

# THE ENVIRONMENTAL, ECONOMIC AND SOCIAL CONDITION OF THE PHOU KHAO KHOUAY NATIONAL PROTECTED AREA'S GREEN PEAFOWL SPECIES CONSERVATION ZONE

Research Report No. 6

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## Abstract

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This Research Report presents baseline information for the development of a Payments for Environmental Services scheme based on the situation of the Green Peafowl Protection Zone within the Phou Khao Khouay National Protected Area in central Lao PDR. It identifies threats to wildlife arising from current management practices and suggests possible management actions to achieve improvements in the protection of the Green Peafowl.

*Keywords: resource use, wildlife management, habitat protection, biodiversity conservation practices, payments for environmental services*

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## 1. Introduction

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This Research Report aims to provide baseline information for the development of a Payment for Environmental Services (PES) scheme applicable to the protection of the Green Peafowl (*Pavo muticus*) within the Phou Khao Khouay National Protected Area (PKK NPA) in central Lao PDR. It identifies the impacts of current resource uses on the environment with a particular focus on land use. It also examines the management practices being undertaken in the NPA in general, and in the Green Peafowl Zone in particular.

The report outlines the biophysical environment of the PKK NPA and the socio-economic characteristics of the relevant population with an emphasis on the area being considered to be the focus of a PES scheme. It provides information on the area's resource uses in terms of land, water and forest resources, their current status and trends, threats to the environment (especially the Green Peafowl population), as well as the socio-economic characteristics of the nearby population including population size, land use systems, livelihood sources, and educational levels. The report also examines ongoing environmental management actions and suggests possible management actions to achieve improvements in the protection of the Green Peafowl, including anti-poaching patrolling.

## 2. Overview

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The PKK NPA, declared by the Prime Minister's decree No. 164/PM (1993), is situated about 45 km to the northeast of Vientiane Capital city (DFRC *et al.*, 2010). It is the NPA that is closest to the nation's capital. Administratively, the NPA is included in four provinces: Vientiane Capital, Vientiane, Bolikhamxay, and the recently established Xaysomboon Province, with a total surface area of 2,000 sq. km (Figure 1).

The NPA contains three major river systems (Nam Yong, Nam Leuk and Nam Mang) and numerous streams which drain in the north-south and easterly directions from the

NPA. The Nam Yong, a tributary of the Nam Leuk, drains from the western part of the NPA. The Nam Leuk flows from the center of the NPA to the southeast, where it joins the Nam Mang, which eventually flows into the Mekong River. The Nam Thouay, delineates the NPA's eastern boundary, and flows directly into the Mekong.

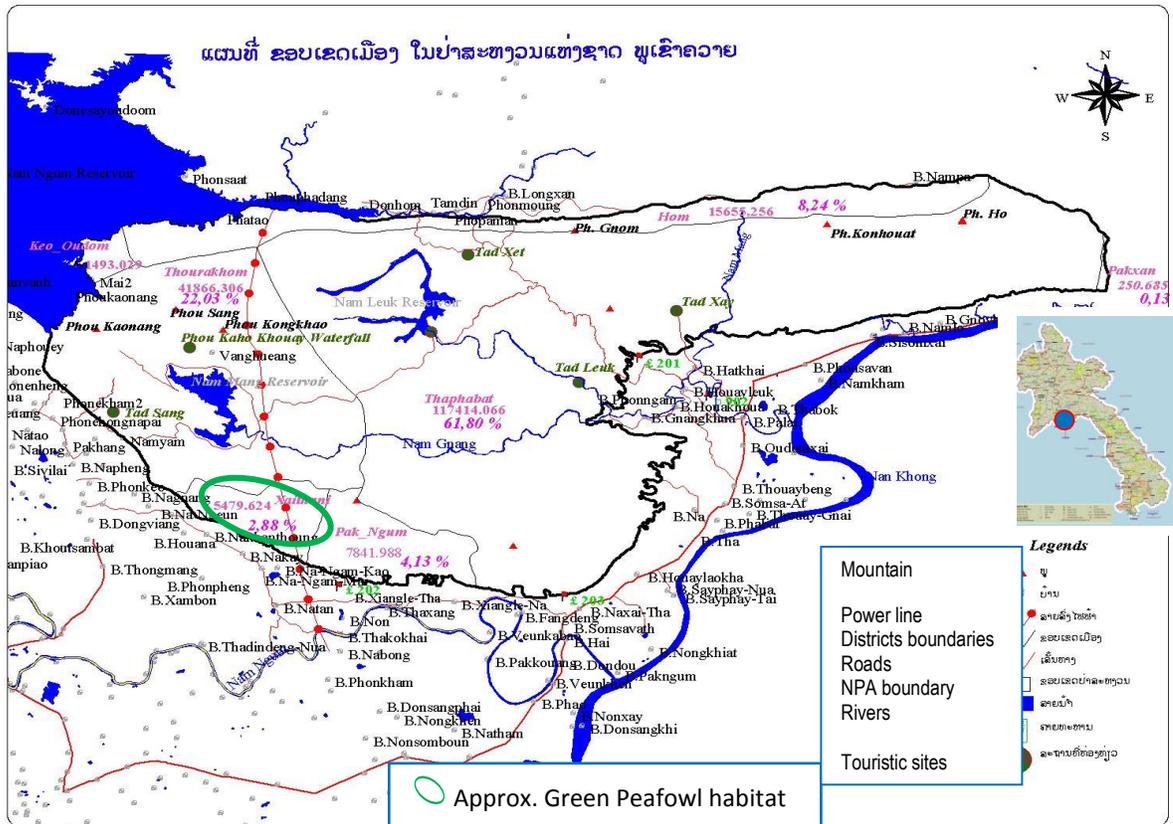
The PKK NPA is rich in natural resources. It provides a variety of environmental services (ES) such as wildlife habitat, recreational opportunities and landscape beauty. The forest habitat is home to a range of large animals including elephants, bears, gibbons and langurs, as well as various reptiles, amphibians and birds (DFRC, *et al.*, 2010). The PKK NPA harbours a population of the Green Peafowl (*Pavo muticus*), a bird believed to be close to extinction in Laos<sup>1</sup>. The bird is classified as Globally Threatened-Vulnerable and At Risk in Lao PDR (Duckworth, *et al.*, 1999). It is listed as a Category I protected species of Lao PDR (Resolution No. 81/PM, 2008). The PKK NPA is one of five NPAs where the Green Peafowl occurs in Lao PDR (Duckworth, *et al.*, 1999). Its protection is of national significance given its status.

