

Technical Report

Protecting the breeding habitat of the lesser adjutant in the
tropical lowland Metau forest, West Kutai District, East
Kalimantan

PROJECT YEAR 2010



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PREFACE AND ACKNOWLEDGEMENTS

This technical report presents results of the project “Protecting the breeding habitat of the lesser adjutant in the tropical lowland Metau forest, West Kutai District, East Kalimantan”. With the support of the Stichting Moluccan and Papuan Wildlife Conservation Ecoguide Fund, the local NGO Yayasan Konservasi RASI was able to conduct two surveys within and at the surrounding area of Metau Forest as well as conducting interviews with local stakeholders. The results of the surveys will be handed to the local government to exclude the area for future forest-conversion schemes.

On behalf of Yayasan Konservasi RASI, we would like to thank Stichting M&P WILCON ECOGUIDE FUND most sincerely for their contribution. We hope for your future support towards protection of high-conservation-value forest.

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INTRODUCTION

Project background

Metau Forest comprises c. 4.100 ha of tropical lowland (dipterocarp) and peat/ freshwater swamp forest and is situated in West Kutai District, East Kalimantan. During biodiversity surveys conducted between 2005-2007 (Budiono *et al.*, 2007), it was identified as important breeding ground for lesser adjutant birds, where colonies of up to 300 birds are breeding. It is adjacent to freshwater swamp forest west of Jempang Lake where the birds are feeding. Other species are egrets, eagles, storks, several primate and deer species as well as monitor lizards. The area forms an important buffer area between Jempang Lake and a large, coalmining concession and palm-oil plantation area. Encroachment is feared, whereas opening of this area would be disastrous in terms of increased sedimentation for Jempang Lake and for the wildlife in this area. Metau forest also represents the main location of capture of lesser adjutants, where in 2004 and 2006, 50 and 400 birds were caught, respectively. Part of the swamp forest is temporarily flooded during the rainy season, where they are caught with underwater fishing hooks and usually killed if the bird is wounded or nearly dead and directly sold for meat or as pet if they are not badly wounded for c. Rp. 50.000 per individual. Juveniles are being caught from their nest in the kahoi tree (*Shorea balangeran*) and raised as pet until they become adult.



The boundaries of Metau Forest with encroaching oilpalm plantation activities on the right.

Project goal and activities

The **goal** of the project is to offer legal protection to Metau Forest to prevent encroachment and land conversion and allow for patrols to control illegal activities such as logging and wildlife captures. The **aim** is to officially propose Metau Forest (4.300 ha in size) as protected forest to West Kutai District Authorities based on updated and detailed information on the area and its conservation value. The other aim is to restore boundaries that have been degraded for at least 300 ha.

Methods

From April to May 2010, 14 days of field surveys were conducted in Metau Forest during high water level conditions, whereas another 10 days survey was conducted in June/ July 2010 at medium-low water conditions. Interviews (rapid assessments) on the historic conditions (size of the forest) of Metau Forest were performed with heads of villages and other knowledgeable community members (c. 40 people in total) mostly in the evenings in the villages of Muara Ohong, Tanjung Isuy and Muara Pahu.

During the field surveys, the following information was gathered: 1) mapping of forest area coverage and condition, 2) flora/ fauna species composition, 3) ecological and hydrological function.

Results

A. General Condition of Metau Forest

A.1. Location and Size of Study Site

The research was conducted in Metau Forest, currently covering c. 5,327.4 ha, whereas the size was c. 13,500 ha before 1995 (Figure 1, landsat imaging and interview), which according to government administration, located in Muara Pahu Village, Muara Pahu Subdistrict, West Kutai District.

Geographically Metau Forest lays between 115°58' 10" - 116°05' 10" East Longitude and 0°22' 20" - 0°25' 50" South Latitude.

