Krakatau, its scale and spectacle is not comparable to the volcanoes in the nomination such as Gunung Kerinci volcano in KSNP (3,404 m). This mountain is a 'classic' and active stratovolcano, the highest indeed in SE Asia (3,800 m). Moreover, the site is remarkable as the only nominated one in SE Asia with active volcanoes embedded in tracts of rainforest.

4. INTEGRITY

4.1. Legal Status

All three nominated parks are public lands designated as national parks by the Government of Indonesia. National Park status is the appropriate level of legal protection in Indonesia. The managing authority of all three nominated sites is presently the Directorate General of Forest Protection and Forest Conservation (PHKA) within the Ministry of Forestry. The nomination refers to the handover of management of the Leuser Ecosystem from the Leuser Management Unit to the Leuser International Foundation (LIF) in 2004. The home page of the LIF advises that it has a thirty year concession over the Leuser Ecosystem. The GLNP, however, will continue under PHKA management.

4.2 Management

Park rangers (mainly Polisi Hutan or Forest Police) administrative staff and technicians are employed at each park. Staff may from time to time be formed into special units such as a 'Rhino Management Unit'. Total staff numbers however (GLNP – 237, KSNP – 162, BBSNP – 127) suggest a greater management capacity than is the case. There is a need for increased training and resourcing to achieve greater effectiveness, especially in law enforcement. Whereas base salaries of staff are funded, in almost all cases there is a serious lack of resources for effective field routine management: for example, a shortage of vehicles severely limits mobility of field staff..

Management plans, as required by Indonesian law, exist for all three parks. However, many staff are not conversant with them, suggesting the need for a more concise document for briefing and training purposes.

The level of involvement and cooperation of local communities, including local government, in management of the parks, vary greatly within the nominated areas. In some cases, local communities and local government are seen by managers as a serious threat to the parks: in others they are playing a supporting role. In KSNP with a memorandum has been developed between 14 or more local governments and the park management: a commendable initiative. Even so, the level of support by local government has declined since management has opposed the opening of new roads through the park and demonstrated increasing effectiveness in anti-poaching and anti-logging activities within it. The operation of two large international aid projects in KSNP (GEF) and GLNP (part of EU sponsored Leuser Management Unit) resulted in a great deal of consultation and interaction with local communities on many aspects of park and wildlife management.

It is apparent that the financial resources available over the past decade have varied greatly within each site, as well as between sites, as shown in Table 2. Further major changes are imminent as a result of recent and pending cessation of several international aid programs.

Table 2: Trends in financial resources to nominated sites (indicative only)

Budget Period	GLNP	KSNP	BBSNP	Total
1984/85-1994/95	US\$63,886.00 (70% from National budget)	Approx. average annual budget - US\$6,546,960.	Most funding came from National Budget	
1984/85–1994/95	US\$63,886.00	Most funding since 1996 came from the KS-ICDP Project* totalling US \$46 million. This project finished in 2002.		
2000	US\$192,696.00 (\$96,460 from National budget; \$13,635 from Gunung Leuser Mgt. Strengthg. Fund)			
2001			US\$240,450	
Annual Funding (approx. only)	US\$190,000	US\$6,546,000*	US\$240,000	*US\$6,976,000

*Note: The KS-ICDP project has now finished.

All three nominated parks have outstanding tourism potential. However, a variety of factors are impeding or preventing significant tourism development. These include inadequate strategic planning for tourism; totally inadequate infrastructure in parks; poor road infrastructure in some localities outside parks; lack of certainty in protection of the natural resource; illegal activities continuing to degrade the resource (e.g. logging along scenic forest routes); and security problems in Nanggroe Aceh Darussalam (NAD). If these issues are

addressed tourism could be an important alternative to provide additional funding for managing these parks.

4.3. Boundaries

Gunung Leuser National Park

GLNP is one component of a much larger block of high quality wildlife habitat and natural landscape known as the 'Leuser Ecosystem'. The Leuser Ecosystem provides major habitat for four threatened and critically threatened Sumatran endemic large mammals exist here, including the Sumatran Orangutan (critically endangered - CR), the Sumatran Tiger (CR), the Sumatran Elephant (endangered, IUCN Red List) and the Sumatran Rhinoceros (CR). GLNP, embedded in the Leuser Ecosystem, contains habitat of all four species though does **not** contain '*the most important habitat*' of three of those species (elephant, tiger and orangutan) in the region. Furthermore, GLNP is the only part of the cluster nomination that falls within the range of the critically threatened endemic Sumatran orangutan: while it contains important orangutan habitat, much of the critically important habitat is located outside the nominated area in the surrounding Leuser Ecosystem.

Unfortunately, some of the best evidence of significant on-going ecological and biological processes is contained in the part of the Leuser Ecosystem outside the nomination. For example, the recent discovery of evolutionary adaptation in a population of orangutans (use of tools) is limited to a population outside of the nominated GLNP. The most important areas of high biodiversity of the Leuser Ecosystem outside GLNP are mainly (i) the Singkil Barat Wildlife Reserve, (ii) Langsa lowlands and foothills, and (iii) the Aceh Highlands and the Tapaktuan lowlands. The Singkil Barat Wildlife Reserve alone is a threatened lowland swamp forest and considered by the Leuser Management Unit as being of global significance for conservation of the Sumatran orangutan.

In addition much of the regional scale migration of the Sumatran elephant in the Leuser area largely takes place outside of GLNP in the Leuser Ecosystem. Furthermore, the Policy Dialogue on World Heritage Forests held in Berastagi, Sumatra in December, 1998 paid particular attention to the nearby Leuser Ecosystem. The Berastagi proceedings refer to both BBSNP and KSNP but specify the Leuser Ecosystem instead of the smaller component GLNP. Limiting the nomination to the Gunung Leuser National Park section of the Leuser Ecosystem creates an anomalous situation and fails to meet international expectations from this important serial site nomination.

Kerinci Seblat National Park

KSNP is by far the largest of the three nominated areas. Whilst many of its boundaries interface with developed lands or highly degraded lands, some boundaries adjoin critically important habitat that currently functions as an integral part of the park ecosystem. With development proceeding apace outside the park, some of those boundaries will become very problematic, especially for the larger mammals. For example, the western boundary of the park between Padang and Bengkulu transects tiger and elephant habitat. If development is allowed to extend up to the park boundary in such locations, the park will become very much more difficult to manage, unnecessary people/wildlife interaction will occur, and long term survival prospects for the larger mammals will be greatly diminished.

There is clearly a case for urgent review of the boundary of KSNP with view to identifying opportunities for protection of additional habitat critical to the larger endangered mammals. In particular, there are a number of adjoining logging concessions in which logging has been completed but which remain important habitat for larger mammals. There is also a critical habitat link between the east and west blocks of the park that requires urgent protection.

Bukit Barisan Selatan National Park

The existing boundaries of BBSNP are adequate for the purpose of the nomination. Smallest of the three nominated sites, BBSNP has greater pressure from surrounding developed lands. Nonetheless, some adjacent protected forests and degraded forest lands are of complementary importance as habitat for the larger mammals, in particular for tiger, elephant and to some extent rhinoceros. Two of the three species are critically endangered and their

survival will depend very much on the protection and management of populations outside the national park, either as future additions to the park or as managed buffer zones. Failure to initiate protection and management of large mammal populations and/or their habitat outside the park will ultimately threaten the survival of the park.

4.4. Human Impact

There are four fundamental and related threatening processes that are continuing to impact on the nominated sites. The common denominator in all cases is access provided by roads and the failure to enforce the law effectively. Roads in tropical forests where law enforcement is ineffective are 'the beginning of the end' for rainforest ecosystems, facilitating illegal logging, encroachment, poaching and other ecologically degrading activities. The nominated Sumatran forests are no exception.