There are three hydropower dams operating in and around the PKK NPA: the Nam Ngum 1 dam (150 MW, the first major hydropower project built in Lao PDR), the Nam Leuk dam (60 MW), and the Nam Mang 3 dam (60MW). The reservoir of the Nam Ngum 1 dam is located along the western boundary outside of the NPA. The reservoirs of the Nam Leuk dam (1,280 ha) and of the more recently built Nam Mang 3 dam (952 ha) are located entirely within the NPA. A new hydropower dam project, Nam Mang 1 ( 60 MW) is currently under construction (Keo-Athone, *pers. comm.*, 2014). A high voltage transmission line from the recently built Nam Ngum 2 hydropower project traverses the PKK NPA's western portion for 32 km (PA Management Unit, 2012-draft). An unsealed road that passes through the PKK NPA from an enclave village in its western section has been upgraded. It is linked to a sealed road that provides transport access to Xaysomboun Province and bisects the NPA.

Figure 1: Map showing the boundaries of PKK NPA

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<sup>1</sup> <http://www.tuanlinhtravel.com/Vietnam/newsdetail/3263/Phou-Khao-Khouay---The-National-Protected-Area.htm>



Source: DFRC, DoF (English legend added). Embedded location map of Laos - Lao National Tourism Administration.

Note: The provincial and district boundaries encompassing the NPA may be outdated and are not necessarily accurate.

Finally, on the western boundary of the PKK NPA along the bank of the Nam Ngum 1 hydropower reservoir is the foreign-owned Nam Ngum Tourism Resort occupying an area of 14,800 ha. Part of the concession area for the resort falls within the PKK NPA (DFRC, *et al.*, 2010).

## Topography

The PKK NPA encompasses a variety of landscapes and habitats, ranging from sheer sandstone cliffs and pristine river gorges to rough mountainous terrain<sup>2</sup>. The PKK NPA western boundary is established from above the contour line of 200 meters above sea

<sup>2</sup> <http://www.tuanlinhtravel.com/Vietnam/newsdetail/3263/Phou-Khao-Khouay---The-National-Protected-Area.htm>

level (masl) ranging to an elevation of 876 masl (PA Management Unit, 2012-draft) on the plateau. Overall more than 60% of the NPA ranges from 168-1,671 masl (PKK and Phou Phanang Management Office, 2008). The topography also consists of undulating landscape and mountain peaks, the highest of which is the Phou Ho Mountain (1,671 masl), located at the eastern part of the NPA (DFRC, *et al.*, 2010). Other mountain peaks include Phou Kong Khao (1,458 masl), Phou Kon Huat (1,551 masl), Phou Phadang (1,621 masl) and Phou Xang (1,666 masl) (Ibid).

## Climate

The average annual temperature in the PKK NPA is 26.6°C; the average maximum temperature is 31.6°C and the minimum average temperature is 21.5°C. The average annual humidity is 73% (DFRC, *et al.*, 2010).

The PKK NPA is influenced by the monsoon with the rainy season lasting from May to November. The average annual rainfall is 1,936 mm (DFRC *et al.*, 2010; PA Management Unit, 2012-draft).

## Soil

The PKK NPA mainly features tropical red soil types (orthic Acrisol and Lithosols), exhibiting the characteristic of mixed sandy-clay and nutrient deficient soil (MRC, 1997 and Kingston, 1987 cited in DFRC *et al.*, 2010). Fertile soils (dystric Nitosols, Ferratic Cambisols) are found in valleys and along river courses (Salter & Bouaphanh, 1990 cited in DFRC *et al.*, 2010). Scattered open rock shelves are scattered across the PKK NPA.