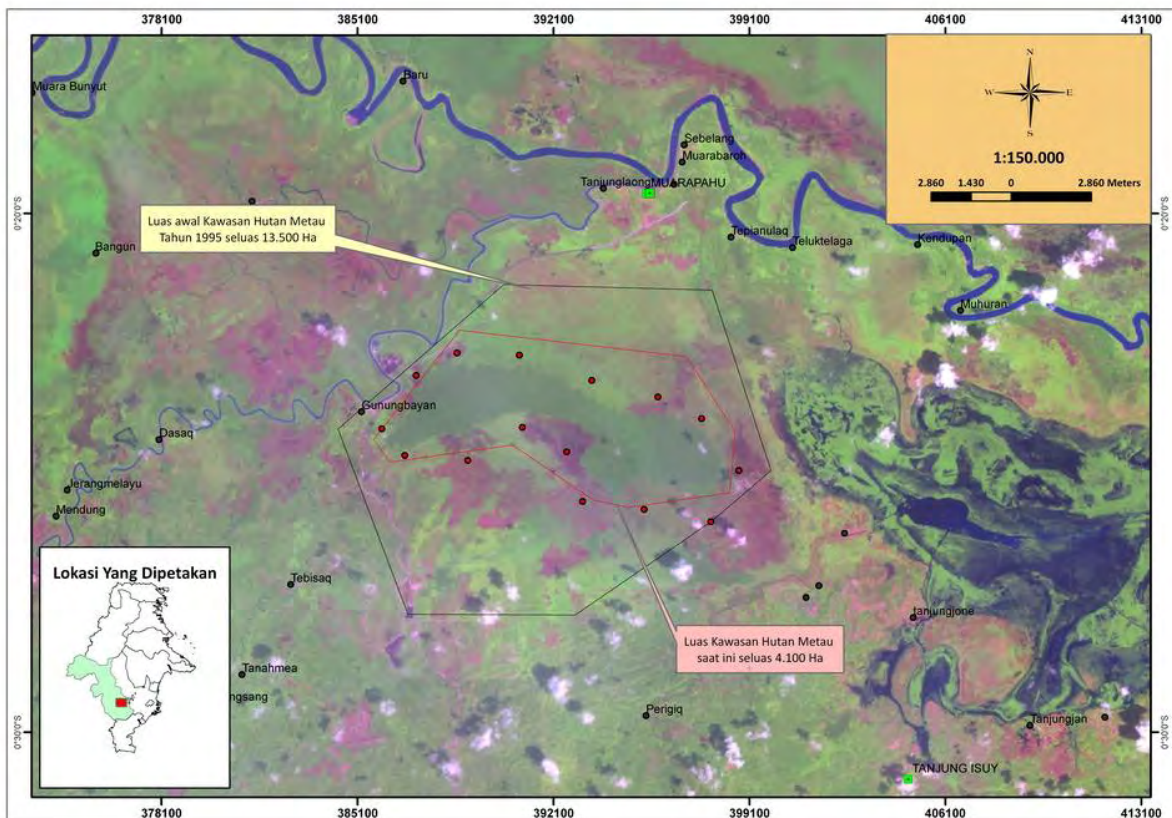


Figure 1. Outer boundaries representing the forest size in 1995 (13.500 ha) and the inner boundary (red) representing the current forest size in 2010 (4.100 ha).

A. 2. Study Site Accessibility

The study site can be reached using land as well as river transportation. We either traveled from Samarinda to Tanjung Isuy c. 300 km using land transportation in 5 – 6 hours, or took a three-hours-land trip c. 125 km from Samarinda to Kota Bangun, then from Kota Bangun to Tanjung Isuy by boat in 8 - 10

hours. The c. 15 km distance between Tanjung Isuy to the sample collection field site, which is Metau Forest, was reached using a small boat or ces in 1.5 - 2 hours.

A. 3. Climate Condition

Based on Schmidt and Fergusson classification, the climate at the study site is extremely wet (type A) with rain intensity relative spread evenly all year round, and the possibility of flood during heavy rain. Highest rain intensity averaging c. 2,500 – 3,000 mm happens in April and the lowest in August. Maximum temperature is 30 - 34° C and the minimum is 22 - 24° C. Minimum temperatures are measured from October to January while maximum temperatures are reached from July to August. Relative humidity is c. 85 % every year (West Kutai BPS, 2007).

Climate condition map (rain intensity) of Metau forest shows that this area is relatively wet with a high rain intensity. See picture 2 below.

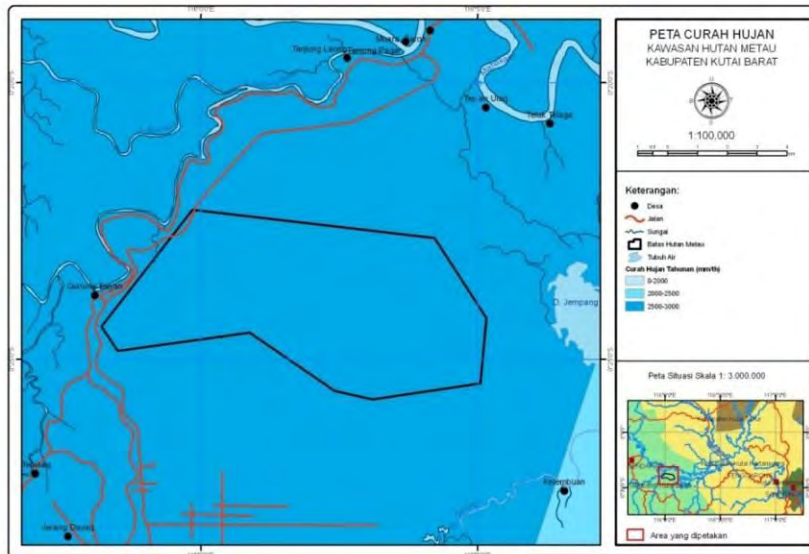


Figure 2. Rain Intensity Map of Metau Forest Area

A.4. Topographic Condition

Topography is a physical configuration of earth surface (land shape) which is showed by shape and density of similar height levels (contour). Topography is closely related to surface relief aspects, height levels, slope angle and land shape (Sarief, 1986).

Metau Forest Area is dominated by flat slope class (0 – 3 %) based on slope class map analysis of Metau Forest Area Scale 1 : 100.000. Below is a table of slope class distribution at Metau Forest Area.

Table 1. Slope Classes found in Metau Forest Area

No	Slope (%)	Description	Size (Ha)	Percentage (%)
1.	0 - 3	Flat	4.404,56	82,67
2.	3 - 8	Slightly slope	765,08	14,36
3.	8 - 15	Slightly steep	137,7	2,58
	Total		5.327,40	100

Generally, the topography of Metau forest area is flat because most area consists of swamps, whereas the borders of the forest area represents a hilly area with 3 – 8% slope, and several spots have 8 – 15% slope with an elongated shape and act as boundary between the swamp forest area and the dry-land forest area. The hilly area, which is bordering the wet swamp forest and dry-land forest makes the Metau forest area a suitable breeding habitat for some bird species, especially the Lesser adjutant (*Leptoptilos javanicus*). Below is the topography map of Metau forest area.