4.4.1 Illegal Logging

The unsustainable exploitation of tropical forests in Indonesia has degraded or destroyed so much of the lowland forests that timber exploitation is now increasingly dependent on illegal exploitation of protected areas, including national parks. This problem is very evident throughout Indonesia and attempts to control it have been largely ineffective. Illegal logging is a threat in all three areas and can be expected to reach a crisis point in the next few years as timber supply from outside the protected areas continues to rapidly decline. The international linkages in the illicit timber trade are presently the subject of a dispute between the Malaysian and Indonesian governments. A number of people interviewed asserted that illegal logging in Sumatra was highly organised, from the forest to the port, and that Sumatran timber was being exported as certified timber from other countries. Illegal logging is now very much a national issue currently being debated in Indonesia, both as an election issue and a matter that the President is publicly trying to address.

4.4.2 Encroachment

Encroachment into forest areas, including national parks, for subsistence agriculture and industrial plantations has now reached a critical point in many parts of the country. The three nominated parks are no exception to this general pattern. Significant recent organised illegal encroachments into a rare tract of lowland rainforest in GLNP were claimed by informed sources to have been an illegal operation facilitated as a 'business venture'.

4.4.3 Poaching

A combination of economic and social issues, combined with improved accessibility has intensified poaching of wildlife, in particular of elephants, tigers and rhinoceroses. All three nominated parks have a poaching problem that threatens the larger mammals. With international assistance, great effort is being put into anti-poaching activities in several of the parks, particularly KSNP.

4.4.4 Roads

As already noted, roads within and near the nominated sites facilitate forest and wildlife destruction.. KSNP is threatened by several road proposals that would cross critically important parts of the park. Those road proposals are currently being publicly debated and there is no guarantee that they will be cancelled.

GLNP, together with the surrounding parts of the Leuser Ecosystem, is also seriously threatened by a major highway proposal and several other road proposals. The proposed Ladia Galaska road traverses the northern section of the Leuser Ecosystem. Although it does not directly cross the GLNP, it will seriously impact on the park by changing the accessibility of the highland parts of the park. Its impact on the greater Leuser Ecosystem will be even greater; as well as facilitating illegal logging it will seriously impact on the critically important habitat of the Sumatran elephant. Although the road is a local initiative, it has now been approved-in-principle by Central Government. However, there appear to be dissenting opinions about the scheme in parts of the Government and the President has become involved in the issue.

4.5 Other Threats

4.5.1 Law Enforcement

Deficiencies in law enforcement probably represent the greatest single threat to the long-term survival of the natural heritage values of the nominated sites. Informal evidence gathered during the mission confirms that law enforcers often fail to uphold the law and instead seek financial gain from illegal activities. Most concerning is evidence of government officials involved in illegal logging in national parks. It was repeatedly asserted to the mission that military personnel participated in or controlled illegal logging operations, especially in the Aceh section of the Leuser Ecosystem. The involvement of law enforcers in illegal operations makes it doubly difficult for the park managers, PHKA, to obtain cooperation and support for their law enforcement. In the absence of major improvements in the effectiveness of law enforcement in the nominated sites, their long-term viability cannot be assured and much of their natural heritage values must be considered under serious threat.

There is some good news: with support from the police, recent convictions have been secured in cases of tiger poaching and illegal logging in KSNP. And the issue of illegal logging is now very much a national one, and has been raised in the course of both parliamentary and Presidential elections.

4.5.2 Decentralisation

There are presently some problems arising in terms of the authority of local government in national parks arising from the 'Otonomi Daerah' legislation that devolves a lot of powers from central government to local government. Provincial Governments are also exercising some powers in national parks in Indonesia. The confusion has the potential to threaten the integrity of the nominated parks and needs to be resolved.

4.5.3 Management Resources

As noted above, the adequacy of resources for management of the TRHS is an issue. Further, more support is urgently needed from law enforcement partner agencies, such as the police. This is an issue acknowledged by PHKA staff and a foreign aid project has been initiated to try to deal with it.

4.5.4 International Assistance

Both KSNP and the Leuser Ecosystem (including GLNP) have benefited from major international assistance in natural heritage management. In BBSNP however there is a low level of international assistance and resources and management are inadequate. The European Union funded the Leuser Management Programme, which has provided excellent data to assist in the planning and management of the Leuser Ecosystem, including GLNP. With cessation of major funding to KSNP in 2002, and the finalisation of the Leuser programme late in 2004, a major shortfall in management resources for the TRHS will arise. Major new international funding for all three sites, especially for BBSNP, will be critically important to their survival as protected areas.

5. ADDITIONAL COMMENTS

Justification for Serial Approach

When IUCN evaluates a serial nomination it asks the following questions based on the requirements in the Operational Guidelines:

a) What is the justification for the serial approach?

The main justification for the serial approach is that together the three parks form the cores of the three regions that offer the greatest potential for long term conservation of the distinctive and diverse biota of the island of Sumatra, including many endangered species. The three sites, all located on the Bukit Barisan mountain chain, in combination also provide biogeographic evidence of the evolution of the island of Sumatra and its rich biota. Together, the three sites include much of the critically important habitat necessary for long term

conservation of critically endangered species, in particular the large mammals endemic to Sumatra.

b) Are the separate elements of the site functionally linked?

The three separate elements of the nomination are essentially not functionally linked, particularly at the large mammal level. Unlike a number of existing serial World Heritage sites, the lack of functional linkages between the three components of this nomination raises questions about the appropriateness of them being considered legitimate parts of a serial nomination. Whereas both the Leuser Ecosystem and KSNP could independently qualify as World Heritage, BBSNP would be in doubt. BBSNP nonetheless makes a significant contribution to the biodiversity significance of the nominated sites by contributing populations of numerous rare or endangered species. BBSNP retains some semblance of a functional habitat link with KSNP but without a concerted effort, this corridor is likely to be eliminated by development over time.

c) Is there an overall management framework for all the units?

There is not presently an overall coordinated management framework for the three units but some coordination initiatives are proposed in the nomination document, which are to be implemented upon World Heritage listing. From a conservation viewpoint, greater cooperation and coordination between the three sites would be beneficial for effective management of each of the sites. Similarly, across the Sunda Strait, the Ujung Kulon World Heritage site would benefit from being included in coordinated management programs with the TRHS sites, more particularly BBSNP as many management issues are similar, e.g. rhinoceros management.

6. APPLICATION OF CRITERIA / STATEMENT OF SIGNIFICANCE

The Tropical Rainforest Heritage of Sumatra has been nominated under all four natural criteria.

Criterion (i): Earth's history and geological features

The site has important earth science values, represented in cross sections across the main mountain range of Sumatra. However the fact that the feature is widespread within the wider region, does not support a distinctive claim for inscription under criterion (i). IUCN considers that the nominated site does not meet this criterion.

Criterion (ii): Ecological processes

The nominated areas represent the most important blocks of forest on the island of Sumatra for the conservation of the biodiversity of both lowland and mountain forests. This once vast island of tropical rainforest, in the space of only 50 years, has been reduced to isolated remnants including those centred on the three nominated sites. The Leuser Ecosystem, including the nominated GLNP, is by far the largest and most significant forest remnant remaining in Sumatra. All three nominated sites would undoubtedly have been important climatic refugia for species over evolutionary time and have now become critically important refugia for future evolutionary processes. IUCN considers that the nominated site meets this criterion.

Criterion (iii): Superlative natural phenomena or natural beauty and aesthetic importance

The TRHS sites are all located on the prominent main spine of the Bukit Barisan Mountains, known as the 'Andes of Sumatra'. Outstanding scenic landscapes abound at all scales. The mountains of each site present prominent mountainous backdrops to the settled and developed lowlands of Sumatra. The combination of the spectacularly beautiful Lake Gunung Tujuh (the highest lake in SE Asia), the magnificence of the giant Mount Kerinci volcano,

numerous small volcanic, coastal and glacial lakes in natural forested settings, fumaroles belching smoke from forested mountains and numerous waterfalls and cave systems in lush rainforest settings, emphasise the outstanding beauty of TRHS. IUCN considers that the nominated site meets this criterion.