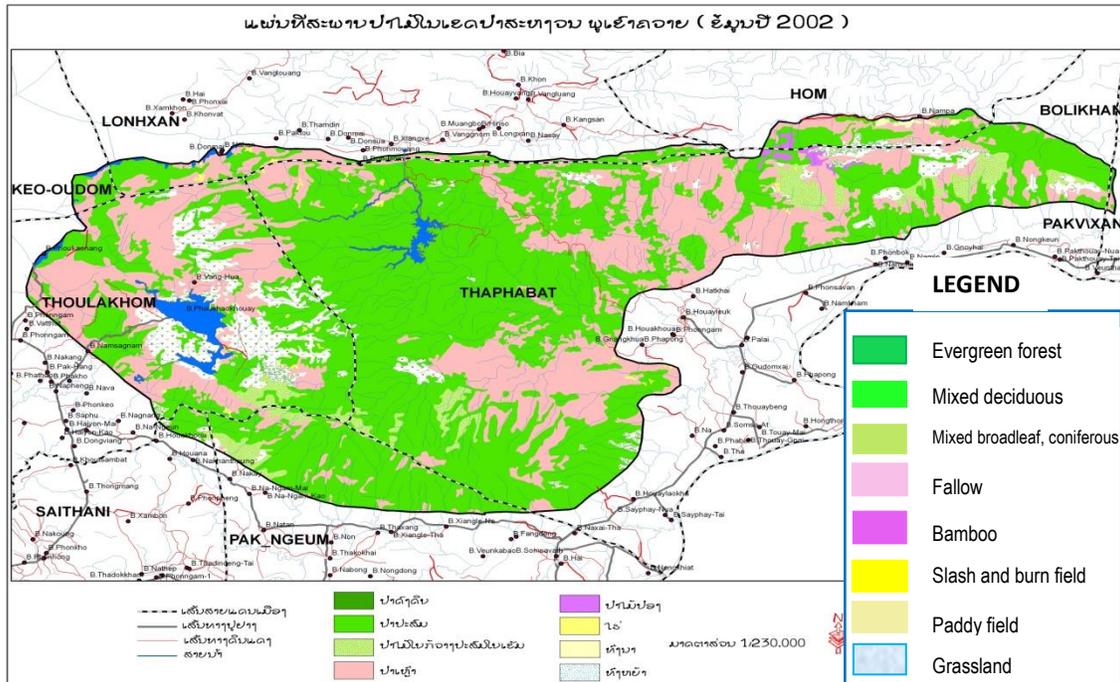
## Vegetation

The forest cover of the PKK NPA is estimated at 74% based on 1992-2002 satellite images (PKK and Phou Phanang NPA Management Office, 2008). The diversity of forest types in the PKK NPA includes evergreen, mixed deciduous, dry dipterocarp and pine. Upper dry evergreen forest occurs predominately in the central part of the reserve and areas downstream of the Nam Leuk and Nam Mang hydropower reservoirs (DFRC *et al.*,

2010). Upper and lower mixed forest, mixed broad leaf and coniferous forest of pine stands and dry upper and lower evergreen forest and regenerating forest occur on nutrient deficient sandy soils in the western part of the reserve (PKK and Phou Phanang NPA Management Office, 2008). Large areas of primary dry evergreen forest are found in the Nam Yong sub-catchment and the Nam Leuk catchment. Mixed pine forest and grassland, bamboo and other types of forest are also present in the western part of the protected area. A variety of orchid species are recorded in the PKK NPA, especially in areas of the Tad Xay waterfall, downstream of Nam Mang River and close to Vang Heua Village (PA Management Unit, 2012-draft).

The area of Green Peafowl habitat consists of open forest with scattered tree stands of rocky savannah, bamboo and shrubs interspersed with open rock shelves. A map of the PKK NPA forest cover types is presented in Figure 2.

Figure 2: Forest Cover Map of PKK NPA (2002 data)



Source: PA Management Unit, Department of Forestry (English legends added).

### 3. Agriculture

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There are 72 villages located within a radius of up to five km from the PKK NPA boundaries. Two of these are located inside the protected area. The main livelihoods of the local residents are paddy cultivation, shifting cultivation and livestock husbandry (DFRC *et al.*, 2010). The villages are largely subsistence-based and depend on direct use of the PKK NPA's forest resources for their livelihoods, especially the collection of Non-Timber Forest Products (NTFP) to supplement their household needs for food and fiber. Fifty seven villages located on the lowland plain surrounding the PKK NPA have been practicing paddy farming as the main livelihood activities (Ibid). Agricultural crops planted include sugarcane, cassava and vegetables that are planted on small plots and in kitchen gardens (DFRC *et al.*, 2010). The topsoils on the plateau inside the NPA are generally shallow, sandy and poor nutrient contents that are not very productive for agriculture. Grazing of cattle, buffaloes and goats on the grasslands is common.