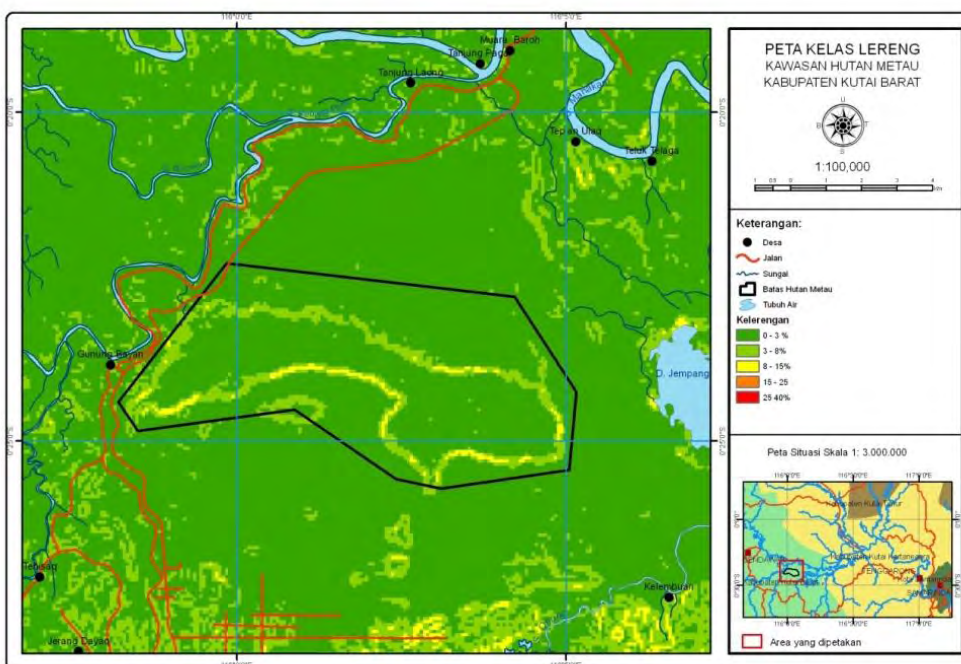


Figure 3. Map of Metau Area Slope Class

A.5. Soil Type

Soil type map of Metau forest area shows that Metau Forest has various soil types e.g. gleisol, kambisol, organosol and podsolik. Below is table of soil type and area size.

Table 2. Type and Size of Soil Types in Metau Forest Area

No.	Soil Type	Size (Ha)	Percentage (%)
1.	Podsolik	672,4	12,62
2.	Gleisol	95,1	1,78
3.	Organosol	4.559,9	85,59
	Total	5.327,4	100

The table above shows that Metau forest area is dominated by organosol soil type, which covers c. 4,559.9 ha (85.59%) of the area and the smallest part, c. 95.1 ha (1.78%), is covered by gleisol soil type. Organosol soil type which is derived from swamp forest organic materials, has a characteristic color of brown to black, a texture of clay dust, no structure, consistency between non sticky to slightly sticky, and low nutrient. This soil was formed from the decomposition process of swamp plants remnants and is not suitable for agriculture or plantation use because of the high pH.

Podsolik soil belongs to the Entisol group and is derived from quartz sand stone, distributed in wet climate areas without dry months and with a rain intensity of more than 2,500 mm/year. The texture is clay to sandy, fertility is low to medium and the color is red and dry. The soil has been gone through a process of bleaching and has an agritic horizon. Its characteristics are acid, with alkaline saturation dan low putrefied mineral.

Gleisol and kambisol soil are often used in agriculture as well as non-agriculture. Gleisol's development is more influenced by local factors i.e topography. Gleisol is almost always inundated. General characteristics e.g. medium soil solum, color gray to yellowish, texture loam to clay, structure muddy to masive, consistency sticky, acid, has organic material. Whereas special characteristic amongst others are the pale gray continuous-glei layer at less than 0.5 m depth as a result of water saturated soil profile. Soil type distribution at Metau Forest area are shown in the map below.

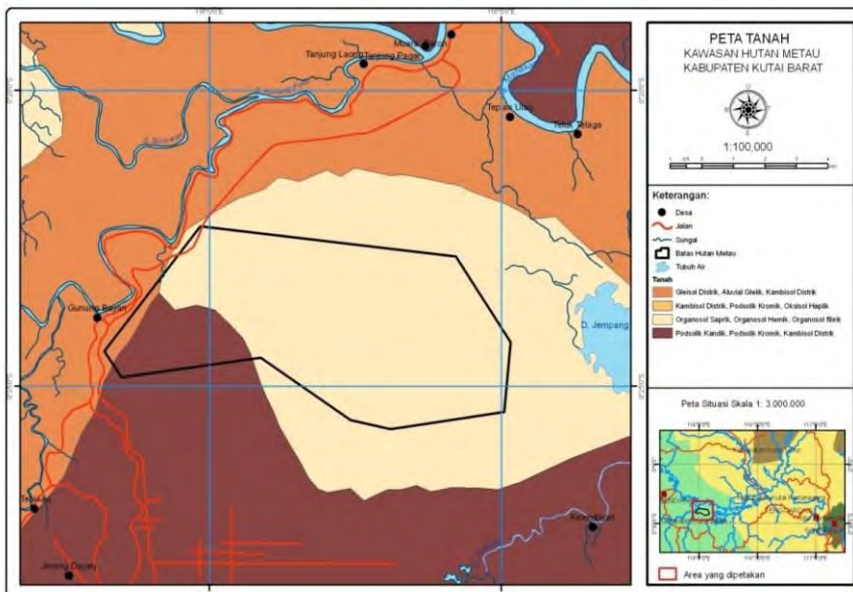


Figure 4. Soil Map of Metau Forest Area

A.6. Land Coverage Condition

Land coverage condition, especially vegetation, at any particular area has an important role as wildlife habitat. Wildlife uses vegetation as a shelter and a place to nest, feed, rest and lay eggs. Various land coverage types at Metau Forest provide habitat for various wildlife as well.