Addition of the Leuser Ecosystem to the nomination, as discussed above, would greatly enhance qualification on this criterion with its magnificent mountain forests, coastal swamp forests and natural beaches and the relative abundance of large mammals.

Criterion (iv): Biodiversity and threatened species

All three components of the nomination are areas of very diverse habitat and exceptional biodiversity. Collectively, the three sites can be expected to include more than 50% of the total plant diversity of Sumatra. At least 92 local endemic species have been identified in GLNP. The nomination contains populations of both the world's largest flower (*Rafflesia arnoldi*) and the tallest flower (*Amorphophallus titanum*)

The relict lowland forests in the nominated sites are very important for conservation of the plant and animal biodiversity of the rapidly disappearing lowland forests of South East Asia. Similarly, the montane forests, although less threatened, are very important for conservation of the distinctive montane vegetation of the TRHS.

The rapid and extensive destruction of the rainforests of SE Asia, Sumatra in particular, will continue to increase the already outstanding importance of the TRHS nomination for biodiversity conservation. The diversity of landscape, altitude, geology and habitat type will facilitate longer-term survival of many species through periods of climatic change.

IUCN considers that the nominated site meets criterion (iv).

Although the three nominated sites meet criterion (iv), qualification against this criterion would have been greatly enhanced if at least the critical habitat of endangered large mammals in the Leuser Ecosystem had been included in the nomination. The Leuser Ecosystem contains the most critically important habitat of the Sumatran endemic orangutan and elephant and some of the most important habitat of the endemic Sumatran tiger. For instance, Marshall, Jones and Wrangham (2000) note that 47% of the orangutan habitat in protected areas will be lost in the next decade, with less than 1% of habitat undisturbed by 'infrastructural' development by 2030. There is clearly an urgency to secure this critically important habitat.

7. RECOMMENDATIONS

- 7.1 IUCN recommends that the World Heritage Committee **inscribe** the Tropical Rainforest Heritage of Sumatra on the World Heritage List under natural criteria (ii), (iii) and (iv).
- 7.2 IUCN further recommends that the Committee should advise the State Party to consider extending the WH site to include other Leuser Ecosystem protected lands surrounding Gunung Leuser National Park, particularly the Singkil Barat Wildlife Reserve, Langsa lowlands and foothills, Aceh Highlands and the Tapaktuan lowlands. Such action should however be not be proceeded with until the integrity questions referred to in section 7.3 have been addressed and the mission called for on 7.4 completed satisfactorily.
- 7.3 IUCN also recommends that the World Heritage Committee should at the same time **inscribe the site on the List of World Heritage in Danger** on the basis of Operational Guidelines 83 (i) Ascertained Danger.

Given the type and immediacy of the identified threats, it is important that the Government of Indonesia, with the assistance of the international community, responds with urgency to ascertained threats facing the three components of this serial nomination. In particular IUCN recommends:

- i) a major coordinated effort, to address the serious threats posed to the nominated sites by on-going illegal logging and agricultural encroachment;
 - ii) urgent review of the Ladia Galaska Road, especially its likely serious impacts on both the nominated Gunung Leuser National Park and the surrounding Leuser Ecosystem;
 - iii) a coordinated effort to secure longer-term international assistance (especially for capacity building) to better protect and manage the nominated sites, with highest priority being for Bukit Barisan Selatan National Park;
 - iv) protection of the critical habitat 'missing link' across the Merangin River between the main eastern and western blocks of the Kerinci Seblat National Park;
 - v) a special funding project to urgently replace the many derelict visitor facilities and infrastructure and to develop a ecotourism/visitor management strategy in Bukit Barisan Selatan National Park.
- 7.4 IUCN advises the Committee to request the State Party to agree to invite a mission to the site within 2 years of its inscription. Based on the report of that mission, the Committee will need to decide whether to remove the site from the List of World Heritage in Danger, to retain it on that List of World Heritage in Danger or to remove it from the World Heritage List altogether.
- 7.5 Finally, IUCN recommends the Committee to request the State Party to submit detailed topographical maps clearly showing the boundaries for each site as soon as possible.

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE DE L'UICN

Patrimoine des Forêts tropicales ombrophiles de Sumatra (Indonésie) ID N° 1167

1. DOCUMENTATION

- i) **Fiches techniques UICN/WCMC:** 2 références
- ii) **Littérature consultée:** De Wilde, W.J.J.O. and Duyfjes, B.E.E. 1996. **Vegetation, Floristics and Plant Biogeography in Gunung Leuser National Park, in Leuser: A Sumatran Sanctuary**, Yayasan Bina Sains Hayati Indonesia; Flora and Fauna International, 2003, **The Ecological and Subsequent Social-Economic Impacts of Ladia Galaska**, Technical Memorandum, Sumatran Elephant Conservation Programme, FFI; Marshall, A.J., Jones, J.H., Wrangham R.W. 2000, **The plight of the apes: a global survey of ape populations**. Briefing paper. Department of Anthropology, Harvard University; Thornton, I. 1997, **Krakatau: The destruction and reassembly of an Island Ecosystem**, Harvard University Press; Whitten, T., Sengli J. Damanik, Jazanul Anwar, Nazzaruddin Hisyam, 2000, **The Ecology of Sumatra**, The Ecology of Indonesia Series, Vol. I Periplus.
- iii) **Consultations:** 5 évaluateurs experts. 10 évaluateurs indépendants consultés. La mission a rencontré des experts et des cadres supérieurs de la Direction de la protection des forêts et de la conservation de la nature (PHKA), à Jakarta; ministère de l'Environnement; Bureau de l'UNESCO à Jakarta; Programme de développement de Leuser; Conseil de planification de Nord Sumatra; Flora and Fauna International; Programme pour les éléphants de Sumatra; personnel des parcs nationaux; collectivités provinciales; Bureau des investissements, de la culture et du tourisme de la province de Lampung.
- iv) **Visite du site:** Peter Hitchcock, janvier 2004

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

Le Patrimoine des forêts tropicales ombrophiles de Sumatra (PFTOS) comprend trois aires protégées, bien séparées, sur l'île de Sumatra. Sumatra est une des îles les plus grandes, le plus à l'ouest, de l'archipel indonésien qui compte quelque 17 000 îles.

L'Indonésie n'occupe que 1,3% de la superficie émergée de la terre mais ses 17 000 îles contiennent plus de 10% des plantes à fleurs du monde, 12% des espèces de mammifères, 17% de tous les reptiles et amphibiens et 17% des espèces d'oiseaux (BAPPENAS, 1993). Cette richesse biologique extraordinaire fait de l'Indonésie l'un des sept pays « mégadivers », contenant deux des 25 centres (« points chauds ») de diversité biologique du monde, des zones de haute diversité définies par Conservation International – CI). Sur les 200 Écorégions mondiales du WWF, 18 se trouvent en Indonésie – 11 en milieu terrestre, 4 en milieu d'eau douce et 3 en milieu marin.

Sumatra comprend une partie du Centre de diversité du « Sundaland » défini par le WWF, ainsi que l'« Écorégion des forêts de montagne et de plaine des îles de Sumatra ». Whitten (2000) a estimé que la couverture végétale d'origine de Sumatra comprenait 5 680 000 ha de forêts de montagne et 25 154 000 ha de forêts tropicales sempervirentes de plaine. Les forêts tropicales de plaine ont été essentiellement détruites depuis quelques décennies (il en reste environ 20%, principalement sous forme de petits vestiges) et les forêts de montagne sont de plus en plus menacées par l'exploitation du bois et l'empiétement de l'agriculture.