While land rights allocation for the villages surrounding and inside the NPA has been completed, encroachment by some villagers on the protected area land for slash and burn cultivation still occurs due to the shortage of paddy land for permanent farming. Some instances of land clearing for agriculture reaching the PKK NPA boundaries were observed during a field site visit. This reduces the extent of the buffer zone which, as a rule, should be between 100 to 500 meters wide (Forestry Law, 2007).

### 4. Forestry

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There are many valuable tree species occurring in the PKK NPA which are found commonly in the region and Southeast Asia. Generally, these are the *Dipterocarpus* and *Keteleeria* species (possibly *Shorea sp.*). Pine trees (*Pinus merkusii*) occurring on the plateau and mountain range on sandy soil, are found mostly on the western part of the PKK NPA. *Fokienia* species or *Mai Longleng*, which is a high value timber species, also occurs along the northern boundaries and on the western slopes of the mountain. Of note

is the presence of the high value timber species *Mai Kha Nhung* (*Dalbergia cochinchinensis*), a rosewood species, which has attracted illegal harvesting inside the PKK NPA in the recent past. Other valuable hardwood species such as *Mai Tae Kha* (*Azelia xylocarpa*), *Mai Dou* (*Pterocarpus microcarpus*) and *Mai Daeng* (*Xylia kerrii*) have also been illegally logged (DFRC, *et al.*, 2010). The status of abundance and threats from illegal logging of these high value hardwood species are not known with certainty.

## Forest land use

Forest land use in and surrounding the PKK NPA has been practiced by local people for a long time on the basis of official and unofficial land tenure. Land right allocation in the PKK NPA started in 1997 in order to carry out land use planning, including determining controlled use zones where the local people can use for NTFP collection (DFRC, *et al.*, 2010). Prior to the establishment of the PKK NPA in 1993, two-thirds of the area in the east of the PKK NPA had been commercially logged, covering a total area of 135,000 ha (Ibid)<sup>3</sup>.

## Small-scale timber harvesting

It is not uncommon for small-scale timber harvesting for domestic use to take place inside the PKK NPA close to village areas. Such harvesting is the focus of regular patrolling (PKK NPA Management officials, pers. comm., 2014). In addition, a degree of commercial timber harvesting, which is considered illegal, especially of the *Mai Kha Nhung* (*Dalbergia cochinchinensis*), had been widespread in recent years. However, estimates of extraction volumes are not available.

## Harvesting of Non-Timber Forest Products

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<sup>3</sup> An external assessment of the NPA subsequently recommended a one third reduction of the protected area because “the park was so heavily degraded”, although the recommendation was not supported by the Lao Government – ADB Performance Audit Report (2004) at: <http://www.adb.org/sites/default/files/ppar-lao-29163.pdf>

Non-Timber Forest Product (NTFP) collection is part of the subsistence livelihood activities of the local people living in and around the PKK NPA. The main NTFPs collected include bamboo (many species) for construction, bamboo shoot, rattan (*Calamus sp.*), broom grass (used for making brooms), *damar resin*, or *khi si* (used in handicrafts and boat construction) and pine tree oil used as a fuel to start fires (DFRC *et al.*, 2010)<sup>4</sup>.

## Hunting and poaching of forest animals

Hunting wild animals both for sale and for food was prevalent in the past posing a direct threat to wildlife in the PKK NPA. Large animals that were subject to hunting include elephants, tigers and muntjacs. Hunting equipment employed included home-made muzzle loaded guns, modern rifles, snares and traps, as well as dogs. Since 1998, gun confiscations have been carried out in the villages of all six districts located in and around the PKK NPA (DFRC *et al.*, 2010). Opportunistic hunting (of minor wildlife) still occurs.

## 5. Biodiversity

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The PKK NPA harbours many species of mammals, bird, reptiles and amphibians. Among major mammals, past surveys recorded two herds of wild Asian elephants<sup>5</sup>, White-cheeked Gibbons (*Hylobates leucogenys*), Tigers (*Panthera tigris*)<sup>6</sup>, Sun Bear (*Ursus malayanus*) and Benteng (*Bos javanicus*). These species now appear to be close to localised extinction (DFRC *et al.* 2010). Twenty two bat species (*Hipposidideros*) are present. A total of 153 bird species have been recorded, including the Green Peafowl (*Pavo muticus*), which is considered close to localised extinction. Twenty six amphibian

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<sup>4</sup> Estimating the value of the harvested resources is beyond the scope of this report.

<sup>5</sup> Status of the wild elephant population in the PKK is questionable. For example, information from the PKK Management Office and the Ban Na Community-based Ecotourism Service, suggests there have been no signs of wild elephants spotted in the area of its usual range since 2012.

<sup>6</sup> Presence of tiger in the PKK was not confirmed in previous surveys (see Duckworth, W. et al., 1999).

species were recorded including 3 frog species, 5 turtle species, 9 lizard species, and 9 snake species.

As stated in the PKK NPA Management Plan (DFRC, et al., 2010), wildlife of international conservation significance found in the NPA include Elephants, two Bear species, White-cheeked Gibbon, Langur sp., Dhole (*Cuon alpinus*), Green Peafowl (*Pavo muticus*), Pheasant (*Lophura sp.*)<sup>7</sup> and Coral-billed Ground Cuckoo (*Carpococcyx renauldi*). A list of mammals and birds recorded in PKK NPA is shown in Table 1.