Based on field observations, land coverage condition at Metau Forest consists of swamp forest, lowland and highland forest. Ongoing encroachment, especially at outside or at the borders of Metau Forest, are decreasing the area size. Along with illegal logging and land conversion into dry-agricultural fields, coalmining concessions, and palm-oil plantations, these activities contribute to degradation of Metau Forest biodiversity.

Most of Metau Forest area is wildlife habitat and many bird species (such as Stork, Eagle, Tern) were found in the swamp areas and they use the swamp shrubs as a place to nest, feed, rest and lay eggs. While mammals, reptiles (long-tailed macaque, snake), and other bird species were found at primary swamp forest area.

Based on land coverage map of Metau Forest area scale 1 : 100,000, land coverage at Metau Forest area can be grouped in 3 community types i.e. primary swamp forest, swamp shrub, and swamp. Below is table of land coverage size at Metau Forest area in detail.

Table 3. Land Coverage at Metau Forest Area

No.	Land Coverage Type	Size (Ha)	Percentage (%)
1.	Swamp Shrub	2.122,40	39,83
2.	Primary Swamp Forest	2.530,40	47,49
3.	Swamp	674,60	12,66
	Total	5.327,40	100,00

As seen in table upon, land coverage of Metau forest area is dominated by primary swamp forest, which covers 2,530.40 ha or 47.49% of total land coverage size. This means that Metau forest area still have virgin primary swamp forest and quite a high biodiversity also. Hence, conservation of Metau forest area must become our priority in order to preserve and protect the biodiversity within, so that the local community can also benefit from the area providing for basic necessities of their livelihoods without excessive exploitation of Metau forest's flora and fauna.

A.7. Village Socio-Economics

Villages in the surrounding area of Metau Forest comprise Tanjung Isuy, Muara Ohong, Tanjung Jone, Perigiq, Mancong and Muara Pahu. Community livelihoods are various e.g. farmer, fisherman, trader and employee at palm-oil plantation companies or coal mines. Their economic condition also varies from low, medium, to high. The low economic level includes work as farmer and fisherman. Farmers are clearing land for farming, while fishermen are fishing in river, lake or swamp around Metau forest.

Table. 4. Total Village Population in the Surrounding Area of Metau Forest

No	Village	Size (ha)	Male	Female	Total
1.	Tanjung Isuy	9.546	1.132	1.088	2.220
2.	Tanjung Jan	5.135	334	290	624
3.	Tanjung Jone	7.505	443	443	886
4.	Mancong	6.452	223	210	433
5.	Perigiq	5.859	197	198	395
6.	Muara Ohong	7.044	416	370	786
8.	Tanjung Laong	9.835	925	819	1.744
9.	Muara Baroh	776	330	294	624
10	Tepian Ulaq	13.304	167	161	328
11	Gunung Bayan	6.629	492	481	973
12.	Pulau Lanting	5.596	479	466	945
	Jumlah	66.069	5.138	4.820	9.958

Source : Population, Civil Record and Programmed Family Department West Kutai District (2008).

Metau forest area is adjacent to Jempang Lake, which has quite rich fish resources, so most local communities make a living as fishermen i.e. at Pulau Lanting, Tanjung Jan, Tanjung Isuy, Tanjung Jone and Muara Ohong village. Farming activity has a direct influence on the lake and Metau forest because it takes place at the upper Ohong River, especially in villages with denser populations e.g. Mancong and Perigiq. Most of the farming activities are shifting-cultivations and although some people work on rubber plantations, they still do dry-agriculturing sometimes. Most people from several villages of other subdistrict were also fishing in Jempang lake and clearing land for dry-agriculture e.g. from Tanjung Laong, Muara Baroh, Tepian Ulaq and Gunung Bayan village.

Religion harmony and relationships of inter-cultural ethnic groups or between natives and newcomers show a quite good social community life. There are several cultural ethnic groups that live in the surrounding area of Metau forest e.g. Kutai, Dayak, Java, Banjarese and Bugis. Despite the differences, the community lives in harmony with sense of respect and value for each other. On the other hand, newcomers also respect and value all native's (Dayak) custom ceremonies.

B. Hydrological and Ecological Function

Metau Forest plays an important role as a filter for water that enters Jempang Lake in the rainy season and drains into the Mahakam in the dry season. Metau Forest is dominated by swamp forest and peat swamp vegetation, which has acid characteristic so it can neutralize the alkaline level of water from Ohong and Baroh Rivers. Besides that, Metau Forest is also a rainwater Catchment Area and contributes to ground water infiltration so that the surrounding villages can drill the ground water to suffice their drinking water. In the dry season, Metau Forest releases trapped water in the surrounding swamp forest to preserve the total water stability of Jempang Lake.

In addition to water regulator, Metau forest also provides a habitat for wildlife such as birds, reptiles, primates, and other mammals. This forest provides enough food for fishing birds, birds of prey (eagle,

falcon) and reptiles (monitor lizard, crocodile, etc). The swamp areas of Metau are also a spawning ground for fishes in Jempang Lake; so in the spawning season, the forest will be full of piscivore birds and other fish predator. From field observations, we found nests of Lesser adjutant, eagle and monitor lizard and these give evidence on the important role of the forest for wildlife's needs.