La biodiversité des forêts de Sumatra est exceptionnelle : On estime que l'île compte 10 000 espèces de plantes dont 17 genres endémiques. Cette flore extrêmement diverse est en grande partie partagée avec d'autres secteurs de la région ouest-malaisienne qui s'étend du sud de la Thaïlande jusqu'à l'île de Nouvelle-Guinée. La partie de Sumatra qui se trouve au nord du lac Toba comprend une flore distinctive de Sumatra (de Wilde et Duyfjes, 1996), surtout dans la végétation montagnarde et subalpine, notamment la forêt «*blang*».

La diversité animale est également impressionnante: on trouve plus de 200 espèces de mammifères et quelque 580 espèces d'oiseaux dont 465 sont résidentes et 21 endémiques. Pour les espèces de mammifères, 22 sont des espèces asiatiques que l'on ne trouve nulle part ailleurs dans l'archipel indonésien et 15 sont inféodées à la région indonésienne, notamment l'orang-outang endémique de Sumatra.

Du point de vue géologique, Sumatra se trouve à l'extrémité méridionale de la plaque tectonique asiatique jouxtant le secteur des fonds océaniques de la plaque indo-australienne qui s'enfonce sous l'île. La collision des deux plaques a créé la chaîne de montagnes de Bukit Barisan qui s'étire sur les 1680 km de l'île et compte de nombreux volcans actifs. Sur le plan climatique, le Parc national de Gunung Leuser (PNGL), le Parc national de Kerinci Seblat (PNKS) et la partie occidentale du Parc national de Bukit Barisan Selatan (PNBBS) sont classés dans le type A (humide) de la classification climatique Schmidt et Fergusson. La partie méridionale du PNBBS est plus sèche et proche d'un climat de type B, avec une saison sèche annuelle de cinq mois.

La proposition compte une zone centrale totale de 2 595 125 ha et concerne trois parcs nationaux (Taman Nasional), établis en vertu de la législation nationale de la République d'Indonésie:

- le Parc national de Gunung Leuser (PNGL) (établi en 1980) 862 975 ha
- le Parc national de Kerinci Seblat (PNKS) (établi en 1992) 1 375 350 ha
- le Parc national de Bukit Barisan Selatan (PNBBS) (établi en 1982) 356 800 ha

Les trois parcs se trouvent dans la chaîne de Bukit Barisan qui se déploie depuis Aceh, au nord-ouest jusqu'à Bandar Lampung, au sud-est. Ensemble, ils représentent tout ou partie des trois «îles» vestiges les plus importantes des forêts de Sumatra autrefois si vastes.

La proposition comprend la plus haute montagne de Sumatra, le Gunung Kerinci (3800 m). Il s'agit aussi du volcan le plus haut de l'Indonésie, qui est encore très actif. Étant donné que le PNGL et le PNBBS touchent à l'océan Indien, le gradient altitudinal de la proposition s'étend des plus hautes montagnes de Sumatra jusqu'au niveau de la mer. En conséquence, les trois aires protégées qui constituent la proposition présentent un vaste zonage altitudinal de la végétation, des forêts ombrophiles de plaine aux forêts de montagne, en passant par les forêts subalpines de basse altitude, les broussailles et les fourrés arbustifs dans le PNGL et le PNKS. Cependant, la majeure partie du territoire des parcs proposés est montagneuse et les zones de plaine sont réduites (par exemple, 12% du PNGL se trouvent au-dessous de 600 m. Les aires protégées proposées sont donc plus caractéristiques de la chaîne de montagnes de Bukit Barisan que de Sumatra dans son ensemble qui est surtout une zone basse avec de très vastes plaines d'inondation.

Le PNGL fait partie d'une des 18 régions d'Indonésie classées dans les 200 Écorégions mondiales du WWF pour leur importance pour la conservation de la diversité biologique de la planète. La distribution de certaines espèces animales, à Sumatra, serait la preuve du rôle joué par les éruptions de tuf du Toba, il y a 75 000 ans. Par exemple, on ne trouve pas d'orangs-outangs de Sumatra au sud du lac Toba et on ne trouve pas de tapirs au nord. En outre, le taux d'endémisme élevé des mammifères et des oiseaux serait une preuve des relations pont-barrière entre le biote de Sumatra et celui de l'Asie continentale par suite des fluctuations des niveaux de la mer. Bien que des ponts terrestres périodiques aient relié l'Asie à Sumatra, cette dernière a développé une endémicité élevée, processus naturel important bien représenté dans les sites proposés. Le gradient altitudinal et la connectivité entre divers habitats du site proposé, en particulier dans le PNGL et le PNKS auraient facilité l'évolution écologique et biologique permanentes.

Il n'y a pas de zone tampon officielle comprise dans la proposition mais le PNGL est le cœur d'un ensemble de terres protégées comprenant l'écosystème Leuser. Celui-ci a une grande importance pour la conservation en lui-même mais est aussi en tant que zone tampon d'importance critique pour le parc. D'autres terres protégées sont contiguës au PNKS et au PNBBS et constituent actuellement des zones tampons efficaces mais, compte tenu de l'exploitation illicite du bois et de l'empiétement important, on ne saurait présumer qu'elles puissent constituer des zones tampons permanentes.

3. COMPARAISON AVEC D'AUTRES SITES

La géologie du PFTOS est typique de la région. Le PFTOS comprend deux exemples de transects à travers la zone de subduction de Sumatra où l'on trouve des paysages à la végétation naturelle pratiquement intacte, et englobe des secteurs de zones de relèvement, d'effondrement et volcaniques. Le PFTOS présente un transect avec une vallée d'effondrement très clairement définie et son volcan associé, le plus grand d'Indonésie. Ces caractéristiques ont, certes, un très grand intérêt pour les sciences de la terre mais elles sont largement répandues dans toute la région et ne sauraient servir de base pour prétendre à une valeur universelle exceptionnelle.

Du point de vue de la biodiversité et de l'écologie, il n'y a pas de région comparable en Indonésie bien qu'un groupe de sites forestiers de Bornéo ait été proposé pour évaluation en 2004/2005. Toutefois, la diversité des mammifères du PFTOS est beaucoup plus élevée que celle de l'île de Bornéo qui n'a pas les grands mammifères endémiques de Sumatra.

Bien des mammifères asiatiques étaient autrefois présents plus à l'est dans l'archipel mais le déboisement généralisé, l'agriculture intensive et d'autres activités humaines ont progressivement éliminé les plus grands mammifères et leur habitat de Bali et de Java. Le seul autre grand bien du patrimoine mondial d'Indonésie est le Parc national Lorentz en Papouasie, qui se trouve dans un domaine biogéographique totalement différent (domaine australien).

Le Parc national et Bien du patrimoine mondial de Ujung Kulon est situé face au PNBBS, juste de l'autre côté du détroit de la Sonde mais il est beaucoup plus petit et beaucoup moins riche sur le plan de la diversité biologique; il ne peut donc être comparé ni au PNBBS ni à la proposition concernant le PFTOS dans son ensemble. Le Bien du patrimoine mondial et Parc national de Komodo, dans l'est de l'Indonésie, dont l'importance principale est due à la présence du «dragon de Komodo» en danger et aux zones marines adjacentes, n'est pas comparable.

D'un point de vue plus général, aucun des sites de l'Asie continentale n'illustre les effets d'oscillation du niveau des mers sur l'évolution biologique en cours dont témoigne le niveau d'endémisme élevé de Sumatra. En fait, le PFTOS doit être comparé à d'autres sites de la région biogéographique d'Asie du Sud-Est ainsi que d'autres régions tropicales du monde. Au niveau mondial, la diversité biologique du site proposé se compare très favorablement avec celle d'autres biens du patrimoine mondial. La meilleure comparaison peut être faite, point par point, avec le Parc national du Manu (Pérou) et avec le Complexe de conservation de l'Amazonie centrale (CCAC, Brésil), qui comprend le Parc national Jaú dans les forêts amazoniennes du Brésil à la diversité biologique très élevée, comme on le voit dans le tableau ci-dessous.