Table 1: List of selected mammals and birds in the PKK NPA

Common Name	Scientific Name	National Priority	Global status	Risk Status in Lao PDR
<b>Mammals</b>				
Pig-tailed Macaque	<i>Macaca nemastrina</i>	-	VU	PARL
Rhesus Macaque	<i>Macaca mulatta</i>	-	GNT	PARL
Phayre's Langur	<i>Semnopithecus phayei</i>	INP	DD	ARL
White-cheeked Gibbon	<i>Hylobates leucogenys</i>	HNP	DD	PARL
Yellow-cheeked Crested Gibbon	<i>Hylobates gabriellae</i>	INP	DD	LKL
Dhole	<i>Cuon alpinus</i>	HNP	VU	ARL
Bear species	(Two species)	-	-	-
Hogbadger	<i>Arctonyx collari</i>			LKL
Clouded Leopard	<i>Pardofelis nebulosa</i>	HNP	VU	ARL
Asian Elephant	<i>Elephas maximus</i>	HNP	EN	ARL
Sambar	<i>Cervus unicolor</i>			PARL
East Asian Porcupine	<i>Hystrix brachura</i>	-	VU	-
<b>Birds</b>				
Siamese Fireback	<i>Lophura diardi</i>	-	VU	PARL
Green Peafowl	<i>Pavo muticus</i>	HNP	VU	ARL
Red-collared Woodpecker	<i>Picus rabieri</i>	-	VU	-
Coral-billed Ground Cuckoo	<i>Carpococcyx renauldi</i>	-	GNT	-
Water cock	<i>Gallicrex cinerea</i>	INP	-	ARL
Purple Swarmphen	<i>Porphyrio porphyrio</i>	INP	-	ARL
Grey-headed Lapwing	<i>Vanellus cinereus</i>	-	GNT	PARL

<sup>7</sup> The species in question known to present in PKK NPA is Siamese Fireback (*Lophura diardi*) per Duckworth *et al.*, 1999, and the information of the PA Management Unit, Dept. Forestry.

Purple Heron	<i>Ardea purpurea</i>	-	-	PARL
Yellow-vented Warbler	<i>Phylloscopus cantator</i>	-	GNT	-
Rufous-throated Fulvetta	<i>Alcippe ruficapilla</i>	-	GNT	LKL

Source: Adapted from DFRC et al., 2010; priority ranking based on Duckworth et al., 1999. Priority codes: HNP – high, INP – medium. Global status categories: VU – Vulnerable; GNT – Globally Near Threatened; EN – Endangered; DD – Data Deficient. National Risk Status: ARL – At Risk in Lao PDR; PARL – Potentially At Risk in Lao PDR; LKL – Little Known in Lao PDR.

While detailed information on flora diversity in the PKK NPA is unavailable, about 60% of the approximately 800 species of orchids in Lao PDR can be found there<sup>8</sup>, demonstrating a high level of plant diversity.

## Green Peafowl species conservation

The PKK NPA portion which is the main habitat of the Green Peafowl lies within Xaythany District, Vientiane Capital Province. The habitat extent is estimated to be approximately 8,000 ha (Vientiane Capital PONRE and PKK NPA Management Office, pers. comm., 2014)<sup>9</sup>, located along the PKK NPA’s southwestern boundaries. Past surveys estimated the number of birds at around 20-30 individuals (DFRE *et al.*, 2010). However, the actual number remains unknown/highly uncertain<sup>10</sup>. The estimation of the Green Peafowl population is highly speculative given the lack of a thorough recent assessment.

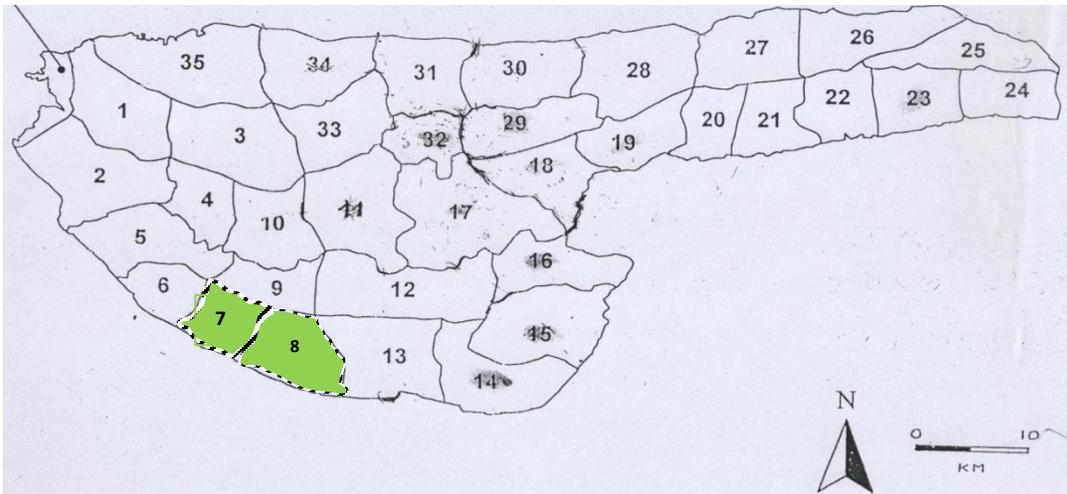
For management purposes, the PKK NPA is divided into 35 sub-zones. Green Peafowl habitat is found in zones 7 and 8, as shown in Figure 3.