C. Historic Condition of Metau Forest

C.1. The origin of the name "Metau Forest"

Metau forest has already existed for a long time and has still quite a high biodiversity until now. Most people believe that Metau Forest still has mystical or eerie values. Hence, the local community only uses the border or outer area of the forest for dry-agricultural fields. They are afraid of clearing land for dry-agriculture within the forest. Metau Forest is also a quite, vast swamp forest, although there are lowland forests and hills too.

The name of Metau Forest comes from a local name that means "vast swamp forest, which has big trees and various wildlife". The remote location and eerie impression makes most part of Metau a virgin forest. This can be seen at the land coverage map, which shows that most of Metau forest is primary swamp forest, which covers 2,530.40 ha in size.

C.2. Biodiversity Richness

Metau forest still has quite a high biodiversity of both flora and fauna. Metau forest is a both a swamp and lowland forest so its tree vegetations are dominated by the most common species in East Kalimantan such as *Cococeras sumatrana*, *Alstonia pneumatophora*, *Ficus retusa*, *Barringtonia spicata* and *Ixora sp.* Other species are *Crudia reticulata*, *Mangifera geddebe*, *Dillenia excelsa*, *Scolopia rinanthera*, *Shorea balangeran*, *Shorea macrophylla*, *Shorea Palembangica*, *Shorea seminis*, *Shorea sumatrana*, *Dipterocarpus tempehes*, *Dipterocarpus eleongatus*, *Hopea nutans*, *Hopea rudiformis*, and *Shorea scabrida* (Endert in Iwatsuki *et al.*, 1980).

There are many wildlife species, e.g. Long-tailed macaque, Lesser adjutant, Brahminy Kite, Crocodile, Deer, Bearded Pig, Changeable Hawk-Eagle, Proboscis monkey, Snake, Tern, Javan Pond-Heron, Intermediate Egret, Little Egret, Common/Greater Coucal, Sooty-Headed Bulbul, Pied Fantail, Treeshrew, Grey-Headed Eagle, Crested Serpent-Eagle, various fish species, etc.

C.3. The Importance of Metau Forest Conservation

According to the local community, the size of Metau Forest has significantly decreases compared to its size before land was converted into palm-oil plantations, dry-agricultural fields, coalmining concessions, and illegal logging. Metau Forest is a habitat for various wildlife. If the land conversions will continue in a similar excessive and irresponsible manner, this will lead to population declines and even extinction of rare flora and fauna species. Other consequence is the prolonged erosion and flood because there is no longer tree vegetation as water reservoir. In addition, during the dry season, less groundwater will be retained and flow to the lower situated peat swamp forest, with the risk of drying out and becoming easily susceptible to forest fires.

Hence, conservation of Metau forest is important to preserve the survival of all living creatures i.e. human, vegetation, and wildlife that live within or in the surrounding area of Metau forest. Metau forest conservation will prevent and decrease the forest degradation that can influence the lives of local

community, vegetation and wildlife. Protection of the area involves the establishment of a clear conservation boundary and strict law enforcement to ban illegal loggers and poachers.

Thus the biodiversity will stay preserved, protected and maintained, especially Kalimantan’s rare or endemic species. In addition, the negative impacts of forest degradation can be avoided such as erosion, flood and river/lake pollution, which water is used by the local community for bath, wash, cooking and drinking.

D. Biodiversity Surveys

D.1. Field Physiography

Based on our field surveys, Metau Forest comprises inundated swamp forest, swamp, lowland forest and upland forest. Some of Metau Forest areas have been converted into palm-oil plantations with small canals or ditches along the land boundary.

There were many dry and dead trees (Kahoi) at the swamp area, as if they were burned, whereas no fire accident has ever happened in that area according to the local community. This case occurred after land clearing for palm-oil plantations. The trees died because they were submerged in flooded water, which was polluted by weed killer pesticides from the land clearing. There also many fish-traps (bubu), which were set up by the local community along the Metau forest border. And some evidences of illegal logging activity such as stacks of cut-trees or wood (lampang species) at the Metau forest border and indistinct chainsaw sound from within Metau forest when we conducted the research.

D.2. Vegetation

We conducted the research at Metau forest area by measuring tree level commercial vegetation in a 100 x 100 (1 Ha) plot. Total tree level vegetation in the plot was 166 individuals. Commercial species that were found included *Shorea balangeran*, *Alstonia pneumatophora*, *Barringtonia spicata* and *Cococeras sumatrana*. The most abundant species at pole level was *Alstonia pneumatophora* and the most abundant species at tree level was *Barringtonia spicata* (Table 5).

Table 5. Metau Forest Vegetation Species

No.	Tree Species	Total Individuals Counted
1.	<i>Barringtonia spicata</i>	64
2.	<i>Alstonia pneumatophora</i>	80
3.	<i>Shorea balangeran</i>	24
4.	<i>Cococeras sumatrana</i>	16
	Total	166



Metau Swamp Forest vegetation type

D.3. Wildlife

Wildlife species of Metau Forest, which were found at field observation, e.g. :