Tableau 1: Comparaison de la diversité biologique entre le site proposé et d'autres biens du patrimoine mondial

Catégorie de biodiversité	Mammifères	Oiseaux	Reptiles et amphibiens	Poissons
Aire protégée				
PFTOS (site proposé)	Environ 180	Environ 450	Environ 200	30+
2 595 124 ha				
PN du Manu (Pérou)	99	850	120	Environ 200

1 532 806 ha				
CCAC, Brésil	120	411	Environ 150	320
5 232 018 ha				
Thungyai-Huai Kha Khaeng, Thaïlande	120	400	139	113
622 200 ha				
PN Lorentz, Indonésie	41	274+	150+	Environ 100
2 350 000 ha				

Lorsqu'on l'analyse dans un contexte mondial, le site proposé excelle visiblement pour la diversité biologique élevée des mammifères et présente une des plus hautes diversités biologiques pour les oiseaux, après le Parc national de Manu qui protège 15% de toutes les espèces d'oiseaux du monde. La diversité globalement comparable du CCAC qui est beaucoup plus grand n'est pas surprenante en raison du gradient altitudinal beaucoup plus important et donc de la diversité des habitats des sites de Sumatra.

Les grands mammifères du PFTOS (le tigre, l'éléphant, le rhinocéros, le tapir, l'ours malais et l'orang-outang) sont indicateurs du domaine asiatique. Les régions directement comparables sont l'île de Java, la péninsule Malaise, la Thaïlande, le Myanmar, Bornéo, le Viet Nam et le Laos. À l'échelle géologique, Java et Sumatra ont été épisodiquement reliées à l'Asie par des ponts terrestres. Toutefois, Sumatra présente une évolution divergente due à un isolement de plus longue durée.

Les sites de Sumatra se distinguent par le niveau d'endémisme élevé – avec les trois grands mammifères endémiques de Sumatra. Au niveau générique, les sites les plus comparables sont plusieurs sites de Malaisie et de Thaïlande qui partagent plusieurs grands mammifères avec le PFTOS, notamment le tigre et l'éléphant, mais qui n'ont pas le même degré d'endémisme des taxons de plantes supérieures et des animaux que l'on trouve à Sumatra dans le biote montagnard.

En résumé, les caractéristiques du PFTOS qui, aux plans mondial et régional, le rendent distinct d'autres biens du patrimoine mondial, pour la diversité biologique, sont les suivantes:

- une diversité biologique animale très élevée au niveau mondial;
- la diversité biologique globale de la faune et de la flore n'est comparable en Asie du Sud-Est, qu'à quelques sites possibles de Bornéo (par exemple, 4000 + espèces de plantes);
- la diversité la plus élevée pour les mammifères, en Asie du Sud-Est insulaire (y compris 22 espèces asiatiques que l'on ne trouve nulle part ailleurs en Asie du Sud-Est insulaire);
- des habitats d'importance critique pour de nombreuses espèces animales rares et menacées (par exemple, 58+ oiseaux qui se trouvent sur la Liste rouge de l'UICN des espèces menacées, 2000);
- un habitat d'importance critique pour quatre grands mammifères menacés dont trois sont endémiques de Sumatra (tigre, éléphant, orang-outang);
- une valeur de refuge climatique exceptionnelle pour de nombreuses espèces et une diversité exceptionnelle des habitats sur un vaste gradient altitudinal (du niveau de la mer à 3800 m);
- la présence d'un biote montagnard «asiatique» extrêmement divers et distinctif.

Enfin, du point de vue du paysage et de la beauté naturelle, le groupe des PFTOS diffère des paysages distinctifs du Parc de Kinabalu et du Parc national de Gunung Mulu à Bornéo. Il diffère aussi de Taman Negara sur la péninsule Malaise et des sanctuaires de faune de Thungyai - Huai Kha Khaeng (Thaïlande). Aucun des sites mentionnés ici ne comprend l'élément volcanique du PFTOS. À la différence du Parc de Kinabalu et du Parc national de Gunung Mulu, la beauté naturelle du PFTOS est essentiellement dispersée et souvent à petite échelle, avec de nombreuses caractéristiques individuelles de grande beauté telles que des paysages alpins, des cascades, des lacs, des grottes et des rivières. Bien que le

Parc national de Ujung Kulon comprend les vestiges d'un des volcans les plus célèbres du monde, le Krakatoa, l'échelle et la beauté de celui-ci ne sont pas comparables à celles des volcans du site proposé, tel le volcan Gunung Kerinci dans le PNKS (3404 m). Cette montagne est un strato-volcan «classique» et actif, le plus haut de l'Asie du Sud-Est (3800 m). En outre, le site est remarquable car c'est le seul site proposé en Asie du Sud-Est qui contienne des volcans actifs enchâssés dans des forêts ombrophiles.

4. INTÉGRITÉ

4.1 Statut juridique

Les trois parcs proposés appartiennent au domaine public et ont été créés en tant que parcs nationaux par le gouvernement de l'Indonésie. Le statut de parc national est le niveau de protection juridique approprié dans ce pays. L'Organe de gestion des trois sites proposés est actuellement la Direction générale de la protection des forêts et de la conservation des forêts (PHKA) au sein du ministère des Forêts. La proposition mentionne le transfert de la gestion de l'écosystème Leuser de l'Unité de gestion Leuser à la Fondation internationale Leuser (LIF) en 2004. Sur la page d'accueil du site de la Fondation, il est indiqué que celle-ci dispose d'une concession de 30 ans sur l'écosystème Leuser. Le PNGL, toutefois, restera géré par la PHKA.

4.2 Gestion

Chacun des parcs emploie des gardiens (essentiellement Polisi Hutan ou police des forêts), un personnel administratif et des techniciens. De temps en temps, le personnel est constitué en unités spéciales, telle l'Unité de gestion des rhinocéros. Le nombre total d'employés (PNGL – 237, PNKS – 162, PNBBS – 127) traduit cependant une plus grande capacité de gestion que ce n'est le cas en réalité. Il est nécessaire d'améliorer la formation et la dotation en ressources pour atteindre une plus grande efficacité, notamment en matière d'application des lois. Les salaires de base du personnel sont budgétés mais, dans presque tous les cas, on constate une pénurie grave de ressources entravant l'efficacité de la gestion courante, en pratique: par exemple, une pénurie de véhicules limite gravement la mobilité du personnel.

Les trois parcs ont des plans de gestion, comme le requiert la loi indonésienne mais beaucoup d'employés ne les connaissent pas bien. Cela laisse à penser qu'il serait utile de disposer d'un document plus concis à des fins d'information et de formation.

Le niveau de participation et de coopération des communautés locales, y compris des pouvoirs publics locaux, à la gestion des parcs, varie énormément d'un site à l'autre. Dans certains cas, les communautés locales et les pouvoirs publics locaux sont considérés par les administrateurs comme des menaces graves pour les parcs; dans d'autres cas, ils jouent un rôle d'appui. Au PNKS, un mémorandum d'accord a été élaboré entre 14 gouvernements locaux au moins et les autorités du parc, ce qui est une initiative louable. Malgré cela, l'appui des pouvoirs publics locaux a diminué depuis que les administrateurs du parc se sont opposés à l'ouverture de nouvelles routes dans le parc et ont démontré une efficacité croissante dans la lutte antitraffiquage et contre l'exploitation illicite du bois. La mise en œuvre de deux grands projets d'aide internationaux pour le PNKS (FEM) et le PNGL (dans le cadre du financement par l'UE de l'Unité de gestion de Leuser) a permis une large consultation et une bonne interaction avec les communautés locales concernant différents aspects de la gestion du parc et des espèces sauvages.

Il est clair que les ressources financières disponibles depuis 10 ans ont fortement varié pour chaque site ainsi qu'entre les sites comme on le voit au tableau 2. D'autres grands changements sont imminents qui feront suite à la fin récente et prochaine de plusieurs programmes d'aide internationaux.