Figure 3: PKK NPA Management Zones

<sup>8</sup> <http://news.destination-asia.com/2013/08/growing-attraction/>

<sup>9</sup> Consistency of the actual bird area is open to confirmation. Thus, based on a report of the PKK NPA Management dated August 1998, where about 7 sq. km (i.e., 700 ha) of the habitat has been marked out whereas a recent PKK survey (2013) of the bird area puts the habitat range at 25 hectares (which is possibly far too small).

<sup>10</sup> A survey in 2013 by PKK NPA Management reported only 2-3 individuals were encountered although information from local interviews preceding the field survey suggested 4-5 birds, chicks and an adult female bird.



Map source: Adapted from PKK NPA Management, Green Peafowl habitat zone indicated.

There are eight villages included in the Ban Xang cluster (*Kumban*) located in the surrounding area of the PKK NPA, of which seven are located close to the habitat of the Green Peafowl (Chittaphone, pers. comm., 2014). Stakeholder discussions revealed that these villages, especially Nakhay Village and three others, make direct use of the resources within the habitat. Activities include the collection of bamboo shoots, edible leave and traditional medicinal plants. .

## Threats to the bird

The main threats to the Green Peafowl in the PKK NPA are uncontrolled annual forest fires<sup>11</sup>, which destroy the bird's habitat, followed by habitat disturbance through villagers located a distance away (Keo-Athone, pers. comm., 2014). A survey by the PKK NPA Management's Forestry Technical Division in 2013, however, reports hunting as among the direct threats to the bird in addition to habitat disturbance (PKK NPA Forestry Technical Division, 2013). Also, formerly egg collection by the locals for home hatching for commercial purpose was reported. That practice has ceased primarily due to awareness raising campaigns conducted by the PKK NPA Management, but also because

<sup>11</sup> According to the PKK NPA Management officials, forest fires occur out of careless people who enter and make fire in the forest as well as from discarded cigarette stubs.

of the introduction of a fine of LAK 300,000 per egg taken (approx. USD37.3, at current value) (PKK NPA Management officials, pers. comm., 2014).

## **6. Other land uses**

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The habitat of the Green Peafowl is used for nature tourism and as a picnic destination given its landscape beauty. A small-scale tourism operator offers trips to weekenders or to people visiting the site on festival holidays such the Lao New Year. According to the PKK NPA management officials, there is a great potential for the use of the Green Peafowl as a tourist attraction. However, while the extent of current tourism is unknown, it is important to ensure that it will not destroy the very resources and natural attractions upon which it is based. Involvement of the tourist operator in a management scheme could be explored. A study conducted in the PKK NPA (Sirivongs, K., nd) shows that when people support and benefit from protected area tourism they are also keen to participate in protected area management activities.

## **7. Administration**

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The area of the PKK NPA, which is the habitat for Green Peafowl, is located administratively in Xaythany District of the Vientiane Capital Province. Within this District, the Ban Xang village cluster of eight villages (*Kumban*) encompasses the area. There are seven villages within the zone of the Green Peafowl habitat (Chittaphone, pers. comm., 2014). The office of the village cluster is located in Nakhay Village. All villages of the cluster gather there for meetings to decide on important issues concerning all villages in the cluster.

## 8. Population

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There are more than 50,000 people living in the 72 villages<sup>12</sup> in and around the PKK NPA. The ethnicities of those people include Lowland Lao (Lao Loum), Khmu of the Mon-Khmer ethno-linguistic family, and Hmong and Iu Mien of the Hmong-Mien ethno-linguistic family. As part of the current research, information on the population in the villages adjacent to the zone of Green Peafowl has been updated with the heads of the eight villages concerned, whose number stands at 8,211 inhabitants. At least four villages with a total population of 5,684 inhabitants are located in close proximity to the Green Peafowl habitat. A list of the concerned villages with their population is given in Table 2.

Table 2: Basic data of the villages located in proximity to the Green Peafowl zone

Village	Population	Literacy rate	Main occupations
Nakhay*	2,579	90%	Paddy rice cultivation
Na Ngom Kao	1,248	100%	Paddy rice cultivation
Na Ngom Mai	573	c. 90%	Paddy rice cultivation
Na Khanthung	1,284	100%	Paddy rice cultivation
Na Tanh	1,016	90-95%	Paddy rice cultivation
Hua Khua	340	>80%	Paddy rice cultivation
Phonh Pheng	315	99%	Paddy rice cultivation
Hua Na	856	100%	Paddy rice cultivation
Total population	8,211		

Source: Village heads interviews (2014); \*PKK NPA Management survey's figure.