Table 6. Wildlife Species, which were found at Metau Forest

No	Wildlife species	Jumlah
1	Lesser adjutant (<i>Leptoptilos javanicus</i>)	38
2	Javan Pond-Heron (<i>Ardeola speciosa</i>)	26
3	Great Egret (<i>Egretta alba</i>)	27
4	Intermediate Egret (<i>Egretta intermedia</i>)	25
5	Little Egret (<i>Egretta garzetta</i>)	29
6	Brahminy Kite (<i>Haliastur Indus</i>)	7
7	Changeable Hawk-Eagle (<i>Spizaetus cirrhatus</i>)	2
8	Grey-Headed Eagle (<i>Ichthyophaga ichthyaeus</i>)	1
9	Black Eagle (<i>Ictinaetus malayensis</i>)	2
10	White-Bellied Fish-Eagle (<i>Haliaeetus leucogaster</i>)	1
11	Rufous-winged Buzzard (<i>Butastur liventer</i>)	1
12	Black-Naped Tern (<i>Sterna sumatrana</i>)	30
13	Common/Greater Coucal (<i>Centropus sinensis</i>)	4
14	Sooty-Headed Bulbul (<i>Pycnonotus aurigaster</i>)	2
15	Long-Tailed Macaque (<i>Macaca fascicularis</i>)	11
16	Proboscis Monkey (<i>Nasalis larvatus</i>)	35
17	Treeshrews (<i>Tupaiaidae sp</i>)	3
18	Pied Fantail (<i>Rhipidura javanica</i>)	2
19	Banded Krait (<i>Bungarus fasciatus</i>)	2

Table 6 shows that most wildlife encountered included various bird species. The reason is that Metau Forest is a swamp forest, which provides various fish species as food resources for the birds and the fishes feed from underwater tree roots. In total 38 Lesser adjutants (*Leptoptilos javanicus*) were recorded and were the most abundant species, which is due to the fact that Metau forest is both their feeding ground as well as a habitat to nest and rest.

Species Abundance (Pi) and Domination (Di)

Species abundance and domination value is used to fix or decide abundant and dominant fauna species at Metau forest. The detail is shown in Table 7 below.

Table 7. Wildlife Species Which Were Found at Metau Forest

No	Wildlife Species	Total	Pi	Di (%)
1	<i>Leptoptilos javanicus</i>	38	0,153	15,3
17	<i>Nasalis larvatus</i>	35	0,141	14,1
12	<i>Sterna sumatrana</i>	30	0,121	12,1
5	<i>Egretta garzetta</i>	29	0,117	11,7
3	<i>Egretta alba</i>	27	0,109	10,9
2	<i>Ardeola speciosa</i>	26	0,105	10,5
4	<i>Egretta intermedia</i>	25	0,101	10,1
16	<i>Macaca fascicularis</i>	11	0,044	4,4
6	<i>Haliastur Indus</i>	7	0,028	2,8
13	<i>Centropus sinensis</i>	4	0,016	1,6
7	<i>Spizaetus cirrhatus</i>	2	0,008	0,8
9	<i>Ictinaetus malayensis</i>	2	0,008	0,8
14	<i>Pycnonotus aurigaster</i>	2	0,008	0,8
15	<i>Rhipidura javanica</i>	2	0,008	0,8
18	<i>Tupaiidae sp</i>	2	0,008	0,8
19	<i>Bungarus fasciatus</i>	2	0,008	0,8
8	<i>Ichthyophaga ichthyaetus</i>	1	0,004	0,4
10	<i>Haliaeetus leucogaster</i>	1	0,004	0,4
11	<i>Butastur liventer</i>	1	0,004	0,4
	Jumlah	247		

Table 7 shows that the Lesser adjutant has the highest abundance value compared to other bird species. *Leptoptilos javanicus*, *Ardeola speciosa*, *Egretta alba*, *Egretta intermedia*, *Egretta garzetta*, *Sterna sumatrana* and *Nasalis larvatus* are dominant species with domination value (Di) > 5%; *Haliastur indus* and *Macaca fascicularis* are sub dominant species with domination value (Di) between 2 – 5%; while *Spizaetus cirrhatus*, *Ichthyophaga ichthyaetus*, *Ictinaetus malayensis*, *Haliaeetus leucogaster*,

Butastur liventer, *Centropus sinensis*, *Pycnonotus aurigaster*, *Rhipidura javanica*, *Tupaiidae sp* and *Bungarus fasciatus* are non dominant species with domination value (Di) between 0 – 2%.

Dominant and sub dominant values of bird species show that these species still have an abundant population and are often found in Metau forest, yet the population can easily decrease as a result of land clearing. Whereas non-dominant species have a low population because they belong to rare or critically endangered species and are scarcely found around Metau forest.



Species Diversity

From direct observation during research, we found 19 different wildlife species e.g. 15 bird species, 3 mammal species, and 1 reptile species (Table 7).

The most common wildlife species was birds, of which many species were found and groups at open swamp areas and swamp shrubs. They depend on different types of food i.e. insectivores, carnivores, fruit-eaters, seed-eaters dan omnivores. Mammal and reptile species were mostly found in primary swamp forest while resting, taking shelter and feeding on tree canopies, especially fruit trees.

Many species were found in primary swamp forest because there were still big trees that could accommodate different habitat types as places to take shelter, rest, nest, feed and breed.

We also found bird species in open swamp forest areas and swamp shrubs from field observation. This is because the birds prey on fish and small animals that live in the water or on waterplants e.g. storks, egrets, eagles and Javan Pond-Heron. They breed and build nests in this area.

Based on our field observations, the wildlife species diversity value (H) is 2.34. From this species diversity value, we can tell that environmental factors have a quite significant influence on living organisms. Environmental factors both support and threaten habitats (vegetation) or wildlife populations. Supporting factors are factors that influence vegetation growth and providing wildlife habitat such as light intensity, soil acidity, topography, climate etc., while threats to the habitat and populations are illegal logging, poaching, land clearing, water pollution etc.

Lesser adjutant Population

During the research, we found 38 Lesser adjutant individuals in the swamp forest area at the boundary zones of the lowland forest and most involved juveniles. Lesser adjutants only nest and rest on dry-high trees at the swamp forest and lowland forest areas.