Tableau 2: Tendances des ressources financières pour les sites proposés (à titre indicatif seulement)

Période budgétaire	PNGL	PNKS	PNBBS	Total
1984/85-1994/95	USD 63 886,00 (70% provenant du budget national)	Budget annuel moyen approx. - USD 6 546 960	La majeure partie du financement est venue du budget national	
1984/85-1994/95	USD 63 886,00	La majeure partie du financement, depuis 1996, est venue du projet KS-ICDP* soit un total de USD 46 millions. Ce projet s'est terminé en 2002		
2000	USD 192 696,00 (96 460 dollars provenant du budget national; 13 635 dollars provenant du Fonds de renforcement de la gestion de Gunung Leuser)			
2001			USD 240 450	
Financement annuel (approx. seulement)	USD 190 000	USD 6 546 000*	USD 240 000	*USD 6 976 000

*Note: le projet KS-ICDP est terminé.

Les trois parcs proposés ont un potentiel touristique exceptionnel mais différents facteurs freinent ou empêchent l'expansion du tourisme: une planification stratégique inadéquate du tourisme; une infrastructure totalement inadéquate dans les parcs; une mauvaise infrastructure routière dans certaines localités en dehors des parcs; l'absence de certitude concernant la protection des ressources naturelles; les activités illicites qui continuent de dégrader les ressources (par exemple exploitation forestière le long de routes forestières pittoresques); et les problèmes de sécurité à Nanggroe Aceh Darussalam. Si ces problèmes sont résolus, le tourisme pourrait être une source importante de financement additionnel pour la gestion des parcs.

4.3 Limites

Parc national de Gunung Leuser

Le Parc national de Gunung Leuser est un élément d'un bloc plus vaste d'habitats de haute qualité pour les espèces sauvages et de paysages naturels qui porte le nom d'«Écosystème Leuser». L'Écosystème Leuser fournit un habitat d'importance critique pour quatre grands mammifères endémiques de Sumatra inscrits dans les catégories En danger (EN) et En danger critique d'extinction (CR) sur la Liste rouge de l'UICN: l'orang-outang de Sumatra (CR), le tigre de Sumatra (CR), l'éléphant de Sumatra (EN) et le rhinocéros de Sumatra (CR). Le PNGL, enchâssé dans l'Écosystème Leuser contient des habitats pour les quatre espèces mais ne contient pas «l'habitat le plus important» de la région pour trois de ces espèces (éléphant, tigre et orang-outang). En outre, le PNGL est le seul élément de la proposition groupée qui se trouve dans l'aire de répartition de l'orang-outang de Sumatra endémique et En danger critique d'extinction: il contient un habitat important pour l'orang-outang mais une bonne partie de l'habitat d'importance critique est située en dehors du site proposé, dans l'Écosystème Leuser environnant.

Malheureusement, certaines des meilleures preuves illustrant d'importants processus écologiques et biologiques en cours sont dans l'Écosystème Leuser, en dehors du site proposé. Par exemple, la découverte récente d'une adaptation évolutive d'une population d'orang-outangs (utilisation d'outils) est limitée à une population se trouvant en dehors du

PNGL proposé. Les zones de haute diversité biologique les plus importantes de l'Écosystème Leuser en dehors du PNGL sont surtout i) la Réserve de faune sauvage de Singkil Barat, ii) les contreforts et basses terres de Langsa et iii) les plateaux d'Aceh et les basses terres de Tapaktuan. La Réserve de faune sauvage de Singkil Barat est une forêt marécageuse de plaine, menacée et considérée par l'Unité de gestion de Leuser comme étant d'importance mondiale pour la conservation de l'orang-outang de Sumatra.

En outre, une bonne partie de la migration régionale de l'éléphant de Sumatra dans la région de Leuser a lieu essentiellement en dehors du PNGL, dans l'Écosystème Leuser. Le Dialogue politique sur les forêts du patrimoine mondial qui a eu lieu à Berastagi, Sumatra, en décembre 1998, a porté une attention spéciale à l'écosystème Leuser proche. Les actes de Berastagi font référence à la fois au PNBBS et au PNKS mais mentionnent l'Écosystème Leuser et non l'élément plus petit du PNGL. En limitant la proposition à la section de l'Écosystème Leuser qui contient le Parc national de Gunung Leuser, on crée une anomalie et l'on ne répond pas aux attentes internationales concernant cette importante proposition sérielle.

Parc national de Kerinci Seblat

Le Parc national de Kerinci Seblat est, de loin, le plus grand des trois sites proposés. Bien que ses limites touchent à des terres mises en valeur ou à d'autres terres très dégradées, certaines de ses limites jouxtent des habitats d'importance critique qui fonctionnent actuellement comme partie intégrante de l'écosystème du parc. Avec la mise en valeur qui progresse rapidement en dehors du parc, certaines des limites poseront de graves problèmes, en particulier pour les grands mammifères. Par exemple, la limite occidentale du parc, entre Padang et Bengkulu, traverse l'habitat du tigre et de l'éléphant. Si l'on autorise l'expansion du développement vers les limites du parc dans ces régions, le parc deviendra beaucoup plus difficile à gérer, des interactions inutiles entre l'homme et la faune sauvage se produiront et la perspective de survie à long terme des grands mammifères sera fortement compromise.

Il est évident qu'il faut réviser de toute urgence les limites du PNKS dans le but de déterminer des possibilités de protéger des habitats additionnels d'importance critique pour les grands mammifères en danger. Il existe, en particulier, plusieurs concessions d'exploitation du bois limitrophes qui ne sont plus exploitées mais qui restent d'importants habitats pour les grands mammifères. Il y a aussi un couloir d'habitat critique entre les blocs est et ouest du parc qui doit être protégé de toute urgence.

Parc national de Bukit Barisan Selatan

Les limites actuelles du PNBBS sont adéquates dans le contexte de cette proposition. Le PNBBS, qui est le plus petit des trois sites proposés, subit de fortes pressions du fait de la mise en valeur des terres des alentours. Néanmoins, certaines forêts protégées et terres forestières dégradées limitrophes présentent une importance complémentaire en tant qu'habitat pour les grands mammifères, en particulier le tigre, l'éléphant et, dans une certaine mesure, le rhinocéros. Deux de ces trois espèces sont en danger critique d'extinction et leur survie dépendra, dans une large mesure, de la protection et de la gestion des populations en dehors du Parc national, soit par de futurs prolongements du parc, soit par la gestion de zones tampons. Faute de mettre en œuvre la protection et la gestion de grandes populations de mammifères et/ou de leur habitat en dehors du parc, la survie de ce dernier sera menacée à terme.

4.4 Impacts anthropiques

Quatre processus menaçants fondamentaux et liés continuent de s'exercer sur les sites proposés. Dans chacun des cas, le dénominateur commun est l'accès procuré par les routes et l'échec de l'application efficace des lois. Dans les forêts tropicales où l'application des lois est sans effet, les routes sont «le début de la fin» pour les écosystèmes de forêt ombrophile car elles facilitent l'exploitation illicite du bois, l'empiétement, le braconnage et d'autres activités qui dégradent l'environnement. Les forêts de Sumatra proposées ici ne font pas exception.

4.4.1 Exploitation illicite du bois

En Indonésie, l'exploitation non durable des forêts tropicales a dégradé ou détruit de telles superficies de forêts de plaine que l'exploitation du bois dépend désormais de plus en plus de l'exploitation illicite des aires protégées, y compris les parcs nationaux. Ce problème est extrêmement évident dans toute l'Indonésie et toutes les tentatives qui ont été déployées pour le régler ont échoué. L'exploitation illicite est une menace pour les trois sites et devrait atteindre son paroxysme dans les prochaines années, au fur et à mesure du déclin rapide de l'approvisionnement en dehors des aires protégées. Les ramifications internationales du commerce illicite du bois font aujourd'hui l'objet d'un différend entre le gouvernement de la Malaisie et celui de l'Indonésie. Plusieurs personnes interrogées ont affirmé que l'exploitation illicite à Sumatra est extrêmement organisée, de la forêt au port, et que le bois de Sumatra est exporté en tant que bois certifié à partir d'autres pays. L'exploitation illicite est aujourd'hui un véritable problème national débattu en Indonésie, tant dans un contexte électoral que comme une question que la Présidente essaie publiquement de résoudre.