Two important features characterize the people of these villages :

- (1) the local residents rely fully on paddy cultivation, implying that forestland clearing for agriculture is not the main livelihood activity of the people living adjacent the PKK NPA; and,
- (2) the literacy rate of the local residents is high.

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<sup>12</sup> A discrepancy occurs in the actual number of villages where the numbers reported vary between 72, 75 and 78 villages; also the overall population data seem outdated as they are based on the 2007 data.

## 9. Land tenure

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It is worth noting that, while the existence of villages inside NPAs is recognized by the State if their existence pre-dates the establishment of the NPA system, permanent land tenure of the residents is not given. The villages are only issued rights to use land that will be revoked upon abandonment (DFRC *et al.*, 2010). This applies to the villages inside the PKK NPA. For other villages located adjacent to the PKK NPA, land tenure certificates have been issued. According to the land allocation process, allocated village land consists of:

- agricultural land, including areas for agricultural expansion;
- concession land;
- construction land;
- cultural land (including spiritual, cemetery, religious and sacred land);
- conservation forest/protected area;
- production forest/village use forest;
- reforestation/regenerating forest areas;
- plantation land; and,
- industrial land, road construction land.

The extents of these land types in the concerned villages remain to be gathered, including information on any customary land tenure.

## 10. Threats to the environment

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The PKK NPA Management Plan (2010) lists the following direct threats to the PKK NPA:

- in-migration for settlement inside the PKK NPA;
- slash and burn cultivation close to the enclave villages (including encroachment on the land);
- (widespread) hunting;

- (frequent) forest fires;
- un-managed livestock grazing;
- illegal logging/timber cutting;
- (unsustainable) NTFP harvest; and
- infrastructure development.

These activities lead to habitat degradation and loss of biodiversity. Causes of these threats include trade, which provides incentive for illegal logging and wildlife poaching, low awareness among the population and the PKK NPA management staff, population growth coupled with limited livelihood options for the local population who continue practising slash and burn farming and limited institutional capacity (DFRC *et al.*, 2010).

Threats to the Green Peafowl, which are the focus of this research, are described more specifically in Section 5 above.

## **11. Existing management strategies and actions**

The management of the PKK NPA as a whole, including the Green Peafowl habitat, is the responsibility of the Phou Khao Khouay-Phou Phanang NPA management division of the Ministry of Defence. General patrolling is carried out on a weekly basis focusing primarily on forest fires, timber cutting and partly on hunting inside the PKK NPA. The PKK NPA Management Plan covers the management of the whole reserve. The first management plan was prepared in 1999 with the support of an external advisor. Major management activities undertaken included wildlife surveys, NPA boundary demarcation with the erection of boundaries posts (86% completed) and regular patrolling (DFRC *et al.*, 2010). Within the plan's timeline and given the presence of the Nam Leuk hydropower plant's operation, there was an agreed commitment of the developer/power generator, Electricité du Laos (EdL), to contribute 1% annually from its power export revenue to the management of the PKK NPA. The first such a payment was received in 2001, however subsequent payments had been much reduced in amount. EdL attributed this reduction to the reduced export of electricity in favour of domestic use (Kyophilavong & Tsechalicha, 2011). With reduced financial resources, management

was limited to patrolling. Recently, a new arrangement was reached with EdL to provide LAK 100 million (c. USD12,500) per year from both Nam Leuk and Nam Mang 3 hydropower schemes for the management of PKK NPA through the EdL-Generation shareholding channel (Keo-Athone, pers. comm., 2014). The current Management Plan was prepared in 2010 and outlines general management actions to be taken for the whole PKK NPA. It will be updated in 2015.

Given that the focus of this research report is the protection of the Green Peafowl, the general NPA Management Plan actions will not be discussed in detail unless they are specifically relevant to the bird. There is no specific written management plan or strategy and actions for the protection of the Green Peafowl, and thus no specific budget is allocated to that goal (PKK NPA Management officials, pers. comm., 2014). Despite mentioning that the Green Peafowl habitat is considered a special conservation zone as well as a local sacred site, the PKK NPA 2010 Management Plan gives no specific management details of the site.

Specific conservation activities including a historical background, are summarized below (Duangvilay and Parr 1999):

- In 1992, a population of Green Peafowl was discovered in the Nakhay Village by PKK NPA staff;
- In 1993, an agreement was reached among the local residents and the then Centre for Protected Areas and Watershed Management of the Department of Forestry to establish a Peafowl Conservation Group. The aim was to protect the bird through the undertaking of patrols and reporting illegal activities to the PKK NPA authorities;
- In 1997, PKK NPA authorities and members of the Peafowl Conservation Group marked out the tracks, trails and habitat of the bird using GPS technology;
- In 1997, PKK NPA authorities received funding from the Canada Fund for a two-year project (US\$ 19,000). The project consisted of three sections as follows and successfully completed:
  - A small sub-station was built in Nakhay Village to maintain the PKK NPA periphery centrally within Xaythany District (of the bird's habitat range);

- A nursery was established in Nakhay Village to propagate fruit tree seedlings for distribution to the local residents for planting (in order to supplement their income);
- Continuing surveying of the Green Peafowl habitat – the surveys showed almost ‘certainly a viable population, may be becoming habituated and may be increasing’. Data of the Green Peafowl population were submitted for inclusion in Red Data Book for Asian Bird Species being collated in Cambridge, UK.
- Building on the above success, in 1999, PKK NPA Management received funding (USD16,380) for a two-year project from the Canada Fund. The focus was to continue on the orchard demonstration work in view of the integrated conservation and development concept. It also provided preliminary financial assistance to the villagers to create a revolving fund as well as to continue Green Peafowl surveying.