Threats to the lesser adjutant Population

Direct threats to the lesser adjutant population in Metau Forest are land conversion (plantations, agricultures and coal mines), illegal logging and capture by community. Based on preliminary questionnaire, we know that people caught lesser adjutants to be sold for meat and as pet. People sold these birds because their meat can be consumed and taste like commonly consumed meats. While some became pets to guard fish-cages from fish burglars, because most of the local community are fishermen and have fish-cages.

Indirect threat to the lesser adjutant population is environmental pollution as a result of coalmining concessions and palm-oil plantations, which are polluting the water and killing fish as lesser adjutant's food resource.

Analysis of suitable habitat for the lesser adjutant

In order to decide whether Metau Forest is suitable as lesser adjutant habitat, we need to know several things i.e. vegetation significant value index, total population and human threats.

The highest significant value index is 93.99% based on the study result. Although the most common species encountered during the research was lesser adjutant, according to the community at the surrounding Metau forest area and especially fisherman, this species is decreasing and rarely found in the forest or flying over the lake. Additionally, threats to lesser adjutants and other species are increasing because of land clearing by local communities, coalmining concessions, palm-oil plantations, illegal logging and poaching.

Based on field observations, lesser adjutants were nesting on top of large and tall trees, mostly Kahoi tree (*Shorea balangeran*). The research results show that Metau forest is an important habitat, a place to nest/take a shelter, lay eggs, feed and breed for lesser adjutants and other species (Table 9). For those reasons, Metau Forest is suitable habitat and must be protected or established as a conservation area.

D.4. Vegetation and Wildlife

The connection between vegetation and wildlife is very close and they influence each other because they are one forest ecosystem unity. Metau Forest comprises flora, which are dominated by trees, is a habitat for most of wildlife in that area. They feed, lay eggs, breed, rest, take shelter and nest in this forest.

Vegetation density cover and diversity can influence the total wildlife population. If the total vegetation is decreasing then the total wildlife population will also decrease because of habitat loss as a place to feed, lay eggs, breed, and take shelter or nest. On the contrary, if vegetation increases, well preserved and maintained, then the wildlife population will also increase. Like the lesser adjutant, which uses large trees such as Kahoi tree species (*Shorea balangeran*) as nesting place.

D.5. Disturbances toward Vegetation and Wildlife

Disturbances toward Metau Forest vegetation and wildlife consist of land clearing or land conversion into palm-oil plantations, coalmines, dry-agricultural fields. Not to mention poaching and illegal logging. Field observation showed traces of logged trees and land clearing for palm-oil plantations and dry-

agricultural fields and also illegal logging. Land clearing has already been observed along the forest boundaries, and there were river/swamp canals that were used for palm-oil planting.

If these activities continue without any control in the form of law enforcement or protected area establishment, then the existence of vegetation and wildlife will be threatened. The impact will destroy the forest and causing flood and erosion. A damaged forest will give bad influence to biodiversity, vegetation and wildlife will be lost or extinct.



Damages in the Surrounding Area of Metau Forest

E. Social Economic Assessment Survey

E.1. Palm-oil plantations and coalmining threats

Based on our field study, we identified several threats towards the vegetation and wildlife within Metau Forest. For those reasons, conservation efforts for this area need to be done, by bordering or protecting the area from palm-oil plantations, dry-agricultural fields, coalminings, which have to obey prevailing district regulations. In order to preserve water and soil, palm-oil companies are urged to use non-dangerous and unexcessive organic fertilizer and pesticides so that it will not pollute the river or lake.

River and lake pollution will harm local community because they use the water for bathing, washing, and the water is even consumed for drinking and cooking. Fish resources are decreasing due to lack of oxygen because of increased sedimentation and due to the increasingly accumulating hazardous compounds, which also causes direct fish kills in the area. As a result the fishermen cannot obtain any income and food. Piscivore birds will also suffer from the negative impacts; they are losing their food resources. Coalmine wastes are also polluting rivers and lakes, whereas the coalmining activities itself is destroying the forest together with illegal logging. The loggers should be punished according to prevailing law.

E.2. Dry-agriculturing/farming activity

Most of the communities that live in the surrounding area of Metau Forest work as farmers. They use Metau Forest as dry-agricultural or farm land. Continuous land clearing for dry-agriculturing activity will finally destroy Metau Forest.

Information about distinct conservation boundaries must be socialized to local community so there will be no case of excessive land clearing. Undistinct area boundaries makes people feel free to trespass and

clear any parts of Metau Forest without paying attention to negative impacts that might happen in the future.

E.3. Poaching

Metau Forest still has quite a high biodiversity, both flora and fauna. Poaching is one of the activities that will decrease or even destroy all wildlife species including the rare ones. Poaching is a real threat to Metau Forest wildlife. People poach because there is no hunting ban in that area and a lack of awareness on protected species status.

Conservation effort is needed to protect rare species from extinction and poachers in the protected forest area have to be punished according to prevailing laws.

E.4. Illegal logging

People clear land at Metau Forest by logging the area in an irresponsible and illegal manner. They took or cut trees illegally for sale or as house materials. Illegal logging will extremely destroy the forest because if the trees were cut in an unappropriate way, the shoots at the surrounding trees will also be damaged. In addition, excessive illegal logging will lead to flood and erosion because there are no longer large trees as water reservoir and the soil will also become barren and infertile.

Conservation effort is needed to prevent illegal logging activities at Metau forest by law enforcement for all kind of illegal loggers, individuals, groups, or companies.