4.4.2 Empiètement

Dans les zones de forêts, y compris des parcs nationaux, l'empiètement de l'agriculture de subsistance et des plantations industrielles a atteint un niveau critique dans bien des régions du pays. Les trois parcs proposés ne font pas exception. Selon des sources fiables, un empiètement important, organisé récemment sur une parcelle rare de forêt ombrophile de plaine dans le PNGL, serait une opération illicite cautionnée comme une «entreprise économique».

4.4.3 Braconnage

Différents problèmes économiques et sociaux, conjugués avec l'amélioration de l'accessibilité, ont abouti à une intensification du braconnage, en particulier des éléphants, des tigres et des rhinocéros. Les trois parcs proposés ont un problème de braconnage qui menace les grands mammifères. Avec l'aide internationale, de grands efforts sont déployés pour lutter contre le braconnage dans plusieurs des parcs, en particulier le PNKS.

4.4.4 Routes

Comme mentionné plus haut, les routes ouvertes dans les sites proposés et à proximité facilitent la destruction de la forêt et de la faune sauvage. Le PNKS est menacé par plusieurs projets de construction de routes qui traverseraient des secteurs d'importance critique dans le parc. Un débat public a lieu, concernant ces projets de construction, et rien ne garantit qu'ils seront annulés.

Le PNGL, ainsi que les zones environnantes de l'Écosystème Leuser, sont gravement menacés par un projet de grande route et plusieurs autres projets de route. Le projet Ladia Galaska traverse le secteur nord de l'Écosystème Leuser. Même s'il ne traverse pas directement le PNGL, il aura de graves répercussions sur le parc en modifiant l'accessibilité des hautes terres du parc. Son incidence sur l'ensemble de l'Écosystème Leuser sera encore plus forte; tout en facilitant l'exploitation illicite du bois, il aura de graves effets sur l'habitat d'importance critique de l'éléphant de Sumatra. La route est une initiative locale mais le projet a maintenant été approuvé en principe par le gouvernement central. Toutefois, il semble qu'il y ait, au gouvernement, des opinions divergentes à ce sujet et la Présidente a été mêlée au débat.

4.5 Autres menaces

4.5.1 Application des lois

Les défaillances dans l'application des lois sont probablement la plus grave menace pour la survie à long terme des valeurs de patrimoine naturel des sites proposés. Selon des informations officieuses, recueillies durant la mission, les personnes chargées de l'application des lois manquent souvent à leur mission et cherchent à bénéficier financièrement des activités illicites. Mais ce qui est le plus préoccupant, c'est que des fonctionnaires du gouvernement seraient parties prenantes à l'exploitation illicite dans les parcs nationaux. Il a été affirmé à la mission, à plusieurs reprises, que le personnel militaire participe aux opérations d'exploitation illicite du bois - voire les contrôle - en particulier dans le secteur Aceh de l'Écosystème Leuser. Compte tenu de la participation des responsables de

l'application des lois aux opérations illicites, il est deux fois plus difficile pour le gestionnaire des parcs, la PHKA, d'obtenir coopération et appui à l'application des lois. En l'absence d'amélioration marquée de l'efficacité de l'application des lois dans les sites proposés, leur viabilité à long terme ne peut être garantie et bon nombre de leurs valeurs de patrimoine naturel doivent être considérées comme gravement menacées.

Il y a quand même de bonnes nouvelles: avec l'appui de la police, des condamnations ont récemment été obtenues dans des cas de braconnage du tigre et d'exploitation illicite du bois dans le PNKS. La question de l'exploitation illicite du bois est aujourd'hui une question nationale qui a été soulevée lors des élections parlementaire et présidentielle.

4.5.2 Décentralisation

Quelques problèmes qui se posent actuellement dans les parcs nationaux découlent de la législation «Otonomi Daerah» qui délègue beaucoup de pouvoirs du gouvernement central au gouvernement local. Les gouvernements provinciaux exercent aussi quelques pouvoirs dans les parcs nationaux en Indonésie. Cette situation confuse pourrait menacer l'intégrité des parcs proposés et doit être démêlée.

4.5.3 Ressources consacrées à la gestion

Comme noté plus haut, les ressources consacrées à la gestion du PFTOS posent un problème. En outre, il faut, de toute urgence, obtenir un appui plus important des organismes d'application des lois, tels que la police. Ce problème est reconnu par le personnel de la PHKA et un projet d'aide étrangère a été lancé pour tenter de le résoudre.

4.5.4 Aide internationale

Le PNKS et l'Écosystème Leuser (y compris le PNGL) ont bénéficié d'une importante aide internationale pour la gestion du patrimoine naturel. Dans le PNBBS cependant, l'assistance internationale, les ressources et la gestion sont inadéquates. L'Union européenne a financé le programme de gestion Leuser qui a fourni d'excellentes données pour contribuer à la planification et à la gestion de l'Écosystème Leuser, y compris le PNGL. Avec la cessation des financements importants consacrés au PNKS, en 2002, et lorsque que le Programme Leuser sera terminé fin 2004, le PFTOS connaîtra une pénurie majeure de ressources de gestion. Il sera vital de trouver un nouveau financement international pour les trois sites et en particulier pour le PNBBS afin de garantir leur survie.

5. AUTRES COMMENTAIRES

Justification de l'approche sérielle

Lorsque l'UICN évalue une proposition sérielle, elle se pose les questions suivantes basées sur les Orientations:

a) Comment l'approche sérielle se justifie-t-elle?

Ce qui justifie avant tout l'approche sérielle, c'est qu'ensemble les trois parcs forment le cœur des trois régions qui offrent le plus fort potentiel de conservation à long terme du biote distinctif et divers de l'île de Sumatra, y compris de nombreuses espèces en danger. Les trois sites qui sont tous situés dans la chaîne de Bukit Barisan, fournissent aussi ensemble, la preuve biogéographique de l'évolution de l'île de Sumatra et de son riche biote. Ensemble, les trois sites comprennent une bonne partie de l'habitat d'importance critique pour la conservation à long terme d'espèces en danger critique d'extinction, en particulier les grands mammifères endémiques de Sumatra.

b) Les éléments séparés du site sont-ils liés sur le plan fonctionnel?

Les trois éléments séparés de la proposition ne sont pas vraiment liés sur le plan fonctionnel, en particulier au niveau des grands mammifères. À la différence de nombreux biens sériels inscrits sur la Liste du patrimoine mondial, l'absence de liens fonctionnels entre les trois éléments de cette proposition amène à se poser la question de savoir si l'on peut les

considérer comme des parties légitimes d'une proposition sérielle. L'Écosystème Leuser et le PNKS pourraient, indépendamment, être inscrits sur la Liste du patrimoine mondial mais il y a un doute pour le PNBBS. Cependant, le PNBBS apporte une contribution majeure à l'importance de la biodiversité des sites proposés, avec ses populations de nombreuses espèces rares ou en danger. Le PNBBS maintient un semblant de lien d'habitat fonctionnel avec le PNKS mais faute d'efforts concertés, ce corridor risque un jour d'être éliminé par le développement.

c) Existe-t-il un cadre de gestion global pour toutes les unités?

Il n'y a pas actuellement de cadre de gestion global coordonné pour les trois unités mais certaines initiatives de coordination sont proposées dans le texte de la proposition qui seront mises en œuvre en cas d'inscription au patrimoine mondial. Du point de vue de la conservation, il serait utile d'améliorer la coopération et la coordination entre les trois sites pour garantir une gestion efficace de chacun d'eux. De même, de l'autre côté du détroit de la Sonde, le Bien du patrimoine mondial de Ujung Kulon bénéficierait de sa participation à des programmes de gestion coordonnés avec les PFTOS et plus particulièrement le PNBBS, car de nombreuses questions de gestion sont semblables, par exemple, la gestion du rhinocéros.

6. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL

Le Patrimoine des forêts tropicales ombrophiles de Sumatra est proposé au titre des quatre critères naturels.

Critère (i): histoire de la terre et processus géologiques

Le site présente d'importantes valeurs pour les sciences de la terre, représentées en coupe transversale à travers la principale chaîne de montagnes de Sumatra. Toutefois, cette caractéristique étant largement répandue dans toute la région, elle ne saurait constituer une justification de l'inscription au titre du critère (i). L'UICN considère que le site proposé ne remplit pas ce critère.

Critère (ii): processus écologiques

Les sites proposés sont les blocs forestiers les plus importants de l'île de Sumatra pour la conservation de la diversité biologique des forêts de montagne et des forêts de plaine. Cette île qui possédait autrefois de vastes forêts tropicales ombrophiles a vu celles-ci réduites, en l'espace de 50 ans seulement, à des vestiges isolés, y compris ceux qui sont à l'intérieur des trois sites proposés. L'Écosystème Leuser, y compris le PNGL qui fait l'objet de la proposition est de loin, le plus grand et le plus important vestige forestier de Sumatra. Les trois sites proposés auraient sans aucun doute été d'importants refuges climatiques pour les espèces au cours de l'évolution et sont aujourd'hui devenus des refuges d'importance critique pour les processus futurs de l'évolution. L'UICN considère que le site proposé remplit ce critère.

Critère (iii): phénomènes naturels éminemment remarquables ou de beauté exceptionnelle

Les sites qui forment le PFTOS se trouvent sur la dorsale principale des montagnes de Bukit Barisan que l'on appelle les «Andes de Sumatra». Des paysages pittoresques et exceptionnels abondent à toutes les échelles. Les montagnes de chacun des sites sont une toile de fond remarquable pour les plaines habitées et développées de Sumatra. L'association de la beauté spectaculaire du lac Gunung Tujuh (le plus haut lac d'Asie du Sud-Est), de la splendeur du volcan géant du mont Kerinci, de nombreux petits lacs volcaniques, côtiers et glaciaires dans un décor de forêt naturelle, de fumerolles qui crachent leur fumée dans les forêts de montagne et de cascades et réseaux de grottes nombreux dans des paysages de forêts ombrophiles luxuriantes met en valeur la beauté exceptionnelle du PFTOS. L'UICN considère que le site proposé remplit ce critère.

L'ajout de l'Écosystème Leuser à la proposition, comme discuté plus haut, renforcerait énormément la qualification du site au titre de ce critère grâce aux magnifiques forêts de montagne, aux forêts marécageuses côtières et plages naturelles et à l'abondance relative de grands mammifères.

Critère (iv): diversité biologique et espèces menacées

Les trois éléments de la proposition possèdent des habitats très divers et une diversité biologique exceptionnelle. Ensemble, les trois sites possèdent probablement plus de 50% de la diversité végétale totale de Sumatra. On a recensé au moins 92 espèces endémiques locales dans le PNGL. La proposition fait état de populations de la plus grande fleur du monde (*Rafflesia arnoldi*) et de la plus haute fleur du monde (*Amorphophallus titanum*).

Les forêts reliques des basses terres des sites proposés sont très importantes pour la conservation de la biodiversité végétale et animale des forêts de plaine d'Asie du Sud-Est en disparition rapide. De même, les forêts de montagne, bien qu'elles soient moins menacées, sont très importantes pour la conservation de la végétation de montagne distinctive du PFTOS.

La destruction rapide et généralisée des forêts ombrophiles d'Asie du Sud-Est, celles de Sumatra en particulier, se poursuivra et ne fera qu'augmenter l'importance déjà exceptionnelle du PFTOS pour la conservation de la diversité biologique. La diversité des paysages, l'altitude, la géologie et les types d'habitats faciliteront la survie à plus long terme de nombreuses espèces à travers les périodes de changements climatiques. L'UICN considère que le site proposé remplit ce critère.

Bien que les trois sites proposés remplissent le critère (iv), leur qualification au titre de ce critère aurait été grandement facilitée si avait été inclus, dans la proposition, au moins l'habitat d'importance critique des grands mammifères en danger qui se trouve dans l'Écosystème Leuser. L'Écosystème Leuser contient l'habitat le plus important pour l'orang-outang et l'éléphant endémiques de Sumatra et certains des habitats les plus importants pour le tigre endémique de Sumatra. Par exemple, Marshall, Jones et Wrangham (2000) notent que 47% de l'habitat de l'orang-outang dans les aires protégées aura disparu dans les 10 prochaines années et moins de 1% de l'habitat ne sera pas perturbé par le développement de l'infrastructure d'ici 2030. Il est absolument urgent de protéger cet habitat d'importance critique.

7. RECOMMANDATION

- 7.1 L'UICN recommande au Comité du patrimoine mondial d'**inscrire** le Patrimoine des forêts tropicales ombrophiles de Sumatra sur la Liste du patrimoine mondial au titre des critères naturels (ii), (iii) et (iv).
- 7.2 L'UICN recommande en outre au Comité de conseiller à l'État partie d'envisager d'agrandir le Bien du patrimoine mondial afin d'inclure d'autres territoires protégés de l'Écosystème Leuser entourant le Parc national de Gunung Leuser, notamment la Réserve de faune sauvage de Singkil Barat, les contreforts et les basses terres de Langsa, les plateaux d'Aceh et les basses terres de Tapaktuan. Cette mesure ne doit cependant pas être prise avant que les questions d'intégrité mentionnées au paragraphe 7.3 aient été résolues et que la mission demandée au paragraphe 7.4 ait été réalisée de manière satisfaisante.
- 7.3 L'UICN recommande également au Comité du patrimoine mondial d'**inscrire le site sur la Liste du patrimoine mondial en péril** sur la base des Orientations 83 (i) *Péril prouvé*. Étant donné le type et l'immédiateté des menaces déterminées, il importe que le gouvernement de l'Indonésie, avec l'aide de la communauté internationale, réagisse de toute urgence aux menaces prouvées qui se posent aux trois éléments de cette proposition sérielle. L'UICN recommande en particulier:

- i) un important effort coordonné pour traiter les graves menaces que posent aux sites proposés l'exploitation illicite du bois et l'empiétement agricole permanents;
 - ii) la révision de toute urgence, du projet de route de Ladia Galaska, et en particulier de ses effets probablement graves tant sur le Parc national de Gunung Leuser qui fait l'objet de la proposition que sur l'Écosystème Leuser environnant;
 - iii) un effort coordonné pour obtenir une assistance internationale à long terme (en particulier pour le renforcement des capacités) afin de mieux protéger et gérer les sites proposés, la plus haute priorité étant accordée au Parc national de Bukit Barisan Selatan;
 - iv) la protection du «chaînon manquant» dans l'habitat d'importance critique à travers la rivière Merangin, entre les blocs est et ouest principaux du Parc national de Kerinci Seblat;
 - v) un projet de financement spécial pour remplacer, de toute urgence, les nombreux équipements et l'infrastructure touristique qui sont en très mauvais état et élaborer une stratégie de gestion de l'écotourisme/des visiteurs pour le Parc national de Bukit Barisan Selatan.
- 7.4 L'UICN conseille au Comité de demander à l'État partie d'accepter une mission dans le site, dans un délai de deux ans suivant son inscription. D'après le rapport de cette mission, le Comité décidera de retirer le site de la Liste du patrimoine mondial en péril ou de le maintenir sur cette Liste, ou encore de retirer totalement le site de la Liste du patrimoine mondial.
- 7.5 Enfin, l'UICN recommande au Comité de demander à l'État partie de fournir des cartes topographiques détaillées montrant clairement les limites de chaque site aussitôt que possible.