Ever since the end of the two-year project in 2001, no activities specifically targeting Peafowl protection have been undertaken. According to PKK NPA Management officials, current management action, especially patrolling, is carried out weekly as general routine management activities, focusing on timber extraction. The reason for not being able to conduct more focused Peafowl monitoring/protection is a lack of budget, field equipment (including GPS devices) and technical staff, many of whom have been re-assigned elsewhere over the years (Keo-Athone, pers. comm., 2014).

## **12. Possible management actions**

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A pre-requisite for success of any conservation action is the full cooperation from all stakeholders, in particular the villagers who live in close proximity to the habitat of the Green Peafowl. Possible management actions specific to the protection and enhancement of the Green Peafowl population and its long term existence include:

- Enhanced patrolling of the habitat and surrounding area to prevent forest fires and hunting/trapping directly impacting the bird.

Enhanced patrolling of the habitat will be a priority activity of the intervention, aimed primarily at preventing habitat destruction/degradation caused by frequent forest fires and opportunistic hunting. This action can be effective as the success of preventing forest fires and hunting can be measured by the reduction or elimination of fire incidents and reduced cases of hunting inside the habitat. In addition, enhancing patrolling can be an effective tool to track other disturbances such as illegal tree cutting and/or destructive harvesting of NTFPs deemed to impact on the habitat. This action will involve local participation to a maximum extent possible to ensure both conservation outcomes and livelihoods improvements for local people. A case study found that about 80% of respondents were very keen to participate in the management of the PKK NPA. Among their motivations, responsibility to protect the local natural environment was prominent (Sirivongs, K. and Tsuchiya, T., 2012).

- Zoning the core area and restricting public access to reduce habitat degradation and other negative impacts.

For the effective protection and conservation of the Green Peafowl, zoning of the habitat (an idea shared by some village headmen) is necessary to prevent encroachment onto the bird's core habitat area. Zoning is important in the context of public use/visitation of the site and surrounding area. The core habitat area needs to be protected. Zoning could include a strictly protected zone, a restricted use zone and a public use zone to be clearly demarcated on the ground. A strictly protected zone could be the Green Peafowl's core breeding zone; a restricted use zone is to be delineated for use by education, research and carefully managed tourism. A public use zone will be delineated mainly along the habitat periphery where mass tourism is expected, as currently experienced during festival events. Mass tourism will not necessarily involve visits to enjoy the presence of the Green Peafowl but will invariably impact on its habitat if the zones are not clearly defined and enforced.

- Awareness campaign on Green Peafowl protection and enforcement of conservation rule and regulations.

Up to now the PKK NPA Management has increased the awareness for Green Peafowl protection. However, conservation and awareness campaigns should continue to be

carried out. The activities could include awareness on participatory patrolling and monitoring, producing/updating rules and regulations on Green Peafowl protection, law enforcement training and production and dissemination of promotional materials.

- Captive breeding for re-introduction of the Green Peafowl.

A captive breeding program could be initiated if the Green Peafowl population is expected to be unviable. Re-planting/rehabilitating feeding plants to reduce the scarcity of food sources for the Green Peafowl could be considered.

- The engagement of villagers in the PES scheme as environmental service suppliers would improve their livelihoods and might reduce the extractive use of the habitat resources, which negatively impact on the Green Peafowl and other species.

The proposed PES scheme is not a rural development project in its own right, however it is the Lao Government's stated preference that protected area management in Lao PDR is most suitable if carried out using an Integrated Conservation and Development (ICAD) approach (Government of Lao PDR, 2005; Robichaud, W. et al., 2001). This is in view of people's dependency on the resources of protected areas as well as fostering their participation. Community support to the villages surrounding the Green Peafowl habitat could be considered. Support may include a continuation of the previous fruit tree plantation initiative that was funded by the Canada Fund during the period 1997-2001. Other viable community livelihood support activities that could reduce the threats to the habitat of the Green Peafowl could be explored.

## 13. Conclusion

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Protection of the Green Peafowl in the PKK NPA is considered important to save the species from possible localized extinction and to support recreational use of the PKK NPA. Accomplishing this task will require Green Peafowl habitat to be protected through a well-designed management and patrolling system with the participation of local villagers. A key requirement of an integrated approach to management is the development of an economic, incentive-oriented approach to facilitate participation and cooperation in the enforcement of management rules and regulations for the protection of the habitat and enhancement of the bird population. This could be achieved through the implementation of a PES scheme.

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