Illegal logger's abandoned cabin



Illegal logs, which were taken from Metau

E.5. Fishery Activity

People at the surrounding area of Metau Forest depend for a great deal on the forest sustainability, and almost 90% of inhabitants from Muara Ohong, Tanjung Jone, Muara Pahu, and Serang village enter Metau Forest area every day in the rainy season to set up fish-traps such as Bubu, Jala rengge, hampang etc. Yet recently sufficient yield has becoming increasingly difficult. They complained on thriving weeds, which blocked their boats. Besides, they felt that the swamp and river area around Metau has become more shallow thus fishing time in a year has also become more limited and can only be done when the swamp area is really flooded. This condition is portrayed in the pictures below.



People's fish catch



Shallowing swamp of weeds

E.6. Community protection

Metau forest is adjacent to Jempang Lake and situated downstream, while the palm-oil plantations and coalmining concessions are situated upstream. The local community is aware of the important reason to protect this forest so the area can support all of their livelihoods aspects, especially in farming/dry-agriculturing activities or as a place to live. Hence, they try to prevent this area from becoming a palm-oil plantation area or coalmining concession.

Community protection can be done by avoiding excessive land clearing, illegal logging, and poaching of rare species. In addition, we hope that the heads of villages and local government will refrain from giving permits easily to coalmining concessions or palm-oil companies without any ecological and environmental analysis.

ACTIVITY RECOMMENDATION

A. Community Level

Communities that live in the surrounding area of Metau Forest basically understand the important meaning of this forest because they entirely depend on the situation and condition of Metau Forest because most of them are fishermen who live from fishing instead of having fish-cages. However, community awareness of Metau biodiversity status has to be upgraded, because they often hunt protected wildlife such as lesser adjutants, eagles, deers, monitor lizards, porcupines etc. Therefore, we propose that future activities that need to be conducted include environmental education and campaign of wildlife protection laws including protected flora species.

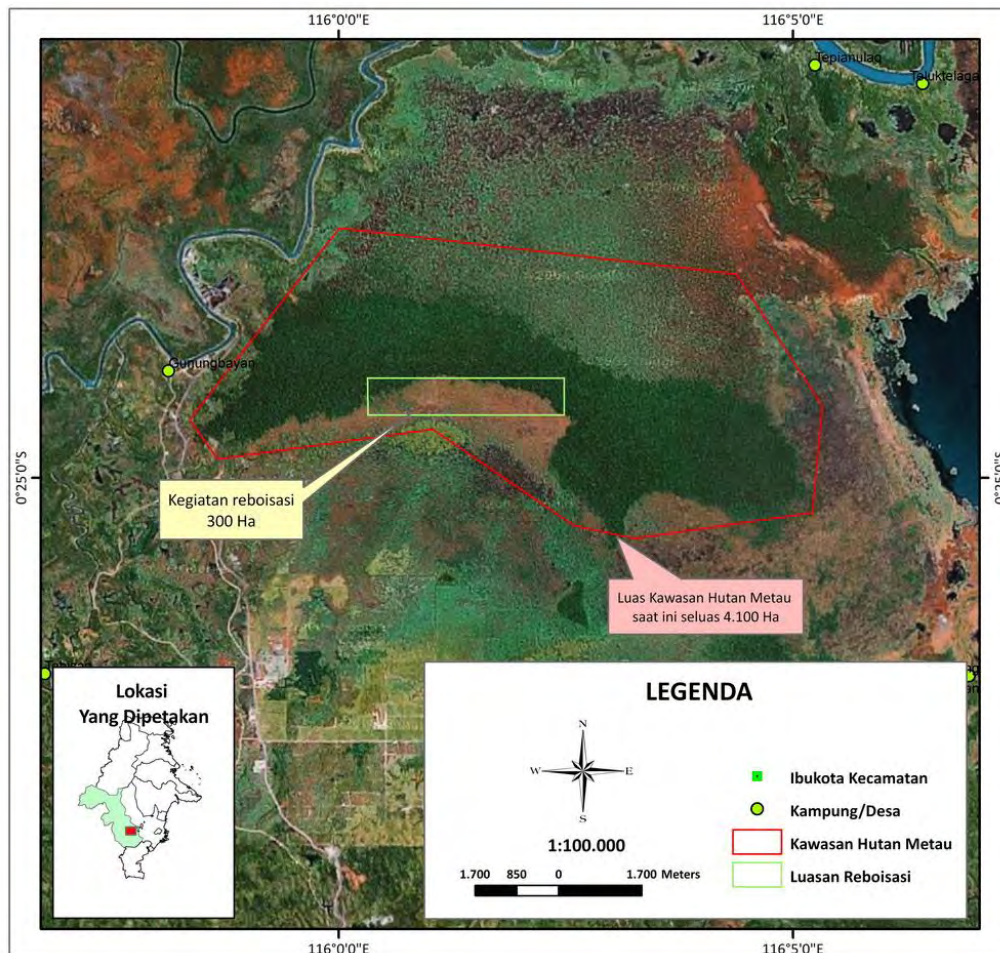
B. Government Level

Metau forest should be officially established as protected forest (4,100 ha) by the District and Province Authorities so that there will be no further land conversion into palm-oil plantations or coalmining concessions, because clearly the impact are causing damage to the ecosystem and forest function as water regulator of Jempang Lake. Local communities, especially at Muara

Ohong, Perigig, Serang Village depend for a great deal on Metau Forest sustainability. In addition to obtaining a protected status the government should also apply active law-enforcement and establish a patrolling system.

In addition, we recommend that an area of 300 ha (figure 5) should be restored to maintain its ecological/ hydrological function and prevent impacts to the surrounding environment such as erosion and forest fires.

Figure 5. Area, which is recommended to become protected forest (4.100 ha) and area that is recommended for restoration (300 ha).



REFERENCES

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